Alaska Oil Spill Curriculum

Grades K-3, 4-6, and 7-12

Updated 2007
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Alaska Oil Spill Curriculum

Updated 2007

Published by Prince William Sound Science Center
and Prince William Sound Regional Citizens’ Advisory Council
in conjunction with Prince William Sound Community College
Sections in this Curriculum

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Alaska Oil Spill Curriculum Evaluation

Curriculum is available online at www.pwsreac.org/outreach/education.html
Alaska Oil Spill Curriculum Introduction

The Alaska Oil Spill Curriculum was originally created in 1990 after the Exxon Valdez Oil Spill (referred to in the curriculum as “the spill.”) The 20th anniversary of the spill is in 2009, and a major concern now is complacency. To combat this we continue to upgrade this curriculum for use in the schools and we invite comments and additions. We hope everyone that uses this can learn lessons from this tragic spill so that it never happens again.

This curriculum does not concentrate on the oil spill, but rather on the positive steps that everyone has made and can make to help prevent future spills, and to reduce the need for oil by energy conservation and recycling. It is important to look at uses of oil in our own communities – so waters close to our homes are not contaminated.

The curriculum provides hands-on experiences to connect events with their consequences. We hope you will experience the joy of being part of this fragile planet as well as explore the responsibilities we have for its well being.

It is organized in three sets: Grades K-3, 4-6, and 7-12, each with its own table of contents. They are all available at no cost from the Prince William Sound Regional Citizens’ Advisory Council website (http://www.pwsrcac.org/outreach/education.html#curric). Subjects covered are science, social studies, language arts, mathematics, economics, technology, engineering, consumer science, art, music, and geography. Each lesson includes extensions at the beginning. In the appendices you will find listed other resources on these subjects. Teachers can use them to amend or enhance each lesson. Appendix A contains some articles courtesy of the Anchorage Daily News and others.

We have tried to make the curriculum objective with exciting activities. We welcome your suggestions, and if you are interested in having someone from the Prince William Sound Science Center or the Prince William Sound Regional Citizens’ Advisory Council present some of this curriculum to teachers or students, contact us via information on our websites.

Disposing of Oily Waste

Some lessons in this curriculum suggest using motor oil for in-class experiments and educational demonstrations. For proper disposal methods of oil, contact your local landfill manager for guidelines. The following sites also offer information about disposal and recycling of oil and other hazardous wastes.

Environmental Protection Agency (EPS) Wastes
http://www.epa.gov/osw/

Anchorage Municipality Hazardous Materials Management
http://www.muni.org/sws/hazardouswaste.cfm
“I hope that we can all learn from this tragedy and work together to protect our jobs, wildlife, and natural heritage.”

Steve Cowper, Governor of the State of Alaska 5/4/89

“It is too shocking to understand. Never in the millennium of our tradition have we thought it possible for the water to die. But it is true. …what we see now is death. Death – not of each other, but of the source of life, the water. We will need much help, much listening in order to live through the long barren season of dead water, a longer winter than before…We have never lived through this kind of death. But we have lived through lots of other kinds of death. We will learn from the past, we will learn from each other, and we will live.”

Walter Meganack, Sr., traditional chief of Port Graham

“To trace on a map the tortured routes of the oil spilled from the Exxon Valdez is to appreciate the vulnerability of every coastline on earth as supertankers of 500,000 deadweight tons and more carry crude oil to market.”

Walter B. Parker, chairman, Alaska Oil Spill Commission 1/5/90

“On Good Friday, every citizen of Alaska suffered a tragic loss, including the more than 800 employees of Alyeska…What is going to be done is to attempt to see to it that this doesn’t happen again, in Alaska or anywhere else in the United States…Government and industry together can cooperate to prevent a repetition of the Exxon Valdez spill and its consequences…We at Alyeska are committed to the path which leads to cooperation and achievement.”

George Nelson, Alyeska President, The Anchorage Times

“One pint of used oil can produce a slick approximately one acre in size, and only one part per million (1ppm) contamination will spoil the taste and odor of drinking water. At this ratio, it would take just 1 pint of oil to noticeably contaminate 125,000 gallons of drinking water. That’s more than 15 people drink in a lifetime…A study done for the U.S. Environmental Protection Agency reported that in 1983, 350 million gallons of used oil were disposed of improperly in the United States. This means that in one year alone, almost 32 times the amount of oil spilled in Prince William Sound was disposed of in environmentally harmful ways nationwide. Crankcase oil drainings have been reported to account for more than 40% of the total oil pollution of US harbors and waterways.”

Dennis Kelso, Commissioner, AK. Dept. of Environmental Conservation

“If you convinced two people to do something for the environment, and the next day they convinced two people, and so on, it would take less than a month to get everyone in the U.S. to take action.”

National Wildlife Federation Wildlife Week Poster 1990
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DEVELOPED BY: Belle Mickelson

EXTENSIONS: Geography & Language Arts

DURATION: Three 30 minute periods

OBJECTIVES: Students will discuss the Exxon Valdez oil spill and other spills. Students will begin student or class journals as they plan for a visit (imaginary in most cases) to south-coastal Alaska. Students will collect articles and pictures about oil spills and other energy issues.

BACKGROUND: Good Friday, March 24, 1989, the tanker Exxon Valdez hit the rocks of Bligh Reef spilling 11 million gallons of oil on the waters of Prince William Sound. The oil continued on down the coast eventually touching over 1,000 miles of beaches including those of the Alaska Peninsula and Kodiak Island. Exactly what happened varies with the news source. In this activity students will begin individual or class journals reflecting on their feelings about the oil spill - and their hopes for the future. Younger students may want to draw a series of pictures for their journal, written on the board or on posterboard by the teacher, then copied onto regular paper. The class text can be xeroxed and stapled onto their pictures.

PROCEDURE:
1. Warm-up: Ask the students if they have ever heard about the Exxon Valdez oil spill. Show students the Alaska Fish and Game “Special Oil Spill Issue” if available, or a sample of magazine pictures, articles or books about oil spills (see appendices at end of curriculum). Note differences in the reports of what actually happened.

2. Announce a “trip” to Prince William Sound to see what is going on this year. Read the

MATERIALS:

☐ News clippings
☐ Magazine articles
☐ Videos on the Exxon Valdez oil spill
☐ Other materials available in your local library, museum, or news service.
☐ Paper and covers or notebooks to make journals.
☐ Markers and/or colored pencils
☐ Map of Alaska
☐ Blackboard
☐ Bulletin board
☐ Alaska Fish & Game “Special Oil Spill Issue”
☐ “Adventures of Ranger Rick,” Ranger Rick March 1990, pg. 29-32
**INVESTIGATING OIL SPILLS**

*Ranger Rick* article about Rick and the gang’s visit to Alaska one year after the big oil spill. Then begin student or class journals about the trip. Have students draw or write their first impressions of the spill.

3. Introduce the video *Voices of the Sound* made by Mike Lewis and David Grimes shortly after the spill happened. Footage by Joel Bennett at the beginning shows the beauty of Prince William Sound and its wildlife. The film was made for adults - but has been shown very successfully in elementary classrooms. Terms to mention beforehand include CDFU (Cordova District Fishermen United) whose role in the spill is described in an article in the back of the curriculum. Have the students point on the map to the Prince William Sound communities. Cordova is a fishing community; Valdez has oil and tourism industries in addition to fishing; Whittier has tourism and fishing; Chenega and Tatitlek are Native fishing communities which depend upon subsistence hunting and fishing. Outside the Sound, impacted communities include Kodiak, the country’s largest fishing port, Seward, Homer, Seldovia, Port Graham, and English Bay on the Kenai Peninsula, and other small villages along the Alaska Peninsula. Ask the students how they would feel if their beaches (ocean, rivers, lakes) were oiled?

4. Then show *Voices of the Sound* to see how the Cordova fishermen and women felt. Have students write or draw their impressions in their journals.

5. **Wrap-up:** Encourage students to clip current event pictures/articles about oil spills in their state and in other countries around the world for a class bulletin board.

**EXTENSION:**

1. Geography/language arts: Write letters to foreign newspapers asking for articles about the Exxon Valdez oil spill — and oil spills in their country. Research in your library/museum for articles about spills around the world.

2. Language Arts: Invite a reporter into class to describe investigative journalism/reporting. Ideally, interview a reporter who worked on the spill or watch video footage made by a news team such as *America’s Biggest Oil Spill* (see appendices).
THE WEB OF LIFE

Adapted from: 4-H Earth Connections, by permission of the University of Maine Extension Services.

EXTENSIONS: Writing & Social Studies

DURATION: 15-20 minutes

OBJECTIVE: Students will participate in a game that shows how parts of natural communities and ecosystems are interdependent.

BACKGROUND: The Exxon Valdez oil spill destroyed many marine habitats and ecosystems found in Prince William Sound and southcoastal Alaska. Many animals, birds and marine life were affected. This activity will help students to understand how important habitat is to wildlife, and how ecosystems depend upon all components for their survival.

PROCEDURE:
1. Warm-up: Have the children discuss people in their community. Who are they? What role do they play? How does their work help others in the community? After you have compiled a thorough list, examine the interdependence among them. Discuss the implications if people do not fulfill their roles (i.e. grocers shutting their stores = harder to acquire food).

2. Have the children stand in a large circle. Explain that the game they are going to play shows how parts of natural communities and ecosystems depend upon each other.

Ask: “What’s the source of all energy on earth?” (The sun). Have a child be the sun and hand her/him the ball of yarn. Then ask: “What depends upon the sun to make food?” (plants). “Can anyone name a plant?” Have the sun toss the ball of yarn to the plant-child, while holding onto one end. Then ask who is dependent on this plant (for food, shelter, warmth, building material, protection, etc.). When a child answers, have them explain their connection. Continue connecting the children with the yarn as their interdependence and relationships emerge. Have ecosystem parts in the web (soil, water, air, decomposers, animals, people, etc.).
3. Have the children pull up the slack and raise the web above their heads and look through it. Bring the web back down, warning them to hold on tightly to their yarn.

4. **Wrap-up:** Pluck on the yarn and note how strongly connected everyone is. Then introduce a threat to the web (such as an oil spill). Have the affected individuals drop the yarn. Has anyone else’s yarn become loose? If so, have them let go also. Continue the process until everyone is unconnected.

**EXTENSIONS:**

1. **Writing:** Have students make journal entries following this activity.

2. **Social Studies:** Repeat activity for “Web of Life” at home, at school, and in your town.
MICRO HIKE

Adapted from: 4-H Earth Connections, by permission of the University of Maine Extension Services

DURATION: 45-60 minutes

OBJECTIVES: Students will build a miniature nature trail. Students will understand that shelter, space, air and water are essential ingredients for large (trees, moose) as well as small (worms, mites) organisms.

BACKGROUND: This activity is meant to encourage students to look closely at the environment around them, increasing their awareness and perception of the space around them. Tell students that the small organisms and creatures are usually the ones that get overlooked when we think about impacted animals and the environment, yet they are essential to the larger organisms, as well as smaller ones. Right now scientists in Alaska are getting down on their hands and knees - just like students will be in this activity. Scientists are using hand lenses and microscopes to study the effects of the oil spill. Encourage students to be scientific observers of their own micro habitats.

PREPARATION: When looking for a suitable site, choose one with a diversity of ground cover, but avoid one with thick vegetation. Prepare sets of 20-foot sections of yarn and popsicle sticks for every two students.

PROCEDURE:
1. Warm-up: Have the children sit near the micro-hike site and imagine what the world would look like if they were only an inch tall. Have them think about how huge their school, house and parents would be.

MATERIALS:
- One 20-ft length of string or yarn for every two students
- 8 popsicle sticks for every two students
- Scratch paper
- 1 Bug cube or magnifying glass (optional)
- "Magic Dust" pouch
2. Explain that there are many creatures and plants that are only an inch tall. Ask the children to find one where they are sitting. Share some of the findings. Explain that they will discover and explore the miniature, natural world.

3. Using guided imagery or a short fantasy trip, bring the children into the miniature world. Bring out your special “Magic Dust” pouch and explain that the magical dust will make them all small. Quietly tell the children to lie back and close their eyes. (The dust will not work if they peek). As you spread the dust on them, speak quietly and slowly. Explain that they are getting smaller and smaller (use your creativity to set the scene).

4. Have them open their eyes slowly and examine the ground. What kinds of plants and animals can they see now? Slowly crawl to the micro-hike site, preparing the children for observing closely.

5. Ask the children if they’ve ever been on a nature trail. What did it look like? (A trail with markers). Explain that they are going to build a nature trail, only with very small things. Provide a few examples (broken egg shell, ants, beetles, colored sand grains, etc.).

6. Divide the naturalists into pairs and give each the string (for the nature path) and popsicle sticks (for trail markers). Set a 40-yard radius boundary and send each group out (on hands and knees) to create their trail. Encourage them to think of a catchy title for their micro-trail (i.e. The Great Ant Parade). Note: With older children, you can have them write out a brief trail guide. Give them 15 minutes for trail making, reminding them they are only an inch tall. Supervise their work on hands and knees, making sure they understand the micro-nature trail concept.

7. Have each pair lead the group down their trail on hands and knees, interpreting points of interest. (Note: Magnifying glasses or bug boxes will help the children appreciate the uniqueness of each find. See Richard Headstrom’s, Adventures With A Hand Lens).

8. **Wrap-up:** Tell the students that at the snap your fingers they will suddenly be full size. Briefly review the discoveries of the micro-nature trails. Ask: “What do these plants and animals need to live?” (Food, water, air, shelter, living space). How do they get these things? Did you like being small? What did you learn? Point out that small creatures meet their survival needs the same way large ones do. What might happen if oil were spilled on you and your home? What would happen if hundreds of people suddenly came and walked all over your home? What if they sprayed water all over your backyard? This is what the oil spill clean-up workers did to the beaches of southcoastal Alaska when they used hot and cold water clean-up techniques. If possible, take a trip to the beach and do a micro-hike so you can see how the intertidal life can be affected by spills and excess foot traffic. Imagine the effects of the oil spill and the effects of the clean-up workers on the beach animals.
Adapted from: 4-H Earth Connections, by permission of the University of Maine Extension Services.

EXTENSIONS: Science & Social Studies

DURATION: 20-30 minutes

OBJECTIVE: Children will learn the four components of an ecosystem by participating in a choral activity.

BACKGROUND: Ecosystem Chorus is a good lead-in activity for studying any ecosystem in-depth because it introduces key living and non-living components. Number of Participants: minimum 20, maximum 50.

PROCEDURE:

Warm-up: Lead a song familiar to all (i.e. Old MacDonald). Define chorus (group of singers). Sing the song again and take away a few boy singers. What happens? Ask students to think about this when they do their activity. Ask them which parts are more important than others? Try to get them to understand that all parts are equally important. Tell them to keep these thoughts in the back of their mind as they do the activity.

2. Ask: “Can someone name something that is not alive today, has never been alive and will not be alive in the future?” Have the child who answers first go to the middle of the circle. Ask for another non-living element and continue to ask until water, air, soil and sunlight have been identified. Have these children stand together. Explain that these non-living factors are the foundation and pulse of the ecosystem. Have the children begin humming quietly.

3. Ask the remaining children: “What’s green, moves very, very slowly, eats up all the sunlight it can get, and makes food?” (plants). Continue to ask for types of plants (producers) until a sizable number of children are chosen. The largest group of living factors should be plants, since they produce the food and support the animals. Have the plants form a circle around the non-living factors, which they depend on for their survival. Explain that plants use the non-living factors to produce sugars (food) and grow. Quietly have the “plant-children” practice their part in the chorus “Grow, grow, grow.”

MATERIALS:
[] Old blanket(s)
4. Ask the remaining children to describe or name some creature that consumes plants, animals or both (animals). Have these children form a loose circle around the producers. Animals eat plants and other animals, and they do it noisily. Have the “animal-children” practice their part loudly in the chorus: “Crunch, munch, crunch, munch.”

5. Ask the children whether plants and animals live forever. “What happens to them, do they just keep piling up and up?” Be creative - describe a world without decomposers (nature’s garbage cleaners and recyclers). Have the remaining children become decomposers by having them name a few (mushrooms, fungi, slime molds, bacteria). Have the decomposers form a circle around all the other ecosystem components and practice their part in the chorus: “Rot, rot, rot.”

6. Have all the children practice their parts in the following order: Non-living factors (air, water, sunlight, soil/rock) = “Hmmmmmmmmmm.” Living factors (producers) = “Grow, grow, grow.” Consumers = “Crunch, munch, crunch, munch.” Decomposers = “Rot, rot, rot.” Keep the chorus going by directing all the parts to get louder and louder, then softer and softer.

7. Introduce a pollutant, oil, to the ecosystem chorus. Use an old blanket(s) to represent oil. Explain that when oil first gushed out of the tanker Exxon Valdez, it was like many blankets on the water. The oil covered rocks, animals, plants, decomposers. Cover victims with blankets.

After awhile the oil broke up into tar balls (roll up blanket) and mousse (blow air into blanket so it expands).

Have students try to continue chanting the chorus while some “victims” are covered with the blanket(s). Does it sound the same?

8. **Wrap-up:** Ask: How did the chorus sound before a pollutant was added? Explain that, like a chorus, an ecosystem may appear to have no order and make little sense. Only after examining nature closely does order emerge. Further explain the same non-living and living factors can be found in any ecosystem. However, they have unique forms and play different roles in sustaining the ecosystem.

**EXTENSIONS:**

1. Social studies: Role play people coming to clean up the ecosystem.

2. Science: Introduce other pollutants (i.e. garbage, plastic bags, etc.) How does its’ presence affect the living parts of the ecosystem? How do we resolve the problems pollutants cause?

**VOCABULARY:** Chorus, ecosystem, producers, consumers, tarballs, mousse, and decomposers.
HABITAT MODELS

BY: Bonnie Jason

EXTENSIONS: Sharing, Math, Language Arts, Art & Science

DURATION: 3 hours, can be divided into short sessions

OBJECTIVES: Students will construct a habitat model for a chosen animal habitat and its habitat requirements. Students will be introduced to the concept of habitat and habitat requirements. Students will consider the effects of oil on their habitat.

BACKGROUND: This is an activity designed to introduce the concepts of habitat and habitat requirements. The construction of models is merely a way of helping to make these concepts more concrete. The materials listed are suggestions. Feel free to have the children use whatever you have available or, if you are feeling courageous, have them use clay or paper mache. Use the Alaska Fish and Game "Special Oil Spill Issue" to provide background on the effects of oil on habitats.

PROCEDURE:
1. Warm-up: Begin the lesson with a whole group brainstorming session. Choose an animal that the children know very well, for example, an eagle. Write this on the board or easel. Ask the children what an eagle needs to stay alive. Feel free to prod them with questions such as: what does an eagle do if it gets thirsty? or, where have you seen eagles? As they call out their ideas write them down in the following categories: food, shelter, water.

2. After a list has been developed ask the children what similarities they see in the items within each group. Introduce the terms food, shelter and water as requirements for all animals. Through leading questions or discussion, help them to understand that these habitat requirements must be in the proper arrangement to be useful to the animal.

MATERIALS:
- Drawing paper
- Pencils/pens/markers
- Large pieces of corrugated cardboard (for models foundation)
- Miscellaneous construction items such as:
  - Popsicle sticks
  - Pipe cleaners
  - Construction paper
  - Cardboard scraps
  - Tissue paper
  - Egg carton
  - Wood scraps
  - Felt pieces
  - Yarn
  - Glue/tape
- Worksheet: Habitat Registration Form
3. Break the class into small groups. Instruct each group to choose an animal. It must be one with which they are very familiar, preferably one found locally. Tell the groups that they are going to construct a model of their animal’s habitat. They must be certain that the habitat includes all of the requirements needed. First they should sketch a draft of their habitat on drawing paper. Have resources available so that children can research their animal to get more information.

4. Once they have completed this drafting process they may use the materials you have provided to construct their model.

5. Answer questions from the Habitat Registration Form to see if they meet the habitat requirements. Tour other group’s habitats.

6. **Wrap-up:** Ask what happens when oil is introduced to an animal’s habitat. Have some students introduce oil to their habitat model using black paint or construction paper. How does this affect the habitat? Does it look pretty anymore? What about the animals and plants in the habitat? What will happen to them? Answer these questions in the class journal or make up a poem to display with the models.

**EXTENSIONS:**

1. **Sharing:** Have the children display their models in a highly visible area such as the library, cafeteria, or foyer. Invite other classes to visit your habitats and station your children beside their work to provide expertise. Have each group make up a play, puppet show, poem or song in which they describe the habitat. Make up games to be played with the models and toy animals.

2. **Math:** Have the children work on large graph paper as they draft their work. Use these to discuss proportion and area. Have the children attempt to shrink or enlarge sections of their drawings.

3. **Language arts:** Use the models as inspiration for writing stories, poems, plays, etc. Include animal names, habitat and habitat requirements as part of your spelling or vocabulary lessons. Have the children write a caption to go with their model. Ask them to read books about animals and habitats, such as *Charlotte’s Web*, *Abel’s Island*, or *Fantastic Mr. Fox*, or read them aloud.

4. **Art:** Design a habitat bulletin board. Make masks of the animals the children studied. Make puppets.

5. **Science:** Take a field trip to observe various habitats. Visit a museum or aquarium. Let them know that you have been studying habitats and the effects of oil on these habitats.
Habitat Registration Form

Before your habitat (home site) can be approved by the Housing Commission, you must answer the following questions. Please return to your habitat site and fill out this application. Thank you.

1. Your animal name ____________________________________________________________

2. Location of your home site ____________________________________________________

3. Materials needed for construction or repair of your home: ______________________

4. How are you protected from weather, wind, rain, snow, etc.? ____________________

5. Where do you get your food? _________________________________________________

6. Where do you store your food? ______________________________________________

7. Where is your water supply? How far is it from your home? _____________________

8. What do you do with your waste? ____________________________________________

9. Would your children be safe in your home if you left them alone? ________________

10. How do you improve your community? _______________________________________

__________________________

__________________________

__________________________

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HABITAT CONCENTRATION

BY Bonnie Jason

EXTENSIONS: Math, Social Studies & Science

DURATION: Two 30 minute periods

OBJECTIVES: Students will be able to identify some southcoastal Alaskan animal habitats and practice matching animals to appropriate habitats. Students will practice cooperation and consideration as they play a card game.

BACKGROUND: Children without any knowledge of animals and habitats will have some difficulty with this activity unless plenty of materials are made available. Perhaps this activity would be best following introductory studies of habitats, or if used as an introductory activity, be prepared to lend a lot of support. This activity could be adapted for younger children by using picture cut-outs instead of drawings. Use the Alaska Fish & Game “Special Oil Spill Issue,” Alaska Dept. of Fish & Game’s Wildlife Notebook Series and the Alaska Sea Week Curriculum Series for information on Alaskan animals and habitats.

PROCEDURE:
1. Warm-up: Review definition of habitat. Play animal charades, with or without sound effects. After guessing the animal, talk about that particular animal’s habitat.

2. Ask each child to choose a habitat and an animal that lives therein. You may need to provide resources to help students identify the specific habitat. The more specific the children can be in identifying a habitat, the better the chances will be of having a successful game (intertidal zone rather than ocean, evergreen rather than tree).

3. Have the children then draw a picture of the animal on one card and a picture of the habitat on the other. If appropriate, have children write the name of the animal and habitat on the cards.

4. Laminate the cards if possible. The cards can then be compiled into a single deck.

5. The game of concentration is played by any number of children, the smaller the group the better. The object of the game is to find matching cards, in this case, matching

MATERIALS:
- Construction paper, cut into card size pieces (two for each student)
- Crayons
- Markers
- Pencils
- Resources about animals and habitats
an animal to its appropriate habitat. The cards are placed face down on the floor or on a desk top, usually arranged in a rectangular fashion, so that all cards are visible. Upon his turn, a player turns over two cards. If they match the player keeps them, if not, returns them, face down, to the same spots. The winner is the one who, after all the cards have been taken, has the most cards.

6. **Wrap-up:** Play the game. Can animals share more than one habitat? How? Read about the effects of oil on the habitats of these animals in the *Alaska Fish & Game “Special Oil Spill Issue,”* pg. 23-31.

**EXTENSIONS:**

1. **Math:** Use the concentration game to reinforce counting, the concept of pairs, or fractions (half the deck, one quarter, one third, etc.).

2. **Language Arts:** Make up a poem, each child contributing a line using the animal and habitat they drew. Or do a nonsense poem by having the children randomly draw cards from the deck and use them to make up a line. Use the names of the animals and habitats for vocabulary or spelling. Use the cards for sentence making activities.

3. **Social studies:** Tape or pin an animal card to a child’s back. Have the child show the card to group. Let the child question the group by asking yes or no questions. (i.e. Am I a mammal? Can I fly? Do I live in the water? etc.).
OIL EXPLORATION

By: Bonnie Jason

EXTENSIONS: Math, Social Studies & Science

DURATION: 45 minutes

OBJECTIVE: Students will feel, observe and describe the effect of oil and water on a group of materials.

BACKGROUND: Without an understanding of the properties of oil and water it is difficult for children to understand why cleanup of an oil spill is such an overwhelming task. This activity will allow children an opportunity to feel, smell and see oil. Students may then discover the effects of oil on a variety of materials. Have an aide or parent assist each group. Do this activity outside if possible.

PROCEDURE:

1. Warm-up: Have kids practice feeling, observing and describing something simple such as their desk top, their face, etc. Explain that they will feel, observe and describe oil and water and materials introduced to oil and water.

2. Use a tempera paint/oil mixture for this lesson so that children can explore safely. Mix black tempera paint or powder with vegetable oil andbeat or blend to make pretend oil. Place 2 basins of water near each small group of children. Use floor protection (newspapers) if doing this inside. Give each group a container of pretend oil to spill into one tub. Explain to the children that their right hand will only go into the water basin and that their left hand will only go into the water and oil basin, or vise versa. It is imperative that the water basin remain oil free, so if children get oil on the water only hand, they must stop and wash with soap. Have children spill oil in the appropriate basin.

MATERIALS:
- Sample of real oil
- Vegetable oil
- Black tempera paint
- Water
- Various containers or basins
- Food coloring (optional)
- Paper or cloth towels
- Fur scraps
- Feathers
- Sand
- Gravel or pebbles
- Shells
- Wood scraps
- Newspapers
- Aprons
- Clothes protection
- Old shirts
3. Ask each child to place one hand in each container, and swish around. As they do this ask them to describe how it feels. List all of their descriptive words on an easel or the board. Try to pull out interesting and exciting words. List these words under appropriate headings, oil and water or water.

4. Give each group some of the following items to submerge in each of their basins: shells, feathers, wood scraps, fur scraps, and containers of sand and gravel or pebbles. Allow children to investigate the changes that occur in the texture of these materials as they are submerged in the containers. Once again, ask the children to describe how they feel and write these words on the easel paper or board. Ask that the students compare and contrast how the items feel in the two containers.

5. Keep basins of oil and water for oil spill cleanup activity.

6. **Wrap-up:** Create a class journal based on observations.

**EXTENSIONS:**

1. **Language arts:** Write a class poem or song (try to include descriptive words). Make up an oil rap using descriptive words. Try to move like oil around the classroom. Give a copy of the descriptive list to students to share with others. See if they can guess what is being described. Make a bulletin board of the descriptive words; use them for spelling or vocabulary.

2. **Art:** Design a bulletin board about the Exxon Valdez oil spill. Design a T-shirt about the oil spill; include a descriptive word.

3. **Science:** Do the cleanup activity that follows.
OIL SPILL CLEAN-UP

By: Bonnie Jason

DURATION: At least one hour

OBJECTIVE: Students will experiment with ways to clean up an oil spill.

BACKGROUND: This activity is designed to follow the Oil Exploration activity. It may be helpful to share articles about the actual cleanup of the Exxon Valdez oil spill with the class before or after this activity. Have an aide or parent assist each group.

PROCEDURE:
1. Warm-up: Read the Ranger Rick story or articles from the oil spill clean up. Do this activity outside if possible; if indoors, use floor protection (newspapers.)

2. Place basins of oiled water and materials, as well as clean-up materials, beside each group. Explain to students that you would like them to get rid of the oil that has contaminated their water and materials therein. Before beginning the clean-up procedure, the children should plan carefully what materials to use and how to use them.

3. Give each member of the group a specific role: scribe, clean-up leader, leader’s assistant, and observer. The scribe is to write down or draw each procedure attempted in the clean-up. The leader suggests the clean-up plan and organizes the team and procedure. The assistant helps the leader in gathering materials and procedure implementation. The observer watches and describes to the scribe what is happening to ensure well documented results. Allow students to switch roles so each child gets to play each role once during the activity.

MATERIALS:
- Ranger Rick story
- Magazine and newspaper articles
- Containers of oiled water
- Materials left over from Oil Exploration Activity
- Newspapers
- Various brushes or other small cleaning tools
- Absorbant materials such as sponges
- Measuring cups
- Strainers
- Basters
- Extra water
- Paper and pencils
- Aprons or paint shirts
4. As the children work, wander around and ask questions that will help children to clarify their goals and methods. Examples: “Can you describe to me what you are doing?” or, “Can you explain to me what you plan to do?” “Can you tell me about your picture?” or, “Can you rephrase what you have written down?” To help children evaluate the success of their procedures you might suggest that they make a pile of those items they have successfully cleaned and a pile of the items that remain soiled for each procedure. Ask the scribe to copy the list onto their paper or quickly sketch the items in appropriate categories.

5. After the children have all had an opportunity to develop and carry out a procedure, call the class together for a large group discussion. Have them share their experiences.

6. Wrap-up: To clean-up the mess in your classroom, try to set an example for the children by not simply throwing everything into the garbage. Recycle when possible.

EXTENSIONS:

1. Language Arts: Have students record their feelings about the activity in their journals, have them draw a picture of their clean-up technique, and make a bulletin board.

2. Science: Have the children research the techniques used to clean up the Exxon Valdez spill. Compare and contrast these to the childrens’ techniques. Ask children to come up with ways of combining their ideas to develop the ultimate clean-up technique. Using the knowledge that they have gained in this activity, ask the children to design a clean-up tool. This could lead to multiple lessons: brainstorming and sketching, drawing a blueprint, building the tool, putting the tool to use, evaluating its success and making changes, and displaying and writing about it.

3. Social Studies: Invite an oil clean-up person(s) to the classroom to share experiences.
OIL SCAVENGER HUNT

By: Belle Mickelson

DURATION: 40 minutes

OBJECTIVES: Students predict what they will find on a nature hike. Students will find products that are made from oil - or require oil to produce. Students will pick up these products and sort, weigh, and recycle or throw them away. Students will visit the dump to see where their oily wastes return. Students will compare their oily waste pickup to that of oil spill workers.

BACKGROUND: Our society is permeated with oil products. What is not made of oil usually requires oil to produce. Once students start looking on a hike to the beach, pond, river, or just around the school — they will find plenty to collect. They may not find an oil spill — but by finding products that took oil to produce, the effect is similar. By picking up and recycling a pop can — they’ve saved one half of a can of gasoline. It takes the equivalent of that much gasoline to produce one aluminum pop can!

PROCEDURE:

1. Warm-up: Have students make three lists predicting products that they might find on a hike that are: 1) made of oil 2) take oil to produce (Hint: virtually everything is made with the help of oil. For example: wood products require oil/gas powered engines for cutting and shaping). 3) are recyclable.

2. Divide the class into teams of 3-5 students for the hike to a beach, river, natural area, or around the school. Hand out gloves and three bags labeled OIL PRODUCTS (plastics), OIL MADE PRODUCTS and RECYCLABLES (use symbols for beginning readers). Remind them to let only adults pick up sharp objects.

3. As you are picking up trash, have students enjoy the beauty of the area. Ask them how they feel to see trash in such a beautiful area. Tell them the oil spill workers in Alaska had many of those same feelings as they picked up black gooey rocks in the middle of gorgeous scenery — mountains, glaciers, green spruce trees, wildflowers, blue water and wildlife.

MATERIALS:
- Work gloves
- Collecting bags
- Labels
- Scale
- Hiking spot (beach, river, park, school grounds)
- Camera (optional)
4. Back at school weigh the three bags. Check the OIL PRODUCTS and OIL MADE PRODUCTS for additional materials that can be used again — maybe for an art project or sculpture. Take the RECYCLABLES to your local recycling center.

5. Plan a trip to the dump and to waste-oil collection sites in your community (harbor or gas station). Discuss with students the increasing problem of full landfills and having to haul trash to sites farther and farther away (which requires oil/gas for vehicles). Talk to students about where to dispose of oil and oily rags from cars and bikes. (Call city hall or the state environmental agency for more information).

6. **Wrap-up:** Ask the students to draw pictures showing ways they can reduce oily wastes and the amount of oil products in our garbage.
Adapted from: Project WILD

DURATION: three 45 minute periods

OBJECTIVE: Students devise a plan to improve their environment.

BACKGROUND: Each of us can make constructive contributions to improving the environment in which we live. Sometimes our actions can improve the environment for people, sometimes for wildlife, and sometimes for both. Sometimes our effectiveness can be improved if we work with other people - sharing ideas, information, and skills. Oil spills can kill many animals and affect their habitat, but there are things students can do to help wildlife. It is important for young people to learn that they "can do" for wildlife and the environment. The major purpose of this activity is to provide students an opportunity to take constructive actions to improve the environment for people and wildlife.

PREPARATION: Review the vocabulary words before beginning the lesson.

PROCEDURE:
1. Warm-up: Ask the students to think of some ways in which they could improve areas of the school grounds as a home for wildlife. Ask them to think of examples they might see around their school that could have a negative impact on wildlife. The list might include: litter that poses a hazard for some kinds of wildlife, a muddy area that has been recommended for blacktopping to minimize dust and mud but is used by birds for water, a proposed pesticide spraying that will not only kill the "pest" but affect other plants and animals; removal of a tree that presently helps contribute to cleaning the air, producing oxygen, and serving as a food and shelter source for varying kinds of wildlife, a lack of food for wildlife that could be helped by planting trees and bushes or setting up a bird feeder.

2. Looking at the list of possible problems, create a list of suggestions for solving or helping with each of the problems. Ask the students to select one that they think they could do to improve the situation.

MATERIALS:
- Writing materials
- Books on wildlife
- Wildlife biologist/observer
3. Once the project has been selected, ask the students to work alone or in small groups to begin generating ideas for possible solutions and their implementation. Use wildlife books for ideas. Ask the students to list local wildlife experts who might be able to help them with their research. Each individual or small group should come up with a plan, including a written description and/or sketch of how it will work, and how it can be accomplished.

4. Invite a wildlife biologist, birdwatcher, or wildlife observer to your class on the day the students make their presentations to the rest of the students. Once all the plans have been presented, ask the students to select the plan that seems most: a) constructive, b) realistic, c) helpful to wildlife, and d) apt to make a lasting contribution. Compile a class book of all the ideas. Ask the wildlife biologist, birdwatcher, or wildlife observer to add his/her input through a series of questions that will get the students thinking even more.

5. Once a plan has been selected, ask students to select a delegation to present their proposal to the school principal or whomever the appropriate authority would be. Remember janitors, groundskeepers, school board, etc. - anyone who would be physically and/or officially involved. A practice session before any interested parents or other groups of students would be helpful. At the practice session, the student delegation would role play their presentation to the principal, janitor, etc. - responding to any questions from their audience that might be raised.

6. The students should make an appointment to present their proposal, make the presentation, and report back to their classmates. If their plan is accepted, they should make sure they know who to contact next in order to successfully complete their project. Making sure they have all necessary permissions secured, the students should proceed to successfully accomplish their project.

7. **Wrap-up:** Once accomplished, ask the students to analyze their results. Did things work out like they wanted them to? Were there any surprises? Any unforeseen problems? How might they have been more effective?

**VOCABULARY:**

- **Problem:** a difficult situation to be improved, or an opportunity to make things better.
  Problems cannot always be "solved," but situations can usually be improved.

- **Authority:** an individual or group of people with the power to make changes.

- **Compromise:** a way to settle a problem in which both "sides" usually give a little.
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INVESTIGATING OIL SPILLS

BY: Belle Mickelson

EXTENSION: Geography & Language Arts

DURATION: Three 45 minute periods

OBJECTIVES: Students will discuss the Exxon Valdez oil spill and other recent spills. Students will view video footage about the Exxon Valdez oil spill. Students will begin collecting articles about oil spills and other energy issues. Students will begin journals as they plan for a visit (imaginary in most cases) to southcoastal Alaska.

BACKGROUND: Good Friday, March 24, 1989, the tanker Exxon Valdez hit the rocks of Bligh Reef spilling 11 million gallons of oil on the waters of Prince William Sound. The oil continued on down the coast eventually touching over 1,000 miles of beaches including those of the Alaska Peninsula and Kodiak Island. Exactly what happened varies with the news source. In this activity students will begin individual journals reflecting their feelings about the oil spill - and their hopes for the future.

PROCEDURE:
1. Ask the students what they know about the Exxon Valdez oil spill. Pass out the Alaska Department of Fish and Game “Special Oil Spill Issue,” sample news articles, and any other magazines containing articles on the oil spill (see appendices at end of curriculum). Note differences in the reports of what was happening.

2. Announce a “trip” to Prince William Sound to see what is going on this year. Have each student make a journal and write out their first impressions about the spill.

3. Introduce the video Voices of the Sound. This video was made by Mike Lewis and David Grimes shortly after the spill happened. Footage by Joel Bennett at the beginning shows the beauty of Prince William Sound and its wildlife. This video was produced for an adult

MATERIALS:
- Alaska Fish & Game “Special Oil Spill Issue”
- News clippings, magazine articles
- Videos on the Exxon Valdez oil spill
- Other materials available in your local library, museum, or news service
- Paper and covers or notebooks to make journals
- Markers/colored pencils
- Map of Alaska
- Blackboard
- Bulletin board
INVESTIGATING OIL SPILLS

audience, but has been shown very successfully in elementary schools. Terms to mention beforehand include CDFU (Cordova District Fishermen United) whose role in the spill is described in an article in the back of the curriculum. Have the students point on the map to the Sound communities. Cordova is a fishing community; Valdez has oil and tourism industries in addition to fishing; Whittier has tourism and fishing; Chenega and Tatitlek are Native fishing communities which depend upon subsistence hunting and fishing. Outside the Sound, impacted communities include Kodiak, the country’s largest fishing port, Seward, Homer, Seldovia, Port Graham, English Bay, on the Kenai Peninsula, and other small villages along the Alaska Peninsula. Ask the students how they would feel if their beaches (ocean, rivers, lakes) were oiled? Then show Voices of the Sound to see how the Cordova fishermen and women felt. Have one of the students read the Cordova City Manager’s statement from the articles included at the back of the curriculum, then write some of their impressions in their journals.

4. Show the ARCO and ALYESKA videos. These describe environmental considerations, some of the cleanup procedures and the industry’s revised response system for a spill. Explain that, later, students will be studying a variety of clean-up techniques.

5. Encourage students to clip current events about oil spills in their state and in other countries around the world for a class bulletin board.

6. Hand out 5” x 10” cards to each student. Ask students to summarize the three videos they just saw. Collect the cards and evaluate the students’ understanding.

EXTENSION:
1. Geography/language arts: Write letters to foreign newspapers asking for articles about the Exxon Valdez oil spill — and oil spills in their country. Research in your library/museum for articles about spills around the world (Suggested by Margaret Ladd, Homer, Alaska).

2. Language Arts: Invite a reporter into class to describe investigative journalism/reporting. Ideally, interview a reporter that worked on the spill or watch video footage made by a news team such as America’s Biggest Oil Spill (see appendices).
BY: Bonnie Jason and Trisha Herminghaus

EXTENSION: Art, Science, Language Arts, Math

DURATION: 1 hour

OBJECTIVES: Students will understand the energy involved in making the ingredients for a birthday cake or other simple food item.

BACKGROUND: March 24, 1990, was the one year anniversary (birthday) of the Exxon Valdez oil spill. It was a tragic event that we do not want to celebrate - but instead, remember for the lessons we can learn. Our oil resources are very precious as is shown by the many oil products we use just to make a cake. Hopefully, by working together we can conserve energy, reduce our need for oil, and prevent more oil spills. This activity is greatly enhanced by showing the movie Toast which describes the energy used to provide the consumer with one slice of toast.

PROCEDURE:
1. Begin by brainstorming about the ingredients for a cake, or by breaking the class into small groups to brainstorm a list of ingredients. Compile these lists on the easel or blackboard.

2. From the list, brainstorm what happens to these ingredients in order to make them available to the consumer. Choose one ingredient to demonstrate to the class. For example:
Have the small groups work in the other ingredients.

3. Once these lists have been compiled, discuss and outline the energy involved at each step. For example:
1) sugar: grow cane - oil and gas for equipment, planting for growing, and fertilizing.
2) harvest - gas and oil to run harvesting equipment, human power.
3) storage - electricity to light, heat or cool.

4. Once again, outline one ingredient as an example then break into small groups. Assign each group 3 or 4 ingredients.

MATERIALS:
- Cake recipe
- Cake or cake ingredients
- Easel paper or blackboard
- Marker or chalk
- Toast movie
5. Eat the cake (or make a cake to eat!). Ask the students if it tastes different now that they know how much oil it took to make the cake. Also, imagine trying to do all this by themselves - growing and grinding the wheat, keeping chickens for eggs and cows for milk. What did people in their area do in the old days?

6. Show the movie Toast. Discuss what it takes to get a piece of bread on the table.

7. Have students describe their feelings and reactions in their journals. If the students want to, share their comments.

EXTENSIONS:

1. Art: Draw pictures or design collages to illustrate the energy used to provide consumers with one ingredient.

2. Science: Research cake making to find actual energy use. Write to companies for information. Visit a farm, processing plant, packaging plant, transporting company or store to further investigate energy use. Have the students analyze their parent’s grocery lists and estimate energy used to provide the items. The students can attempt to grow, package and sell an item and analyze the energy used as a class project. Try using both normal and alternative energy sources.

3. Language Arts: Students can write and perform a play to show how energy is used to supply consumers with various items. Have students write a newspaper report describing this process, or do a news program. Students can illustrate timelines that describe this process. They can write to related companies and industries to ask for more information.

4. Math: Develop charts and graphs to illustrate energy used in supplying consumers with the ingredients to make a birthday cake or piece of toast. Develop word problems based on the information in the study.
WHERE HAS ALL THE ENERGY GONE?

Adapted from: Energy - It’s Everywhere, by Peg Willett; Energy Alternatives Program, SALRM, University of Alaska, Fairbanks.

EXTENSION: Science/Social Studies & Language Arts

DURATION: 3 days (40 min. per day)

OBJECTIVES: Students will investigate the changes in energy consumption from generation to generation. Students will conduct an energy interview with someone at least one generation removed from their own (two or three generations apart is even better).

PROCEDURE:
1. Ask the students to list which forms of energy were used in the past. Show them the Foxfire type books (examples of student interviews of older generations). Explain to students that they will be interviewing an elder (perhaps their grandparent) to find out which types of energy they used when they were growing up. They will need to get information on the type of energy and how much was needed for daily living. Review the interview questions with the students. Discuss interview techniques. Talk about ways to make the person being interviewed feel at ease. Suggest that they photograph the person they are interviewing (with permission). Close up photographs are best. Try to have the person holding something or doing something, i.e. using a canoe paddle, holding a basket.

2. Have each student prepare a chart comparing the results of their interview. Have their own or current energy uses listed, then their parents and then their grandparents.

3. As a class prepare a pie chart showing the differences in energy use.

4. Discuss current and future consequences of an increase in non-renewable energy use.

MATERIALS:
- Paper
- Pencils
- Camera and film (optional)
- Chart paper
- Felt-tip markers
- Foxfire type books (optional)
- Worksheet: Energy in the Past
5. Have someone who lives without either running water or electricity talk to the class. Ask questions and discuss the similarities and differences between: this lifestyle now and in the past. Have the students imagine how it would be to live without running water or electricity. **Sample questions to ask your guest:**

How do you obtain water? What do you use for light? How does the cost of electric lights compare with propane? Kerosene? What do you do for entertainment? Do you wish you had a television set? Do you have a car? If so, how do you warm it up without electricity in the winter? How do you keep food from spoiling? What are the costs and benefits of living this way?

Add this information to the chart, where applicable.

6. Plan a “pioneer day” in class. Use candles, haul water, share books, have individual slates with chalk to write on (these can be made by wrapping black tape on cardboard).

**EXTENSIONS:**

1. Science/social studies: Here are some field trip ideas: municipal utility company, power plant, cabin without electricity or running water, house with all modern conveniences, solar or alternative energy home, waste water treatment plant, landfill.

2. Language arts: Have students write themes about the day the power went off in their community.
An Interview

Name of person being interviewed: ____________________________________________________________________________
Age: ____________________________________________________________________________

Date today: ____________________________________________________________________________
Student name: ____________________________________________________________________________

1. How did you heat your home? ____________________________________________________________________________
   What kind of fuel did you use for heating and cooking? ____________________________________________________________________________

2. What did a workweek consist of in days and hours? ____________________________________________________________________________

3. How did you obtain the necessary things: food, clothing, medicines, etc.? ____________________________________________________________________________

4. What kind of work did you do? ____________________________________________________________________________
   What did you get as a result of your work? ____________________________________________________________________________
   Did your family own a car? ____________________________________________________________________________
   If so, do you remember the make of the car and the cost of fuel? ____________________________________________________________________________
   If not, how did you get from place to place? ____________________________________________________________________________

5. What kinds of entertainment did you enjoy? ____________________________________________________________________________

6. What was clothing made of? ____________________________________________________________________________
   How did you wash your clothes? ____________________________________________________________________________
   How did you dry your clothes? ____________________________________________________________________________
   How would you heat your water? ____________________________________________________________________________

7. What were the 3 foods which you ate the most? ____________________________________________________________________________
   Did they come in packages? ____________________________________________________________________________
   If so, what were they like? ____________________________________________________________________________
Did your home have running water? _________________________________

How did you keep food from spoiling? ______________________________

8. If you went to school, what were the eating facilities like at your school? ______________

What were your school supplies? _________________________________

If you didn’t go to school, where and from whom did you learn? ______________________________

9. How was your home lighted? _________________________________

Did you have electrical appliances? ______________________________

If so, what were they? _________________________________

10. Did your family travel for fun? _________________________________

Did your family travel as a way of life? (for example - to hunt and find food)

Did you travel on roads? _________________________________

If so, what were the roads like? _________________________________

If not, what did you travel on? How did you find your way? _________________________________

11. If you went to school, what happened to your old schoolhouse? _________________________________

12. How did the car change your village, town, or city? _________________________________

How did snowmachines, and motorboats change your village, town or city? _________________________________

13. What changes do you like the most? _________________________________

14. What changes do you like the least? _________________________________
OIL IN YOUR COMMUNITY

Adapted from: The Alaska Sea Week Curriculum Guide Vol. 7, by Belle Mickelson

SUBJECTS: Language arts, science, social studies

DURATION: 1 period plus homework

OBJECTIVES: Students will investigate oil use in their community. Students will make a list of products made from oil. Students will take a field trip around the community to investigate oil use. Students will plan an education program about oil conservation and use.

BACKGROUND: Oil and its products are an integral part of our society, from transportation to plastics. Alaska is at the “end of the road.” Little recycling occurs here, and as a result, our dumps are filled with used oil products—many that are harmful to the environment. Oil is hazardous waste. Refer to DEC’s Changing Oil in Changing Times in the appendices. Plastics can be dangerous for animals. Birds mistake styrofoam pellets for food. Often these plastics are retained in their stomachs permanently, taking up room that is better used for food. A high percentage of Alaska seabirds have been found with plastics in their stomachs. Other birds and wildlife end up with plastics (such as monofilament fish nets) wrapped around their necks, cutting off their ability to breathe, eat and flee from predators.

PROCEDURE:
1. Discuss the role of oil in your community. Ask students: What is our source of energy for electricity? for heating? for cooking? to run cars? and buses? How many products do we use in school that are made from oil? (List plastics, styrofoam, movie films, synthetic fabrics, as well as gas and oil). Pass out the Petroleum Tree worksheet to help in making the list. Assign the class to inventory their homes for products made from oil.

2. Pass out old magazines. Have students cut out pictures of oil products for a bulletin board. Use felt-tip markers for picture captions.

MATERIALS:
- Chart paper
- Pencils
- Camera and film
- Old magazines
- Scissors
- Felt-tip markers

Worksheets:
- Petroleum Products Checklist
- Home Energy Worksheet
- Community Energy Worksheet
- Petroleum Tree
3. Have students complete the Home Energy Worksheet.

4. Have students make a class list of all the oil and oil-product messes (current and potential) around your community such as: old oil drums, oil storage tank leaks, oil pipeline leaks, gasoline spills at the gas pumps, kerosene that overflows when filling, propane leaks, discarded oil from boat motors, draining oil filters, crankcase oil from vehicles, and oil dumped by boats or ships. Discuss ways oil and oil products could be reused or disposed of properly. Add this information to your bulletin board.

5. Take a field trip around your community to look for oil products and messes. Remind students not to touch any oil they find as it is a toxic substance. Take notes and photograph your findings. Even the simplest camera will work for this exercise. Make sure students get close enough to their target and hold their breath, letting it out slowly as they snap the picture. Use prints to make posters, or create a slide show.

6. Complete the Community Energy Worksheet.

7. What can your class do to help? Remember, oil is a non-renewable resource. Once used up, we will not have any more. Discuss conservation. Ask the class for suggestions like the following: Re-use plastic bags; use cups that can be washed rather than styrofoam cups; be careful not to spill oil; reuse old oil for wood stove fire starter (mixed with sawdust, but be very careful) or for oiling tools; limit boat, car or snow-go trips to only necessary ones. Note that many communities have specific oil-dump sites where oil is placed in storage tanks and stored for later use as heating fuel. Contact the Alaska Department of Conservation if you have questions on oil disposal.

6. Plan an education program on local oil uses and misuses. Make up cartoons and posters or a slide show and present your findings and suggestions to other classes and the community.
PETROLEUM PRODUCTS CHECKLIST

Check and circle those products that you find in your home and school, or those industries you are involved in:

GASOLINE ___ solvents, lighting, leather industry, motor fuel, heating, dry cleaning.

KEROSENE ___ heating, lighting.

LUBRICATING OIL ___ sewing machine oil, knitting machine oil, engine oil.

RESIDUAL OIL ___ insulation, paint, paving, artists crayons, graphite

PARAFFIN ___ candles, matches, canning industry, wax paper, chewing gum.

GREASE ___ grease, cable grease, railway, track and transmission grease.

FUEL OIL ___ furnaces, power plants, locomotives, diesel engines, industrial establishments.

GAS OIL ___ fuel gas, absorption oil, illuminating gas.

SPECIAL OILS ___ medicinal oil, switch oil for electrical equipment.

ARTIFICIAL RUBBER ___ tires, druggist supplies, cements, clothing.

ALCOHOLS ___ cleaning, solvent, preservatives, acetic acid.

AROMATIC HYDROCARBONS ___ explosives, saccharine, antiseptics, perfumes, dye-stuffs.

FATTY ACIDS ___ butter substitutes, edible fats, soaps.
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1. How many kilowatts/month does your family use? 
   Collect one year’s worth of data, or compare July’s usage to December’s usage.

2. Which appliance in your home uses the most energy?
   a) Do you own:
      ___ freezer
      ___ refrigerator
      ___ electric stove
      ___ dishwasher
      ___ microwave
      ___ washer
      ___ electric dryer
      ___ hair dryer
      ___ air conditioner
      ___ electric fan
      ___ TV
      ___ stereo

   b) Which could you do without?

3. a) Which types of energy does your family use?

   ELECTRICITY ____ Name three uses:  1. 
                              2. 
                              3.

   GAS ____ Name three uses:  1. 
                              2. 
                              3.

   PROPANE ____ Name three uses:  1. 
                                   2. 
                                   3.

   WOOD ____ Name three uses:  1. 
                               2. 
                               3.

   OIL ____ Name three uses:  1. 
                            2. 
                            3.

   b) Which costs the most to use?
4. Name three ways you could help reduce your family’s energy consumption level

1.

2.

3.
1. a) What is the major source of energy in your community? _________________ (diesel, coal, oil, gas, wood)

   b) Where does it come from? _________________ (i.e. barge, local source, etc.)

2. How do most businesses heat their space?

3. How do most homes heat their space?

4. What are the three most prominent types of vehicles in your community and their gas mileage?

   ____ m/g
   ____ m/g
   ____ m/g

5. How much do each of these types of fuel cost in your community?

   electricity  ¢ /kh.
   oil  ¢ /gal.
   propane  ¢ /lb.
   gasoline  ¢ /gal.
   diesel  ¢ /gal.
   fuel oil  ¢ /gal.

   Which is most expensive?

6. Rank the three most important forms of transportation in your community and the cost of their fuel.

   1. _______________________ $_________/gal.
   2. _______________________ $_________/gal.
   3. _______________________ $_________/gal.

7. If all oil products disappeared what things would be left in your community? (name 10)
1. ________________________________________________________
2. ________________________________________________________
3. ________________________________________________________
4. ________________________________________________________
5. ________________________________________________________
6. ________________________________________________________
7. ________________________________________________________
8. ________________________________________________________
9. ________________________________________________________
10. _______________________________________________________

**EXTENSION:** Begin collecting cost and consumption data and publish a quarterly graph in the school newspaper showing cost and consumption rates for your school and community.
THE PETROLEUM TREE

MINERALS

THE PETROLEUM TREE
(Products obtainable from crude oil)

Alaska Oil Spill Curriculum 4-6
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TRANSPORTATION

Adapted from: The Alaska Sea Week Curriculum Guide Vol. 7, by Belle Mickelson

DURATION: Minimum of 10 minutes one day, 40 minutes the next.

OBJECTIVES: Students will trace the origin of goods and services arriving in the community. Students will discuss transportation issues, considering energy conservation needs.

BACKGROUND: Studies have shown that 47 percent of Alaska’s energy budget has gone for transportation. Alaskans are great travelers. Each year they log thousands of miles traveling to jobs, meetings, berry picking, hunting, fishing, and to visit friends and relatives in a state so big that it covers five time zones (though for convenience most of the state is now in one time zone). Additionally, most of Alaska’s goods and supplies are transported from the Lower 48 by ship, truck or plane.

Each community has a unique transportation system, often consisting of boats, planes, ATVs, and snowmachines. Many communities are deciding whether to tie into the central road system, which would make it easier for them to “get to town,” but would also make it easier for “town” to get to them.

PROCEDURE:
1. Ask students to list on the chalkboard different means of transportation. Circle the ones most important to your community.

2. List all the goods and services arriving in your community. Have students inventory the food and materials found at home and school, listing the states or country of origin.

3. Compile your results on the world map. On little slips of paper, write the names of the items on your list of goods imported into Alaska. Place these tags in countries or states on the map that export these products to Alaska. Connect these places to Alaska with yarn.

MATERIALS:
- Alaska map
- World map
- Chalkboard and chalk
- Yarn
- Felt-tip markers
- Thumb tacks
- Slips of paper
4. Point out on the Alaska map how these products get to your community.

5. Estimate the percentage of transportation that is water-dependent. Also estimate what percentage of the product’s cost is from transportation. What would happen if fuel costs escalated tremendously? What would happen to transportation within your community? At what point would products from the “outside” be unaffordable? What jobs would be affected?

6. Have students pick a local transportation issue to explore. Is the barge, ferry or riverboat service adequate? Is your community expecting a new road, airport or harbor? Do you need additional trails along or to the beach, the river or a nearby lake? Are snowmachines and ATVs being used to carry and haul supplies as well as for recreation? Are there conflicts between people who use trails for skiing and hiking and people who drive motorized vehicles along them?

7. Does knowing about the world’s need for energy conservation make a difference in the way you think on these issues? Students can collect information from a variety of viewpoints. Visit the site (if possible) and inventory and photograph what is there now; brainstorm alternative solutions; come up with a class solution; develop a plan to implement that solution, which may include talking to the decision makers, writing letters and/or a news article, preparing a slide show or charts and graphs. Discuss what will make the most impact. Often, just talking to the right person is more important than anything else. Then, implement your plan. Evaluate it afterwards. What would the class do differently the next time?
Adapted from: “Alaska Resource Kit: Minerals” and Alaska Tidelines

EXTENSIONS: Social Studies/Science, Science

DURATION: Three 40 minute periods

OBJECTIVES: Students will predict how oil is drilled, then read about drilling for oil. Students will build a working model of an oil well and understand how it operates. Students will discuss how oil is refined.

BACKGROUND: In addition to all the familiar animals in our oceans and lakes, there are billions of tiny one-celled animals and plants called plankton. In each miniscule body there are minute droplets of fats and oils (hydrocarbons). After dying, these bodies sink down to the bottom of the ocean. Over the centuries they pile up as layers of mud and ooze. During the rock-forming process these layers are squeezed which forces the drops of oil to move with the water in the sediment. The water and oil move upward to the high points in the layers, where there is a cap rock that halts further passage. It is here that the oil and water separate and the oil nestles in the tiny pores of the rock above the water. Gas usually accompanies the oil and can be found in the spaces in the rock above the oil. An oil field consists of sedimentary rock which is saturated with gas at the top, oil in the middle, and water below. Strike it rich in this activity by actually building your own oil well!

PROCEDURE:
1. Read the background information to the students.
2. Distribute the worksheet From Pterodactyls to Petroleum: (Answers: 1-true; 2-true; 3-false; 4-true; 5-false; 6-true; 7-false; 8-true) Remind students that oil originates primarily from decayed plants (plankton), as well as from animals such as the pterodactyl. Mention that oil is a non-renewable resource—once used up, it is gone forever, or at least until more plants and animals decay. Each quart of oil took thousands and thousands of years to form. It really is black gold!
3. Place the tubes in the jar. Pack gravel and sand into the bottom half of the jar around the tubes. Firmly pack a 3 centimeter layer of plasticine on top of the gravel and seal tightly around both tubes and the edge of the jar. Fill the rest of the jar with sand. Attach the rubber tubing to one of the tubes. Pour the water slowly into the funnel. Raise the funnel higher above the jar to apply more pressure.

4. Make a sketch of the model and trace the path of the water. What happens as you apply more pressure by raising the funnel?

5. This discovery shows that as external pressure is applied to oil reservoirs, the liquid is forced out. The pressure can come from either expanding gas or from water seeking to move into pore spaces vacated as the oil is removed.

6. Complete the Where Does That Oil Go? worksheet. (Answers: 1-down the pipeline to Valdez and onto tankers for shipment outside; 2-chemicals made from oil and gas; 3-hydrogen and carbon; 4a-fuel gas; 4b-gasoline; 4c-jet fuel; 4d-heating oil; 4e-lubricating oil; 5a-gasoline; 5b-lubricating oil; 5c-jet fuel)

EXTENSIONS:
1. Social Studies/Science: Do a project on the great importance of oil and natural gas in everyday life.

2. Science: Plankton are the tiny, one-celled animals that are in the water. Using a biology resource text, see how many different kinds of plankton you can find and draw them. Do you think they will eventually turn into oil?
FROM PTERODACTYLS TO PETROLEUM

How well can you predict the connections between pterodactyls and petroleum? Read the following statements and write true or false, then read Where Did the Oil Come From? and see how many you have right.

1. Some pterodactyls were as big as small planes.
Your prediction______________________    Correct Answer___________________

2. At one time all of Alaska was under water.
Your prediction______________________    Correct Answer___________________

3. Tremendous pressures changed the silt, sand and clay sediments into oil.
Your prediction______________________    Correct Answer___________________

4. Petroleum means “rock oil.”
Your prediction______________________    Correct Answer___________________

5. Petroleum lies in great underground lakes.
Your prediction______________________    Correct Answer___________________

6. To find oil, scientists look for sedimentary rocks.
Your prediction______________________    Correct Answer___________________

7. Special mud is used in the drilling operation.
Your prediction______________________    Correct Answer___________________

8. Once oil is struck, it always has to be pumped out of the ground.
Your prediction______________________    Correct Answer___________________

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WHERE DID THE OIL COME FROM?

Start with a far-out flying reptile, which glided around in prehistoric times on wings made of skin attached to long-fingered arms in the best TV Batman fashion. It had a pointy head and a nose like a beak. And fossils show that it ranged from the size of a small sparrow to that of a giant with a wing-span like a Piper Super Cub. Its scientific name is pterodactyl (tair-oh-DACK-til) from the Greek petron, meaning “wing,” and dactylos, meaning “finger.”

In pterodactyl’s day - say, 150 million to 65 million years ago - a warm, shallow sea stretched from what is now the Arctic coast of Alaska almost to the Gulf of Mexico. As zillions of generations of pterodactyls, along with countless other forms of plant and animal life, lived and died over that enormous time span, their remains settled to the bottom of the ancient sea. There they were broken down by bacteria and covered over by silt, sand and clay.

Over the ages, layer upon layer of decaying material and debris crushed down upon each other, forming what are called sedimentary basins, thousands of feet deep. The great pressure, heat and dampness changed the once-living remains of pterodactyl and his like into oil and natural gas, while the silt, sand and clay were molded into rock. So the right name of the kind of oil we’re talking about is petroleum which comes from the Latin petra, meaning “rock,” and oleum, meaning “oil.”
WHERE DID THE OIL COME FROM?

Sea floor

shale

Hard rock

Porous rock with trapped oil and gas

Hard rock
WHERE DOES THAT OIL GO?

Directions: Read the following story and answer the questions at the end.

Once the oil comes in, the well is capped and equipment is installed to control the flow, and to separate the crude oil from the natural gas. Prudhoe Bay, on the arctic coast of Alaska, is ice-bound most of the year. So the oil must run a long route to market. From the wells, the crude oil moves through small pipelines to the big trans-Alaska pipeline. There it begins the 800-mile journey to Valdez, where it is loaded on tankers for shipment Outside.

Once the oil reaches the Lower 48, modern plants and refineries process the oil and natural gas into gasoline, jet fuel, heating oil, diesel, liquified gas and fertilizer. And those are just a few of the products that can be made from petroleum. Petrochemicals (chemicals made from oil and gas) are used as a base for a wide assortment of things, from plastics to vitamins to detergents, movie films, fabrics, and antifreeze.

This strange stuff we call petroleum is made up almost entirely of only two elements—hydrogen, a gas-like element that will burn; and carbon, a chemical element that is found in all living matter. If you really want to sound like a pro, you can use the scientific word for petroleum, which is “hydrocarbons.” These hydrocarbons are present in thousands of different combinations that can be separated and purified in the process called “refining.”

The first step in refining is to sort out the major “fractions” or parts of the hydrocarbons that make up crude oil. These fractions boil and vaporize (like steam) at different temperatures. So the simplest form of refining works like this:

a. The crude oil is heated in a furnace and the vapor is piped into a tall refinery tower.
b. Hot steam is pumped in below to speed up the process.
c. The vapors from the different fractions rise, cool off and condense (turn back into liquid) at different levels.
d. There they are drawn off and collected for further processing if necessary.

5. Circle the most highly refined fuel in each case:
   a. jet fuel or gasoline
   b. lubricating oil or asphalt
   c. heating oil or jet fuel

REVIEW:

1. Where does the oil from Prudhoe Bay go?
2. Define petrochemicals.
3. What are the major elements that make up petroleum?
4. Here is a representation of a refinery or distillation tower that shows at which points the different products are drawn off and collected. Have the students fill in the blanks. (Hint: products are drawn off from coolest to hottest.)
By: Belle Mickelson

Extensions: Social Studies/Language Arts/Science & Language Arts/Geography

Duration: Three 40 minute periods

Objectives: Students will be able to describe how oil is carried in tankers. Students will measure the size of a tanker with a piece of string. Students will role play different jobs on the tanker. Students will debate single versus double-hulls and other safety features. Students will design and draw a tanker, illustrating each safety feature. Students will understand the connection between energy conservation and tankers.

Background: Measuring 987 feet, the Exxon Valdez was just a midsized tanker. The largest tanker in the world, the Knock Nevis (formerly called the Jahre Viking and now used as an immobile offshore platform), is 1,504 feet long and 226 feet wide. “The Tankers Full of Trouble” reprint, from the Seattle Times, describes a voyage on the Arco Anchorage. This six part special report covers tanker crews, safety features, the double-bottom debate, inspectors and investigations; tanker traffic in Washington, and what can be done to improve tanker safety. Since the Exxon Valdez oil spill these issues have become very important. For example, some argue that if the Exxon Valdez had had a double-hull, the grounding on Bligh reef would have punctured fewer containers, thus greatly reducing the size of the oil spill in Prince William Sound.

Procedure:
1. Ask students what are the biggest things they can imagine? Oil tankers are some of the largest ships and they carry a cargo that is very hazardous to our oceans, coastlines, and the people, plants, and animals that inhabit these waters and shores. Yet oil is one of our most valuable resources and one that all of us use daily. In this activity we will be studying one way that oil reaches our homes and schools - by tanker.

2. Ask students if any of them know someone who works on a tanker. Show students pictures of tankers and their crews in the Seattle Times reprint. Trace the route of tankers from Alaska to the West Coast on a map of North America. Show them how some tankers go through the

Materials:
- Ball of string
- Yardstick or measuring tape
- Paper
- Pencils
- Map of North America
- “Tankers Full of Trouble” Seattle Times reprint

The Polar Resolution, a double-hulled tanker operated by ConocoPhillips, made its first voyage into Valdez in the summer of 2002.
Panama Canal and on up to the East Coast. Have students read some of the paragraphs that talk about what it is like to be on a tanker. Imagine the wintertime weather in the Gulf of Alaska “100 mph winds, sea swells the size of five story buildings, and numbing cold that can encase the deck in ice.” Read about being a lookout, on the bridge, in the engine room, loading and unloading the oil.

3. Take a piece of string and measure out the length of the Exxon Valdez, 987 feet long and 166 feet wide, on the playground. Is the tanker larger than your playground? Role play some of the crew duties on your playground tanker. Load up oil in Valdez and run the tanker down to Seattle or another port, then unload the oil and get ready to head back up to Alaska.

4. Plan a class debate on tanker safety. Have the students read the articles in the Seattle Times about safety features and single versus double-hulls. Encourage students to do additional research in the library.

5. Have students design and draw the ultimate tanker including safety features. Encourage creativity.

6. Discuss how preventing oil spills is many times easier than cleaning them up. Ask students if they think transporting oil by pipeline is less dangerous than bringing it by tanker. Explain that Congress was trying to decide whether to run Alaskan oil by pipeline to Valdez and then by tanker to the West Coast and through the Panama Canal to the East Coast or by pipeline through Canada. The vote in the U.S. Senate was tied 50 to 50 and Vice President Spiro Agnew broke the tie vote, so the pipeline went to Valdez and then took the ocean route. Ask the students how they would have voted. Explain that if we conserve energy, then less oil will need to be transported. Ask students to list 10 ways they can conserve energy today.

EXTENSIONS:
1. Social studies/language arts/science: Invite a boat captain to come to class and discuss navigation, weather, crew training, safety and survival, sea stories, and how to become a boat captain.

2. Language arts/geography: Imagine what it would be like to be a tanker crew or captain. Use the World Tanker Route Map on page 14 of the Seattle Times reprint to follow your routes on a world map. Read sea stories about travels to these foreign destinations.
OBJECTIVES: Students will be challenged to estimate the environmental impact of a simulated oil spill.

BACKGROUND: In these days of heightened environmental awareness, great efforts are being made to prevent oil spills. Yet in spite of precautionary measures, oil spills from ships, offshore drilling operations, pipelines, and natural seepage continue. As past spills have so tragically demonstrated, a major oil spill can take a devastating toll on wildlife. Inshore fisheries, shorebirds, intertidal organisms, and shallow subtidal organisms are most often harmed because spills usually occur in the shallow coastal areas where these organisms are concentrated. The environmental impact of an oil spill depends on the size of the spill, the prevailing wind and water conditions during the spill, and the variety and abundance of life (both wild and human) in the affected area.

Although developed for the seashore, this activity may also be conducted at a lake, river, or stream. Reduce the amount of popcorn for smaller bodies of water. The activity will be more exciting if you choose a site with strong dispersal features (such as water currents and wind) and an abundance of life. Breakwaters or docks are convenient places from which to toss popcorn into the water. If you conduct the activity at an inland site where oil spills rarely occur, tell the youngsters that the activity simulates a toxic chemical discharge from an industrial or agricultural source.

MATERIALS:
- 20 liters of popped popcorn (plus another 20 liters for “Extensions”)
- Impact Challenge Cards
- Pencils
- Guides for identifying saltwater/freshwater organisms
- 1 plastic bucket or can with a metal handle (about 20 liters in volume)
- 1 50 cm x 50 cm piece of plastic window screen, nylon mosquito netting, or several 50 cm x 50 cm sheets of small mesh cheese cloth
- 1 large rubber band, strip of inner tube, or elastic band that will fit snugly around the plastic bucket
- 3 100-cm lengths of wide duct tape or masking tape
- 25 meters of heavy twine or light rope marked off in 5-meter intervals
- 1 mini-hacksaw, jigsaw, or serrated knife
- Permanent-ink marking pen
PROCEDURE:

1. To make a popcorn slinger, cut out the bottom of the bucket with a hacksaw, jigsaw, or knife. With the bucket turned upside down, place the screen material over the open end of the bucket. Let the material drape over the side. With the duct tape or masking tape, tightly tape the edge of the screen material to the bucket. Firmly tie the 25-meter line to the metal handle on the bucket and tie a loop (large enough to go over a nearby rock or post) at the other end of the line.

2. Before you reach the site, discuss safety. Use the buddy system. Keep an eye on nonswimmers.

3. At the site, tell the youngsters that they are going to pretend to be environmental impact experts who have been rushed to the scene of an oil spill to estimate its impact (damage) on the seashore environment. Say that you will simulate the oil spill by tossing out a large bucket of popcorn to represent the oil. Tell the youngsters that you are using popcorn because it will not harm the environment, and it floats like refined oil.

4. Explain to your group of “experts” that they are responsible for estimating the impact of the spill on (a) the landscape, (b) the plant life, (c) the animal life, and (d) human activities. Divide the group into four smaller groups, and give each group an Impact Challenge Card. Ask the youngsters to pick a buddy in their groups to work with at all times. Tell the teams to assume that anything the popcorn touches will be covered with oil.

5. Before you toss out the popcorn, ask the youngsters to predict in which direction the spill will move and how long it will take to reach the shore. Ask someone to measure the time it takes for the spill to reach the shore or some other reference point.

6. Now you are ready to use your popcorn slinger. With the loop of the rope anchored to a rock or post, practice tossing the bucket a few times before putting in the popcorn. Take a strategic but secure position on a dock, breakwater, or large rock. The rope should be loosely coiled on a flat surface below your tossing arm so the rope will fly out freely when the bucket is tossed. Make sure you are not standing on the rope. When you are ready, grab the rope about a meter from the metal handle and start swinging the popcorn slinger over your head. When the bucket has gathered momentum, let it fly out over the water. Try to pick a location where you can toss the bucket with the wind instead of against it.

7. After you have gotten the knack for tossing the bucket, place a small flat rock (about 200 grams) in the bucket and then put in about 20 liters of popcorn. With the teams ready to time and follow the spill, toss out the slinger. After landing, the rock will help pull the bucket under the water and the buoyant popcorn will be forced out the top.
of the bucket. Let the bucket sink beneath the surface before hauling it in so the spill won’t be disturbed.

8. Count the marked intervals on the rope as you haul in the bucket to determine the spill’s starting distance from the shore. Ask your environmental experts to begin their investigation.

9. Join in and follow the movement of the spill with the rest of the group.

10. Near the end of the alloted time or after the spill has been thoroughly dispersed, gather the youngsters together to have a SLICK TALK to report their findings. In addition, consider the following questions:
   1. How quickly did the spill reach the shore?
   2. What agents dispersed the spill? (Wind, tide)
   3. How might different wind or water conditions affect the spill?
   4. How could an oil spill be prevented from spreading?
   5. Who should be responsible for cleaning up a spill?

EXTENSIONS:
   1. Science: Create another "oil spill" under different conditions (e.g. when the tide is going out rather than coming in) or at a different site (e.g. a river rather than a lake, or on one side of a breakwater rather than the other side). Compare the effects of the second spill with those of the first.

   2. Social studies: Try several methods of keeping an oil spill from spreading. For example:
      - Surround the spill with logs or floats.
      - Scoop the “popcorn oil” out of the water.
      - Clean up the spill after it reaches shore.
      - Herd the spill with a giant squeegee into a pen so it can be scooped up. Discuss your results and compare them with the clean-up workers on the Exxon Valdez spill. How would students feel if it was real oil?

   3. Science: Use bird field guides to identify the birds that come to clean up your spill. Watch their behavior. Who is dominant? What are the differences/similarities between how these birds feed and your school lunchroom?
Impact Challenge Cards &4

Human Activities

- How many degrees was the oil spill by an eroding beach? More than 90°
- How many birds perished during the spill? 1,000
- How many birds were returned to their homes? 500
- How many different species of plants were affected? 10

Impact Challenge Cards &4

Animal Life

- How many different species of animals were covered? 50
- How many different animals did you see? 10
- How many different animals did you hear? 15
- How many different animals did you smell? 5

Impact Challenge Cards

Plant Life

- How many different plants were covered? 50
- How many different plants were affected? 20
- How many different plants were returned to their homes? 10

Impact Challenge Cards

Landscape

- How many different landscapes were covered? 10
- How many different landscapes were affected? 5
- How many different landscapes were returned to their homes? 5

Follow the spill and estimate its impact on animal life.
BY: Bill Noomah and Belle Mickelson

DURATION: four sessions:
the first, 15 - 25 mins.
the second, 60 - 90 mins.
the third and fourth, 45 - 60 mins.

OBJECTIVES: Students will develop an experiential knowledge of having to respond to a simulated environmental disaster, and will reflect on the technological and political responses to an oil spill emergency.

BACKGROUND: A major oil spill like that of the Exxon Valdez can take a devastating toll on wildlife. Sea birds are attracted to oil slicks and will try to dive and feed in them, hopelessly oiling their feathers. When oil gets on the fur of seals, sea lions and sea otters, it means a loss of insulation. In the great baleen whales, oil clogs the hairs that filter plankton out of the water, thus impairing their feeding. Eggs and young of many species of fish and shellfish are harmed by extremely small concentrations of oil (as low as 1 to 10 parts per billion!). Larger (but still small) concentrations (10 to 100 parts per billion) can cause reduced feeding or reproduction in adult fish. And as the spill moves onshore, intertidal organisms, as well as shore birds, are affected.

Mechanical clean-up methods include skimmers and booms, suctioning up the oil, or using buckets to skim it up like some of the fishermen did very successfully. Dispersants (detergents or sand) make the oil sink - but not disappear. Oftentimes, the dispersants combine with the oil to form even more dangerous hydrocarbons. Another technique is the use of Corexit, a kerosene derivative. Some scientists are concerned that Corexit may have very harmful effects on wildlife and fisheries.

MATERIALS:
- News clippings
- 5 1/2 gallon plastic milk containers
- Aluminum foil/styrofoam
- Wire/popsicle sticks
- Detergent
- String
- Oil absorbant material
- Cotton balls
- Construction paper
- Wax paper/plastic wrap
- Scissors/tape/paper clips
- Eyedropper
- Sand/gravel
- Seaweed or pondweed
- Yard debris containing sticks and leaves
- Bird feathers
- Used motor oil
- Refrigerated salt water (enough to fill tubs)
- Pencils/Protractor
- Worksheet:
- Ocean Oil Pollution
The pressurized hot water beach clean-up techniques used during response to the Exxon Valdez spill were quite controversial, because although it took the oil off the rocks, it drove some of the oil deeper into the substrata only to gradually leak out again. Some experts felt, however, that by breaking up the oil it kept pavement from forming on the beach. Some of the citizen clean-up programs initiated oiled seaweed pick-up on the beaches. The seaweed was a natural oil collector and the more that was picked up, the less oil that spread around to other bays and estuaries. Bioremediation, the use of fertilizer to increase the populations of oil-eating bacteria was another technique that was tried. Also a rock washing program was developed where rocks were cleaned by tying them up in specially designed bags - so the ocean’s tidal action could wash them. And oil absorbant pads were used to wipe off rocks individually.

At the end of this activity, students will have a chance to investigate other sources of oil pollution. Even though large spills are the most spectacular and devastating, it is actually the day-to-day operations of oil tankers and daily life in coastal and river communities that do the most damage.

PROCEDURE:
Day 1 - Activating Interest
1. Search school and public libraries for news magazines with articles about the Exxon Valdez oil spill and use the selection of articles at the end of the curriculum. Have enough different magazines so there is at least one different article for each student. Use this as an opportunity to teach about news reporting by comparing and contrasting different accounts of identical events.

2. Before students arrive in the class, soak a feather, a leaf, or a small stuffed animal in thick, used motor oil. Use a plastic glove to hold an oil covered object up and let them guess what it is. Discuss whether they had seen pictures of objects like yours.

3. Show a video about the spill (see appendices).

4. Ask students if they know someone who worked on the Exxon Valdez oil spill clean-up. Ask them to interview the person before the next lesson.

Day 2 - Simulated Oil Spill
5. Before the students arrive in class, set up the mock oil spill. Two tables should be dedicated to materials to be used to clean up oil. There could to be at least one oil spill site for every three students.

6. For a class of thirty, cut 5 1/2 gallon milk containers in half lengthwise to make ten tubs. Fill each with refrigerated salt water. (You can make your own salt water by adding 1 teaspoon of sea salt per gallon of water) In three of the tubs, place enough gravel at one end to form a shallow beach. Form sand beaches in three other tubs, and let the other four tubs have open water. Spread these tubs evenly about the room.
7. The students should be very curious when they arrive. Without any introduction, read a blow-by-blow account of the first hours of the Exxon Valdez oil spill. Without fielding any questions, proceed to introduce the materials at hand: plastic wrap, popsicle sticks, etc. Then, with great dramatic flair, stand in front of a student who has an open water tub on his or her desk and say, “You never know when, like the people of Alaska, you’ll wake up and find oil spilled in your front yard.” With great ceremony, pour one-half a capful of used motor oil into the tub. After the initial wonder is over and someone realizes that the oil has to be cleaned, pour oil in the other nine tubs.

8. For the next hour allow students to generate their own solutions to keeping the oil off the beaches and to clean up the oil. If a group ever looks too successful or confident, pour in more oil or add some seaweed, pondweed, sticks and leaves.

9. Describe clean-up methods used in the Exxon Valdez spill: mechanical (skimmers, buckets, and suction-eyedropper), dispersants (detergent and sand), commercial absorbant, bioremediation, Corexit, and cold and hot water washing of beaches. The pondweed/seaweed and bird feathers can be used to demonstrate what happens to oiled plants and animals.

10. Check with your local Department of Environmental Conservation (DEC) about how to properly dispose of your oily wastes from clean-up.

11. At the end of the hour debrief and have students write in their journals about what went well and what was frustrating.

Day 3 - Follow-up
12. Discuss the experience of the previous day. The children should be eager to share both their journal entries from the day before and their reflections from overnight.

13. Using mapping techniques on the board, explore two issues: the effectiveness of our technology to combat the oil; and the emotional issue of having a seemingly tireless adversary. Often the two webs on either side of the board mingle in the middle.

14. Distribute Ocean Oil Pollution to assist in a discussion of sources of oil pollution. Students will need pencils and protractors. (Answers for pg 2 of worksheet: degrees in column 3 from top to bottom: 36, 79, 11, 36, 112, 47, 4, 36—this totals 361 if students round off the degrees; 1a. tanker accidents; 1b. 3 percent; 2a. coastal facilities; 2b. 13 percent; 3a. tanker operations; 3b. 22 percent; 4. well blowing up, drilling rig sinking, transferring oil from the rig to ship or pipeline; 5a. runoff from roads or trails, people dumping oil, seepage from dumps, vehicle going in water, boat engine use, especially if it’s not working properly, etc.; 5b. rain or snow falling on the road and then dripping into the water; 6a. answers will vary, but one potential increase is from offshore drilling, due to the greatly accelerated leasing and drilling program as well as the difficulty of drilling under northern storm and ice conditions; 6b. answers will vary, but decreases depend a lot on all of us, and also on any changes in oil production and transportation).
Day Four - Evaluation
15. Ask the students:
   a) Which was easier, cleaning the spilled oil or working with others to clean up the oil spill? Why?
   b) Write a letter to either an oil company, the U.S. Coast Guard, an environmental group, or the U.S. President. Share your concerns about oil spills and clean-up.
   c) Do one of the two drawings below.
      1) Design a piece of equipment that can pick up oil off the surface of the ocean. In your drawing show how the equipment will look in the water. Label each part of this piece of equipment to show what it is made of and what it does.

      2) Design a piece of equipment that can keep oil off the beach. In your drawing show how the equipment will look in the water. Label each part of this piece of equipment, to show what it is made of and what it does.
What are the sources of ocean oil pollution?
About 37% of oil in the ocean is from a mix of materials and wastes from urban run-off, and industrial plants. Storm drains, creeks and rivers transport these pollutants into the ocean.

About 7% of oil in the ocean is natural oil seeping through fissures in the ocean bottom. After earthquakes more seeps are often visible.

The world’s oil industry contributes approximate 14%. These pollutants are from exploration, production and transportation of oil (pipelines) and from incidents involving oil tankers.

Vessels other than oil tankers (fishing vessels, cruise ships, etc.) contribute approximately 33%.

Oceans absorb the final 9% from the atmosphere.

Using the percentages above, use your compass and complete the pie chart above.
Ie: .07 x360=approximately 25 degrees (360 degrees in a circle.)
Questions to answer:
1a. Most of the oil pollution we know about involve which one of the sources on the chart?

1b. What percentage of ocean oil pollution is caused by that source?

2a. Which source might describe oil spills in harbors?

2b. What percentage is caused by that source?

3. When an oil tanker is carrying no oil, it fills up its cargo space with water so that the ship will be stable. A ship getting ready to load new cargo will dump the water it has been using as “ballast.” This ballast will have picked up oil from the hold of the tanker. Ballast water should be pumped into an onshore treatment facility to prevent oil wastes from being flushed into the ocean.
   a. Which source describes this type of pollution?
   b. What percentage is caused by that source?

4. How could oil get into the water from offshore drilling operations?

5a. List some ways that petroleum could get into rivers.

5b. The next time you are riding on a road or highway, look ahead of you. A well-traveled highway usually has a dark streak running down the center of each lane. The streak is caused by petroleum products, such as crankcase oil, that drip out of vehicles. How could this serve as a source of oil pollution for water?

6a. Which of the ocean oil pollution percentages do you think will increase in the future?

6b. Which do you think will decrease?

For more information go to website
http://www.world-petroleum.org/education/ocean/index.html
OIL SPILL RESPONSE

BY: Belle Mickelson

DURATION: 2 hours

OBJECTIVES: Students will read articles about how different individuals, agencies, and organizations responded to the Exxon Valdez spill. Students will discuss the role, and difference, of each group of respondents. Students will write about their response to an oil spill in their community.

BACKGROUND: On Good Friday, March 24, 1989, Alaskans awoke to disaster. Shortly after midnight, the 987-foot-long oil tanker, Exxon Valdez, had run aground on Bligh Reef, spilling nearly 11 million gallons of crude oil into Prince William Sound. The worst case had occurred.

This was the tanker catastrophe residents of the Sound had dreaded ever since the trans-Alaska pipeline was proposed in the late 1960s.

Individuals, organizations, communities, agencies, and industry moved into high gear to respond to this emergency. For volunteers and employees alike, this meant long hours and high levels of stress. They worried about their economic future and way of life, dealt with the death of birds and animals, and the oiling of their incredibly beautiful environment. There was a tremendous sense of helplessness and, for many, the need to try to rectify what had gone wrong. Disorganization, greed and infighting also occurred. But most people just wanted to help.

Many people went through the traditional grieving stages that one sees when there is a death in the family. In this case, “family” was an area that they loved and treasured; for many, an area on which their...
“family” was an area that they loved and treasured; for many, an area on which their whole way of life depended.

(Beginning quotes from SPILL, the Report of the Alaska Oil Spill Commission)

PROCEDURE:
1. Ask the students to remember their first thoughts after they heard about the spill. Ask them what people they know did in the weeks that followed.

2. Divide the class into groups. Have each group focus on a certain response group and read the corresponding articles about how different individuals, agencies, and organizations responded to the spill. Come together as a class and have each group report on their response team. Be sure to focus on the type of response action, i.e. volunteer, organizational, agency, individual; the emotional aspects of the response, what the response group hoped to accomplish and what they actually did accomplish (this could range from feelings and personal satisfaction to actual saving of animal lives or fisheries).

3. Have students write a paper about what they would do if an oil spill happened in their community.

EXTENSIONS:
1. Social studies: Invite a social worker or psychologist to talk to the class about the effects of a disaster on communities.

2. Social studies: Go on a field trip to city hall and the fire department to talk about their contingency plans for disasters.

3. View part 2 of PWSRCAC’s Peer Listener Training Program
BY: Belle Mickelson

DURATION: Three 45 minute periods

OBJECTIVES: Students will be able to describe several southcoastal Alaskan animals and their habitats. Students will explain the potential effects of oil on these species. Students will select one species to research and write a report.

BACKGROUND: The Exxon Valdez spill was the 14th largest in the world in terms of size—but number 1 in terms of animals that died. As many as 300,000 birds and several thousand otters perished. Otters died initially from hypothermia caused by oiled fur and by organ degeneration from oil ingestion. They also died from stress-related causes. Over 150 bald eagles were found dead and many more undoubtedly died. Also, their reproductive rates in oiled areas were reduced to zero. Land mammals were affected by browsing in the intertidal area. Resident killer whales that normally have a mortality of 2-3%, had a mortality of 20%. Those that died were reproductive females and young. Gray whales were found dead, but it is impossible to determine if they died from oil or natural causes. Of the seabirds, murres died in the largest numbers. Intertidal life, including clams, were completely wiped out in heavily oiled areas. Shrimp, crab, and herring fisheries in western Prince William Sound were shut down. The spill occurred right where the tanner crab were spawning—and herring were just beginning to spawn. Much of the commercial salmon fishery was shut down in 1989—a fishery that in Prince William Sound had an ex-vessel value of $110 million in 1988. And the 1989 run of pink salmon (the main cash fishery) was predicted to be the largest ever recorded—4 times that of 1988.

Exact mortality figures are difficult to gauge because the spill covered such a vast area of land and water and because animal carcasses have a tendency to sink, drift away, or be eaten by other animals.

MATERIALS:
- Alaska Fish and Game “Special Oil Spill issue”
- Wildlife Field Guides (see bibliography)
- Worksheets:
  - Land Mammals
  - Birds
  - Marine Mammals
  - Shellfish/Intertidal Life
  - Finfish
  - Wildlife and Oil
PROCEDURE:
1. Ask the students to list animals affected by the oil spill. Show them the Alaska Fish and Game “Special Oil Spill issue.”

2. Divide the students into teams to study land mammals, birds, marine mammals, shellfish, finfish, and intertidal life. Pass out the appropriate worksheets to each team. Their assignment is to identify the animals on their worksheets and write a report discussing the effects of oil on each species. Use field guides and other books found in your library or mentioned in the bibliography.

3. Use the worksheet Wildlife and Oil to provide basic information on what happens when animals are oiled. Explain that numbers of animals that died are very difficult to prove as animals sink and disappear and are never found.
WILDLIFE WORKSHEETS - BIRDS
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Oil on beaches damages shoreline life. Oil seeps downward into sand and remains there for years. Rocky shorelines can clean themselves naturally through wave action, but bays, estuaries and marshes have few waves. Oil spills in such areas are very damaging because wetlands are the nursery grounds for fish, birds and shellfish.

Oil causes serious harm to birds by coating their feathers. An oily bird does not float, and it has no insulation against temperature changes. Also, birds poison themselves by eating the oil that coats them.

Oil can smother communities of animals that live on the sea floor. This really affects clams, mussels, shrimp and crabs important to the shellfish industry. Most of these areas will eventually become settled again, but some organisms, like mussels, cannot survive in an oiled area.

Adult fish are not affected by oil pollution as much as other organisms. A massive spill can kill large numbers of fish, but, ordinarily, adult fish are able to escape injury from minor accidents. Smolt and eggs are extremely vulnerable to oil spills, however.

Marine mammals, such as whales, sometimes swim away from oil spills. But the oil affects them internally as they breathe its toxic fumes. Sea otters die when their fur becomes matted; they do not have any protection from the cold ocean water.

Different petroleum products have different affects on organisms. Diesel or heating oils are the most poisonous, while heavy crude and fuel oils are the worst for smothering animals.

Now, answer these questions:

1. Describe a kind of oil spill that could kill large numbers of adult fish, smolt, or eggs.

2. What kinds of petroleum products have the most undesirable effects?

3. How do these affect the organisms?
4. Are all areas of the coastline affected in the same way by oil pollution? If not, explain these differences.

5. Success in cleaning up an oil spill depends upon rapid action by the spiller and by federal, state and local agencies. When a spill occurs, it is reported to the U.S. Coast Guard. To be effective, containment must be done as soon as a spill is detected. In the case of the Exxon Valdez, Exxon headed up the clean-up efforts with suggestions from the Coast Guard and the State of Alaska. Unfortunately, the spill was not contained immediately through the use of booms and mechanical skimmers-so the oil spread over 1,000 miles.

Write a story about what you would do to protect the wildlife if you were in charge of cleaning up a spill.
IMAGINARY ISLAND

BY: Bonnie Jason
EXTENSIONS: Sharing, Geography, Language Arts, Math

DURATION: At least three 45 minute sessions, preferably more

OBJECTIVES: Students will have the opportunity to apply their knowledge of habitats as they invent an imaginary island. Students will reinforce their researching, mapping, conferencing, journaling, planning, brainstorming, revising, and cooperation skills. Students will experience an oil spill on their island.

BACKGROUND: This activity is designed to allow students to put to use all of their understanding of habitats that they have acquired throughout the previous lessons. The students will be developing a map of habitats on an imaginary island of their design. The map work involved in this activity may seem quite advanced, but developing precise maps is not integral to the success of the lesson. A child that comes into this activity with no map skills may, upon completion, recognize a map as a picture of an area. A child with sophisticated map skills might realize that only certain habitats can exist at specific lines of longitude and latitude and thus create a map that reflects this understanding. Students can work individually or in small groups. Student-teacher and peer conferences need to be held regularly throughout the activity. Base your evaluation on individual growth and participation.

PROCEDURE:
1. Explain that the students are going to design an imaginary island incorporating as many habitats as they can. Later they can populate their island with appropriate animal species.

MATERIALS:
- Various art supplies
- Journals
- Various maps
- Research books for information on habitats and maps
IMAGINARY ISLAND

2. Brainstorm items that can be included in their drawing. As a whole group or in small teams the children should list as many types of habitats as they can. Compile the list onto the board or easel. Next ask the children to brainstorm what types of vegetation might be found in each habitat. Perhaps a list of other non-living things could be formed as well (i.e. boulders, houses, roads).

3. Ask the children to quickly sketch the shape of their island, decide what types of habitats they would like to include and draw these in. If appropriate, refer them to a map of the world and have them decide where their island could be located. Introduce or use longitude and latitude for referring to the locations the children have chosen.

4. During conferences ask the students why they chose the area and whether or not the habitats they have included would be feasible there. For example, if a student wants to include a meadow as a habitat but has chosen to place their island in the Antarctic this may not be feasible.

5. Referring the student as often as possible to maps, have them begin designing a rough draft of their island, including all the various habitats and vegetation. The use of a key or legend may keep the task less complicated. Ask the students to be as specific as you see fit (spruce grove rather than woods, willow rather than bushes, lupine rather than flowers).

6. Conference with the children frequently to see how they’re doing and if they need any help. Refer them to other students and to reference books for advice.

7. After every session, have the students reflect in their journal about what they worked on that day and what they would like to do next. Always refer them back to these entries before beginning work again. The final draft of the island might include: designated habitats, colors, longitude and latitude lines, compass rose, elevation lines and numbers, legend and a name. However, it could also simply be a drawing. Perhaps a written caption or paragraph could be presented with the map.

8. Once the map is completed, students may populate it with animal species. Rather than drawing these onto the map, use a small symbol to represent each species and define the symbol in the legend. Or students can bring in from home miniatures or models of animals and set these upon their map.

9. Be sure to conference with students while they are working on populating their maps. It is important that students be certain their habitats fulfill the species requirements. Also, with older students, you may want to discuss population density and impacts of the species upon one another.
10. While the students are away from the classroom, use black construction paper and tape to simulate an oil spill on the island’s shores. How do students feel on their return? What cleaning methods will they use? Can they work together? How does the smell and feel of real oil differ from this oil?

EXTENSIONS:
1. Sharing: Invite other classes into your room to visit the children’s display of islands and oil spills. Take the show on the road (set it up in the cafeteria, foyer or library). Invite parents in, or grandparents or people from the local nursing home. Have the local newspaper come and take pictures.

2. Geography: Design a map of the world and have students display their island upon it (kids could design the world map instead of you). Remind students that oil travels. Tar balls can be found even on remote islands.

3. Language arts: Ask the children to make up a story, poem song or rap about their island. It could be an adventure or a description of their island and the oil spill. Publish and/or perform these. Have the children design a book for younger children about their islands. It could be an alphabet book, a picturebook, a number book, an animal book or a concept of their choice.

4. Math: Use the maps for work with measurements, scale, shapes and geometry. Set up challenges for the kids such as: Can you measure the perimeter of your island using your thumb? Your toe? Your ear? Your nose? Can you compare these measurements to a friend’s and get usable information? Can you find the square footage of your imaginary island? (They’ll first have to establish scale). Can you draw the perimeter of your island using only straight lines without changing its area? With only curved lines? Can you draw your island with exactly half its area without changing its shape? Can you make a graph to show the areas of all the maps in the class? Can you make a graph to show the numbers of various species?
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BY: John Stark, for Project WILD

EXTENSIONS: Social Studies, Language Arts, Mathematics

DURATION: three 40 minute periods

OBJECTIVES: Students will be able to describe the general events of the March 1989 Exxon Valdez oil spill in Prince William Sound, Alaska. Students will draw a mural of PWS. Students will play a game simulating conditions for cleaning up a maritime oil spill. Students will discuss the feelings of workers in the Alaskan clean-up effort. Students will identify energy conservation ideas.

PROCEDURE:
1. Show pictures of Prince William Sound with its majestic mountains and glaciers, blue water and diversity of plant and animal life. Help students locate a) Alaska on the globe and b) the Sound on the Alaska state map.

2. Have students form teams of five to ten. Each group paints and draws a large newsprint mural of a scene on the Sound.

3. Teacher(s) and/or students perform a skit to reenact the day of the spill. Students hold up the murals as a backdrop for the skit. The characters can include the captain, first mate, sea otters, birds, fish, oil industry officials, Alaska government officials, fishermen and environmentalists. As the actual moment of the spill is reenacted, a teacher comes up and smears black paint over the murals to dramatize the fouling of the water and beaches by oil.

4. Students play a game to simulate conditions

MATERIALS:
- Newsprint
- Crayons
- Colored magic markers
- Tempera paint (include the color black)
- Globe
- State map of Alaska
- Paper
- Pencils
- 100-150 plastic balls or other small objects
- Red and blue ribbon or flagging tape
- Pictures of Prince William Sound (see bibliography)
of the cleanup effort and explore the feelings of the cleanup workers. The game characters are as follows:

**Beach cleaners:** individuals who collect oil on the beach (they wear red ribbons or tape on their belts)

**Cleanup boats:** groups of five students who collect on the water (also wear red ribbons)

**Squalls:** small storms (wear blue ribbons around waist)

**Dumping site supervisor:** one or two students or teachers

**Harbor master:** a student or teacher

5. The rules of the game are as follows:

a. Teacher(s) spread the plastic balls over a large area such as a playground or football field. The field symbolizes the beach of the Sound, and the balls are the tar balls fouling it.

b. Some students play the part of beach cleaners. They go out individually, pick up one ball and deliver it to the dumping site, which is supervised by the dumping site supervisor(s), and return to the beach for more.

c. In the case of cleanup boats, four students play the part of “collection devices.” They put one hand on the shoulder of the fifth student, who is the “oil waste holder.” The five of them move from place to place as a unit. The four collection devices reach down and grab plastic balls and hand them to the oil waste holder. When the holder has five balls, the “boat” must move together to the “dumping site” to release the balls.

d. While workers collect tar balls the squall(s) chases them. If he/she can steal the red ribbon from a cleanup worker or all five ribbons from a boat, the worker or the boat has been caught by a squall on the Sound and must return to “port” to wait out the storm.

e. While cleanup workers are collecting tar balls the dump supervisor(s) throws some of them back onto the water and beach to symbolize the vastness of the volume of oil spilled.

f. As the game progresses and the bad weather of September approaches, more students are assigned as squalls, and clean-up efforts become more difficult and dangerous. Finally, in September weather conditions are so bad and the Sound so full of squalls that all clean-up efforts must be suspended until the following spring. The game portion of the game ends.

6. Teacher leads a discussion based on the following questions:

What emotion did you feel when you saw how big the beach and the spill are?
What emotions did you experience when the waves washed the oil back out into the water?
How do you think a real oil spill clean-up employee would feel seeing the dead and oiled animals on the beach and floating in the water?
Do you think it will be possible for the workers to restore the Sound to the way it was before the spill? Why? Why not?
Oil from Prudhoe Bay is shipped through Prince William Sound and other areas in order to supply some of our energy needs. Can you say that your own family’s use of oil products is the partial cause of this oil spill? If so, why is this true? If not, why not?
Are you willing to change your own energy use habits in order to make such spills less likely? If so, what kinds of changes would you make?
7. At this point the teacher may invite the students to write letters to express what they would say to clean-up workers to express thanks for their hard work and to encourage them in the clean-up effort. Letters may be written to the President or to congressional representatives or other officials expressing concern over the spill. Students may explore ways to encourage energy conservation in their own families and in their community.

EXTENSIONS:
Social Studies: Students may identify other environmental disasters or potential disasters in their area. They may find ways to help out in those situations by writing letters, raising public awareness, or raising money.
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OFFSHORE OIL DRILLING

BY: Belle Mickelson, adapted from Alaska Sea Week Curriculum, Vol. VI

EXTENSION: Social Studies/Science

DURATION: four 40 minute periods

OBJECTIVES: Students will write to congressional representatives to find out what areas are coming up for leases in the near future. Students will produce an imaginary TV special about the effects of offshore drilling. Students will research opinions about offshore drilling in their own community. Students will invite people concerned with offshore leasing to visit their class. Students will write to their congressional representatives with the results of their research.

BACKGROUND: The 1989 Exxon Valdez oil spill, like the 1969 Santa Barbara oil spill, released a powerful surge of public concern about the environmental effects of exploring for and producing oil and gas from the outer continental shelf. This focus on oil spills, while understandable and legitimate, has obscured other subtler issues regarding offshore oil.

At the root of the problem is what resources we should give priority to: offshore oil and gas? Onshore oil and gas? Coal? Nuclear? Hydro? Conservation? Solar and other renewables? Commitments to offshore leasing by governmental and industrial resources means that those resources cannot be devoted to other energy sources. Several national energy analyses have concluded that foreign oil imports could be eliminated if the nation were aggressively pursuing energy conservation.

Are the risks arising from offshore oil and gas acceptable in light of other sources? Do we know enough about the cumulative effects of oil operations at sea to expand the offering of offshore lands by (say) twenty times in the next five years? More than half the U.S. total—more than 500 million acres—is off Alaska’s coast.

Headline-grabbing catastrophic oil spills like the Exxon Valdez can definitely have significant and long-term adverse effects on ecosystems, but routine discharges are even more serious. They can amount to millions of gallons over the life of a single well, and because their stressful affects are cumulative over a long period, they are more difficult to observe and measure. And today, when economic analysis is so prevalent, how do we quantify the value of a healthy ecosystem? For instance, estuaries and other coastal wetlands provide nursery grounds for 70 percent of the nation’s commercial fish. But how can one calculate the value of wetlands in comparison to a barrel of oil, which has a price fixed in the marketplace?

MATERIALS:

- Paper/pencils/pens
- Addresses of congressional representatives
- Stamps/envelopes
- Map of United States showing coastline
- Worksheet: A Tidelines TV News Special: Oil in Troubled Waters
What should our national offshore oil policy be? Should we continue at the present pace? Should we expand? Should we slow down while further research is conducted and alternatives explored? Oil is a mighty precious commodity, as well as a nonrenewable resource. What we use now will not be there for future generations. But any way we look at it, oil will be an important issue for students to grapple with both today and in succeeding years. What will be their solution?


PROCEDURE:
1. Ask students to point out the coastlines of the United States. Explain that oil is found on the continental shelf which follows that coastline. Explain that a whole series of offshore lease sales are planned by the government. How can you find out what sales are planned in the near future? One way is to write your congressional representatives.

2. Use the paper and pen to compose a class letter to your representatives asking for information on upcoming lease sales in your area or areas of interest to your students. Discuss protocol for writing to members of congress.

3. Use the worksheet A Tidelines TV News Special: Oil in Troubled Waters to produce an imaginary TV news documentary. This was written in 1982, but these same issues are being discussed today. You may want to have students dress their parts and videotape the results for a more realistic atmosphere.

4. Have students prepare a short survey form about offshore drilling and leasing and solicit community opinions.

5. Invite those concerned with offshore drilling to make presentations to your class: oil companies, Native corporations, Alaska Department of Fish and Game, U.S. Fish & Wildlife Service, National Marine Fisheries, the Bureau of Land Management, fishermen, environmental groups, etc. Discuss community changes resulting from offshore drilling operations, environmental effects of drilling, safety considerations, and national energy needs. An Alaskan video on this topic is Uncertain Summer. Ocean Ranger by CBC describes a drilling rig that went down off the coast of Newfoundland.

6. Write individual or class letters to your Congressional representatives with the results of your research on offshore drilling.

EXTENSION:
1. Social studies/science: Show and discuss films/videos on offshore drilling. Uncertain Summer is a film based on reactions of Alaskans concerning leasing of the northeast Gulf of Alaska for oil exploration and production. Ocean Ranger is a film about an offshore drilling rig that went down off Newfoundland. (See appendices for information on obtaining these).
**Winds of change are blowing over Alaska.**  When the largest oil field in North America was discovered at Prudhoe Bay in the late 1960s, few doubted that the state would ever be quite the same again.

This is an imaginary TV News Special about the problems and promises of future oil development. The people in it are imaginary, too. But their questions and concerns are very real. And they have been discussed in such widely scattered places as an oil company board room, the wheelhouse of a fishing boat, and the community hall of an isolated village on the shores of the Bering Sea.

Read the script through. Then choose members of your class for each part and let them select a team of “advisors.” Each part represents a different point of view, and there are other arguments you might think of as you go along.

**Cast of Characters:**

**MODERATOR**

**CARRIE,** spokesperson for the U.S. Interior Department

**MIKE,** oil and gas company official

**JIM,** member, Alaska chapter, Friends of the Environment

**OLAF,** commercial fisherman

**JOE,** North Slope Borough official

**BARB,** member of the governor’s staff

**JACOB,** Mayor of a village on the Bering Sea coast

**FAY,** marine biologist

**MODERATOR:** Good evening, ladies and gentlemen.

Prudhoe Bay seems far away to most Alaskans. Still, the oil income from that great discovery has touched people in all parts of the state. It has meant less taxes, more jobs, better airports, low-cost loans, satellite TV, new village schools with basketball courts and hot showers, and a lot of other things we didn’t think we’d get for awhile.

Oil development always has its risks, especially where unspoiled seas and coasts and wilderness areas are concerned. But so far the damage has been limited to an occasional spill along the trans-Alaska pipeline to Valdez.
Then last spring the U.S. Interior Department announced a plan for oil development that would bring the risks of Prudhoe Bay to more than two-thirds of Alaska’s coastline. In a move to make the nation less dependent on foreign oil, the government said it would speed up lease sales on hundreds of millions of acres of offshore lands in the Bering, Chukchi and Beaufort seas. Most of these waters not only have been called the most dangerous in the world, but they also hold some of the richest fisheries in the world.

That announcement touched off a storm of protest—from fishermen, from environmentalists, and from the people who live along those isolated coasts. Is it possible to drill safely in such treacherous waters? Can you clean up a spill in 40-foot seas? Are we moving too far too fast?

Our panel here tonight is made up of people who will try to answer some of those questions, and may raise some more of their own. Let’s start with you, Carrie. Tell us about this new plan. And why the big rush to drill offshore?

CARRIE: The President feels very strongly that we need to find out as soon as possible how much oil the United States has within its borders. We think more than half of the nation’s undiscovered oil may lie in Alaska and its outer continental shelf. But we won’t know for sure until we look. So we want to give the oil and gas people a chance to discover what’s out there and where it is.

MODERATOR: How much offshore land are we talking about?

CARRIE: Some changes still are being made. But our original plan is to offer about 200 million acres for leasing each year for the next five years. All that land certainly won’t be leased. But the oil companies will be able to develop the most promising tracts.

JIM: One billion acres in five years is far too much. That adds up to an area about the size of the whole land mass of Alaska. You even took the oil companies by surprise. Some of them said it might be more than their experts and equipment could handle.

MIKE: Oh, no. We can handle it. We’re ready. We’ve more than doubled our offshore surveying over the past two years. We wouldn’t be out there if we didn’t know what we were doing.

CARRIE: You see, Jim, most of these areas were already set for future leasing. We just increased the number of sales, changed some of the dates, and rearranged a few boundaries so that they line up better with the best potential oil basins.

OLAF: You sure did a job on some of those boundaries. You enlarged the North Aleutian Basin to take in Bristol Bay, which has the biggest red salmon runs in the world. Think of the damage a spill out there might do! And that’s not all. During the height of the season we hardly have room for our own fishing fleet—and think of the foul-up of boats and nets and drilling rigs and seismograph tows...
MIKE: (interrupting) We would hold up exploration during the peak of the runs.

OLAF: Well, how about St. George Basin? There are year-round fisheries out there—for pollock, cod, yellowfin sole. Millions of tons of whitefish are harvested each year in that area by foreign fishing fleets. It’s a major source of food fish for the world. And it’s also one of the state’s prime crab-fishing grounds.

The point is that fish are renewable resources. Oil isn’t. These fisheries can last for thousands of years if we don’t goof. But the life of an oil field is only 20 to a top of 50 years.

BARB: The governor went through the roof when he heard that Bristol Bay was included. And he didn’t like the idea of leasing in St. George Basin much better. But at his request, Interior Secretary Watt said he might change or delay some of the sales in those two areas.

CARRIE: Interior Secretary Watt is a reasonable man. He’s aware of Alaska’s concerns. He will listen to facts presented to him about possible risks. But because of the nation’s pressing need for oil, he won’t listen to fears unsupported by facts or experience.

OLAF: But we fishermen are about the only ones who have had experience in the southeast Bering Sea. And we know how wild those waters can be. Winds to 130 miles an hour. Snow, sleet, rain, fog. It isn’t called the worst weather in the world for nothing.

JACOB: We know, too. We hunt on the moving ice pack farther north. And we have been caught in snowstorms where you cannot see ten feet, with winds so strong you have to get down and crawl to move. How would you clean up an oil spill in weather like that?

JIM: The government itself has made some pretty frightening forecasts for oil development in the Bering, Chukchi and Beaufort seas. It says right here in its own Environmental Impact Statement that we can expect 30 oil spills of more than one thousand barrels and 10 oil spills of more than ten thousand barrels during the probable life of these basins.

CARRIE: Those reports have to consider the whole range of possibilities—from no spills at all to the worst that can be expected. And, of course, everybody seems to leap on the worst possibilities.

JIM: Well, my understanding was that those figures were “best guesses.”

MIKE: Actually, Jim, we have a very clean record offshore. Let me give you a few figures. In the past ten years there have only been two spills of more than 1,000 barrels from all of the offshore rigs operating in U.S. waters. Probably the worst spill we’ve ever had was in 1969 off Santa Barbara, California. And even that did no lasting damage. The fish were still there—although the fishermen didn’t want to put their nets down through the oil. And the shellfish re-established themselves within a year or two.
JACOB: The idea of trying to fish in oily waters is sickening. Who would want the fish? Our only cash income comes from commercial fishing. How could we make any money? We could not go to the bank. The Bering Sea is our bank. Furthermore, anything that affects the food chain of the sea would do far more damage here, because the growth rate of marine life is far slower in cold water.

MIKE: I was talking about the worst case, Jacob. We’ve learned a lot since then. And we’ve found that in the long run, oil development has had very little effect on the fisheries.

BARB: The governor says he’d sleep better at night if he heard that from a marine biologist instead of a petroleum engineer.

MODERATOR: Well, let’s hear from our marine biologist. What do scientists think, Fay?

FAY: Frankly, scientists disagree on the effects of oil on fish and shellfish. Some say that fish like salmon wouldn’t be affected because they could swim away from a spill. Others think the oil might disrupt their migrations—even plugging up their nostrils and throwing off their homing instincts.

Deepwater bottom-dwellers such as crab probably wouldn’t be directly affected because in very cold water the oil usually stays on the surface. But an oil spill certainly could kill young crabs and other free-swimming larvae. And if storms or breaking waves churn the oil into bottom sediments, intertidal life could be smothered.

We do know that oil is disastrous to seabirds. It gets into their systems when they preen their feathers, and it destroys their insulation so that they freeze or drown. Marine mammals that depend on their fur for insulation, such as fur seals, sea otters and polar bears, also would suffer. We need to know much more about this. But unfortunately, federal funds for such studies are being cut back severely.

MIKE: Believe me, we don’t want any oil spills either. And we haven’t had any to speak of up here. We’ve developed new drilling techniques for the Beaufort Sea. And as Joe knows, that’s hazardous environment. We’ve been operating safely in the upper Cook Inlet for more than 20 years. Cook Inlet has a silty bottom, much like the Bering and Chukchi seas. And there we’ve learned to deal with some of the biggest tides in the world and chunks of ice churning around all winter.

FAY: But what if you did get a spill, Mike. How could you clean it up?

MIKE: It would be tough and tricky. No question about that. But we’ve done a lot of research of Beaufort Sea conditions, and we’ve learned from our Canadian neighbors who have drilled in broken ice farther offshore than we have.
Actually, we’ve found that our cold climate is a help, so far as cleaning up oil is concerned. Oil in very cold water will thicken and stay on the surface where it can be skimmed up or soaked up. Cold water also keeps it from spreading. For example, a spill of as much as 40,000 barrels in calm cold would cover less than a mile up here, where the same spill in warmer waters might cover up to 100 miles.

JOE: What if the oil is trapped beneath the ice, or is caught in the moving ice as Jacob was talking about?

MIKE: That’s a bigger problem. But floating ice sometimes acts as a natural barrier to contain the oil until we get to it . . .

JOE: . . . if you can get to it . . .

JACOB: . . . if you could find it. You would probably find it washed up on our beaches after break-up.

OLAF: How about trying to clean up a spill in 40-foot seas with waves breaking all over the place.

MIKE: Well, no, we wouldn’t even try it. But that’s where nature takes over for us. In stormy seas, the oil breaks up and evaporates very rapidly. The open ocean has a great ability to absorb oil.

OLAF: Listen, Mike, we don’t want to sound totally negative because we all need the gas and oil. We need it for our fishing boats, our snowmachines, our trucks, our planes. We just wish you’d get it somewhere else. And what I would like to know is this: Can anything be done to stop these offshore sales?

CARRIE: Well, the plan still must be approved by the President and passed by the Congress.

JOE: But the President is the one who asked for it in the first place, and he certainly seems to be able to get what he wants from Congress.

CARRIE: Well, it’s federal land. All offshore land outside the state’s three-mile limit belongs to the federal government. And so does the oil from those lands. You’ve got to realize that that oil doesn’t belong to Alaskans any more than it belongs to somebody in Nebraska.

BARB: And unlike the Prudhoe Bay oil, the state won’t get a penny for it—except possibly in a few cases where the oil fields might extend out under state lands.

MIKE: Now wait a minute, Barb. This state has been running on oil dollars ever since Prudhoe Bay began producing. We’ve spent hundreds of millions of dollars to find the oil and you take
all the profits.

OLAF: Not all the profits. The oil companies are still making plenty of money.

MIKE: But the state has raised our taxes to the point where we can hardly afford to operate up here. So you shouldn’t be surprised that we’re willing to move offshore.

JACOB: Still it seems strange. Our lives depend on the fish and animals that live in those waters. You could not find a place to drill that could do us more harm. Yet because it is federal land, we have nothing to say about what you do out there. And we will get nothing for it.

MIKE: Well, talk to Joe here. The North Slope Borough has certainly benefited from the jobs and dollars oil development has brought in.

JOE: Fortunately, Prudhoe Bay is far away from most of our villages. So we are able to benefit without the bad direct effects of a boom-town. Some of our people hold jobs at Prudhoe. But their tours of duty allow for time off so that they can go home to hunt and fish. And some of our villages have invested in the construction of drilling rigs.

FAY: That’s odd, since you’ve been fighting oil development because of its possible effects on the bowhead whale.

JOE: The oil industry is there. That is a fact of life. So to survive, we must make trade-offs.

We’re an organized borough, of course, so we can tax oil and gas facilities on lands within our borders. And what we have done is to use this tax money to hire our own people to build new homes, public buildings, light plants and other things that we need—not just in Barrow but in all of our villages.

JACOB: But we don’t have any regional government. Our villages are on their own. What will we do when the oil companies move in? What will happen to our lifestyle and our culture? Will it be like Unalaska after the fishing industry moved in at Dutch Harbor? Unalaska isn’t an Aleut village any more. It is just a village with some Aleuts living in it.

MIKE: No, no. It doesn’t have to be like that. You and your village can decide whether you want to be involved. And if you don’t, we’ll go somewhere else.

For example, Yakutat chose not to get involved when we were exploring for oil off the North Gulf Coast. So our drilling crews just flew in and out of the airport and never even went into town. On the other hand, Kenai chose to participate, and our plants and refineries there have 90 percent local hire.

And it isn’t just the jobs. If we plan together, some of the oil company’s needs might be help-
ful to you in the future. Like enlarging the airport or the boat harbor, or improving your roads and water systems. Maybe even building our warehouse with slanted floors so that you can use it later as a fish processing plant. You might think of these things, too, when you talk about “quality of life.”

**JACOB:** Well, we heard about a recent poll in Barrow that made us wonder. The people were asked about changes that had occurred since oil development began. And even though Prudhoe Bay is more than 200 miles away, they said there was more fighting, drinking and drug abuse in Barrow than there used to be, and not as much helping and sharing. They said prices had risen sharply and fish and game stocks had declined. They still rated the quality of life as “good,” but not as good as it was in 1970.

So we worry about what it would be like in our villages. We are so small and the oil companies are so big. And the travelling salesman has been here before.

**MIKE:** We are not travelling salesmen. Alaska is our home, too, and we are going to be here for many years. We can work together. It isn’t oil versus fisheries, or oil versus lifestyles or oil versus anything else. It’s oil and fish and whales and seals and people . .

**BARB:** Sometimes it seems as though the outside world is asking the impossible of Alaska. They want us to provide the oil for their industrial economy. They want our prime fish products from unpolluted waters. And they still want us to remain the great unspoiled wilderness area of their dreams.

**FAY:** Well, we’ve lived through all kinds of “rushes” before—for gold, for furs, for fish.

**CARRIE:** And there will be more in the future—for coal, for minerals . . .

**JIM:** Which means we’ve hot to handle this one better than it’s ever been handled before.

**JOE:** And we can do it if we’re careful—if we don’t cut any corners.

**JACOB:** The oil has been there for millions of years. It will last a little longer.

**OLAF:** Which brings us back to the first question: What’s the big hurry?

The story of development of Alaska’s offshore oil resources is just beginning. Find out what has happened since this imaginary debate took place in 1982, and watch for TV and newspaper reports on the current situation.
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BY: Bonnie Jason, Janet Fink and Bill Morisette

EXTENSIONS: Sharing, Math, Geography, Social Studies, Language Arts

DURATION: 3 weeks, minimum of 15 mins. daily

OBJECTIVES: The students will learn how to monitor their electrical consumption and suggest how to make reductions. The students will practice appropriate small group behavior and communication skills. The students will practice designing and interpreting graphs.

BACKGROUND: This project requires a commitment of a few weeks. Daily time, however, is minimal. It is imperative, for a successful study, that you receive permission from a few families to monitor their electricity consumption. This can be done by sending home a letter soliciting volunteers prior to the beginning of the project. For best results six homes should participate. Three of these will be your control group, three will be your experimental group. The control group will be asked to keep their energy consumption as normal as possible for the duration of the study. The experimental group will, based upon the recommendations of the children, attempt to reduce their energy consumption. With permission from the families, ask the local electric company for their past records (perhaps asking for the records of the same month of the previous year). Also, line up an expert from the company to visit your class on at least two occasions. Dedicate one bulletin board to a display of graphs showing the daily results of your study. Organize your bulletin board as follows:

MATERIALS:
- Bulletin board
- Graph paper
- Resources on electricity use
- Journals
- Worksheet: Energy Hog or Energy Hoarder
HOME ELECTRICAL AUDIT

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**PROCEDURE:**

1. **Week previous to start of project:** Send letter home to families. Ask families for permission to obtain their past records from the electric company. Notify families as to which group their home will be placed (control or experimental). Line up an expert from the electric company to visit your class the following Monday and Friday. Ask the expert to bring copies of families’ electric records with him/her on Monday. Use the Energy Hog or Hoarder worksheet to get students thinking about energy saving measures.

2. **Week one of project:**
   
   **Monday:** Describe the project to the class. Tell them that they will be monitoring the electrical consumption of some of the families in the class. They will be keeping daily records and making recommendations for how some of these families can reduce their electrical use. As these families incorporate these suggestions, their consumption records will be compared to the homes whose electrical use remains unchanged. Have your expert from the electric company teach the children how to read an electricity meter and what information the meter provides. Also, ask the expert to teach the children how to read the electricity records. Now break the class into six small groups. Each group should contain one child whose home is being monitored. The groups could be named for the last name of the family being studied (i.e. the Smiths, the Browns, etc.). Hand out the electricity records from the same month of the previous year to the appropriate groups. With the help of the expert have each group design a graph that depicts the information on the record. Display these on the bulletin board and discuss the similarities and differences. Describe the daily routine for this project. Each day’s homework assignment, for the children whose homes are being monitored, will be to read the electricity meter at their house. This must be done at exactly the same time each day. These children will report their reading to the group the following school day. The group will record the results on a graph for that week, and keep the graph on display on the bulletin board. After completing this task, the children must briefly write in their journal about what they believe the results reflect and what results they expect for the following day.

   **Tuesday:** Children whose homes are being monitored should share their first meter reading with their group. Groups will design a graph for week one of the project and include day one’s reading. Children will briefly write in their journals.
HOME ELECTRICAL AUDIT

Wednesday and Thursday: Groups will add results from day 2 and 3 to their week one graph, and in their journals, reflect upon the results. Keep in mind that the expert from the electric company is visiting again on Friday.

Friday: Groups should complete their daily assignment. As a full group discuss the similarities and differences observed in the graphs. Use the expert to help you and the class understand what these similarities and differences mean. Using the expert as a resource, ask the children to brainstorm suggestions on how families can reduce their electric consumption. Decide on a reasonable number of useful suggestions to recommend to the families in the experimental group. For the next week of the study these families will attempt to implement these suggestions into their daily life. It will also now be the responsibility of the children in these homes to report back to the group on how successfully their families are able to do this.

Remind the appropriate children that they must take meter readings over the weekend and report back to the group on Monday.

3. Week two of project: Continue on with the daily routine, but add in more large group discussion time in order to evaluate the success of the implemented suggestions for reducing the electricity consumption in the experimental group. You may want to once again invite your expert in to help in this process. Do not, until Friday, make any changes to your electricity reduction plan unless it is unavoidable. Come Friday, based upon the week’s results, make a final evaluation and change your plan as needed.

4. Week three of project: Continue on with the daily routine, making time for frequent discussions. On Monday ask each group to put together a presentation of their information to give to the class on Friday. This presentation should provide the results of their study and explain how these results compare to other groups. It should also include an interpretation of the results, an evaluation of the process, and a description of how the project has altered their views, if indeed it has.

Finally, the presentation should include a description of what they intend to do with what they have learned. Be sure to leave time for this sharing on Friday. Also, save time this week for writing thank you notes to the expert and to the families involved in the study. You may want to include the results of the study in these letters.

EXTENSIONS:

1. Sharing: Notify the newspaper about the project and the results of your study (get permission from the families before giving their names to the press). Have the groups give their presentations during an assembly. Invite members of the community in to educate them about ways of reducing electricity consumption. Have your children write their suggestions and make a brochure available to the public (include the brochures in the newspaper, hand them out door to door, leave a pile at the public library, ask the electric company to
send them out in their next billing, etc.). Make sure your brochure is printed on recycled paper! Make up a video news presentation to be shown to other classes, schools or interested groups.

2. Math: Use your graphs to do some studies on interpreting graphs. Ask your class to design a different type of graph depicting the results of the study. Use electricity meters to work on place value. Make up word problems using the information on the graphs or the information on the electricity records.

3. Geography/social studies/language arts: Have students write to schoolchildren in other states or countries and compare their energy use. Chart similarities and differences. Discuss the energy advantages and disadvantages of living in different areas. Have an energy saving contest with the other school. Suggested by Peg Willett.

4. Social studies: Have students list all the electrical appliances in their home and find the wattage for each. Then pick 3 and record how much time they are used for a 3 day period. Read the meter before and after. Using information from the utility company on the cost of kilowatt hours, compute the cost: per day, per week, per year. This could also be multiplied by the amount of households in this city. For the next 3 days students should make a special attempt to limit use of those 3 appliances. Have students predict the effect this will have on consumption figures. Take a reading before and after to check their prediction. Suggested by Peg Willett.
ENERGY HOG OR ENERGY HOARDER

(Reprinted from the Alaska Sea Week Curriculum Series, Volume VII)

Read and mark the answers that best describe what you do to save or use energy. Then total up your points: 70 points or more and you’re an energy hoarder; 30 to 69 points you’re not too bad; 29 to -29 need some improvement; and -30 points or less you’re an energy hog!

1. Do you turn the heat down and use lots of quilts and blankets at night? (7 pts) ________
   ....an electric blanket? (4 pts) ________
   ....or just keep the whole house warm? (-2 pts) ________

2. Do you grow some of your own vegetables? (5 pts) ________
   ....pick berries? (5 pts) ________
   ....hunt or fish for food? (5 pts) ________
   ....rely only on food from the Lower 48? (1 pt) ________

3. Do you eat food from the four basic food groups everyday? (5 pts) ________
   ....sometimes eat from the four basic food groups? (3 pts) ________
   ....like pop, candy and potato chips? (-1 pt) ________

4. In your spare time, do you always have your nose in a book? (5 pts) ________
   ....bicycle, hike, swim, jog, canoe, sail, or cross country ski? (5 pts) ________
   ....ride a three wheeler, in a car, motorboat, or on a snowmachine? (-5 pts) ________
   ....feel that your nose may one day become permanently glued to the tube (TV)? (-3 pts) ________

5. Is your house weatherstripped and caulked? (5 pts) ________
   ....real drafty? (-3 pts) ________
   ....or does it have holes big enough for voles (Alaskan mice!) to come in through? (-5 pts) ________
   (subtract another 3 pts if the holes are big enough for weasels!)

6. Are your windows single-paned? (1 pt) ________
   ....visqueen? (1 pt) ________
   ....double-paned? (5 pts) ________
   ....triple-paned? (8 pts) ________
   ....heat mirrored? (10 pts) ________
   ....argon filled? (10 pts) ________

7. Give yourself a point for each inch of insulation (or equivalent)
   ....in your roof
   ....in your floor
   ....in your walls
   (if you have log walls, figure 1/2 pt for each inch of thickness)
8. Add 4 pts if your house has a vapor barrier ________

9. Is the temperature in your house in wintertime*
   
   .....warm enough for bikinis? (-7 pts) ________
   
   .....OK for T-shirts and shorts? (-5 pts) ________
   
   .....cool enough for light sweaters? (3 pts) ________
   
   .....requires heavy sweaters and wool shirts (5 pts) ________

*If your house is well insulated, you can still have it warm and be saving lots of energy, but there is such a thing as overheating!

10. Do you have a hot water heater? (-12 pts) ______
   
   .....add 5 pts if it is insulated ________
   
   .....add 5 pts if it is set at 120 F or less ________
   
   .....add 10 pts if it only heats “on demand” rather than having a tank continually filled with hot water. ________

11. Do you cook several dishes in the oven at once? (5 pts) ______
   
   .....use the oven for one large dish? (2 pts) ________
   
   .....or use it to make toast in the morning? (-1pt) ________

12. Do you boil water with the lid on the pan? (3 pts) ______

13. After washing clothes, do you hang them up to dry rather than using the electric dryer?
   
   .....never (-1 pt) ________
   
   .....in good weather (3 pts) ________
   
   .....in any weather (5 pts) ________

14. Do you turn off lights when you are not using them?
   
   .....never (-2 pts) ________
   
   .....sometimes (3 pts) ________
   
   .....always (5 pts) ________

15. Do you repair things when they break? (10 pts) ______
   
   .....or throw them away? (-5 pts) ________

16. Are your clothes
   
   .....from second-hand stores or hand-me downs? (8 pts) ________
   
   .....almost always new? (1 pt) ________
   
   .....only the finest designer specials? (-3 pts) ________
17. Do you recycle or reuse newspapers, cans, bottles, paper? (10 pts)_______

18. Do you shut off the TV or radio when you’re not using them?
   ....always (3 pts) ________
   ....sometimes (-1 pt) ________
   ....never (-3 pts) ________

19. Subtract 3 pts for each gas or electric appliance in your house. ________

20. Do you have solar panels, wind generator, geothermal, hydropower, air-to-air heat exchanger, or a heat pump in your house? (15 pts) ________

21. Add 3 pts for each additional way you save energy. Write them here. ________

22. Bonus question (15 pts). List at least 5 new ways you can save energy in the future.

23. What changes could you make to improve your score?

Now total your points. __________

Are you an ______energy hoarder?
    ______not too bad?
    ______need some improvement?
    ______an energy hog?

23. What changes could you make to improve your score?
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HOW MANY BARRELS DOES MY HOUSE USE?

BY: P.J. Bauer and Claudia Bain

EXTENSION: Math

DURATION: 10-15 minutes

OBJECTIVE: By calculating the number of barrels of oil used by their own households in one year, students will make the connection between their personal energy consumption and the cargo of the Exxon Valdez.

PROCEDURE:
1. Write this formula on the board: 22 barrels per person per year.

2. Begin by explaining that all of the energy used by a person each year can be expressed in oil equivalents. Experts tell us that in the U.S., on the average, a person consumes 22 barrels each year.

3. Have each child calculate how many barrels of oil his/her family consumes each year. How many barrels are used by the whole class together? By all of the families represented in the class? How can you calculate how many tanker equivalents come to your town in a year? Have the children compare their town’s energy consumption to the 11 million gallons spilled in Alaska. (1 barrel = 42 gallons)

4. Using the formula, calculate the energy consumption, in barrels of oil, of your school, too. What else can you think of to measure this way?

EXTENSION:
1. Math: Use the worksheet How Much Oil? to figure out how much 11 million gallons of oil is in descriptions that your students can understand.

MATERIALS:
- Pencil
- Paper
- Worksheet: How Much Oil?
Homer High School chemistry and physics students wondered just how much 10 or 11 million gallons of oil really is. They got busy with some calculations designed to make it a little easier to visualize, and instructor Richard Ingels shared it with the community.

- The oil would fill up over 4.5 Homer High School Commons to the top.
- The oil would fill up over 3.5 Homer High School gyms to the top.
- The oil would fill over 44 Homer High swimming pools.
- If one left the kitchen faucet running at full volume it would take over 9.7 years to get the same volume as the oil spill.
- The oil spill is equivalent in volume to 8.8 million cars draining their oil.
- If 45 percent of the oil was converted to gasoline, a car using the gas could go around the world almost 4,000 times.
- If 45 percent of the oil was converted to gasoline, it would take a person 7,933 years to use the gasoline (filling up once a week).
- The oil would fill 92 average houses to the ceiling.
- It would take over 15,300 pickup trucks to haul the oil.
- It would require a fleet of 3,143 large fuel trucks to carry the oil.
- If the oil were spread out on the Sterling Highway half an inch deep and 24 feet wide it would stretch about 279 miles (from Homer to Wasilla).
- If the oil were soda pop, every person in Homer would be able to consume one can every day for about 82 years.
- It would take about 332 million boxes of Kleenex to soak up the oil.

Now - figure some examples for your community.
SCHOOL ENERGY DETECTIVES

BY: Belle Mickelson

DURATION: three 40 minute periods

OBJECTIVES: Students will investigate energy sources for their school. Students will suggest energy saving measures. Students will tabulate the cost savings from saving energy.

BACKGROUND: Schools in the north are traditionally overheated. Temperatures can be reduced during the day—and even more on the weekends. Windows are often sources of drafts. Hot water heaters are usually left on at night and on weekends. Most classes use vast amounts of paper. Lunchrooms often waste paper and styrofoam. Leftover food from student plates can be used to feed animals. Other items can be recycled. Once your student detectives begin to look, they may find many other ways to reduce waste and save energy.

PROCEDURE:
1. Ask the students to list ways the school could save energy. Tell them this is their chance to be school energy detectives.

2. Have students predict how much energy would be saved if the school started an energy saving program.

3. Find out how much money the school spends now for heating, electricity, paper and styrofoam products.

4. Weigh the amount of trash produced each day in the lunchroom. Weigh the amount of trash produced each day in your room. Then institute energy and waste saving measures and compare the savings.

MATERIALS:
- Thermometers
- Measuring tape
- Pencils
- Paper
- Tape
5. Measure and record the window and wall temperatures in the classroom. Record thermostat settings. How do they compare?

6. Make a draftometer by taping a piece of paper on a pencil. Check for drafty windows and doors. Give your findings to the janitor. Maybe parents can help with caulking and weather stripping.

7. Measure the total areas of the windows. Measure the total area of the floor. Divide the floor measurement into the window measurement to get the window to floor ratio. A ratio greater than 10% is an energy waster. Are your windows on the north or south side of the building? What difference would that make? What is the importance of windows? How can windows be improved to reduce heat loss?

8. Tour the furnace room with the janitor. Is there any way the heat can be reduced? Would students be willing to wear sweaters during the winter? Could someone turn the heat down at night and on weekends? What temperature is the hot water heater set on? Could someone turn the hot water heater off at night and on weekends? Ask the janitor for other suggestions to save energy.

9. What other suggestions does your class have? Can paper be used on both sides? What about using the blackboard for lessons to save on paper? Or attempting to do more activities that don’t require paper?

10. Compile your detective report and compare energy use and costs from one day to the next. Present your information to other classes, the principal, the school board, and the school newspaper.

(Procedures 5, 6, and 7 adapted from the U.S. Dept. of Energy’s Science Activities in Energy.)
SUN TEA

BY: Bonnie Jason, adapted from Energy it’s Everywhere curriculum. Used with permission.

EXTENSIONS: Sharing, Language Arts, Social Studies, Science, Math

DURATION: Total of 1 hour, divided into short segments throughout a single day

OBJECTIVES: Students will attempt to determine the usefulness of the sun as an energy source. Students will develop graphs to describe their data. Students will practice good observation techniques and group cooperation skills. Students will discuss energy sources using the terms renewable and non-renewable.

BACKGROUND: This is a very simple experiment in which students use the energy of the sun to make tea. Before beginning this activity you may want to discuss the concept of energy as defined by something that causes light, heat, and movement. The children will probably be very aware of the sun as a form of energy, but the clues for detection may seem subtle.

PROCEDURE:
1. Have a brainstorming session in which students list ways they can prove the sun produces energy (they see plants grow, people get hot when they sit in the sun, it causes the wind to blow, warms the water in their pools, makes the hood of the car hot, etc.).

2. Divide the class into 6 small groups. Give each group one jar of water and 6 tea bags (more or less depending on the size of the jars). Explain to the groups that they will be making tea, each using a slightly different procedure. Assign one group to place their jar in direct sunlight outdoors, place the tea bags into the jar and secure the top. The second group should place their jar in the shade outdoors. The third should...
place theirs on the window sill. The fourth, in a cabinet free from light. The fifth, in the classroom away from sunlight. And the sixth should make a reflector from the tinfoil and cardboard, place their jar in direct sunlight, and position the reflector beside it.

3. The groups should now observe their tea and write their observations into their journals. They should focus on the color and the movement of the tea and water. Ask them to take the temperature of the water and record this in their journals. Using spoons have them sip the tea and record their description of the taste. Encourage them to do these procedures very rapidly, so as to minimize disruption of the experiment.

4. Repeat this process once every half hour or forty-five minutes. Be sure to have the children mark down the time of their journal entries. Take the last reading approximately forty-five minutes prior to the end of the day. Then, ask the groups to make graphs that reflect the results of their study. These can be simple line or bar graphs, one representing color, one temperature, one taste. Display graphs where children can easily see them.

5. While you are enjoying your iced tea, discuss the similarities and differences that the graphs reflect. Compare the taste of the different teas. To help generate conversation ask questions similar to these: Which group’s tea is the strongest? Why? Which group’s tea is the next strongest? Why? Which group’s tea is the weakest? What caused the water to turn to tea at different rates? What are the pros and cons of using the sun as a source of energy?

6. Discuss other forms of energy. Which energy sources are renewable? (sun, wind, wood, water) Which energy sources are non-renewable? (coal, oil, gas)

7. Science/social studies: Plan a field trip to a solar collector. Use a check list like the one enclosed (Sun Tour) to keep students looking for renewable and non-renewable energy sources. Have students interview the owner regarding the advantages/disadvantages of solar heat.

EXTENSIONS:
1. Sharing: Designate a bulletin board for the groups to display their graphs. Make large quantities of sun tea to share with the school at lunch or recess. Use herbal teas and flavored teas.
2. Language arts/social studies: Have the children write up a recipe for successful sun tea. Have children interview someone who uses the sun to get energy for their home or work place.
3. Science: Have the children develop other sun recipes and try them. Try some other sun experiments. Compare evaporation of water indoors and out. Plant some seeds and compare their growth indoors and out.
4. Math: Use the graphs for graph making and interpreting activities. Generate a graph to compare the success of various energy sources. Develop word problems based on the information in the graphs.
SUN TOUR

How many of the things will you see on your field trip?

The Sun  An insulated building
A solar collector with roots  A building with icicles
A flying solar collector  Arctic entryway
A building with south-facing windows  Closed curtains
An uninsulated building  Log house
Storm windows  A car with 6 people in it
Wood smoke  Somebody walking
Visqueened windows  A hitchiker
A car with one person in it  A stop sign
People riding a bus just like us (wave)  A store with lots of lights on
A truck with dual exhausts  A river
A paddle wheel  Sidewalk
A street light  Airport
Bike path  Neon sign
Airplane  Railroad
Parking lot  Stop light
Yield sign  Telephone pole
Train  Wind
Transformer  Somebody bicycling
Coal-fired power plant  Radio tower
Grocery store  A park
Fast-food store  Dumpster
A forest  Waste paper
Taxi  Television
Aluminum can  Somebody wasting energy
Flourescent lights  Somebody saving energy
Laundromat  A working solar collector
Something plastic

How are these items related to energy?

How many renewable energy sources did you see?

How many non-renewable energy sources?

Circle all the renewable energy sources, or things that help save energy.
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WIND POWERED BOATS

BY: Bonnie Jason

EXTENSIONS: Social Studies, Art, Math, Sharing, Language Arts, Science, Math

DURATION: Three 45 minute periods, three different days

OBJECTIVES: Students will explore wind as an alternative energy source. Students will make wind-powered boats for a class race.

BACKGROUND: Any use we can make of the wind reduces our dependence on oil. Cooperation is an effective use of energy. This activity is designed to promote creative thinking and imagination. Allow the children great freedom in the design of their boats, restricting only the size of the vessel. If you don’t have easy access to a pond where you teach, have the children design land boats, which can be sailed in the parking lot. If you do have a nearby pond, use it. The children will want to be certain that their boats will float, so keep a basin of water in the classroom where the children can test out their inventions as they create them. The list of materials is just a suggestion. You will want to develop your own based on the materials that are available. Use scraps and throw-aways as an example to students of ways materials can be recycled.

PROCEDURE:
1. Explain to the class that to help reduce our dependence on oil, they are going to invent wind powered boats (Use this term rather than sail boat in hopes that the students may invent other means of capturing the wind’s power). After the boats have been constructed they may be entered into the GREAT TOY BOAT RACE. Mention the location of the race, the materials at hand and any restrictions on size of the boat such as one foot long and two feet tall.

MATERIALS:
- Cardboard scraps
- Styrofoam, plastic or tinfoil trays and scraps
- Scrap cloth (sheets, etc.)
- Popsicle sticks/toothpicks/straws
- Lego pieces (especially wheels)
- Wood scraps
- Construction paper
- Straight pins
- Rubber cement/glue
- Plastic wrap
- Egg cartons
- Needles and thread/string
- Rubber scraps (old rubber boots)
- Strong scissors/Exacto knife (you use it, not the kids)
- Wire/coat hangers
- Rulers/pencils
- 1 whistle
- 1 bag of peanuts
- Fan (for wind)
- Basin of water
2. Group the students in twos or threes, and allow them to investigate the pile of materials.

3. Before allowing students to begin the construction of their boats, ask them to draft up an idea and list the materials they will need. Allow them to bring things in from home. On this first day students draft, conference with the teacher, redraft, collect materials and write in their journal about what they are going to do the next day.

4. On day two, the construction process takes place. Allow the students to have trial runs of their boats using a fan to create wind. If the boats are for water, have the trial runs in a basin. Don’t place the fan near the water, instead have students blow through straws to create wind.

5. Have students write in their journal about their experiences constructing the boats and predict how their boats will fare in the race. If time permits, let them share their journal entries and talk about their projects.

6. Day three is the big event. If day three is windless you may want to postpone the event, but be certain to discuss this with the children. You want them to realize that relying on the wind for energy means either waiting for the wind to blow or learning how to store the energy.

7. Structure the race as follows: Each group is given a peanut. The boat must carry the peanut from the starting line over the finish line. The object is to be the first boat to cross the finish line. At any point that a boat capsizes or goes off the racetrack or gets stuck on a pebble or in grass, the group involved must pick up the boat and bring it back to the starting line. (Lost peanuts can be replaced at the starting line). Races in ponds may require boots or long poles or rowboats with lifejackets for rescue. The race begins on the whistle and ends when the last boat has crossed the line or withdrawn from the competition.

8. At the completion of the race, display the boats and allow students to compare and contrast their designs and discuss how this affected their success. Also discuss how it felt to rely on the wind to power their inventions. Talk about the variety of ways the students harnessed the wind and how successful these methods proved to be. Talk about old-time sailing boats that were used for trade, transportation and for fishing. What kinds of boats/cars do you think we will use in the future?

9. Have the children reflect in their journals once again about the project, the race and their feelings.

EXTENSIONS:
1. Social studies/art/math: Imagine your family is planning to buy a sailboat or a power boat for recreation. Discuss which would use the least oil/gas. How much does oil and gas
cost now? How much gas does your boat burn in an hour? What is the cost per hour of running a power boat? What other considerations will be important? Draw a picture of your choice.

2. Sharing: Display the boats and the blueprints. If you can do so without hurting feelings, display them in terms of first, second, third place, etc. or have prizes and categories for each boat. Encourage students to name their boats and design a nice sign to go with their display. Take the boat show on the road. Display it in the library, foyer, cafeteria, a local marina or yacht club. Invite the press to photograph your race. Be sure you take pictures for a hallway bulletin board. Have a boat show and invite the parents, administrators, and the press.

3. Language Arts: Have the children write about their projects and publish their work in the school newspaper. Use the boats as inspiration for creative writing. Learn some yachting terminology and add these to your spelling and vocabulary lists.

4. Science: Study ways in which people harness the power of the wind. Discuss the pros and cons. Visit a wind generated energy supply. Do comparative studies of energy sources and their pros and cons.

5. Math: Make graphs showing the results of the race. Design graphs comparing various energy sources. Make up work problems based on the information in the graphs. Use cuise-nere rods to approximate the area of the boats. Do scale drawings, and change the scale.
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BY: Bonnie Jason

EXTENSIONS: Sharing, Science, Math

DURATION: Variable

OBJECTIVES: Students will investigate animals as an alternative source of energy and draw conclusions about their usefulness. Students will practice group cooperation skills.

BACKGROUND: Admittedly, this is an unusual experiment. The children will be harnessing the power of the hamster by rigging up a contraption to the hamster’s exercise wheel. The success of the experiment does rely on the willingness of the hamster to cooperate. Harnessing the power of animals is a realistic alternative to other energy sources, but it certainly has its limitations.

To prepare for this activity, ask one of the students to bring to school a pet hamster.

PROCEDURE:
1. Rig up the coat hanger to the outer edge of the exercise wheel. Bend it over the edge of the cage and onto the cranker of the egg beater. Prepare the ingredients for the cake as instructed. Place the egg beater into the bowl. Either balance the beater or have the children take turns holding it. As the hamster exercises on its wheel, the beater ought to mix the ingredients. Obviously, the hamster will not perform upon request so this activity may take a good part of the day to complete.

2. Bake and eat the cake. While snacking, discuss the pros and cons of such an energy source. Consider its usefulness, practicality, dependability, etc. Discuss the use of dog teams rather than snowmachines in arctic Alaska. Ask local dog team handlers and snowmachiners for their ideas on advantages and disadvantages.

MATERIALS:
- Hamster (or other small rodent)
- Cage with exercise wheel
- Coat hanger or strong, light-weight wire
- Egg beater
- Cake mix and ingredients
- Mixing bowl
- Baking pan
- Access to oven
EXTENSIONS:
1. Sharing: Have students write in their journal about their experiences in this activity. Share, if the students consent. Invite others in to snack with your class.

2. Science: Have the students invent other ways of using the hamster’s energy. Have them write these up as experiments and carry out the procedures, if possible. Experiment with other ways of using animal power. If possible, visit someone who uses animals as an energy source.

3. Math: As students prepare the cake focus on measuring liquid and dry ingredients. Have students develop graphs to reflect the energy output of the hamster. Or, develop graphs that compare the energy output of the hamster to other forms of energy. Have them develop a hamster unit of energy. Make up word problems based on your experiment.
JUNK SCULPTURE FOR ETERNITY

BY:  Janet Fink

EXTENSIONS:  Language Arts, Science, Science/Social Studies

DURATION:  45 - 60 min

OBJECTIVES:  Students will create a sculpture that is non-biodegradable.

BACKGROUND:  Discuss products that come from oil. Try to generate plastic, styrofoam and rubber. Discuss the future of each of these products emphasizing that plastic and styrofoam do not biodegrade. At this point an expert in the field may be invited to discuss the properties of petroleum based products.

PROCEDURE:
1. Place the pile of “trash” in the middle of the room. Discuss with the class the possibilities of the future of this pile. The discussion will probably center around the sending of the trash to the dump and it being buried. What would its future be? Keeping in mind that plastics do not decay, what are the options? Since this plastic will be around in thousands of years, propose the possibility of creating an art project using only plastic and styrofoam.

2. Break the class into groups of 3 to 4 students each. Divide up the plastic. Allow each group to design a sculpture using their share of the plastics. Cooperative learning enters at this point. Use a glue gun to attach the pieces. Do not attach any pieces unless the whole group agrees. The group dynamics are enjoyable as students determine together their end product.
   In conclusion, with the pieces on display, discuss their future.

MATERIALS:
- Plastic trash
- Glue gun
EXTENSIONS:

1. Language arts/science: Have students write in their journals for a week, keeping track of all plastic that is used in his/her household.

2. Science/social studies: Take a field trip to the supermarket. Record items that can be purchased in “environmentally safe packaging.”

3. Social studies/language arts: Share your sculptures with the community, perhaps at the local supermarket, museum or in the hallways of the school. Write an article for the local newspaper.
By: Janet Fink and Bonnie Jason

Duration: Variable

Objectives: Students will establish an environmental consciousness. Students will design their own future houses.

Background: One result of the Exxon Valdez oil spill is that many people are becoming much more conscious of their lifestyle - and the amount of energy used in their daily life. The less energy used, the smaller number of tankers that will be traveling the oceans of the world - and the less spills we will have. Recycling can really help to save energy, because it takes much less energy to produce an item the second time around. In the case of an aluminum can - it only takes 5% as much energy as the first time: And each can recycled is like saving half that can filled with gasoline in terms of btu’s saved!

Procedure:
1. Brainstorms ways that your students can reduce their use of petroleum products and their energy consumption. Go over the worksheet 50 Things You Can Do.

2. Choose one of these as a class project:
   a. Start a recycling bin at your school or participate in one in your community.
   b. Try to change the packaging at a local fast food outlet.
   c. Focus on plastic usage within your school. Could it be reduced? Lunchrooms seem to be a good area for this (styrofoam trays, plastic silverware etc.).
   d. Focus on local grocery stores. Do they offer paper or plastic bags? Perhaps a poster campaign will encourage shoppers to choose paper. Or better yet, make bags out of cloth for the students’ families to use when they go grocery shopping.

Materials:
- Variable
- Worksheets: 50 Things You Can Do
e. Start a letter-writing campaign to food companies to try to get them to reconsider their packaging techniques. Many food companies have recently switched to plastic instead of glass.

f. Make mugs to be used by your students in the lunchroom, or at class parties.

g. Write, print and distribute leaflets that educate the public on ways that they can reduce their energy consumption. Be sure to use recycled paper.

h. Have an Energy Awareness Fair, open to the public, to promote responsible energy use, alternative energy use, and reductions in energy use. Invite the press.

i. Write editorials to the local newspaper focusing on how energy is used or misused in your community.

j. Make a video that describes ways that families can reduce their energy consumption. Make this available in the public library. Be sure to do a little advertising so that it will be well circulated.

3. Have students design their own future houses — taking into consideration alternative energy and energy conservation.
50 THINGS YOU CAN DO

IN YOUR HOME

• Learn where the energy for your home comes from.
• Investigate local recycling centers.
• Recycle everything you can: newspapers, cans, glass, aluminum foil and pans, motor oil, scrap metal, etc.
• Save your kitchen scraps for the compost pile.
• Try to use phosphate-free laundry and dish soaps.
• Avoid the use of household pesticides. Flyswatters work very well.
• Clean your windows with vinegar and water instead of chemical products. Crumpled up newspapers are great for washing windows.
• Hang your clothes out to dry.
• Use washable rags, not paper towels, for cleaning up spills and other household chores.
• Use cloth diapers.
• Use cloth, not paper, napkins.
• Don’t use electrical appliances for things you can easily do by hand.
• Re-use brown paper bags to line your trash can instead of plastic liners. Re-use bread bags, butter tubs, etc.
• Use re-usable containers to store food, not plastic wraps and foil.
• Write to companies that send unwanted junk mail. Ask them to take you off their list.
• Take unwanted, re-usable items to a charitable organization or thrift shop.
• Don’t leave water running needlessly.
• Turn off the water when you brush your teeth.
• Install a water saving shower head.
• Take shorter showers.
• Set your water heater at 130 degrees.
• Turn the heat down and wear a sweater.
• Turn lights off when you’re out of the room.
• Burn only seasoned wood in your stove or fireplace.
50 THINGS YOU CAN DO

IN YOUR CAR
• Drive sensibly...don't waste gas.
• Keep your car tuned up.
• Carpool.
• Ride your bike or walk instead.
• Drive a more efficient car.
• Recycle your engine oil.
• Keep your tires properly inflated to save your tires.
• Don't litter.

WHEN YOU'RE SHOPPING
• Don’t buy food or household products in plastic or Styrofoam containers if there is an alternative. They can’t be recycled and they don’t breakdown in the environment.
• Don’t buy “disposable” anything. Paper plates and towels, Styrofoam cups, etc. are extravagant wastes of the world resources.
• If you buy disposables, buy paper products rather than plastics or Styrofoam.
• Buy durable products and keep them longer. Cheap furniture, clothes and appliances often have a short life span.
• Check the energy rating on major appliances.
• Read labels and buy the least toxic product available for cleaning, pest control, etc.
• Put your parcels in one big sack instead of collecting several small ones - or better yet, use a re-usable string or canvas bag. Don’t buy things with excess packaging.
• Buy in bulk.
• Ask questions...don’t buy products that are hazardous to the environment or that were manufactured at the expense of important animal habitat.
• Buy locally grown food and locally made products when possible to save on transportation costs.

PERSONAL EFFORTS
• Join a conservation organization.
• Volunteer your time to conservation projects.
• Give money to worthy conservation/environmental causes.
• Check your lifestyle...think about the effects of your daily actions on the environment.
• Read books and articles on wildlife and environmental issues.
• Watch nature programs on T.V.
• Subscribe to conservation or environmental publications. Purchase them as gifts for others.
• Pick up litter along highways and near your home.
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In most of our activities, we recommend the use of "pretend oil: made of black tempera paint and vegetable oil. As spill educators, we do not want to be part of the oil spill problem! One pint of used oil can produce a slick approximately one acre in size. Only one part per million contamination will spoil the taste and odor of drinking water. At this ratio, it would take a pint of oil to contaminate 125,000 gallons of drinking water. That is more than 15 people drink in a lifetime. Oil has been shown to cause cancer in mice. Oil is currently considered to be a hazardous material. Used oil is regulated by both state and federal regulations in the event of a spill or discharge. It is also regulated under current hazardous waste regulations pertaining to its use as a fuel burned for energy recovery. Some of the most toxic fractions of oil are the aromatics (the odor from oil). In addition, waste oil can contain heavy metals such as lead, chromium and cadmium. So limit your students' exposure to crude oil as much as possible. Open a jar briefly so they can identify the smell of aromatics - then close it up and ventilate the room.

Use gloves when you are handling crude or waste oil. If you get any oil on your skin, wash it off immediately with soap and water. Wash oiled clothes before wearing them again. Do not stick oily rags in your pockets. Do not use kerosene, paint thinners, or waterless cleaners on your hands when trying to clean up the oil as they may remove the skin's natural protective oils and can cause dryness, irritation and possibly more serious effects.

DISPOSE OF OIL PROPERLY. Take waste oil to service stations or community collection sites for recycling. If you use newspapers for floor coverings during experiments, the resulting oily newspapers can be burned for heat by someone who has a wood burning stove. Oiled clothing or rags can be washed and used again. Other oil wastes can be stored in metal containers for spring community clean-ups and hazardous waste pickups. IT IS IMPORTANT NOT TO PUT OILY WASTES IN LANDFILLS where they will eventually leach into the water table. Also, BE SURE YOU GET ALL THE OIL OUT OF THE WATER before you pour it down the drain. Oil absorbant pads are perhaps the best way to get oil out of the water. They should be available at marine and hardware stores.

In the event of a spill or discharge, or if you have any questions or concerns, contact the Alaska Dept. of Environmental Conservation (DEC) at 907-269-3063 (Anchorage); 907-451-2121 (Fairbanks); 907-465-5340 (Juneau); or toll-free at 800-478-9300. See more information on their Spill Prevention and Response website: http://www.dec.state.ak.us/spar/spillreport.htm.
INVESTIGATING THE OIL SPILL

By Belle Mickelson

SUBJECTS: All

DURATION: Minimum of 2 periods

OBJECTIVES: Students will research the Exxon Valdez oil spill and other spills around the country and the world by reviewing news clippings, magazine articles and videos. Students will make a journal of their experiences and impressions.

BACKGROUND: Good Friday, March 24, 1989, the tanker Exxon Valdez hit the rocks of Bligh Reef spilling 11 million gallons of oil on the waters of Prince William Sound. The oil continued on down the coast eventually touching over 1,000 miles of beaches including those of the Alaska Peninsula and Kodiak Island. Exactly what happened varies on the news source.

PROCEDURE:
1. Ask the students what they remember about the Exxon Valdez oil spill which occurred in the spring of 1989. Pass out the Alaska Department of Fish and Game “Special Oil Spill Issue,” sample news articles, and any other magazines (see appendices at end of curriculum). Note the differences in reports of what has happened.

2. Have each student make a journal and write out their initial impressions of the spill.

3. Introduce the video Voices of the Sound. This video was made by Mike Lewis and David Grimes shortly after the spill happened. Footage by Joel Bennett at the beginning shows the beauty of Prince William Sound and its wildlife. Terms to mention beforehand include CDFU (Cordova District Fishermen United) whose role in the spill is described in a news article found at the end of the curriculum. Have the students point on the

PHOTOS TAKEN IN 2005 AT HERRING BAY IN PRINCE WILLIAM SOUND SHOW OIL RESIDUE FROM THE 1989 EXXON VALDEZ SPILL. PHOTO BY JIM PAYNE, PAYNE ENVIRONMENTAL CONSULTANTS, INC.

MATERIALS:
- News clippings, magazine articles
- Voices of the Sound
- Paper and covers or notebooks to make journals
- Markers/colored pencils
- Map of Alaska
- Blackboard
- Bulletin board
map the communities in Prince William Sound. Cordova is a fishing community; Valdez has oil and tourism industries in addition to fishing; Whittier has tourism and fishing; Chenega and Tatitlek are Native fishing communities which depend on subsistence hunting and fishing. Outside the Sound, impacted communities include Kodiak, the country’s largest fishing port, Seward, Homer, Seldovia, Port Graham, and English Bay on the Kenai Peninsula, and other small villages along the Alaska Peninsula. Ask the students how they would feel if their beaches (ocean, rivers, lakes) were oiled? Then show Voices of the Sound to see how the Cordova fishermen and women felt. Have one of the students write in their journals some of their impressions.

4. Show the ARCO/Alyeska videos. These describe environmental considerations, clean-up procedures and the industry’s revised response system to a spill. Explain that in this unit, they will be studying a variety of clean-up techniques.

5. Encourage students to clip current events about oil spills in their states and in other countries around the world for a class bulletin board.

6. Hand out 5” x 10” cards to each student. Ask students to summarize the two video tapes they just saw. Collect the cards and use them to evaluate students’ understanding.

EXTENSION:
1. Geography/Language Arts: Write letters to foreign newspapers asking for articles about the Exxon Valdez oil spill — and oil spills in their countries. Research in your library or museum, articles about spills around the world. (Suggested by Margaret Ladd, Homer, Alaska).

2. Language Arts: Invite a reporter into class to describe investigative journalism/reporting. Ideally, interview a reporter that worked on the spill. Or watch video footage made by a news team such as America’s Biggest Oil Spill (see bibliography).
ALASKAN ECONOMY AND OIL

BY: Elizabeth Trowbridge

SUBJECTS: Social studies, economics

DURATION: 1 period

BACKGROUND: Alaska’s economy has a history of “boom or bust” cycles. The most recent “boom” has been the oil discovery at Prudhoe Bay. Since oil has been moved down the trans-Alaska pipeline, Alaskans have enjoyed a very prosperous lifestyle. Aside from the oil spill, the fishing industry has been a relatively stable economic base for Alaska. The main difference between these economies though, is that one is based on a non-renewable resource and one on a renewable resource. Even though fisheries provide the most jobs in the state, the oil industry provides the most revenue to the state government and funds most of the state’s fiscal budget. It is time we looked at what will happen when the oil runs out.

PROCEDURE:

1. Make a bubble diagram with the students about the source of local government revenue and spending. Which services does government provide? Which are most important to you? Which ones would you cut from the budget? How much of Alaska’s economy is based on oil production? What does this mean for other states and other industries? What does this mean for the environment? Generate a discussion based on student responses.

2. Hand out the Alaskan Oil Finance worksheet. Ask students what it means to depend upon one major non-renewable resource for the state’s economy? What happens when the oil runs out? What are some alternatives? Have students respond to these questions in their journals.

3. To evaluate students’ understanding of the state economy, use question “C” of the worksheet to initiate a class discussion.

MATERIALS:  
- Worksheet: Alaskan Oil Finance
Link to article 8/11/89, Anchorage Daily News:

www.adn.com/evos/stories/EV400.html

SPILL FORCES EXXON ECONOMY ON KODIAK: Some Gain, Some Lose in the Cleanup and the Claims. By CHARLES WOHLFORTH
The following information is from the Alaska Oil and Gas Association website revenue page (www.aoga.org/revenue.html):

"State revenues from the oil and gas industry are projected to reach a record high of $4 billion in fiscal year 2006."

"Since the completion of the trans-Alaska oil pipeline, petroleum revenues to the State of Alaska have averaged 84 percent of the state's unrestricted general fund. Total petroleum revenues are projected to be 90 percent in fiscal year 2007."

1. The chart below shows where the State of Alaska's general fund revenues came from during the fiscal year 2006. What percentage of the state's income was paid by the oil and gas companies?

   __________ %

2. If this percentage equals $4 billion, what would be the total state revenue for that year?

   $ __________
A. This chart shows that for fiscal year 2006 the State of Alaska spent nearly half of its general funds in just two areas. What are they? ________________________________

B. What general area gets the least amount of money? ________________________________

C. If you were a state legislator, where would you spend more money? ________________

Where would you spend less? ________________________________

Discuss how these figures below, from the 1989 proposed operating budget, differed from 2006:

- Development: 10%
- Transportation: 8%
- General Government: 12%
- Education: 38%
- Health and Social Services: 14%
- Natural Resource Management: 6%
- Public Safety and Courts: 12%
BY: Elizabeth Trowbridge, adapted from Alaska Sea Week Curriculum Series Vol. VI

SUBJECTS: Social studies, art

DURATION: Minimum of 2 periods

OBJECTIVE: Students will draw a cartoon reflecting an oil spill issue.

BACKGROUND: The Exxon Valdez oil spill of March 24, 1989, was the largest oil spill in U.S. history. There were conflicting opinions on all aspects of the spill. Naturally, this accident had many political ramifications and was a highly emotional event for all involved. Cartoons and/or a sense of humor can be very effective politically. Humor helps us all bear the unbearable and makes life a little more enjoyable. Political cartoons dramatize the opinions of the people and give us a window into history.

PROCEDURE:
1. Brainstorm with the class about oil spill issues: who were/are the major players? What were the most obvious issues? What were the feelings of affected people? etc. The list may include: Exxon, Alyeska, fishermen/women, local communities, wildlife, Alaska’s dependency on the oil industry, the captain of the Exxon Valdez being charged with driving while intoxicated, the closing of fisheries, etc.

2. Select and research one issue. Use newspaper clippings, magazine articles, videos and any other information collected regarding the oil spill. Students may wish to interview local officials or community members.

3. Decide on a point of view or a proposed solution, i.e. environmentalist, Exxon shareholder, pro-development, fisherman/woman. Then draw a cartoon to illustrate your point of view.

4. Display the results on a bulletin board. Print them in the school paper on an editorial page, and use them for covers of the oil spills journal each student will keep.

MATERIALS:
- Paper
- Pencil
- Pens
EXTENSIONS:
1. History/social studies: Have students research political cartoons in history. How have these “editorials” reflected public opinion of the times? One famous cartoonist who used his art to influence public sentiment was Ding Darling. A wildlife refuge on Sanibel Island, Florida now bears his name. What are the majority of the cartoons drawn concerning the oil spill saying about the public attitude toward the oil spill? Exxon? development? wildlife? the current administration? This could be a class discussion or a small research project with a written product.

2. Social Studies/language arts: Have students pick a point of view and then write editorials, or letters to the editor, expressing this view or concerns relating to the oil spill. This can be an ongoing project in which the students write after each activity of the oil spill curriculum or once at the beginning and once at the end (to see if their views or understanding of the issues have changed or developed). The letters can be submitted to the school paper or to the local community paper. Include the students’ cartoons.
BY: Jane Middleton

SUBJECTS: Science, math

DURATION: 1 period

OBJECTIVES: Students will use mathematical skills to compute the size of an oil slick. Students will learn about the three fractions of spilled oil and its effect on organisms.

BACKGROUND: The Exxon Valdez oil spill was a major environmental catastrophe. As many as 300,000 seabirds, and several thousand sea otters perished. One-hundred and fifty bald eagles were found dead and many more undoubtedly perished from eating oil-infested bodies of seabirds. Over 1,000 miles of intertidal habitat was badly fouled. Land mammals were impacted by browsing in the intertidal area. Intertidal life died from oil suffocation, oil ingestion, and from trampling by 10,000 oil spill workers.

The oil slick that formed after the spill soon began to change physically and chemically. An undetermined amount of the lighter compounds evaporated into the air. The remainder of the toxic oil spread out from the main slick as fingers of a very thin iridescent sheen on the surface of the water. This layer of sheen can be deadly to seabirds and other marine life.

As oil on the water is agitated by wind and begins to weather, it changes, in about 2 weeks time, to a thick, gel-like substance called mousse. Mousse is a mixture of oil with air and water.

Following the oil spill, the media featured pictures of dead birds covered with heavy oil or with mousse, leaving the impression that only the heavy fractions of oil were capable of killing birds. The simple experiment in this activity should bear a clear message to

MATERIALS:
- 1 cubic centimeter
  - 10W-40 motor oil
- 1 quart sea water
- Hand whisk or egg beater
- 1 large bowl
- Eye dropper
- Graduated cylinder
- 2 culture bowls, 6" diameter
- 4 seabird feathers
- 1 large, flat pan or cafeteria tray
- 4 small rocks
- 1 oil absorbant pad
- Dennis Kelso quote from Curriculum Introduction
students that the iridescent sheen that develops around boats when fuel is spilled or oily bilge is pumped overboard is also deadly to seabirds. Ask your students how often they have witnessed this practice. You may develop a lively and productive discussion about ways to avoid fouling the water from fishing and pleasure boats. Perhaps students will be inspired to lead a harbor clean-up campaign complete with an educational program for harbor users.

PROCEDURE:
1. Remind students that oil is toxic - a hazardous substance they should breathe as little as possible and not touch.

2. To demonstrate the effect of the oil spill on birds, pour a layer of salt water about 1” deep into each of the culture bowls. Have a student drop a single drop of motor oil onto the surface of the water in one of the bowls. Dip 2 seabird feathers into the bowl of plain salt water (control). Remove them, place one on top of the other, and place in a well-ventilated or sunny spot to dry. Dip two clean feathers into the bowl of sheen. Remove them. Can you see the oil? Place one on top of the other and set alongside the control feathers to dry. (SAVE THE OILED SALTWATER FOR PROCEDURE #5). What happened? Did the feathers dipped into clean sea water dry quickly and separate from one another? Did the oiled feathers remain matted together? This is a very significant lesson that illustrates that even a very minute amount of oil may cause bird feathers to become matted together. In this condition, they cannot be fluffed for warmth and the bird may die of hypothermia.

3. Demonstrate the way oil leaking from a tanker spreads out to form a slick on the surface of the water. Pour a layer of sea water into the large, flat tray. Drop a cubic centimeter of oil on to the water’s surface.

4. Have students compute the area of the slick which forms. Then compute the area of a slick formed by a liter of oil by multiplying by 1000. But the Exxon oil spill was measured in gallons! There are 3.785 liters in one gallon. Have the students figure the size of a slick formed by one gallon of oil. Then they can multiply by 11,000,000 to get the size of the slick in square centimeters. Next, tackle the problem of converting sq. cm. to sq. mi. (1 sq. ft. = 929 sq. cm. and 1 sq. mi. = 27,900,000 sq. ft.)

5. Read the quote from Dennis Kelso, Commissioner of the Department of Environmental Conservation (DEC) found in the curriculum introduction. Discuss the effects of minute amounts of oil in our environment.
6. **TAKE THE OILED WATER FROM PROCEDURES #2-4** and pour into a large bowl. Mix with egg beater for at least 20 minutes. The froth which forms on top is mousse. Have the students skim the mousse off and measure it. Is it more or less than the amount of oil that was poured into the bowl? Ask them what happens to an oil slick at sea that is agitated by high winds and strong seas for 2 weeks or more, as was actually the case with the Exxon oil in the Gulf of Alaska. (This experiment can be done in a blender, but the oil will be impossible to clean out completely. Any oiled items—bowl, beater, tray—should not be used for food ever again).

Thick, foamy mousse blew ashore and remained in the intertidal areas. Pour some of your mousse onto a few dry rocks to illustrate its tendency to cling to the shore rather than wash back out to sea. *(SAVE YOUR OILED WATER AND ROCKS FOR CRITTER CLEAN-UP AND CLEAN-UP TECHNOLOGY—the next two activities).*

7. Begin a discussion or have students write in their journals on the effects of mousse on intertidal life:
   a. What happens to animals such as chitons, snails, and limpets which normally crawl across the surface of rocks looking for food? Do you think they can remain attached and move in this gooey stuff?
   b. Barnacles normally attach themselves to rocks and reach their fragile legs out to capture food from the water. What happens to the barnacles if they are covered with mousse? Can the barnacles feed? How long can they live without feeding?
   c. Many shorebirds feed on the barnacles. What happens to the shorebirds if their barnacle food is covered with mousse?
   d. There are many kinds of crabs which live on the shore. Crabs breathe by means of gills which lie just under the top shell. What will happen if mousse gets into their gills?

8. Follow-up this activity with Critter Clean-up, Clean-up Technology, Intertidal Zones, and the Field Trip to the Beach.

9. Have students summarize what they have learned in their journals. How have their impressions of the oil spill changed?
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Use this chart to construct a graph of bird casualties discovered immediately following the *Exxon Valdez* oil spill. Compare these figures to other figures available from research conducted following the Oil Spill. See the Appendix for a complete list of research conducted by scientists funded by the *Exxon Valdez* Oil Spill Trustee Council.

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**TABLE 1.** Proportions (%) and total numbers of birds retrieved from Prince William Sound (PWS), Kenai Peninsula (KP), Barren Islands (BI), Kodiak (KOD), and the Alaska Peninsula (AP) between 25 March and 13 October, 1989.

<table>
<thead>
<tr>
<th>Species group</th>
<th>PWS</th>
<th>KP</th>
<th>BI</th>
<th>AP</th>
<th>KOD</th>
<th>Total before Aug 1</th>
<th>Total after Aug 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loons</td>
<td>8.7</td>
<td>1.8</td>
<td>0.3</td>
<td>0.4</td>
<td>&lt;0.1</td>
<td>1.5</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Grebes</td>
<td>11.8</td>
<td>1.6</td>
<td>0.2</td>
<td>0.3</td>
<td>0.1</td>
<td>1.7</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Procellariids</td>
<td>0.4</td>
<td>4.8</td>
<td>0.7</td>
<td>1.1</td>
<td>4.9</td>
<td>2.9</td>
<td>50.7</td>
</tr>
<tr>
<td>Cormorants</td>
<td>16.0</td>
<td>4.3</td>
<td>0.4</td>
<td>0.6</td>
<td>0.7</td>
<td>3.0</td>
<td>1.0</td>
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<tr>
<td>Sea Ducks</td>
<td>24.9</td>
<td>8.4</td>
<td>0.7</td>
<td>1.6</td>
<td>0.7</td>
<td>5.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Gulls</td>
<td>1.8</td>
<td>5.5</td>
<td>0.5</td>
<td>1.2</td>
<td>2.4</td>
<td>2.4</td>
<td>21.6</td>
</tr>
<tr>
<td>Murres</td>
<td>15.2</td>
<td>58.1</td>
<td>88.3</td>
<td>89.0</td>
<td>84.6</td>
<td>73.7</td>
<td>7.1</td>
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<tr>
<td>Murrelets*</td>
<td>11.6</td>
<td>4.9</td>
<td>3.7</td>
<td>0.6</td>
<td>0.5</td>
<td>2.2</td>
<td>2.0</td>
</tr>
<tr>
<td>Guillemonts</td>
<td>4.7</td>
<td>4.6</td>
<td>1.2</td>
<td>1.6</td>
<td>0.8</td>
<td>2.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Puffins</td>
<td>0.0</td>
<td>1.5</td>
<td>0.2</td>
<td>0.2</td>
<td>1.4</td>
<td>0.9</td>
<td>13.8</td>
</tr>
<tr>
<td>Other alcids</td>
<td>0.8</td>
<td>1.6</td>
<td>3.6</td>
<td>3.3</td>
<td>2.9</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Other birds</td>
<td>4.1</td>
<td>2.9</td>
<td>0.7</td>
<td>0.1</td>
<td>0.9</td>
<td>2.5</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Total numbers

| Retrieved   | 3,358 | 6,225 | 2,163 | 8,881 | 8,548 | 29,175 | 6,940 |
| Identified  | 2,882 | 5,174 | 1,922 | 8,691 | 8,200 | 26,869 | 6,238 |

*Includes 167 old carcasses that were oiled and apparently killed before 1 August, but retrieved after 1 August. Total does not include 31 oiled birds found on Middleton Island and 1,091 birds that died at oiled-bird rehabilitation centers.

*Brachyramphus murrelets only.*

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Adapted from: Sea World Education, used with permission. Revised by Beth Trowbridge, PWS Science Center, 1995

SUBJECT: Science

DURATION: 1 period

OBJECTIVES: Students will: 1) identify ways oil spills can affect wildlife adversely; 2) demonstrate a variety of ways humans can remove oil from birds’ feathers, animal fur, hair and leather; 3) graph data collected on injured wildlife species.

BACKGROUND: The impacts of environmental pollution are often difficult to see. A major oil spill, however, provides dramatic evidence of potential impact to wildlife. Examples include damage to feathers, killing of embryos when oil seeps into eggs, suffocation of fish when gills are clogged, and death to marine and terrestrial animals by ingesting food and water contaminated by the oil.

People are involved in efforts to prevent oil spills and their consequences. They also are involved in efforts to “clean up” after such spills take place. Such actions are not always successful, and sometimes they have unfortunate consequences as well. For example, the process of using detergents to clean oil from the feathers of birds may also damage the birds’ feather structure and arrangement and thus the birds’ waterproofing. Birds may also be more susceptible to disease during this time of stress, and may be weakened to the extent that it is more difficult for them to secure their necessary food and water. Also, food and water quality may be affected.

Oil spills are just one example of the kinds of pollutants that can have adverse short and long-term effects on wildlife, people and the environment. The impact of DDT on food chains is well-known. DDT’s influence on thinner egg shells in bald eagles and other birds is well documented. Pollution is just one factor which contributes to threatening, endangering, and eliminating species of flora and fauna.
PROCEDURE:
1. Before class, fill the five bowls with water. In the first bowl pour a slick of cooking oil mixed with 2 tbsp. of paprika (to give the oil color and make it easier to see) on the surface. (You may also use the leftover oil slick from the Sheen-Oil-Mousse lesson). Leave the second bowl as just plain water. Label the other three bowls #1-3. Dissolve a tbsp. or two of one of the detergents in each bowl. Do not let the students see which solution is in which bowl. (They are secret or mystery solutions).

2. Put enough motor oil in a small container to submerge three hard-boiled eggs. Take another egg and roll briefly in the oil and then leave it on a newspaper for 30 minutes. Put the eggs under a good light and watch closely. Remove one egg after five minutes and examine it – before, during and after peeling off the shell. Try to remove the excess oil from the outside before attempting to peel the egg. Remove the second egg after 15 minutes and the third egg after 30 minutes, repeating the procedure, examining each carefully. Compare the results to the fourth egg which was merely dipped in the oil. Discuss observations. What effect could oil have on the eggs of birds nesting near the water? WARN THE STUDENTS THAT MOTOR OIL IS A TOXIC SUBSTANCE. STUDENTS SHOULD WEAR PROTECTIVE GLOVES AND AVOID DIRECTLY TOUCHING AND BREATHING THE FUMES.

3. Examine samples of feather, leather and fur with a hand lens. Sketch what you see. Dip each one in the second bowl of plain water for one or two minutes, and examine again with a hand lens. Sketch and compare to the original observations. Place each sample in cooking oil for one or two minutes, and then examine with a hand lens, sketch and compare with other sketches. Try to clean each sample dipped in oil with plain water. Record what happens to each sample. (DON’T CREATE YOUR OWN OIL SPILL BY LETTING THE OILY WATER GO DOWN THE DRAIN).

4. Now have the students try to clean their samples in each of the detergent solutions. Try one sample per detergent. Ask the students to write down which detergent (solution #1, #2, or #3) worked the best. Let the students compare their results and record them on a data sheet or in their journal. Discuss changes in the samples after exposure to oil and then to detergents. What effect could these changes have on normal bird or animal activity?

5. Reveal the names of the detergents and show the students the containers they were in. Which detergent was the most effective? The Bird and Otter Rescue Centers in Alaska used Dawn Detergent. How do their results compare with yours? Explain that detergents are like dispersants. They break up the oil, but the hydrocarbons in a natural ecosystem would still be in the water column and would end up in the sediments. The toxic compounds released in the water column also have the potential to affect the minute plants and animals involved in food chains which lead to fish, birds and mammals.

6. POUR YOUR REMAINING OIL BACK IN ITS ORIGINAL CONTAINER USING A FUNNEL. SAVE YOUR OIL AND WATER MIXTURES FOR THE NEXT ACTIVITY—CLEAN-UP TECHNOLOGY. (BE
SURE TO KEEP THE OIL/WATER MIXTURE SEPARATE FROM THE OIL/WATER/DETERGENT MIXTURES.) DISPOSE OF OILY WASTES PROPERLY SO THEY DO NOT END UP IN THE LANDFILL AND THE WATER. (See the directions in the introduction for proper disposal recommendations).

7. Discuss what could happen to a bird, an otter or a seal in an oil spill. Why are feathers, fur and leather important to wildlife? How do birds clean their feathers? What might happen if a bird ingested the oil? How do sea otters clean their fur? What would happen if a sea otter ingested oil? Discuss possible impacts on other wildlife species, on humans, and on the environment. What trade-offs are involved? What are other examples of human-caused pollutants that can have negative consequences for wildlife, people and the environment? What can you do to help with these problems?

8. Discuss how people try to save birds caught in oil spills. Does handling birds cause problems? stress Could detergents be harmful to the birds? What ingredients are listed on the package? Are they safe for animals? Marine birds need waterproof feathers. Would their feathers be waterproof after cleaning? Is cleaning the bird the best option? What about triage - the intentional (but painless) killing of animals? What are some factors that may need to be taken into account before deciding the best action for animals caught in an oil spill? Answer these same questions for other animals.

9. To evaluate students' understanding have them answer these questions in their journals:
   a. How could an oil spill affect the success of birds nesting near the water?
   b. Describe some possible effects of oil on a feather.
   c. Explain why the effects of oil are different from those of water.
   d. Describe some possible negative effects of three other human-caused pollutants on people, wildlife and the environment.

EXTENSIONS:
1. Science/language arts. Investigate why and where oil spills occur. What kinds of animals are found in these places? What kinds of rescue and cleaning techniques have been tried and how successful have they been? What were the results of the Alaskan Bird and Otter Rescue Centers after the Exxon spill?

2. Science/language arts. Ask each student to write a report, summarizing the findings of the experiment as well as making recommendations. Refer to the Wildlife Rescue activity of this curriculum.

3. Choose references from the appendices or conduct a literature search through your local library on impacts of oil spills on wildlife. Research a species of wildlife and determine the impacts of the Exxon Valdez oil spill. Report on scientific research conducted and the findings.
**CLEAN-UP TECHNOLOGY**

**Adapted from** Alaska Science and Marine Science Project: FOR SEA Poulsbo, Washington 98370.

Revised by Beth Trowbridge, PWS Science Center, 1995 with background information provided by Bruce McKenzie, Alaska Clean Seas.

**SUBJECTS:** Science

**DURATION:** 1 period

**OBJECTIVE:** Students will: 1) evaluate various clean-up techniques and their efficiencies; 2) demonstrate use of various clean-up techniques for an experimental oil spill; 3) discuss the causes and effects of ocean pollution.

**BACKGROUND:** Many different clean-up techniques were used following the Exxon Valdez oil spill. Below a brief discussion of each technique is given. For more detailed information on various clean-up techniques and their merits, see references sited in the appendices.

There are basically four ways to clean-up oil spills. These are: mechanical containment and recovery, dispersants, shoreline clean-up, and burning.

**Mechanical skimming** of oil is considered the response method least harmful to the environment. It requires large quantities of equipment and personnel. It is a multistage process that can be time consuming and has several potential bottlenecks in which the system can break down. First you need to contain the oil; then you need to recover it, store it temporarily, treat it (remove the water) and then dispose of it. In each stage you handle the oil; equipment and personnel are needed. The operation will be hampered if, in any stage, the system breaks down. Equipment used can include skimmers, booms, suctioning devices and buckets.

**Chemical Dispersants** are used to break oil into small droplets in the upper part of the water column. They cause a chemical change to occur in the oil that allows it to disperse into the water column. Some studies show that dispersants speed up natural dispersion, degradation and evaporation. Other studies show dispersants to be highly toxic and ineffective in cold waters. To be effective, dispersants must be applied soon after a spill, since weathered oils are hard to disperse. Mixing energy from wind and waves is also needed. Pre-approval is required from the government before dispersants can be applied on a spill.
Shoreline Clean-up involves the physical removal of oil from beaches. This is the most labor and equipment intensive response method and techniques must be chosen carefully. Removal of oiled sediments can sometimes create environmental problems such as beach erosion. Running heavy equipment on shorelines can sometimes do more damage than the oil. A variety of shoreline clean-up methods are available. The one used depends on the beach type, its location, the type of oil and the equipment and manpower available.

In-situ Burning creates a temporary air pollution problem that may pose a risk to people exposed to the smoke. Unwanted fires can also happen. Burning works best on fresher oil and specialized equipment and trained personnel are necessary. Controversy exists about this method’s effectiveness and hazards.

Another response, not always recognized, is “no response.” After the Exxon Valdez spill, NOAA studied sites that were not cleaned up and documented considerable survival and recovery of marine life.

Citizen clean-up programs after the Exxon Valdez oil spill involved many different techniques such as oiled seaweed pickup on the beaches. Seaweed is a natural oil collector so the more picked up meant less oil that spread to other bays and estuaries. Pom-poms made of oil-absorbant material were also used to pick up oil. Bioremediation, the use of fertilizer to increase the populations of oil eating bacteria, was another technique that was tried. Also, a rock washing program was developed where rocks were cleaned by tying them up in specially designed bags so the ocean’s tidal action could wash them. Oil absorbant pads were used to wipe off rocks individually and for general clean-up, i.e. boots of oil spill workers.

Discuss with students how they would determine if the area affected by the spill was clean enough. How clean is clean enough? This is an area of debate among scientists and agency representatives who disagree about what “clean” really is.

PROCEDURE:
1. Introduce the lesson to students by explaining to students that they will investigate various clean-up products and methods, such as: skimmers and booms, dispersants (detergents), oiled seaweed or pom-poms, absorbant pads, suctioning (eyedropper), and collecting with buckets. Discuss with them creative solutions to cleaning up oil spills. Allow them to list alternative methods and experiment with them during the following exercise. The problems they will face will be similar to those that occurred in Prince William Sound in 1989.

2. Place a tablespoon of salad oil (mix with paprika if desired) in the water. First try containing the oil spill with booms. Decide on one material to use as a boom, and use it to contain the oil spill. How well does it work? What if there was rough weather? Simulate rough weather by blowing over the surface, or fanning the surface with a card. Have students record their results on the Clean-up Data Sheet.
3. Now use at least two other techniques for cleaning up the oil spill such as dispersing the oil and absorbing the oil with various materials. Use a watch to determine the amount of time it takes to clean up the spill. Record your results on the data sheet.

4. Now perform the same procedures using a heavier oil such as motor oil. **YOU CAN USE THE OILED WATER FROM YOUR PREVIOUS EXPERIMENTS.** Are there differences in the amount of time or materials necessary to clean up heavy oil?

5. One of the conditions that hampered the Prince William Sound oil spill clean-up was rough weather. Set up the experiment again, and simulate rough weather by blowing over the surface or by moving a card through the water. Repeat two of the techniques with heavy oil and rough water. Record the data.

   Encourage students to experiment with various materials or to design their own clean-up device or technique.

6. Clean up the lab stations and **DISPOSE OF THE OIL AND OILY WASTES PROPERLY** (See instructions in the curriculum introduction). Now discuss, or have students answer in their journals, the following questions:

   A. With which method were you able to most rapidly clean up the oil spill?
   B. Ocean spills are often contained by placing booms, or barriers around the oil. What types of booms did you use to contain your oil spill? How well did they work in rough weather?
   C. Which of the techniques removed oil by absorption?
   D. Some people say that absorption techniques simply move the oil spill from the water to the land. What do you suppose they mean?
   E. What effect did detergent have on your oil spill?
   F. Did the detergent make your clean-up technique more effective or less effective? Please explain.
   G. Detergents are useful in cleaning because they kill bacteria. Does the fact that detergents kill living things present any problems when detergents are used to clean up oil spills? Please explain.
   H. Fire is another technique often used to remove oil spills. The oil spill is ignited and allowed to burn. Unfortunately, oil will only burn when it is fresh because the volatile aromatics will evaporate quickly. Where does the oil from the water go when it is burned? What kind of problems might this cause?

7. Have students use their journals to summarize, in one or two paragraphs, what they have learned about oil spill clean-up. Be sure to include environmental factors which can influence clean-up efforts and oil composition. In a third paragraph, have them state their opinion of the best techniques to clean up an oil spill.
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**CLEAN-UP DATA SHEET**

<table>
<thead>
<tr>
<th>Material</th>
<th>Time to Clean Up Spill</th>
<th>Estimate % of oil cleaned up</th>
<th>Comments: (e.g. messy, left with oily straw, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Oil</td>
<td></td>
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<tr>
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<td></td>
</tr>
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<td>Heavy Oil</td>
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<td>Heavy Oil and Rough Water</td>
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<tr>
<td>Heavy Oil plus Detergent</td>
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Reprinted from: Alaska Science, Centralized Correspondence Study, Alaska Dept. of Education.
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MAPPING THE SPILL

BY: Dr. John Morack, Physics Dept., Univ. of Alaska, Fairbanks.

Revised by Beth Trowbridge, PWS Science Center, 1995

SUBJECTS: Physical science, geography, mathematics

DURATION: 1-2 periods

OBJECTIVES: Students will 1) demonstrate an understanding of a scale drawing or a map; 2) demonstrate an understanding of the concept of area by using proper measurement techniques; 3) explore the uncertainties associated with experimental data and develop possible solutions.

BACKGROUND: The maps provided were produced from three different overflights: Exxon, DEC and NOAA. This is a good example of how data collected can vary depending on the researcher. These overflight maps are from the same day yet they show varying amounts of oil in Prince William Sound.

PROCEDURE:

1. Begin by showing slides or photographs of an oil slick. Discuss what students think they are seeing and what they actually are seeing. Note the differences in observations and conclusions drawn by the students. Compare this to the differences in maps produced by the agencies in this lesson. Discuss prior knowledge of oil spills and how they spread. What do they think will influence spreading? What might be an obstacle to mapping a spill?

2. Take one of the overflight maps and show the students on an Alaskan map or a globe what this enlarged map represents. Discuss the meaning of drawing the maps to different “scales.” Possible discussion questions:
   a.) Why do we make maps in different sizes?
   b.) How can we take a part of the surface of a globe and draw it on a flat surface?
   c.) What does the label 147° on the map mean?

3. Introduce the operational definition of an area:
   a.) Define a standard area (one of the squares on the plastic grid). In this case the standard is quantified as 1 square mile. This standard is arbitrary and you could choose some other grid if you wish.
   b.) Place the grid over the unknown area and count the squares (estimating the fractions of squares) that cover the area. This sum is what we call the area and it should

MATERIALS:
- Overflight maps: see Appendix C
- Grid reproduced on clear plastic or overhead
- Alaska map or globe
- Oil spill maps
- Slides or photographs of an oil slick
4. Have all the students (or groups of students) perform this activity on one of the oil spill maps to determine the size of the spill on the afternoon of March 26, 1989. Possible discussion questions:
   a.) Why can’t we use LxW to determine the area in this case? (The reason LxW cannot be used in this situation is that the oil spill has too many fingers and extensions that don’t fit into a simple LxW equation).
   b.) What would one have to do to measure the area on a map of different scale? (Note: different size is different than different scale).

5. Make a histogram of the students’ area measurements of the oil spill for each of the three oil spill maps. Along the horizontal axis you should plot a linear scale that encompasses all the area values that the students have measured. Divide this scale up into approximately eight equal segments. Each segment will encompass a range of area values. Determine the number of measurements that fall in each range and plot as a bar graph. For example, if three measurements fall in one of the ranges, then you should plot a bar of height 3 for that segment. The bar chart shows that you get a spread in the data when you make a measurement. Determine the average of the data values and indicate it on the bar graph at the proper place. The measured value for each area should be the average value calculated (or estimated from the bar graph) along with plus and minus values which are large enough to include all of the actual data. The plus and minus values indicate the maximum uncertainties in the data.

6. Using the wind data provided, construct a time history of the slick and what winds did to it. Ocean current information is not available.

7. Use the following discussion questions to evaluate student understanding of the lesson’s objectives:
   a.) Where does the average value fit on each bar graph? Why is it near the middle of the data?
   b.) Why are the area values for each oil spill map so different when the maps were drawn at approximately the same time?
   c.) What kind of conclusions can one draw concerning the method used to map the spill? How might this procedure be improved in the future? How might the class insure that different techniques are used in future spills?

EXTENSION:
1. Invite a government or industry person to the class to discuss how the oil spill was tracked and mapped.
BY: Jim Lokken

SUBJECT: Chemistry

DURATION: 1 period

OBJECTIVE: Students will use the Merck Index to identify chemicals found in crude oil.

BACKGROUND: Chemicals are everywhere. They are in the smallest villages, they are used in many jobs and are dumped or left lying around. Many cause no health problems. Others are poisonous or carcinogenic (cause cancer) or are very flammable or corrosive.

If chemicals are around you, you need to find out about their dangers. Use the MERCK INDEX, the chemist’s dictionary which can be found in libraries across Alaska.

PROCEDURE:
1. North Slope crude oil contains hundreds of different chemicals in each fraction. To become familiar with the Merck Index and the toxicity of crude oil, students will look up the following chemicals found in oil and write down a description of the dangers associated with them.

   hexane

   naphthalene

   toluene

   benzene

   ethylbenzene

   xylene

2. Discuss the dangers of these chemicals with the students. Which is the most dangerous?
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BY: Jim Lokken

SUBJECT: Organic chemistry

DURATION: 1 - 2 periods

OBJECTIVES: Students will fractionally distill North Slope crude oil into its components.

BACKGROUND: Crude petroleum is an exceedingly complex mixture consisting primarily of saturated hydrocarbons of the paraffin or methane series. The separation of components from such a mixture by the process of fractional distillation depends upon the fact that the compounds present in crude petroleum boil at different temperatures (have different boiling points, BP). Such a distillation is not efficient enough to permit the separation of individual pure compounds but yields “fractions” or mixtures of compounds having similar boiling temperatures. This experiment demonstrates what occurs in an oil refinery. Refer to “Where Does That Oil Go?” worksheet in the grades 4-6 curriculum.

PROCEDURE:
1. Set up the distillation apparatus from which fractions can be taken according to observed temperature changes.
2. Record the variety of physical data that is available to you using the tabulation chart found at end of lesson.
   1.) Range of temperature in which fraction is taken;
   2.) Volume and weight of fraction, from which density can be calculated;
   3.) Time required for fixed volume of fraction to flow from pipet of specified volume: measure of viscosity;
   4.) Color of fractions and odor;
   5.) Qualitative observations of changing refractive index.
3. Assign names to the respective fractions, according to their probable uses and in terms of their physical properties.
4. Do calculations and answer questions on worksheet.

MATERIALS:
- Distillation apparatus
- Data Tabulation sheet
- Identification of Petroleum Fractions Worksheet
- Fractional Distillation of Crude Petroleum Worksheet
- Crude oil sample
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### Identification of Petroleum Fractions, Typically Alkanes Separated from Crude Oil

<table>
<thead>
<tr>
<th>Name</th>
<th>Average C Composition</th>
<th>Boiling Range °C</th>
<th>Approx. % of Total Crude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light gases</td>
<td>-C₂</td>
<td>-0⁰</td>
<td>Small</td>
</tr>
<tr>
<td>Petroleum &quot;ether&quot;</td>
<td>-C₅</td>
<td>-25⁰</td>
<td></td>
</tr>
<tr>
<td>Naphtha (&quot;white gas&quot;)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gasoline</td>
<td>-C₈</td>
<td>50-100⁰</td>
<td>-20%</td>
</tr>
<tr>
<td>Kerosene (Jet fuel)</td>
<td>-C₁₂</td>
<td>150-200⁰</td>
<td>-20%</td>
</tr>
<tr>
<td>Heating oil and Diesel Fuel</td>
<td>-C₁₅</td>
<td>200-250⁰</td>
<td>-25%</td>
</tr>
<tr>
<td>Lubricating oil and mineral oil</td>
<td>-C₃₀</td>
<td>250-350⁰</td>
<td>-10%</td>
</tr>
<tr>
<td>Residuum</td>
<td>-C₅₀ and up</td>
<td>350⁰</td>
<td>25%</td>
</tr>
</tbody>
</table>

*Although the boiling point of pure ethans is -90⁰, quantities of C₁-C₄ gases may be held in solution in petroleum at higher temperatures.*
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### TABULATE DATA

Volume of sample distilled: _________ ml  
Weight of sample distilled: _________ g  
Density of crude oil: ______________

<table>
<thead>
<tr>
<th>Fraction Number</th>
<th>Boiling Range</th>
<th>Color</th>
<th>Commercial Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
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<tr>
<td>2.</td>
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<td>3.</td>
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<tr>
<td>5.</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fraction Number</th>
<th>Weight</th>
<th>Volume</th>
<th>Density</th>
<th>% of sample by weight</th>
<th>Viscosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>______ g.</td>
<td>______ cc.</td>
<td>______ g./cc.</td>
<td>______ %</td>
<td>______ sec.</td>
</tr>
<tr>
<td>2.</td>
<td>______ g.</td>
<td>______ cc.</td>
<td>______ g./cc.</td>
<td>______ %</td>
<td>______ sec.</td>
</tr>
<tr>
<td>3.</td>
<td>______ g.</td>
<td>______ cc.</td>
<td>______ g./cc.</td>
<td>______ %</td>
<td>______ sec.</td>
</tr>
<tr>
<td>4.</td>
<td>______ g.</td>
<td>______ cc.</td>
<td>______ g./cc.</td>
<td>______ %</td>
<td>______ sec.</td>
</tr>
<tr>
<td>5.</td>
<td>______ g.</td>
<td>______ cc.</td>
<td>______ g./cc.</td>
<td>______ %</td>
<td>______ sec.</td>
</tr>
</tbody>
</table>
CALCULATIONS:

1. Calculate **density** for the crude oil and each of its fractions.

2. Calculate **by weight** the percent represented by each fraction relative to the crude oil sample distilled.

QUESTIONS:

1. What requirement must be met if two compounds are to be separated by the process of fractional distillation? __________________________________________________________________________

2. Judging from the results of the laboratory demonstration, what general relationship exists between molecular weight and volatility? __________________________________________________________________________

3. From everyday experience, cite evidence tending to show that the viscosity of a liquid changes with change in temperature. __________________________________________________________________________

4. Among the products of the distillation of crude petroleum, is there any apparent relationship between boiling range and viscosity? Explain. __________________________________________________________________________

5. By what means may high-boiling fractions such as fuel-oil or paraffin be converted into gasoline? Explain briefly. __________________________________________________________________________

6. What evidence is there for the presence of sulfur compounds in this petroleum? __________________________________________________________________________
BY: Elizabeth Trowbridge

Revised by Beth Trowbridge, PWS Science Center, 1995

SUBJECTS: Chemistry, biology

LESSON LINKS: Chemicals in Oil; The Chemistry of Oil

DURATION: 2-3 periods

OBJECTIVES: Students will 1) demonstrate an understanding of the chemistry of oil by conducting basic experiments on different forms of oil; 2) analyze potential effects of oil on a marine environment by reviewing papers written by science experts preceding and following the Exxon Valdez oil spill.

BACKGROUND: Crude oils vary greatly in their properties and crude oil spills behave in different ways because of these inherent oil property variations. For examples, some crude oils tend to strongly and quickly emulsify when spilled (within a few hours), while others are slow to emulsify. Knowing whether an oil emulsifies quickly or not is very important because emulsification dramatically affects the feasibility of both dispersant-use and in-situ burning, the rate at which the spill can be skimmed, the types of skimmers that can be used and the ultimate fate of the spilled oil. Similarly, crude oils with high pour points behave very differently than otherwise similar oil that have lower pour points; the former tend to gel quickly and persist on the water surface. On the other hand, very light oils and condensate, when spilled, can evaporate and naturally disperse so quickly as to make conventional spill countermeasures unnecessary.

Note: It is strongly recommended that you precede this lesson with “Chemicals in Oil” and “The Chemistry of Oil.”

MATERIALS:
Excerpts from the following article:
☐ “The Legacy of the Exxon Valdez” by Dr. Riki Ott
☐ Oil Vocabulary List
☐ Journals or notebooks
PROCEDURE:
1. Introduce the students to the background information on properties of oil. Review previous lesson results and common oil vocabulary. Hand out the vocabulary list and have students research definitions prior to reading the following articles, or have them complete the worksheet while reading the articles.

2. If you are unable to do the lessons that were recommended to precede this lesson, you may want to conduct the following lab demonstration, suggested by Bruce McKenzie, Alaska Clean Seas, to show the varying viscosity characteristics of common liquids at room temperature. A demonstration such as this will provide an excellent example of the spreading of liquids with varying viscosity on water. Listed below are a few different liquids and their viscosity levels.

<table>
<thead>
<tr>
<th>Liquid</th>
<th>Viscosity (cP)</th>
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<tbody>
<tr>
<td>Water</td>
<td>1</td>
</tr>
<tr>
<td>Kerosene</td>
<td>10</td>
</tr>
<tr>
<td>SAE 10 motor oil</td>
<td>100</td>
</tr>
<tr>
<td>Glycerin or castor oil</td>
<td>1,000</td>
</tr>
<tr>
<td>Corn syrup</td>
<td>10,000</td>
</tr>
<tr>
<td>Molasses</td>
<td>100,000</td>
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<tr>
<td>Peanut Butter</td>
<td>1,000,000</td>
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Viscosity is probably the most important oil property from the perspective of spill behavior because it is the predominant factor that:
* controls oil spreading (more viscous oils spread more slowly)
* controls natural and chemical dispersion (more viscous oils are harder to disperse)
* controls emulsification (more viscous oils form more stable emulsions)
* controls recovery and transfer operations (more viscous oils are generally harder to skim and more difficult to pump)
3. Have students outline an article in their notebooks or journals, filling in any missing pieces.

4. Ask each student to come up with a definition or sentence describing a vocabulary word on the list. Secretly assign words to students. Collect these sentences/definitions and create a quiz or worksheet for the students.
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OIL VOCABULARY

- crude oil:
- hydrocarbon:
- aliphatic:
- aromatic:
- naphthalene:
- inorganic compounds:
- reining:
- evaporation/dissolution:
- dispersion:
- metabolism:
- mousse:
- zooplankton:
- copepods:
- detritus:
- pelagic:
- benthic:
- acute exposure:
- chronic exposure:
- toxicology:
- carcinogen:
- teratogen:
- mutagens:
- parent compound:
- metabolite:
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BY: Belle Mickelson and Elizabeth Trowbridge

SUBJECTS: Shop, voc. ed., math, science

DURATION: Minimum of 2 periods

OBJECTIVES: Students will be able to describe how oil is carried in tankers. Students will discuss tanker navigation and the role of tanker captains. Students will debate single versus double hulls and other safety features. Students will design and build model tankers incorporating a variety of safety features. Students will understand the connection between energy conservation and tankers.

BACKGROUND: The Exxon Valdez ran aground on Bligh Reef and ripped a hole in its hull renewing a controversy over the pros and cons of single vs. double hulled tankers and other safety features. The Exxon Valdez was a midsized tanker 987’ long and 166’ wide. The largest tanker in the world, the Knock Nevis (formerly called the Jahre Viking and now used as an immobile offshore platform) is 1504’ long, 226’ wide. “Tankers Full of Trouble,” the SeattleTimes reprint, describes a voyage on the Arco Anchorage. This six-part special report covers tanker crews, safety features, the double-bottom debate, inspectors and investigations, tanker traffic in Washington, and what can be one to improve tanker safety. Since the Exxon Valdez oil spill these issues have become very important.

PROCEDURE:
1. Use the opening page of the Seattle Times reprint “Tankers Full of Trouble” to introduce the topic of tankers and tanker safety. Read the section on tanker crews. Ask the students if they know anyone who has worked on a tanker. Make a list of tanker crew and captain duties. Discuss the problem of alcoholism in the marine industry. What are the Coast Guard regulations? Why should captains want to be sure that their

MATERIALS:
- “Tankers Full of Trouble” Seattle Times reprint
- Rulers
- Measuring tape
- Drafting tools
- Materials for constructing model tankers: cardboard, heavy paper, aluminum, etc.
crews are not drinking? (A ship is its own island - in an emergency each crew member will be needed with his/her full faculties to save the ship and/or lives.)

2. Measure the size of the Exxon Valdez outside your school and mark its size to show to other students and the community. Mention to students that they will be making a scale model of a tanker.

3. Discuss safety features. Oil tankers are some of our largest ships and they carry a cargo extremely hazardous to oceans, coastlines, and the people and wildlife that inhabit these waters and shores. Oil is a very valuable resource and one that all of us use daily. So how can it reach us more safely? List tanker safety features and costs described in “Tankers Full of Trouble.”

4. Challenge students to design the safest tanker to transport oil. Have students draft plans for model tankers and build them.

5. Have students research the costs associated with building their tankers. Is there a design that is cheapest and safest? How do the costs compare? What might be some consequences of using the “cheapest” design if it is not necessarily the “safest” design? Can compromises be made? Are students willing to pay more for the cost of their gas and oil to cover the costs of building safer tankers? Would safety features actually cost more? Think how much Exxon spent on the oil clean-up in Alaska.

6. Have students analyze their tanker designs developed in class. What suggestions do your students have for transporting oil? Invite a marine architect, shipwright, captain, or oil industry official to visit your class and look over your plans. Then write a letter to an oil company with your suggestions.

7. Discuss the fact that by saving energy (using less oil), less tanker traffic will be required worldwide. The less oil that is carried in tankers, the less oil that will be spilled. Ask students how they could conserve energy. Mention better insulated and weather-proofed homes, more efficient engines, using less electricity, changing oil less often and recycling oil.
BY: Elizabeth Trowbridge

SUBJECTS: Biology, art

DURATION: Minimum of 4 periods

OBJECTIVES: Students will identify several species of wildlife in southcoastal Alaskan waters impacted by the spill. Students will identify the major habitats of each species. Students will learn to identify birds, mammals and fish found in southcoastal Alaska; understand the richness of life this area holds, how all living things are interconnected by their dependence on each other; and how an oil spill can alter this dependency in life threatening ways.

BACKGROUND: Prior to March 24, 1989, southcoastal Alaska was a haven for many species of wildlife: five species of salmon, bottomfish, shellfish, marine mammals, terrestrial mammals, shorebirds, sea birds, migratory ducks and birds of prey. When the Exxon Valdez spilled its cargo into Prince William Sound, habitats were contaminated with crude oil, altering the life and feeding cycles of these species.

PROCEDURE:
1. Read sections of Alaska Fish and Game “Special Oil Spill Issue.”

2. Brainstorm, or use bubble diagram, to find species of wildlife students are familiar with and habitats they have seen. Use this time for open discussion of experiences students have had exploring these habitats, wildlife they have seen, and what it has meant to them to see this wildlife.

3. Hand out the Word Search worksheet. Explain that several of the impacted species can be found within the puzzle. Have students initially try to find as many as they can on their own, creating their own list of species. When
they have “given up,” hand out the printed list of species that can be found in the puzzle. Ask them how well they did on their own. For the sake of simplicity the word search puzzle uses common general names.

4. In this next phase students will be making their own “Wildlife Field Guide to Southcoastal Alaska.” This activity can be as elaborate as you wish to make it. The main objective is to have the students identify, classify, draw, and describe the wildlife found in this area, depending on the grade level of the students. If the students are in Jr. High, hand out copies of the AK Dept. of Fish and Game Wildlife Notebook series to each student. If the students are in high school it may be more appropriate to hand out copies of common field guides such as Freshwater Fishes of Alaska, Pacific Fishes of Canada, Guide to the Birds of Alaska, A Field Guide to the Mammals, A Field Guide to the Birds of North America, and Natural History of Alaska’s Prince William Sound. Use whichever field guides are available but be sure to have one covering each of the major wildlife groups: fish, birds and mammals. If there are enough guides for each student, do this activity individually. If resources are limited, divide the class into groups. Have the students look up each species found in their puzzle. A worksheet with each of the species is included with this unit and may be used for cutting and pasting the field guide. If this is a class activity, assign each student a species to research and prepare a page for the field guide. If this is an art project, have students draw the species, making certain that major characteristics are apparent. Next to each drawing students should list the major characteristics, habitats and range of each species. Students should also list the major sources of food for each species.

5. The “Wildlife Field Guide to Southcoastal Alaska” should be the final result of this activity. Discuss with the students how their view of southcoastal Alaska may have changed. Were there more animals and birds than they thought? Explain also that this task does not even begin to cover all the living things that are found in the Sound, this represents those vertebrate species most impacted by the Exxon Valdez oil spill. How long do they think it would take them to put together a comprehensive field guide to the Sound? Do they understand why there are separate field guides for each major group of wildlife? Can they think of other living things that may have been left out of their field guide?

6. As a final and evaluative activity, come up with a statement to preface their field guide (either individually or as a class) that best describes the wildlife in southcoastal Alaska.
WILDLIFE WORKSHEETS - BIRDS
WILDLIFE WORKSHEETS - WORDSEARCH

Look for words forward, backward, vertically, and diagonally (words listed on next page).
bear
canvasback
coho
cormorant
coyote
crab
eagle
falcon
fox
goldeneye
grebe
gull
halibut
kingfisher
loon
mink
murre
pintail
porcupine
puffin
raven
rockfish
sandpiper
scoter
seal
seasotter
sockeye
teal
weasel
whale
wolverine
Vertebrate Species Potentially Impacted by the Exxon Valdez Oil Spill in Prince William Sound

WATER BIRDS
Common Loon
Yellow-billed Loon
Pacific Loon
Red-throated Loon
Red-necked Grebe
Horned Grebe
Black-footed Albatross
Laysan Albatross
Northern Fulmars
Pink-footed Shearwater
Sooty Shearwater
Short-tailed Shearwater
Fork-tailed Storm-Petrel
Leach's Storm-Petrel
Double-crested Cormorant
Pelagic Cormorant
Red-faced Cormorant
Great Blue Heron
Tundra Swan
Trumpeter Swan
Canada Goose
Black Brant
White-fronted Goose
Snow Goose
Mallard
Gadwall
Pintail
Green-winged Teal
American Widgeon
Shoveler
Ring-necked Duck
Canvasback Duck
Greater Scaup
Lesser Scaup
Common Goldeneye
Barrow's Goldeneye
Bufflehead
Oldsquaw
Harlequin Duck
Steller's Eider
Common Eider
King Eider
White-winged Scoter
Surf Scoter
Common Scoter
Red-breasted Merganser
Sandhill Crane
Pomarine Jaeger
Parasitic Jaeger
Long-tailed Jaeger
Glaucous Gull
Glaucous-winged Gull
Herring Gull
Mew Gull
Bonaparte's Gull
Black-legged Kittiwake
Sabine's Gull
Arctic Tern
Aleutian Tern
Common Murre
 Thick-billed Murre
Pigeon Guillemot
Marbled Murrelet
Kittlitz's Murrelet
Ancient Murrelet
Parakeet Auklet
Crested Auklet
Rhinoceros Auklet
Horned Puffin
Tufted Puffin
Belted Kingfisher

RAPTORS
Bald Eagle
Golden Eagle
Great-horned Owl
Short-eared Owl
Northern Harrier
Osprey
Merlin
Sharp-shinned Hawk
Red-tailed Hawk
Rough-legged Hawk
Northern Goshawk
Peregrine Falcon

PASSERINES
Northwestern Crow
Raven
Black-billed Magpie
Gray Jay
Steller's Jay
American Robin
Varied Thrush
Hermit Thrush
Water Pipit
Rusty Blackbird
Rosy Finch
Savannah Sparrow
Song Sparrow
Lapland Longspur
Snow Bunting

SHOREBIRDS
Black Oystercatcher
Semipalmated Plover
Lesser Golden-Plover
Black-bellied Plover
Surfbird
Ruddy Turnstone
Black Turnstone
Common Snipe
Whimbrel
Bristle-thighed Curlew

MARINE MAMMALS
Sea otter
Steller's sea lion
Harbor seal
Dall porpoise
Harbor porpoise
Killer whale
Gray whale
Minke whale
Belukha whale
Fin whale
Humpback whale

TERRESTRIAL MAMMALS
Mink
River otter
Deer
Black Bear
Brown Bear
Coyote
Red Fox
Least weasel
Wolf
Lynx
Beaver
Muskrat
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Adapted from Alaska Sea Week Curriculum Vol. VI.

SUBJECTS: Biology, science, language arts

DURATION: 1 period

OBJECTIVES: Students will identify characteristics of intertidal zones. Students will identify invertebrates found in intertidal zones in Prince William Sound. Students will demonstrate an understanding of the effects of oil on intertidal invertebrates.

BACKGROUND: Intertidal invertebrates were heavily impacted by Exxon Valdez oil in the water because they were inundated by oil during each tidal cycle. Most intertidal creatures are planktonic feeders so they ingest spilled oil with every tide. The results are death, deformities and lack of turgidity. The oil spill clean-up, with its thousands of workers trampling over barnacles and mussels, also impacted heavily. The pressurized hot water clean-up technique used not only washed off oil, it washed off and killed all intertidal life. Some scientists argued that getting rid of the oil was more important because it avoided long-term toxicity; other scientists felt that intertidal life could have recovered much more rapidly on its own. Use the Alaska Sea Week Curriculum Guide Series, Under Alaskan Seas by Lou and Nancy Barr, and Natural History of Alaska's Prince William Sound by Pete Mickelson for additional background information on intertidal life (available from libraries).

PROCEDURES:
1. Review intertidal zones. Ask students to predict invertebrates they would find at each intertidal zone.

2. Hand out the Intertidal Zones worksheet. Discuss each zone, identifying invertebrates and their habitats. Identify predator/prey relationships. Diagram the food web on posterboard or blackboard. Divide the class into pairs and have students answer the questions on the worksheet.

MATERIALS:
- [ ] Paper
- [ ] Pens
- [ ] Pencils
- [ ] Posterboard or blackboard
- [ ] Worksheet: Intertidal Zones
3. Mount poems from the worksheets, with illustrations, on bulletin boards. Use the students’ poems to evaluate their understanding of intertidal invertebrates and the effects of oil on this habitat.
Intertidal animals and plants have to be very hardy to survive exposure to air, fresh water (rain and snow), summertime warmth and dryness, wintertime freezing temperatures, and predators from both the land and the sea. On the outer coast, they have to be able to hang on in pounding surf. Even in the more protected bays and inlets, fierce storms and waves occasionally flare up. There are benefits, too—the tide brings a fresh supply of rich food and nutrients twice a day. Each of the predators can reach them only at certain tidal stages—so there are periods of rest and recovery. Also, these tough intertidal conditions make it difficult for some species to compete for food and space. Each species of marine plant and animal has a particular tolerance to the hazards of being out of salt water. By looking at the beach in a section from its highest high water mark down to the water level of a low, low tide, you can quickly begin to see major differences in plant and animal populations.

The Highest Fringe

At the upper limits of the intertidal zone, the fewest life forms are evident. You may notice that the rocks appear black here. This is because they are covered by a black encrusting lichen or by a blue-green algae that makes the rocks treacherous and slippery when wet. In these upper reaches, too, may be found the common tiny periwinkle—a fat, ridged snail that sometimes seems to pepper the rocks.

The Middle Zone

As you move toward the water’s edge at low tide, you will be aware of obvious color bands or patches on the beach. There may be bands of Fucus, the common brown rockweed, and of blue-black mussels (the intertidal and subtidal bivalves that attach themselves by tiny threads to rocks, pilings and other surfaces), and barnacles. Here too, you will begin to see limpets, amphipods, various sea stars, tiny black sea cucumbers, and other forms of life not in evidence at higher levels.

The Lowest Zone

Approaching the water’s edge, you will not find some of the plants and animals evident at higher levels. In general, however, the lower you go in the intertidal zone, the greater the diversity of life forms. Here you will find sea urchins, a wide variety of large sea stars, perhaps juvenile King crabs, large white or vari-colored sea anemones, and the larger snails.
Answer these Questions:

1. What are five reasons why it is difficult for marine plants and animals to live in the intertidal zone?
   a. 
   b. 
   c. 
   d. 
   e. 

2. What are two life forms you can find at the upper limits of the intertidal zone?
   a. 
   b. 

3. What are six life forms you can see in the middle zone?
   a. 
   b. 
   c. 
   d. 
   e. 
   f. 

4. What five marine life forms can you see at the lowest zone?
   a. 
   b. 
5. Now think about the Exxon Valdez oil spill. What might be the effects of the oil on the beaches?


6. Which tidal zone(s) do you think would be impacted the most? And why?


7. Which invertebrates might be impacted?


8. Which vertebrates do you think might be impacted by oily beaches (hint: think about the predator-prey relationship)


9. Make up a riddle or poem about your favorite intertidal creature and how they might be affected by an oil spill.


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BY: Elizabeth Trowbridge

SUBJECTS: Biology, art

DURATION: Minimum of 2 periods

OBJECTIVES: Students will identify major habitats of south coastal Alaska and their inhabitants. Students will identify wildlife impacted, directly and indirectly, by the oil spill. Students will devise clean-up and rescue procedures for impacted wildlife and habitat.

PROCEDURE:
1. Read Alaska Fish and Game “Special Oil Spill Issue” and National Geographic articles on wildlife and rescue operations in south coast Alaska. Review “Field Guide to Southcoastal Alaska” and, as a class, identify the major habitats found in south coast Alaska and the characteristics of each.

2. On map provided, have each student place at least three species of wildlife in each habitat. This can be done by either drawing the wildlife or cutting and pasting from the wildlife worksheets. This can also be done as a class activity by making the map into a mural or bulletin board. Have each student place at least one species on the map. After the maps are completed ask the students how they think these species relate to each other. Try to identify obvious food webs.

3. Hand out the Wildlife and Oil worksheet. Then complete the Oil in the Food Web worksheet and discuss results as a class.

4. Using oil spill overlays, trace the development of the oil spill on the map. After each day/week observe how much area the spill is covering and the wildlife the oil has covered. Use a large pad of paper to trace the oil spill’s movement and impact on wildlife. Discuss why these animals have been impacted and what characteristics they have that may have caused them to live.

MATERIALS:
- Alaska Fish and Game “Special Oil Spill Issue”
- National Geographic January 1990
- “The Otter Ward” from Hard Aground
- “Otter Rescue Questioned” “Field Guide to Southcoastal Alaska”
- Map of southcoastal Alaska
- Oil spill overlay
- Large pad of paper
- Markers
- Worksheets:
  - Oil in the Food Web
  - Wildlife and Oil
  - Wildlife Rescue Information
or die because of the oil. What animals feed upon them, what animals do they feed upon? (Predator/prey relationships)

5. Do the Wildlife and Oil worksheet. This activity will demonstrate the properties of oil in the water and on wildlife. Use the results from the Critter Clean-Up experiments to analyze wildlife rescue techniques.

6. What are you going to do? Have the class brainstorm ideas for clean-up and rescue of habitat and wildlife. Read “The Trauma of Being Cleaned” and “Otter Rescue Questioned” articles. Divide the class into small groups. Each group should pick one idea or method for rescue, protection and clean-up of habitat and wildlife. Use the Wildlife Rescue Information worksheet provided as an outline for considerations that must be taken into account (cost, logistics, weather, human impact, stress, etc.). Have each group present their plan of attack. Vote, as a class, on the most viable solution to the problem.

7. Have students do a fast write in their journals about their impressions of the clean-up, protection and rescue process. What were their frustrations in coming up with a solution? What are their feelings about southcoastal Alaska now?

EXTENSIONS:
1. Have students assume the point of view of a gull, sea otter or land mammal and write a story about the trauma of being cleaned.

Oil on beaches damages shoreline life. Oil seeps downward into sand and remains there
All animals and plants must have food to survive. Our coastal waters are particularly rich in food resources. See if you can figure out who eats who in this picture. Draw arrows from the predators to the prey. What runs this whole system?
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WILDLIFE RESCUE INFORMATION WORKSHEET

Take all of these factors into consideration as you develop a strategy for wildlife rescue operations. Be prepared to defend your rationale.

<table>
<thead>
<tr>
<th>COST</th>
<th>upper limit</th>
<th>lower limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>What will be the cost of rescue operations? Facilities? Staff? Rehabilitation and relocation? (It cost $89,000 to rehabilitate one sea otter after the Exxon Valdez spill)</td>
<td>1st choice</td>
<td>2nd choice</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOGISTICS</th>
<th>1st method</th>
<th>2nd method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where will the facilities be located? What buildings could be used? Whose boats? Collection method? Recruitment and training of staff?</td>
<td>acceptable</td>
<td>unacceptable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEATHER</th>
<th>1st method</th>
<th>2nd method</th>
</tr>
</thead>
<tbody>
<tr>
<td>What kind of weather might your crews encounter? How would this affect your recovery efforts?</td>
<td>acceptable</td>
<td>unacceptable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STRESS AND HUMAN IMPACT</th>
<th>1st method</th>
<th>2nd method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is it better to leave the impacted animals to fend for themselves or to capture them and risk having them die from stress or disease? For many wild animals, especially sea otters, the trauma of human impact is often greater than most environmental or natural impacts.</td>
<td>negative effects</td>
<td>positive effects</td>
</tr>
</tbody>
</table>
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for years. Rocky shorelines can clean themselves naturally through wave action, but bays, estuaries and marshes have few waves. Oil spills in such areas are very damaging because wetlands are the nursery grounds for fish, birds and shellfish.

Oil causes serious harm to birds by coating their feathers. An oily bird does not float, and it has no insulation against temperature changes. Also, birds poison themselves by eating the oil that coats them.

Oil can smother communities of animals that live on the sea floor. This really affects clams, mussels, shrimp and crabs important to the shellfish industry. Most of these areas will eventually become settled again, but some organisms, like mussels, cannot survive in an oiled area.

Adult fish are not affected by oil pollution as much as other organisms. A massive spill can kill large numbers of fish, but, ordinarily, adult fish are able to escape injury from minor accidents. Smolt and eggs are extremely vulnerable to oil spills, however.

Marine mammals, such as whales, sometimes swim away from oil spills. But the oil affects them internally as they breathe its toxic fumes. Sea otters die when their fur becomes matted; they do not have any protection from the cold ocean water.

Different petroleum products have different affects on organisms. Diesel or heating oils are the most poisonous, while heavy crude and fuel oils are the worst for smothering animals.

Now, answer these questions:

1. Describe a kind of oil spill that could kill large numbers of adult fish, smolt, or eggs.

2. What kinds of petroleum products have the most undesirable effects?

3. How do these affect the organisms?
4. Are all areas of the coastline affected in the same way by oil pollution? If not, explain these differences.

5. Success in cleaning up an oil spill depends upon rapid action by the spiller and by federal, state and local agencies. When a spill occurs, it is reported to the U.S. Coast Guard. To be effective, containment must be done as soon as a spill is detected. In the case of the Exxon Valdez, Exxon headed up the clean-up efforts with suggestions from the Coast Guard and the State of Alaska. Unfortunately, the spill was not contained immediately through the use of booms and mechanical skimmers so the oil spread over 1,000 miles.

Write a story about what you would do to protect the wildlife if you were in charge of cleaning up a spill.
ADAPTED FROM: FOR SEA and the Alaska Sea Week Curriculum Guide by Elizabeth Trowbridge

SUBJECTS: Science

DURATION: Minimum of 3 periods

OBJECTIVE: Students will demonstrate birth and death rates and the difficulties of estimating sea otter populations.

BACKGROUND: Read Alaska Fish and Game “Special Oil Spill Issue” article on sea otters. Xerox article for each student or read as a class. Sea otters can be found abundantly in the waters of Prince William Sound and the Gulf of Alaska. Sea otters were exploited to the verge of extinction in the late 1800s and were granted protection in the early 1900s. Populations of sea otters can be found in many areas of Alaska now, including those areas affected by the Exxon Valdez oil spill.

Sea otters feed primarily on clams, crabs and octopus. They have big appetites, eating 23-37% of their body weight daily. Total population numbers vary but a pre-spill estimate for Prince William Sound is 8,000-12,000, with somewhat fewer than half of them in the heavily oiled west side of the sound.

Sea otters are particularly vulnerable to oil contamination because they lack substantial subcutaneous fat and depend upon maintaining a layer of air trapped within their fur for protection against cold. Most of the sea otters that died from the spill died from hypothermia. Many sea otters also died from breathing and ingesting the most volatile and toxic fractions of thick, unweathered crude oil. Sea otters ingested the highly toxic crude oil from grooming, a necessary and continual procedure. Many of the sea otters that died were not even recovered. The high mortality rate in the first weeks puzzled rehabilitation center workers until necropsies revealed the extent of internal damage the otters suffered. There was evidence of severe damage

MATERIALS:

☐ Alaska Fish and Game “Special Oil Spill Issue”
☐ Two (2) one-quart jars of dry kidney or pinto beans
☐ Cardboard box about 12”x14”x2”
☐ Acetate about 3”x5”
☐ Tape
☐ Overhead projector
to the otters’ livers, kidneys, and lungs, presumably from ingestion during grooming, from absorption through the skin, and from the toxic effects of breathing volatile hydrocarbons such as benzene and toluene.

Scientists do not agree on the population of the sea otters in Prince William Sound. It is difficult to collect accurate data on wildlife populations. Various techniques can be used but each has its shortcomings. The following activities are designed to help the students gain an understanding of the difficulties scientists face when having to count wildlife. This can be compounded when the species migrates. Birth and death rates are also crucial pieces of information that help scientists understand the strengths and weaknesses of a population.

PROCEDURE:

1. Before class, make a counting box out of a two-inch-deep cardboard box (or two lids). Cut out a “window” in the top and the bottom and tape a three-by-five inch piece of acetate on it. Now put a number of beans in the box.

2. Begin with a jar of beans which will be representative of the sea otter population. Spill the jar of beans onto the floor and ask the students how they would count the population of sea otters. Discuss various techniques such as flying over otters, boating, radio transmitting, etc. Discuss the advantages and disadvantages of each. What are some of the difficulties they might encounter? (weather, movement, feeding patterns, not being able to tell the difference between specific animals, etc.).

3. Do bean activity. Show the students the counting box (ocean), with beans representing sea otters. Place the box on the overhead projector. Shake the box around vigorously so the beans move before the students have time to count those appearing in the window. On the basis of the beans they see, can the students estimate the total number? Take their guesses and ask what they are based on. Now try a different number of beans, either a great deal more or a great deal less, and repeat the estimations.

Based on this exercise, what does the class think are some of the problems in trying to count sea otter populations? (The otters move around, you can’t tell if you’ve counted them before or not, they live in areas that we can’t always watch, etc.).

4. Use beans, once again, to get across the effect of birth and death rates on population growth. Place two one-quart jars at the front of the classroom and divide the students into two groups. Students in one group will each add two beans to their jar, and students in the other group will add three beans at a time to their jar, to represent two different birth rates. Compare how fast the jars fill up. Now demonstrate birth and death rates. Start with both jars full. Have each group add two beans at a time to their jars, but have one group take away one and the other group take away three to represent two different death rates. What eventually happens to the three-bean group? This is an extremely simplistic model, but will show the effect of high death rates on a population, as occurred
with the oil spill on the sea otter population. Remind students that sea otters have only 1 young per year. Explain that sea otter researchers use radio transmitters plus boat and plane counts.

EXTENSIONS:
1. Science: You have just been hired by the Fish and Wildlife Service as a marine mammal biologist. Next summer you will be conducting research on the sea otter population in Prince William Sound. Your project has these objectives: 1) Compare both short and long term changes in population size based on historic and recent survey data, and intensive surveys of specific regions before and after oiling.

2. Determine post spill distribution of sea otters in Prince William Sound and examine the pattern of recovery. Design your research project. What methods will you use to determine population size? How will you determine changes in population? What factors will you have to take into account?

3. Science/language arts: Research and report on other wildlife research projects being conducted as a result of the oil spill. What methods are being used? Can you identify the strengths and weaknesses in the design of the projects?
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Alaska Oil Spill Curriculum  7-12

Adapted from: Alaska Sea Week Curriculum, Vol. VI, activity by Jim and Mary Lou King.

SUBJECTS: Math, science, language arts, art, social studies

DURATION: Minimum of 2 days.

OBJECTIVES: Students will conduct a random sample and a systematic sample using a transect. Students will demonstrate an understanding of the importance of sampling as a gauge of change. Students will observe the affects of garbage and waste pollution on the beach. Students will use communicative skills to conduct interviews and present findings.

BACKGROUND: This beach activity will serve as a catalyst for many follow-up activities and discussions. It is very important for students to gain first-hand knowledge of the resources and the impacts of humans. Understanding the difficulties of gauging populations and monitoring change will help the students evaluate the roles of local scientists and the impacts of pollution and development.

Do you ever wonder when you hear a large figure such as the total of ducks in North America, trees in the National Forest, or people who watch a certain television program, how such high numbers can possibly be counted? Often this is accomplished by a process called sampling—taking an exact count in a small area and then multiplying to obtain an estimate for the total area.

Biological sampling is sometimes done by taking counts in randomly selected plots. Coat hangers pulled into squares are a good device for marking plot boundaries. Counts are taken inside the plots and then used to estimate the number of small animals per acre on a rocky beach, the number of flowers or berries on an

FIELD TRIP TO THE BEACH

MATERIALS:
- One coat hanger for every two students
- Yardstick
- 100 ft. lengths of 1/4" rope or heavy twine (for the transect method)
- Wooden stakes
- Felt-tip markers
- Hammer (or rock)
- Adhesive tape
- Small rulers
- Paper
- Pencils
- String
- Pocket notebook for each student
- Clipboard
- Field identification guides
- Camera and film (optional)
This method will work for anything that is fairly evenly distributed over a large area and small enough to be found inside coat hanger plots.

Sampling is very useful for gauging changes taking place over a period of time. One may wish to measure changes resulting from natural causes: earthquakes, storm surges, shifting currents, the seasons, etc. Cycles of succession—lakes that eventually fill in to become marshes and later dry land, or meadows that gradually turn into forests—can be best understood by studying changes in animal and plant life over a period of many years.

One may also study changes caused by human activities: the construction of a boat harbor or subdivision; the building of a road or pipeline; a dredging operation, or an oil spill. Ocean pollution is a serious threat to the earth. Two forms of pollution are plastics, which harm wildlife and biodegrade very slowly, and oil, which is poisonous. Scientists are sometimes asked to investigate an area and develop baseline data before a construction project takes place. If the proposed changes are on a large scale, environmental impact statements are required. To determine the actual effects of the development, data must also be collected during and after completion of the project.

This activity describes random plot sampling and systematic sampling using transects. Your students can use either one or both of these methods to monitor local changes. Standardize your sampling techniques as much as possible so that classes year after year can collect and compare data. Sample not only your spot, but also a local development site or polluted spot. If you live in an area impacted by an oil spill, choose this as your site.

Discuss planned development projects with city planners or members of the village council. Ask their advice on what area to study and also on what types of information would be most helpful to them for your class to study. Interview a person from the US Coast Guard, the US Fish & Wildlife Service, or the ADF&G to find out how extensive the problem of plastic debris or oil pollution is in Alaskan waters. The Alaska Sea Grant Program has many handouts on plastic debris and beach clean-ups.

The data your class collects may be of real use in the future, so be sure to save your field notes and the report summarizing your findings.

**PROCEDURE:**

1. Decide on a study site. Ask students to describe how they would find out about the plants and animals living at this site. Plan to try out some of their suggested methods. Then explain the following two sampling techniques. Both require a supply of frames; these can be of any size, so long as the same size is used consistently in any one study. Coat hangers pulled into squares make handy plot frames, but wood or metal frames can also be used.

   **Random Plot Sampling:** Explain that to make their plots random, each pair of students should stand along an edge of the site, close their eyes and throw their coat hanger inside. After counting and recording all the plants and animals inside the frame, they should close their eyes and throw again, proceeding in the general direction of the opposite side of the study site. Each pair should complete 5-10 plots (whatever is agreed on beforehand and what time allows).
**Systematic Sampling Using Transects:** to make transect lines, stake 100 ft. ropes (use nylon-cotton, as it will not stretch) across the study site. The ropes should be numbered consecutively and marked off ahead of time with adhesive tape every three feet or at some other regular interval. If your study site has a variety of habitat types (including, for example, tundra, marsh and lake) your transect lines should be laid out to cross all of them. Teams of two students each, using the coat hangers, should take sample measurements along the transect line at the taped intervals.

2. For both types of sampling, at least two of the study site corners should be marked with stakes or by some other means. If transect lines are used, these also should be marked, so that the study can be duplicated in the future.

3. Each team of two students should record its findings in a small pocket notebook. (Notebooks can be made by cutting sheets of scrap paper in quarters, then stapling them together. Punch a hole in one corner and tie a pencil to it with a string). Students should head their notes with the date, time, location and weather. While sampling, one student of each pair can count while the other records. A separate page of the notebooks should be used for each plot.

   Have students write down the names of all species of plants and animals inside, or at least more than halfway inside, their square. If students cannot identify something, ask them to draw a picture or write a description. Students should make as accurate a count as possible of each species within the square. If there are too many to count, they can estimate by counting the number within one square inch, then multiplying by the number of square inches in the plot.

   If grasses, algae or other plants are not too dense, they can be counted individually. Otherwise, have students measure the surface area, in inches, that each species occupies. Make a note of inanimate evidence of life found in a plot—detached seaweed, seashells, bird feathers, animals tracks, or droppings.

4. To be sure that students understand the procedures, you may want to try sampling in the classroom or on the school playground before you do your field study. Place construction paper plants and animals on the floor or ground. Then have students mark and measure their study site, sample using random plots or a transect, and summarize data.

5. When you arrive at the study site, have each student estimate how many plants and animals are living there.

6. Assign at least one team to do an inventory of all the garbage found at the site. List and catalog the kinds of pollution deposited on the shore. Be specific. Mark the kinds of debris that are not biodegradable. While you are there, collect the debris and put it in a garbage container, except for the garbage that you can recycle.
7. Assign one team to be reporters. They can photograph or draw the entire operation and interview the biologists at work. Be sure they photograph or draw the study site and the benchmarks at the beginning and end of each transect. Have students write a story about their class findings for your local school or community newspaper or parent newsletter.

8. Another team (more than one team if there is time) should draw a map of the study site showing prominent biological, geographical and geologic features, along with any man-made features. One student can establish scale for the map by measuring his or her normal stride with the yardstick, then pacing off the size of the study site.

9. After the teams have finished their sampling, hold a summary session. Have each pair tell briefly of its findings. Try to look at the study site as a whole. What are its general characteristics?

10. Back at school, have each team record its findings on a data summary sheet. (A data summary sheet can also be used in the field instead of the field notebooks. If you have been to the study site before and are aware of what you will find, you can draw up your own sheet ahead of time. Or students can make their own as they go along by writing down each plant or animal the first time they find it).

11. Have the teams make bar graphs of their results, so that they can see graphically how populations of animals and plants vary at your study site.

12. To compute the average number of animals or plants per plot, divide the total number recorded by the number of plots sampled. To figure the number of animals or plants on the entire study site, use this formula:

$$\frac{\text{total square inches on study site}}{\text{total square inches in all plots}} = \frac{\text{average on plots sampled} \times \text{total plots}}{\text{total creatures on study site}}$$

For example, say you found a total of 1500 barnacles in 10 plots. 1500/10 gives you an average of 150 barnacles per plot. Figure out the number of square inches in your coat hanger plot (9 x 9" coat hangers = 81 sq. in.) and the average number of barnacles per square inch:

$$\frac{150}{81} + 1.85 \text{ barnacles per sq. in.}$$

Now to estimate the number of barnacles on your study site, figure the number of square inches in your study site. Assuming a site 100 ft. x 40 ft.:

$$100 \times 40 = 4,000 \text{ sq. ft.} \quad 4,000 \times 144 \text{ (sq. in. per sq. ft.)} = 576,000 \text{ sq. in.}$$
and 576,000 x 1.85 = 1,065,600 barnacles in your study site.

These figures may be more meaningful if they are translated into creatures per acre. One acre equals 43,560 sq. ft. or 6,272,640 sq. in. Thus, in the example:

1.85 barnacles/sq. in. x 6,272,640 sq. in./acre = 11,604,384 barnacles per acre.

12. Have students analyze and summarize their data. Ask them:

What species are most abundant?
What species are most widely distributed?
Is there much size range within individual species?
What species are present but represented only by a few individuals?
What natural changes are occurring within the study site?
What accounts for the abundance of life in the sample plots?
What human changes do you foresee in the future for this area?
What human changes are evident now?
How will the animals and plants change in response to these human changes?
What kinds of things are being done to encourage proper disposal of garbage and wastes from boats?

13. Show your results to local officials and SAVE YOUR FIELD NOTES AND SUMMARY REPORT! Emphasize to students that their data will be kept and compared with additional data taken the following year at the same time. (Or if possible, repeat the above sampling scheme in the fall, winter and spring, to measure seasonal change in the study area.) But most important is the fact that in some remote areas of Alaska, your surveys may be the only ones that have ever been made. Your reports might be of real help to scientists!

EXTENSIONS:
1. Science: Have students measure and record sizes of the largest and smallest plants and animals within the plots.

2. Science/language arts/art: Have students write questions they have about their findings and about specific plants and animals. Then research the answers to these questions and design an attractive bulletin board display with the results.

3. Language arts: Have you had a personal experience with ocean pollution of some kind? Tell about it.


5. Art/language arts: Make a poster that describes ocean pollution and suggests ways to
combat this pollution.

6. Art/photography: Make a photo essay of the debris or pollution you find in your coastal area. Write short descriptions beneath your photos and mount them on a poster.
BY: Belle Mickelson

DURATION: 2 periods

SUBJECTS: Social studies, language arts

OBJECTIVES: Students will discuss the role of volunteers in the oil spill clean-up. Students will investigate the importance of volunteers in their own community. Students will volunteer a few hours to make their own community a better place. Students will compare their own efforts with the oil spill volunteers and write about their feelings.

BACKGROUND: As soon as the Exxon Valdez oil spill happened, thousands of Alaskans and people all over the world rushed to help. Those who could not come sent letters, moral support, and/or money. In the impacted communities it was important for people to feel like they were helping in some way. Some people were paid employees, but thousands of others were volunteers, who gave countless hours of their time. Disasters like the Exxon Valdez oil spill do not happen very often, but in every community there is someone and something that needs your help. People feel better when they help others.

PROCEDURE:
1. Read some of the news articles at the back of the curriculum. Ask students if they know anyone who volunteered to clean up the spill. What did they do? How did they feel? Why did they do it?

   People cleaned birds and otters, volunteered boats and equipment, staffed offices, set up a volunteer hotline, helped with scientific studies, took care of other folk’s kids, made oil containment booms, talked to the press, made phone calls, wrote thank you letters, drew pictures, made baked goods for the oil spill workers,
picked up their own beaches, contributed money, and wrote this curriculum. Some workers were paid — and paid well — but there were also many people who contributed and are still contributing.

2. Ask students what volunteer projects they have done. Did they like them? How did it make them feel?

3. Discuss volunteer projects that could be done in your own community: visit elders in the hospital or in your own neighborhood, help a parent with his or her children or help at a childcare center, clean your local parks, serve meals to the needy, or stuff mailing envelopes for an environmental group. Check your local newspaper for other ideas.

4. Pick a project as a class or individual.

5. Have each student do at least 2 hours of volunteer service in the community.

6. Have students reflect on their experience in their journals.
SUBJECTS: Social studies, Alaska studies

DURATION: 1 Period

BACKGROUND: The Chugach and Eyak Eskimos and the Aleuts have inhabited the shores and waters of Prince William Sound and southcoastal Alaska for ages. They depended upon the waters and the land for food and shelter. Alaska Natives still depend heavily on a subsistence way of life even though they are part of a cash economy. Rural lifestyles and traditional ways make subsistence activities essential. Coastal waters have provided herring, salmon, crab, mussels, seaweed, shrimp and a variety of invertebrates, among others, for food and livelihood. Terrestrial mammals that feed off of marine life have been very important resources for Alaska Natives. The Exxon Valdez oil spill truly impacted the Native villages found in southcoastal Alaska. Not only did it destroy their subsistence food supply, it threw thousands of dollars into their economy; in most villages, money is not necessarily what is needed. Alaska Natives need to be sure their lifestyle will be stable, and their traditional food source and livelihood will be intact; they do not need a false economy that will only last for one or two years. What is left is an uncertain future and a changed culture. The following worksheet and article written by a Native elder are meant to increase the students’ awareness of the lifestyles of southcoastal Alaska Natives and the impacts of the oil spill on those lifestyles and cultures.

PROCEDURE:
1. Hand out and read, as a class, the article by the Native elder, Walter Meganack Sr. Discuss what it means to depend upon the land and water for your food and shelter. Read other news articles such as: “Spill Stench Permeates

MATERIALS:
☐ “Coping with the Time the Water Died” by Walter Meganack Sr.
☐ “Crude Reminders 10 Years After ‘The Day the Water Died’ -- pain of Valdez spill still stings in Alaska”
☐ “Future of Village in Doubt”
☐ Paper
☐ Pencils/pens
☐ Journals
☐ Foxfire books
☐ Worksheet: Native Uses of the Coast
Aleut Village” and “Future of Village in Doubt.” Review the Native groups of Alaska, their lifestyles and general subsistence characteristics. Use a large map of Alaska to mark the Native groups of Alaska.

2. Hand out the Native Uses of the Coast worksheet and have students complete either individually or in groups. Discuss #6 & 7 as a class. Have different students relate their views of the community 100 years ago. Ask some to describe what they think the community will be like 100 years from now! What changes in lifestyle might occur and how would this affect their personal, family and community life. You may want to have the students respond to this in their journals.

3. One of the most sensitive issues facing the Alaska Natives in Prince William Sound and southcoastal Alaska is that of the impacts of beach cleaning and “cleaners” on archaeological remains. Many beach workers may be tempted to take artifacts that are found. Non-Natives view these remains as “artifacts;” to the Alaska Natives in this area these are the remains of their ancestors and cultural heritage. Try to personalize the issue by asking students how they would feel if their grandparents remains were uncovered and stolen. Find pictures or replicas of artifacts and speculate as to their usage. Have students try to create a profile of settlement patterns in Prince William Sound and southcoastal Alaska based on artifacts and archaeological remains. Refer to other lessons for information on habitat and wildlife characteristics.

4. Have students try to define their “cultural values.” List them on the board, then have students prioritize them in their journals. Have them defend their number 1 and 2 choices. Now tell them that something has happened and these highly prioritized values have been destroyed. (For example, they are not able to be with their family at Christmas, or they can no longer visit local parks due to construction or destruction). What would this mean to the students and their families? What sort of actions might they take as a result of these changes? Have them reflect on these thoughts in their journals.

4. Interview an elder in your community. Put together a book of compiled stories or interviews to be shared throughout the community. Have each student or a group of students interview an elder asking questions about their lifestyle when they were young, changes that have occurred and what these changes have meant to them personally. Use the Foxfire books, and Shandaa: In My Lifetime, ed. by Bill Pfisterer for ideas about format and content. Include photographs and drawings if possible. You may want to coordinate with an art or photography class to help compile the book. Include maps, personal background of the elder interviewed and anecdotes from their life story.

Adapted from: the Alaska Sea Week Curriculum, Vol. 7
1. Write the names of nine Native groups on the map above, showing their traditional areas.

2. Describe the Native groups in your area. They are called

How did they use the coast traditionally?

Now?

In times long ago, they lived in

and hunted with

They used ________________ for transportation on the seas and rivers.

Now they live in ____________ and use ____________ for transportation on the seas and rivers.

One word in their language is

It means

3. Compare the ways two of Alaska’s Native groups depend on the coast.
Five similarities are:

Five differences are:

4. Name the 5 most important food items to Alaska Natives in southcoastal Alaska:
   1.                      2.                           3.                            4.                           5.

   If you live in a different area of the state, name the 5 most important food items for the Native group in your area:
   1.                      2.                           3.                            4.                           5.

5. Who are the major employers in the villages in your area?

   How many jobs do they provide for the local population?
   How would you describe the economic base of the villages near you? (subsistence based, cash economy, oil based, commercial fishing, etc.)
6. Compare and contrast the lifestyle of the Native groups in southcoastal Alaska:

<table>
<thead>
<tr>
<th></th>
<th>100 years ago</th>
<th>pre oil spill</th>
<th>post oil spill</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food source</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Economic base</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Transportation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cultural value</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. Describe life in your community 100 years ago through the eyes of a student your age. Tell why the coast is important to you.
BY: Belle Mickelson

DURATION: 2 periods

SUBJECTS: Social studies, language arts

OBJECTIVES: Students will read articles about how different individuals, agencies, and organizations responded to the spill. Students will discuss the role, and difference, of each group of respondents. Students will write about their response to an oil spill in their community.

BACKGROUND: On Good Friday, March 24, 1989, Alaskans “awoke to the shock of disaster. Shortly after midnight, the 987-foot-long supertanker, Exxon Valdez, had run hard aground on Bligh Reef, spilling 10.8 million gallons of crude oil into the unspoiled waters of Prince William Sound. The worst case had occurred.”

“This was the threatened tanker catastrophe residents of Prince William Sound had dreaded—but many had come to discount—even since the trans-Alaska pipeline was proposed in the late 1960’s...” (from SPILL, the Report of the Alaska Oil Spill Commission)

Individuals, organizations, communities, agencies, and industry moved into high gear to respond to this emergency. For volunteers and employees alike, this meant long hours and high levels of stress. They worried about their economic future and way of life, dealt with the death of birds and animals, and the oiling of their incredibly gorgeous environment. There was a tremendous sense of helplessness and, for many, the need to try to rectify what had gone wrong. Disorganization was prevalent. Greed and infighting among some people contrasted with the idealism, leadership, and dedication of others.

Many people went through the traditional grieving stages that one sees when there is a death in the family (shock/denial, anger,
bargaining, depression, acceptance). In this case, “family” was an area that they loved and treasured; for many, an area on which their whole way of life depended.

PROCEDURE:
1. Ask the students to remember their first thoughts after they heard about the spill. Ask them what they did and what people they know did in the weeks that followed.

2. Divide the class into groups. Have each group focus on different individuals, agencies, and organizations and read articles about how they responded to the spill. Come together as a class and have each group report on their response team. Be sure to focus on the type of response action, i.e. volunteer, organizational, agency, individual; the emotional aspects of the response; what the response group hoped to accomplish and what they actually did accomplish (this could range from feelings and personal satisfaction to actual saving of animal lives or fisheries).

3. Have students write a paper about what they would do if an oil spill happened in their community.

EXTENSIONS:
1. Social studies: Invite a social worker or psychologist to talk to the class about the effects of a disaster on communities. In Alaskan southcoastal communities directly affected by the spill, it is important that students have a chance to talk about what they felt when the spill occurred. They need to feel good about what they did, and can do, to prevent future spills (energy conservation, recycling, etc.).

2. Social studies: Go on a field trip to city hall and the fire department to talk about their contingency plans for disasters.
BY: Liz Burck

SUBJECTS: All

DURATION: Minimum of 1 period

OBJECTIVES: Students will demonstrate decision-making skills by evaluating personal values.

BACKGROUND: Decision-making is a life skill which challenges the student to evaluate personal values. It is essential for education. The oil spill, then, lends itself to this exercise quite readily. That challenge is an integral part of the energy (oil spill) controversy and, ultimately, an integral part of societal expectations of our youth.

PROCEDURES:
1. Hand out the response forms and the “I” Values form.
2. Define and discuss ethics.
3. Go over all the steps - including a review and/or explanation of the “I” values.
4. Practice using the model by suggesting a bio-ethical problem to which the students can easily relate. For example: What ought I do when the landfill is closing in three months and I know that I will continue to generate garbage.
5. Brainstorm ethical issues related to the oil spill.
6. Choose one issue at a time to use with the model.
7. Have the student complete the model. NOTE: Individual responses cannot be graded (too subjective) but can be checked for understanding and/or completion.
8. The responses can then be used to stimulate or generate classroom discussions, or the students can reflect in their own journals.

MATERIALS:
Worksheets:
- Bio-ethical Decision-Making Model
- “I” values form
I. State the bioethical problem. State problem as an ought to do question (e.g., “What ought I do when....”)

II. List possible alternative actions or solutions to the problem, even if you don’t agree with some. (Five is the minimum.)

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
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<tr>
<td>4.</td>
<td></td>
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<td>5.</td>
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<td>6.</td>
<td></td>
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<tr>
<td>7.</td>
<td></td>
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<tr>
<td>8.</td>
<td></td>
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</tbody>
</table>
III. Rank these alternatives in order of preference by placing numbers beside them. For example, place #1 beside the first choice, #2 beside the second, etc. (Rank them from the one (#1) your values agree with most to the one (#?) your values agree with least.

IV. Take your #1 solution and list at least 5 values you hold that cause you to rank it #1.

   “I” Value  Personal Meaning of Value Word
   1. 
   2. 
   3. 
   4. 
   5. 
   6. 
   7. 
   8. 

V. Now take your solution and describe the CONSEQUENCES you think it would have. Use any 5 of the long term and short term consequences.

   How would this solution affect my:  Short Term  Long Term
   Money 
   Time 
   Personal relationships 
   Family 
   Friends 
   Psychological self 
   Community 
   Country
VI. Place a (+) beside each consequence you hold as “good” and a (-) beside each consequence you hold as “bad.”

VII. Are there any real “bad” consequences that you couldn’t live with? If so, try another solution or modify your solution.

VIII. List 3 reasons why others might not agree with your solution to the problem.

1. 
2. 
3. 

IX. Restate your solution and then place a confidence or conviction measure on it by Xing the number on the confidence scale below.

My solution:

<table>
<thead>
<tr>
<th>I can live with my solution</th>
<th>I cannot live with my solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

(From the Mertens/ Hendrix Model from Ball State University)

NOTE: Cross out values that have no meaning for you and add others that do have meaning for you. Be sure to define the ones that you add.
ACHIEVEMENT: Accomplishment; a result brought about by hard work to attain a desired goal.
AESTHETICS: The appreciation and enjoyment of beauty for beauty’s sake.
ALTRUISM: Concern for the interests of others.
AUTONOMY: Self-directed, capable of existing alone; acting without aid of others.

BEING LIKED: Being held in favor or regard by others.

COOPERATION: Working together for a mutual benefit.
CREATIVITY: Initiating new and innovative ideas and designs.

EDUCATION: The process of gaining knowledge and skills while developing reason, judgement and intellectual maturity.
EMPATHY: The ability to share in someone else’s feelings.
EMOTIONAL WELL-BEING: Freedom from overwhelming anxieties and barriers; a peace of mind; inner security.
EQUALITY/RIGHTS: Correspondence in quality, degree, value, rank or ability.

FAMILY/BELONGING: Related by blood or marriage
FRIENDSHIP: The state of one person being attached to another by feelings of affection or personal regard.

HEALTH: The soundness of one’s body.
HONESTY: Fairness of straightforwardness or conduct; integrity; uprightness of character or action.
HUMAN DIGNITY: Holding all humans in high esteem regardless of age, race or creed.

INTERDEPENDENCE: The mutual need for support, aid, comfort, etc.
INTIMACY: A close, familiar, and usually affectionate or loving personal relationship.

JUSTICE: The quality of being impartial to treat others fairly or adequately.

KNOWLEDGE: The seeking of truth, information, or principles for the satisfaction of curiosity, for use, or for the power of knowing.

LOVE: Affection based on admiration or benevolence; unselfish devotion.
LOYALTY: Maintaining allegiance to a person, group, institution, or political entity.
MORALITY: The moral values held by an individual or society.

OWNERSHIP: To have or hold material objects or to acknowledge specific ideas as being part of your ideology.
PERSONAL HEALTH: The condition of being sound in body; freedom from physical disease or pain; the general condition of the body, well-being.

PHYSICAL APPEARANCE: Concern for the beauty of one's own body.

PLEASURE: The agreeable emotion accompanying the possession or expectation of what is good or greatly desired; a state of gratification.

PRESTIGE: Holding a position of high value relative to society standards.

POWER: Possession of control, authority, or influence over others.

RECOGNITION: Being made to feel significant and important; given special notice or attention.

RELIGIOUS BELIEFS: One's convictions or opinions about religion, faith, devotion, etc.

SELF-CONTROL: Restraint of oneself or one's actions, feelings, etc.

SELF-PRESERVATION: Looking out for your own welfare.

SELF-WORTH: A feeling of being useful and/or held in high esteem by others.

SKILL: The ability to use one's knowledge effectively and readily in execution or performance; technical expertise.

SOLITUDE: The state of being removed from society; a quiet life.

TRUTH: An ideal abstraction conforming to a universal or generalized reality.

WEALTH: Abundance or valuable material possession or resources; affluence.

WISDOM: The ability to discern inner qualities and relationships; insights, good sense, judgement.

WORK/LABOR: Exertion or effort directed to produce or accomplish something; toil, effort.
Adapted from: Barbara Browning, Homer High School

SUBJECTS: Social studies, government

DURATION: 2 weeks

OBJECTIVES: Students will participate, understand, and be successful in a senate simulation. Students will experience the give and take, the party alliances, and the stress and preparations involved in passing legislation.

BACKGROUND: As a result of the Exxon Valdez oil spill many types of legislative bills have been introduced both at the state and national level. Introducing new, or changing old, legislation is a long and complicated process yet one that should be understood by citizens. Understanding the difficulties in making and changing laws will help students gain insight into the political process and the challenges of trying to implement change. The mock senate exercise is an opportunity for students to research issues of importance to their state and to role play the political process where they will introduce bills important to them. The Mock Senate exercise, developed by Barbara Browning, has been used with high success rates in her Homer High School classroom. Students enjoy being involved in the entire process.

The Senate can hold subcommittee hearings, committee hearings, and then, a final hearing on the floor before the full Senate for each issue or bill. Finally, one bill is passed out of the Senate. The same happens in the House. The Senate and House then get together in conference and basically make trade-offs, concessions, compromises, etc., to pass one combined bill. The bill goes to the President who signs it into law or vetoes it.

MATERIALS:
- Example bill
- Mock Senate Guidelines
- Roberts Rules of Order
- Oil Spill Legislation info sheets
PROCEDURE:
1. Ask students if they remember learning about the process of passing a bill. List, on the board, points and procedures they remember. Ask students how they think companies such as Exxon are regulated. What do they think it takes to set aside land as a national park or a wildlife refuge? Introduce the idea of a “Mock Senate” where students will actually play the roles of legislators and write and pass bills.

2. Each student must pick a party affiliation and research their own state to find oil spill/energy issues and view points of their state and their party. They will present a state profile. (see Mock Senate Guidelines). Have students present their information in outline form. Elect or appoint a President of the Senate and a Secretary. Have the President review the roles of each “elected official.” Inform them that the President will be responsible for presenting a sample bill and explaining the rules of conduct in the senate.

3. Introduce the sample bill. Review the format. Have students copy the format in their journals. Tell the students they will be responsible for introducing two (2) bills. One bill must concern an energy-related economic change that would benefit their state and/or nation; one must solve or deal with an oil related problem in their state and/or the nation.

4. This exercise assumes that the students are already familiar with party roles, legislative proceedings, passing bills, etc. If this is not the case, you will need to review some of these aspects with the students.
   The senate proceedings should run by Roberts’ Rules of Order. Students should be encouraged to assume the viewpoints of their respective party affiliation. The bills they introduce should also reflect their party’s viewpoint.

5. During the Senate sessions have students submit a newspaper item about the Senate proceedings. It may be an article, letter to the editor, political cartoon, etc. It must concern someone or something that happens in the Senate proceedings. It should be typed or drawn in black ink.

6. The key to the success of the Mock Senate is participation. Students need to be encouraged to introduce bills or amendments and to speak in defense of or in opposition to other bills, etc. The Mock Senate should be in session for at least one week in order to give students ample time to participate in the entire process.

7. Each day, take the first 5 minutes and have the students write a reaction to the session the day before either in their journals or on 8x10 note cards.

8. As a final activity, have published in the school paper a list of bills passed by the Senate. Have the sponsors of each passed bill write a short summary of the purpose and intent of the bill. Compare bills passed in the Mock Senate to state and federal legislative happenings.
PRESIDENT OF THE SENATE:
1. You must plan and deliver a presentation on the rules of conduct in the Senate (Roberts’ Rules of Order).

2. Plan a bill that will be presented to the class as an example.

3. Prepare and give a quiz on the following day.

4. When in session, be present every day, maintain order, run by the rules you establish.

SECRETARY:
1. You must be present every day. If the President cannot be present, you will be expected to run the Senate.

2. Make a poster of all the Senators and their political parties and highlight socioeconomic characteristics of your state.


4. If your school has a newspaper, have a printed summary of the bills and the action on the bills.

STATE PROFILE:
A. State name

B. State Government: strongest political party, male to female ratio of Senators and Representatives, political parties, anything else of interest.

C. Economics: types of industry, unemployment rate, income levels, poverty rate, job growth rate, tax base, spending, etc.

D. People: population, changes in population, urban/rural ratio, racial mix, religion, age spread, etc.

E. Other: education, violent crimes, major concerns or problems, environmental concerns, pollution, development, etc. These should be items that as a Senator, you want to try to solve, or would influence how you vote.
Senate Bill No. ________

In the Legislature of the state of ______________

___________(#) Legislature - _________(1st or 2nd) session.

A Bill

For an Act entitled: “An Act Concerning ............

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ______________:

Section 1.

Section 2.
Oil Pollution Act of 1990 (OPA 90)

OPA 90: Terminal and Tanker Oversight and Monitoring (Legal Information Institute website): http://www4.law.cornell.edu/uscode/html/uscode33/usc_sec_33_00002732----000-.html
OPA 90: Prince William Sound Provisions (Legal Information Institute website): http://www4.law.cornell.edu/uscode/html/uscode33/usc_sup_01_33_10_40_20_II.html
Entire OPA 90 document (PWSRCAC website): http://www.pwsrcac.org/docs/d0000200.pdf

Alaska Statutes

TITLE 26. MILITARY AND VETERANS AFFAIRS/CHAPTER 23. DISASTERS/ARTICLE 1. ALASKA DISASTER ACT
Sec. 26.23-077(c) Plan Review: Incident Command Systems: An incident command system recommended or included under this section must provide that the Department of Military and Veteran’s Affairs has a major role in mobilization of personnel and resources, communications, transportation planning and other logistics involved in a state response to a disaster or other emergency.

TITLE 46. WATER, AIR, ENERGY AND ENVIRONMENTAL CONSERVATION/CHAPTER 3. ENVIRONMENTAL CONSERVATION/ARTICLE 2. DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Sec. 46.03.759 Civil Penalties for Discharges of Crude Oil: Civil penalties for discharges of crude oil. Anyone found liable under any state law for an unpermitted discharge of crude oil in excess of 18,000 gallons is liable for penalties, damages, the cost of containment and cleanup, and liable to the state for a civil penalty up to $500,000,000. Determines the formula for how many gallons of crude oil have been discharged for purposes of assessing a penalty.

TITLE 46. CHAPTER 4. OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTROL/ARTICLE 1. OIL POLLUTION CONTROL
Sec. 46.04.010. Reimbursement for Cleanup Expenses. The department shall seek reimbursement under AS 46.03.760 (d). AS 46.08.070 or an applicable federal fund for expenses incurred in cleanup or containment of a discharge of oil. Money received by the department shall be deposited in the general fund.

TITLE 46. CHAPTER 4. OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTROL/ARTICLE 1. OIL POLLUTION CONTROL
Sec. 46.04.030. Oil Discharge Prevention and Contingency Plans: The following are not permitted unless an oil discharge prevention and contingency plan has been approved and the person is in compliance: cause or operation of an oil terminal facility in the state; operation of a pipeline, exploration or production facility in the state; operation of a tank vessel or an oil barge within the waters of the state or cause or permit the transfer of oil to or from a tank vessel or oil barge.
When the contingency plan has been approved a certificate of approval shall be issued by the state. The contingency plan must be submitted for renewal every three years. Reasonable terms and conditions may be attached to the contingency plan being approved or modified to ensure the applicant has access to sufficient resources to protect environmentally sensitive areas and to contain, clean up and mitigate potential oil discharges. The department may modify approval of a contingency plan if it is determined a change has occurred in the operation of a facility or vessel or the operator’s discharge experience demonstrates a necessity for modification. Outlines who can approve, modify or revoke a contingency plan and under what conditions and circumstances a plan can be approved.

TITLE 46. CHAPTER 4. OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTROL/ARTICLE 1. OIL POLLUTION CONTROL
Sec. 46.04.040. Proof of Financial Responsibility: Establishes under what financial conditions the operation of an oil terminal facility may be permitted and what the specific financial responsibility for incidents shall be. Establishes how to determine financial responsibility

TITLE 46. CHAPTER 4. OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTROL/ARTICLE 2. OIL AND HAZARDOUS SUBSTANCE DISCHARGE AND PREVENTION CONTINGENCY PLANS
Sec. 4604.200. State Master Plan: Outlines all elements of a prevention contingency plan, and under what conditions and how a plan can be modified.

TITLE 46. CHAPTER 8. OIL AND HAZARDOUS SUBSTANCES RELEASES/ARTICLE 1. RELEASE PREVENTION AND RESPONSE FUND; REIMBURSEMENT; LIENS
Sec. 46.08.070. Reimbursement for Containment and Cleanup: States when and how the commissioner shall seek reimbursement costs for oil spill containment and cleanup.

TITLE 46. CHAPTER 8. OIL AND HAZARDOUS SUBSTANCES RELEASES/ARTICLE 2. OIL AND HAZARDOUS SUBSTANCES RESPONSE FUND
Sec. 46.08.100. Office Established: Establishes the oil and hazardous substance response office including a director and employees specifically in programs and technologies related to the containment and cleanup of threatened releases of oil and hazardous substances.

ALASKA STATE STATUTES & CODES

Alaska State Statutes that address tankers (transport of crude oil).

08.62.010: Establishment of Board of Marine Pilots & qualifications and examination of pilots.

46.04.030: Lease expenditures related to the costs of production of oil and gas.

29.35.020: Financing of oil & hazardous substance release prevention account.
46.03.822: Strict liability for the release of hazardous substances related to the owner and/or operator of a vessel.

46.08.080: Legislature may appropriate from the Oil & Gas Substance Prevention Account.

46.04.055: Oil response contractors: a response action contractor who responds to a release or threatened release of oil is not civilly liable for removal costs or damages that result from an act or omission in the course of providing care, assistance, or advice if the contractor is listed in the contingency plan.

38.35.120: Assumes the status of and will perform all of its functions undertaken under the lease as a common carrier and will accept, convey and transport without discrimination crude oil or natural gas.

Alaska Administration Code 18/Environmental Conservation/Oil and Hazardous Substances Pollution Control: Owner/Operator of an oil tank vessel, oil barge, pipeline, oil terminal, exploration facility or production facility is responsible for meeting the applicable requirements and for preventing the discharge of oil into waters or onto land of the state.

1. Oil Pollution Prevention Requirements (18 AAC 75.005 - 18 AAC 75.090)
2. Financial Responsibility for Oil Discharges (18 AAC 75.205 - 18 AAC 75.290)
3. Discharge Reporting, Cleanup, and Disposal of Oil and Other Hazardous Substances (18 AAC 75.300 - 18 AAC 75.396)
4. Oil Discharge Prevention and Contingency Plan and Nontank Vessel Plans (18 AAC 75.400 - 18 AAC 75.496)
5. Oil Spill Primary Response Action Contractors and Nontank Vessel Cleanup Contractors, Incident Management Teams, and Response Planning Facilitators (18 AAC 75.500 - 18 AAC 75.580)
6. Civil Penalties for Discharge of Petroleum and Petroleum Products and Byproducts (18 AAC 75.605 - 18 AAC 75.670)
7. Surface Oiling (18 AAC 75.700 - 18 AAC 75.730)
8. Oil Discharge for Scientific Purposes (18 AAC 75.800 - 18 AAC 75.830)
9. General Provisions (18 AAC 75.905 - 18 AAC 75.990)

FEDERAL

U.S. Codes/"transport of crude oil"

US Code: Title 42,6240. Petroleum Products for Storage, Transport or Exchange
Title 42. The Public Health and Welfare/Chapter 77 - Energy Conservation/ Subchapter I - Domestic Supply Availability/ Part B - Strategic Petroleum Re-
serve

**US Code:** Title 42,9601. Definitions

**US Code:** Title 43,2007. Decision of President
Title 43 - Public Lands/Chapter 38 - Crude Oil Transportation Systems

**US Code:** Title 42,6903. Definitions
Title 42 - The Public Health and Welfare/Chapter 82 - Solid Waste Disposal/Subchapter I - General Provisions

**US Code:** Title 43,2002. Statement of Purposes
Title 43 - Public Lands/Chapter 38 - Crude Oil Transportation Systems

**US Code:** Title 46, Chapter 37 Carriage of Liquid Bulk Dangerous Cargoes
Title 46 - Shipping/Subtitle II - Vessels and Seamen/Part B - Inspection And Regulation of Vessels

**US Code:** Title 50A, 2096. Synthetic Fuel Production Subsequent to Determinations Respecting a National Energy Supply Shortage of Defense Fuels
Title 50, Appendix - War and National Defense/Defense Production Act of 1950/Act Sept 8, 1950, CH. 932, 64 STAT. 798/Title III - Expansion of Productive Capacity And Supply

**US Code:** Title 50A, 2095. Synthetic Fuel Production Title 50, Appendix - War and National Defense/Defense Production Act of 1950/Act Sept. 8, 1950, CH. 932, 64 STAT. 798/Title III - Expansion of Productive Capacity and Supply
Alaska Oil Spill Curriculum  7-12

by Belle Mickelson and Elizabeth Trowbridge

SUBJECTS: Language arts, science, social studies

DURATION: 2 periods plus homework

OBJECTIVES: Students will investigate current and potential energy resources and usage in their own community.

BACKGROUND: Renewable energy resources are those such as solar and wind energy whose supplies are endless. However, our country relies heavily on non-renewable resources. The use of these resources is believed by many to be a prime factor in global warming. The drilling for oil and its transportation can have a major effect on our environment. Oil, though, is indispensable to our society and is used for a multitude of products. It is time we all took a good look our dependency on non-renewable resources and the best place to start is at home and in our community.

PROCEDURES:

1. Ask students what the energy resources are in their community. List their responses. Ask which energy resources used are renewable and which are non-renewable. What other energy resources are there in the community. Plan a trip to investigate these resources.

2. Distribute the Petroleum Tree Handout and Petroleum Products Checklist. Discuss what it means to be dependent upon so many petroleum products. Are students surprised that so many everyday items are made from petroleum?

3. Have students conduct a survey of current and potential energy resources in their home and community. Hand out the Home Energy worksheet and the Community Energy worksheet. Have students take the Home Energy worksheet.

MATERIALS:
- Pencils
- Chart paper
- Markers

Worksheets:
- Petroleum Tree Handout
- Petroleum Products Checklist
- Home Energy Worksheet
- Community Energy Worksheet
worksheet home to complete. Divide the class into groups and complete the Community
Energy worksheet. Discuss the result of both surveys as a class. Which form of energy is
used the most? What is the cost of each form of energy used in the community? How do
they compare?

4. If there are residents who use a form of alternative energy such as solar or wind power
get usage and cost per month data from them and compare to the standard energy usage
and costs.

5. Take a field trip to investigate the sources of your community’s energy. Look for mis-
uses of oil (spills, improper disposal, lack of waste oil/gas facilities, oily trash, tarballs, oil
streaks, oiled products on a beach). Look at the way oil products are disposed of in your
landfill. How can the amount of trash entering your landfill be reduced?

6. Plan an education and clean-up program based on your studies. Work with the art class
and village/city officials to design public education posters on cleaning up harbors, properly
disposing of automotive/boat oil, conserving energy and recycling. Remember, economics
is a prime motivator! Saving money is always a popular approach.
THE PETROLEUM TREE

(Product obtained from crude oil)
Dotted frames indicate probable future products
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1. How many kilowatts/month does your family use?  
Collect one year’s worth of data, or compare July’s usage to December’s usage.

2. Which appliance in your home uses the most energy?  
a) Do you own:  
___ freezer  
___ refrigerator  
___ electric stove  
___ dishwasher  
___ microwave  
___ washer  
___ electric dryer  
___ hair dryer  
___ air conditioner  
___ electric fan  
___ TV  
___ stereo  

b) Which could you do without?

3. a) Which types of energy does your family use?

ELECTRICITY _____ Name three uses:  
1.  
2.  
3.  

GAS _____ Name three uses:  
1.  
2.  
3.  

PROPANE _____ Name three uses:  
1.  
2.  
3.  

WOOD _____ Name three uses:  
1.  
2.  
3.  

OIL _____ Name three uses:  
1.  
2.  
3.  

HOME ENERGY WORKSHEET
b) Which costs the most to use?

4. Name three ways you could help reduce your family’s energy consumption level.
   1. 
   2. 
   3. 

1. a) What is the major source of energy in your community? ________________ (diesel, coal, oil, gas, wood)
   b) Where does it come from? ________________ (i.e. barge, local source, etc.)

2. How do most businesses heat their space?

3. How do most homes heat their space?

4. What are the three most prominent types of vehicles in your community and their gas mileage?
   ______m/g
   ______m/g
   ______m/g

5. How much do each of these types of fuel cost in your community?
   electricity € /kh.
   oil € /gal.
   propane € /lb.
   gasoline € /gal. (regular)
   € /gal. (unleaded)
   diesel € /gal.
   fuel oil € /gal.

Which is most expensive?
6. Rank the three most important forms of transportation in your community and the cost of their fuel.

1. ______________________ $____________/gal.
2. ______________________ $____________/gal.
3. ______________________ $____________/gal.

5. If all oil products disappeared what things would be left in your community? (name 10)

1. ________________________________________________________
2. ________________________________________________________
3. ________________________________________________________
4. ________________________________________________________
5. ________________________________________________________
6. ________________________________________________________
7. ________________________________________________________
8. ________________________________________________________
9. ________________________________________________________
10. _______________________________________________________

EXTENSION: Begin collecting cost and consumption data and publish a quarterly graph in the school newspaper showing cost and consumption rates for your school and community.
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Check and circle those products that you find in your home and school, or those industries you are involved in:

**GASOLINE** ___ solvents, lighting, leather industry, motor fuel, heating, dry cleaning.

**KEROSENE** ___ heating, lighting.

**LUBRICATING OIL** ___ sewing machine oil, knitting machine oil, engine oil.

**RESIDUAL OIL** ___ insulation, paint, paving, artists crayons, graphite

**PARAFFIN** ___ candles, matches, canning industry, wax paper, chewing gum.

**GREASE** ___ grease, cable grease, railway, track and transmission grease.

**FUEL OIL** ___ furnaces, power plants, locomotives, diesel engines, industrial establishments.

**GAS OIL** ___ fuel gas, absorption oil, illuminating gas.

**SPECIAL OILS** ___ medicinal oil, switch oil for electrical equipment.

**ARTIFICIAL RUBBER** ___ tires, druggist supplies, cements, clothing.

**ALCOHOLS** ___ cleaning, solvent, preservatives, acetic acid.

**AROMATIC HYDROCARBONS** ___ explosives, saccharine, antiseptics, perfumes, dye-stuffs.

**FATTY ACIDS** ___ butter substitutes, edible fats, soaps.
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by P.J. Bauer and Claudia Bain

DURATION: 10-15 minutes

OBJECTIVE: By calculating the number of barrels of oil used by their own households in one year, students will make the connection between their personal energy consumption and the cargo of the Exxon Valdez.

PROCEDURE:
1. Write this formula on the board: 22 barrels per person per year.

2. Begin by explaining that all of the energy used by a person each year can be expressed in oil equivalents. Experts tell us that in the U.S., on the average, a person consumes 22 barrels each year.

3. Have each child calculate how many barrels of oil his/her family consumes each year. How many barrels are used by the whole class together? By all of the families represented in the class? How can you calculate how many tankers come to your town in a year? Have the children compare their town’s energy consumption to the 11 million gallons spilled in Alaska. (1 barrel = 42 gallons)

4. Using the formula, calculate the energy consumption, in barrels of oil, of your school, too. What else can you think of to measure this way?

EXTENSION:
1. Math: Use the worksheet How Much Oil to figure out how much 11 million gallons of oil is in descriptions that your students can understand.

MATERIALS:
☐ Pencil
☐ Paper
☐ Worksheet: How Much Oil
Homer High School chemistry and physics students wondered just how much 10 or 11 million gallons of oil really is. They got busy with some calculations designed to make it a little easier to visualize, and instructor Richard Ingels shared it with the community.

- The oil would fill up over 4.5 Homer High School Commons to the top.

- The oil would fill up over 3.5 Homer High School gyms to the top.

- The oil would fill over 44 Homer High swimming pools.

- If one left the kitchen faucet running at full volume it would take over 9.7 years to get the same volume as the oil spill.

- The oil spill is equivalent in volume to 8.8 million cars draining their oil.

- If 45 percent of the oil was converted to gasoline, a car using the gas could go around the world almost 4,000 times.

- If 45 percent of the oil was converted to gasoline, it would take a person 7,933 years to use the gasoline (filling up once a week).

- The oil would fill 92 average houses to the ceiling.

- It would take over 15,300 pickup trucks to haul the oil.

- It would require a fleet of 3,143 large fuel trucks to carry the oil.

- If the oil were spread out on the Sterling Highway half an inch deep and 24 feet wide it would stretch about 279 miles (from Homer to Wasilla).

- If the oil were soda pop, every person in Homer would be able to consume one can every day for about 82 years.

- It would take about 332 million boxes of Kleenex to soak up the oil.

Now - figure some examples for your community.
by Elizabeth Trowbridge

SUBJECTS: Social studies, language arts, science

DURATION: Minimum of 1 period

OBJECTIVES: Students will evaluate their own energy consumption patterns. Students will distinguish between renewable and non-renewable resources. Students will illustrate an understanding of alternative energy uses.

BACKGROUND: The March 24, 1989, Exxon Valdez oil spill made many impacted by the spill think more about energy consumption and conservation. Our dependency upon oil resources became much more obvious as we felt the immediate impacts of the spill. It is especially timely that we reconsider the issue of energy conservation and take a look at some of our consumption habits; even small changes in energy consumption can make a difference in how long our non-renewable resources last.

PROCEDURE:
1. As an introductory activity have students do the Energy Hog or Energy Hoarder worksheet. Discuss their “scores.” Are they surprised by how energy intensive some of their habits are? Do they have any suggestions for raising their scores? Use this as a lead-in for discussion on renewable and non-renewable resources. (This exercise might need a little revision for southern climates!)

2. Discuss energy sources in your local community. Have each student make a diagram of all energy sources and their uses in your community. Have each student research and list current prices of the various fuels and electricity costs. Discuss how energy influences lifestyles in your community. What do higher fuel costs mean to fishing boat captains, to canneries, to the price

MATERIALS:
- Markers
- Posterboard
- Worksheets:
  - Is Your House Drafty?
  - “Energy Hog or Energy Hoarder”
  - “50 Things You Can Do”
of fish? (Change this to reflect the major industries in your community). (From Alaska Sea Week curriculum, Vol. VII).

3. Design a house, or room, that you would like to live in or build in 10 to 20 years. What climate will you be in? Label the location of your house, or room, and all the energy saving features it would include.

4. Distribute 50 Things You Can Do. Discuss some of the options. Have students make and illustrate a large poster to hang in the classroom, the hall, and/or the community. On posterboard, keep track of ways for the students who have tried to conserve. Make a large check list and monitor your successes daily.

5. Do an energy audit of your home or school. How can improvements be made? Have the class come up with a list of energy saving recommendations to present to the principal, such as caulking and weather stripping. You could also include a cost analysis of the recommendations. Students might want to do the same for their home.

6. Try to figure out how many barrels of oil can be saved in your community by energy conservation. Alaskan communities often have their fuel brought in by barge. Each barge not needed due to energy conservation means one less barge that might be involved in an oil/gas/diesel spill. Plus, the oil saved can be used for future generations. Discuss what oil saved means for your community.
ENERGY HOG OR ENERGY HOARDER
(Reprinted from the Alaska Sea Week Curriculum Series, Volume VII)

Read and mark the answers that best describe what you do to save or use energy. Then total up your points: 70 points or more and you’re an energy hoarder; 30 to 69 points you’re not too bad; 29 to -29 need some improvement; and -30 points or less and you’re an energy hog!

1. Do you turn the heat down and use lots of quilts and blankets at night? (7 pts) _____
   ....an electric blanket? (4 pts) _____
   ....or just keep the whole house warm? (-2 pts) _____

2. Do you grow some of your own vegetables? (5 pts) _____
   ....pick berries? (5 pts) _____
   ....hunt or fish for food? (5 pts) _____
   ....rely only on food from the Lower 48? (1 pt) _____

3. Do you eat food from the four basic food groups everyday? (5 pts) _____
   ....sometimes eat from the four basic food groups? (3 pts) _____
   ....like pop, candy and potato chips? (-1 pt) _____

4. In your spare time, do you always have your nose in a book? (5 pts) _____
   ....bicycle, hike, swim, jog, canoe, sail, or cross country ski? (5 pts) _____
   ....ride a three wheeler, in a car, motorboat, or on a snowmachine? (-5 pts) _____
   ....feel that your nose may one day become permanently glued to the TV? (-3 pts) _____

5. Is your house weatherstripped and caulked? (5 pts) _____
   ....real drafty? (-3 pts) _____
   ....or does it have holes big enough for voles (Alaskan mice!) to come in through? (-5 pts) _____
   (subtract another 3 pts if the holes are big enough for weasels!)

6. Are your windows single-paned? (1 pt) _____
   ....visqueened? (1 pt) _____
   ....double-paned? (5 pts) _____
   ....triple-paned? (8 pts) _____
   ....heat mirrored? (10 pts) _____
   ....argon filled? (10 pts) _____

7. Give yourself a point for each inch of insulation (or equivalent) _____
   ....in your roof _____
   ....in your floor _____
   ....in your walls _____
   (if you have log walls, figure ½ pt for each inch of thickness)
8. Add 4 pts if your house has a vapor barrier.

9. Is the temperature in your house in wintertime*
   ....warm enough for bikinis? (-7 pts)
   ....OK for T-shirts and shorts? (-5 pts)
   ....cool enough for light sweaters? (3 pts)
   ....requires heavy sweaters and wool shirts (5 pts)
   *If your house is well insulated, you can still have it warm and be saving lots of energy, but
   there is such a thing as overheating!

10. Do you have a hot water heater? (-12 pts)
    ....add 5 pts if it is insulated
    ....add 5 pts if it is set at 120 F or less
    ....add 10 pts if it only heats “on demand” rather than having a tank
        continually filled with hot water

11. Do you cook several dishes in the oven at once? (5 pts)
    ....use the oven for one large dish? (2 pts)
    ....or use it to make toast in the morning? (-1 pt)

12. Do you boil water with the lid on the pan? (3 pts)

13. After washing clothes, do you hang them up to dry rather than
    using the electric dryer?
    ....never (-1 pt)
    ....in good weather (3 pts)
    ....in any weather (5 pts)

14. Do you turn off lights when you are not using them?
    ....never (-2 pts)
    ....sometimes (3 pts)
    ....always (5 pts)

15. Do you repair things when they break? (10 pts)
    ....or throw them away? (-5 pts)

16. Are your clothes
    ....from second-hand stores or hand-me downs? (8 pts)
    ....almost always new? (1 pt)
    ....only the finest designer specials? (-3 pts)

17. Do you recycle or reuse newspapers, cans, bottles, paper? (10 pts)
18. Do you shut off the TV or radio when you’re not using them?
    ....always (3 pts) _____
    ....sometimes (-1 pt) _____
    ....never (-3 pt) _____

19. Subtract 3 pts for each gas or electric appliance in your house. _____

20. Do you have solar panels, wind generator, geothermal, hydropower, air-to-air heat exchanger, or a heat pump in your house? (15 pts)

21. Add 3 pts for each additional way you save energy. Write them here. _____
    _____________________________________________________________________
    _____________________________________________________________________
    _____________________________________________________________________
    _____________________________________________________________________
    _____________________________________________________________________
50 THINGS YOU CAN DO

IN YOUR HOME

• Learn where the energy for your home comes from.
• Investigate local recycling centers.
• Recycle everything you can: newspapers, cans, glass, aluminum foil and pans, motor oil, scrap metal, etc.
• Save your kitchen scraps for the compost pile.
• Try to use phosphate-free laundry and dish soaps.
• Avoid the use of household pesticides. Flyswatters work very well.
• Clean your windows with vinegar and water instead of chemical products. Crumpled up newspapers are great for washing windows.
• Hang your clothes out to dry.
• Use washable rags, not paper towels, for cleaning up spills and other household chores.
• Use cloth diapers.
• Use cloth, not paper, napkins.
• Don’t use electrical appliances for things you can easily do by hand.
• Re-use brown paper bags to line your trash can instead of plastic liners. Re-use bread bags, butter tubs, etc.
• Use re-usable containers to store food, not plastic wraps and foil.
• Write to companies that send unwanted junk mail. Ask them to take you off their list.
• Take unwanted, re-usable items to a charitable organization or thrift shop.
• Don’t leave water running needlessly.
• Turn off the water when you brush your teeth.
• Install a water saving shower head.
• Take shorter showers.
• Set your water heater at 130 degrees.
• Turn the heat down and wear a sweater.
• Turn lights off when you’re out of the room.
• Burn only seasoned wood in your stove or fireplace.
50 THINGS YOU CAN DO

IN YOUR CAR
• Drive sensibly...don’t waste gas.
• Keep your car tuned up.
• Carpool.
• Ride your bike or walk instead.
• Drive a more efficient car.
• Recycle your engine oil.
• Keep your tires properly inflated to save your tires.
• Don’t litter.

WHEN YOU’RE SHOPPING
• Don’t buy food or household products in plastic or Styrofoam containers if there is an alternative. They can’t be recycled and they don’t breakdown in the environment.
• Don’t buy “disposable” anything. Paper plates and towels, Styrofoam cups, etc. are extravagant wastes of the world resources.
• If you buy disposables...buy paper products rather than plastics, rather than Styrofoam.
• Buy durable products and keep them longer. Cheap furniture, clothes and appliances often have a short life span.
• Check the energy rating on major appliances.
• Read labels and buy the least toxic product available for cleaning, pest control, etc.
• Put your parcels in one big sack instead of collecting several small ones - or better yet, use a re-usable string or canvas bag. Don’t buy things with excess packaging.
• Buy in bulk.
• Ask questions...don’t buy products that are hazardous to the environment or that were manufactured at the expense of important animal habitat.
• Buy locally grown food and locally made products when possible to save on transportation costs.

PERSONAL EFFORTS
• Join a conservation organization.
• Volunteer your time to conservations projects.
• Give money to worthy conservation/environmental causes.
• Check your lifestyle...think about the effects of your daily actions on the environment.
• Read books and articles on wildlife and environmental issues.
• Watch nature programs on T.V.
• Subscribe to conservation or environmental publications. Purchase them as gifts for others.
• Pick up litter along highways and near your home.
IS YOUR HOUSE DRAFTY?

A house that has leaks around windows and doors will permit heated air to escape and cold air from the outside to enter. About 10% of heating fuel can be wasted because of this. To prevent air from leaking into the house, caulking and weatherstripping can be used around most doorframes and windows.

Have samples of caulking and weather stripping materials handy for students to see.

Make your own draftometer: On a windy day, hold a lit incense stick next to locations of potential air paths to the outside, like windows, doors, electrical boxes, plumbing fixtures, electrical outlets, and ceiling fixtures. If the smoke blows horizontally, you have found an air leak that can use weatherstripping, sealing, or caulking.

Another way to keep cold air from seeping into your house and warm air from escaping is to close the damper on your fireplace or stove when it's not in use.

Check around the edges of windows for drafts.
Adapted from Energy Guide for Secondary Home Economics classes

DURATION: 2 periods

SUBJECTS: Home economics, mathematics, language arts

OBJECTIVES: The student will consider energy conservation choices. The student will learn the cost per kilowatt hour for electricity in his/her own community. The student will compare energy efficiency of two different appliances. The student will list ways to conserve energy with a variety of appliances.

BACKGROUND: With the passage of the Energy Policy and Conservation Act in December of 1975, it became mandatory for appliances to be labeled with energy cost and consumption information. Seven categories of appliances are required to have labels: water heaters, refrigerator freezers, room air conditioners, freezers, furnaces, clothes washers, and dishwashers. Energy Guide labels are an important and invaluable addition for all consumers if they make use of them.

PROCEDURE:
1. Ask students to list ways to conserve energy when using appliances.

2. Pass out Energy Conservation Tips for Appliances and add additional items.

3. Use Thinking About Your Energy Use to help decide on values in energy conservation.

4. Have one student call the electric company to find out costs per kilowatt hour in your area (or use information gathered from the Home and Community Energy Surveys).

5. Introduce the Energy Guide Label and the Comparison Shopping Worksheet.

6. Follow up with a field trip to an appliance store.

MATERIALS:
- Energy Conservation Tips for Appliances
- Thinking About Your Energy Use
- Comparison Shopping
- Blackboard chalk

Adapted from: Energy Guide for Secondary Home Economics Classes
**REFRIGERATOR/FREEZER:**

The most important aspect of refrigeration is the removal of heat. A refrigerator is a means of cooling food below the temperature of the surrounding atmosphere to prevent spoilage from the presence of molds, yeasts, and bacteria. The way refrigeration works is by removing the heat, not by adding cool. Therefore, a trick to conserving energy with your refrigerator/freezer is to remember one thing: cool air isn’t blown in; instead, heat is taken out—and the more warm air you let in, the harder your refrigerator or freezer has to work.

**Tips for Conserving Energy:**

1. Choose a refrigerator/freezer based on the capacity needs of your family. A refrigerator or freezer operates at peak efficiency when filled to capacity but not overfilled.
2. Let hot foods cool to room temperature before putting them in your refrigerator or freezer.
3. Before opening the door, know what you are looking for! Standing there with the door wide open costs money and lots of energy.
4. Open your refrigerator door as few times as possible to prevent heated air from getting inside.
5. If you do not have an automatic defrost unit in your freezer, you should defrost it when the frost gets 1/4 inch thick. The frost acts as an insulator which makes it harder to remove heated air.
6. Turn off your refrigerator when you go on vacation. Plan to use all perishables before you leave.

**WATER HEATER:**

Conventional water heaters require vast amounts of energy. The water heater is an essential appliance in today’s home. The quantities of hot water needed by the family will differ according to:

- habits of the family
- size of the family
- geographic location
- methods of washing clothes and dishes

A water heater is an automatically controlled container for heating and storing water. It is designed to heat water to a temperature of less than 180 degrees. Unless turned off, water heaters operate all day, every day and account for about 22 percent of the household’s fuel bills. Water may be heated by various methods, but gas and electric heaters are the most common.

“On-demand” water heaters are now available which only heat water when it’s needed. These save large amounts of energy although there is a few minutes delay before the hot water comes on; then there is continual hot water because it’s being continually heated.

**Tips for conserving energy:**
1. Select a conventional model—or better yet an “on-demand” water heater.
2. Select a well-insulated model.
3. Add a blanket of insulation around your water heater if it is not already well-insulated.
4. The location of the water heater is important if the consumer is to make the most efficient use of this resource. The heater should be located as close as possible to the points of use, and it should be in as warm a place as possible.
5. Set your water heater thermostat at 120 degrees. (If you have an automatic dishwasher, you may have to set the thermostat at 140 degrees for the dishwasher to clean properly).
6. Turn your water heater off or very low when you go on a trip.

CLOTHES WASHER:
A clothes washer uses mechanical agitation and a water solution of soap or detergent to clean clothes. The “compact” washer is one with a tub capacity of less than 16 gallons. Other larger models include all household clothes washers with a tub capacity of 16 gallons or more.

Tips for Conserving Energy:
1. Select a model that can use cold water for rinsing.
2. Consider a model with a variable water fill setting. Minimizing water usage will reduce operating costs.
3. Consider a model with a suds-saver feature if you typically wash 2 or more loads one right after the other.
4. Soak heavily soiled garments instead of washing them twice.
5. Use warm and cold water whenever possible.
6. Operate your clothes washer fully loaded whenever possible.

DISHWASHER:
An automatic dishwasher gives the consumer a convenient effective way to clean dishes, pots, and pans. The principal operation of the automatic dishwasher is the direction of hot water and detergent at high speeds over the dirty dishes. “Compact” dishwashers are countertop models with a capacity of fewer than eight place settings. Larger dishwashers include portable or built-in models with a capacity of eight or more place setting.

Tips for Conserving Energy:
1. Select an appliance with an energy-saver switch that allows natural rather than forced drying of dishware.
2. Consider a model with a short cycle for lightly soiled dishes.
3. Operate your dishwasher fully loaded whenever possible letting the dishes from several meals accumulate before running the dishwasher.
4. Only use the manufacturer recommended detergent. The wrong detergent may cause over sudsing or may not contain germ killing agents that ensure proper cleaning of the dishware.
AIR CONDITIONER:
Air conditioning accounts for a little over 12 percent of the typical American family’s total annual electric bill. Air conditioning is the third largest user of electricity in your home after heating and water heating. To save money while staying cool, you should:

Tips for Conserving Energy:
1. Purchase a correctly sized air conditioner with a high energy efficiency rating.
2. Set the cooling thermostat no lower than 78 degrees (You may be asked to raise this temperature in times of energy shortages).
3. Keep the air conditioner’s filter clean.
4. Leave storm windows and doors in place year-round.
5. Vent the clothes dryer and range to the outside during the cooling season.
6. Close draperies on the sunny side of the house during the cooling season.
7. Use heat-producing appliances (such as stoves, dishwashers, clothes washers, and clothes dryers) during the cooler parts of the day.
8. Don’t block air flow from the air conditioner with drapes or furniture.
9. Place the air conditioner in a window where it will be shaded from the sun.

Alaskans don’t need air conditioners—but they are a big energy user in other parts of the country!

FURNACE:
Heating and cooling account for 60 percent of the energy consumed in the home. To heat a home usually requires fuel. The common fuels, called “fossil fuels,” are derived from fossils in the ground, and are coal, natural gas, and petroleum. To heat a home, these fuels are either used directly through combustion in the home’s furnace, or indirectly, through combustion at a utility plant which then supplies electricity for heating and other purposes. A few homes are beginning to supplement conventional heat sources with solar energy, which helps conserve these scarce, non-renewable fossil fuels.
1. In the spaces below, list 12 major appliances used in your home regularly.

1. ____________ 7. ____________
2. ____________ 8. ____________
3. ____________ 9. ____________
4. ____________ 10. ____________
5. ____________ 11. ____________
6. ____________ 12. ____________

2. If there were a law that said you had to use less electricity, draw a pencil line through the three items in the list you could do without.

3. Circle in pencil the three that really mean the most to you and that you would hold on to until the very end.

4. Now look back over your list and your decisions and consider:
   a. Why did you decide to do without the three items?
   b. Why did you want to keep the other three?

5. List below some efficiency steps you can take to reduce the energy and money consumed by each of the three appliances you chose in Question 3.

   a. 
   
   b. 
   
   c. 
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One appliance might have a higher purchase price than another but be more energy efficient—or it could cost more initially but not be any more efficient. You have to check all the facts to know for sure which is the better buy in the long run.

Refrigerator 1

Refrigerator 2

Your family needs a new refrigerator. The one you used for years has just stopped working and the cost to repair is too much, considering its age.

When you go to shop for the refrigerator, you find different models and sizes. Refrigerator 1 costs $1,400, and refrigerator 2 costs $2,000. Both have a similar yellow label attached to them, with the same information on it (as shown above).

**WHICH REFRIGERATOR WOULD YOU BUY? WHY???**
Model A
Standard Model

Model B
Energy-Efficient Model
If you have to choose between two appliances with the same features, capacities, and price, but with different annual energy costs, then obviously you are better off buying the one with the lower annual energy cost (the more energy efficient model). In this case, you can simply look at the big number on each label, see which is lower, and take that model with you. Be careful to compare similar items (are refrigerators 1 and 2 similar? If not, how are they different?).

The purchase price of the energy efficient model may be higher than the price of the standard model. (This is because extra insulation and more efficient motors often cost more). But think again: the lower energy cost of the energy efficient model will usually make up for its higher purchase price. The question, then, is how to figure out which model will cost you less in the long run.

Are the appliances comparable in size and features? _____. To find the capacity of the model, look just below the word “Energy Guide” on the label. The refrigerators in this example are different capacities, and the features given on the top left side of the labels are slightly different, so the answer to the above question is “no.”

Step 1. Purchase Price

Step 2. Yearly Cost
   (from appliance label)

Step 3. How many years do you expect to keep it?

Total Operating Cost
   (Multiply Yearly Cost by number of years you will keep it).

Step 4. Total Cost to you
   (Add Purchase Price and Total Operating Price).

Step 5. To figure how long it will take to recover the extra cost of the energy efficient model, divide the difference in price from line 1 by the difference in yearly operating cost from line 2.

\[ \text{Difference in Purchase Price} \div \text{Difference in Yearly Cost} = \text{Years to Recover.} \]
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by Elizabeth Trowbridge

SUBJECTS: Social studies, science, art

DURATION: 1-2 periods

BACKGROUND: Waste disposal is a major problem in our country. If we are to live a more energy conscious lifestyle then we need to be aware of energy that we waste when we dispose of trash that could be recycled and produce consumable items that cannot be recycled. Recycling is a concrete way of helping to reduce our trash problem and begin conserving energy. Twenty recycled cans can be made with the energy needed to produce one can using ore. Throwing an aluminum can away instead of recycling wastes as much energy as filling the can half full of gasoline and pouring it out. Each ton of recycled glass saves 9 gallons of fuel oil in the glass production process. Paper made from waste papers instead of virgin wood requires 64% less energy and 61% less water; it also results in 70% fewer air pollutants. It takes 42 gallons of high quality crude oil to produce two and a half quarts of motor oil. It only takes one gallon of waste oil to produce the same amount. Recycling saves resources, saves energy, reduces litter and takes very little time. Also, recycling saves landfill space which is very important in most communities.

PROCEDURE:
1. Have students research any local efforts at recycling resources such as aluminum and paper. What are the benefits to the community? Have these efforts created any new jobs or local income? Where are recycling centers or drop offs located? Have a group of students, or the class, write for a brochure describing everything anyone ever wanted to know about recycling.
2. Have students set up a recycling center at the school or begin a recycling drive at the school. Coordinate this effort with community groups. Advertise by creating posters showing the benefits of recycling and the ugliness of litter. Have recycling drop-off’s visible and easily accessible to the students. Make reports of cans, paper, etc. collected in the local and school newspapers. Set a goal and make a chart showing progress. Make this visible to all students.

EXTENSIONS:
Have students design and make T-shirts on new or recycled cloth. The easiest way to do this is to use fabric markers if available in your area.
FINISHED SIZE: 15 inches high x 16 inches wide not including the straps

NOTE: Do not use hook that you don’t want to break or be stained. Your hook may become stained from the bags, so it’s not necessary to use a high-quality hook while crocheting with plastic bags.

DIRECTIONS:
with white bags

ch 28

Round 1 - hdc in 2nd ch from hook and in each remaining ch, working around the backside of the ch hdc in each st, join with a sl st to 1st hdc (54 total)

Round 2-5 - ch 1, hdc in each st around, join with a sl st to 1st hdc at the end of round 5 change to yellow bags, do not cut white bags

Round 6-7 ch 1, with yellow bags, hdc in each st around, join with a sl st to 1st hdc, cut yellow bags, at end of round 7 pick up the dropped white bags

Round 8-10 - ch 1, with white, hdc in each st around, join with a sl st to 1st hdc, at end of round 10 change to blue bags, do not cut white bags

Round 11-13 - ch 1, with blue bags, hdc in each st around, join with a sl st to 1st hdc, cut blue bags, at end of round 13, pick up the dropped white bags

Round 14-20 - ch 1, with white, dc in each st around, join with a sl st to 1st hdc, at end of round 20 change to yellow bags, do not cut white bags

Round 21 - ch 1, with yellow, hdc in each st around, join with a sl st to 1st hdc, cut yellow bags, at end of round 21 change to white bags

Round 22 - ch 1, with white hdc in next 7 sts, ch 24, sk 8 sts, hdc in the next 19 sts, ch 24, sk 8 sts, hdc in next 12, join with a sl st to 1st hdc

Round 23 - ch 1, sc in next 6sts, work 28 sc around the next ch 24 sp on last round, sc in next
INSTRUCTIONS - PLASTIC BAG TOTE

19 sts, work 28 scs around the next ch 24 sp on last round, sc in next 13 sps, join with a sl st in beg sc (94 total)

Round 24 - ch 1, sc in each st around (94 total)

INSTRUCTIONS FOR MAKING THE PLASTIC BAG “YARN”

NOTE: The below instructions are for making the double thick “yarn” using the plastic bags; you will need to use a larger hook when using this method.

1. Lay the bag flat

2. Cut the handles and bottom seam off the bag

3. Fold the bag into a strip

4. Cut the bag into 1 1/2 - 2 inch pieces

5. Connecting the rings: place - one ring over the other

6. Take one end of the white bag and insert it into the other end

7. Pull tightly but not too tight or it will tear. This forms a knot that will not be seen when you crochet. Keep repeating the above and roll up your strips into your new ball of “yarn.”
by William Ross

SUBJECTS: All

DURATION: Three periods

OBJECTIVES: Students will list, by means of role playing, discussion and issue cards, the issues faced by different groups on concerns of The Arctic National Wildlife Refuge. Students will describe the difficulty in reaching a unilateral agreement in group discussion.

PROCEDURE:
1. Before the issue cards are dealt out, review some of the resource material, such as videos, and newspaper and magazine articles on the Arctic Refuge.

2. Have students summarize, in their journals, their reactions to and questions raised from reviewing the resource materials.

3. List some of the issues readily apparent and discuss. Divide the class into groups (3 students per group). Deal the issue cards to each group of students. The group elects a spokesperson and that person represents the group in discussion and question sessions. Each group reviews their issue card and has to come up with a uniform and effective way to defend their issue. This will involve cooperation and compromise and should be a challenge for the students. Remind groups to use the resources they just reviewed to back-up their arguments. The objective here is to raise issues and not necessarily to solve them. The debate will consist of open ended questions and will not be expected to lead to any conclusions. Each group spokesperson will be expected to defend his particular issue card.

5. Ask students to evaluate other groups based on whether or not they presented the issue with clarity. This evaluation system will simply be a numerical value between 1 and 10.

6. Ask students to write a paper listing the issues covered by the issue cards and highlighting the points of discussion that followed.

EXTENSION:
1. Ask the students to write an essay on the difficulty of reaching a definite conclusion concerning the development of the Arctic Refuge.
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1. A Middle East war has closed the Arabian Gulf preventing transportation of fuel oil to the U.S.A. It is imperative that the oil resources of the Arctic Refuge be developed.

2. You are in favor of putting a sales tax on gasoline, making it twice as expensive as it is now at the gas pump. Advocate that this will reduce gas consumption and leave billions of gas tax dollars available for research on alternative sources of energy.

3. You are living in a developed area of the country surrounded by little, if any, wilderness areas. You feel it is important that wilderness exists even if you never use or see it. It is your belief that the remaining wilderness areas scattered throughout the country (of which the Arctic Refuge is one) should be protected at any cost. You believe that the U.S. economy is able to afford to not develop the Arctic Refuge.

4. As an Alaska Native living a subsistence lifestyle you believe that the summer calving grounds of the caribou will be destroyed by oil development. Your subsistence way of life is being threatened!

5. As an oil company you believe that there has been no ecological impact on the North Slope-Prudhoe Bay oil fields. You feel that lessons that have been learned from this experience, plus advanced technology will even further lessen the impact of oil exploration in the Arctic Refuge.

6. As an environmentalist you can see the terrible impact oil production has had on the North Slope. There is no doubt that the same would happen in the Arctic Refuge, destroying forever the only remaining unspoiled stretch of arctic coastline in the U.S.A.
7. You are an Alaskan resident and store owner. You depend upon the oil revenues to fuel the economy. Most people who buy your goods work for the state. You would like to see the Arctic Refuge developed in order to ensure a growing economy.

8. North Slope oil production is at an all time low. Unless the oil companies are able to switch operations to the Arctic Refuge, the Alaskan economy will undergo a recession resulting in a huge loss of jobs and massive migration from the state.

9. Since the oil spill of March 24th, 1989, Congress has been reluctant to allow exploration for oil in the Arctic Refuge until the effect of the oil spill in Prince William Sound has been fully documented and researched. However, Congress is being asked to make its decision more quickly because of the huge amount of money involved with the oil companies.

10. You are a Native stockholder living in the North Slope Borough. Oil revenues provide corporate revenues which supply services and benefits to shareholders. Benefits come mostly in the form of dividend checks. You support the development of the Arctic Refuge because of the potential for economic growth in your community.
Appendix A

Articles, Books, and Other Educational Resources

A.C.E.’s Response to Exxon Spill (see hard copy)

Alaska Sea Week Curriculum Series
http://seagrant.uaf.edu/bookstore/edu.html#seaweek

Alaska State Legislature
http://w3.legis.state.ak.us/

Alaska Department of Fish and Game Wildlife Notebook Series
http://www.adfg.state.ak.us/pubs/notebook/notehome.php

Alaska Fish and Game “Special Oil Spill Issue”
http://plato.muni.org/web2/tramp2.exe/goto/A1td404c.001?screen=record.html&server=aml&item=1&item_source=aml

Alaska forum: series of articles on TAPS Right of Way Historical Issues
http://www.alaskaforum.org/rowhistorical.html

Alaska Science Center at Alaska Pacific University Kits

Basics of Oil Spill Clean Up, by Environment Canada
http://www.amazon.com/Basics-Oil-Spill-Cleanup-Second/dp/1566705371

Broken Promises, Alyeska Record Shows How Big Oil Neglected Alaskan Environment, Charles McCoy, Wall Street Journal, July 6, 1989
http://www.alaskaforum.org/rowhist/Wsj/101WSJ.pdf

Case Histories, Other spills, Marine Pollution Bulletin
http://www.itopf.com/casehistories.html

CDFU to the Rescue (see hard copy)

Central Intelligence Agency (CIA) World Factbook

Changing Oil in Changing Times (Alaska Dept. of Environmental Conservation booklet to help individuals, businesses, communities and officials manage used oil in Alaska)
http://web2.uaa.alaska.edu/web2/tramp2.exe/authority_hits/A160s0nf.002?server=aml&item=1
Children’s Task Force Goes to Work (see hard copy)

Coping with Technological Disasters: A User Friendly Guidebook
http://www.pwsrac.org/docs/d0001001.pdf

Coping with the Time the Water Died, by Walter Meganack, Sr. (see hard copy)

Cordova fishermen fear lifestyle threat (see hard copy)

Criteria for Oil Spill Recovery: A Case Study of the Intertidal Community of Prince William Sound, Alaska, Following the Exxon Valdez Oil Spill
http://www.springerlink.com/content/hnte8m9fn6dfp51b/

CRUDE REMINDERS: 10 years after 'the day the water died,' pain of Valdez spill still stings in Alaska
http://www.jomiller.com/exxonvaldez/dallas.html

Emergency Response: Exxon Valdez Oil Spill. NOAA’s National Ocean Service, pictures gallery and emergency response information
http://response.restoration.noaa.gov/gallery_gallery.php?RECORD_KEY%28gallery_index%29=joinphotogal_id,gallery_id,photo_id&joinphotogal_id(gallery_index)=171&gallery_id(gallery_index)=12&photo_id(gallery_index)=106

Energy Information Administration
www.eia.doe.gov

Environmental Protection Agency, Exxon Valdez
http://www.epa.gov/oilspill/exxon.htm

Ex-skipper blasts Hazelwood actions (see hard copy)

Exxon Valdez Oil Spill
http://www.unu.edu/unupress/unupbooks/uu21le/uu21le0l.htm

Exxon Valdez Oil Spill: 10-Day Cleanup Timeline
http://library.thinkquest.org/10867/cleanup/timeline.shtml

EXXON VALDEZ OIL SPILL: Ten Years Later
http://arcticcircle.uconn.edu/SEEJ/Alaska/miller2.htm

Exxon Valdez Oil Spill, Wikipedia
http://en.wikipedia.org/wiki/Exxon_Valdez_oil_spill

Food limitation and the recovery of sea otters following the Exxon Valdez Oil Spill,
Future of Village in Doubt (Anchorage Daily News)

Hard Aground series (Anchorage Daily News articles about Exxon Valdez oil spill)
http://www.adn.com/evos/index.html (numerous articles cover the event, clean-up, impact on life, the captain, the ship, the legal battles, and the legacy)

Homer residents begin building booms (see hard copy)

Hot-Water Cleaning: Andrea Hilla, Anchorage Daily News
Too Hot to Handle in Prince William Sound
http://horticulture.coafes.umn.edu/vd/h5015/99fpapers/hilla.htm

Limited Fishing after EVOS, US Food and Drug Administration
http://www.fda.gov/bbs/topics/CONSUMER/CON00067.html

Marine Pollution – Oil Spills, Environment Canada
http://www.nearctica.com/environ/water/oilspill.htm

National Geographic (archived issues of magazine)

Numbers reveal oil spill’s lasting legacy (see hard copy)

Oil Spill Accelerates Science Center (see hard copy)

Otter Rescue Questioned, Charles Wohlforth, Anchorage Daily News, April 17, 1990

Prince William’s Oily Mess: A Tale of Recovery, Alan Mearns

PWSAC Watches Over Hatcheries (see hard copy)

PWSCC Assists Community (see hard copy)

PWSRCAC’s Peer Listener Training Program (part of Coping with Technological Disasters: A User Friendly Guidebook)
http://www.pwsrca.org/docs/d0001001.pdf

Ranger Rick and his friends (see hard copy)

Seldovia puts up its own defense against oil
Shandaa: In My Lifetime

Spill stench permeates Aleut village (see hard copy)

Statement of City Manager Donald L. Moore of Cordova, Alaska, April 5, 1989 (see hard copy)

Tankers Full of Trouble, The Seattle Times, November 12, 1989

The Day the Water Died: Cultural Impacts of the Exxon Valdez Oil Spill
http://www.jomiller.com/exxonvaldez/articles/picougill1.html

The legacy of the Exxon Valdez: Interview with Dr. Riki Ott
http://www.participate.net/node/2333

The trauma of being cleaned (see hard copy)

Think Quest, “Oil Spills”
http://library.thinkquest.org/CR0215471/oil_spills.htm

Toxicity of Weathered Exxon Valdez Crude Oil to Pink Salmon Embryo, SETAC abstract

U.S. Fish and Wildlife Service, Arctic National Wildlife Refuge
http://arctic.fws.gov/issues1.htm

Valdez folks feel “cheated” (see hard copy)

Waterfowl Web of Life
www.akcoastalstudies.org/Pdf/waterfowl_ Web_of_Life_Activity.pdf

Wildlife Watchers’ Newsletter (see hard copy)

World Petroleum Education
http://www.world-petroleum.org/education/ocean/index.html
The tragic tanker accident that resulted in the Valdez Exxon oil spill is already nearly two months in our past, yet the frenzy of spill-related activity in the A.C.E. office has not yet abated and the spill continues to spread. To bring our members up to date, I'd like to briefly outline the various responsibilities that the Center has assumed. In addition to institutional responsibility, however, the spill has now given each of us new responsibilities as the world watches to see what type of cleanup we require, what policy changes we demand, and what changes we make in our personal lives.

**Volunteer Response Hotline:** Within hours of the spill the Center's phone lines were jammed with calls from concerned individuals from around the world seeking information or offering to help. In order to respond to these calls the Center, in conjunction with Greenpeace and the Alaska Chapter of the Sierra Club, installed a hotline number and office. The number is 276-3688 and the office is located at 241 E. 5th Avenue on the same floor as the Sierra Club office.

Over 1,500 calls have been received to date. Information about callers, including special skills, materials, vessels, or knowledge of the Sound, is recorded in a database. The State was so impressed with our operations and with a companion office that we helped to establish in Valdez that they have contracted with us to maintain the hotline service.

The next step will be to define a larger role for volunteers. Several state agencies as well as the President have expressed an interest in doing so. Volunteers have already been used in animal cleanup operations. Volunteer efforts to identify oiled beaches and retrieve oiled wildlife are planned or already taking place in Cordova and Homer. While most would agree that all of these functions should be paid for by Exxon, the company is simply not responding in a timely manner and volunteers have taken these initiatives out of necessity.

**Prince William Sound Cleanup and Rehabilitation Fund:** Recognizing that responding to an environmental catastrophe of this magnitude was far beyond the normal resources of local conservationists, the Center took the lead in establishing a special, tax deductible fund. The Fund's main goals are to provide means for volunteers to get involved in the cleanup, assist educational projects relating to the spill, and assure public oversight for government and Exxon policy decisions concerning the cleanup.

Donations to the fund should be sent in care of the Alaska Conservation Foundation, 430 W. 7th Ave., Suite 215, Anchorage, AK 99501, (907) 276-1917. The Fund board will meet once a week to consider written proposals.

**Political Response:** Before the truth gets lost in the waves of backpedaling (Continued on Page 2)

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**Anchorage Creek Cleanup**

**MAY 20th**
politicawwe should remember that as one of the worst ecological disasters imaginable lapped at our shores, the initial response of many of our elected officials in Washington and Juneau was a shameless collusion with the oil industry to downplay the problem.

Starting with the top, the Center took the lead in writing to President Bush, along with thirteen other local conservation groups, demanding improved regulation of the oil industry and a halt to leasing in sensitive areas, including Bristol Bay. The President did not respond, but the Governor subsequently requested our assistance in developing proposals for improved regulation.

With the spill over one week old, Representative Young had not deemed it worth his while to visit the scene, Senator Stevens was laying low, and Senator Murkowski had made some disparaging comments about the spill being the price we pay for receiving a permanent fund check. To demand a better response, the Center organized a rally in front of the Federal Building on March 27. Several hundred people attended to listen to speakers and demonstrate their outrage.

While our delegation was stalling and fumbling for a response palatable to the oil industry, Congressman George Miller of California, chair of the House Interior Subcommittee on Water, Power, and Offshore Energy Resources and an important voice on Alaskan issues, visited the spill and recognized it for what it truly represented: a failure of the controls meant to prevent spills and a breakdown of the entire regulatory system charged with overseeing the oil industry. I was fortunate enough to attend a meeting with the Congressman and local fishermen where I was able to pass on some of our concerns and recommendations. Representative Miller plans extensive hearings in Washington and held hearings in Valdez, May 7 and 8. Don Young is a member of this subcommittee.

Future Policy Concerns: For the first time in recent memory, many politicians will be looking to the conservation community for the appropriate response to the spill. The Center has taken the lead in working with national conservation groups to develop an environmentalist agenda relating to the oil industry. This includes reforms related directly to the spill, such as needed changes in tanker safety laws, as well as broader concerns such as the need for a national energy policy. A similar state agenda was developed before the end of this legislative session.

Remembrance: The spill, of course, has significance far beyond the economic or political realms. The loss of Prince William Sound has had profound spiritual effects as well. The Center helped to coordinate Prince William Sound Day, a local day of remembrance held April 23rd and a national day of remembrance was held May 7th.

Media: Keeping up with Exxon's public relations machine has been a monumental task. As one observer so well put it, the only thing that Exxon has been good at containing is the truth. Daily, the calls have come in from around the world. I have done interviews with everyone from the Los Angeles Times to London television stations to the Clark Junior High newspaper.

Although the overall coverage has recognized the spill for the disaster it is and exposed Exxon's inadequate response,

Exxon has still be successful in obscuring many details of this scandal and there remain many questions which the press has failed to tackle. For example, what are the likely long term impacts of the spill and why was only one animal cleanup center established for the first several weeks? More importantly, why, when we discover that industry has in essence been lying to the public over the years, do reporters continue to take so many industry comments at face value without referring to other sources, such as the Center, for balance?

The reporting of the spill has already far outlasted the normal attention span of the American media. The challenge now will be to maintain interest so that the full story is covered and Americans can fully reflect on the implications of this type of disaster.

** **

This spill will shape our lives for years to come. Our responsibilities are daunting. Although all Alaskans are spill victims, we as local conservationists have the greatest responsibility to respond with creative, effective means for restoration of the Sound and its long-term protection, political remedies which realistically address the risks posed by the oil and gas industry, and renewed efforts to decrease our dependency on these fuels.

NOTE: ACE activities in response to the spill continue to change and grow daily. Please contact the office for a current update.

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**CENTER NEWS**

A publication of

The Alaska Center for the Environment

ACE is a non-profit environmental advocacy and education organization dedicated to the conservation of Alaska's natural resources. Since 1971, ACE has worked to promote sound environmental policy and programs in the Southcentral Alaska area and statewide.

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**Newsletter Production**
P.S.: Publications
Cordova District Fishermen United (CDFU) was probably the first non-oil industry or non-government agency to mobilize to combat the Exxon Valdez oil spill on March 24, 1989. It began at 7:00 a.m. on that first morning as a small staff making calls to determine the extent of the emergency and organizing local fishermen to assist in the clean-up. By the beginning of April, the staff had grown to 32 people working nearly around the clock dispatching and coordinating the work of volunteer fishing boats, acquiring boom, making overflights and dealing with the massive number of media from around the world reporting on the spill. To this date, CDFU continues with a high level of involvement on several fronts, organizing clean-up efforts, helping fishermen and others in the Exxon laims system and providing prompt and accurate information to fishermen, communities, media and others interested in the oil spill.

A CDFU presence was established in Valdez on the 1st day of the spill with up to ten people working with ADEC (Alaska Department of Environmental Conservation) and other agencies to facilitate the fishermen’s assistance in clean up. The CDFU office was maintained for more than six months until the beginning of October with a full-time office manager and a secretary.

CDFU plans to continue work throughout the winter months with its Executive Director, a secretary and at least ten part-time assistants devoting their time to the oil spill related issues in Cordova. In addition, CDFU has representatives in Seattle working on fishermen claims and attorneys and Exxon’s attorneys. CDFU and its partners have developed very effective historical price and tech data for use in this effort. At the same time, CDFU continues its work on long-standing issues such as interception, mariculture and logging.

Working in conjunction with the City of Cordova, CDFU submitted a proposal to ADEC for a winter project. The project consisted of an effort by fishermen to clean up imported oil from impacted beaches in Prince William Sound. There were more than 90 boats signed up for the event and over 150 fishermen took a safety class in anticipation of working on the project.

Another issue in which CDFU is taking its mark is on a new Alyeska Oil Spill Contingency Plan. Alyeska named a Citizen’s Advisory Committee in July and CDFU held a seat on the Committee since its inception. The Committee is currently working on formation of a permanent committee and making decisions on membership for permanent committee and by-laws affecting its operation. At the same time, the Committee is reviewing the Alyeska Oil Spill Contingency Plan and providing direct input to Alyeska for suggested revisions. Our Executive Director has attended 12 meetings of meetings in Anchorage to present CDFU and Prince William Sound fishermen on the Committee. She also attended a tanker towing exercise in Prince William Sound on October 12. In that practice, the Escort Response Vessel, the Heritage Service, was able to successfully get a line on the fully laden tanker Keystone Canyon and tow it in a simulation of a tanker which has lost power while outbound in Prince William Sound.

CDFU is also working directly with Alyeska to formulate a local response program. It is anticipated that both a winter and summer inventory of boats in Cordova, Valdez, Tatitlek and Chenega will be developed for immediate call-out in the event of another spill. Alyeska is working with CDFU on their planning for storage of boom and other materials in Cordova. Because CDFU was involved from the beginning, its members and staff have been a valuable resource for Alyeska in its planning. CDFU fully intends to remain an active participant in future oil spill planning.

Since mid-April, CDFU has sent members to Juneau and Washington DC to testify in congressional hearings and have considerable input into state and federal legislation. CDFU is currently continuing to provide advice in Washington DC on the current oil spill legislation through its on-the-scene lobbyist and by members traveling to the Capitol.

It’s obvious that, although CDFU has a history of heavy involvement on oil industry issues, the efforts made during the last seven months have been well beyond the normal level of activity. CDFU has been spending roughly a normal year’s budget every month since March 27 with the current expenditures equaling what would normally be about seven years of CDFU’s normal budget. CDFU has been able to accomplish this by obtaining funding in the amount of $250,000 from Exxon early in April for office staff and direct oil spill work. In addition, donations have been received literally from all over the world. Those donations have been used specifically for clean-up, research and legislation. CDFU also has several very successful and ongoing fund raisers. Well-known artist Ray Troll designed a “Tanker From Hell” T-shirt. CDFU is selling the shirts directly and Troll is donating his royalty to CDFU from other sales of the shirts. CDFU has also sold approximately 500 copies of a high-quality videotape entitled “Voices of the Sound.” The videotape, which was made in the early days of the spill, has beautiful footage of Prince William Sound before the spill and graphic footage of the effects of a 240,000 barrel oil spill on the beaches. It also portrays the effect the spill has had on the communities and people of Prince William Sound. Both the shirt and the videotape continue to be available by mail order.

CDFU plans to continue its work on oil spill issues for its membership, Prince William Sound fishermen, affected communities and people.

Cordova District Fishermen United, 10116/89
P.O. Box 939, Cordova, AK 99574

21 b
Children’s Task Force Goes to Work

The Cordova Children’s Task Force began when those community members who serve and care about the welfare of children realized that there was an immense impact occurring as a direct result of the Exxon Valdez Oil Spill. The Task Force solicited funds from the Division of Emergency Services, and through their support, was able to provide help to the children and families in Cordova.

The following is a list of the programs implemented:

1. Respite Voucher Program: This program provided $50 to 47 parents so that they could take some time off, hire a babysitter and reduce their stress load.
2. “Listen To Me”: This program was co-sponsored with, and funding support from, the Sustina Girl Scouts. There were 94 children who attended and spent one whole day with mental health professionals and environmental educators processing their sadness and confusion about the oil spill. They made arts and crafts projects, played games, sang songs and had a panel of professionals from this community to answer their well thought out questions.
3. Child Care Provider Training: A program contracted with Child Care Connection, Inc. to train parents, adults and teens to better care for the children in this community. The need for this program was based on the outflow of care givers in Cordova to oil spill cleanup crews.
4. Scholarships: This program gave $3,000 to needy families who were impacted from the oil spill.
5. Child Care Center’s Aid: Both of Cordova’s child care centers were impacted when their staff left to work on the oil spill cleanup. Problems compounded when parents left, also increasing child care needs substantially. This program gave money to both centers to offer wage increases to their employees to keep them from leaving to work for VECO. They also received money for new equipment and one center received additional funds for construction of an infant center.
6. Exxon Grant: $18,000 was given to the City of Cordova for child care. The Task Force divided this money between the two child care centers to be used to supplement wages to keep employees from going to work on the oil spill cleanup.
7. Oil Spill Activity Handbook: Endorsement of a proposal which would create a handbook of activities for young children, pre-school to sixth grade, related to the oil spill. The purpose of this handbook is to turn this disaster into a teachable moment about oil, our need for it and our responsibility toward it.
8. Testimony: Testimony provided to the Oil Spill Commission, the National Wildlife Federation and plan to make a presentation to ACAC to include children’s issues in the contingency plan so that the “Spiller” is responsible for the impact on children, not the State or local governments.

These programs were implemented over the summer during the period of immense crisis. However, as we move into the recovery period, we are ever reminded that the crisis is not over. One result of the oil spill has been a change in the economic structure of this community.

Persons who made the high VECO wages are not looking for work and the inflated prices in this town make it impossible to live on $6.25 per hour. Thus the crisis in the child care centers remains as they incur a debt by offering higher wages with no added revenues. To help this problem, two grants are proposed; one to the State of Alaska Department of Community and Regional Affairs and one to the City of Cordova. They ask for grant of a subsidy to these essential services so that they can meet their operational overhead which will allow them, in turn, to offer the wages necessary to maintain their staff, as mandated by law.

Cordova Children's Task Force, 11/13/89
P.O. Box 2337, Cordova, AK 99574

PWS MCC Assists Community

Although the Prince William Sound Community College (PWS MCC) is usually closed during May, June and July, due to the many requests for assistance this year, the college remained open. The college began receiving requests in April for classes to help facilitate individuals who wanted secretarial, computer, bookkeeping and general updating of office skills.

The local campus requested and received transfer of leftover fiscal year '89 Outreach funds to the Cordova site to meet these needs. In November 1989, Exxon reimbursed the college for those expenses related to services provided during the summer.

Approximately 80 students took classes from April to August. These classes included various computer skills, bookkeeping, typing and English to help them on-the-job, or just function better in the community. The college computer instructor also provided consultation to local fishermen, businesses and other individuals with computer problems. The college administered exams for other Universities whose students left school early to work on the spill. Space was also provided to the Bidarki youth project.

The college responded to numerous requests from visiting journalists, researchers, television crews, NOAA, Forest Service, university professors, audio-conference calls, and many others. Rooms were lent, equipment was used, supplies were consumed. The college also acted as a public shower service to many who arrived on the ferry in the early morning hours and could find “no room at the inn”.

PWS MCC has just received full accreditation from the Commission on Colleges of the Northwest Association of Schools and Colleges. Such an achievement is the culmination of the hard work of many Cordovans who shared their talents and time with students, who spent many hours of service to the college, and who gave material goods.

PWS MCC exists to serve the community. It responded during the crisis this summer and will continue to be service-oriented. Indeed, it is a community college.

Prince Willium Community College, 12/12/89
P.O. Box 1248, Cordova, AK 99574
Coping with the time when the water died

By WALTER MEGANACK SR.

The Native story is different from the white man's story of oil devastation. It is different because our lives are different, what we value is different; how we see the water and the land, the plants and the animals, is different. What we feel about sport and recreation is different. We are a part of nature. We don't need clocks or calendars to tell us what time it is.

When the days get longer, we get ready. Boots and boats and nets and gear are prepared for the fishing time. The winter beaches are not lonely anymore, because our children and our grownups visit the beaches in the springtime and they gather the abundance of the sea: the shellfish, the snails, the clams. When the first salmon is caught, our whole villages are excited. It is an annual ritual of mouth watering and delight.

When our bellies are filled with the fresh new life, then we put up the food for the winter. We dry and smoke and can. Hundreds of fish to feed a family. Much has happened to our people in recent centuries. We have toilets now, and schools. We have clocks and calendars in our homes. Some of us go to an office in the morning. The children go to school in the morning. But sometimes the office is empty and locked. Sometimes the child is absent from school. Because there are more important things to do. Like walking the beach. Collecting the clams. Watching for the fish.

The land and the water are our sources of life. The water is sacred. The water is like a baptismal font, and its abundance is the Holy Communion of our lives. Of all the things we have lost since non-Natives came to our land, we have never lost our connection with the water. The water is our source of life. So long as the water is alive, the Chugach Natives are alive.

It was early in the springtime. No fish yet. No snails yet. But the signs were with us. The green was starting. Some birds were singing. The excitement of the season had just begun. And then we heard the news. Oil in the water. Lots of oil. Killing lots of water. It is too shocking to understand. Never in the millenium of our tradition have we thought it possible for the water to die. But it is true.

We walk our beaches. But the snails and the barnacles and the clams are falling off the rocks. Dead. Dead water. We caught our first fish, the annual first fish, the traditional delight of all — but it got sent to the state to be tested for oil. No first fish this year. We walked our beaches. But instead of gathering life, we gather death. Dead birds. Dead otters. Dead sea- weed.

Before we have a chance to hold each other and share our tears, our sorrow, our loss, we suffer yet another devastation... we are invaded by the oil company. Offering jobs. High pay. Lots of money. We are in shock. We need to clean the oil, get it out of our water, before the birds die to life. We are intoxicated with desperation. We don't have a choice but to take what is offered. So we take the jobs, we take the orders, we take the disruption.

We start fighting. We lose trust for each other. We lose control of our daily life. Everybody is pushing everyone. We Native people aren't used to being bossed around. We don't like it. But now our own people are pointing fingers at us. Everyone wants to be boss; we are not working like a team. We lose control of our village.

Our people get sick. Elders and children in the village. Everybody is ready to jump you and blame you. People are angry. And afraid. And confused. Our elders feel helpless. They cannot work on cleanup, they cannot do all the activities of gathering food and preparing for winter. And most of all, they cannot teach the young ones the Native way. How will the children learn the values and the ways if the water is dead?

The oil companies lied about preventing a spill. Now they lie about the cleanup. Our people know what happens on the beaches. Spend all day cleaning and the tide comes in and covers it with oil again. Send a week wiping and spraying the surface, but pick up a rock and the oil is underneath. Our people know the water and the beaches. But they get told what to do by ignorant people who should be asking, not telling.

We fight a rich and powerful giant, the oil industry, while at the same time we take orders and paycheck from it. We are torn in half.

Will it end? After five years, maybe we will see some springtime water life again. But will the water and the beaches see us? What will happen to our lives in the next five years? What will happen this fall, when the cleanup stops and the money stops? We have lived through much devastation. Our villages were almost destroyed by chicken pox and tuberculosis. We fight the battles of alcohol and drugs and abuse. And we survive.

What we see now is death. Death — not of each other, but of the source of life, the water. We will need much help. Much listening in order to live through the long barren season of dead water, a longer winter than before.

I am an elder. I am chief. I will not lose hope. I will help my people. We have never lived through this kind of death. But we have lived through lots of other kinds of death. We will lose from this, and we will live. The water is dead. But we are alive. And there is life, there is hope.

Thank you for listening to the Native story. God bless you.

Walter Meganack is chief of the Native village of Port Graham. This essay is an edited version of remarks he prepared for a conference of mayors who met June 27 in Valdez to discuss the Valdez oil spill's impact. The speech was read by the village council secretary, Elanore McGlennon.
Cordova fishermen may be worst hit

Continued from page A1

Sound gillnetter, "There could be no more Cordova, Alaska, after the violence of this spill. The salmon might come back, but we don't know if we can sell them."

Twelve people sat at a black-brocaded table on the gym stage. They included Alyeaska Pipeline Service Company President George M. Nelson, Exxon spokesman Don Cormex, US Coast Guard Commander Steve McCall, Fish and Game Commissioner Don Collingsworth and other state and federal fisheries management officials. There was an angry, frustrated, even desperate air in the audience, as the town's fishermen and their families got a chance to vent their anger at the salmon symbol of the oil spill. But despite the many angry outbursts and many bitter comments, the meeting remained relatively calm.

After Nelson, Cormex and McCall arrived late for the start of the 7 p.m. meeting, they drew an angry response when they complained they should have been there. The meeting ended after about 11 p.m.

Cormex and McCall were attacked for the oil company's roles in the tanker grounding and the subsequent spill of some 20,000 barrels of oil.

Cormex apologized for the accident and contended Exxon would pay off reasonable claims to those responsible for the spill. "If you show you had a loss as a result of the spill, we will compensate you," he said.

"You have my word."

But fishermen were skeptical of any oil payment settlement of their claims, and many asked if money might be taken from their claims. "How much is your lifestyle worth to you?" challenged one speaker.

Each of the officials spoke briefly on how their agencies were reacting to the spill.

Ken Florey, a research manager for Exxon, announced the halt of shrimp harvesting in pots and that the scheduled April 29 clostra opening was canceled pending studies of the extent of the damage to the fish.

The oil is known to be highly toxic to salmon fry soon to be emerging from their eggs. Florey said. It also endangers the millions of recently hatched fry held in the four major salmon hatcheries that supply most of the state's pink salmon harvest.

The state also will watch to see whether the spill is interfering with the herring roe fisheries, both wild and cultivated, and other species including crab, halibut, shrimp and bottomfish.

"The state doesn't yet know whether the salmon season, projected to bring a harvest of some 27 million pink salmon alone, will take place this summer," Florey said.

James Brady, Cordova area biologist for Alaska Fish and Game, said the rescue efforts need to focus on e xciting oil-restraining booms across the harbor mouths at the four major hatcheries.

"We need to deploy our defenses in the most critical areas," Brady said. "We have a tremendous resource and we'll do everything in the world to protect its reputation in the marketplace."

After listening politely to the fishermen managers, technicians asked what the role of the Coast Guard, Exxon and Alyeaska Pipeline Service Co. Fishermen blamed them for inadequate contingency plans, insufficient quantities of cleanup materials, delays in deciding whether to use chemical dispersants, and their refusal to accept volunteer cleanup help offered by fishermen.

Maria Ahdins, a Prince William Sound lodge owner, read a statement criticizing the state and oil industry for "complacency."

"I realize that no one is ever prepared for a spill of this magnitude," she said, "but I find the response time, cleanup actions, and lack of immediate contingency plans totally unsatisfactory."

The officials defended the record of tankers oiling Valdez and said they were doing the best they could.

"We didn't know what to do with our help," Cormex said, noting that previous use of volunteer help in other spills had led to legal problems for the company.

McCall was jeered by fishermen when he said his radar lost track of the tanker 20 miles out of Valdez. One fisherman said his 20-foot tanker's radar had better reach.

While some vented anger, others expressed cynical resignation in the face of the oil spill. "The slightly dollars rule the world, and the Alaskan who agreed to the pipeline had the oil pulled over their eyes," said Bob Reiss, skipper of a local salmon seiner. "I've heard people say we were overreacting, but I'm dammed afraid there's a real tragedy, and we may not find out all about it for years."

"I've got two sons under 3 years old," said John Meheolich, a seiner from Cordova. "I've got to feed them. My biggest concern is my whole way of life. This year I'm going to have to go out and clean up oil, and I'd rather be fishing."

Cordova fishermen listen to Exxon officials talk about the oil spill during a three-hour meeting held Tuesday evening.
Ex-skipper blasts Hazelwood actions

By DON HUNTER
Daily News reporter

Capt. Joseph Hazelwood recklessly put his ship and crew in danger through a series of bad decisions that Included a risky attempt to free the ruptured Exxon Valdez from Bligh Reef, a former tanker captain testified Tuesday.

Robert Beavers said Hazelwood acted recklessly in leaving the bridge of the Valdez during a critical maneuver, placing the ship on autopilot in the confined, ice-laden waters of Prince William Sound, and leaving unqualified seamen in charge of the ship during his absence.

"He created the risk of grounding the vessel, he created the risk of completely losing the vessel, he created the risk of fire and explosion and possible death of his crew," Beavers said.

Hazelwood is charged with felony criminal mischief and three misdemeanors, including operating a vessel under the influence of alcohol. Previous witnesses have testified he spent much of the afternoon before the grounding drinking vodka in the Valdez bars. If convicted, he could be jailed for seven years and fined $61,000.

The Valdez slammed into Bligh Reef a few minutes after midnight, spilling nearly 11 million gallons of oil. The mess fouled hundreds of miles of shoreline, killed thousands of seabirds and mammals, and canceled commercial fishing seasons in Prince William Sound.

Shortly after the Hazelwood trial ended for the day in state court, a federal grand jury issued an indictment charging Exxon with violations of environmental and shipping laws, including two felonies. Apparently in anticipation of the pending indictment, Superior Court Judge Karl Johnstone broadened his regular admonishment to jurors in the Hazelwood case, warning them to avoid all news reports about the oil spill and reminding them he can sequester the jury.

Beavers worked in the merchant marine for 24 years, served as a tanker captain for 14 years, and made an estimated 50 to 60 trips through Prince William Sound. The trip is paying him about $25,000, plus expenses, to testify as an expert.

In testimony frequently interrupted by outbursts from defense attorneys, Beavers faulted Hazelwood for poor judgment in practically every significant decision the captain made on his last, brief voyage.

Jurors believe him, Beavers said Hazelwood's defense. The defense has a slate of tanker captains in the wings who presumably will counter Beavers' testimony.

As proceedings closed Tuesday, defense attorney Richard Madson was attempting to drive a wedge at Beavers' credibility, alternating sly jibes and heavy-handed slaps.

"I'm not standing in the sight of God, am I?" Madson said.

Beavers, he maintained, had nothing to learn, that his ship had not run any ships aground, either.

According to Beavers' analysis of the ship's bridge recorder and other instruments, Third Mate Gregory Cousins and Helmsman Robert Kagan either lied about taking the bridge or failed to make a course change when they said they did.

Hazelwood put the ship on automatic pilot after issuing a course change to avoid ice ahead. Cousins and Kagan both testified the autopilot was disengaged moments after the captain went below. Cousins said he followed Hazelwood's order and issued a new course change at 11:35 p.m., as the ship reached a point designated by Hazelwood.

But Beavers said the ship's automated course recorder indicates the Valdez didn't register a turn until 12:02 a.m., about seven minutes after Cousins said he ordered Kagan to execute a 10-degree right rudder maneuver.

Beavers said the course recorder should have shown such a turn within 20 to 30 seconds after Kagan moved the wheel.

Beavers also testified that he believes Hazelwood tried to force the Valdez off Bligh Reef after the grounding, a maneuver that experts agree could have capsized the vessel. Although Hazelwood said in a tape-recorded radio conversation with the Coast Guard shortly after the grounding that he was trying to maneuver the ship "off" the reef, he now claims he was trying to hold the ship on the reef.

But Beavers said he had analyzed the engine and rudder orders issued by Hazelwood that night and concluded Hazelwood in fact was trying to free the ship.

Beavers said Hazelwood also displayed bad judgment by:

- Returning to the Valdez shortly before the vessel was to depart, instead of being on hand hours before to see to cargo loading, check on weather and ice conditions and prepare the ship for departure.
- Leaving the bridge while harbor pilot Ed Murphy saw the vessel through Valdez Narrows. Murphy was a qualified pilot, but Beavers said the captain of a vessel should stay on the bridge, ready to take over if the pilot erred or an emergency arose.
- Prematurely deciding to divert the Valdez from the normal, outbound tanker lane to the inbound lane in order to deuter around ice. Beavers said Hazelwood should have reduced speed and made a closer approach to the area where his radar showed floating ice "bergs," before deciding if he wanted to change course or simply maneuver through the ice field.
- Leaving the bridge a second time, in the middle of the maneuver around the ice.
- Putting Cousins in charge of the ship during the maneuver. "He had his ship heading into a dangerous situation, a situation that needed someone with experience to maneuver it, a situation that was beyond what you'd expect any relatively inexperienced third mate to do on his own." Beavers said.

- Leaving Kagan at the wheel during a critical maneuver in a confined area. "If you put a person you had confidence in on the wheel than to put a man that you knew had problems steering," Beavers said. Previous witnesses have testified Kagan was sometimes unreliable and needed supervision even when performing simple tasks.
- Pulling the ship's lookout from the bow to a wing near the bridge. When maneuvering through ice, Beavers said, it is better to have two sets of eyes on the bow, and he said he would have sent his chief mate to the forward lookout position.
- Ordering the ship ahead at a speed about twice what Beavers said he considered prudent for maneuvering near ice.
- Failing to order all hands on deck with their survival suits. Two cooks earlier testified they dived through the grounding and didn't realize the ship was in danger until hours later.
Homer residents begin building booms

By JOE HUNT
Times Writer

HOMER — Tired of waiting for boom that may never show, Homer residents brought out their chainsaws, cant hooks and hammers Thursday and began manufacturing the material needed to save Cook Inlet shores.

The long, black fingers of the Exxon Valdez tragedy have reached this fishing community and tourism hub on Kachemak Bay by spreading fear ahead of the slick itself. But the slick is not far behind.

When the Exxon Valdez ran aground three weeks ago, the only consolation felt by residents here was that their own pristine inlet was spared by the nation’s worst oil spill. Today, a trail of brown, oil-based mousse and thin sheets of iridescent sheen are hovering at the entrance to Cook Inlet.

The residents of Homer have no intention of letting it in.

Concern about the local fisheries, a plan to save beaches filled with clams and mussels and an appreciation for the intricate marine world in their own backyard has kept residents scurrying for more than two weeks.

The local fishermen knew within a few days of the tanker accident that the mass of oil was out of control and heading their way, according to Marge Tillian, an organizer of the local defense efforts.

Fishermen know the flow of currents better than anybody, she said. “Hey, we fish there and we know how long it takes to have fish gear float this way,” Tillian said. “If you’re fishing, you know how the

See Homer, page A-9

Homer: Residents tire of wait; build own booms

Continued from page A-1

tides move and how the currents move.”

Overflights Thursday showed the leading edge of oil mousse and sheen has reached within three miles of Cape Douglas at the easternmost edge of Katmai National Park. That oil will likely head toward Shellfish Strait, according to Leonard Wehking, a Bureau of Land Management specialist tracking the spill.

“The main body of oil appears to be moving past and at this time it doesn’t appear to have any movement toward the inlet,” Wehking said. “I’m not saying there’s nothing coming up here, but there’s nothing major coming up here.”

Tillian’s fishing instincts tell her the oil will reach the beaches along Cook Inlet within a few days, not in large patches, she said, but one small blotch at a time.

Others agree. “With the winds, it’s inevitable that it’ll be here,” said Ed Schofield, organizer of a boom-manufacturing effort. “I only wish we could have started sooner.”

The tip of the Homer Spit is literally buried with the sound of chainsaws as a crew of 30 builds deflection boom out of logs, plywood and a thick synthetic material known as “Polaron.”

The work is the culmination of five days of planning and experimentation. Exxon’s cleanup contractor Veco shipped in the necessary materials and put the crew on the payroll to begin rolling out the makeshift boom Wednesday afternoon.

A sense of urgency kept the construction at a fevered pace. Schofield hoped to put out 600 to 1,000 feet of the crude-looking boom a day. The crew, earning $18.60 an hour through Veco, worked continuously to meet that order.

The money, most say, has little to do with the hard work. Many of them were at the job planning and organizing the operation long before Veco made it possible by providing materials.

“We live here. The bay is here. I’d do it for nothing,” said a helmet-wearing, oil-covered, drag-and-go fighter named Randy Holt, a local carpenter. “It’s not dollars at all.”

“We were tired of sitting around doing nothing,” added Peter Gagne, a logger. “We’re tired, we’re anxious, we’re here to do our part.”

“Tillian believes the boom building is good therapy for the town. “They (Exxon) should let people build boom for a couple of weeks and work out their frustrations,” she said.

“I’m no psychologist,” Tillian said, “but it doesn’t take much to realize what people need in a disaster. They need to work out their emotions and frustrations.”

Four of the organization in Homer has been spearheaded by the BLM’s Incident Command Team. They’re a group that’s made a profession of emergency response and organization, usually associated with forest fires.

The government command team is phasing out its involvement today and relinquishing control to Exxon. Wiley Bragg, Exxon’s liaison in Homer, praised the resident volunteers and the BLM crew for picking together a working organization.

Bragg said that he planned on keeping the local residents working, though he wasn’t sure how many would actually be paid for their efforts. The payroll will undoubtedly grow, however.

“in getting things done the quickest way possible, we’re going to use local people to fill in the key slots, bringing with them the knowledge of the area and the knowledge of what needs to be done,” Bragg said.

He, too, saw the futility of trying to cover all the vital shoreline that needs protection. “We take the position that some barrier is better than no barrier,” Bragg said. “If we didn’t do that, in my opinion, it would be unconscionable. We’ve got to do whatever we can to get boom in place.”
Numbers reveal oil spill's lasting legacy

BY KENT STURGIS

After the angry words of summer died down, Exxon packed up and went home, and fierce storms moved in to scrub Prince William Sound. What remained, besides unrecovered crude oil, were The Numbers.

These statistics compiled from Exxon and from state and federal agencies define the nation's worst oil spill, its effects, and the massive reaction to it:

The green day—At 12:04 a.m. March 24, 1989, the 987-foot tanker Exxon Valdez ran aground on Bligh Reef, carrying 1,263,015 barrels (10,930,000 gallons) of Prudhoe Bay crude. Eight of nine tanks were ruptured, spilling an estimated 260,000 barrels.

- Exxon cleanup costs—$1.9 billion, according to U.S. Transportation Secretary Samuel Skinner.
- State oil cleanup fund, March 24—$2 million.

SHORELINE OPERATIONS
- State's estimate of number of barrels of oil recovered—3,500 barrels.
- Approximate total cost of oil recovered—$3,846,100.
- Unrecovered oil (estimated)—114,000 barrels.
- State's estimate of the portion of spilled oil that has evaporated—50 percent.
- State's estimate of oil contamination—1,541 miles including 311 miles in Prince William Sound, 100 on the Kenai Peninsula and 833 on Kodiak Island and the Alaska Peninsula.
- Shoreline treated—1,069 miles total including 337 miles in Prince William Sound and 732 in the Gulf of Alaska.
- Solid waste collected (estimated)—25,000 tons.
- Average daily volume of water used for shoreline cleaning—200 million gallons.

EQUIPMENT DEPLOYED AT PEAK
- Vessels—1,456.
- Skimmers—54.
- Aircraft—85.
- Booms—504,000 feet.

WORKFORCE
- Peak employment—More than 11,000.
- Worker's compensation injury claims paid through Oct. 23 and the Alaska Department of Labor—1,635.
- Peak weekly requirements to supply oil-recovery workers:
  - Food—200 tons.
  - Fuel—400,000 gallons.
  - Potable water—450,000 gallons.
  - Offshore berths—4,000.
  - Sewage and wastewater requiring treatment—1.4 million gallons weekly.

- Exxon's spending on recruiting and housing approximately 1,000 workers for Valdez and Cordova area jobs that could not be filled locally because the workforce had been lured away by higher-paying cleanup jobs—$80 million.

DAMAGES
- Wildlife mortality (actual count)—98,471 birds, 1,910 otters, 151 eagles, 18 other raptors.
- U.S. Fish and Wildlife Service estimate of number of birds killed—Between 90,000 and 270,000.
- Wildlife treated and released—815 birds, 193 otters, 19 eagles.
- Exxon's estimated expenditure per sea otter rehabilitated—$40,000.
- Claims paid through Dec. 8—$100 million to approximately 10,000 claimants.
- Average amount of claim paid—$11,000.
- Lawsuits filed (estimated)—150.
- Lawyers fees—10-15 percent of judgments in class-action cases; 15-20 percent and up in direct-action cases.

- Maximum penalty if Capt. Joseph Hazelwood is convicted of three felony charges—10 years in prison, $100,000 fine.
- Exxon's insurance coverage (estimated)—$800 million less deductibles.
- Funds appropriated by Alaska Legislature for spill response—$69 million.
- Pipeline/Valdez Terminal:
  - Average daily throughput of trans-Alaska pipeline for the week ending Dec. 3—1,914,546 barrels.

- Tanker berthing for week ending Dec. 3 at Valdez total—30.
- Largest tanker ever loaded—1,853,000 barrels.
- Average tanker turnaround time—18 hours.
- Number of tanker crew members failing new sobriety tests through Dec. 7 at Valdez terminal—53.

Kent Sturges, former managing editor of the Daily News-Miner, is now working as a free-lance journalist in Seattle.
Oil Spill Accelerates
Science Center

Scientists and others interested in the Prince William Sound and Copper River Delta region have long talked about establishing a research center in Cordova, the fishing community that provides easy access to both areas. The March 24, 1989 Exxon Valdez oil spill accelerated the need for basic and applied ecological research on both the effects of oil spills in subarctic regions and the rich ecosystems which form the basis of the region.

Since opening its doors in April, 1989, the Prince William Sound Science Center has renovated an old city building as its temporary home, defined its purpose in a mission statement, begun the process of grant and endowment funding applications, and lobbied for passage of a senate bill which establishes a separate oil spill recovery institute. The Center currently provides office space for a research project studying the impact of the oil spill on bald eagles. Last summer, the Center provided bunkhouse space to volunteers working on an oil spill related wildlife observation project, and also assisted several other researchers working in the Delta and the Sound.

Incorporated as a non-profit, independent institute, the Science Center is dedicated to facilitating research toward more complete ecological understanding of Prince William Sound and the Copper River Delta. The Center’s board of directors includes several scientists, a fishermen, and a president of Prince William Sound Aquaculture Corporation. Advice on the Center’s scientific study program will be given by a Scientific Committee whose members represent a broad spectrum of scientific disciplines and a wide geographical area.

Interim Director of the Center is John Harville, a renowned biologist and retired administrator who is a former executive director of the Pacific Marine Fisheries Commission and a former member of the North Pacific Fishery Council.

The City of Cordova offered support to the Center with a $100,000 loan to assist its first year of operation. The Center also recently received a $50,000 grant from Conservation International, an organization which promotes ecosystem monitoring projects worldwide. The Center’s staff is currently working to secure long-term funding for the research facility while continuing renovation of the building to provide additional office space and a laboratory in conjunction with the Cordova branch of Prince William Sound Community College.

The Science Center is also lobbying to be the host institute for an Oil Spill Recovery Institute, a research center included in pending federal legislation. The oil spill institute, as described in a Senate bill sponsored by Senator glucos (and which passed the Senate 99-0), would identify and develop techniques for dealing with oil spills in cold water. It would assess the long-term effects of the Exxon Valdez spill and would be funded by oil industry tax monies. The Senate bill and a more recently passed House oil spill liability bill will be reviewed in a joint conference committee later this winter.

According to Interim Director Harville, the Oil Spill Recovery Institute and the PWS Science Center will remain two distinctly separate entities. The original idea of Cordovans — to promote basic research on the region and provide a facility for scientists and students of science to work — is still the major focus for the Science Center.

Harville noted that Cordova is the perfect location for the Institute. Located on the eastern shore of Prince William Sound, it is accessible to both the Sound and the Copper River Delta, the largest contiguous wetland in the western United States. Cordova also has reliable daily air service to both Anchorage and Seattle.

One of the Science Center’s purposes is to serve as a repository for scientific research conducted in the Prince William Sound and Copper River Delta region. This fall, the Center submitted a proposal to the Alaska Science and Technology Foundation requesting funds to set up a computer-accessible annotated bibliography of published and unpublished research reports on the region. The Foundation will review this proposal by February.

In November, the Science Center began two educational programs for Cordova residents: a weekly Science Club for elementary school children, and a monthly Science Lecture Series for adults. Both of these programs are being co-sponsored by the Copper River Delta Institute, a recently established institute associated with the U.S. Forest Service.

Prince William Sound Science Center, 12/12/89
P.O. Box 705, Cordova, AK 99574
PWSAC Watches over Hatcheries

Prince William Sound Aquaculture Corporation successfully met the challenges of a difficult harvest season, rebounding from around-the-clock oil response operations to manage a massive cost recovery harvest at the Armin F. Koenig (AFK) Hatchery, and on-again, off-again harvests and fish sales at the Wally Noerenberg (Esther) and Cannery Creek Hatcheries.

In addition to protecting the hatcheries from oil spilled by the Exxon Valdez, the aquaculture corporation harvested and sold a total of 7.2 million pink salmon, for a total revenue of $14.5 million. The brood stock harvest was also a success, with a total of 270 million eggs taken at Noerenberg, 161 million at Cannery Creek and 128 million at AFK.

With the scarcity of the wild pink return this season, over 90 percent of the pinks caught by the commercial fishermen in Prince William Sound in 1989 were hatchery-produced. Approximately 14 million pinks were commercially harvested in the Sound, the majority of those in the areas surrounding the hatcheries.

When the Department of Fish and Game closed the Southwest District of the Sound June 14 because of oil contamination from the March 24 spill, PWSAC was forced to change harvest plans accordingly. As no commercial fishery would intercept the AFK pinks, the entire run would return to the hatchery. Thus, instead of taking fish from all three hatcheries to meet the corporation's revenue goal of $11.6 million, PWSAC's new plan was to harvest sales fish only at AFK— an estimated 5.5 million of them.

However, periodic closures caused by oil contamination in the Esther Subdistrict and Unakwik Inlet required PWSAC to conduct unanticipated sales harvests at both Noerenberg and Cannery Creek Hatcheries. Contract seiners harvested fish at the hatcheries when the commercial fishery was closed, and ceased harvesting when possible during the commercial openers.

In addition to harvesting at all three PWSAC hatcheries, the corporation also harvested 101,000 chum salmon in front of the state's Main Bay Hatchery, at the request of the Commissioner of Fish and Game. The area surrounding Main Bay was also closed to commercial set and drift gillnetting because of oil contamination, and ADF&G did not want the fish returning to the hatchery to be wasted.

None of the chums were necessary for brood stock as the hatchery has been converted to a sockeye facility.

With the conclusion of the harvest season, and the removal of the protective booms at the hatcheries in October, PWSAC continues to be involved in oil spill prevention and response, and in the ongoing protection of the hatcheries. Special Projects Manager John McMullen oversees the Exxon and Ayleska winter hatchery protection plans and is also a member of the Regional Citizens Advisory Committee (RCAC).

The RCAC meets twice monthly in Anchorage; the 15 members represent the communities of Prince William Sound, the Kenai Peninsula and Kodiak Island, as well as fishing, conservation, aquaculture and native groups. The RCAC has begun its review of the Ayleska Oil Spill Response and Contingency Plan, and is in the process of developing bylaws and articles of incorporation for a nonprofit corporation, and negotiating a contract between Ayleska and RCAC for a permanent committee.

Exxon has placed containers of sorbent boom and other materials at each hatchery. Also, large deflection booms are available for use at each hatchery. At AFK in Sawmill Bay, an inflatable boom is stored in beachside containers at the village of Chenega Bay. Boom anchors and buoys have been installed in place, to help speed the process of boom deployment by the Chenega villagers on contract with Exxon.

Working for Cordova Chamber of Commerce

Cordova Chamber of Commerce efforts since the oil spill have been directed at assuring that the economic damages suffered by Cordova businesses are compensated and that the economic future of the community is assured.

As a result of the Chamber's efforts, Cordova was recognized by Exxon as a unique community completely dependent on the fishing industry and all businesses were declared eligible to file claims based on lost net income. Cordova was the only community to receive this recognition.

Had the Chamber not acted, Cordova businesses would not have received this special status. Most businesses also had unusual expenses this summer, in particular, higher labor costs. The shortage of labor was first called to Exxon's attention by a Chamber-sponsored committee. Working in cooperation, Exxon, the City, the Alaska Department of Labor and the Chamber implemented a labor search as well as a housing program.

According to Chamber President Connie Taylor, "The Chamber believes that by approaching Exxon with reasonable requests accompanied with hard data, we have been notably successful in achieving positive results. The community can be justly proud of the work the Chamber has accomplished."

Cordova Chamber of Commerce, 10/16/89
P.O. Box 99, Cordova, AK 99574
“This is my kind of country, Rick!” said Mollie Muskrat as she sniffed and poked along the marshy ground.

“Well, it’s not mine!” growled Cubby Bear. “My feet are soaking wet. Isn’t there any dry land around here, Rick?”

“Sure, Cubby,” answered Rick, “but we have a little farther to go before we reach the beach.”

Ranger Rick, Mollie, Cubby, and Ollie Otter were celebrating the Year of the Coast by visiting some of the places along the shores of the beautiful Chesapeake Bay in Maryland.

Ollie was especially happy. Wherever they went there was plenty of delicious food for him to eat. The marshes were teeming with life. The only thing he missed just a little bit was a nice long mud slide.

“Hey, Cubby,” Ollie called, “stand up on your hind legs and see if there’s anything ahead that looks like a hill. I’m ready for a good long slide.”

Cubby, eager to please his friend, stood up quickly – too quickly! He lost his balance and toppled over backward. With a big splash he disappeared in the marsh grass. “Help!” he yelled. “I’m drowning!”

Ranger Rick laughed. “In two feet of water, you cousin-of-a-polar-bear?! Here, take my paw.” Leaning over, Rick helped up a soaking wet Cubby.

Just as Cubby started to shake the water from his fur, a great roar filled the air. Frightened by the noise, the animals crouched down in the marsh grass. The roar grew louder and louder. Then, suddenly, right over their heads flew a big red and white helicopter.

“U.S. Coast Guard!” Rick yelled. “What are they doing flying so low?”

A moment later another Coast Guard helicopter came roaring overhead.

“Something’s up,” said Rick after it had gone. “We’d better find out what’s going on!”

With Rick leading the way, the animals soon reached the edge of a sandy beach. Rick stood up. “Oh, wow!” he cried, straining to get a better look out across the bay. The other animals stood up too. Ollie gasped. “Look at the way those waves are pounding that oil tanker out there. The ship is breaking up, Rick! That’s why the Coast Guard is here!”

“You’re right, Ollie. They’re probably out to rescue the crew. That ship must have run aground in the storm we had the other day. If she’s full of oil, it means big trouble!”

“I don’t understand,” said Cubby.

“Come on,” Rick said. “Let’s walk farther down the beach. I think I can show you just what I mean by trouble!”
The four friends hadn’t gone very far when Mollie stopped dead in her tracks.

“Look at all that black goo up ahead. Is that oil, Rick? It smells terrible!”

“It sure is, Mollie. It’s from the ship, and that goo means a lot of birds and other sea creatures are going to get sick or die! That oil will also poison seafood from the bay that people eat, such as crabs, clams, and oysters.”

The friends stood silently, staring out at the awful scene.

Suddenly there was a rustle in the marsh grass nearby. A great blue heron walked toward them. Its feet and some of its wing feathers were black with oil.

“Hi! I’m Ranger Rick, and these are my friends from Deep Green Wood,” said Rick. “Let’s see if we can help you clean off some of that oil.”

“Thank you,” said the heron. “My name is Susie and I’m lucky I’m not more messed up. You should see what’s happening farther down the beach where all those people are. There must be hundreds of ducks and other birds covered with oil. The people are trying to help them, but there isn’t an awful lot they can do.

“You know, we birds are in trouble even if we don’t get covered with oil. That black stuff has already been washed way into the marsh by the tides and wind. And that means our food supply could be ruined. If the oil doesn’t kill the things we eat, it gets into their bodies. Then when we eat them, it gets into our bodies and makes us sick!”

“Gosh, Rick,” exclaimed Ollie, “oil spills are really terrible, aren’t they?”

“They sure are, Ollie. And when they hit an estuary like this, they’re a disaster.”

“An estuary? What’s that?” asked Molly.

“An estuary is a place where a river meets the sea,” answered Rick. “The Chesapeake Bay, with four large rivers flowing into it, is the biggest estuary in the world! Countless birds stop here to feed. And thousands and thousands of sea creatures lay their eggs and raise their young here. An estuary as big as the Chesapeake is a source of food for great numbers of animals and people too.”

“We’ve had spills on the bay before,” said Susie as Ollie wiped the last bit of oil from her feathers. “But now that people are building tankers as long as three football fields, even more terrible things can happen if one of them breaks up.”

“I know,” said Rick. “And don’t forget, tanker wrecks aren’t the only problem. Oil wells drilled in the sea floor sometimes ‘blow out’, or break open, and spill thousands of gallons. Much more pollution comes from tanker crews cleaning out their empty tanks. They often dump the leftover oil into the ocean – on purpose! The spill here is terrible, but it’s only a drop in the bucket.”

“Looks like a pretty big drop to me,” said Ollie. “Think I’ll take a closer look.” Always curious, he wandered farther down the beach to where the people were trying to rescue some of the oil-covered birds. He watched them from the safety of the tall grass. It was a sad sight. The once-beautiful birds were now covered with thick black oil. Dead and dying fish floated along the edge of the beach. The sand was covered with the sticky mess.

As Ollie watched, he heard a faint sound in the reeds beside him. He looked down. There, struggling to walk, was a duck. It, too, was coated with oil.

“What are you doing here?” Ollie asked in surprise.

“I’m in terrible trouble,” the duck whispered. “I can hardly move. When I tried to swim, I almost sank. When I tried to clean the oil off my feathers, I got very sick. Can you help me?”
“I’ll try,” said Ollie. He picked the duck up very gently. “We’ll see what my friends and I can do for you.”

“Rick!” he called as he got closer to where the others were standing. “This guy is in awful shape. We’ve got to help him!” But by the time Ollie reached Rick and started to hand the bird to him, it was too late. The duck was dead.

No one knew what to say. Finally Rick spoke up. “Just one of thousands to die,” he said, shaking his head sadly. “Just one of thousands!”

“Isn’t there anything anyone can do?” asked Susie.

“Yes,” Rick answered. “People could build safer ships and make sure worn-out ones are sent to the scrap heap. They could also make sure that all of the captains from every country know how to run their huge tankers.”

“And another thing,” added Susie. “I’ll bet that if people didn’t waste oil when they used it, they wouldn’t need as much. That would mean fewer tankers would be needed to carry it.”

“Fewer tankers, fewer chances of one breaking up!” exclaimed Ollie.

“That’s right,” said Rick. “And besides saving energy, people can use other kinds of energy – like the good old sun.”

“So there’s hope?” asked Susie.

“There’s always hope,” said Rick. “So long as people care enough to do what’s best for all – for people and for wildlife. Right now, I think all of us should do our best to help those sick birds up there on the beach. Let’s go!”

The End.
Spill stench permeates Aleut village

By JEAN LAMMING
Time Writer

TATITLEK — Residents of this tiny Aleut fishing village faced a unique problem in the settlement located closest to North America's largest oil spill.

Monday, Tatitlek fishermen trapped in Port Valdez by vicious winds complained of the stench of diesel fuel that permeated their houses over the weekend and expressed concern that if the winds had turned, smoke from oil slick burns would have wafted into their village.

"You could smell it inside the homes," said Tatitlek Village Council President Gary Kompkoff. "My first thought was our generator was leaking fuel."

Kompkoff heard about the massive oil spill in his neighborhood 25 miles southeast of Valdez on ABC's TV news program "Good Morning America" Friday morning. Based on that report, he thought the slick was forming in the Valdez Narrows.

Instead, it was spreading less than five miles from the village of RS, on the far side of an island where villagers catch silver salmon and hunt deer.

"The village of Tatitlek is affected more than anyone in the world," Kompkoff said. "We're right in the middle of it."

Villagers grew more concerned when they found oil cleanup crews were burning the fuel. No one had bothered to tell the residents of Tatitlek or advise them of the likelihood of danger from the smoke if it came their way, Kompkoff said.

"Our concern is they didn't keep us informed of what they were doing and the affects," Kompkoff said. "After the burn we found out it could be harmful to pregnant and older people." Tatitlek fisherman Herman Geffe, 21, said he flew his wife out of the village Saturday because she is expecting their child in a month and he was afraid for her health. She is staying in Cordova, Geffe said.

Department of Environmental Conservation officials said one other resident had left the village for Cordova to wait out the spill cleanup. The DEC promised to advise the villagers of any other burning, but by Monday the wind had chased the slick away from the village and with it went the possibility of fumes and smoke lingering there.

But fishermen such as Steve Toremotte and his cousin, Calvin, worry that their subsistence fishing and hunting grounds will be tainted and possibly decimated by the oil that spilled in and around them.

Sunday they were working under contract laying boom along the intricate shoreline where they travel in skiffs to catch silver salmon running in streams there.

They hunt deer, duck, seal and sea lion on an island located less than two miles from the stricken tanker Exxon Valdez.

"Most people here rely on subsistence. Some don't even buy town meat," Kompkoff said.
STATEMENT OF CITY MANAGER DONALD L. MOORE OF CORDOVA, ALASKA

April 5, 1989

The people of Cordova, Alaska are privileged to live and work in one of the two most beautiful places on Earth—the formerly pristine Prince William Sound. As the world now knows, on March 24, 1989, the fully loaded tanker Exxon Valdez hit a well-marked reef near Bligh Island and spewed 10.5 million gallons of crude oil into the Sound. We are now experiencing a catastrophe of unprecedented impact on our environment, our economy and our way of life. Most unfortunately, the impact is worse than it needs to be because we trusted those who profess to know how to triage their own negligence.

In the early phase of the spill we in Cordova expected Exxon to mobilize to clean up the spill and begin assisting Cordova and other Sound communities with recovery efforts.

The truth is that the people of Cordova reached into their own treasury and began cleaning up the spill and protecting uncontaminated areas of the Sound while Exxon helped its out-of-town experts react. It is not a joke that the inevitable souvenir "T-shirts" were deployed before the containment boom was around the Exxon Valdez. In our view, Exxon has mustered only a fraction of its available resources to clean up the spill.

The City of Cordova and the two villages in the Sound are totally dependent upon commercial and subsistence fishing for our existence.

On April 3, 1989, the Alaska Department of Fish and Game announced that our herring fishing days were over. The impact of the spill on the salmon fishery is uncertain.

We also greatly fear the socio-economic displacements that will afflict our community as a result of this tragedy. The loss of jobs, the loss of a way of life and all the attendant expectations of perhaps a generation of Cordovans are at risk. The people are afraid and they are frustrated. I will assume, for now, that Exxon will be driven by fundamental fairness to honor its pronouncement to "make us whole."

I appeal to the world to watch.

I referred to Prince William Sound as one of the two most beautiful places on Earth. I leave it to each of you to individually decide what the other one is. We all have a special Shangri-La in our hearts and minds. Think of yours when you contemplate what has happened to ours.

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The trauma of being cleaned

By BILL SHERWONIT

The terror begins when oil contaminates a bird's feathers and lasts until the animal is finally freed—or dies.

"Think about it," Porter says. "First the bird is crammed into a net. Then it's stuffed into a box or bag. It has food crammed down its throat. It's put into a hot-wash tub and scrubbed while being held down by creatures that pose a natural threat—you have to remember that we're predators to birds. They don't understand we're trying to help. After washing, the bird is put into a sink and rinsed with a jet spray, then it's thrown into a blow-dryer, picked up again and bathed for future identification.

"When you consider all the birds have to go through, the clean-up is a survival test in itself."

As of Wednesday, 396 birds had been brought to Valdez's rescue center; 189 of those had died. Another 61 had been killed by euthanasia to prevent further suffering.

"Euthanasia is controversial in a lot of places, but it's a sad fact of life in an operation like this," Porter says. "If a bird has no chance for recovery, there's no reason for it to continue suffering. We put the birds to sleep painlessly, with an injection to the heart or abdomen; they're dead within seconds."

Some species survive their oil-induced traumas better than others. Of the birds rescued since the tanker Exxon Valdez spilled 11 million gallons of crude oil 37 days ago, loons have suffered the highest mortality rate. Of seven brought to the rescue center, only one has survived.

"Loons always do the worst," says Porter, a staff member of the International Bird Rescue Center at San Juan Island, Wash., and veteran of numerous oil-spill rescue operations over the past 25 years. "Loons are primitive birds; their feather structures are slightly different than other species and more easily damaged by oil. And they don't die very well.

As if loons didn't have enough problems, the March 24 spill occurred during their springtime moult.

"You couldn't ask for anything worse," Porter says.

Diving birds such as cormorants, murres and grebes have also fared rather poorly, while ducks such as barrows, scoters and old squaws have generally done well.

The primary difference, says Porter, is preening, the process in which birds use their beaks or bills to clean and trim feathers.

Ducks tend not to preen as much as the sharp-beaked diving birds, so they swallow less oil. Post-mortems have demonstrated that ingested oil has done extensive damage to oiled birds' livers, kidneys and intestinal tracks.

Sea birds doing best in the spill's wake have been gulls. No surprise there, Porter says.

"Gulls usually make up a real, real small part of a spill's casualties," she notes. "Gulls fly over the top (of the water); they see something and dip down, so they tend not to get right in the oil. Most of the gulls we've seen have been relatively lightly oiled."

And the few gulls brought in for cleaning have all survived.

See Rescued, page 3
The number of reported bird deaths has dropped noticeably the past couple weeks. The declining mortality rate was expected, Porter says, because the spill has changed in character.

Early on, the Prudhoe Bay crude was rich in volatiles, including toxic fumes. Cold air tended to trap and slow the evaporation of those volatiles, which were then inhaled by sea birds (and otters). Now most of the gases have dissipated and the oil's toxicity has diminished.

"Don't get me wrong, the crude is still toxic," Porter says, "but less than it was in the beginning."

The chief threat to birds is now mechanical rather than physiological. Birds contaminated by the oil lose their ability to stay warm, float and dive. It doesn't take much to kill a quarter-sized droplet is sufficient.

"You have to understand how a bird is waterproofed," Porter says.

Birds have two layers of feathers. Next to the skin is an insulating underlayer of down; that's covered by an interlocking network of feathers which acts as a sort of dry suit.

When the protective feathery network is clean, it traps pockets of air and locks water out. But when soiled, the outer feathers begin to clump or mat, the network begins to develop leaks and water soaks the down, which then loses its ability to insulate.

"If a (sea) bird becomes oiled, it's only a matter of time before it dies," Porter says. "They're all gooped up, so they can't float, they can't dive and they're susceptible to hypothermia. All their energy is directed at cleaning themselves."

More than 2,500 birds have already been found dead within Prince William Sound, but those numbers reflect only a small percentage of the actual death toll.

"There's no way to guess the number, but it's thousands and thousands," Porter says. "Birds don't stick around long after they die. They sink, or they're eaten."

The presence of dead, oiled birds on beaches presents a danger to scavengers such as eagles, ravens, bears and foxes. At least one bald eagle is known to have died from oil ingestion. It's likely many others face a similar fate.

"A lot of eagles are dying, I'm sure of it," Porter says. "It's real obvious that the presence of oil-contaminated birds will affect predators. Certainly it takes a lot more oil to kill a bear than a bird, but how much oil is something we don't know. And there's lots of dead birds on the beaches for bears to feed on."

Birds which survive the spill — and the rescue operation — will eventually be returned to the wild. About 60 "patients" have been released so far.

Some species, however, must endure a waiting period of several weeks. Cormorants, common murres, auks and puffins are known to nest in the spill area. If released, "they'd go right back, to within a half mile of where they were found," Por-
Valdez folks feel 'cheated'

By CHARLES WOHLFORTH
Daily News reporter

VALDEZ — Valdez is holding its breath, expecting to change because of the Exxon Valdez oil spill, but still wondering how much.

"They've always been one of the most pro-development communities in Alaska," said Valdez City Councilman Lynn Chrystil. "We probably still will be. But we feel very let down, and very cheated. It's almost like you found out your wife is cheating on you."

The marriage of Valdez to oil, although betrayed, will survive. Valdez lives on oil. Except for the fishermen. They're not happy about it.

"People need any kind of help, they look to us. It's like losing a child's best friend."

"The problem is, we have lost our identity," said City Manager Doug Griffin. "We're dealing with a lot of stress."
EXXON VALDEZ OIL SPILL

Soon after the grounding of the Exxon Valdez on Bligh Reef, ADFG’s Nongame Wildlife Program staff initiated studies assessing the effects of the oil spill on raptors, loons and shorebirds in addition to other ADFG studies on big game, furbearers, marine mammals, and waterfowl. In addition, the US Fish and Wildlife Service has initiated studies and surveys on raptors, seabirds, shorebirds and other water birds.

Bald Eagle Production Down

ADFG and the USFWS recently began a 5-year study to document the immediate and long-term extent of the impacts of the Exxon Valdez oil spill on Bald Eagles. Biologists are concerned about impacts to eagles from ingestion of oil, physical oiling of feathers and eggs, decreases in nesting success, and reduction in available food.

More than 5000 Bald Eagles are associated with intertidal habitats that have been impacted by the oil spill in Prince William Sound. As of August 1989, 146 Bald Eagles (including several chicks) have been found dead, although this is believed to be only a fraction of the total mortality.

Nearly all the eagle nests in the Sound occur within 100 meters of the beach, so nest surveys were conducted from May to August, 1989 to assess the effects of the spill on the number of chicks raised. More than 800 nests from areas affected by the oil spill and in non-oiled areas were located and checked for occupancy and productivity. Nests in oiled areas of Prince William Sound produced only a third as many eaglets as a comparative number of nests in the Copper River Basin (distant from spill).

Biologists have also collected the remains of foods found in eagle nests, eggshell fragments, and more than 20 unhatched eagle eggs. These samples will be analyzed for contaminants associated with crude oil, to learn more about how oiling affects Bald Eagles.

Peregrine Falcons in Prince William Sound

Surveys in Prince William Sound and along the outer coast of the Kenai Peninsula in the past have documented a considerable population of Peale’s peregrine falcons. Peale’s falcons are thought to be year-round residents of this area preying upon seals, small gulls, and waterfowl, and occupying traditional nesting territories during the breeding season.

Concern about the effects of Exxon Valdez oil spill on Peale’s falcons prompted ADFG and USFWS to initiate follow-up surveys in this area. Potential impacts to Peale’s falcons include ingestion of oiled prey, physical oiling, impairment of productivity, and reductions in the amount of available prey.

Peale’s falcons are known to have occupied as many as 35 nesting territories each year in Prince William Sound and coastal areas of the Kenai Peninsula. Territories occupied by falcons in recent years and potential nesting habitat in these areas were surveyed between 30 April and 18 May to count adult peregrines, and again in early July to count young. Cliffs suitable for peregrines occur primarily along exposed outer coasts and on offshore islands. These areas were the focus of the surveys done by helicopter using two observers in addition to the pilot.

Only 10 occupied nesting territories were identified during the surveys. Seven of the 35 previously inventoried nesting territories were occupied and 3 previously unknown nesting territories were identified. These initial surveys indicate a significant number of unoccupied nesting territories in Prince William Sound and along the coast of the Kenai Peninsula. Although some annual variability in the number of occupied nesting territories is normal, the low rate of occupancy and the few peregrines observed are well below the range of expected fluctuation.

Surveys to monitor eyrie occupancy, productivity and assess impacts from the Exxon Valdez oil spill will continue next year.
Shorebirds Studied in Sound

When news of the spill first came out, many people were concerned about its effect on the Copper River Delta where more than 10 million birds stop each spring en route to their northern nesting areas. Fortunately, the oil did not spread to the mudflats of the delta. As it became clear that the rocky shorelines within Prince William Sound were being heavily oiled, concern shifted to shorebirds reliant on those habitats. Most, if not all, of the entire world populations of some species, such as the Surfbird and Black Turnstone (estimated to number in the 50,000 to 200,000 range), pass through Prince William Sound every spring. Others, like the Black Oystercatcher spend their entire annual cycle in the rocky intertidal habitat of the Sound.

Studies were designed to assess the impacts of oil on these species. Field work on the migrants using rocky intertidal habitats was conducted in late April through mid-May by the US Fish and Wildlife Service with the assistance of an ADF&G nongame biologist. Large numbers of Surfbirds and Black Turnstones were found on northern Montague Island, apparently attracted to the herring roe which had recently been spawned there. These two shorebirds and large numbers of gulls, waterfowl, and other birds appeared to home-in on this super-abundant food source. Fortunately, this area was only lightly touched by the oil spill. Herring roe may serve as a critical food for these migrating shorebirds as they replenish fat reserves on their passage north to nesting areas. A US Fish and Wildlife Service crew from Oregon was recruited to conduct studies on breeding Black Oystercatchers in late May and June. Data on hydrocarbon contamination from these two projects are not available at this time.

The waterborne oil slick also threatened pelagic species like the phalaropes. Limited surveys from the 1970's suggested perhaps 1 to 3 million red and red-necked phalaropes used nearshore waters in Prince William Sound and adjacent portions of the Gulf of Alaska. Unfortunately, studies of phalaropes in nearshore waters of Prince William Sound and the Gulf of Alaska were never conducted by the USFWS.

Although oil did not reach the Copper River Delta, its critical importance to millions of shorebirds prompted researchers from the University of Alaska and Hawk Mountain Sanctuary to independently duplicate field work conducted in the mid-70's. About 3 weeks were spent in the field in April and early May studying migrant Dunlins and Western Sandpipers and their invertebrate prey on the mudflats of Hartney Bay on the western edge of the Copper River Delta.

Wintering Loons Affected by Spill

By late September 1989, 387 dead loons had been collected from coastal areas affected by the Exxon Valdez oil spill. Over 200 Common Loons and 86 Yellow-billed Loons were tallied. Biologists suspect that these numbers represent only a fraction of the total mortality because many of the carcasses sank, were scavenged by predators, or were not found and tallied.

Most of the loons were killed in March and April before the adults fly to freshwater lakes for breeding. The relationship between marine wintering areas and freshwater breeding areas is not well understood for loons in western North America. However, because historical data on breeding Common Loons were available for 93 lakes in nearby areas of southcentral Alaska, ADF&G initiated follow-up surveys last summer on these lakes. These surveys included the northern Kenai, Anchorage and Matanuska-Susitna Valley. No loss of breeding adults in these areas was found, so it remains unknown where the Common Loons killed in the spill normally nest.

Although there appeared to be fewer Yellow-billed Loons killed by the spill, the deaths are of greater concern because their total population size is so much smaller. There are about 34,000 Common Loons in Alaska, but probably less than 5,000 Yellow-bills that nest in the state, which may represent half of the total world population. Thus, the mortality of Yellow-billed Loons probably represents the greatest population impact of the spill on any bird species.

To investigate the status of Yellow-bills breeding in Alaska following the spill, aerial and ground surveys were conducted on lakes in northern and northwestern Alaska known to have nesting Yellow-bills in the past. Dr. Judith McIntyre, a loon expert from Utica College, and Dr. Rebecca Field from the University of Massachusetts, coordinated the surveys with funds from the National Geographic Society, Exxon USA and the North American Loon Fund. No loss of breeding adults was found, although only about 10% of the breeding range was surveyed. Again, lack of historical and migratory data hindered knowing which breeding areas were affected.

Wintering populations of loons in the spill area will continue to be surveyed by biologists from the U.S. Fish and Wildlife Service. With this information, we may learn more about the status of these populations following the spill.
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Appendix B

Organizational Resources

Alaska Coastal Management Program
http://www.alaskacoast.state.ak.us/

Alaska Department of Environmental Conservation
http://www.dec.state.ak.us/

Alaska Dept. of Fish and Game
http://www.adfg.state.ak.us/

Alaska Division of Community Advocacy
http://www.commerce.state.ak.us/dca/commdb/CIS.htm

Alaska Ocean Observing System
http://www.aoos.org/

Alaska Regional Response Team
http://www.akrrt.org/

Alaska Resources Library and Information Services—Oil Spill Links
http://www.arlis.org/oillinks.php3

Alaska Sea Grant
http://seagrant.uaf.edu/index.html

Alaska SeaLife Center
http://www.alaskasealife.org/

Alaska Youth for Environmental Action
http://www.ayea.org/FAYEA.html

Alyeska Pipeline Service Co.
http://www.alyeska-pipe.com/default.asp

American Petroleum Institute
http://www.api.org/

Auke Bay Laboratory Exxon Valdez Oil Spill Research
http://www.afsc.noaa.gov/abl/oilspill/oilspill.htm

Center for Alaskan Coastal Studies
http://www.akcoastalstudies.org/
Coastal Response Research Center
http://www.crrc.unh.edu/index.htm

Cook Inlet Keeper
http://www.inletkeeper.org/

Cook Inlet Regional Citizens’ Advisory Council
www.circac.org

Cordova District Fishermen United
http://www.crsalmon.org/cdfu.html

Exxon Valdez Oil Spill Trustee Council
http://www.evostc.state.ak.us/

International Petroleum Industry Environmental Conservation Association (IPIECA)
http://www.ipieca.org/ipieca_info/about.php

Intertanko
http://www.intertanko.com/

Joint Pipeline Office
http://www.jpo.doi.gov/

National Audubon Society
http://www.audubon.org/

National Invasive Species Information Center
http://www.invasivespeciesinfo.gov/

National Wildlife Federation
http://www.nwf.org/

Nature Conservancy
http://www.nature.org/

NOAA National Marine Fisheries
http://www.nmfs.noaa.gov/

North Pacific Research Board
http://www.nprb.org/

Oil Spill Recovery Institute
http://www.pws-osri.org/
Oiled Regions of Alaska Foundation
http://www.orafoundation.org/index.cfm

Organization of the Petroleum Exporting Countries (OPEC)
http://www.opec.org/home/

Petroleum News
http://www.petroleumnews.com/cgi-bin/start.cgi/homeauto.html

Pratt Museum: Darkened Waters: Profile of an Oil Spill
http://www.prattmuseum.org/exhibitry/darkwater.html

Prince William Sound Aquaculture Corporation
http://www.pwsac.com/

Prince William Sound Keeper
http://www.pwsoundkeeper.org/

Prince William Sound Regional Citizens’ Advisory Council
www.pwsrcac.org

Prince William Sound Science Center
http://www.pwssc.gen.ak.us/

Sierra Club
http://www.sierraclub.org/

U.S. Coast Guard, Alaska District
http://www.uscg.mil/d17/

U.S. Environmental Protection Agency
http://www.epa.gov/

U.S. Fish and Wildlife Service, Alaska Region
http://alaska.fws.gov/

Washington State Oil Spill Advisory Council
http://www.governor.wa.gov/osac/

World Wildlife Fund
http://www.worldwildlife.org/
Appendix C

Maps

Areas oiled by the Exxon Valdez spill, 1989
http://www.pwsrac.org/resources/evosmap.html

Geographic Response Zones for Prince William Sound
http://www.dec.state.ak.us/spar/perp/grs/pws/home.htm

Hard Aground series (Anchorage Daily News)
http://www.adn.com/evos/pgs/maps.html

Long-term Environmental Monitoring Sites
http://www.pwsrac.org/resources/mapltemp.html

Overflight Maps (see hard copies)

Prince William Sound
http://www.pwsrac.org/resources/mappws.html

PWSRCAC Region
http://www.pwsrac.org/resources/mapscak.html

Tanker Lanes and Escort Zones in Prince William Sound
http://www.pwsrac.org/resources/mapzones.html
EXXON VALDEZ

Galt/Dahlin/Payton
1300-1500 26 March
overflight (NOAA)

147°

- heavy oil

bonds of heavy oil

Glacier Island

heavy coverage

Bligh Island

some grounded oil

rainbow sheen

fingers of oil with rainbow to gray sheen

Naked Island
Appendix D

Videos/DVDs and Photos

America’s Biggest Oil Spill (film)
www.worldcatlibraries.org/wcpa/top3mset/20592347

A Noble Experiment: The Story of the Prince William Sound Regional Citizens’ Advisory Council (film)
http://video.google.com/videoplay?docid=39275729294009273

NOAA Image Gallery

Ocean Ranger (documentary filmed in Newfoundland in the fall of 2001, chronicles the worst offshore drilling accident in North American history)
http://www.imdb.com/title/tt0368096/ (info only)

Photo Galleries: Prince William Sound Regional Citizens’ Advisory Council
http://www.pwsrcac.org/photogallery/galindex.html

Photo Gallery: Exxon Valdez Oil Spill Trustees Council
http://www.evostc.state.ak.us/Gallery/index.cfm

Sierra Club Chronicles: The Day the Water Died
http://video.google.com/videoplay?docid=-2200919808132393024

Toast (film that reveals our underlying dependence on fossil fuels)
http://www.bullfrogfilms.com/catalog/t.html

Uncertain Summer (documentary film based on reactions of Alaskans concerning leasing of the northeast Gulf of Alaska for oil exploration and production)
http://lrc.uaa.alaska.edu/media/details.php?catalogID=000961

Voices of the Sound (film)
http://web2.uaa.alaska.edu/web2/tramp2.exe/authority_hits/A1655cq9.001?server=aml&item=1
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Appendix E

Puzzles and Miscellaneous Resources

(see hard copies)
Exxon Valdez Oil Spill

Across
4. large vessel for carrying oil
5. bird species affected by the spill
6. people who helped during clean-up
7. month the Exxon Valdez ran aground
9. type of oil spilled
11. these were sprayed on spilled oil
12. name of reef the Exxon Valdez hit

Down
1. oil containment equipment
2. last name of captain of Exxon Valdez
3. marine mammal affected by the spill (2 wds)
8. fish species affected by spill
10. nearly 11 million of these spilled into Prince William Sound
Some Products Made from Petroleum

Across
5. roll these to see how lucky you are
6. blow these up for parties
9. cover your house with this
10. add this to your radiator
12. throw this on the field
14. take this to stop itching or sneezing
15. this helps you smell nice

Down
1. wear these on your feet
2. color your lips with this
3. carry your things in this
4. take a picture with it
7. wash your hair with it
8. fill your tank with this
11. sprinkle this on your lawn
13. knit with it
End of the Pipeline

Unscramble the tiles to reveal a message.
Mantra for Energy Conservation

Unscramble the tiles to reveal a message.

E U S R E C R E D E E , U C E , R Y C L
North America's Largest

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 3 |   | 21 |   |   |   |   |   |   |   |   |   |

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Shorebirds

Unscramble each of the clue words.
Take the letters that appear in boxes and unscramble them for the final message.
These Live in the Sea

Unscramble each of the clue words.
Take the letters that appear in boxes and unscramble them for the final message.
Prince William Sound Words

boom
coastline
crab
fish
gull
herring
mussel
oil
puffin
response
salmon
seaweed
seiner
shrimp
skimmer
spill
tanker
Prince William Sound Words Solution

C G + + + + P S + + + + + R L
S O N + + + + U A + + + + E E
E + A I + + + + F L + + + S S
I C + S R L I O + F M + + P S
N + R + T R + + + + I O + O U
E + + A + L E + + S + N N N M
R + + + B + I H + E F + + S +
+ + + + + + N G A + I + E S
+ + + + + + U E W + + S K T
P M I R H S L + + E + + I H A
L M + + + L + + + E + M + + N
+ L O + + + + + D M + + + K
+ + I O + + + + E + + + + E
+ + + P B + + + R + + + + + R
+ + + + S + + + + + + + + +
Things Made from Petroleum

candles
clothing
crayons
gasoline
gum
insulation
linoleum
paint
perfume
saccharine
soap
solvents
Things Made from Petroleum Solution

+ + + + + + E S I M S E S +
+ + + + + + N O N G U N N E +
+ + + + + I L S N + E O I L +
+ + + + L V U I + + L Y R D +
+ + + + O E L H + + + O A A N +
+ + S N A T + + G + N R H A +
+ A T T O + + S U + I C C C +
G S I L + + O + M + L + C + +
+ O C P + A + + + + + + A + +
N + + A P + + + + + + + S + +
+ + + I + + + + + + + + + + +
+ + + N + + + + P E R F U M E
+ + + T + + + + + + + + + + +
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ALASKA OIL SPILL CURRICULUM EVALUATION

Please complete and return this form to help us improve this curriculum and to be placed on the mailing list to receive notices of other materials and workshops. Thank you.

Name __________________________________________________ Grade Level ______________________

School ___________________________________________ Phone (s) ______________________

School Address __________________________________________

Home Address __________________________________ Phone (h) _______________

Oil Spill Curriculum Received: _______ grades K-3 ________grades 4-6 ________grades 7-12

Activities Used:

_____________________________________________________________________________________

_____________________________________________________________________________________

Number of students reached: ____________________________

Were the materials appropriate for the grade level of your class? ______________________________

Did the materials provide enough background information? _________________________________

Will you use the materials in future years? __________________________________________________

In what part of your curriculum did you use the materials? _______ Science ________ Math

______ Social Studies _______ Language Arts ________ Art _______ Other _______ (describe) 

Rate the curriculum generally on a scale of 1 (not so good) to 5 (great) _______________________

Would you recommend the curriculum to others? ____________________________________________

What were your students’ reactions to the curriculum? _______________________________________

What was the best feature of the curriculum? _______________________________________________

What additions would you suggest for the curriculum? _______________________________________

What should be deleted from the curriculum? _____________________________________________

Were the materials balanced? ___________________________________________________________

Please list other suggestions, activity ideas, or appendices additions on the back – or attach separate sheets.

RETURN TO: ALASKA OIL SPILL CURRICULUM, PWSRCAC, 3709 SPENARD ROAD, SUITE 100, ANCHORAGE ALASKA 99503. THANK YOU!