Conservation Can't Wait

Photo taken by Rolf Ream, NMML

Lab Program Curriculum
Grades 6-8

Program Description

This 45–60 minute lab program will introduce students to marine conservation and help them to understand how they can become involved. After a short discussion of the concept of conservation and what it means to them, students and chaperones will travel to four interactive learning stations. Here, students will learn about commercial fishing bycatch, try to clean up an oil spill, see bioaccumulation in action and find out how marine debris affects ocean life. Participating in this program and using the enclosed activities will help your students meet ODE Science Content Standards and national Ocean Literacy Principles.

Chaperones will be asked to take an active role in the lab program, which is designed so that they read informational cards to the students in their group. It will also be the chaperone's responsibility to monitor the students' behavior during the lab program.

Before your visit:

- Let your students try their hands at **Tangling With Trash**. Students will gain an understanding of what it might be like to be an animal tangled up in marine debris.
- Use the **Perilous Pollution** activity to help your students understand more about different types of pollution and their affects on marine mammals.
- Have your students discover what is recycled at school and at home. Use this as a way to show them that even a small action makes a difference to the planet.

During your visit:

- Provide your students and chaperones with copies of the **Oregon Coast Aquarium Self Guided Materials**. A master copy of the pages needed to create this booklet can be found on the Teacher Resources page at the Aquarium website, www.aquarium.org.

After your visit:

- Use the **Conservation Quilt** activity to have each student make a promise about what they will do to help protect the planet.
- Facilitate a **Conservation Inquiry Project** with your students to demonstrate relevant conservation possibilities in your school and community.

Cover Photo Photo Credit
National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, National Marine Mammal Laboratory.

Conservation Can't Wait addresses the following**:**

ODE Science Content Standards:

6.2 *Interaction and change*: The relative parts within a system interact and change.
6.2L.2 Explain how individual organisms and populations in an ecosystem interact and how changes in populations are related to resources.

6.3 *Scientific Inquiry*: Scientific inquiry is the investigation of the natural world based on observation and scientific principles that includes proposing questions or hypotheses, and developing procedures for questioning, collecting analyzing and interpreting accurate and relevant data to produce justifiable evidence-based explanations.

6.4 *Engineering Design*: Engineering design is a process of identifying needs, defining problems, developing solutions, and evaluating proposed solutions.
6.4D.3 Describe examples of how engineers have created inventions that address human needs and aspirations.

7.2 *Interaction and change*: The components and processes within a system interact.
7.2L.2 Explain the process by which plants and animals obtain energy and materials for growth and metabolism.
7.2E.1 Describe and evaluate the environmental and societal effects of obtaining, using and managing waste of renewable and non-renewable resources.

7.3 *Scientific Inquiry*: Scientific inquiry is the investigation of the natural world based on observation and scientific principles that includes proposing questions or hypotheses, and developing procedures for questioning, collecting analyzing and interpreting multiple forms of accurate and relevant data to produce justifiable evidence-based explanations.

7.4 *Engineering Design*: Engineering design is a process of identifying needs, defining problems, identifying constraints, developing solutions, and evaluating proposed solutions.
7.4D.3 Explain how new scientific knowledge can be used to develop new technologies and how new technologies can be used to generate new scientific knowledge.

8.2 *Interaction and Changes*: Systems interact with other systems.
8.2P.2 Explain how energy is transferred, transformed, and conserved.

8.3 *Scientific Inquiry*: Scientific inquiry is the investigation of the natural world based on observation and scientific principles that includes proposing questions or hypotheses, and developing procedures for questioning, collecting analyzing and interpreting multiple forms of accurate and relevant data to produce justifiable evidence-based explanations.

Ocean Literacy Principles:

Principle 4: The ocean makes Earth habitable.
A: Most of the oxygen in the atmosphere originally came from the activities of photosynthetic organisms in the ocean.

Principle 6: The ocean and humans are inextricably interconnected.
A: The ocean affects every human life. It supplies freshwater (most rain comes from the ocean) and nearly all Earth's oxygen. It moderates the Earth's climate, influences our weather, and affects human health.

B: From the ocean we get foods, medicines, and mineral and energy resources. In addition, it provides jobs, supports our nation's economy, serves as a highway for transportation of goods and people, and plays a role in national security.
C: The ocean is a source of inspiration, recreation, rejuvenation and discovery. It is also an important element in the heritage of many cultures.
D: Much of the world's population lives in coastal areas.
E: Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollution (such as point source, non-point source, and noise pollution) and physical modifications (such as changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.
G: Everyone is responsible for caring for the ocean. The ocean sustains life on Earth and humans must live in ways that sustain the ocean. Individual and collective actions are needed to effectively manage ocean resources for all.

Conservation
Background Information

What is Pollution?
Pollution is the addition of undesirable substances to an ecosystem.

Where Does it Come From?
There are two ways in which pollution can get into the water: directly or indirectly. Direct pollution can be dumped, poured or spewed directly into the water. An oil tanker spilling oil into the middle of the ocean would be an example of direct pollution.

Indirect pollution comes from another source (land or air) before it reaches the ocean. Eighty percent of water pollution comes from activities on land. From the land it is washed into rivers and streams and eventually into the ocean. A common type of indirect pollution is **runoff**. For example, when fertilizer is added to your lawn, some of that fertilizer will likely be washed down the nearest storm drain next time it rains or you water the lawn. The water from the storm drain, and the pollutants in it, will eventually end up in the ocean.

Effects on Marine Animals
Seabirds, marine mammals, fish and invertebrates are all affected by water pollution, but in different ways. Habitats can be ruined by pollution, leaving animals without a healthy place to live. Breeding and nursery grounds are especially susceptible to the effects of water pollution.


Sea otter

Ingesting pollutants can also be harmful, affecting the behavior, breeding and health of the animal. These effects can be seen directly or further along the food chain. In one study the levels of pollutants in harbor seals found in the North Sea were so high that the seals were declared toxic waste!

Some pollutants, such as oil, affect marine life from the outside in, rather than the inside out. Birds and otters are especially sensitive because they rely on their feathers or fur to survive. Once its feathers are soaked in oil, a bird can no longer keep itself warm and becomes too heavy to fly. Sea otters, who have no blubber and depend on their thick fur to keep them warm, are also in danger of hypothermia once their fur is covered in oil.

Effects on Humans
It may make you sick just thinking about pollution, but did you know water pollution could really make you sick? Marine animals are not the only ones who can get sick from swimming in polluted waters; humans are at risk too. Even without going near the ocean, pollution can be dangerous to humans who eat fish or other seafood from polluted waters.

What Can We Do?
Stop pollution before it starts! Many of the products that we use in our households (oven cleaner laundry detergent, gas and fertilizers) contain some type of chemicals. These chemicals may be harmful to marine animals even in small amounts.

There are safer alternatives for many household cleaners. For example, instead of using scouring powder to clean a sink stain, try a damp cloth dipped in baking soda. For tougher jobs, try using steel wool. Three tablespoons of baking soda mixed with one quart of warm water can be used to clean your oven. A soft cloth and mayonnaise or one part lemon juice and two parts vegetable oil makes an effective furniture

polish substitute. In the yard, replace chemical fertilizers with compost from the kitchen and yard wastes such as grass clippings and leaves.

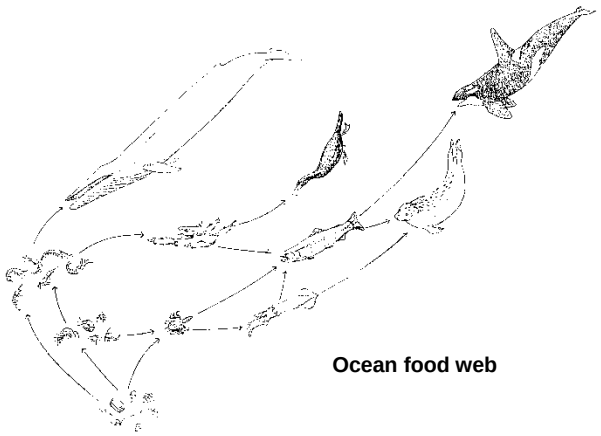
You can also try to reduce your use of harmful chemicals, properly dispose of the chemicals that you do use and don't pour anything toxic down storm drains. Get involved and educate others by stenciling (identifying) your local storm drains so that people will be less likely use them as dump sites.

Bioaccumulation and Biomagnification

Bioaccumulation is a natural and essential process that organisms use to accumulate vitamins, minerals and essential amino acids necessary for growth. However, bioaccumulation can be harmful when pollutants find their way into the ocean. **Bioaccumulation** is the increase of pollutant concentration over time in an organism relative to pollutant concentration in the environment. **Biomagnification** is the increase in concentration from one link of a food chain to the next. Bioaccumulation refers to how pollutants enter the food chain, while biomagnification refers to the tendency of the pollutant to become concentrated as it moves up the food chain.

How Does it Happen?

When pollutants enter the ocean they can be absorbed by plankton. These drifting plants and animals create the base of the food chain, and the pollution continues to move up from there.



Ocean food web

The following is an example of how bioaccumulation might affect a food chain found in the ocean. One day Charlie decides to wash the car and then rinse the soap and water down the driveway and into a storm drain. The toxic chemicals in these products are now on their way to the ocean, where they will be absorbed by zooplankton. A herring swims by and begins feeding, unknowingly swallowing a mouthful of contaminated plankton, ingesting the toxins along with it. The herring has already begun to increase the concentration of pollutants compared to its surrounding environment, but let's see where it goes from there. Next, a larger fish called a lingcod eats several herring and the toxins are passed on and concentrated again. Finally, the toxic lingcod are eaten by a killer whale where the toxins are now concentrated enough to affect behavior, cause birth defects, and lower resistance to disease.

Effects on Marine Animals

The accumulation of pollutants can affect marine animals in different ways. There are both lethal and sub-lethal effects. Sub-lethal effects may affect the behavior of the animal, its reproductive success or its ability to escape from predators or fight off disease. These effects can also be passed on to the animal's offspring, which can be seen in shell thinning in seabirds. Birds that consume contaminated fish lay eggs with thin shells that lower the survival rate of their chicks. In marine mammals, pollutants can also be passed from mother to a newborn through the mother's milk. Large, long-lived animals with abundant fatty tissue and low metabolic rates are the most susceptible to the effects of bioaccumulation, putting marine mammals at high risk.

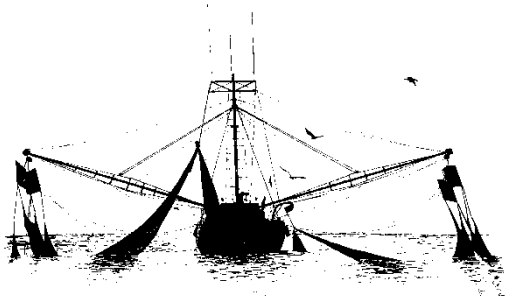
Effects on Humans
As members of the food chain, humans are also affected by bioaccumulation and biomagnification. People can become sick from eating fish that have accumulated toxins. These processes can also affect the fishing industry by polluting their catch.

Fishing for Solutions

What is Bycatch?
A **target species** is exactly what it sounds like it might be—it's the fish or invertebrate species that a fisherman *wants* to catch. **Bycatch** is everything else a fisherman catches besides their target species. Bycatch can be anything from marine mammals, birds and reptiles to other species of fishes and sharks. Bycatch also includes animals protected by fishing regulations. They may be too small, too large or federally protected species.

Effects on Marine Animals
Bycatch comprises around 25 percent of all commercial fisheries every year—over 20 million tons. Bycatch is discarded overboard, often dead or dying. **Discards** may include not only unwanted bycatch animals, but also target species that may be of poor market quality or in excess of their limit or quota. Some animals are released alive. Marine mammals, turtles, and to a lesser extent fishes and sharks may all be released alive if found in time. However, stress and injury of capture and handling may result in death or an increased risk of predation after release.

Effects on Humans
Bycatch is wasteful and unwanted by fishermen and environmentalists alike. For fishermen, bycatch takes up hooks or space that could have accommodated target species. It may damage gear and takes time and effort to sort and dispose of. Some fisheries are managed so the entire fishery is shut down when a certain level of bycatch is reached. Bycatch becomes an environmental problem when it affects populations of bycatch species, ocean food chains or the marine environment. Even though a target species fishery might be healthy, a bycatch species may become extinct before we become aware of the problem.


Commercial seiner

What Can We Do?
There are many ways to reduce bycatch. Certain areas or seasons can be closed to protect bycatch species. Fishing skill and equipment also play a role. Traps and pots are an alternative way to catch shrimp and produce less bycatch than trawl nets (which drag the seafloor).

"Pingers" can be installed on drift nets and longlines to discourage sound-sensitive marine mammals. Fishing at deeper depths, fishing at night, flying streamers above your gear and the use of dyed bait all reduce seabird bycatch. Bycatch Reduction Devices (BRDs) and Turtle Excluder Devices (TEDs) can be installed to allow unwanted animals to escape. The use of more selective fishing gear and methods can greatly reduce bycatch but may increase the costs to both fishermen and consumers.

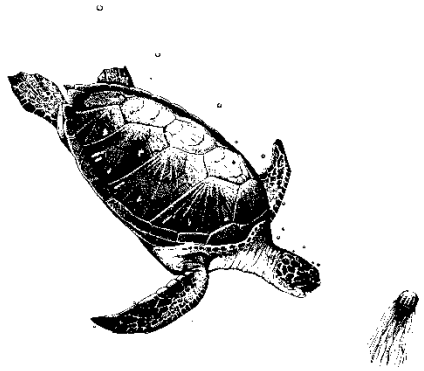
Many people are familiar with the dolphin-safe tuna label. You can now opt to buy only turtle-safe shrimp, as well. The Marine Stewardship Council is developing an ocean-friendly label for products that are fished or produced in sustainable ways. When you buy seafood or eat in a restaurant, ask questions about how the fish was caught and if the store or restaurant buys seafood that is fished responsibly

Marine Debris

What is Marine Debris?
Marine debris is any object of wood, glass, rubber, plastic—or any man-made item—that has been lost or discarded in the marine environment. The debris may have been intentionally dumped, accidentally dropped or indirectly deposited from the land. Marine debris may sink to the seafloor, drift in the water column, or float on the surface of the sea.

Whenever trash finds its way into the ocean, wildlife is at risk. Thousands of marine animals die each year from entanglement in fishing line, strapping bands, discarded ropes and nets and plastic six-pack rings. In addition to entanglement, many marine animals confuse plastic items for food, which can cause internal injury, intestinal blockage or starvation.

Plastic is unique due to its lightweight and durability. This, along with its frequent use, makes plastic the most commonly observed type of marine debris, as well as the deadliest.
Plastic can take hundreds of years to biodegrade; so one mistake could last generations.



Effects on Marine Animals
In general, the effects of an encounter with marine debris are known only for individual animals, not for the population as a whole. The exceptions are endangered species, such as sea turtles, whose current populations are so small that any additional source of mortality may threaten the survival of the species.

Marine Mammals
Evidence suggests that the greatest threat to marine mammals is getting caught in discarded fishing nets and other plastic debris. Seals are the most common marine mammals to become entangled in marine debris. Fur seals entangled in debris were spotted as early as the 1930s, and at one time it was estimated that 50,000 northern fur seals died each year from entanglement. Recent studies show this number has dropped to about 30,000 a year, most likely due to a reduced population of fur seals and lower entanglement rates.

Many marine mammals eat plastic, mistaking it for food. Of the 115 species of marine mammals, 49 are known to have swallowed plastic debris. Plastic sheeting has been found in the stomachs of pygmy whales, sperm whales, round-toothed dolphins and a Cuvier beaked whale.

Seabirds
Seabirds may also become entangled in marine debris such as fishing nets, fishing line, kite string and plastic bags. In addition, seabirds often ingest plastic pellets, mistaking them for fish eggs. Of the 312 species of seabirds, 111 are known to have ingested plastics.

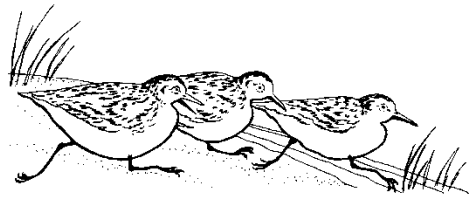
Sea Turtles
All of the eight known species of sea turtles have been designated as either threatened or endangered under the U.S. Endangered Species Act. Sea turtles are more affected by ingesting marine debris than by getting caught in it. They will often ingest plastic bags because they mistake them for jellyfish. They may also ingest Styrofoam, fishing line or several other kinds of marine debris.

Fishes and Invertebrates
The most common problems for fish are getting caught in lost gill nets and ingesting plastic resin pellets. Fish may also become trapped in larger floating debris where they can asphyxiate, starve or become unable to escape from predators.

Animals that live in the sand can become smothered by plastic sheeting, filter feeders may consume microplastics and crabs may be stranded in lost crab traps.

Effects on Humans
Marine debris also endangers the safety and livelihood of fishermen and recreational boaters. Nets and fishing line can get tangled in boat propellers. Plastic sheeting and bags can block cooling intakes. In a survey conducted in Newport, Oregon, 58 percent of the fishermen indicated they had experienced vessel problems due to plastic debris.

What Can We Do?
Reduce, recycle, reuse! Start by reducing the amount of packaging you use, and then make sure it is disposed of properly. Keep debris from entering the ocean in the first place, and then bring a bag with you when you go to the beach to pick up trash you do find.



Adapted from the Center For Marine Conservation Web site (http://www.cmc-ocean.org) Used with permission.

Tangling with Trash

Lesson at a glance:
Students will better understand how marine debris affects marine mammals.

ODE Science Content Standards:
7.2E.1 Describe and evaluate the environmental and societal effects of obtaining, using and managing waste of renewable and non-renewable resources.

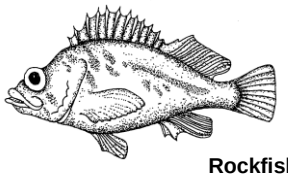
Ocean Literacy Principles:

Principle 6: The ocean and humans are inextricably interconnected.

E: Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollution (such as point source, non-point source, and noise pollution) and physical modifications (such as changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.

G: Everyone is responsible for caring for the ocean. The ocean sustains life on Earth and humans must live in ways that sustain the ocean. Individual and collective actions are needed to effectively manage ocean resources for all.

Materials:
- Rubber bands (one per student)


Rockfish

Background Information:
Trash floating in the ocean, called marine debris, is a big problem for many animals including fish, seabirds and marine mammals. For example, a six-pack ring, fishing line or fishing net can get caught around a fish, bird or marine mammal's body, causing the animal to starve or succumb to infection as a wound develops where the debris applies pressure. This is because as the animal grows, the marine debris doesn't. These animals, once caught, find it hard to free themselves. Marine birds and mammals may also become entangled in commercial fishing nets, since they are attracted to the fish caught in the net. Nets are difficult to see underwater, and many animals swim into them and become trapped. In this situation they will inevitably drown.

Activity:
1. Have each student hook one end of the rubber band around his or her pinky finger.
2. Have each student stretch the rubber band across the back of his or her hand and hook it onto his or her thumb.
3. Now have each student try to remove the rubber band without touching anything or using his or her other hand. Are they able to do it?
4. Discuss how the severity of the entanglement would be much more severe for a wild marine animal.

Suggestions:

1. Have students time each other as they try to untangle themselves.
2. Graph and discuss the results.

Summary:

1. How many students were successful at freeing themselves from the rubber band? How many were not? Discuss how this might be a realistic example of the number of animals that are able to free themselves.
2. Have a class discussion about how trash enters the ocean and what the students can do to help keep trash out of it.

Extensions:

1. Have students make a list of items that could potentially become marine debris and entangle various marine mammals.
2. Have students research the two marine mammal species that are probably the most susceptible to marine debris entanglement (the Hawaiian monk seal and the right whale) due to their range (in close proximity to heavy commercial fishing activity and debris accumulation) and already seriously depleted populations.
3. Organize a field trip for your class to clean up a beach, perhaps as part of either the fall or spring Oregon Beach Cleanup.

   For beach clean up information contact:

   SOLV
   PO Box 1235
   Hillsboro, OR 97123
   1-800-322-3326

Adapted from "All Tangled Up," Educational Insights ©1991.

Perilous Pollution

Lesson at a glance:

Students will learn about different types of pollution and the effects on marine mammals in this interactive survival game where students use math and agility to survive.

ODE Science Content Standards:

6.2 *Interaction and change*: The relative parts within a system interact and change.
6.2L.2 Explain how individual organisms and populations in an ecosystem interact and how changes in populations are related to resources.

7.2 *Interaction and change*: The components and processes within a system interact.
7.2L.2 Explain the process by which plants and animals obtain energy and materials for growth and metabolism.

8.2 *Interaction and Changes*: Systems interact with other systems.
8.2P.2 Explain how energy is transferred, transformed, and conserved.

Ocean Literacy Principles:

Principle 6: The ocean and humans are inextricably interconnected.

E: Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollution (such as point source, non-point source, and noise pollution) and physical modifications (such as changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.

G: Everyone is responsible for caring for the ocean. The ocean sustains life on Earth and humans must live in ways that sustain the ocean. Individual and collective actions are needed to effectively manage ocean resources for all.

Materials:

- ❑ Obstacle-free playing area
- ❑ Watch with second hand timer
- ❑ Bags of candy with different colored wrappers or large colored beads (approximately five pieces per student)
- ❑ Paper and pencils for students to add up calories

Background information:

Marine debris is any object of wood, glass, rubber, plastic—or any man-made item—that has been lost or discarded in the marine environment. The debris may have been intentionally dumped, accidentally dropped or indirectly deposited from the land. Marine debris may sink to the seafloor, drift in the water column, or float on the surface of the sea.

Whenever trash finds its way into the ocean, wildlife is at risk. Thousands of marine animals die each year from entanglement in fishing line, strapping bands, discarded ropes and nets and plastic six-pack rings. Seals are the most common marine mammals to become entangled in marine debris. Fur seals

entangled in debris were spotted as early as the 1930s, and at one time it was estimated that 50,000 northern fur seals died each year from entanglement. Recent studies show this number has dropped to about 30,000 a year, most likely due to a reduced population of fur seals and lower entanglement rates.

Many marine mammals eat plastic, mistaking it for food. Of the 115 species of marine mammals, 49 are known to have swallowed plastic debris. Plastic sheeting has been found in the stomachs of pygmy whales, sperm whales, round-toothed dolphins and a Cuvier's beaked whale. Plastic is unique due to its lightweight and durable composition. This, along with its frequent use, makes plastic the most commonly observed type of marine debris, as well as the deadliest. Plastic can take hundreds of years to biodegrade; so one mistake could last generations.

What can you do?
Reduce, recycle, reuse! Start by reducing the amount of packaging you use, and then make sure it is disposed of properly. Keep debris from entering the ocean in the first place, and then bring a bag with you when you go to the beach to pick up trash you do find.

Activity:
As a class, discuss the causes and effects of marine debris on marine mammals.

1. Assign point values (calories) to each of the different kinds of candy (or beads). For example: yellow = 10 points, pink = 15 points, orange = 20 points, red = 30 points and chocolate =3 points.

   Note: Point values can be adjusted to accommodate different grade levels and math skills, including fractions and decimals.

2. Divide students into five groups and assign one marine mammal per group. For example: each student in Group 1 will be a seal, Group 2 a sea lion, Group 3 a sea otter, Group 4 a gray whale, and Group 5 a killer whale.

3. Play the following game, which consists of three rounds. At the end of each round students should record their data in table format. At the end of all three rounds this data can be represented in a graph individually and as a group.

   Round 1:

   - Sprinkle candy over playing area.
   - Give students thirty seconds to gather as much candy as possible without running or pushing.
   - Instruct students to return to their desks (or other designated area) and record their calorie totals.
   - Once totaled, collect all of the candy.
   - Tell students that their total from Round 1 will be the number of calories they need to get from each round to survive from then on.

   Round 2:

   - Sprinkle candy over playing area.
   - Assign some of the marine mammals (students) injuries obtained from marine debris. For example: Two seals have become caught in six-pack rings and now

collect their food with only one hand; one sea lion has fishing line wrapped around its flippers and must collect food on its hands and knees; three sea otters have ingested plastics and must collect food with their hands behind their backs; one gray whale is tangled in a ghost net and must collect food while hopping on one leg; etc. Be sure to leave some animals injury-free. Have fun and get creative!

- Give students 30 seconds to gather as much candy as possible, keeping in mind their injuries.
- Instruct students to return to their desks (or other designated area) and record their calorie totals.
- Once totaled, collect all of the candy.
- If the totals from Round 2 do not meet or exceed the totals from Round 1, their animal does not survive to Round 3.

Round 3:

- Sprinkle candy over the playing area one last time.
- Students that have survived must keep their injuries, and injury-free students will remain unharmed.
- Non-survivors will record results from Round 2 and observations from Round 3 on their paper.
- Give students 30 seconds to gather as much candy as possible.
- Instruct students to return to their desks (or other designated area) and record their calorie totals.
- After students tally up their final totals and before collecting the candy, inform students that all of the red candies (or any other specific type) were plastic bags that they swallowed mistakenly and tell them to subtract 15 points for each one and figure out their new totals.
- Go over totals to see who the final survivors are.

4. Students should record Discuss the results with your class.
5. Help eradicate pollution by eating all of the candy! OR use the beads to create a necklace or bracelet.

Extensions:

- Collect data on the front board to monitor the population change of marine mammals.
- Go through the activity **Tangling with Trash** to further understand entanglement in marine debris.
- Have students design marine mammal friendly fishing nets.

Conservation Quilt

Lesson at a glance:
In this lesson, students will research a specific marine animal and share what they learned on one side of a paper quilt square. On the other side, they will write a conservation pledge or message. As a class, students will connect their squares to make a conservation quilt.

ODE Science Content Standards:

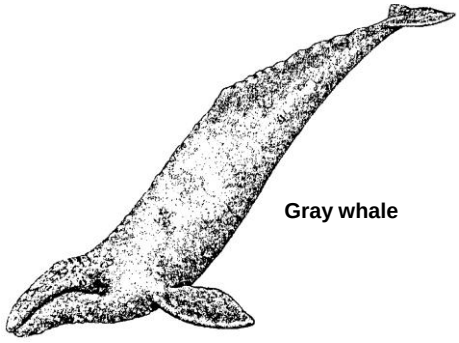
6.2L.2 Explain how individual organisms and populations in an ecosystem interact and how changes in populations are related to resources.

Ocean Literacy Principles:

Principle 5: The ocean supports a great diversity of life and ecosystems.
Principle 6: The ocean and humans are inextricably interconnected.

Materials:

- Marine animal resources
- Card stock paper
- Quilt square pattern (provided)
- Crayons, pens and/or colored pencils
- Hole punch
- Hole reinforcers
- Yarn



Activity:

Preparation:

1. Copy the quilt square pattern onto card stock paper (at least one quilt square per student).
2. Use your hole punch to punch holes as marked on the quilt square pattern.
3. Stick hole reinforcers around each hole.
4. Cut the yarn into six-inch pieces. You will need eight pieces of yarn per quilt square.
5. Gather marine animal resources for your students.
6. Introduce your students to the research process if they are not already familiar with it.

Activity:

1. Introduce your students to the ocean habitat and marine conservation issues.
2. Assign each student a marine animal to study or allow them to choose their own.
3. Here is a list of questions on which your students might want to focus their research:
   - Where is my animal's natural region and habitat?
   - What is the natural history of this animal?
   - How does this animal fit into the natural food web of the ocean?
   - Does it migrate to find food or a mate?
   - Is my animal endangered or threatened? Why?
   - How do humans affect my animal's survival?

4. Provide students with opportunities to visit the library or use the Internet to research their project. Remind them that when using the Internet, they might encounter sites that provide what might seem to be accurate information, but a second reliable source should

also be used. Some sites you can assume are reputable, Oregon Coast Aquarium, www.aquarium.org ; Sea World's, www.seaworld.org ; National Wildlife Federation, www.nwf.org; The Ocean Conservancy, www.oceanconservancy.org.

5. Once your students have gathered all of their information, have them write a paragraph about their animal (on a piece of paper other than their quilt square). The paragraph should include facts about the marine mammal that they researched as well as any conservation efforts that may be related.
6. Hand out the quilt squares.
7. Once their paragraph has been checked for grammar and punctuation, have your students write their final paragraph somewhere on their blank quilt square. Remind them that they should leave room for a drawing of their animal.
8. Have students draw their animal. Ask them color their animals as true to their actual color as possible.
9. On the backside have them write a conservation pledge: I will do _____ to help protect the _____'s survival.
10. As students finish decorating their quilt square, begin tying the squares together with yarn. Use one piece of yarn for each hole punched in the square.
11. As the students tie their square onto the quilt, have them share about their animal as well as their conservation pledge to the rest of the class.

Suggestion:

Before you begin tying your squares together, select an area that is appropriate for hanging the final quilt. Have students measure the area and decide how many squares they should tie together (in a row) so that their quilt will fit in the space allotted.

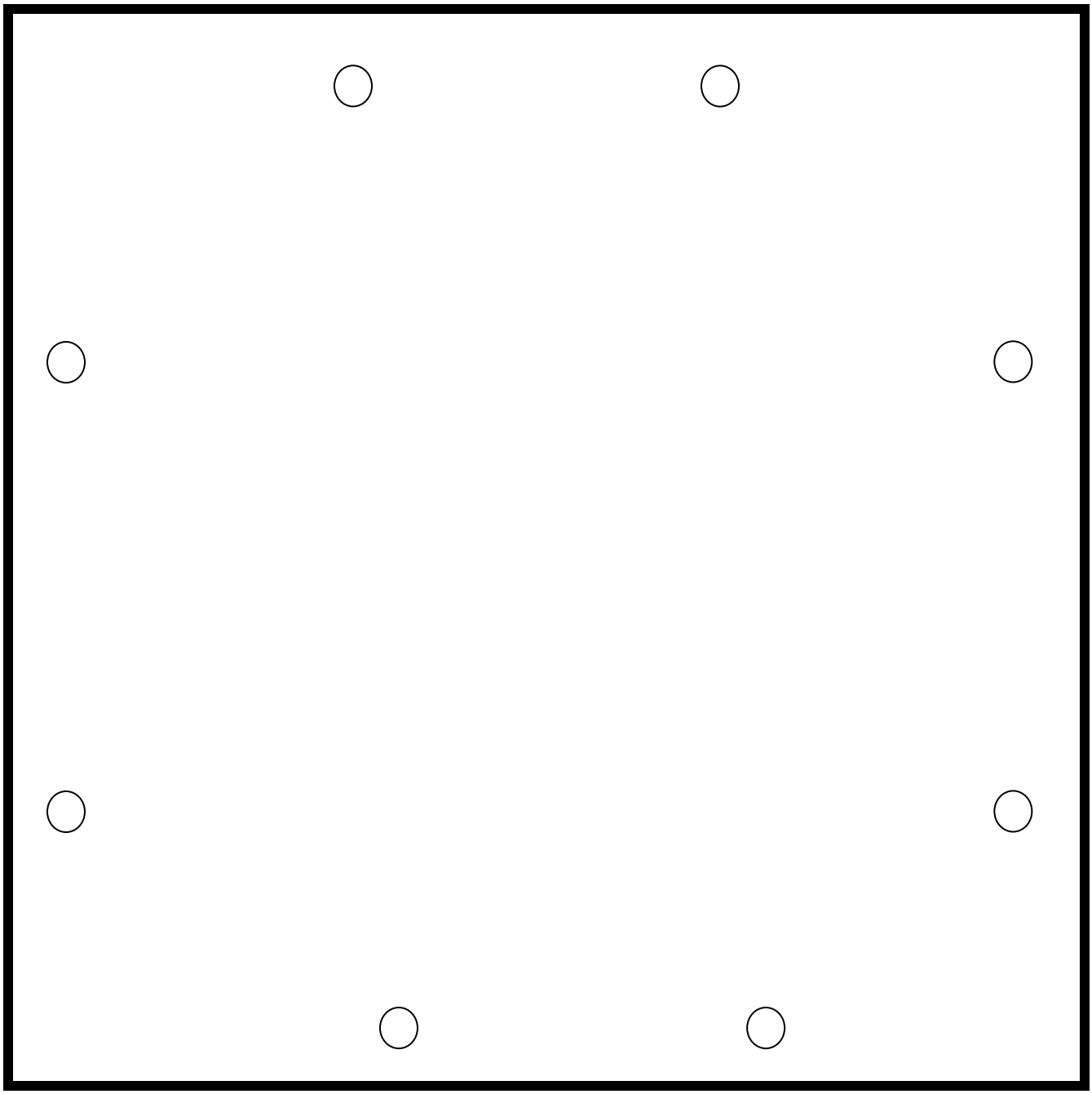
Summary:

Display your class quilt on the wall in your classroom or hallway.

Extension:

1. Have students complete a full research project on their marine animal, including an oral presentation.

Quilt Square Pattern



Conservation Inquiry Project

Lesson at a glance:

This project will demonstrate inquiry techniques to students allowing them to investigate conservation strategies at their school, collect data, and communicate explanations and possible solutions to the community.

ODE Science Content Standards:

6.3 Scientific Inquiry: Scientific inquiry is the investigation of the natural world based on observations and science principles that includes proposing questions or hypotheses, and developing procedures for questioning, collecting, analyzing, and interpreting accurate and relevant data to produce justifiable evidence-based explanations.

6.3S.1 Based on observations and science principles, propose questions or hypotheses that can be examined through scientific investigation. Design and conduct an investigation that uses appropriate tools and techniques to collect relevant data.

6.3S.2 Organize and display relevant data, construct an evidence-based explanation of the results of an investigation, and communicate the conclusions.

7.3 Scientific Inquiry: Scientific inquiry is the investigation of the natural world based on observation and scientific principles that includes proposing questions or hypotheses, and developing procedures for questioning, collecting analyzing and interpreting multiple forms of accurate and relevant data to produce justifiable evidence-based explanations.

7.3S.1 Based on observations and science principles, propose questions or hypotheses that can be examined through scientific investigation. Design and conduct a scientific investigation that uses appropriate tools and techniques to collect relevant data.

7.3S.2 Organize, display, and analyze relevant data, construct an evidence-based explanation of the results of an investigation, and communicate the conclusions including possible sources of error.

8.3 Scientific Inquiry: Scientific inquiry is the investigation of the natural world based on observation and scientific principles that includes proposing questions or hypotheses, and developing procedures for questioning, collecting analyzing and interpreting multiple forms of accurate and relevant data to produce justifiable evidence-based explanations.

8.3S.1 Based on observations and science principles, propose questions or hypotheses that can be examined through scientific investigation. Design and conduct a scientific investigation that uses appropriate tools, techniques, independent and dependent variables, and controls to collect relevant data.

8.3S.2 Organize, display, and analyze relevant data, construct an evidence-based explanation of the results of a scientific investigation, and communicate the conclusions including possible sources of error. Suggest new investigations based on analysis of results.

Ocean Literacy Principles:

Principle 6: The ocean and humans are inextricably interconnected.

Materials:

- Dependent on inquiry project

Activity:

Preparation:

1. Introduce your students to the process of scientific inquiry if they are not already familiar with it.
2. Review with students the conservation themes that they discussed in their lab program.
3. Discuss ideas that they already have about how they can conserve in their own everyday lives. Spend time researching green practices or current issues in the news or in your community.

Activity:

1. Propose a question to research:
    a. Group students into groups. Each group can do a different project or collect data using different methods for the same project (surveys, observations, interviews, etc.)
    b. As a group brainstorm different projects that they could investigate. During this step have students realistically determine whether the question is testable with the resources available to you.
        i. Example topics: Amount of energy (electricity) the school consumes and possible alternatives. Type of vehicles the school uses (parents, staff, busses) and efficiency of these vehicles. Waste production and recycling programs. Other green practices involving renewable vs. nonrenewable energy production.
2. Collect evidence:
    a. There are many ways evidence can be collected depending on the project chosen. Students could interview staff, parents or other community members or scientists. Surveys could be conducted with entire school population. Observations could be made throughout the school and community. Historical data could be collected at a local library or city hall.
3. Construct evidence-based explanations:
    a. Using collected data student groups should determine an explanation and/or argument to present
4. Present information:
    a. Each group should present their findings in some manner. This can be a presentation to the class, posters or banners in the school, presentations to administrators or local community members with their findings and suggested points of action.

Suggestion:

For each of the above steps give as much or as little direction that your students might need. Younger students, or students not as familiar with inquiry projects, might need more direction. Students will be more invested if it is a topic that they themselves choose. The ultimate outcome should be some sort of action project for the classroom, school or community.

Assessment:

Conservation Inquiry Project

Student Name: _____

CATEGORY	Outstanding	Strong	Basic	Developing
Planning	Planning is thorough and detailed with descriptive steps to investigation.	Planning is thorough with clear steps for investigation.	Planning is somewhat clear with general steps for investigation.	Planning is missing many steps and is not organized very clearly.
Notetaking	Careful data is collected in an extremely organized format. Information is put into the student's own words, or proper quotation format is used.	Careful data is collected an organized format. Information is put into the student's own words; proper quotation format is usually used.	Some data is collected from sources, and are in a relatively organized format. Most information is put into the student's own words; proper quotation format is sometimes used.	Limited data is collected and is poorly organized. Information is sometimes put into the student's own words; very little sign of proper quotation format being used.
Content	The student clearly and convincingly answers their investigation question. Powerful supporting details are provided from a variety of resources.	The student adequately answers their investigation question. Supporting evidence is provided from several sources.	Some attempt is made by the student to answer their investigation question. Some supporting evidence is provided from more than one source.	Little or no attempt is made by the student to answer their investigation question. Little or no supporting evidence is provided.
Clarity	Information is organized in a way that engages the audience. Vocabulary is well chosen for the purpose and audience. Very limited errors in spelling, grammar, and/or sentence structure.	Information is well organized. Vocabulary is appropriate for the purpose and audience. Few errors in spelling, grammar and/or sentence structure.	Information has a general structure, but can be difficult to follow in places. Some difficulty choosing appropriate vocabulary for purpose and audience. Some errors in spelling, grammar and/or sentence structure.	Information is poorly organized and is difficult to follow. Vocabulary is not appropriate for the purpose and audience and distracts from the effectiveness of the project. Many errors in spelling, grammar and/or sentence structure.
Voice Quality and Body Language	When presenting, voice (volume, tone, inflection, pace) is used for great effect. Student uses appropriate posture, eye contact, and gestures all of the time.	When presenting, voice (volume, tone, inflection, pace) is used effectively most of the time. Student uses appropriate posture, eye contact, and gestures most of the time.	When presenting, voice (volume, tone, inflection, pace) is used effectively some of the time. Student uses appropriate posture, eye contact, and gestures some of the time.	When presenting, voice (volume, tone, inflection, pace) is rarely used effectively. Student uses little, if any, eye contact. Posture and gestures are inappropriate.

Visual presentation	The project is exceptionally attractive and appealing. It is very evident that the student put a considerable amount of time and effort into preparing their project for presentation. The project format greatly enhances the audience's understanding of the material.	The project is attractive and appealing. It is evident that the student put time and effort into preparing their project for presentation. The project format effectively supports the audience's understanding of the material.	The project is somewhat attractive and appealing. The student spent some time and effort into preparing their project for presentation. The project format provides some support for the audience's understanding of the material.	The project lacks visual appeal. It is evident that little effort was put into preparing the project for presentation. The project format does little, if anything to support audience understanding of the presentation.