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Developing a Marine Debris Reduction Plan for Virginia

Written and prepared for the Coastal Zone Management Program by:

Katie Register, Executive Director, Clean Virginia Waterways

Under the direction of:

Laura McKay, Manager, Virginia Coastal Zone Management Program

Stakeholder facilitation and research by:

Todd Janeski, Virginia Commonwealth University

*Angela Neilan, Community Involvement Specialist, Virginia Department
of Environmental Quality*



Virginia Coastal Zone
MANAGEMENT PROGRAM



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Project Leadership Team

LeAnne Astin, Ecologist II, Stormwater Planning Division, Fairfax County
Donna Bilkovic, PhD., Research Associate Professor, Virginia Institute of Marine Science
John W. Deuel, Environmental Sustainability Consultant, GreenQuest
Kirk J. Havens, PhD, Director, Coastal Watersheds Program, Asst. Director, Center for Coastal Resources Management, Virginia Institute of Marine Science
Nicholas Mallos, Conservation Biologist, Marine Debris Specialist, Ocean Conservancy
Laura McKay, Manager, Virginia Coastal Zone Management Program
Geralyn Mireles, Wildlife Biologist, Back Bay National Wildlife Refuge
Alicia Nelson, Fisheries Management, *Virginia Marine Resources Commission*
Kathy O'Hara, Marine Debris Researcher & Consultant, Virginia Aquarium Stranding Response Program
Susan Park, Assistant Director for Research, Virginia Sea Grant, Virginia Institute of Marine Science
Jason Rolfe, Southeast and Caribbean Regional Coordinator, National Oceanic and Atmospheric Administration, Marine Debris Program
Kathy Russell, Education and Outreach Coordinator, TFC Recycling
Renee Searfoss, Ocean and Dredge Disposal Team Lead, Office of Monitoring and Assessment, U.S. EPA Region III
Anne Smith, Virginia Clean Marina Program, Virginia Institute of Marine Science
Mark Swingle, Director of Research & Conservation, Virginia Aquarium & Marine Science Center
Christina Trapani, Owner, Eco Maniac Company, Marine Debris Researcher & Consultant, Virginia Beach Clean Community Commission

Additional contributors to the Virginia Marine Debris Reduction Plan are listed in Appendix H.

This document, as well as a shorter version of the Virginia Marine Debris Reduction Plan can be downloaded from the Virginia Coastal Zone Management Program web site:
<http://www.deq.state.va.us/programs/coastalzonemanagement.aspx>

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Executive Summary

Marine debris is of local, regional, national, and global concern. It has become one of the most widespread pollution problems in the world's oceans and waterways, impacting wildlife, human health and safety, habitats, and economies.

Marine debris is defined as *any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment or the Great Lakes*, according to the National Oceanic and Atmospheric Administration (NOAA). As much as 80% of marine debris comes from land-based sources – though abandoned or derelict fishing gear, vessels, and other water-based sources significantly contribute to the problem.

In order to strategically address this problem through Virginia policies and programs, the Virginia Coastal Zone Management (CZM) Program undertook a planning process from 2012 to 2014 that culminated in the development of the Virginia Marine Debris Reduction Plan (VMDRP).

The VMDRP describes major goals and strategies to address marine debris on a statewide basis through prevention, interception, innovation, and removal for ecological, social, and economic benefits. It is designed to guide the work of a collaborative team of Virginia agencies, community groups, citizens, and other stakeholders for the next decade. The VMDRP identifies priorities and actions Virginia could feasibly coordinate and accomplish to measurably reduce marine debris in Mid-Atlantic waters.

The VMDRP was developed by a leadership team consisting of representatives from government agencies (federal, state, and local), academia, nonprofit organizations, businesses, experts in marine debris issues, and other stakeholders who are potential implementers of the reduction plan.

Throughout the process, the focus was on determining specific actions that are politically, socially, and economically feasible for Virginia to accomplish in the near-term (two years), mid-term (two to five years), and long-term (up to 10 years).

The planning process sought input from participants who attended the 2013 Virginia Marine Debris Summit, surveys and one-on-one interviews, and through multiple meetings of the leadership team. Goals and strategies of the VMDRP were based on the most problematic and abundant types of debris in Virginia that, according to 2013 summit participants, are: (1) fishing gear (commercial and recreational); (2) cigarette butts and balloons; (3) food and beverage containers; and (4) plastic bags. Marine debris plans from other states were also consulted.

The plan was developed around five main goals: leadership, prevention, interception, innovation, and removal and clean up.

Strategies for achieving each of these goals were organized around five themes: (1) influencing individual behavior change; (2) increasing collaboration among Virginia litter and marine debris prevention and removal projects; (3) increasing the marine debris knowledge base; (4) identifying and securing necessary funding for implementation; and (5) utilizing regulations to reduce the sources of marine debris.

The Virginia Marine Debris Reduction Plan identifies near-term actions and specific steps for 2015 - 2016:

1. **On-going Leadership and Coordination.** Establish an on-going Virginia marine debris advisory committee.
2. **Balloon Reduction Campaign.** Develop and implement a social marketing campaign targeting behaviors that will reduce balloon litter in the marine environment. (Balloons were identified as one of the most harmful items to wildlife.)
3. **Legislation and Policy.** Analyze existing legislation and policies and provide recommendations to support land-based waste minimization of the most common items found as marine debris (e.g., single-use plastic bags, food and beverage packaging, balloons, cigarette butts).
4. **Revenue.** Identify existing and potential revenue streams to sustain statewide marine debris and litter prevention.

Goals beyond the near-term are described in general terms in the Virginia Marine Debris Reduction Plan, and will require further work to develop specific steps.

Under contract to the Virginia CZM Program, Clean Virginia Waterways of Longwood University (Katie Register) facilitated research and coordinated the development of the VMDRP. The Virginia Department of Environmental Quality (Angela Neilan) and Virginia Commonwealth University (Todd Janeski) assisted with stakeholder engagement and meeting facilitation. Virginia CZM Program staff (Laura McKay and Virginia Witmer) provided project oversight.

Introduction

Marine debris is an enormous and growing problem. It is important for Virginia to play its part in reducing marine debris on a statewide level. Under the leadership of Virginia's Coastal Zone Management Program, a plan was developed that will upon implementation reduce the state's contribution to marine debris. This document describes the development of Virginia's Marine Debris Reduction Plan (VMDRP), and is a deliverable under NOAA Grant FY11 Task 95.03.

This document also describes the process of developing the plan under the guidance of a leadership team; details the plan's near-term objectives and strategies to achieve these objectives; and describes mid- and long-term objectives and strategies to address types, sources, and problems caused by marine debris in Virginia.

The over-arching goal of the Virginia Marine Debris Reduction Plan is to reduce the amount of trash and marine debris from land-based and water-based sources in Virginia waters through prevention, interception, innovation, and removal for ecological, social, and economic benefits.



Beverage containers, food wrappers, bait containers and other debris – mostly plastic – litter the bank of the Potomac River in Alexandria, Virginia. (Photo: K. Register, CVW)

The plan identifies priorities and actions Virginia could feasibly coordinate and accomplish to measurably reduce marine debris in Mid-Atlantic waters. Throughout the process, the focus has been on determining specific actions that are politically, socially, and economically feasible for Virginia to accomplish in the near-term (two years), mid-term (two to five years), and long-term (up to 10 years).

This report is organized as follows:

Section 1 describes the sources, impacts, nature of and extent of marine debris. This section also includes a discussion of the definition of marine debris and the current programs and technologies being applied to address the issue.

Section 2 provides information about activities currently underway in Virginia to quantify and characterize the problem of marine debris in Virginia.

Section 3 describes the process that Virginia has undertaken to develop the Virginia Marine Debris Reduction Plan, which may be of interest to other states and groups engaged in addressing the types, sources, and problems caused by marine debris.

Section 4 details the findings from stakeholder input gathered to inform the development of a multi-phase marine reduction plan for Virginia.

Section 5 presents the Virginia Marine Debris Reduction Plan, along with a discussion of reasons for its organization and detailed descriptions of plan elements (goals, strategies, and actions) and priorities.

Section 6 discusses the implementation of the Virginia Marine Debris Reduction Plan, including an in-depth discussion of near-term activities to be undertaken in the upcoming two-year period.

1. Marine debris: the scope of the problem

Definitions

Marine debris is a local, regional, and global pollutant of concern. It has become one of the most widespread pollution problems in the world's oceans and waterways, impacting wildlife, human health and safety, habitats, and economies.

Marine debris is defined as *any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment or the Great Lakes*, according to the National Oceanic and Atmospheric Administration (NOAA) Marine Debris Program.

Growing concern about the impacts of marine debris in the ocean and coastal waters, along with increasing emphasis on stormwater management of litter and debris, have led to a new urgency to understand and address the sources of marine debris in Virginia's coastal and ocean waters.

Many names, one problem

Many terms describe this type of water pollution. "Marine" refers to seawater and the oceans, so some people prefer to call this type of pollution "aquatic" to include freshwater rivers and lakes as well as the oceans. Indeed, the majority of trash in coastal waters and the ocean comes from inland sources via storm drains, streams, and rivers. Others call this problem "plastic pollution" to put an emphasis on plastics that make up the majority of the debris. No matter what it is called, eliminating plastic and litter in inland local streams and rivers also eliminates it from coastal waters, the Chesapeake Bay, and the ocean.

An abundance of plastic

Over the past few decades, the amount of single-use disposable items has grown, as has our population. World production of plastics in 2013 reached 317 tons (or 288 million metric tonnes), nearly 3 percent higher than in 2011 (PlasticsEurope, 2012). As seen in Table 1, the amount of plastics generated in the U.S. since 1960 has risen sharply. One-third of this plastic material becomes single-use disposable packaging (Thompson, 2014).

One result of these trends can be seen in freshwater rivers, coastal waters, and the ocean where synthetic materials like plastic are found on the water surface, in the water column, and in the benthic (bottom) regions of water bodies. While methods of determining abundance of marine debris vary, there is agreement that the majority of marine debris (up to 75 percent) is made up of plastics.

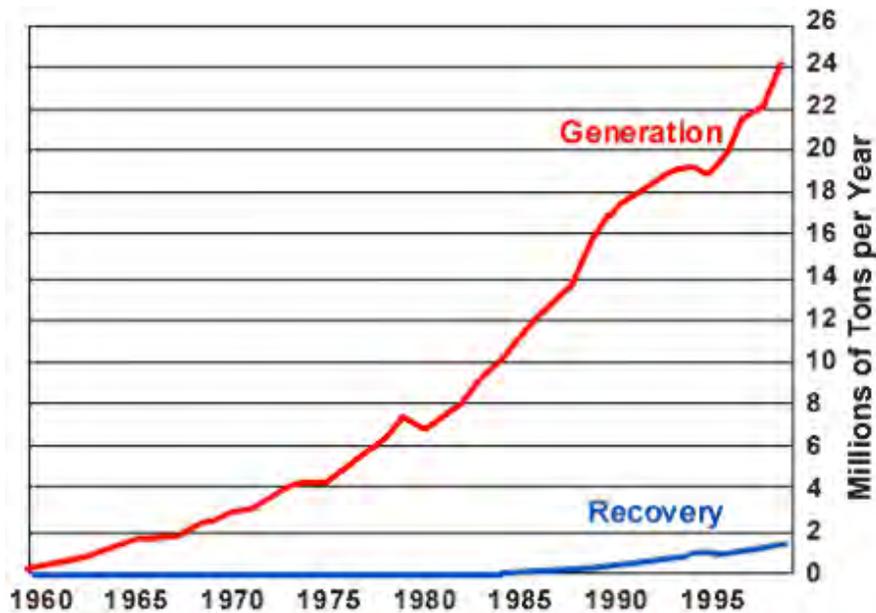


Table 1. The generation of plastics in the U.S. since 1960 have greatly increased, while only a small fraction is recycled. Source: Plastics White Paper, California Integrated Waste Management Board, 2003.

Microplastics: a growing concern

NOAA defines microplastics as any piece of plastic smaller than 5 mm in the largest dimension. Some microplastics in the ocean come from fragmentation of larger pieces of plastic – for example, one plastic bottle can be transformed into hundreds of shards of microplastic over time. Another source of microplastics are polyethylene and polypropylene “microbeads” that are found in personal care products such as facial scrubs and toothpaste. When rinsed down the drain, they travel through the sanitary sewer system, where they often pass through waste treatment plants – most are not equipped to remove microbeads – and so enter streams, rivers and eventually the marine environment or freshwater lakes.

Microplastic debris is of growing concern for several reasons. First, there is evidence that many species, including fish, ingest microplastic debris (Rochman, Hoh, Hentschel, & Kaye, 2013). Second, hazardous chemical contaminants found in the water sorb (attach) to the tiny pieces of plastic. Research is underway to understand the rate at which chemicals can transfer from ingested plastics to animals, and what bioaccumulation and biomagnification implications these chemicals may present to aquatic food webs.

One NOAA-funded project, led by Professor Robert Hale at the Virginia Institute of Marine Science (VIMS), is focusing on characterizing in the laboratory leaching and sorption of “persistent, bioaccumulative, and toxic” (PBT) chemicals from microplastics.

Sources of marine debris: land-based and water-based

Where does marine debris come from? The National Marine Debris Monitoring Program (NMDMP) in a study conducted between 2001 and 2006 by Ocean Conservancy and the U.S. Environmental Protection Agency determined that, in the U.S., land-based sources accounted for 49 percent of the marine debris surveyed in the United States. Ocean-based sources contributed 18 percent, while general sources (items that could have come from either land- or ocean-based sources) made up the remaining 33 percent (Sheavly, 2007). The most abundant types of marine debris on the U.S. coastline were plastic straws, plastic bottles, plastic bags, balloons, and metal beverage cans (Sheavly, 2007).

Land-based sources: litter, storm drains, and the urban runoff connection

The sources of litter in our environment are myriad – some start with inadvertent or intentional discards by people, while other comes from poor management of waste. While many people believe that storm drains in urban and developed areas transport rainwater to a place where it is “cleaned up,” this is rarely true. Litter and trash (along with pet waste, pesticides, herbicides, fertilizers, and motor oil) are often carried by stormwater directly into streams, bays, and the ocean.



Overflowing and inadequately maintained trash receptacles can contribute to litter on streets, and eventually become aquatic or marine debris. (Photos: K. Register, CVW)

Land-Based Sources come from people who ...

- Litter while driving or walking
 - Illegally dump waste
 - Overload or fail to empty trash receptacles and dumpsters
 - Fail to secure trucks that are loaded with waste items
 - Practice improper disposal of trash including construction activities
-

Most urbanized areas have storm sewer systems that convey stormwater from city streets to local streams and rivers. Under the Clean Water Act, the storm sewer systems in large and mid-size localities are regulated as point sources and are called municipal separate storm sewer systems (MS4s).

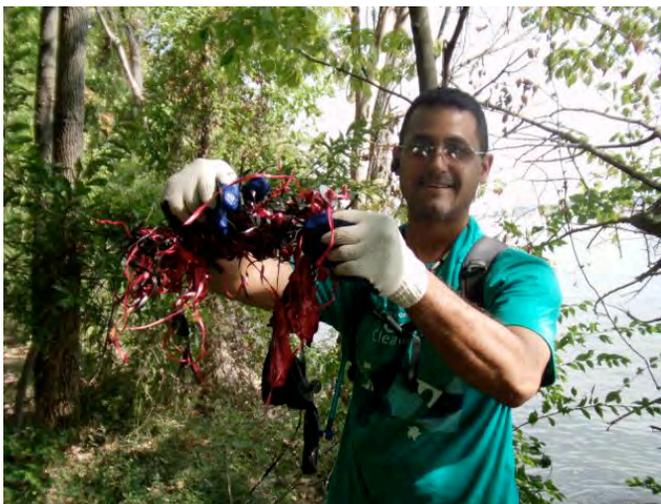
In Virginia, there are more than 115 permitted MS4s, which are regulated under the Virginia Stormwater Management Act through the Virginia Stormwater Management Program (VSMP). The Virginia Department of Environmental Quality administers this program. Permits require MS4 owners/operators to implement a series of programs to reduce the discharge of pollutants in order to protect the water quality of nearby streams, rivers, wetlands, and bays. This includes keeping litter and trash out of storm drains (DEQ, 2014).

Cities that have Combined Sewer Overflow (CSO) infrastructure discharge untreated storm and wastewater into streams and rivers during heavy rain and thus are yet another source of marine debris. The cities of Richmond and Lynchburg have CSOs that discharge into the James River and tributaries of the James. A portion of Old Town Alexandria has a CSO that discharges into the Potomac River and its tributaries. Each of these cities is improving its infrastructure to reduce problems associated with CSOs.

Airborne sources of marine debris

While the majority of debris enters the coastal areas via watersheds, another method of land-based debris transport involves wind. Light items, such as plastic bags and helium-filled balloons, can travel for miles.

A comprehensive response to marine debris must take into consideration sources of debris that may be outside of local, regional, or state jurisdictional boundaries. For example, the airshed of the Chesapeake Bay is a great deal larger than its watershed.¹



This tangle of balloons with plastic valves and ribbons was removed from the Potomac River by a volunteer. (Photo: K. Register, CVW)

¹ See http://www.chesapeakebay.net/maps/map/chesapeake_bay_airshed for map of the Chesapeake Bay airshed.

Water-based sources of marine debris

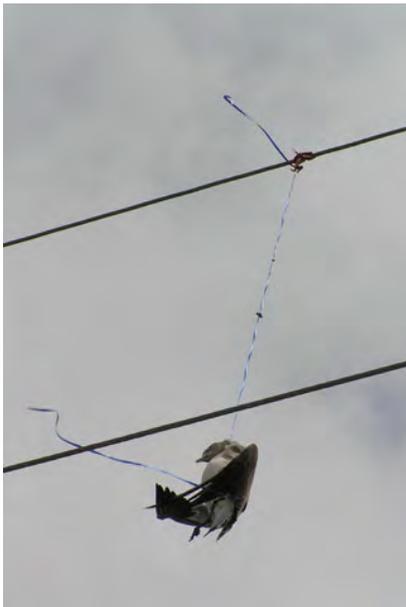
Marine debris does not all come from the land. Ocean-based (or water-based) sources contribute 18 percent to marine debris in the United States, according to the National Marine Debris Monitoring Program study (Sheavly, 2007). This includes nets, crab pots, fishing line, and other commercial and recreational fishing equipment that is lost or abandoned and becomes “derelict.” Water-based sources of marine debris include commercial fishing vessels, merchant ships, cruise ships, recreational fishing and pleasure craft, petroleum rigs and drilling operations, naval and other government vessels that illegally discharge marine galley waste and other forms of trash into coastal and offshore waters debris.

While land-based sources contribute the majority of debris to waterways and coastal waters, the debris that is contributed by water-based activities can be exponentially deadly to marine organisms. As explained by Nancy Wallace, NOAA Marine Debris Program Director, “Nets, crab pots, and other fishing gear are specifically designed to capture and kill” (personal communication). When abandoned, discarded, or unattended, fishing gear continues to capture and kill.

Impacts of marine debris

Entanglement and ingestion by wildlife

According to the United Nations Environmental Programme, more than 260 species of animals worldwide—including marine mammals, birds, turtles, crustaceans, and fish—have been reported entangled in marine debris or have ingested it (Kershaw, et al., 2011). In the United States, at least 115 different marine species have become entangled in plastic marine debris, according to a 2014 report from the NOAA Marine Debris Program in partnership with the National Centers for Coastal Ocean Science (NOAA, 2014a). In particular, fishing line and nets, plastic ribbons on balloons, and similar types of trash can easily entangle animals.



*This laughing gull became entangled in a balloon ribbon on Virginia’s Eastern Shore.
(Photo: P. Denmon)*

Marine animals also consume plastic bags, balloons, and other types of marine debris when they mistake it for a food source or ingest it accidentally during normal feeding habits (NOAA, 2014b). Ingesting debris items can cause throat or digestive track obstruction and damage to the gut, resulting in malnutrition or death.

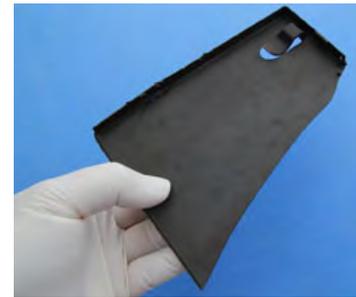


A Kemp's Ridley sea turtle, a critically endangered species, was found on Fisherman Island, Virginia with the string of a balloon protruding from the mouth. A latex balloon attached to the ribbon was found in the turtle's esophagus. The Virginia Aquarium's Stranding Response Team found a second balloon in the lower GI tract. (Photo: US FWS Northeast Region)



Dead croaker, flounder, and crabs found in derelict crab pots. Derelict fishing gear includes nets, crab pots, fishing line, and other commercial and recreational fishing equipment that is lost or abandoned. (Photo: CCRM/VIMS)

A young female sei whale died near Portsmouth, Virginia in August 2014. The Virginia Aquarium Stranding Response Team's necropsy revealed that, in addition to a presumed vessel strike, the animal had ingested a large sharp piece of rigid, black plastic. It was eventually identified to be a piece of a DVD case. The plastic appeared to have damaged the lining of the stomach thereby preventing the animal from feeding normally. There was no evidence that the whale had fed recently.



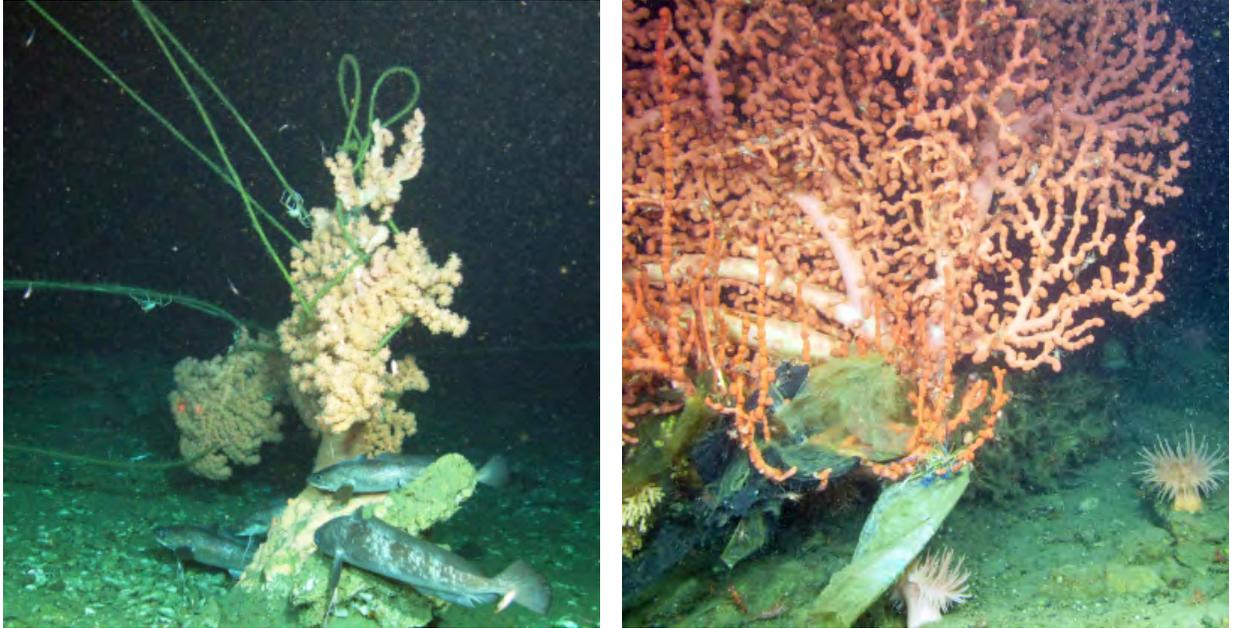
Virginia Aquarium Stranding Response Team members examine a young sei whale found dead in August 2014. This section of a DVD case was found in her stomach (Photos by Steven Katz, The Virginian Pilot; Virginia Aquarium.)

Besides the immediate effects of ingested plastics, researchers are studying whether the compounds used in manufacturing plastics, and the chemicals that adhere to plastics found in the environment, may have any lethal and sub-lethal impacts (Kershaw, et al., 2011).

Ecosystems, human safety, and economic impacts of marine debris

In addition to posing significant threats to wildlife, marine debris also impacts ecosystems. Plastic tarps, abandoned nets and fishing gear, tires, and other debris can smother and crush sensitive ecosystems such as deep sea corals found in the submarine canyons 50 miles off Virginia's coast (Ross, personal communication).

During deep-water canyons research in 2012 and 2013, researchers Dr. Steve Ross (University of North Carolina-Wilmington) and Dr. Sandra Brooke (Florida State University) observed a variety of debris items including plastic bags, military related (spent shell casings), and derelict fishing gear including trawl netting, traps, and fishing lines. Debris items were often entangled in deep-sea corals. Researchers (supported by the Bureau of Ocean Energy Management and NOAA's Office of Ocean Exploration and Research) commonly observed debris in the Baltimore and Norfolk canyons off the coast of Virginia and the Delmarva peninsula, particularly near the canyon heads. They reported that there was more debris at those two sites than in similar depth sites investigated elsewhere off the eastern U.S. (Ross, personal communication).



Deep sea corals in the Baltimore canyon are entangled in fishing line (left) and plastic debris (apparently a bag and ribbon). (Photos: S. Ross, University of North Carolina-Wilmington)

Human health and safety can also be impacted by marine debris. Medical and personal hygiene debris containing pathogens can enter waterways when sewer systems fail or overflow. Broken glass, syringes, and other hazardous debris items can also harm bare-foot beach goers. Boaters' safety can be compromised when debris items – fishing line, nets, plastic bags, and rope pieces – wrap around boat propellers or clog seawater intakes.

A recent NOAA Marine Debris Program economic study demonstrates that marine debris can also have considerable economic costs. The study of several beaches in California found that beach goers avoid littered beaches, spending their recreational dollars elsewhere (Leggett, Scherer, Curry & Bailey, 2014). As the report states, “Given the enormous popularity of beach recreation throughout the United States, the magnitude of recreational losses associated with marine debris has the potential to be substantial.” Virginia communities also spend taxpayer dollars on beach cleanups, litter removal, street sweeping, and other methods to prevent or remove marine debris.

Solutions to marine debris

Just as marine debris is derived from many sources, so too are marine debris solutions. Reports such as the Honolulu Strategy provide an extensive global framework for the prevention and management of marine debris (United Nations & NOAA, 2011). Marine debris plans for California and Hawaii also contain comprehensive approaches to reduce marine debris. The Virginia plan for reducing marine debris utilizes strategies found in these other plans, but is ultimately built upon the many activities and programs currently underway in Virginia. These activities and programs are outlined in Section 2.

2. Understanding and responding to marine debris in Virginia

To effectively address the problem of marine debris pollution, it is important to understand the nature and scope of the problem. Several research studies and volunteer cleanup events contribute data that help define the problem of marine debris found on the beaches and waters of Virginia. The most important studies in Virginia are described below.

Monitoring programs

National Marine Debris Monitoring Program

Data collected during the National Marine Debris Monitoring Program (Sheavly, 2007) for the region² that included Virginia showed the most common debris items were:

- Straws (41,015 or 39.4% of all items found)
- Plastic beverage bottles (14,382 or 13.8%)
- Plastic bags, < 1 meter (8,076 or 7.7%)
- Balloons (8,050 or 7.7%)
- Cotton swabs (6,177 or 5.9%)

Virginia Aquarium & Marine Science Center Monitoring Program

Researchers from the Virginia Aquarium & Marine Science Center and Clean Virginia Waterways are currently collecting data on the quantities and types of marine debris found in Virginia's coastal zone using NOAA's Marine Debris Shoreline Survey protocol (Opfer, Arthur & Lippiatt, 2012).

Two different surveys (accumulation and standing stock) are conducted on a monthly basis at four coastal sites (Chincoteague National Wildlife Refuge, Fisherman Island National Wildlife Refuge, Back Bay National Wildlife Refuge, and Grandview Nature Preserve in Hampton). Funding to support this work comes from NOAA through a Virginia CZM Program grant.

Such marine debris monitoring programs are, according to NOAA, "...necessary to compare debris sources, amounts, locations, movement, and impacts across the US and internationally" (NOAA, 2012). In addition, data collected by the Virginia Aquarium can be used to evaluate the effectiveness of Virginia's policies and efforts to mitigate marine debris through the VMDRP.



Virginia Aquarium volunteers collect data about marine debris at Back Bay National Wildlife Refuge. (Photo: C. Trapani)

² Monitoring sites in "Region 2" of this study were in Massachusetts, Rhode Island, New York, New Jersey, Delaware, and Virginia.

Participants of the Virginia Marine Debris Summit identified the need for high-quality data about the quantity and types of marine debris found on Virginia's beaches. While extensive data exists about the types of litter and trash found in Virginia's waterways, beaches and coastal waters, these data are of the "snapshot" variety. Data collected using a rigorous, standardized protocol will increase understanding of the nature and sources of marine debris and contribute to adapting management strategies for reducing marine debris.

Volunteer cleanup events in Virginia

Volunteers in Virginia turn out every year for many river and coastal events to remove litter and marine debris from Virginia's waterways, including the International Coastal Cleanup, Potomac River Watershed Cleanup, James River Cleanup, Clean the Bay Day, Roanoke Valley Waterways Cleanup, Mattaponi and Pamunkey Rivers Cleanup, and many more.

Volunteers with local groups, schools, churches, and businesses participate in Virginia Department of Conservation and Recreation's Adopt-a-Stream, which provides opportunities to become a caretaker of a local waterway and assume a watershed-based stewardship ethic (VA DCR, 2014).

Collectively, these volunteer events remove hundreds of thousands of pounds of litter and debris from Virginia's waterways every year.

International Coastal Cleanup in Virginia - Virginia Waterways Cleanup

The Virginia Waterways Cleanup is part of the Ocean Conservancy's International Coastal Cleanup (ICC). Clean Virginia Waterways (CVW) organizes this annual statewide cleanup event of streams, rivers, bays, and coastal waters throughout Virginia. More than 3.3 million pounds of litter and debris have been removed from Virginia's waterways from 1995 through 2013.

Volunteers act as citizen scientists by using data forms to tally the number of cigarette butts, beverage containers, food-related wrappers, balloons, plastic bags, and other common marine debris items – information that CVW has used to build a comprehensive database of litter and marine debris found in Virginia's waterways. Each year, CVW issues a "Top 20" list for the state, as well as Top 20 lists for each individual cleanup.

During the 2013 Virginia Waterways Cleanup, more than 7,600 volunteers removed 328,238 pounds of trash from Virginia's rivers and beaches. Table 2 shows the Top 20 list for 2013, which accounts for 80.6 percent of all litter and trash picked up by volunteers. The majority of litter items are made of plastic. Table 3 shows the trend of trash items over 19 years of waterway cleanups in Virginia.

Many of these "Top 20" items were mentioned as items of concern in Virginia during the stakeholder survey and interviews conducted during the development of the VMDRP (see Section 3).

Table 2. Top 20 Items reported by volunteers statewide during the 2013 Virginia Waterways Cleanup. Items containing plastic are in bold.

	Item	Total Items	Total Percentage
1	Cigarette Butts	24,619	15.69
2	Beverage Bottles (Plastic)	15,937	10.16
3	Food Wrappers (candy, chips, etc.)	15,050	9.59
4	Beverage Cans (Metal)	12,430	7.92
5	Grocery Bags (Plastic)	12,159	7.75
6	Beverage Bottles (Glass)	7,215	4.60
7	Bottle Caps (Plastic)	5,999	3.82
8	Other Plastic Bags	5,986	3.81
9	Straws, Stirrers (Plastic)	3,988	2.54
10	Cups & Plates (Foamed Plastic)	3,382	2.16
11	Other Plastic/Foam Packaging	3,310	2.11
12	Lids (Plastic)	2,512	1.60
13	Take Out/Away Containers (Plastic)	2,335	1.49
14	Construction Materials	2,231	1.42
15	Fishing Line (1 yard/meter = 1 piece)	2,025	1.29
16	Bottle Caps (Metal)	1,739	1.11
17	Cups & Plates (Plastic)	1,596	1.02
18	Forks, Knives, Spoons (Plastic)	1,391	0.89
19	Strapping Bands (Plastic)	1,359	0.87
20	<u>Cups & Plates (Paper)</u>	<u>1,307</u>	<u>0.83</u>
	Total	126,570	80.60



This volunteer cleanup event removed several hundred pounds of debris from the Shenandoah River – including a bowling ball. (Photo: N. Sottosanti, Shenandoah River Outfitters)

Table 3. International Coastal Cleanup data for Virginia, 1995-2013; Top 20 items over 19 years.

(Source: Clean Virginia Waterways and Ocean Conservancy)

	1995-1999	2000-2004	2005-2009	2010-2013
1	Cigarettes/Cigarette Filters	Beverage Bottles (Plastic)	Cigarettes/Cigarette Filters	Cigarettes/Cigarette Filters
2	Bags	Cigarettes/Cigarette Filters	Beverage Bottles (Plastic)	Beverage Bottles (Plastic)
3	Cups, Plates, Forks, Knives, Spoons	Beverage Bottles (Glass)	Food Wrappers/Containers	Food Wrappers/Containers
4	Food Wrappers/Containers	Food Wrappers/Containers	Bags	Bags
5	Beverage Cans	Beverage Cans	Beverage Cans	Beverage Cans
6	Caps, Lids	Bags	Beverage Bottles (Glass)	Cups, Plates, Forks, Knives, Spoons
7	Beverage Bottles (Glass)	Cups, Plates, Forks, Knives, Spoons	Cups, Plates, Forks, Knives, Spoons	Beverage Bottles (Glass)
8	Beverage Bottles (Plastic)	Caps, Lids	Caps, Lids	Caps, Lids
9	Straws, Stirrers	Straws, Stirrers	Straws, Stirrers	Straws, Stirrers
10	Building Materials	Balloons	Building Materials	Tires
11	Balloons	Building Materials	Clothing, Shoes	Building Materials
12	Rope	Clothing, Shoes	Tobacco Packaging/Wrappers	Toys *
13	Clothing, Shoes	Tobacco Packaging/Wrappers	Balloons	Tobacco Packaging/Wrappers
14	Fishing Line	Toys	Fishing Line	Cigar Tips
15	Oil/Lube Bottles	Fishing Line	Bait Containers/Packaging	Clothing, Shoes *
16	Tires	Bait Containers/Packaging	Cigar Tips	Fishing Line **
17	Toys	Rope	Toys	Strapping Bands
18	Buoys/Floats	Cigarette Lighters	Tires	Balloons
19	Cigarette Lighters	Oil/Lube Bottles	Rope	Rope
20	Six-Pack Holders	Pull Tabs	Pull Tabs	Bait Containers/Packaging *

* Due to a change in the Data Form starting in 2013, data for these items were not collected in 2013. In spite of no data in 2013 for toys, clothing/shoes and bait containers/packaging, these items still made the top 20 list for this four-year time period.

** Due to a change in the Data Form starting in 2013, the methodology for collecting fishing line data changed. Starting in 2013, one meter of fishing line is equivalent to "one piece." This change has greatly increased the number of pieces of fishing line reported by volunteers. For example, in 2012, a total of 636 pieces of fishing line were recorded by volunteers compared to 2,025 pieces in 2013.

Blue indicates food and beverage-related items

Orange indicates fishing-related items

Green indicates smoking-related items

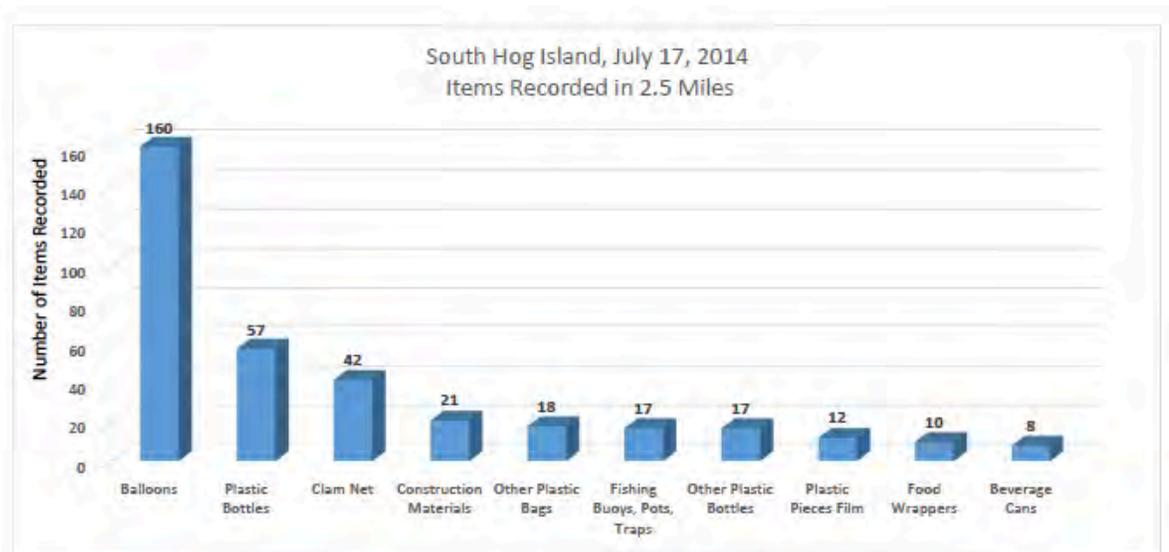
Items in **bold** indicate that these items have appeared on the "Top 20" list in each of these time periods.

Virginia Balloon Litter Study

Since 2012, Clean Virginia Waterways and the Virginia Aquarium & Marine Science Center have been conducting the Virginia Balloon Litter Study to better understand the sources and impacts of littered balloons. People who find a littered balloon anywhere in Virginia or in its coastal waters are asked to provide information via a website survey³.

The study provides information to better understand the following issues:

- The fate of helium-filled balloons (do they shatter into tiny pieces or deflate and return to earth?).
- Percentage of found balloons with attachments (e.g., ribbons, plastic valves, etc.).
- Types and materials of attachments.
- The percentage of latex vs. metalized nylon (also known as foil or "Mylar") balloons.
- Origins of balloon releases based on messages printed on them (e.g., graduation, Valentine's day, or birthday messages).
- Where balloon litter is found (are balloons likely to be found in one type of environment rather than another?)



As part of the Virginia Balloon Litter Study, researchers have conducted surveys on several barrier islands. This chart shows the relationship of balloon litter to other litter items found on South Hog Island on July 17, 2014. (Trapani and O'Hara, 2014).

³ See <http://www.virginiaballoonstudy.org/>

Derelict fishing gear

The above programs focus on marine debris items that can be seen, located, and retrieved by volunteers or researchers that are, for the most part, on land. Two additional efforts in Virginia focus on marine debris that is water-based, namely lost, abandoned, and derelict crab pots and clam netting.

Virginia Marine Debris Location and Removal Program: Crab pots in the Chesapeake Bay and Virginia coastal waters

In Virginia's coastal waters and the Chesapeake Bay, approximately 20 percent of the crab pots deployed annually are lost due to breaks in buoy lines, breaks resulting from wear, or from being severed by vessel propellers. Many other crab pots are purposely discarded (abandoned), vandalized, or are lost due to storms (Havens, Bilkovic, Stanhope, Angstadt, Hershner, 2008). These lost and abandoned crab pots are capable of capturing and killing fish, crabs, and other organisms that are economically important.

In response to this problem, the Virginia Institute of Marine Science, in partnership with the Virginia Marine Resources Commission, trained and employed commercial fishers to remove derelict crab pots and other fishing gear. Over the course of four winters, more than 32,000 crab pots, nets, and other fishing gear were removed. More than 40 species and 31,000 animals were found in the retrieved traps including blue crabs, fish, ducks, and diamondback terrapins (Havens, Bilkovic, Stanhope & Angstadt, 2011; Bilkovic, Havens, Stanhope & Angstadt, 2014).

Commercial fishermen were hired to find and remove 32,000 pieces of derelict fishing gear from Virginia's waters through the VIMS/VMRC program. (Photo: CCRM/VIMS)



According to a review of the VIMS program and six other NOAA-funded trap fisheries studies, indiscriminate impacts

on target and non-target species demonstrate the considerable potential marine debris has to kill individual animals, as well as impact breeding populations, habitat, and ecosystems (Arthur, Sutton-Grier, Murphy, and Bamford, 2014). The review also determined that the losses to habitat and harvestable annual catch due to derelict traps are pervasive, persistent, and largely preventable.

VIMS has conducted research using biodegradable material on crab pots to minimize the negative impacts of lost or abandoned pots (Bilkovic, Havens, Stanhope, and Angstadt, 2012). This research has led to the manufacture of a biodegradable panel for use in crab, lobster, and other fishing traps that is now available from a Virginia-based company, Mobjack Binnacle Products. (www.mobjackbp.org)

Clam netting from aquaculture operations

Clam netting used in aquaculture operations is another special concern in the coastal mid-Atlantic region. The plastic netting, used to protect clams from predators during grow-out operations, can become marine debris during storms, accidental strikes from boat propellers, or when they are disposed of inappropriately.

From 2004 through 2006 as part of Virginia CZM's Seaside Heritage Program, the Virginia Eastern Shorekeeper and volunteers worked to locate, assess, and document the extent of discarded clam netting on the barrier beaches of the Eastern Shore of Virginia, and to document possible impacts to sensitive marine resources (Ayers, 2006). Their 2006 report recommended further research on the impacts to wildlife; monitoring, education and outreach; enforcement to decrease abandoned netting; and work with the aquaculture industry to decrease the amount of lost, abandoned, or derelict netting. This study was funded by NOAA and the Virginia CZM Program.



Clam netting frequently washes up on Virginia's barrier islands. Here, the Virginia Eastern Shorekeeper removes a large net from the Mockhorn Island Wildlife Management Area. (Photo: D. Field, Virginia Department of Conservation and Recreation)

Current Virginia initiatives and the need for a coordinated response

A great deal has been accomplished in Virginia over the years to prevent and clean up litter and marine debris. Leadership has been provided by several state agencies, local governments, nongovernmental organizations, researchers, formal and informal educators, as well as citizens volunteers.

Activities range from regulatory programs, state supported non-regulatory programs, litter prevention, fee programs⁴, land based and stream/waterways cleanup events, and monitoring activities.

Appendix A provides a list of marine debris research and reduction activities currently underway in Virginia, including programs hosted or coordinated by state and local government agencies, nonprofit organizations, community groups, and academic institutions.

A specific strategy of the VMDRP is to develop effective methods for continually updating and publicizing these programs and resources.

There are many efforts underway in Virginia to better understand the sources, impacts, and fate of marine debris, and several thousand Virginians are involved in litter prevention outreach as well as cleanup and removal projects. However, these efforts need to be unified.

A marine debris reduction plan is necessary so that all the stakeholders in Virginia can more efficiently collaborate on behavior change campaigns, pollution prevention, research, and policies to reduce this form of pollution. The VMDRP builds on these many programs and initiatives so that future efforts to reduce marine debris are better coordinated and ultimately more effective.

The VMDRP establishes a comprehensive framework for future action to reduce the ecological, economic, health, and safety impacts of marine debris as resources become available in the future. The VMDRP presented in Section 5 is a dynamic document to be updated as the process of addressing Virginia's marine debris issues evolves over the next decade.

On a regional level, Virginia participates as a member of the Mid-Atlantic Regional Council on the Ocean (MARCO), which implements a governors' agreement addressing four regional ocean priorities: (1) promoting offshore renewable energy; (2) protecting key ocean habitats; (3) adapting to climate change; and (4) protecting ocean water quality. The VMDRP may serve in the future as a resource for MARCO in addressing marine debris as a water quality issue in the mid-Atlantic region.

⁴ In accordance with Virginia Code (§ 58.1-1707), distributors and sellers of selected food and beverage items in Virginia currently pay a litter tax the proceeds from which are distributed to local governments for litter and recycling programs.

3. Developing a marine debris reduction plan for Virginia

This plan was developed during 2013 and 2014 through a participatory and collaborative process involving many marine debris stakeholders in Virginia including representatives from state and local governments, nonprofit organizations, academia, industries, and private business partners. The plan utilized input from stakeholders obtained from conducting surveys and interviews, hosting a marine debris summit, and through multiple meetings of a Virginia leadership team engaged to address the problem of marine debris on a statewide basis.

The next sections describe the process by which stakeholders in Virginia were brought together to acknowledge and identify the scope of the problem in Virginia, the need for a more coordinated response, and the steps undertaken to develop the VMDRP.

Role of Virginia Coastal Zone Management Program

The Virginia Coastal Zone Management (CZM) Program is a network of Virginia state agencies and local governments, established in 1986 through gubernatorial order under the federal Coastal Zone Management Act (CZMA) of 1972. NOAA, within the federal Department of Commerce, administers the CZMA. The Virginia CZM Program includes the enforceable laws, regulations, and policies that protect Virginia's coastal resources, and fosters sustainable economic development.

The Virginia CZM Program is housed in the Virginia Department of Environmental Quality, within the cabinet-level secretariat of natural resources. The Virginia CZM Program helps agencies and localities develop and implement coordinated coastal policies and solve coastal management problems. Together, Virginia's localities (represented by Virginia's eight Coastal Planning District Commissions), state agencies, and NOAA form an effective intergovernmental partnership.⁵ The Coastal Policy Team (CPT) includes representatives of the Virginia CZM Program's network of natural resource agencies and planning district commissions. The CPT provides a forum for discussion and resolution of crosscutting coastal resource management issues.

The partnership consists of:

- Department of Agriculture and Consumer Affairs
- Department of Conservation and Recreation
- Department of Environmental Quality
- Department of Emergency Management
- Department of Forestry
- Department of Game and Inland Fisheries
- Department of Health
- Department of Historic Resources
- Department of Mines, Minerals and Energy
- Department of Transportation
- Virginia Economic Development Partnership
- Virginia Institute of Marine Science
- Virginia Marine Resources Commission
- Virginia's coastal planning district commissions

⁵ See: <http://www.deq.virginia.gov/Programs/CoastalZoneManagement.aspx>

A key mission of the Virginia CZM Program is to identify coastal policy issues that cut across agency jurisdictions and develop policy recommendations. Marine debris is one of those issues.

Every five years, the Virginia CZM Program is required by NOAA to complete a "coastal needs assessments" for nine coastal issues, one of which is marine debris. The assessment involves prioritizing issues that need attention and solutions. Not until most recent assessment for FY 2011-2015 was marine debris ranked as a high priority.⁶

For the period 2011-2015, the Virginia CZM Program included the creation of a Virginia Marine Debris Reduction Plan as a component of its "ocean resources" strategy.

Thus, while the VMDRP was developed as a collaborative effort, the Virginia CZM Program initiated its development and has taken responsibility for encouraging ongoing cooperation necessary to implement various phases and activities described in the plan.

It should be noted that the Virginia CZM Program is a member of the Mid-Atlantic Regional Council on the Ocean (MARCO), which includes representatives from New York, New Jersey, Delaware, Maryland, and Virginia. This partnership was formed in 2009 to address shared regional issues and provide a regional voice for solving ocean problems. The Virginia Marine Debris Reduction Plan will be shared directly with MARCO partners as a possible model for MARCO to meet one of its priorities: promoting improvements in ocean water quality.

The 2013 Virginia Marine Debris Summit



Stakeholders gathered at the Virginia Aquarium in February 2013 in the first marine debris summit to be held on the East Coast. (Photo: Virginia CZM Program)

⁶ See <http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/CoastalNeedsAssessment.aspx>

The first step towards formulation of the Virginia Marine Debris Reduction Plan occurred in February 2013, when the Virginia CZM Program and its partners hosted the Virginia Marine Debris Summit at the Virginia Aquarium & Marine Science Center in Virginia Beach.

The goal of the summit was to lay the groundwork for development of a Virginia marine debris plan. Planning and hosting the summit resulted in several accomplishments. In particular, the summit:

- began the process of engaging stakeholders in order to assess the scope of the issue in Virginia;
- provided a venue for soliciting recommendations and ideas;
- helped build the coalition that will eventually be required to implement the plan; and
- was used to identify and recruit members of a leadership team.

The following agencies and organizations came together to help plan the summit, develop the agenda, and to design and administer the pre-summit survey:

- Virginia Coastal Zone Management Program
- Virginia Aquarium & Marine Science Center
- Clean Virginia Waterways/Longwood University
- Virginia Institute of Marine Science
- Virginia Commonwealth University
- Virginia Sea Grant
- Virginia Department of Environmental Quality - Office of Pollution Prevention

The summit engaged 66 professionals from federal, state and local governments, nonprofits, community groups, industry, and academia who work to prevent and mitigate the litter and waste that degrades coastal and ocean waters. Speakers included representatives from NOAA and EPA, universities, nonprofit organizations, industry stakeholders, and state and local governments.

The summit presentations and breakout session were organized around four themes:

- Derelict Fishing Gear (Commercial and Recreational)
- Items of Special Concern: Cigarette Butts and Balloons
- Plastics in the Marine Environment: Food and Beverage Containers
- Plastic Bags: Innovative Programs, Solutions, and Actions.

Members of the summit planning team chose these topics as some of the most problematic and abundant types of debris in Virginia. Appendix B includes the agenda for the summit and the attendee list.

During discussions and breakout sessions, summit attendees identified the sources and impacts of marine debris in Virginia, and possible ways to reduce marine debris in Virginia waters. Ideas ranged from new ways to change behavior through motivation, education, and incentives, to utilizing innovative technologies and tools to reduce debris in the marine environment.

Participants of the 2013 Virginia Marine Debris Summit identified the following four types of marine debris to be *of particular concern* in Virginia:

- Plastics (food and beverage containers and plastic bags)
- Recreational and commercial fishing gear
- Cigarette butts
- Balloons

Summit attendees also identified topics and articulated questions that were later used in a survey to gather input from additional interested parties who were not at the 2013 Summit.

A summary of the summit and the presentations are available on the Virginia CZM Program web site:

<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/CZMIssuesInitiatives/VirginiaMarineDebris.aspx>

Building the leadership team

The VMDRP Leadership Team (“the leadership team”) was formed from summit participants and additional members with a stake in implementing the reduction plan. All are involved in different aspects of marine debris, solid waste management, and litter prevention. Though largely comprised of agency and organization representatives that helped plan the summit, several additional members were recruited.

The leadership team was instrumental in moving forward with creating the plan and helped guide subsequent activities including the post-summit surveys and interviews. The team collectively identified the strategies that were likely to be feasible to implement in Virginia, which ultimately became part of the VMDRP.

Review of other marine debris plans

In order to build on marine debris planning work done by other organizations, a review was conducted to identify the range of goals, strategies, and actions implemented or being considered by other marine debris reduction programs.

A review was conducted of several major marine debris management plans from California, Hawai’i, the West Coast Governors Alliance, and U.S. EPA Region 9 as well as authoritative publications on marine debris from NOAA, EPA, and the United Nations Environmental Programme. Program elements from other existing state plans were summarized and provided to the leadership team to assist in identifying strategies that would be feasible for Virginia and to guide the development of the VMDRP. The summary can be found in Appendix C.

Gathering stakeholder input

The survey

The goal of the survey was to obtain input from stakeholders that would help inform the next steps in developing the VMDRP. Among other questions, the respondents were asked to identify strategies for reducing marine debris that they thought were politically, socially, and economically feasible in Virginia.

The survey was sent to more than 650 people and organizations, including

- Summit planners and attendees
- Virginia's Local Litter Prevention and Recycling program managers⁷
- Virginia Clean Marina⁸ program participants
- Ocean program managers
- Non-governmental organizations involved with litter prevention and/or marine debris issues
- Members of the waste management and recycling community
- Scientists working in the field of marine debris
- Community educators
- Local, State, and regional government agency staff members

The initial survey was created based on input during the summit and feedback from participants following the summit. The survey was then reviewed by the leadership team, and pre-tested with 20 stakeholders who agreed to provide feedback on the survey itself. The survey was distributed electronically via SurveyMonkey to 650 potential respondents. Results were downloaded into Excel and analyzed. (See Appendix D for survey questions.)

A total of 151 people responded to the survey. Of these, 47 described themselves as experts in marine debris issues (i.e., they rated themselves "4" or "5" on a scale of 1 to 5). As seen in Figure 1, the majority of people who took the survey represented local governments, nonprofit organizations, academic or educational institutions, and state government agencies. Note that the numbers in this figure do not add up to 151 because a few survey respondents did not answer this question.

The survey also asked respondents about their role in preventing or removing marine debris. As seen in Figure 2, the majority of survey respondents indicated that their role was in education, volunteering at cleanup events, or organizing cleanup events. A smaller number were involved in stormwater or solid waste management, policy development, research or other related activities. Note: survey participants were allowed to select more than one category.

Survey responses were compiled and shared with members of the leadership team during subsequent meetings to help inform the next steps in developing the plan.

Survey findings can be found in Appendix E.

⁷ DEQ's Recycling and Litter Prevention Program works closely with local governments on litter prevention and to strengthen the state's recycling infrastructure. Funding for local programs comes from annual grants funded by Virginia's Litter Tax. See <http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/CoastalNeedsAssessment.aspx>

⁸ The Virginia Clean Marina Program promotes the voluntary adoption of measures that prevent or reduce pollution from marinas, boatyards and recreational boats. It was initiated by the Virginia CZM Program and is now housed at VIMS and supported through Virginia Sea Grant. See <http://www.viriniacleanmarina.com/>

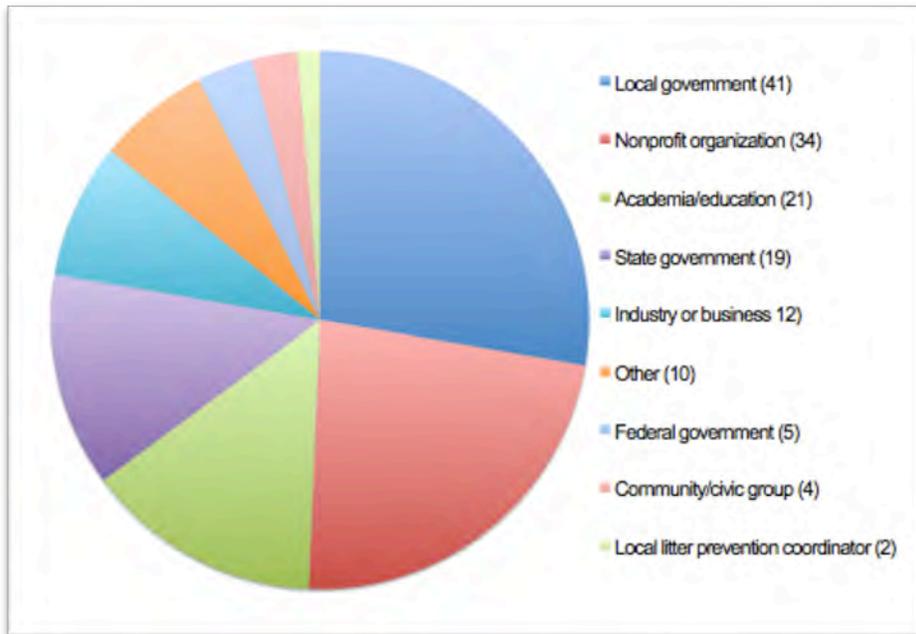


Figure 1. About 50% of the respondents represented local governments or non-profits.

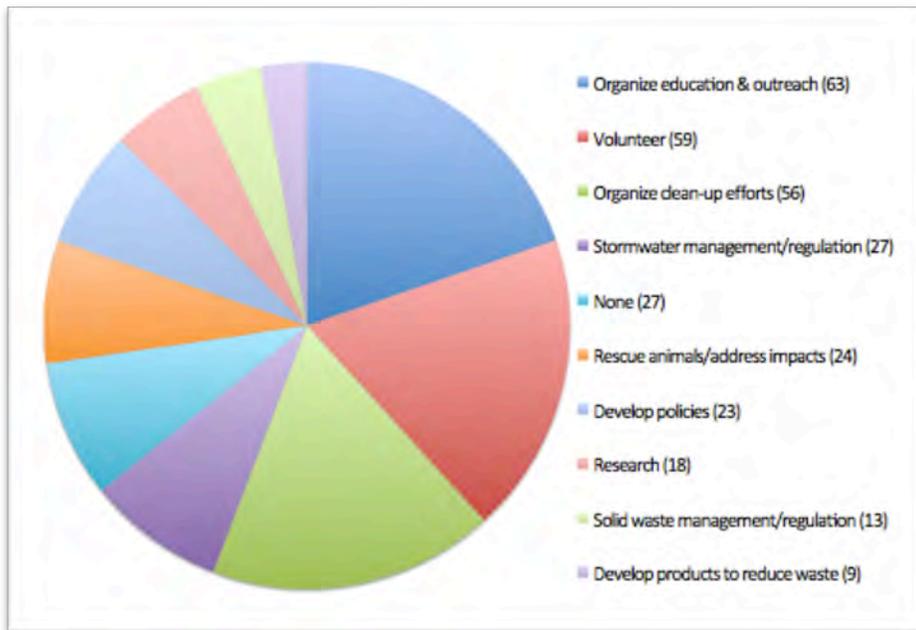


Figure 2. More than 50 percent of survey respondents indicated that their role in preventing and reducing marine debris involved education, volunteering, or organizing cleanup events.

Stakeholder interviews

The next step was to conduct one-on-one interviews with key stakeholders representing government (local, state and federal), the waste industry, researchers, and nonprofit organizations. All interviews were conducted by phone except one that was conducted in person.

The purpose of these interviews was to further identify strategies for reducing marine debris that would be politically, socially, and economically feasible in Virginia. The survey results were shared with each interviewee, who was asked to help select the most feasible strategies in Virginia.

Interview participants were told that a major goal in developing the marine debris reduction plan was to identify a small number of near-term strategies, and then to develop implementation activities (“actions”) for achieving success in these activities.

Appendix F lists the questions used in the individual interviews.

Establishing priorities

The focus of the VMDRP process was first on identifying priorities, then on developing processes and methodologies Virginia could feasibly coordinate and accomplish that will make the most difference in measurably reducing marine debris in the Mid-Atlantic coastal waters.

During each step in the process, stakeholders were reminded that the Virginia plan needed to be politically, socially and economically feasible for Virginia to accomplish in the near-term (two years), mid-term (two to five years) and long-term (up to 10 years).

Aligning with Virginia’s programs and priorities

The VMDRP, developed collaboratively with input from a broad array of stakeholders, will require the coordinated efforts of local governments, nonprofit organizations, academia, businesses, as well as collaborative efforts among several state agencies and the Virginia General Assembly.

This plan aligns with many of Virginia's priorities including the Virginia CZM Program's mission to create more vital and sustainable coastal communities and ecosystems, as well as its goals of coastal resource protection and coastal management coordination.

Further, it aligns with DEQ's mission to protect and enhance Virginia's environment and promote the health and well being of the citizens of the Commonwealth.

The VMDRP also aligns with the goals and supports the commitments of other state agencies that work to protect and enhance Virginia's natural resources and water quality including the Department of Conservation and Recreation and the Virginia Marine Resources Commission (VMRC).

Execution of the plan will reinforce current multi-agency efforts within state government to reduce litter and marine debris, and increase the health of Virginia's rivers, bays, and coastal waters.

The goals, strategies, and actions in the VMDRP will help Virginia meet its commitment in the 2014 Chesapeake Bay Agreement to ensure "...an environmentally and economically sustainable Chesapeake Bay watershed with clean water, abundant life, conserved lands and access to the water, a vibrant cultural heritage, and a diversity of engaged citizens and stakeholders."

Creating the plan

Input from the process described above (summit, surveys, and interviews) was shared during multiple meetings of the leadership team, where members ironed out the plan's goals, strategies, and actions. A draft of the plan was presented to the leadership team and their input was incorporated. The final plan will be presented to the Virginia Coastal Policy Team for review and adoption. The plan will also be presented at the December 2014 Coastal Partners Workshop to be referenced as the next round of 2015-2020 five-year CZM Coastal Enhancement Grant strategies are developed.



*Members of the VMDRP Leadership Team with some of their bang-for-buck charts.
(Photo: Virginia CZM Program)*

4. Findings from stakeholder input

The following sections of this report describe the significant findings from the summit, survey, and interviews that informed the development of the VMDRP, including decisions by the leadership team on identifying priorities for near-term action.

Summit conclusions

There was general agreement during the summit that:

- A coordinated plan was needed to stop the flow of trash from entering Virginia's waterways and coastal waters.
- Marine debris is not solely an ocean and coastal issue, but a larger watershed-based issue. Like other nonpoint sources of pollution, litter and marine debris emanates from many diffuse sources. To fully address marine debris, the overall plan must include statewide *and* watershed-based components.
- Virginia's efforts must be based on collaboration and fully engage coastal program partners, researchers, and nonprofits that work on water quality issues, and local governments that already include trash reduction as part of their programs.

Reducing/eliminating specific items and changing behaviors

Survey and interview participants named several specific types of marine debris – including plastic bags, cigarette butts, beverage containers, food wrappers, and balloons – and suggested targeted ways to reduce these common sources of marine debris.

Several noted that fees and bans on single-use shopping bags in other states and cities have encouraged a shift in behavior towards the use of reusable bags, reduced the number of bags found littered, and have also generated revenue that can be used for litter and marine debris prevention. For example, Washington D.C. implemented a law (D.C. Code § 8-102.01) in January 2010 that imposes a \$.05 fee per single use shopping bag. As of July 2014, \$9,066,503 in bag fees has been collected since the law was implemented. Revenues are earmarked for cleaning and protecting the Anacostia River and other impaired waters through education, monitoring, installation and maintenance of storm drain screens and trash traps, distribution of reusable bags, and related measures – a success highlighted in October 2014 on the national CBS Morning News.

Others suggested that bans on polystyrene foam (commonly called Styrofoam) food containers could combat this common type of litter. Several stakeholders pointed out that food and drink containers made of polystyrene foam will no longer be allowed for carryout use in Washington D.C. after January 2016 (D.C. Omnibus Act of 2014).

Some interviewees stressed the need to address general behaviors that lead to marine debris, both eliminating harmful behaviors (such as littering) and reinforcing positive behaviors (recycling and choosing re-usable bags, bottles, and coffee mugs rather than disposable items).

Systemic waste reduction

Several participants urged undertaking a holistic evaluation of the items that are common sources of marine debris. Several stakeholders stressed that a systemic change in the production of common waste items will be required to make a difference in reducing marine debris. As one stakeholder said, “Turn off the faucet. Post-consumer solutions are less effective than eliminating wasteful packaging.” Such a systemic approach – best implemented on a national or regional scale – would require a collaborative effort involving government agencies, non-government organizations, academia, fast food chains, and packagers to minimize packaging.

Specific types of marine debris: priorities in Virginia

The survey included a question that asked respondents to rank in importance (i.e., prioritize) reducing specific types of marine debris.

The **top priorities** identified by survey respondents ranked in importance:

1. Fishing gear (commercial and recreational)
2. Plastic single-use bags
3. Beverage and food related litter
4. Cigarette butts and smoking related litter
5. Microplastics
6. Balloons
7. Waste from ships

Stakeholders who were interviewed were asked to comment on the prioritized list. Most who were interviewed expressed general agreement with the priorities identified by the survey respondents. One person said, “I would maybe re-rank one or two, but what matters is that these items are all important.”

Most achievable in Virginia

Survey participants were asked to respond to an open-ended question that asked “Which are the MOST ACHIEVABLE things that Virginia could focus on in the next few years to reduce marine debris?” These “Most Achievable” items from the survey are ranked in order of achievability:

Land-based marine debris items

1. Plastic bags
2. Cigarette butts and smoking-related litter
3. Balloons from mass releases
4. Beverage containers, straws, and food-related packaging
5. Waste from land-based industrial/manufacturing facilities
6. Uncovered trucks (includes municipal and commercial waste hauling vehicles)

Ocean-based marine debris items

1. Abandoned commercial fishing gear including crab pots
2. Waste from cargo, cruise, or other ocean-going commercial ships
3. Vessels: lost, abandoned or derelict

During the interviews, most stakeholders expressed general agreement with the survey results on what would be achievable in Virginia as ranked by the survey respondents.

Specific comments of interest

The following is a list of comments from survey and interview participants considered important to note by the leadership team. Many of these ideas were considered or included in the VMDRP.

1. Research is needed to better understand the public perception of marine debris. For example, does the public's perception of the quantity of marine debris that comes from ships actually match the amount that is coming from ships? (The concern is that the public may overestimate what comes from ships and underestimate what comes from individuals on the land.)
2. Virginia should focus on efforts that others are not working on. For example, Keep America Beautiful (KAB) has a well-funded, well researched, and successful program to combat cigarette butt litter. Many communities in Virginia are implementing the KAB cigarette litter prevention program, some with mini-grants from Keep Virginia Beautiful and its corporate partners. (Thus, while cigarette litter ranks highly on the priority lists, it may not be the most suitable target for Virginia's state effort.)
3. Virginia's Litter and Recycling Tax has not been raised since it was passed in 1976. It currently generates approximately \$2 million annually for local litter prevention and recycling programs. (Had the tax been tied to inflation, it would now be generating nearly \$8 million per year.)
4. Removing crab pots and other derelict fishing gear requires a limited group with special knowledge, skills and equipment – indicating that derelict fishing gear removal requires a very specialized strategy.)
5. Some of the sources of trash in our waterways and ocean can be thought of as “point sources” and others as “non-point sources” For example, a readily identifiable group of people (smokers) produces smoking-related waste items. Likewise, only people who catch fish and crabs or operate vessels are candidates for outreach campaigns to reduce lost and abandoned fishing gear. On the other hand, it is harder to identify a distinct group of people who are responsible for producing food and beverage-related waste. This distinction may be important to keep in mind as behavioral change campaigns are developed.
6. Virginia should facilitate the adoption of waste management best practices, including maintenance of trash receptacles and dumpsters and ensuring waste loads transported by trucks are covered. Virginia should also seek ways to increase compliance with existing laws regarding waste management, illegal dumping, and litter.
7. Because the Dillon Rule narrowly defines the power of local governments, communities in Virginia are not able to pass local legislation regarding plastic bags or other common marine debris items unless specifically enabled by the Virginia legislature.
8. Virginia should encourage entrepreneurship and disruptive innovation (i.e., innovation that challenges or bypasses the status quo). Virginia should also encourage more public-private partnerships that can address marine debris by reducing the creation of waste (e.g., eliminating wasteful packaging, built-in obsolescence of manufactured items).
9. Virginia should encourage regional and national efforts to 1) increase recovery and reuse of materials, 2) develop a zero waste approach to food and beverage packaging and 3) develop a better understanding of the economic costs and food-chain impacts of marine debris.

10. Discharges from municipal separate storm sewer systems (MS4s) are regulated, and the regulations include “floatables” which include most littered trash items. Find ways to assist MS4 permittees in reaching their permit goals by preventing litter from entering storm drains to begin with.
11. Effective marine debris reduction strategies must be based on an understanding that marine debris seriously degrades water quality, habitat and ecological health, human health and safety as well as having significant economic costs to communities and businesses.

Awareness of sources: does the term “marine debris” add to confusion?

During interviews, several stakeholders conveyed the belief (their own, or that of the public) that most marine debris comes from ocean-based sources such as cruise ships, cargo ships, recreational boaters, and offshore energy platforms. Some suggested that perhaps the term “marine” makes people think that the debris is all originating from marine sources. Other stakeholders stressed the need to better “connect” the plastic and trash found in the ocean or alongside waterways with people’s behaviors on land.

Several mentioned that watershed education is key to making people aware that most marine debris items come from inland sources.

Some stakeholders who suggested that there is a need for a law against dumping trash into the ocean were apparently unaware that ocean dumping has been prohibited since 1990 under the international shipping regulation MARPOL Annex V (U.S. Coast Guard, 2014).

Responses to the survey and interviews with stakeholders revealed that a combination of approaches and solutions would be needed to reduce litter from reaching the water and becoming marine debris.

Suggested solutions fell into the following overarching categories, which became four of the main organizing goals of the VMDRP, as described in Section 5.

- 1) **Prevention** – Preventing trash from becoming litter and entering the water is the most important of the VMDRP goals. This approach generated more comments from stakeholders than all the others combined.
- 2) **Interception** – This refers to strategies employed to intercept a piece of trash before it becomes part of stormwater runoff and conveyed to and through the storm sewer system via storm drains. While interception is a sub-set of prevention, it has unique features, challenges, and solutions.
- 3) **Innovation** – Innovation of materials, designs, practices, and recovery could all help reduce marine debris. Examples include eliminating packaging and increasing recyclability or biodegradability of waste.
- 4) **Removal and Clean up** – Cleaning up litter and marine debris, including removing lost and abandoned fishing gear, is necessary, although it is remedial, and doesn’t stop the creation of marine debris.

Leadership team: developing priorities

As members of the leadership team reviewed the survey and interview results, it was clear that there are many opinions about the multiple approaches to solving the problem of marine debris pollution. After reviewing a summary of results from the survey and interviews, members of the leadership team were asked to select their priorities for Virginia in the near-term based on what they saw as politically, economically, and socially feasible.

Priorities:

1. Plastic bags (6 votes)
2. Reduce balloon releases (3 votes)
3. Increase coordination and collaboration (2 votes)
3. Reduce cigarette butt and smoking-related litter (2 votes)
4. New laws and regulations (1 vote)
4. Reduce beverage and food related litter (1 vote)
4. Increase enforcement (1 vote)

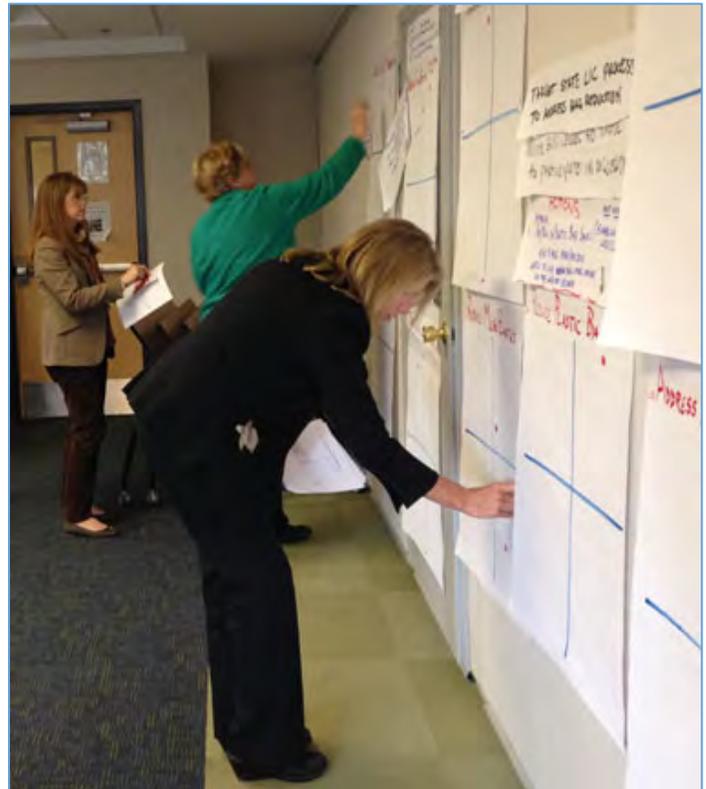
Bang-for-buck

In order to prioritize actions and allocate resources, the leadership team participated in a “bang-for-buck” exercise during which they considered the costs and benefits of several actions.

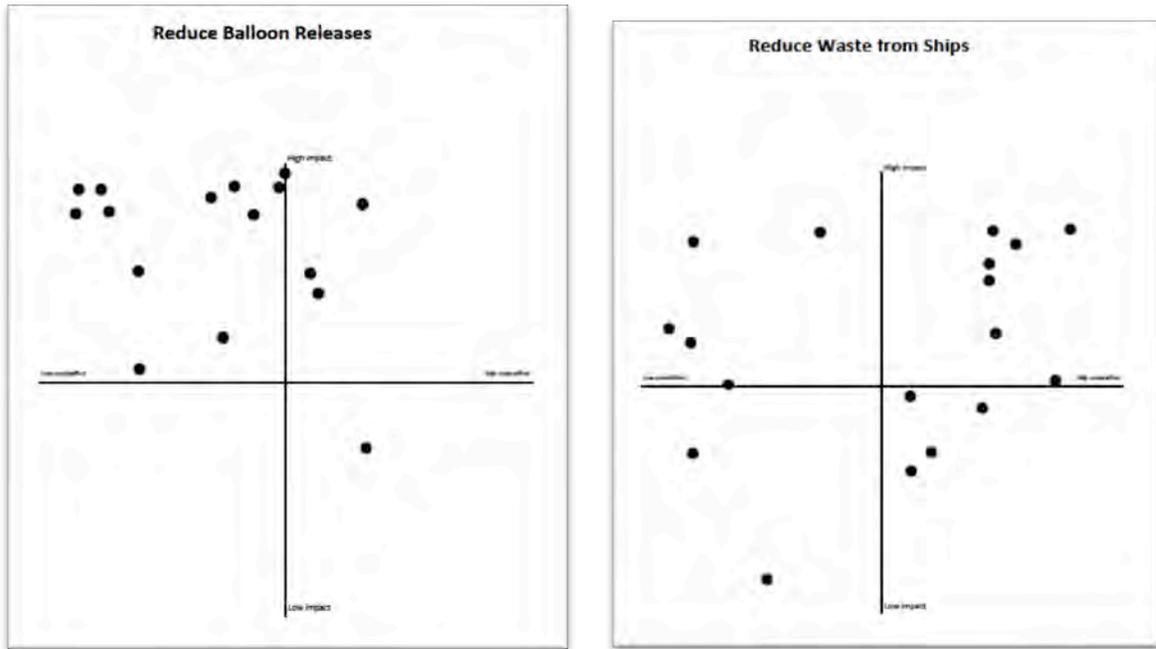
Major actions that had been suggested by the survey and interview process were printed at the top of flipchart sheets. On each sheet was a chart with four equal sections. The x-axis represented costs or effort, starting with “low costs/low effort” and increasing to the right with “high costs/high effort.” The y-axis represented impact, the lowest values representing “Low impact” and increasing toward the top with “High impact.”

Each member of the leadership team was asked to place a dot on the flipcharts that corresponded to their opinion as to whether an action would be high or low cost, and have high or low impact. The results were then digitized (see Appendix G). As seen in Figures 3 and 4, some of the bang-for-buck charts showed close agreement, while others did not.

The bang-for-buck charts assisted the leadership team in determining near-term and longer-term priorities.



After thinking about the relative costs and benefits of several possible actions to reduce marine debris, leadership team members place dots on bang-for-buck charts. (Photo: K. Register, CVW)



Figures 3 and 4. Bang-for-buck charts for several possible actions were created during a meeting of the VMDRP Leadership Team. Each point represents the opinion of one team member. The upper left quadrant of the charts is the “sweet spot” where costs of strategies are low and impacts are high. As these two examples (“Reduce Balloon Releases” and “Reduce Waste from Ships”) demonstrate, some charts showed tighter agreement than others.

5. Virginia Marine Debris Reduction Plan

This plan charts a course for Virginia to reduce marine debris over the next decade.

The over-arching goal of the Virginia Marine Debris Reduction Plan (VMDRP) is to reduce the amount of trash and marine debris from land-based and water-based sources in Virginia through prevention, interception, innovation, and removal for ecological, social, and economic benefits.

The plan identifies actions Virginia may undertake to measurably reduce marine debris in Mid-Atlantic coastal waters, with a focus on **specific actions that are politically, socially and economically feasible** for Virginia to accomplish in the near-term (two years), mid-term (two to five years) and long-term (up to 10 years).

The VMDRP includes a two-year activity and implementation plan (Section 6) as well as identifies future goals to reduce marine debris.

While the plan has been developed under the Virginia Coastal Zone Management Program, the VMDRP's scope encompasses more than just coastal waters. Any strategy that prevents litter from reaching the coastal and ocean waters of Virginia will also help prevent litter from entering Virginia's freshwater streams and rivers. Indeed, combating marine debris requires a watershed approach.

This statewide plan serves as a roadmap for nonprofit organizations, local governments, state agencies, regional partners, researchers, and industry as they work together on sustained approaches to reducing the flow of plastic trash and other trash items into our coastal waters. As the first statewide marine debris plan on the East Coast, it is hoped that elements of this plan and its development process will be transferable and contribute to a regional Mid-Atlantic approach.

Overview of Goals and Strategies

The **Goals** of the Virginia Marine Debris Reduction Plan fall into five broad categories, which are listed first as action verbs as a shorthand way to encourage and motivate, and then defined more descriptively.

1. **Lead:** Virginia will pursue a collaborative and coordinated approach to reduce marine debris from land- and water-based sources, and will therefore establish a long-term overarching results-oriented Virginia Marine Debris Advisory Committee of partners.
2. **Prevent:** Reduce marine debris through source reduction, preventing trash from becoming litter and entering the water, and by preventing fishing gear from becoming lost or abandoned.
3. **Intercept:** Reduce marine debris by intercepting litter at storm drains. While intercepting litter can be considered a sub-set of prevention, it has unique challenges, as well as funding and research needs.
4. **Innovate:** Reduce marine debris through innovation of materials, designs, practices, equipment, technologies, and recovery.
5. **Remove and Clean Up:** Reduce marine debris by removing and cleaning up litter and debris items as well as mitigating the impacts and the damage marine debris causes.

Building the capacity to achieve these goals is essential for the Virginia Marine Debris Reduction Plan to be successful in reducing marine debris. Each of the five main goals is further broken down into strategies that describe how success will be achieved through a coordinated approach, dedicated funding, research, behavioral change, and regulatory framework. These strategies are:

- A. Changing behaviors** – People’s behaviors and choices often lead to waste items becoming marine debris; therefore changing behaviors is a key strategy to this plan.
- B. Collaboration** – Many Virginians currently work on litter and marine debris prevention and removal projects; a coordinated and inclusive approach will promote more collaboration, efficiencies, and sharing of best practices.
- C. Increasing knowledge** – Many data gaps exist, and much research needs to be done to better understand sources, fates, impacts, and solutions to marine debris.
- D. Funding** – Implementing many of the elements in this plan will require significant funding to support research, coordination, behavior change campaign development, infrastructure improvements, and grants to local governments.
- E. Improved regulations and enforcement** – Regulations play key roles in pollution prevention and implementation of best practices. They can create incentives and disincentives to reduce waste at the source, as well as the behaviors that lead to marine debris. Likewise, appropriate and strategic levels of enforcement of regulations are needed to provide for strong deterrents to behaviors that result in the most marine debris.

The survey, interviews, and leadership team meetings supported the idea that every Virginian has a role in preventing marine debris: school children and teachers, manufacturers and distributors, waste management industry and environmental groups, regulatory agencies, families, the fishing community, and stormwater managers.

Foundations of the plan

The following core principles to serve as the foundation for the Virginia Marine Debris Reduction Plan and its implementation.

Politically, socially and economically feasible in Virginia –The reduction plan must be politically, socially, and economically feasible and align with other goals as identified within the Virginia CZM Program, DEQ, VMRC, other state agencies, and when feasible with regional and local initiatives.

Ongoing leadership provided by Virginia CZM Program – Virginia’s marine debris efforts will be led by the Virginia CZM Program with guidance from the Virginia Marine Debris Advisory Committee.

Evaluating progress as a key to success – Monitoring and evaluation of each step of this plan is critical through transparent reporting of progress and achieving key milestones.

Adaptive management to guide implementation – An adaptive management approach will be used to continually improve the plan based on a two-year evaluation cycle.

Utilizing multiple approaches – Solutions should come from a combination of:

- Behavior change campaigns;
- Policies and enforcement;
- Increased responsibilities of producers, manufacturers and distributors;
- Informed consumers;
- Acceptable and readily available substitutes (e.g., fabric shopping bags);
- Increased infrastructure to capture materials at sources and increase “ease” in doing the right thing with waste items

The Virginia Marine Debris Reduction Plan

The strategies listed under each goal are described in general terms and will require further work to develop specific steps to be taken. However, more specific steps are outlined in Section 6 for those actions chosen as near-term (next 2 years) priorities.

GOAL 1. Program Leadership

Successful implementation of the VMDRP depends on a collaborative and coordinated approach, engaging related programs, coastal program partners, and local governments that already include waste reduction and proper waste management as part of their programs.

Audience: A first priority is to organize a long-term results-oriented Virginia Marine Debris Advisory Committee of partners.

The Virginia Marine Debris Advisory Committee should be made up of potential implementers (many of whom served on the VMDRP leadership team) as well as other stakeholders to be identified. In addition, elected officials with the ability to assist with improving regulations should be invited to serve.

The Virginia Marine Debris Advisory Committee would:

- Oversee a coordinated program to reduce targeted sources of marine debris based on the goals outlined in the Virginia Marine Debris Reduction Plan.
- Establish criteria to track the progress of implementation, accomplishments, and challenges (barriers) of implementation of this plan.
- Align the VMDRP with other goals as identified within the Virginia CZM Program, state agencies including DEQ, DCR, and VMRC, and with regional initiatives when feasible.
- Use an adaptive management approach to continually improve the plan based on a two-year evaluation cycle.

GOAL 1 Program Leadership Strategies

1.1 Change Behaviors

Action 1.1.a Examine ways to synchronize the many silos of current activities and change management behavior to be more collaborative.

1.2 Collaboration

Action 1.2.a Foster coordination, cooperation, and communication among government agencies (federal, state, and local), nonprofit organizations, research institutions, industry, and consumers.

Action 1.2.b Identify and invite missing parties to the table to help with VMDRP implementation.

Action 1.2.c Create, maintain, and share an inventory of litter-prevention and marine debris projects, best practices, and research that are underway within Virginia and regionally.

Action 1.2.d Use web-based tools to foster collaboration, increase internal and external communication, and track implementation of the VMDRP.

1.3 Increase Knowledge

Action 1.3.a Identify knowledge gaps and foster collaboration on research.

1.4 Fund

Action 1.4.a Identify existing and potential revenue streams to sustain statewide marine debris and litter prevention.

1.5 Improve Regulations

Action 1.5.a Analyze existing legislation and policies and provide recommendations for improvements.

GOAL 2. Prevent

Reduce marine debris through prevention.

Audiences: While everyone can help prevent marine debris, targeting specific groups may accelerate pollution prevention: restaurants and retail businesses; gas stations, landscape managers; local governments, especially stormwater managers; consumers; marina and boat ramp operators; event and memorial planners.

GOAL 2 Prevention Strategies

2.1 Change Behaviors

Action 2.1.a Develop and implement social marketing campaigns to reduce marine debris from specific sources and to help make the public better stewards of our waterways and oceans.

Example: Conduct, promote, and sponsor collaborative research on successful social marketing campaigns targeting common, persistent, and harmful marine debris items such as balloons.

Action 2.1.b Promote desired behavior change through incentives and disincentives (positive and negative reinforcements).

Action 2.1.c Disseminate effective best practices to address marine debris from land-based and water-based sources.

Examples: Encourage gas stations and convenience stores to offer and maintain trashcans for customers' use; encourage outdoor restaurants and retail businesses to sweep up litter outside of their business and dispose of in trashcans as opposed to hosing down sidewalks and moving litter into gutters.

Action 2.1.d Develop and implement dedicated education and outreach initiatives, tools, and campaigns to encourage changes in behavior and improve efforts to address marine debris.

Examples: Insert marine debris topics into formal (K-12) and informal educational programming; encourage signs at marinas (such as "We are unable to provide recycling services, so please take your bottles, cans, and other recyclable items home with you...then recycle!"); encourage the application of Keep America Beautiful's cigarette litter prevention program with increased infrastructure, pocket ashtrays, and outreach.

2.2 Collaboration

Action 2.2.a Create a clearinghouse of marine debris prevention activities, tools, and resources.

Action 2.2.b Develop regional approaches – when and where possible.

Examples: Create opportunities to address marine debris issues in cooperation with other Mid-Atlantic states and non-governmental organizations. Encourage collaboration between local governments within the Commonwealth of Virginia.

Regional partners may include:

- *Mid-Atlantic Regional Commission on the Ocean (MARCO)*
- *Ocean Conservancy*
- *National Oceanic and Atmospheric Administration's (NOAA) Marine Debris Program*
- *U.S. Environmental Protection Agency's (EPA) Trash Free Waters Program*
- *Mid-Atlantic Sea Grant*

Action 2.2.c Collaborate with other groups to implement or expand their litter prevention turnkey programs in Virginia.

Examples: Keep America Beautiful/Keep Virginia Beautiful: cigarette litter prevention program; VDGIF and VMRC monofilament fishing line recycling program.

2.3 Increase Knowledge

Action 2.3.a Increase knowledge about effective methods to change behaviors.

Examples: Methods to research can include social marketing, education, outreach, regulations, and best practices. Behaviors can include increased recycling, proper disposal, source reduction, and retrieving fishing gear. Future social marketing campaigns could target common, persistent, and harmful marine debris items such as single use plastic bags, derelict fishing gear, crab pots, microplastics, and cigarette butts.

Action 2.3.b Support systemic waste-source reduction research, including investigations of reusable, biodegradable, and other alternative materials.

Action 2.3.c Analyze ecological and economic impacts of litter and marine debris to Virginia's tourism revenue, recreational spending, property values, and economically important species.

2.4 Fund

Action 2.4.a Identify existing and potential revenue streams to sustain statewide marine debris and litter prevention.

Action 2.4.b Seek funding from a diverse array of sources, including industry partners, to support local community-based marine debris prevention projects that benefit coastal habitat, waterways, and wildlife.

Action 2.4.c Prioritize the allocation of funding to support implementation of the plan (including but not limited to):

- Marine debris reduction best practices
- Research
- Behavior change campaigns
- Collaboration
- Infrastructure improvements
- Removal of marine debris
- Habitat restoration to mitigate the impacts of marine debris

2.5 Improve Regulations

Action 2.5.a Analyze existing legislation and policies and provide recommendations to support waste minimization of the most common and harmful items found as marine debris (e.g., single-use plastic bags, food and beverage packaging, balloons, cigarette butts, and microplastics).

Examples: Gain support and sponsorship for local ordinances and/or statewide legislation that would address marine debris items such as single-use bags; require trash receptacles, recycling collection containers, and litter-prevention messaging at businesses that sell the most common items found as marine debris (could include gas stations, convenience stores, marinas); include litter reduction in construction permits; prohibit the practice of hosing down sidewalks that moves litter into gutters and storm drains.

Action 2.5.b Support increased enforcement of Virginia’s current laws regarding littering, illegal dumping, balloon releases, waste management, and stormwater runoff.

GOAL 3. Intercept

Reduce marine debris by intercepting litter at storm drains. While intercepting litter can be considered a sub-set of prevention, it has unique challenges, as well as funding and research needs.

Audiences: Intercepting litter has unique challenges for stormwater managers, the target audience for the interception goal.

GOAL 3 Interception Strategies

3.1 Change Behaviors

Action 3.1.a Assess trash interception practices in MS4 and non-MS4 permitted localities and facilitate cross-departmental communication to support effective litter and marine debris education and management.

3.2 Collaboration

Action 3.2.a Facilitate the expansion of inter-jurisdictional programs and public-private partnerships to intercept litter.

3.3 Increase Knowledge

Action 3.3.a Conduct literature review of existing research on effectiveness of stormwater interception best practices for commonly littered items.

Action 3.3.b Conduct research to determine best practices for interception and removal of microplastics at wastewater treatment plants.

Action 3.3.c Work with local MS4 program managers to determine resource needs to address floatables and litter.

3.4 Fund

Action 3.4.a Identify existing and potential revenue streams to sustain statewide marine debris and litter prevention.

Action 3.4.b Secure dedicated funding from a diverse array of sources to support interception infrastructure and practices.

Action 3.4.c Explore bulk or state procurement of the most effective interception equipment in order to reduce the burden of cost on localities.

3.5 Improve Regulations

Action 3.5.a Analyze existing legislation and policies and develop strategies to improve interception infrastructure through legislation, regulations, and policies.

GOAL 4. Innovate

Reduce marine debris through innovation of materials, designs, practices, and recovery.

Audiences: Industry and trade groups, academic researchers, and manufacturing and production facilities/businesses are involved in developing materials, products, practices, and packaging to reduce and minimize waste; increase recyclability and biodegradability; and encourage practices and behaviors that will reduce litter and marine debris.

GOAL 4 Innovation Strategies

4.1 Change Behaviors

Action 4.1.a Promote the adoption of innovative practices and behaviors that will lead to a reduction in litter and lost fishing gear – through media attention, educational opportunities, and partnerships with academic institutions, non-governmental agencies, and local, state, and regional governments.

4.2 Collaboration

Action 4.2.a Explore and develop innovative methods for sharing information and data

Examples: Smartphone Apps that can be used to promote citizen data gathering, such as geocoding the location of debris. Innovative ideas can be shared via web and cloud based clearinghouses.

Action 4.2.b Influence innovation through collaboration between government, non-governmental organizations, businesses, and industries within Virginia and in the Mid-Atlantic region.

Example: Partner with “source” industries to research and develop new materials that are reusable, biodegradable, or otherwise less harmful. Explore ways to reduce packaging and other waste.

4.3 Increase Knowledge

Action 4.3.a Conduct, promote, and sponsor collaborative research to locate and remove lost and abandoned fishing gear.

Action 4.3.b Conduct, promote, and sponsor collaborative research on alternative packaging and innovative product design for commonly littered items.

Action 4.3.c Conduct, promote, and sponsor collaborative research on innovative interception and recovery.

Action 4.3.d Conduct, promote, and sponsor collaborative research on successful social marketing campaigns that target common, persistent, and harmful marine debris items such as

balloons, single use plastic bags, lost and derelict fishing gear, crab pots, microplastics, and cigarette butts.

- Action 4.3.e** Conduct, promote, and sponsor collaborative research on successful social marketing campaigns for targeting specific audiences, including those from the recreational or commercial fishing communities, economically disadvantaged communities, and other areas with unique marine debris problems.

4.4 Fund

- Action 4.4.a** Incentivize partnerships to fund alternative material research and development as well as commercialization of the results of the partnerships.

- Action 4.4.b** Provide incentives (or subsidies) to encourage the use and adoption of alternative materials.

4.5 Improve Regulations

- Action 4.5.a** Reduce legal and administrative barriers to adopting alternative materials and practices.

GOAL 5. Remove, Clean Up, and Mitigate

Reduce marine debris by removing and cleaning up litter and debris items and mitigate the impacts of marine debris.

Audiences: Many litter cleanup programs can engage a broad audience, but there is also a role for targeted cleanups that require targeted audiences. For example, locating and retrieving crab pots requires special knowledge, skills, and equipment.

GOAL 5 Removal, Clean Up, and Mitigation Strategies

5.1 Change Behaviors

Action 5.1.a Engage the public in active, personal participation including cleanup events to remove marine debris from in-land waterways, shorelines, and coastal waters.

Example: Strive for diversity through engaging families, schools, businesses, and boating and fishing communities in removing and cleaning up lost and derelict fishing nets and vessels, litter, lumber, tires, and other harmful debris items.

5.2 Collaboration

Action 5.2.a Support multi-jurisdictional and public-private partnerships in cleanup and removal efforts to create long-term ecological improvements for coastal and in-land waterways, habitat, and wildlife.

Example: Coordinate with disaster debris management plans.

Action 5.2.b Support clearinghouse for cleanup and removal events and programs to include events, approaches, organizing groups, results of and data generated during cleanup events.

Action 5.2.c Identify partners for on-water cleanup activities.

Example: Seek partners with specialized skills, knowledge, and resources (e.g., fishing industry, sailing clubs, marinas, divers).

5.3 Increase Knowledge

Action 5.3.a Identify and investigate barriers to cleanup and removal efforts.

Examples: Clarify the legal implications of removing derelict and abandoned vessels and other marine debris including those related to storm-related impacts.

Action 5.3.b Support research on effectiveness of various removal methods.

Examples: Volunteer stream/shore cleanups; roadside cleanups; crab pot/fishing gear cleanups; trash scooping barges; street sweeping.

Action 5.3.c Facilitate creation of data collection and sharing system.

Examples: Reporting system for lost gear; simplified and standardized data form for all cleanups; self reporting to a central on-line database; product tracking.

Action 5.3.d Increase awareness of monitoring results, volunteer cleanup data, and marine debris removal programs and outcomes.

5.4 Fund

Action 5.4.a Identify existing and potential revenue streams to sustain statewide marine debris and litter prevention.

Action 5.4.b Seek dedicated funding from a diverse array of sources.

Examples: Fees on single-use bag, throw as you go programs.

Action 5.4.c Provide incentives (or subsidies) to encourage the commercial fishing industry and others to remove derelict crab pots, clam netting, and other lost or derelict fishing gear and repurpose or recycle the materials when possible.

Action 5.4.d Support funding for locally driven, community-based marine debris removal projects that benefit coastal habitat, waterways, and wildlife.

Examples: Monofilament recycling; volunteer cleanup events; Adopt-a-Stream program; collection of derelict clam netting.

5.5 Improve Regulations

Action 5.5.a Remove administrative barriers to cleanup events and removal of lost or derelict gear and derelict vessels.

6. Implementation and near-term goals.

Near-Term (2015-2016) Action Items

A major objective of this Plan was to outline an approach for the near-term (2015-2016). The focus of this section is to provide details on the four near-term priorities identified by the leadership team based on input from stakeholders. These are:

1. Establish an on-going Virginia marine debris advisory committee.
2. Develop and implement a social marketing campaign targeting behaviors that result in a common, persistent, and harmful marine debris item: balloons.
3. Analyze existing legislation and policies and provide recommendations to support waste minimization of the most common and harmful items found as marine debris (e.g., single-use plastic bags, food and beverage packaging, balloons, cigarette butts).
4. Identify existing and potential revenue streams to sustain statewide marine debris and litter prevention.

The Virginia CZM Program, based on priorities set in the 2011-2015 Coastal Needs Assessment, allocated \$20,000 for the next two fiscal years (October 2014 through September 2015 and October 2015 through September 2016) to begin implementation of this plan. In addition, the Virginia CZM Program has received a NOAA Marine Debris Education and Outreach grant, which will partly fund the development of a social marketing campaign, aimed at changing the behavior of people who plan mass releases of balloons.

The following sections provide more detail on the rationale, plans for near term implementation, and measureable outcomes.

1. Establish an on-going Virginia Marine Debris Advisory Committee

Given that successful implementation of the VMDRP depends upon a collaborative and coordinated approach, a near-term priority is to organize an ongoing advisory group, tentatively called the Virginia Marine Debris Advisory Committee.

The Virginia Marine Debris Advisory Committee should be made up of potential implementers (many of whom served on the VMDRP Leadership Team) as well as policy makers and stakeholders to be identified. Sharing best practices among the Committee and with stakeholders will be essential to making decisions on the best avenues to pursue for marine debris reduction. In addition, elected officials with the ability to assist with improving regulations should be invited to serve.

Measurable Outcome

The desired outcome will be the development of this committee. The process of creating this committee will include determining where the Virginia Marine Debris Advisory Committee will be housed, and at what level (gubernatorial, agency, or program level). The authority of the committee will also have to be determined.

2. Develop and implement a social marketing campaign targeting a common, persistent, and harmful marine debris item: balloons.

Why start with a social marketing campaign to reduce balloon litter?

Social marketing is a process that influences changes in behavior. Social marketing applies marketing principles and techniques to influence target audience behaviors that benefit society as well as the target audience. Community-based social marketing borrows from social marketing an emphasis on understanding what impedes and motivates a target audience to act.

Community-based social marketing is grounded on direct contact with individuals and communities and the removal of internal and external barriers. Social science research suggests that such an approach is most likely to bring about behavioral change.

A major outcome of this project will be to **build our expertise in behavioral change campaigns and our capacity for future significant actions to prevent marine debris**. During the research phase of this project, information about attitudes, beliefs and behaviors will be collected that will inform future social marketing educational efforts on other common behaviors that lead to marine debris. In addition, the project will be designed to be scalable to the regional and national levels.

Incidental and mass balloon releases are often used as a way to celebrate special occasions such as weddings, birthdays, festivals, fundraisers, graduations, store openings and sporting events; and, to commemorate the loss of loved ones at funerals and memorials.

Balloons are unique among all the man-made litter and debris found in the ocean and on the land. Helium-filled balloons (and their attachments including plastic valves, disks and ribbons) are the one form of litter that people actually purchase with the intent to release them “on purpose” into the environment.

As they rise, the balloons may or may not burst, but eventually all balloons and their attachments return to earth as litter, landing in the ocean, inland water bodies, or on land. Many of these airborne balloons or their fragments will end up in the oceans where they can be mistaken for food by marine animals and ingested. The string, ribbon or other material can wrap around fins, wings, and limbs—leading to starvation, infection, amputation, or drowning. Scientists who work with stranded whales, dolphins, seals, and sea turtles have found balloons, parts of balloons, and balloon string in the stomachs of many of these dead animals. A 2006-2011 Queensland study of stranded sea turtles found that of the 41 pieces of rubber eaten by turtles studied, 32 pieces (78%) were balloon fragments.

There is documentation of several species of birds and endangered sea turtles impacted by balloon litter in Virginia through ingestion and entanglement. Moreover, recent beach cleanup data have shown that nesting beaches used by threatened loggerhead sea turtles and endangered shorebird species are severely impacted by balloons. During recent surveys of remote islands on Virginia’s Eastern Shore, up to 125 balloons were documented per mile of beach (Trapani & O’Hara, pers. comm.).



Entanglement in balloon ribbons can lead to death for wildlife. A cormorant (species unknown) entangled in the ribbons of two balloons was found dead on a beach in Virginia in April 2014. (Photo: B. Holliday)

Measurable Outcomes

The desired outcomes of this action will be:

1. A significant and measurable number of commitments from our targeted audience(s)—individuals and organizations—to switch from the mass release of balloons to a more environmentally sensitive activity ultimately leading to a decrease in balloon releases.
2. A measurable number of balloon releases that were cancelled and the number of balloons that were subsequently NOT released.
3. A significant and measurable number of commitments from our targeted audience(s) to prevent the accidental release of balloons.
4. A measurable reduction in balloon litter in Virginia.

3. Analyze existing legislation and policies and provide recommendations to support waste minimization of the most common and harmful items found as marine debris.

Because Virginia is a Dillon Rule state, the powers of local governments are limited to land use planning and any other authorities specifically enabled by the state legislature. Therefore, communities in Virginia may only pass local regulations regarding marine debris items of local concern (such as single use shopping bags) if specifically enabled by the Virginia legislature. In 2013, a bill was introduced into the Virginia General Assembly, requesting that communities in Northern Virginia be allowed to place a fee on single use shopping bags; however, the bill did not get out of committee.

Measurable Outcomes

The desired outcomes will be:

1. A review of possible legislation and regulatory options.
2. Coordination with counties and cities in Virginia, as well as citizen groups, that are interested in obtaining authority to enact local fees on litter items of local concern (i.e., single-use bags) to investigate the potential of a joint coordinated request to the General Assembly.

4. Identify existing and potential revenue streams to sustain statewide marine debris and litter prevention

Most of the actions in the VMDRP require additional funding. Some, such as intercepting litter at storm drains, will require a substantial amount of funding. Therefore, researching sources of funding to support this plan is a high priority.

The proposed Virginia Marine Debris Advisory Committee will start by listing and investigating the market-based instruments used by other states to raise revenue for litter-prevention and to encourage changes in behavior. Market-based instruments include taxes, charges, fees, fines, penalties, subsidies and incentives. These may change the price of associated products (for example, beverage containers, plastic shopping bags); alter the cost of services, such as waste collection and community recycling; and affect manufacturing inputs (materials) and outputs (pollution).

For example, container deposit bills (also referred to as “bottle bills” or redemption fees) now encourage recycling in 10 states. Several communities have – or are considering – a fee on the distribution of single-use shopping bags at stores. However, market-based instruments do not include bans, such as the regulation in California that will prohibit grocery chains and pharmacies from handing out plastic shopping bags (as of July 1, 2015) and convenience stores and liquor stores (as of July 1, 2016).

Some states have considered these market-based instruments equivalent to a fee-for-service rendered as opposed to a tax. Depending on the state, portions of the revenue from these fees are earmarked for litter prevention, improving recycling practices, or for helping to fund public parks and historic sites. Due to growing concerns over the environmental impact and cost of cleaning up cigarette butts, San Francisco enacted a “cigarette litter abatement fee” of \$.20 per pack, the proceeds of which helps defer the costs of cleaning streets, sidewalks, and public property⁹.

Local governments also charge fees for waste collection, recycling, and tip fees at landfills. Of course, when looking at current and potential revenue streams, steps must be taken to avoid unintended consequences. For example, raising some fees might provide perverse incentives for illegal dumping.

While Virginia does not have a container deposit program – and the VMDRP leadership team was in consensus that Virginia would not likely pass such legislation – Virginia does have a Litter Tax that is paid by wholesale distributors and retail merchants. This fee, currently \$10 to \$15 annually, has not been increased since the Litter Tax was enacted in 1976.

Despite the difficulties in passing new or raising current fees and taxes, many of the participants in the development of this plan acknowledged that fee-for-use possibilities must be explored in order to generate funding needed to substantially reduce the amount of litter and marine debris from Virginia’s inland- and water-based sources, and for cleanup and removal activities.

Other funding sources for marine debris activities are grants from government agencies and private foundations, or industries that are committed to this issue. Having a statewide marine debris reduction plan in place will be beneficial as Virginia-based researchers seek funding from competitive grant programs.

⁹ <http://sftreasurer.org/cigarette-litter-abatement-fee>

7. Glossary of Acronyms

CPT	Coastal Policy Team
CVW	Clean Virginia Waterways
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DCR	Department of Conservation and Recreation
DEQ	Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
ICC	International Coastal Cleanup
MARCO	Mid-Atlantic Regional Council on the Ocean
MARPOL	International Convention for the Prevention of Pollution from Ships
MS4	Municipal Separate Storm Sewer System
NOAA	National Oceanic and Atmospheric Administration
NMDMP	National Marine Debris Monitoring Program
PBT	Persistent, Bioaccumulative, and Toxic
US EPA	United States Environmental Protection Agency
VA CZM	Virginia Coastal Zone Management Program
VDGIF	Virginia Department of Game and Inland Fisheries
VIMS	Virginia Institute of Marine Science
VMDRP	Virginia Marine Debris Reduction Plan
VMRC	Virginia Marine Resources Commission
VSMP	Virginia Stormwater Management Program

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