

TURNING THE TIDE ON TRASH

A LEARNING GUIDE ON MARINE DEBRIS

SOURCES: THE US ENVIRONMENTAL PROTECTION AGENCY (EPA) AND
THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)



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Covering nearly three-quarters of the Earth, the ocean is an extraordinary resource. The ocean supports fishing industries and coastal economies, provides recreational opportunities, and serves as a nurturing home for a multitude of

marine plants and wildlife. Unfortunately, the ocean is currently under considerable pressure. The seeming vastness of the ocean has prompted people to overestimate its ability to safely absorb our wastes. For too long, we have used these waters as a receptacle for our trash and other wastes.

TURNING THE TIDE ON TRASH

Individual citizens – including young students – can become an immediate part of the solution. That's because all marine debris can be traced back to a single source – people. For the last few decades, a great deal of our solid waste stream has consisted of durable synthetic materials that remain in the environment, causing harm to wildlife and habitat along the way. With the world's coastal populations on the rise, it is likely that the amount of debris entering the oceans will also increase. Consequently, it is important that we act now to keep debris out of our oceans and waterways and preserve the quality of the marine environment.

Connecting People's Behavior to Marine Debris

Marine debris is any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment. It can enter the environment either directly through human action or indirectly when blown or washed out to sea via rivers, streams, and storm drains/sewers.

One of the most important messages of this learning guide is that any trash that is disposed of improperly can potentially enter the ocean or other waterways, and anyone who disposes of trash improperly can be a source of marine debris! Hopefully, when people are educated about the sources and effects of marine debris, they will be less likely to contribute to the problem.

The lessons in this learning guide are designed to increase students' awareness of the impacts of marine debris and to teach them about pollution prevention techniques. At the same time, the activities strive to inspire an appreciation of the ocean and a commitment to the preservation of its water quality, beauty, and wildlife.



Other Pollution in the Ocean

Marine debris is not the only form of marine pollution. Marine pollution also includes forms of sewage, oil, gasoline, toxic chemicals, fertilizer, animal wastes, and pesticides that are released on land or empty into the ocean.

Education

Education is the first step to lasting, effective solutions. Marine debris is an issue that will require continued attention for generations to come. It is essential that education start with the decision-makers of the future – our children. Unlike many environmental issues, children can play a direct and significant role in reducing the marine debris problem. Every child who learns to dispose of trash properly can be one less source of litter and marine debris. Every child who volunteers to participate in a local beach cleanup campaign can help to improve the current marine debris problem. And every child who influences one or more adults in their life to reduce their use of plastic and to properly dispose of their trash can make a difference. We need to help ensure the future welfare of our ocean by instilling in our young people an environmental ethic that will last a lifetime.

FOR INLAND CLASSROOMS

Although this learning guide focuses on marine debris, trash is found in other aquatic environments such as ponds, lakes, rivers, and streams, most of the concepts associated with marine debris can apply to all aquatic debris. Therefore, the use of this learning guide should not be limited to coastal areas. Teachers in inland communities can replace the term marine debris with aquatic or waterborne debris.



The Definition, Characteristics, and Sources of Marine Debris

Marine debris is any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment. It may enter directly due to human action, or indirectly when washed out to sea via rivers, streams and storm drains. Marine debris has become one of the most pervasive pollution problems facing the world's oceans and waterways.

Two characteristics of some types of marine debris – buoyancy and the ability to be blown around – affect how easily an item becomes marine debris, while the ease with which debris degrades dictates how long it remains intact in the marine environment. However, not all debris is buoyant, and some debris will sink underwater and out of sight. There are several sources of marine debris, both on the ocean and on land, but the majority of marine debris comes from the land (80%). Proper collection, handling, and disposal of trash, as well as reduction of consumption and packaging can help to reduce the marine debris problem. Marine debris includes objects that typically do not naturally occur in the marine environment (i.e., oceans, salt marshes, estuaries, and beaches).

What Trash Management Practices Can Reduce the Marine Debris Problem?

Practicing the “3 Rs” (reduce, reuse, recycle), plus proper disposal of trash will go a long way to reducing the amount of marine debris.

“Recycling” is one way to reduce the amount of trash that must be disposed. Recycling is the collection and reprocessing of materials so they can be used again. Recycling not only reduces the amount of solid waste going to landfills, but also prevents the emission of many greenhouse gases and water pollutants, saves energy, supplies valuable raw materials to industry, creates jobs, stimulates the development of greener technologies, conserves resources for the future and reduces the need for new landfills and combustors.

“Reduce” and “Reuse”: Ways to Produce Less Waste

Adopting pollution prevention strategies that produce less waste in the first place is an even better solution than recycling alone. There are many ways to produce less waste, including reusing materials, using reusable items rather than disposable ones, and reducing the amount of packaging that is used. For example, when shopping, use fabric bags instead of the plastic or paper bags provided by stores, and purchase items that have less packaging. Carry water in a reusable bottle rather than buying multiple bottles of water.

Keeping Trash Out of the Ocean

Marine debris can only be truly managed by changing the behavior that causes it to enter the environment. Proper disposal of trash is the responsibility of every business, boater, and person. Boaters should ensure that trash and other items do not blow away, and that they bring back all of their trash to shore to dispose of it properly. Before trash is left out for collection, it should be tightly secured in bags or trash cans with secured lids. Garbage trucks should always be covered, and landfills should be fenced in to capture any trash that may temporarily escape. Industrial facilities that produce, transport, or use plastic resin pellets⁺ can modify handling processes to control the accidental release of materials into the environment. All of these methods can help to ensure that trash is put, and stays, in its proper place.

⁺ Before plastics are molded into the products we use, they are first produced as plastic resin pellets the size of rice grains – about 2-6 mm in diameter. These pellets are heated up, treated with other chemicals, stretched and moulded into plastic products. Plastic resin pellets may be inadvertently released into the environment during transportation or handling. As with other types of materials, wind and stormwater can carry these pellets to nearby water bodies.



Key Points

- Marine debris includes all objects found in the marine environment that do not naturally occur in those areas.
- Debris that is buoyant and/or easily blown around is more likely to become marine debris.
- Biodegradable debris, which can be broken down by microorganisms, stays intact in the environment for a relatively short period of time. Non-degradable plastic debris will persist in the environment.
- There are several sources of marine debris, including beachgoers, litter from people living inland, storm sewers and combined sewer overflows, commercial and recreational vessels, industrial facilities, waste disposal activities, and offshore oil and gas platforms.
- Proper handling of trash and practicing the “3 Rs” (reduce, reuse and recycle) are pollution prevention activities that will help to reduce marine debris. Most important, is to make changes so that you and others use way less plastic, especially the plastic that is used only once, which is half of the plastic in the world.

LESSON

Coming to Terms with Marine Debris

Grade Level:

Grades 1 – 6

Subjects:

Language Arts, Mathematics, Science, Social Studies

Overview:

This lesson is designed to increase students' awareness of different kinds of debris in water environments and the impact it can have on animals, humans, and **aquatic habitats**. Students will first define marine debris, discuss its possible impacts, and then sort household trash items into different categories to learn about different sources of marine debris. Older students then use statistics and graphing to better understand the types of marine debris that are collected each year.

Objectives:

- Define "marine debris."
- Discuss the concept of debris and entanglement.
- Predict the effects different kinds of debris (litter) will have on animals in water.
- Describe specific examples of debris' hazardous impacts on wildlife.
- Classify different kinds of debris found in water, using several different categories.
- Create a poster with information gathered from the classification exercise (older students can produce charts and graphs).

Vocabulary:

debris, marine, marine debris, trash, entanglement, ingestion

Materials:

A large bag of assorted trash items (clean and safe), provided by the teacher. Items can include soda cans, bottles, candy wrappers, balloons and ribbons, six pack holders, plastic/paper cups, forks, straws, shopping bags, small toys, fishing line, rubber bands, scraps of paper, and other items that are often found littered.

Learning Skills:

Analyzing, Calculating, Classifying, Collecting Data, Observing. Can also include Graphing/Charting, and Communicating.

Duration:

40 minutes

SAFETY PRECAUTIONS

All trash objects should be cleaned and checked by the teacher before being handled by students. Avoid any sharp objects or materials containing harmful chemicals.

Activity

1. Begin the lesson by asking students to define trash and litter. Through this discussion, identify the characteristics of "trash" and develop a definition. Write the definition on the board. Then ask students to think of synonyms for trash, and help them come up with the term "debris." List all of the synonyms on the board. Emphasize to the students that trash or garbage refers to generated waste. If the waste is improperly disposed, it then can become debris or litter.

LESSON

2. Now that debris has been defined, ask students what “marine” means. Write the definition on the board. Ask the students to list synonyms for marine and write them on the board.

3. Then combine the terms and discuss the meaning of “marine debris.” Write this definition on the board. Use the lists of synonyms to come up with other terms that describe the concept of marine debris (such as “sea trash” and “ocean waste”). Read the definitions and terms aloud along with the class, so they can practice the words by reading them out loud. Leave these descriptive words written up on the board to help the children as they classify the trash items into groups.

4. Ask the students how the trash their families produce might find its way into a stream, lake or the ocean. Ask the students if they have recently visited a river, lake, or the ocean, and what trash they may have seen on the shore or floating in the waterway.

5. Talk with the students about how different kinds of debris in water may affect the animals living in that habitat. Discuss the concepts of ingestion and entanglement. If time allows, ask children to work in groups to predict some effects that debris might have on different animals. After the groups have shared their suggestions, describe some specific examples of debris’ hazardous effects on wildlife.

During the discussion, it is important that the students understand:

- Any trash that is improperly disposed of is considered debris (litter).
- Debris can potentially enter a waterway and have negative impacts there.
- Litter on our streets can enter **storm drains** when it rains, and become marine debris.



6. Provide the class with a collection of trash. For safety reasons, the teacher should provide this trash. Students should not bring trash from home. This allows the teacher to be sure that students will not come into contact with any harmful objects. The trash should also be washed clean before bringing into the classroom. A large plastic garbage bag can be filled with cleaned trash in advance, and emptied out in the classroom, either on the floor or on a large table.

7. Classifying Debris Items

Have the students work in small groups (four to six students) for the classification activity. Begin by having each of the small groups work together to sort their own collection of trash objects into separate groups of related items. Allow the students to select how they will separate the items into groups. Make sure to walk from group to group and ask a spokesperson from each group what it is that the objects grouped together share in common with each other. Young children will usually separate items into two groups, while older children tend to use several groups. Some items, including juice boxes, are made from several types of materials including foil, plastic and paper. Such items may generate questions from students as to how to classify these items.

LESSON

Usually the students will group the objects based on the descriptive words that were used to communicate their earlier observations about litter and debris. When each group has sorted their objects, ask the group spokesperson to explain how the sorting was carried out. Then the groups of students should be instructed to reclassify the objects into groups again, this time using a different criteria for classification – they should not use a classification method that has already been used. This exercise teaches students that there are many different types of information (data) that can be learned from one situation.

Suggested Common Classification Categories

- By material (plastic, metal, glass, cloth, paper, etc.)
- By recyclable versus non-recyclable
- By different activities producing trash (fast food consumption, smoking, fishing, other sports and games, advertising with balloons, illegal dumping, etc.)
- By biodegradable or non-degradable
- By the type of impact they can have on the environment
- By color of trash items

8. Discuss with the class the different ways that groups have classified the trash, and tell students about some of the other possible ways that they may not have considered. Ask if some classification methods led to interesting observations, while other classification methods were not as useful.

9. **For younger students:** Have the students complete the classification activity with each group working together to create a poster showing how they chose to do their final classification. The students can glue the families of trash objects onto their

poster board. They should label each of the families of objects that they create on the poster board with a descriptive word, and they should write a number for each family of objects.

For older students: Have the students complete the classification activity with each group working together to create a pie chart and bar graph showing how they chose to do their final classification. The charts and graphs can be created on a computer, and should be labeled with descriptive words and percentages for each category.

EXTENSIONS

As a class, conduct your own cleanup activity at a seashore, lake, pond, stream, or river. Have students record the types and numbers of debris they find. See Unit III for more information on conducting a beach cleanup. Be sure the items you collect in the cleanup are recycled or properly disposed. Also, you could clean up the same area periodically and compare the quantity of debris collected each time.

Either in class or as a homework assignment, ask students to use trash items to create a marine debris sculpture. Display the sculptures in the classroom or school library.

For a long-term class activity, have students participate in an adopt-a-beach, -lake, -river, or -stream program.

DIVE DEEPER:

Other Resources on Marine Debris

- NOAA's Marine Debris website: www.marinedebris.noaa.gov
- EPA's Marine Debris site: <http://water.epa.gov/type/oceb/marinedebris/index.cfm>

The Effects of Marine Debris



Marine debris can have serious impacts on both marine wildlife and humans. Debris can entangle, maim, and even drown many wildlife species. Animals can also mistake some debris for food; once ingested, these materials can cause starvation and/or choking. Although almost any species can be harmed by marine debris, certain species – including seals, sea lions, seabirds and sea turtles – are more susceptible to its dangers than others. For humans, marine debris can be a health and safety hazard. The impacts of marine debris can also result in economic hardships for coastal communities related to tourism and the fishing industry.

How Does Marine Debris Affect Marine Wildlife?

The two primary threats that marine debris poses to marine wildlife are **entanglement** and **ingestion**. Entanglement results when an animal becomes encircled or ensnared by debris. Some entanglement occurs when the animal is attracted to the debris as part of its normal behavior or out of curiosity. For example, an animal may try to play with a piece of marine debris or use it for shelter. Some animals, such as seabirds, may see fish caught in a net as a source of food, and become entangled while going after the fish.

Entanglement is harmful to wildlife for several reasons:

- It can cause wounds that can lead to infections or loss of limbs.
- It may cause strangulation, choking, or suffocation.
- It can impair an animal's ability to swim, which may lead to drowning, or make it difficult for the animal to move, find food, and escape from predators.

Ingestion occurs when an animal swallows marine debris. Ingestion sometimes happens accidentally, but generally animals ingest debris because it looks like food. For example, a floating plastic bag can look like a jellyfish, and resin pellets (i.e., small, round pellets that are the raw form of plastic, which are melted and used to form plastic products) can resemble fish eggs.

Ingestion can lead to choking, starvation or malnutrition if the ingested items block the intestinal tract and prevent digestion, or accumulate in the digestive tract and make the animal feel "full," lessening its desire to feed. Ingestion of sharp objects can damage the digestive tract or stomach lining and cause infection or pain. Ingested items may also block air passages and prevent breathing, causing the animal to suffocate.

ENDANGERED AND THREATENED SPECIES

Marine debris can pose significant threats to threatened and endangered species.

Endangered species: A species of animal or plant that is in immediate danger of becoming extinct.

Threatened species: A species whose numbers are low or declining. A threatened species is not in immediate danger of extinction, but is likely to become endangered if it is not protected.

Throughout the world, many species of plants and animals are in danger of going extinct.



Endangered green sea turtle

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) protects wildlife against over-exploitation by restricting international commerce in plant and animal species believed to be actually or potentially harmed by trade. This agreement between governments aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. For more information, visit www.cites.org.



Hawaiian monk seal with fish trap piece on muzzle

Affected Animals

Marine mammals, sea turtles, birds, fish, and crustaceans all have been affected by marine debris through entanglement or ingestion. Unfortunately, many of the species most vulnerable to the impacts of marine debris are **endangered** or **threatened**. Endangered species are plants or animals that are in immediate danger of becoming extinct because their population levels are so low. Threatened species are plants or animals that may become endangered in the near future.

Marine Mammals and Debris

A conservative estimate is that more than 100,000 marine mammals die every year from entanglement or ingestion of marine debris.¹ Of the different types of marine mammals, seals and sea lions are the most affected (primarily by incidents of entanglement) because of their natural curiosity and tendency to investigate unusual objects in the environment.² Fishing nets, fishing line, ropes, plastic sheeting and packing straps can be major problems for these animals. Some studies have linked the decline of

the northern fur seal of Alaska and the endangered Hawaiian monk seal partially due to entanglement in marine debris.³ Whales, including endangered humpback and gray whales, have been found entangled in derelict fishing nets and line, and some **stranded** (run aground) whales have been found with nets and other forms of marine debris in their stomachs. Manatees (another endangered species) have become entangled in crab-pot lines, and dolphins and porpoises can also get caught in abandoned or active fishing nets. Ingestion of debris by marine mammals appears to occur less frequently, but it has been reported for elephant seals, sea lions, certain types of whales and manatees. These cases are significant because they contribute to or result in the death of the animals due to suffocation or starvation.



Entangled manatee

¹ David Laist, Marine Mammal Commission, private communication, March 22, 2007.

² Marine Mammal Commission Annual Report to Congress, 2002, <http://mmc.gov/reports/annual/welcome.shtml> (accessed May 25, 2007)

³ Marine Mammal Commission Annual Report to Congress, 2002, <http://mmc.gov/reports/annual/welcome.shtml> (accessed May 25, 2007)

Sea Turtles and Debris

All seven species of sea have been found entangled in different types of marine debris, such as fishing line, rope and fishing nets. However, ingestion of debris is an even greater problem for these species, as they are indiscriminate feeders. Sea turtles have swallowed plastic bags because they look like jellyfish, one of their favorite foods. Cases of turtles swallowing balloons, tar balls, and other debris that has become encrusted with algae and other marine forms have also been reported. Ingesting debris can block a sea turtle's digestive tract, leading to starvation and a painful death.

Sea turtles are air-breathing reptiles that are well adapted to life in the marine environment. They inhabit tropical and subtropical ocean waters throughout the world. Nearly all species of sea turtle are classified as Endangered.



Entangled Hawksbill sea turtle. Source: NOAA

Seabirds and Debris

Thousands of seabirds are thought to die from entanglement or ingestion each year. Since many seabirds feed on fish, they are often attracted to fish that have been caught or entangled in nets and fishing line. Unfortunately, when birds prey upon entangled fish, they can become entangled themselves. Entanglement in fishing



Entangled shearwaters

line has been a particular problem for the brown pelican, which has been listed as an endangered species. Seabirds are some of the most frequent victims of **abandoned nets**. As many as 100 birds have been found in a single abandoned net.⁴ Ducks, geese, cormorants, terns, plovers, gulls, and even penguins have been found entangled in debris. The ingestion of resin pellets and other small, colorful plastic pieces can also be a problem for wildlife. Many types of birds have been found to feed on these pellets, most likely because they mistake them for fish eggs or other types of food.

Plastic debris eaten by adult birds can be regurgitated as food for **hatchlings**. In 2006, teachers and scientists involved with the Northwestern Hawaiian Islands Multi-Agency Education Project found a dead Laysan albatross chick with 306 pieces of indigestible plastic in its stomach, some as long as six inches. Normally, the chick's diet consists of pieces of fish, fish eggs, squid and octopus.⁶

⁴ US Environmental Protection Agency, Assessing and Monitoring Floatable Debris, August 2002. EPA Document EPA-842-B-02-002. www.epa.gov/owow/oceans/debris/floatabledebris (accessed May 25, 2007)

⁶ Patricia Greene, Northwestern Hawaiian Islands Multi-Agency Education Project, "Death of a Laysan Albatross Chick," July 2006, www.hawaiianislands.org/research/june2006/albatross_death.php (accessed April 17, 2007).

Fish, Crustaceans and Debris

Fish and crustaceans (such as lobsters and crabs) are frequently caught in lost or discarded fishing nets and fishing line (also referred to as **derelict fishing gear**). This phenomenon is known as **ghost fishing** (see below). For example, a 1/2-mile section of nylon net was found in Lake Superior. The net had been abandoned for an estimated 15 years and contained 100 pounds of fish, much of which was rotten. It is estimated that

coastal fishermen in the state of Washington have lost an estimated 150 to 300 **gillnets** per year over a 30 year period. These nets can measure 1,800 feet long and 100 feet deep, resulting in a dangerous ghost fishing situation.



Entangled
crab

GHOST FISHING

When fishing nets, fishing line, crab and lobster pots or other fishing gear are lost or discarded, they continue to "fish" for sea animals long after they have been forgotten by fishermen. Fishing nets and fishing lines from commercial fishing boats can be

very long and can be transported by currents and waves for long distances. This ghost fishing catches seabirds, fish, sharks, sea turtles and other creatures and most die if they cannot free themselves in time to prevent drowning or starvation.



Lobster
traps



Fishing nets collected in Hawaii

Lost traps also continue to attract fish and crustaceans, which enter them in search of food or shelter. In New England alone, it is estimated that nearly one-half million lobster pots are lost every year.⁴ Over 900 derelict crab pots were observed during five days of sonar surveying in the northern Puget Sound, Washington, and studies show that derelict crab pots have a detrimental effect on the Chesapeake Bay - they continue to catch blue crabs and other important living bay resources without ever being retrieved.⁵

In addition to killing marine animals, derelict fishing gear can smother or scour many sensitive aquatic habitats such as **coral reefs**, **sea grass beds** and shallow areas of an **estuary**.

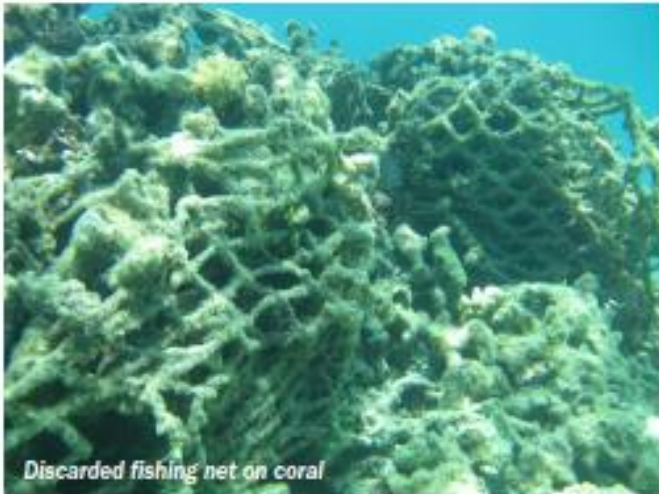
More information about how anyone, including boaters and fishermen, can reduce marine debris can be found at **www.MarineDebris.noaa.gov**.

⁴ US Environmental Protection Agency, *Assessing and Monitoring Floatable Debris*, August 2002. EPA Document EPA-842-B-02-002. www.epa.gov/oceans/debris/floatabledebris (accessed May 25, 2007)

⁵ NOAA Office of Response and Restoration, "NOAA, Virginia Institute of Marine Science Announce Plans to Aid Chesapeake Bay Cleanup," Sept. 5, 2006, www.noaa.gov/stories2006/s2693.htm (accessed April 17, 2007)

Other Impacts on Wildlife

Marine and coastal animals are also affected when their feeding grounds, nesting sites and other **habitats** are harmed by marine debris. For example, lost or discarded fishing gear and nets can drag along the ocean floor or through coral reefs, damaging the animals and plants that live there. Tarps and sheets of plastic can smother large areas of the ocean floor, coral reefs and other sensitive habitats.



Discarded fishing net on coral



Pelican caught in fishing line

As mentioned earlier, many marine animals ingest small pieces of marine debris (primarily made of plastic) that can accumulate in their bodies. **Zooplankton** and other small organisms have been found to ingest micro-particles of plastic. According to a report by the US Environmental Protection Agency, when animals higher on the **food chain** eat those small organisms, they also ingest the debris those organisms have eaten. The debris accumulates in their bodies.⁴ The higher an animal is on the food chain, the greater the quantity of the debris that is consumed and accumulated. For example, eagles and other predators high on the food chain have been found with large concentrations of plastic pellets in their stomachs after preying on smaller birds, which ingested the pellets in fish they consumed. This accumulation is called **bioaccumulation**. **Biomagnification** refers to the tendency of pollutants to concentrate as they move from one feeding level (also called trophic level) to the next.

⁴ US EPA, "Assessing and Monitoring Floatable Debris," August 2002, Publication number EPA 842-B-02-002. Full Document at www.epa.gov/owow/oceans/debris/floatabledebris/ (accessed April 17, 2007).

Key Points

- All species of wildlife can be harmed by marine debris, but certain species are more susceptible to its dangers because their behavior patterns attract them to marine debris. The impact of marine debris on endangered or threatened species is particularly significant because the numbers of these species are already so low.
- The entanglement of animals in marine debris can cause wounds, associated infections, strangulation and the impaired ability to swim, find food, and escape predators. Entangled marine mammals and sea turtles can drown if they cannot reach the water's surface to breathe.
- The ingestion of marine debris by animals can cause starvation, suffocation, internal injuries, and infections.
- Marine debris is an eyesore that litters open ocean and beach environments.
- Marine debris can cost coastal communities a great deal of money in lost tourist revenues. Cleaning up marine debris also can be expensive.
- The impacts of marine debris on an area's fishing industry can be significant. Marine debris damages boats and can kill fish and other important commercial species that otherwise would be sold.
- It can also impact marine ecological communities by changing the diversity and relative abundance of commercial and non-commercial species.
- Marine debris can endanger the lives of people when the functioning of boats and other vessels is impaired.

Diving Deeper

To view the complete Turning the Tide on Trash guide, which includes more lessons, see:

[2015_TurningTideonTrash_HiRes_Final.pdf](#)

Additional information and educational resources can be found on NOAA's Marine Debris Program website: www.MarineDebris.noaa.gov

For a comprehensive look at the Impacts of Plastic in Our Oceans, including numerous pictures of entangled marine animals and also many depicting the results of ingestion, see:

<https://endotnereidadotorg.files.wordpress.com/2016/03/2-marine-pollution-the-impacts-of-plastic-debris-170316.pdf>

LESSON ONE

Marine Animals and Harmful Debris

Grade Level:

Grades 2 – 4

Subjects:

Language Arts, Science

Overview:

Students listen to descriptions of marine animals and then identify marine debris items that could harm them.

Objective:

To learn about the characteristics of marine animals that can make them susceptible to the hazards of marine debris.

Vocabulary:

endangered species, entanglement, ingestion, resin pellets, threatened species

Materials:

- One or more copies of the “Animal Tales” handout
- Foamed plastic cup/plate/bowl pieces
- A piece of fishing net (or a large mesh onion or vegetable bag)
- Fishing line or rope
- Six-pack ring
- Plastic shopping bag or piece of plastic sheeting
- Lobster or crab pot (or a wooden box or crate)
- Balloon and its ribbon
- Other types of debris (such as a plastic cup, a pull tab from a can, a metal bottle cap and a glass bottle)



Entangled sea lion

Learning Skills:

Analyzing, Public Speaking, Reading, Visualizing

Duration:

40 minutes

Activity

1. Place the items of debris on the floor in the middle of the classroom and have students form a circle around the items. Read the description of the seal on the “Animal Tales” handout, or ask one of your students to read it to the class. (NOTE: You might want to make copies of the handout and distribute it to the students so they can follow along.)

LESSON ONE



Sleeping monk seal

NOAA NMFS

2. Choose a volunteer to be a seal and ask him or her to go into the center of the circle and pick up an item of debris that might harm a seal. Ask the "seal" to tell how and why it might become injured by this piece of debris. Encourage students to think about how animals could become entangled in the debris items, plus how the animals might eat the items, mistaking the debris for food.

3. Repeat this procedure for the remainder of animals on the handout. After you have finished, ask the students if they can associate any other pieces of debris with one of the animals in a way that the class has not yet discussed.

4. Explain that many species of mammals, sea turtles, birds and fish that encounter marine debris are endangered or threatened. Ask students how marine debris could pose special problems for these species. End your discussion by helping students to understand that **any** animal that lives in the ocean or along the coast can be affected by marine debris.

EXTENSIONS

Have students locate photographs, artwork or articles describing the impacts of marine debris on wildlife. Students can work individually or in pairs to research a particular type of marine wildlife and develop a "photo essay" or brief presentation about how marine debris harms a particular species. Students could also focus on a particular type of marine debris and its impacts on wildlife in general.

Take students on a field trip to an aquarium or nature center/reserve, where they can learn about endangered and threatened species that might be harmed by marine debris. Contact the aquarium or nature center/reserve in advance and ask for a guided tour that emphasizes the problems that marine debris poses for endangered and threatened species.

Animal Tales



SEABIRD

I look for food in the piles of seaweed and shells that wash up on the beach by the tides. If I can, I will eat food that has already been caught by someone or something else. I also like to eat fish eggs, which are round and clear.



SEA LION

I like to play in the water and I am curious about new things. I like to investigate objects that float on the surface of the ocean. My nose is perfect for poking into things – but sometimes I can get caught.



FISH

I swim into holes and near objects that offer shelter from bigger fish. If a lot of smaller fish are gathered in one area, I may swim closer to see if I can eat them for lunch.



SEA TURTLE

I am a turtle that lives in the ocean. One of my favorite foods is jellyfish. Jellyfish float near the surface of the water and you can see right through them!



LOBSTER

I crawl along the bottom of the ocean searching for food. Sometimes I find a meal inside a wooden crate resting on the ocean floor—but once I get into the crate, I can't get out again.

LESSON TWO

All Tangled Up



Entangled green sea turtle

Grade Level:

Grades 1 – 4

Subjects:

Language Arts, Science

Overview:

Students perform an experiment in which they wrap a rubber band around their fingers and across the back of their hand and try to disentangle themselves. As a class, students discuss their thoughts and reactions and relate to real animals. Older students will write a short story about an entangled animal.

Objective:

To learn about wildlife entanglement by experiencing what it might be like to be a marine animal trapped in debris.

Vocabulary:

abandoned net, entanglement

Materials:

- A small- to medium-sized (thin) rubber

band for each student

- One copy of the “Animal Entanglement” Handout

Learning Skills:

Analyzing, Experimenting, Visualizing, Writing

Duration:

20 minutes

Activity

1. Discuss how animals need a healthy environment in which to live, just like we do. This includes a habitat that is free from pollution. Litter that becomes marine debris can harm the animals that live in or near the ocean.

2. Distribute the rubber bands to students and have them follow the procedure below. (Note: As an alternative, you may want to have one or two students come up to the front of the room to perform the exercise with rubber bands as a demonstration; then include the entire class in the discussion.)

- Hold your hands up in front of your face, with the back of your hands towards your face.
- Hold the rubber band in your right hand and hook one end of it over the little finger of your left hand.
- Hook the other end of the rubber band over the left-hand thumb. The rubber band should be taut and resting across the bottom knuckles on the back of your left hand (see photo above).
- Place your right hand on the bottom of your left elbow, and keep it there.

LESSON TWO



All tangled up

- Try to free your hand of the rubber band without using your right hand, teeth, face or other body parts.

3. While students are struggling, ask the class to imagine that they are seagulls that have gotten pieces of fishing line, abandoned net or other debris wrapped around their beaks or necks. Tell them the birds are unable to eat until they are free from the debris. Ask the students the following questions:

- How would you feel after struggling like this all morning?
- How would you feel after missing breakfast?
- What would happen if you continued to miss meals and spent all of your strength fighting to get free?
- What would happen if a predator were chasing you?

Encourage students to share their thoughts and feelings about being entangled. Remind them that their experience is

similar to that of a bird or other marine animal that becomes entangled in debris.

4. For Grades 3 and 4: Post the "Animal Entanglement" handout at the front of the class. Ask students to select one of the animals pictured and write a paragraph from that animal's point of view telling how it feels to be entangled in marine debris. Students should include as many details from the illustration as possible in describing their experience. Encourage students to use a range of senses and feelings in their descriptions, and to be as imaginative as possible.

EXTENSIONS

Have a volunteer come up to the front of the room and experiment with entangling his or her hands or arms in a six-pack ring. This activity should be carefully guided by the teacher. Have the student remove the six-pack ring, or help him or her to do so. Then cut the loops of each ring with a scissors. Have another volunteer experiment with becoming entangled in the cut ring. Have students compare the two experiences. Then discuss why cutting six-pack rings is a good practice.

Have students discuss how balloons and balloon ribbons can present problems to fish, birds, turtles and seals. Using the Internet, older students can investigate whether your state has a law against the mass release of balloons. Students can make posters, or write letters to the editors of newspapers to help increase knowledge about the need to keep balloons and balloon ribbons from becoming marine debris.

LESSON TWO

HANDOUT

Animal Entanglement

