J. ENVIRONMENTAL SYSTEMS, Vol. 18(2) 183-188, 1988-89

WASTES ON NEW YORK AREA BEACHES

R. LAWRENCE SWANSON
Director, Waste Management Institute
Marine Sciences Research Center
State University of New York at Stony Brook

ABSTRACT

Some 93 Km of Long Island, New York's beaches were closed during the summer of 1988 as a consequence of the washup of floatable wastes. In August 1987 80 Km of New Jersey ocean beaches were closed as a consequence of similar wastes. While the relative volume of floatable medical wastes was extremely small, it is the focus for public outrage concerning general conditions of coastal waters. The sources of floatable wastes and their transport are reviewed. Because Long Island is particularly vulnerable to washups of floatable wastes in summer, it is important to work towards reducing the wastes materials at the sources.

Another summer beach season has come to a close and like the summers of 1976 on Long Island and 1987 in New Jersey (Figure 1) this one will be remembered for the beach closures, the faltering tourist trade and perhaps reduced sales at the fisheries markets. For the most part, buoyant waterborne waste materials and debris euphemistically called floatables were the root of the problem.

Typical anthropogenic materials classified as floatables include wood, refuse, sewage related debris (materials acknowledged to regularly reach sewage treatment systems such as condoms, sanitary napkins, tampon applicators, diaper liners, grease balls, etc.) tar balls, fecal material, and fishing gear. A different category of floatables these past two summers is that of medical wastes (hypodermic needles, syringes, bandages, red bags, enema bottles).

Floatables have been a concern in New York and New Jersey coastal waters for well over a century. They contributed to New York City's image as one of the filthiest urban centers of the 1800s. Among other offensive materials, tanneries, slaughter houses, and butchers disposed of their waste water including "hair, bone, blood and other animal byproducts" in the Hudson River. Along with other wastes, floatables were legally dumped at various locations off the

doi: 10.2190/U5UQ-1UKP-YYRB-YWQ0
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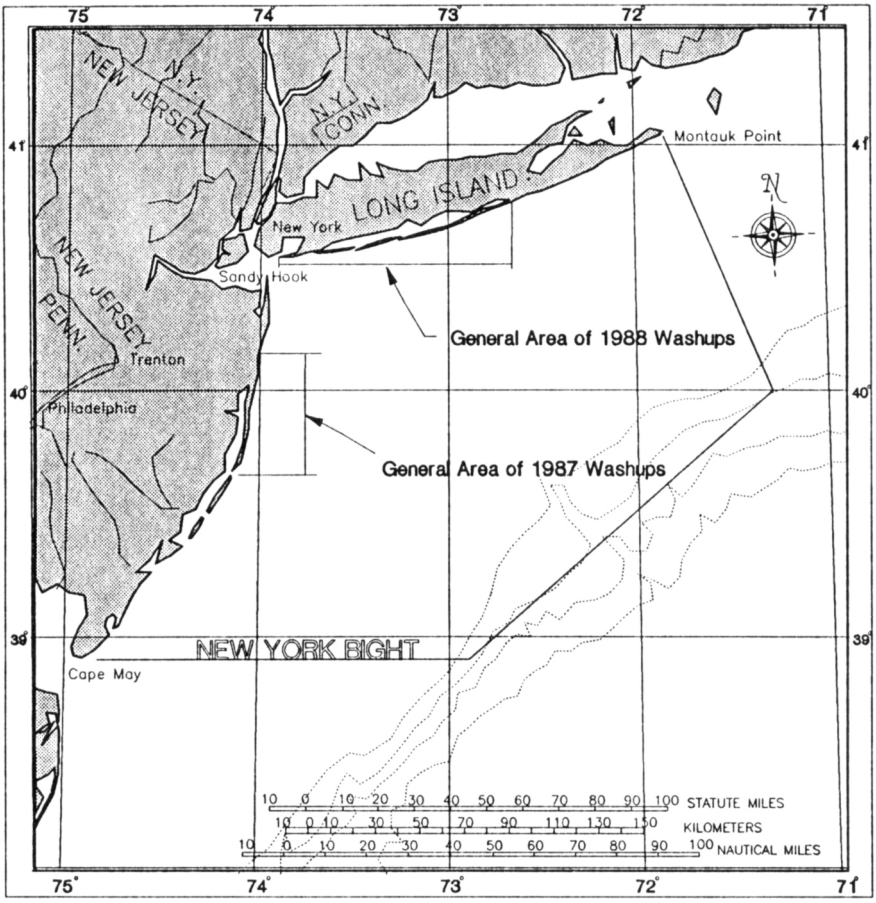

Figure 1. The New York Bight showing the general areas of beach closures due to floatables in 1987 and 1988.

coast for the period 1888-1932. The Supreme Court halted the dumping of refuse at sea and the last barge sailed on 28 June 1934.

Over the last century, the character of floatable waste has changed considerably as have our sensibilities to it. Late in the last century and until the 1930s, refuse, largely in the form of garbage, paper, bottles, degradable metal containers, and dead animals were dumped at the designated refuse and floatable sites. Untreated sewage and associated materials such as condoms entered the harbor waters through the sewerage system.

By the mid-1950s, America had become the throwaway society. *Life* magazine documented the phenomenon with its 1 August 1955 story on "Throwaway Living." The volume of floatables had increased but perhaps, more

importantly, by the mid-1960s their character changed. The styrofoam cup and disposable diapers were part of daily life. Late in 1969, one of the major manufacturers of feminine hygiene products introduced their plastic tampon applicator. Perhaps by the summer of 1970, these infamous "beach whistles" began to wash ashore kindling a renewed concern about floatable waste–but this time centered primarily around sewage related items.

Even more noticeable in the context of the floatable problem, was the introduction of the 1-liter PET (Polyethylene terephthalate) soda pop bottle in 1977.

The beach closures along coastal New Jersey in 1987 and the south shore of Long Island in 1988 have focused on a totally different set of waste products–hospital or infectious waste. Their volume is relatively small, but, as with sewage wastes, concern centers around the issue of public health. Why these wastes are appearing more frequently is not certain. However, there are several possible contributing factors. Among these are:

1. a marked increase in disposable medical care materials,
2. an increase in the use of medically associated equipment on the streets as drug paraphernalia, and
3. an increase in illegal disposal of medical wastes as a consequence of the increased costs of disposal.

The bulk of noxious materials continue to reach New York Bight waters and beaches from the same sources in 1988 as in 1976. Major sources of floatables to the New York Bight include combined sewer outfalls (CSOs), wastewater discharges, solid waste handling, commercial ships, fishing vessels and recreational boaters, and beach users.

The Hudson-Raritan estuary serves as the greatest general source of floatable waste to the Bight since the bulk of the individual sources tend to be located around the periphery of the estuary. Floatables are effectively flushed from the estuary during the time of the spring freshet, typically from March to May in the upper Hudson. The impact of the freshet on the Bight lags this by about one month so that large quantities of floatables can be expected to be flushed into coastal waters at or near the time of the commencement of the summer beach season. Other than at the time of the spring freshet, the floatable load at any one time in the estuarine plume is largely a consequence of the relatively recent rainfall history. A heavy rain following an extended dry period such as in late July 1988 will most likely produce the heaviest volume of floatable material; streets will be cleansed, sewage treatment plants bypassed, and the garbage transfer points and landfills flushed by runoff and perhaps higher storm high waters. Occasionally accidental spills and illegal discharges will add to the normal heavy floatable load.

Once floatable materials are flushed into the Bight, they are subject to the physical oceanographic and meteorological processes operating on Bight waters (see Table 1). Most frequently they will be carried with the Hudson-Raritan

Table 1. Meteorological and Oceanographic Conditions Favoring Source Generation and Transport of Floatables

SOURCE GENERATION	
High river runoff	Usually occurs in May flushing surrounding shorelines and marshes.
High stands of monthly mean sea level	These high stands, particularly in concert with spring tides can refloat stranded materials.
Thunderstorms	High rainfall intensities flushing urban areas and coastal marshes may lead to major combined CSO events and sewage treatment plant bypassing. Power outages may also occur causing sewage treatment plant bypassing.
Heat waves	Brownouts or blackouts cause sewage treatment plant bypassing.
TRANSPORT AND DEPOSITION	
Hudson River plume	High fresh water input into the Bight intensifies the coastal plume. It typically hugs the New Jersey shore, carrying with it a substantial floatable load, but may expand to the east and south during high flows.
Summertime wind field	The winds shift from the west and northwest to the south for the period May through September. These winds primarily favor floatable transport toward Long Island.
Sea breezes	The temperature contrast between the land and the sea creates a vigorous sea breeze that can help move floatable material shoreward. The sea breeze intensifies the normal southerly wind field off Long Island making its south shore particularly vulnerable.

estuarine plume along the New Jersey coast. This is why the beaches at Sandy Hook are so often cluttered with undesirable materials.

The general flow of surface waters over the continental shelf is from the northeast to the southwest parallel to the trend of the coast. Floatable materials in the surface layers are transported with these currents but also influenced by wind driven transport.

During summer months, prevailing winds have a pronounced effect on the distribution and fate of floatables. Typically the prevailing wind is from the south to southwest but intermittently shifting to other directions. These winds tend to transport the floatables to the north and east. Thus floatable materials will generally be well disbursed–some lost at sea, others creating the general clutter that we have objected to on both New Jersey and Long Island beaches.

Floatable material will tend to be concentrated at zones of convergence such as at the edge of the Hudson River plume. Thus streaks of floatable material are often observed. They are modified by currents near the shore so that they

become more coast parallel and are often described as washing ashore in waves. Once floatables are accumulated in this way and driven close to the coast, sea breezes are probably a predominant factor in moving them ashore.

In 1976, the prevailing summer wind field intensified from the south and was extremely persistent (no wind shifts) for a period of two weeks (9-25 June), driving the floatable material northward and eastward and eventually ashore on Long Island. The winds of July 1988 were nearly identical to those of June 1976.

In 1987, the winds were much more variable when on a number of occasions they blew from the east coinciding with the washup of floatables on New Jersey beaches.

Floatable wastes are ubiquitous in the New York Bight. Illegal disposal has probably been a source of floatable medical wastes during the 1987 and 1988 events, as a result of deliberate dumping by some medical facilities or waste contractors servicing these facilities for the sole purpose of avoiding the high cost of appropriate disposal. Some medical wastes probably are also mixed in carelessly with domestic solid wastes by small medical offices including dentists and veterinarians and chronic home based patients. The recent rise in the costs of disposing of medical or infectious waste is an incentive to dispose of such wastes illegally.

It is important to recognize that the profusion of medical wastes on regional beaches in 1987 and 1988 is not a consequence of a technological breakdown. Instead it is linked to irresponsible or unthoughtful acts of people. Perhaps the most effective mechanisms for reducing the material waste problem is by tightening controls on such wastes. The proposed chain of custody for these materials from manufacture to ultimate disposal or destruction should be implemented.

Source reduction is a key to the overall problem of waste management, reducing the total volume of potentially floatable materials. With regard to medical wastes, the medical profession and its suppliers must examine the real need for its disposable supplies. Perhaps 20 to 30 percent of hospital waste is plastic compared to 3 to 6 percent for municipal solid waste.

Educational programs should be designed to encourage beach users and recreational boaters and marina operators to be more conscientious concerning proper waste disposal. Expanded disposal facilities should be available at all beaches and marinas and the frequency of trash removal increased. Governments and businesses can perhaps work together to create incentive programs to reduce beach littering and over-the-side disposal. The State of New Jersey is already instituting these types of programs.

There have been some improvements in the overall floatable waste problem in recent years. Specifically, the volume of raw sewage discharged in the metropolitan area has been reduced over an order of magnitude. There is also the rudiments of a program to control CSOs.

There are, however, technological improvements that should continue to be explored in order to further reduce the volume of floatable wastes reaching area beaches. Some of these are:

1. improve operation and maintenance of sewage treatment plants and reinstitute emergency supplies to reduce bypassing during power shortages;
2. strive to reduce or eliminate CSOs;
3. explore more thoroughly, alternatives for isolating material released to the marine environment by combined sewer overflow;
4. continue to improve the process of removing litter and floatable debris from streets and other paved areas served by combined sewer systems;
5. improve solid waste handling practices aimed toward recycling and the use of wastes as an energy source; and
6. improve the process of transferring materials to landfills and reduce the volume of materials escaping to marine water from landfills.

Short of these improvements we must be prepared to suffer the consequences of floatable beach pollution and associated beach closures.

Climatic conditions just before and during summer including high spring river runoff, intense thunderstorms, and high stages of monthly mean sea level in the metropolitan area lead to large floatable loads in the harbor. Power outages or brownouts caused by electrical storms and summer heat increase the likelihood for sewage treatment plant breakdowns and bypassing, thus potentially adding to the already large floatable burden.

Unfortunately, both Long Island and New Jersey beaches are vulnerable to the washup of floatables. The Hudson River plume will continue to transport its floatable load along the northern New Jersey coast where it can periodically be transported shoreward.

Long Island is particularly vulnerable because of the normal southerly wind field during the summer months. The daily onshore sea breeze intensifies the mean flow.

Until fewer potential floatables are manufactured, controlling their dispersal will be increasingly costly and uncertain. Until source control is more effective, intensive beach cleaning efforts are the remaining solution. Further, existing levels of source control may well reduce the usage of beaches nearest most of the metropolitan region's users, resulting in unprecedented pressures upon beaches further to the east and south, and heightening frustrations of those unable to reach the most distant beaches.

On Labor Day, 1976, we put the floatable problem out of our minds hoping that it would disappear. It is important not to let the passage of summer dim our memories this year if we want our politicians and public agencies to initiate action to reduce the problem. We must also realize that these improvements will be costly.

Direct reprint requests to:

R. Lawrence Swanson
Director, Waste Management Institute
Marine Sciences Research Center
State University of New York
Stony Brook, NY 11794-5000