



*This document includes Section 1: Introduction to the document: Assessing and Monitoring Floatable Debris, published in August 2002. The reference number is: EPA-842-B-02-002. Download the full document at: <http://www.epa.gov/owow/oceans/debris/floatingdebris/>*

## ASSESSING AND MONITORING FLOATABLE DEBRIS

August 2002

# Section 1

# Introduction



**Importance of Coastal Watersheds**  
**Impacts of Floatable Debris**  
**Impacts on Wildlife**  
**Impacts on Humans**  
**Beaches Environmental Assessment and Coastal Health Act of 2000**  
**Other Floatable Debris-Related Legislation**

## **Section 1: Introduction**

This document is designed to be a tool to help states, tribes, and local governments develop programs to assess and monitor their coastal recreation waters for floatable material. Coastal recreation waters are part of the coastal watershed. They are defined by the Clean Water Act (CWA), as amended by the Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000, as “the Great Lakes and marine coastal waters (including coastal estuaries) that are designated under section 303(c) of CWA by states” and are used for swimming, bathing, surfing, or similar water contact activities. The programs developed would be used to help identify sources of floatable debris, protect human and animal health and safety in those waters, and restore and preserve the overall coastal watershed and aquatic environment. *Assessing and Monitoring Floatable Debris* also will help to preserve and strengthen local and state economies by maintaining or increasing tourism in coastal communities.

Much of the information presented here comes from data collected by marine debris monitoring studies and assessment programs already being implemented in the United States.

### **1.1 Importance of Coastal Watersheds**

Oceans cover more than two-thirds of our planet and are extraordinary resources that contribute to the health and well-being of people and other living things. Likewise, freshwater rivers, streams, lakes, and other water bodies provide significant value to our coastal watersheds. A watershed is a geographic area in which all sources of water, including lakes, rivers, estuaries, wetlands, and streams, as well as ground water, drain to a common surface water body. Coastal watersheds begin with the streams and rivers that ultimately flow to the coastal areas, and they include upstream areas, beaches, nearshore waters, estuaries, oceans, and offshore habitats such as coral reefs and shellfish beds that receive flow from the terrestrial watershed. These surface waters provide a home for thousands of species of aquatic plants and animals and are important to people because they yield an abundance of natural resources, such as nutritious foods and pharmaceutical and petroleum products. In addition, these waters are appreciated for their great beauty, recreational opportunities, and economic and scientific resources.

At the same time, however, coastal recreation waters have been used as a repository for trash and other wastes. Although the aquatic environment can safely receive pollutants and wastes to some degree, this ability is limited. This limitation is particularly significant now that part of our solid waste stream is made up of synthetic materials, which can remain in the environment for many years without decomposing. Some of the wastes consist of materials that are extremely buoyant and thus can float many miles from the point where they originate.

More and more people are moving near the Nation's coasts, and the production of trash and floatable debris continues to increase. Unless we better control the disposal of trash and other wastes, it is likely that the amount of such debris entering our waterways will increase. In the past, floatable debris on beaches and in waterways was considered an eyesore. It has now become evident, however, that such materials can also have serious impacts on human health, wildlife, the aquatic environment, and the economy, and therefore the problem of floatable debris should be addressed.

For the purpose of this document, the terms *floatable materials*, *floatable debris*, *trash*, and *marine debris* are used interchangeably. Floatable materials is defined by the BEACH Act to mean any foreign matter that may float or remain suspended in the water column and includes plastic, aluminum cans, wood products, bottles, and paper products.

## 1.2 Impacts of Floatable Debris

Floatable debris causes problems in coastal watersheds because it can easily come into contact with aquatic animals, people, boats, fishing nets, and other objects. Thousands of aquatic animals are caught in and strangled by floatable debris each year. Coastal communities also lose money when littered beaches must be closed or cleaned up, and the fishing industry and recreational and commercial boaters must spend thousands of dollars every year to repair vessels damaged by floatable debris.

### 1.2.1 Impacts on Wildlife

The two primary problems that floatable debris poses to wildlife are entanglement and ingestion. Entanglement results when an animal becomes encircled or ensnared by debris. It can occur accidentally or when the animal is attracted to the debris as part of its normal behavior or out of curiosity. For example, an animal might try to use a piece of floatable debris for shelter, as a plaything, or as a source of food (if other plants and animals are already trapped in the debris or if the debris resembles prey that is part of the animal's normal diet). Entanglement is harmful to wildlife for several reasons. Not only can it cause wounds that can lead to infections or loss of limbs, but it can also cause strangulation or suffocation. In addition, entanglement can impair an animal's ability to swim, which can result in drowning or difficulty in moving about, finding food, and escaping from predators.

Ingestion occurs when an animal swallows floatable debris. It sometimes occurs accidentally, but usually animals feed on debris because it looks like food. Ingestion of debris can lead to starvation or malnutrition if the ingested items block the intestinal tract, preventing digestion, or accumulate in the digestive tract, making the animal feel "full" and lessening its desire to feed. Ingestion of sharp objects can damage the mouth, digestive tract, or stomach lining and cause

infection or pain. Ingested items also can block air passages and prevent breathing, thereby causing death.

Marine mammals, turtles, birds, fish, and crustaceans all have been affected by entanglement in or ingestion of floatable debris. Many of the species most vulnerable to the problems of floatable debris are endangered or threatened. *Endangered species* are plants and animals that are in immediate danger of becoming extinct because their population levels are extremely low. *Threatened species* are plants and animals that might become endangered in the near future if nothing is done to protect them.

It is estimated that some 100,000 marine mammals die every year from entanglement or ingestion of floatables. Of the different types of marine mammals, seals and sea lions are the most affected (particularly by entanglement) because of their natural curiosity and tendency to investigate unusual objects in the environment. Packing straps and net fragments are a major problem for these animals. Some studies have linked the decline of the northern fur seal of Alaska and the endangered Hawaiian monk seal to entanglement in debris. Whales, including the endangered humpback whale, right whale, and gray whale, have been found entangled in fishing nets and line. Manatees, another endangered species, have become entangled in crab-pot lines, and dolphins and porpoises have been caught in 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 have usually contributed to or resulted in the death of the animals due to suffocation or starvation (USEPA, 1992b).

Right whales are at risk from entanglement in fishing gear and collisions with ships (ENN, 1999). They are especially vulnerable because they move slowly and spend extended periods of time at or near the surface (Ferdinand, 2002). In the summer of 2001, the attempted rescue of a right whale entangled in fishing gear off the coast of Massachusetts became a top news story. The right whale, fondly referred to as Churchill, was suffering from a severe infection caused by a synthetic line embedded in his upper jaw. The rescue effort entailed tracking Churchill for 100 days by beacon satellite, injecting him with drugs, and strapping a harness to his tail to keep him from thrashing, while attempting to remove the entangled fishing gear. The mission eventually failed and Churchill became the sixth right whale death in 2001 and the second that year as a result of entanglement (Dooley, 2001).

Sea turtles also have become entangled in floatable debris. All of the five sea turtle species found in the United States are endangered species, and all have been found entangled in different types of floatables debris, such as fishing line, rope, and fishing nets. Ingestion of floatable debris is an even greater problem for these species. Sea turtles have been found to swallow plastic bags because the bags look like jellyfish, one of their favorite foods. A plastic bag can block a turtle's digestive tract, leading to starvation. Cases of turtles swallowing balloons, tar balls, and debris that has become covered with algae also have been reported (USEPA, 1992b).

Nearly a million seabirds are thought to die from entanglement or ingestion of floatable material each year. Because most seabirds feed on fish, they are often attracted to fish that have been caught or entangled in nets and fishing line. Entanglement in fishing line has been a particular problem for the brown pelican, which is 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. Many birds, including ducks, geese, cormorants, and gulls, have been found entangled in six-pack rings and other encircling debris. The ingestion of plastic resin pellets (the small, round pellets that are melted and used to form plastic products) is a major concern. 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 (USEPA, 1992b).

Fish and crustaceans such as lobsters and crabs are frequently caught in lost or discarded fishing gear in a phenomenon known as ghost fishing. For example, a ½-mile section of nylon net was found in Lake Superior. It had been abandoned for an estimated 15 years and contained 100 pounds of fish, much of which was decomposing. Lost traps also continue to attract fish and crustaceans, which enter them in search of food or shelter. In New England alone, nearly 500,000 lobster pots are lost every year (USEPA, 1992b).

Wildlife are affected when floatable debris disturbs their environment. Lost or discarded fishing gear and nets can drag along the ocean floor or through coral reefs, disrupting the animals and plants that live there. In addition, debris can bioaccumulate in the food chain. Bioaccumulation occurs when organisms low on the food chain consume a substance that builds up in their bodies. When animals higher on the food chain eat those organisms, they also ingest that substance and it accumulates in their bodies. The higher an animal is on the food chain, the greater the quantity of the substance 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 feeding on smaller birds, which had previously ingested fish that had eaten the material. Also, floatable debris can smother corals and other sessile benthic organisms. It can prevent the sunlight from reaching plants, inhibiting their ability to produce energy through photosynthesis.

Bioaccumulation refers to the degree to which an organism takes up and retains a contaminant from all applicable exposure routes. Bioaccumulation takes into account that organisms may accumulate contaminants through multiple exposure routes and that the total accumulation will depend upon the rate of intake versus the rate at which the organism is capable of eliminating (through urine or feces) or breaking down the chemical through metabolic processes (Ecorisk, 2002).

### 1.2.2 Impacts on Humans

Floatable debris also can have serious consequences for people. First, floatables can endanger human health and safety. Sharp objects, such as broken glass and rusty metal, can cause injuries

when people step on them on the beach or ocean floor. Abandoned fishing nets and lines can entangle scuba divers, and some divers have barely escaped serious injury or death. Floatables that wrap around boat propellers or puncture holes in the bottom of boats can disable vessels, thereby endangering human lives. This problem is especially serious if power is lost in a storm and the boat cannot return to shore or steering is hampered and the boat cannot avoid a collision. Submarines can be obstructed by abandoned fishing nets, making navigation and surfacing difficult. Contaminated debris, including medical waste and sewage, can pose a public health hazard through disease transmission. There is a strong correlation between swimmers in contaminated waters and higher rates of gastrointestinal illness compared to nonswimmers. During the summers of 1987 and 1988, beaches in New York and New Jersey were closed when medical waste, including syringes and bandages from hospitals, washed up on their shores. These beach closings caused many vacationers to go elsewhere, adversely affecting the economies of the areas with closings.

Second, floating debris is an eyesore, and debris stranded on beaches and shorelines degrades coastal aesthetics. Coastal communities lose millions of tourism dollars when large amounts of floatables make their beaches unattractive to visitors. Not only does floatable debris cost coastal communities lost revenues from tourism, but cleaning up beaches littered with floatables also can be very expensive, and it can be disruptive to the aquatic organisms that may live there.

Finally, lost or discarded fishing gear can financially harm a region's fishing industry. In addition to the costs associated with replacing the missing gear, floatable debris can cause costly or irreparable damage to boats. Fishing nets can wrap around propellers, plastic sheeting can clog cooling water intakes, and lost nets or lines can entangle vessels. In a 1987 survey in the Seattle area, almost two-thirds of the people who responded to the survey indicated that their boats had been damaged by floatables in the previous 2 years. When lobster or crab traps are lost, they trap thousands of animals that consequently are never caught and sold. Ghost fishing also kills thousands of fish that might otherwise have found their way to market.

### 1.3 Beaches Environmental Assessment and Coastal Health Act of 2000

Congress enacted the BEACH Act on October 10, 2000. It is designed to reduce the risk of disease to users of the Nation's coastal recreation waters. The act authorizes the Environmental Protection Agency (EPA) to award program development and implementation grants to eligible states, territories, tribes, and local governments to support microbiological testing and monitoring of coastal recreation waters, including the Great Lakes, that are adjacent to beaches or similar points of access used by the public. BEACH Act grants also provide support for developing and implementing programs to notify the public of the potential for exposure to disease-causing microorganisms in coastal recreation waters.

**The BEACH Act amended the Clean Water Act and required EPA to accomplish the following:**

- Publish new or revised microbiological water quality criteria within 5 years of enactment and review the criteria every 5 years.
- Ensure state or tribal adoption of existing microbiological water quality criteria within 42 months of enactment and within 36 months of revisions.
- Provide technical assistance to states, tribes, and local governments for assessment and monitoring of floatable material.
- Maintain a public right-to-know database.
- Implement a state and tribal grant program for beach monitoring and notification consistent with performance criteria.

The act also authorizes EPA to provide technical assistance to states and local governments for the assessment and monitoring of floatable materials. In partially fulfilling that obligation, through this document, EPA has compiled and presented the most current information available addressing the assessment and monitoring of floatable debris.

### 1.4 Other Floatable Debris-Related Legislation

In response to growing concern over floatable debris, governments have taken actions nationally as well as internationally, to reduce discharges at their source. For example, intentional at-sea dumping of garbage generated on land became subject to international control in 1972 through the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (commonly called the London Convention (LC)). Similarly, at-sea disposal of garbage generated during the routine operation of ships (e.g., garbage not deliberately carried to sea for the purpose of disposal) was addressed through a 1978 Protocol to the 1973 International Convention for the Prevention of Pollution by Ships (commonly called the MARPOL Convention). Specifically, the **1978 Protocol to the MARPOL Convention** added five annexes, each dealing with a different form of pollution from ships. Of these, **Annex V** established regulations on discharging ship-generated garbage, including a prohibition on discharging any plastics at sea.

In 1987, two important actions were taken in the United States to address this marine pollution problem. First, Congress approved the ratification of Annex V to the MARPOL Convention and enacted domestic legislation known as the **Marine Plastic Pollution Research and Control Act (MPPRCA)**, which prohibited any ship in U.S. waters from dumping plastics. Second, MPPRCA required EPA, the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Coast Guard to work together to assess the feasibility of using volunteer groups in monitoring floatable debris on the Nation's coastlines.

**The Shore Protection Act of 1988 (33 U.S.C. 2601 et seq.) (SPA)** was enacted to minimize trash, medical debris and other unsightly and potentially harmful materials from being deposited into the coastal waters of the United States as a result of inadequate waste handling procedures by vessels transporting wastes on U.S. coastal waters and at associated loading and offloading facilities. EPA and the Department of Transportation (DOT) are assigned the responsibility for implementing SPA. EPA is responsible for developing regulations implementing Sec. 4103 of the Act which requires owners and operators of waste sources, vessels transporting waste, and waste receiving facilities to take all reasonable steps to minimize the amount of municipal and commercial waste deposited into coastal waters during various vessel and facility operations. EPA proposed its implementing regulations on August 30, 1994 (Waste Handling Practices for Vessels and Waste Transfer Stations, 40 CFR Part 237). The Department of Transportation developed an interim permit and enforcement program such that all vessels transporting solid wastes require a permit from the U.S. Coast Guard and concurrence from EPA that the vessel owner or operator has not violated applicable environmental regulations. DOT's interim rule was finalized in the spring of 2002.

**Regulations under the Marine Protection, Research, and Sanctuaries Act (33 U.S.C. 1401 et seq.) (MPRSA)**, promulgated in 1977, implement the London Convention nationally. The regulations prohibit the transport for the purpose of dumping into the ocean of any "persistent inert synthetic or natural materials which may float or remain in suspension in the ocean in such a manner that they may interfere materially with fishing, navigation, or other legitimate uses of the ocean." Activities involving transport of material for the purpose of disposal at sea are regulated under this act, and permits granted by the Agency prohibit the transport of floatable plastics or debris out to sea for the purpose of dumping.

As amended by the **Water Quality Act of 1987, the Clean Water Act (33 U.S.C. 1251 et seq.)** requires EPA to establish regulations that treat storm water as point source discharges that must be regulated. Under Phase I and Phase II of the National Pollutant Discharge Elimination System (NPDES) Storm Water Program, EPA has issued regulations for storm water that require more than 5,000 municipalities (including many in coastal areas), as well as many industrial facilities, to obtain NPDES permits to discharge storm water. Specifically, Phase I requires NPDES permit coverage for storm water discharges from storm water associated with industrial activity (including construction sites greater than 5 acres in size) and from municipal separate storm sewer systems (MS4s) located in incorporated places or counties that serve populations of

100,000 or more. The Phase II rule requires NPDES permit coverage for storm water discharges from construction sites between 1 and 5 acres and from MS4s that serve areas with populations less than 100,000 down to a lower limit based on the U.S. Census Bureau's definition of an urbanized area. The permit prohibit non-storm water discharges to storm sewers and are leading to improved source control techniques and best management practices. The best way for municipalities and industries to meet the storm water regulation and protect the quality of our waters is to prevent floatables and other pollutants from washing into storm sewers.

Pursuant to the same Water Quality Act, EPA issued the **National CSO Control Strategy**, which also treats CSO discharge points as individual point sources, subject to NPDES permit requirements. The strategy sets forth three objectives:

1. Ensure that all CSO discharges occur only as a result of wet weather.
2. Bring all wet weather CSO discharge points into compliance with the technology-based requirements of the Clean Water Act and applicable state water quality standards.
3. Minimize water quality, aquatic biota, and human health impacts from wet weather overflows that do occur.

EPA's *National CSO Control Strategy* confirms that CSOs are point sources independent of the publicly owned treatment works (POTWs) and reaffirms that both technology-based and water quality-based requirements apply to CSOs. The strategy also emphasizes that CSO point sources that discharge without a permit are unlawful and must be issued permits or be eliminated.