Litter and Debris in Our Waterways

Defining Aquatic Litter and Debris

Aquatic litter and debris are any manufactured or processed solid waste that enter the aquatic environment from any source. In short, it is our misplaced waste and trash. It is a highly pervasive and visible form of pollution that has harmful impacts on wildlife and human health.

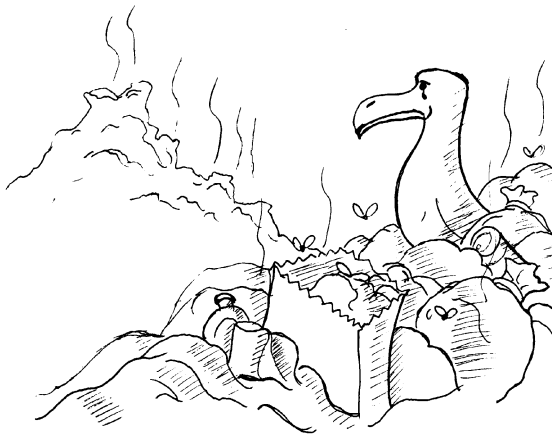
Aquatic ecosystems–streams, rivers, wetlands, and estuaries–are under considerable pressure from human activities, including incorrect disposal of trash. While the world's oceans are vast, they do not have an infinite ability to safely absorb our wastes. Preserving and restoring the quality of freshwater and marine environments requires that we understand how much trash we create, what we do with that trash, and how we can prevent it from entering our waterways.

Sources of Aquatic Debris

According to The Ocean Conservancy, all the trash in our water shares a common origin: "…at a critical decision point, someone, somewhere, mishandled it, either thoughtlessly or deliberately."

Some debris originates from the sea and inland waterways. This includes debris from ships, boats, offshore drilling platforms, and offshore rigs.

The rest of the debris we find in our waterways comes from land-based sources, including people who litter, landfills, and storm drains. Another source of land-based debris is from *combined sewer overflows*. In some cities with older infrastructures, such as Richmond and Lynchburg, Virginia, the water that enters a stormdrain during a rainstorm enters the same pipes that take wastewater from homes and businesses. This mixture of wastewater and storm water travels to the cities' wastewater treatment plants. During times of heavy rain, the volume of this water coming into the wastewater treatment plant can overwhelm the capacity of the plant, thereby causing an overflow. In combined sewer overflow situations, untreated wastewater (including raw sewage and untreated pollutants) directly enters the receiving stream or river. Therefore, items flushed down the toilet can end up in our waterways. Millions of dollars are being spent in Virginia and across the U.S. to eliminate this problem.



It should be noted that in most towns and cities, storm drains flow directly to streams and rivers. Litter on sidewalks and streets and in gutters is swept into the storm drain system when it rains. Just as a drop of rain can travel from a small stream to a river to the Chesapeake Bay or the Atlantic Ocean, so can a piece of litter. According to The Ocean Conservancy, 60% to 80% of debris found on ocean beaches is washed, blown, or dumped from shore.

Behavior Behind the Debris

Deliberate littering and illegal dumping contribute debris to our waterways, as do other non-deliberate actions—such as having a piece of debris blow out of your car window or off your boat. Sometimes our trash cans will be knocked over by animals or the wind, resulting in more accidental litter. One important concept for students to grasp is that there is a behavior and a person behind every piece of debris we find in our waterways. Some of these behaviors are:

Litter from Recreational Activities and Fast Food Consumption

This category includes trash from fast-food restaurants that is littered by people in cars, or is left behind after a picnic. People who litter fast-food items contribute a significant amount of debris to our waterways. Other items include bags, balloons, beverage containers, clothing, and toys.

Debris from Ocean and Waterway Activities

This category includes fishing-related items from recreational and commercial fishermen like nets, fishing line, and bait boxes. Debris can also come from offshore oil and gas rigs, and from ships (military, cruise, and commercial).

Litter from Smoking

This category includes cigarette butts, cigar tips, lighters, and the wrappers on cigarette packs. Smoking-related activities account for a tremendous amount of litter—in some places cigarette butts make up more than 85% of all littered items.

Illegal Dumping Activities

This category includes household waste, refrigerators and other appliances, building and construction waste, tires and sometimes entire cars.

Personal Hygiene and Medical Debris

This category includes items from sewers that overflow, diapers, needles, and other related items.

Whether these items enter the aquatic environment from dumping, litter, or accidental routes, debris not only looks ugly, but it can harm

the animals and plants that make their homes in stream, lake, wetland, and coastal environments.

Types of Aquatic Debris

Every year, volunteers across the world participate in the International Coastal Cleanup, picking up aquatic debris and collecting data about the quantity and types of litter they find. The *top ten* list from these cleanups gives us a tremendous amount of information about the behaviors and activities that contribute most to the aquatic debris problem. The Top Ten items vary little year-to-year.

Plastics — A Special Problem

Plastic is widely used due to its light weight, strength, durability, versatility, and low cost. We use plastic bags, bottles, cups, forks, spoons, straws, and six-pack rings. Many toys are made from plastics, as are tools including strapping bands, and plastic sheeting. Plastic is also used in making packing materials and fishing gear. Plastics can take hundreds of years to break down, so they may continue to entangle and kill animals year after year. One study found that almost 90 percent of the debris floating on our oceans is plastic. The filters on cigarettes are also made from plastic fibers.

Top Ten Litter Items in the United States

In the 2001 International Coastal Cleanup, these items comprised 82% of all debris found in the U.S.

1. Cigarette butts/cigarette filters
2. Bags/food wrappers
3. Caps, lids
4. Beverage bottles (glass)
5. Beverage cans
6. Cups, plates, forks, knives, spoons
7. Beverage bottles (plastic) 2 liters or less
8. Straws, stirrers
9. Fast food Containers
10. Cigar tips

Top Ten Litter Items in Virginia

In the 2001 International Coastal Cleanup, these items comprised 85% of all debris found in Virginia.

1. Cigarette butts/cigarette filters
2. Bags/food wrappers
3. Beverage bottles (plastic) 2 liters or less
4. Beverage bottles (glass)
5. Beverage cans
6. Cups, plates, forks, knives, spoons
7. Caps, lids
8. Fast-food containers
9. Straws, stirrers
10. Tobacco packaging/wrappers

Any trash that is improperly disposed of can potentially enter a waterway and have negative impacts on aquatic animals, plants, and humans. Aquatic debris can be categorized in several ways:

- By material (plastic, metal, glass, cloth, paper)
- By source or by the activity which led the trash to be in the water. Some activities include fast food consumption, smoking, fishing, illegal dumping, sports/ games, balloons used in advertising, etc.
- By impact the items have on the environment and wildlife
- By biodegradable / nondegradable (Much of our solid waste contains synthetic materials that do not degrade quickly, if at all.)
- By recyclable / non-recyclable

Impacts of Aquatic Debris

Litter not only detracts from the beauty of a riverside park or beach, but also can be a health and safety hazard for humans, and aquatic wildlife. Another big impact of litter is the cost to society. Millions of dollars are spent every year in Virginia by state and local governments, parks, schools, and businesses to pick up litter.

Impacts on Aquatic Habitat

Habitat destruction or harm is caused when submerged debris (for example, a piece of plastic sheeting) covers seagrass beds, or smothers bottom-dwelling species. Some debris can also cause physical damage.

Impacts on Water Quality

Debris can also affect the water quality by adding chemicals to the water. Construction waste illegally dumped in a stream can include buckets that once held paints, solvents, and other chemicals that can enter the water. Cigarette butts and some other littered items contain toxic chemicals that leach into the water.

Impacts on Aquatic Animals — Entanglement and Ingestion

Aquatic debris can be particularly dangerous and often lethal to wildlife. Each year, more than 100,000 marine mammals die when they ingest debris or become entangled in ropes, fishing line, fishing nets, and other debris dumped into the ocean. Seals are especially prone to become entangled because they are by nature curious and will investigate unusual items in their environment.

As many as 2 million seabirds also die every year due to debris ingestion and entanglement. Fishing line, fishing nets, strapping bands, and six-pack rings can hamper the mobility of aquatic animals. Once entangled, animals have trouble eating, breathing, finding food, escaping predators, or swimming, all of which can have fatal results. Entanglement can also cause wounds that can become infected. According to the National Oceanic and Atmospheric Administration (NOAA), marine debris threatens over 265 different species of marine and coastal wild-life through entanglement, smothering, and interference with digestive systems.

Sea turtles, birds, fish, and mammals often mistake plastic items for food. For instance, sea turtles often mistake plastic bags for jellyfish, one of their favorite foods. With plastic filling their stomachs, animals have a false feeling of being full, and may die of starvation. Ingested items can also block the intestinal tract and prevent digestion.

Impacts on Human Health and Safety

Trash in our waterways can also affect human health and safety. Hazards include glass and metal left on the beach, or hospital needles and syringes that can carry disease. Fishermen and recreational boaters can also be endangered as nets and monofilament fishing line wrap around a boat's propeller. Plastic sheeting and bags can also block the cooling intakes on boats. Such damage is hazardous and costly in terms of repair and lost fishing time. A survey in Oregon revealed that nearly 60 percent of fishermen had experienced equipment damage due to marine debris, costing thousands of dollars in repairs.

Economic Impacts from Aquatic Debris

A tremendous amount of time, effort, and machinery is devoted in Virginia to cleaning up litter on the land and in our waterways. Many Virginian coastal communities and parks have regular beach sweeping to remove trash left behind by visitors. Virginia's Department of Transportation spends more than $6 million to remove litter from our roadsides in addition to the thousands of hours Adopt-A-Highway volunteers spend picking it up. For information on the Adopt-A-Highway program, see *http://www.virginiadot.org/infoservice/prog-aah-default.asp* College grounds maintenance crews spend thousands of hours every year picking up litter, as do employees of restaurants, hotels, stores, and other businesses.

Every county in Virginia has a Litter Prevention and Recycling Coordinator. To find the coordinator in your county, visit this website: *http://www.deq.state.va.us/recycle/citycountylist.html*

Cigarette Butts—A Special Problem

During the International Coastal Cleanup, sponsored by The Ocean Conservancy, cigarette butts are the #1 most frequently found litter item. Trillions of cigarette butts are disposed of yearly, many directly tossed into the environment. Cigarette filters are made out of cellulose acetate, a plastic that takes several years to degrade.

Cigarette butts accumulate outside of buildings, on parking lots, and in streets where they can be transported through storm drains into streams and rivers. In addition to being unsightly, the chemicals that leach out of cigarette butt litter present a toxic threat to aquatic animals. The compounds in discarded cigarette butts (the filters and remnant tobacco) are biohazards to the water flea, *Daphnia magna*, a small crustacean at the lower end of, but important to, the aquatic food chain. Cigarette butts in the environment are an important litter issue – not a smoking issue.

In addition to costly cleanup procedures, there are other economic impacts that are harder to put a price on. Littered parks, marinas, and beaches suffer from lost tourist income, and fisheries that are full of debris can result in decreased yield of food such as crabs and fish.

Solutions to Aquatic Debris

Cleanup

One solution to the aquatic debris problem is cleaning up the trash using paid employees and volunteers.

Several groups organize volunteer cleanups in Virginia, and are happy to include school groups in their efforts to make our streams and beaches cleaner. The International Coastal Cleanup in Virginia, an annual statewide cleanup of all water bodies in Virginia, is organized by Clean Virginia Waterways, located at Longwood University in Farmville. In addition to this statewide event, there are several regional cleanup events held every spring including the James River Regional Cleanup (organized by the James River Advisory Council), Clean the Bay Day (organized by the Chesapeake Bay Foundation), and the Potomac River Cleanup (organized by the Alice Ferguson Foundation). Hundreds of local cleanups are also organized every year through the *Adopt-a-Stream* program (run by the Virginia Department of Conservation and Recreation), where groups of interested citizens adopt a stream in their area. Virginia also has dozens of *Friends of...* groups, including Friends of the Rappahannock, Friends of the Shenandoah River, and Friends of the Appomattox River. These groups offer a variety of stewardship opportunities for citizens and students. See the list at end of chapter for contact information.

Are Cleanups the Answer?

Cleaning up pollution after it has entered the water is important, but it can be only a temporary solution if the sources of pollution are not also addressed. As mentioned above, the costs associated with cleanups can also be high. While both pollution cleanup and pollution prevention are needed, when it comes to the very preventable problem of aquatic debris, emphasizing prevention will yield greater results.

Pollution Prevention

There are two main approaches to preventing litter and trash from entering our waterways.

1. Proper Disposal. Educate people on the need to dispose of their trash properly, and make it easy for them to do so.
2. Waste Reduction. Examine how much waste we produce, and find ways to reduce it.

Proper Disposal

What a difference proper disposal of waste can make! As seen above, the vast majority of the aquatic litter is from items we can all

easily carry until we find a trash can. Fast-food wrappers, bottles, cans, and cigarette butts are more than 80% of the litter we find in our waterways.

Waste Reduction

In the United States, we have 4.6% of the world's population, but we produce about 33% of the world's solid waste. Each of us can make incredible strides in reducing the amount of waste we are responsible for creating by employing the three "**Rs**"– **Recycle**, **Reuse**, **Reduce**. For every item we recycle or reuse, there will be one less piece of trash that can become a part of the aquatic debris cycle.

People can reduce the amount of trash they dispose of by:

- Buying reusable items rather than disposable ones. This can include reusable lunchboxes, plates, cups, eating utensils, and food containers instead of disposable items.
- Reusing items several times before throwing them away.
- Recycling plastics, glass, metals, and paper, and buying recycled goods too.
- Choosing items that have the least packaging.
- Not buying helium-filled balloons, and discouraging the release of balloons. Ask communities to celebrate in a way that

Balloons — A Special Problem

What goes up must come down! Balloons return to the land and sea where they can be mistaken for prey and eaten by animals. Sea turtles, dolphins, whales, fish, and seabirds have been reported with balloons in their stomachs. It is believed that they mistake balloons for jelly-fish which are their natural prey. In 1985, an infant sperm whale was found dead of starvation as a result of ingestion of an inflated Mylar balloon which had lodged in its intestines. Ribbons and strings tied to balloons can also lead to entanglement.

In 1991, Virginia joined a handful of states in banning the mass release of balloons. The law states:

"It shall be unlawful for any person to knowingly release or cause to be released into the atmosphere within a one-hour period fifty or more balloons which are (i) made of a non-biodegradable or nonphotodegradable material or any material which requires more than five minutes' contact with air or water to degrade and (ii) inflated with a substance which is lighter than air."

Balloons released for scientfic or meteorological purposes are allowed.

doesn't add these deadly balloons to our aquatic environment.

- Composting kitchen and yard waste.
- Using rechargeable batteries and recycling them when their useful life is over.
- Using a canvas or string bag to carry groceries and other items.
- Using cloth napkins, dishtowels, and handkerchiefs instead of paper ones.

Laws and Regulations

Growing public awareness and concern for controlling debris in our oceans and waterways has led to international, national, and state-wide laws that prohibit littering and the dumping of trash in waterways. In the United States and in Virginia, there are several laws regulating the use, disposal, and effects of solid waste on aquatic environments.

In 1988, the U.S. signed onto the International Convention for the Prevention of Pollution from Ships—called MARPOL for short—joining 64 other countries that signed this international protocol that made dumping plastic into the ocean illegal. After signing MARPOL, the U.S. passed the Marine Plastic Pollution Research and Control Act. This act makes it against the law to dump plastics at sea and in all U.S. navigable waters. Laws like this have reduced the amount of trash on our beaches and in our ocean. Even so, it is estimated that there are more than 46,000 pieces of plastic debris floating on every square mile of ocean today.

In Virginia, we have litter laws, and also a ban on the mass release of balloons (see box on page 7 of this chapter). To read Virginia's litter laws, go to the Virginia General Assembly's web site (*http://legis.state.va.us*) and select *Code of Virginia*. Type *litter* in the search box, and then click on *Submit*. You will see a list of statutes and regulations addressing this topic.

Litter as a Teaching Tool

For young students, litter is often the first thing they think of when they are asked to visualize pollution. And unlike less visible forms of aquatic pollution (pesticides, gasoline, oil, toxic chemicals, sewage), children can play a significant role in reducing the aquatic debris problem. They can help by cleaning debris out of a stream or off a beach, and they can also learn to dispose of all trash properly and never be a source of litter. Other ways litter can be a valuable teaching tool include:

- Teaching the connection between our actions and environmental impacts. Decisions we make can lead to pollution, or to a cleaner environment. The environmental consequences of our actions can be hard to predict.
- Understanding how trash becomes aquatic debris (storm drain connection).
- Participating in a cleanup activity, gathering data about the debris found, and analyzing the data can lead to a student's development of an environmental ethic, and heightened commitment to preserve water quality, beauty, and wildlife. Participating in cleaning

an area can help them realize that solving water pollution problems requires everyone's involvement.

- Cleaning up aquatic debris is one way students can have a direct and positive role in protecting our aquatic habitats.
- Animals are dependent on a safe and healthy habitat. Their water and land homes should be free from litter.
- Trash that is not in the right place (like a recycling bin, a trash can, or other waste container) is litter.
- Litter makes our communities less attractive and less healthy places to live in.

RESOURCES

For the teacher...

Marine Debris Education. National Oceanic and Atmospheric Administration (NOAA). *http://www.education.noaa.gov/books/debris/debris1.htmhttp://www.publicaffairs.noaa.gov/oceanreport/marinedebris.html*

Pocket Guide to Marine Debris. The Ocean Conservancy (2002).

Pollution Solutions: Litter Prevention Activities for Virginia Teachers. Virginia Department of Environmental Quality, Department of Environmental Education.

*Trash in our Oceans—You Can Be Part of the Solution: Marine Debris Abatement.*U.S. Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds. *http://www.epa.gov/owow/oceans/debris/index.html*

Turning the Tide on Trash: Marine Debris Curriculum. U.S. Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds *http://www.epa.gov/owow/OCPD/Marine/contents.html*

Virginia Department of Environmental Quality's Office of Litter Prevention and Recycling. *http://www.deq.state.va.us/recycle/*

For the student...

Marine Debris Coloring Book. National Oceanic and Atmospheric Administration (NOAA). *http://www.education.noaa.gov/books/debris/debris1.htm*

WATERWAYS CLEANUP EVENTS IN VIRGINIA:

- *The International Coastal Cleanup in Virginia* (Every September) organized by Clean Virginia Waterways

  Email: *cleanva@longwood.edu*
  Phone: 434–395–2602
  Web Site: *http://web/longwood.edu/cleanva*

- *Clean the Bay Day* (Every Spring) organized by Chesapeake Bay Foundation

  Email: *chesapeake@cbf.org*
  Phone: 757-622-1964 or 1-800-savebay
  Web Site: *http://www.savethebay.cbf.org/clean*

- *Potomac River Watershed Cleanup* (Every Spring) coordinated by the Alice Ferguson Foundation

  Email**:** *potomaccleanup@ferguson foundation.org*
  Phone**:** 301–292–6665
  Web Site**:** *http://www.ferguson foundation.org*

- *James River Regional Cleanup* (Every Spring within the counties of Chesterfield, Henrico, Powhatan, Goochland, Cumberland, and Charles City and the cities of Richmond and Lynchburg) sponsored by the James River Advisory Council

  Email**:** *conleyk@chesterfield.gov*
  Phone**:** 804–748–1567
  Web Site**:** *www.jamesriveradvisory council.com*

- *Adopt-a-Stream* and storm-drain stenciling programs sponsored by the Virginia Department of Conservation and Recreation

  Phone**:** 804–692–0148
  Web Site**:** *http://www.dcr.state.va.us/sw/ adopt.htm*

Virginia also has dozens of *Friends of...* groups, including Friends of the Rappahannock, Friends of the Shenandoah River, and Friends of the Appomattox River. A list of these organizations can be found on this web site: *http://www.deq.state.va.us/cmonitor /links.html*