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Trash Talk:

An Exploration of the Problem of Marine Debris and Some Virginia-Specific Solutions



Photo courtesy of Katie Register, Executive Director,
Clean Virginia Waterways of Longwood University

Elizabeth Pindilli, J.D. 2020
Virginia Coastal Policy Center
William & Mary Law School



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About the Author



Elizabeth Pindilli graduated from William & Mary Law School in May 2020. During law school, she participated in the Virginia Coastal Policy Center’s Practicum I and II courses. While studying for her Bachelors’ Degree in History and Political Science at the University of Pittsburgh, she developed her passion for environmental justice and worked with her University to mitigate storm-water runoff and improve campus sustainability. While at William & Mary she served as the co-president of the Student Environmental and Animal Law Society and interned with the Virginia Department of Environmental Quality. During her first semester with the Virginia Coastal Policy Center, she drafted a white paper discussing property rights and possible beneficial uses of dredged material.

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About the Virginia Coastal Policy Center

The Virginia Coastal Policy Center (VCPC) at the College of William & Mary Law School provides science-based legal and policy analysis of ecological issues affecting the state’s coastal resources, by offering education and advice to a host of Virginia’s decision-makers, from government officials and legal scholars to non-profit and business leaders.

With two nationally prominent science partners – the Virginia Institute of Marine Science and Virginia Sea Grant – VCPC works with scientists, local and state political figures, community leaders, the military, and others to integrate the latest science with legal and policy analysis to solve coastal resource management issues. VCPC activities are inherently interdisciplinary, drawing on scientific, economic, public policy, sociological, and other expertise from within the University and across the country. With access to internationally recognized scientists at VIMS, to Sea Grant’s national network of legal and science scholars, and to elected and appointed officials across the nation, VCPC engages in a host of information exchanges and collaborative partnerships.

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questions, or suggestions.

VCPC grounds its pedagogical goals in the law school’s philosophy of the citizen lawyer. VCPC students’ highly diverse interactions beyond the borders of the legal community provide the framework for their efforts in solving the complex coastal resource management issues that currently face Virginia and the nation.

I. INTRODUCTION

Marine debris is a pressing environmental problem at a local, regional, and global level. The introduction of litter into our waterways has severe consequences for human health, wildlife, the environment, and the economy. As indicated by a poll conducted by The Shelton Group in 2019, Americans' level of awareness about the issue of plastics in the ocean was tied with their awareness about climate change.¹ However, when the question was about the level of concern an individual felt about each issue, distress surrounding plastics in the ocean surpassed all others, even distress about climate change.²

In an effort to address the problem of marine debris, the Virginia Coastal Zone Management Program (Virginia CZMP) undertook a planning process that resulted in the Virginia Marine Debris Reduction Plan (VMDRP) in 2014. In light of the policy issues raised in the VMDRP, this paper will explore the issue of marine debris and some possible solutions that can be pursued in Virginia.

II. WHAT IS MARINE DEBRIS?

Marine debris is defined by the U.S. Environmental Protection Agency 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.”³ Marine debris can enter the marine ecosystem from land-based or ocean-based sources.⁴ As of 2016, “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, which are defined as “items that could have come from either land- or ocean-based sources,” constituted the remaining 33 percent.”⁵ This paper focuses on solutions to mitigate land-based sources of marine debris because they are the most prevalent contributor to the problem.

The most common material contributing to the marine debris problem is plastic. Plastic makes up approximately 75% of marine debris.⁶ In recent decades the use of single-use disposable items has grown exponentially; single-use plastic, such as plastic bags and disposable food containers, make up one third of plastic manufactured in the United States.⁷ “World production of

¹ SHELTON GRP., WAKING THE SLEEPING GIANT: WHAT MIDDLE AMERICA KNOWS ABOUT PLASTIC WASTE AND HOW THEY'RE TAKING ACTION 5-6 (June 19, 2019), <https://storage.googleapis.com/shelton-group/2019%20Shelton%20Waking%20the%20Sleeping%20Giant%20Report/Shelton-Waking-the-Sleeping-Giant-2019.pdf>. The Shelton Group is a marketing communications firm focused exclusively on sustainability. *Id.* at 32.

² *Id.* at 6.

³ *Trash-Free Waters - Toxicological Threats of Plastic*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/trash-free-waters/toxicological-threats-plastic> (last updated June 19, 2017).

⁴ KATIE REGISTER AND LAURA MCKAY, VIRGINIA MARINE DEBRIS REDUCTION PLAN: SUMMARY AND LOOK AHEAD 3 (March 2016), http://www.longwood.edu/cleanva/images/VA_Marine_Debris_Reduction_Plan_Summary.pdf (prepared for the Virginia Coastal Zone Management Program).

⁵ KATIE REGISTER AND LAURA MCKAY, DEVELOPING A MARINE DEBRIS REDUCTION PLAN FOR VIRGINIA 7 (Oct. 2014), <https://www.deq.virginia.gov/Portals/0/DEQ/CoastalZoneManagement/Virginia%20Marine%20Debris%20Reduction%20Plan.pdf> [hereinafter REGISTER, MCKAY, DEVELOPING A MARINE DEBRIS REDUCTION PLAN FOR VIRGINIA].

⁶ *Id.* at 5.

⁷ *Id.*

plastics in 2013 reached 317 tons, nearly 3 percent higher than in 2011.”⁸ A scientific study, funded by California Sea Grant, examined trends in plastic deposition by analyzing plastic levels in a sediment core going back to 1834.⁹ Scientists from the Scripps Institution of Oceanography discovered that the level of plastic deposition correlated with the level of worldwide plastic production and increased exponentially, from 1945 to 2009, doubling every 15 years.¹⁰ This kind of data demonstrates that in order to effectively mitigate the impact of marine debris we must take steps to reduce the consumption and production of plastic.

Approximately 90% of plastics in the marine environment are microplastics, which are less than 5 millimeters in diameter.¹¹ Microplastics are further divided into two categories: (1) manufactured as a form of plastic abrasive or (2) created by the fragmentation of larger pieces of plastic from “the effects of ultraviolet rays, and wind and wave action”.¹² As plastics deteriorate, plastic additives leach into the water and biofilms—consisting of bacteria, plankton, and other organisms—grow on the microplastics. These biofilms can prove harmful when later ingested by animals or humans. Current treatment methods commonly employed at water treatment plants are unable to remove microplastics from the water supply.¹³ An EPA Microplastics Expert Workshop in 2017 reviewed an abundance of microplastics research that found microplastics present in seafood, drinking water, and sea salt.¹⁴

III. THE NEGATIVE IMPACTS OF MARINE DEBRIS

Marine debris impacts humans, the marine ecosystem, marine life, and the economy. Coral reefs and salt marshes are smothered by marine debris.¹⁵ The presence of plastics in the marine ecosystem creates a physical threat to marine wildlife. For instance, marine animals are often entangled in plastics: “[m]arine species, including seals, sea birds, sea turtles, whales, and dolphins can become entangled in debris, resulting in hindered movement, decreased feeding ability, injury, and death.”¹⁶

Additionally, fish, crustaceans, shellfish, and zooplankton continually ingest microplastics. This is especially dangerous because microplastics absorb contaminants and trace metals from their surroundings and can transfer these contaminants to the tissue of the ingesting animal.¹⁷

⁸ *Id.*

⁹ Jennifer A. Brandon, William Jones & Mark D. Ohman, *Multidecadal Increase in Plastic Particles in Coastal Ocean Sediments*, 5 SCI. ADVANCES 2, Fig. 1 (Sept. 2019), <https://advances.sciencemag.org/content/5/9/eaax0587>.

¹⁰ *Id.*

¹¹ *Trash-Free Waters - Toxicological Threats of Plastic*, *supra* note 3.

¹² *Id.*; for reference, a penny is 20 millimeters.

¹³ REGISTER, MCKAY, DEVELOPING A MARINE DEBRIS REDUCTION PLAN FOR VIRGINIA, *supra* note 5, at 6.

¹⁴ MARGARET MURPHY, U.S. ENVTL. PROT. AGENCY OFFICE OF WETLANDS, OCEANS AND WATERSHEDS, MICROPLASTICS EXPERT WORKSHOP REPORT: TRASH FREE WATERS DIALOGUE MEETING 18 (Dec. 4, 2017), https://www.epa.gov/sites/production/files/2018-03/documents/microplastics_expert_workshop_report_final_12-4-17.pdf.

¹⁵ CAL. OCEAN PROT. COUNCIL & NAT’L OCEANIC AND ATMOSPHERIC ADMIN. MARINE DEBRIS PROGRAM, CALIFORNIA OCEAN LITTER PREVENTION STRATEGY: ADDRESSING MARINE DEBRIS FROM SOURCE TO SEA 37 (June 2018), https://marinedebris.noaa.gov/sites/default/files/publications-files/2018_California_Litter_Strategy.pdf.

¹⁶ *Id.*

¹⁷ *Id.*

Marine animals can also ingest larger fragments of plastic waste, leading to gastrointestinal blockage.¹⁸

The ingestion of plastics is not only detrimental to the health of the marine animals, but these animals are often sold for human consumption with yet to be determined health effects. A 2014 study conducted by Belgian aquatic ecologists showed that “[a] serving of six oysters grown off the coast of France could contain as many as 50 plastic particles, indicating that plastic litter that we produce and allow to leak into the environment may end up back on our plates.”¹⁹

In the assessment of California’s marine debris problem, the California Ocean Protection Council deduced that “[t]he economic impacts of ocean litter include costs associated with beach and harbor cleanup, loss of coastal tourism and recreation, impacts to the fishing and aquaculture industries, and other impacts to human welfare and ecosystem services.”²⁰ A worldwide study by the United Nations in 2014 found that “communities on the west coast of the United States, spend more than \$520m per year to curtail litter.”²¹ In 2008, the Asia-Pacific Economic Cooperation (APEC) estimated that the cost of marine debris to the tourism, fishing, and shipping industries of that region was \$1.3 billion.²²

IV. TRACKING MARINE DEBRIS IN VIRGINIA

The majority of existing data on marine debris in Virginia is the result of the efforts undertaken by Clean Virginia Waterways, a nonprofit organization that organizes annual clean-ups of Virginia’s waters. In addition to doing clean-ups, it is critical to track the details about what types of trash are intercepted to document and understand the sources of marine debris pollution. Litter should be cataloged in an existing marine debris tracker, detailing what items were found, where it was collected, and whom it was collected by.²³ Data collected from clean-ups dating back to 1995 indicate that the top items found in Virginia are cigarettes/cigarette filters, beverage bottles, food wrappers/containers, and plastic bags.²⁴ Keep America Beautiful, a non-profit whose

¹⁸ *Trash-Free Waters Toxicological Threats of Plastic*, *supra* note 3.

¹⁹ CAL. OCEAN PROT. COUNCIL & NAT’L OCEANIC AND ATMOSPHERIC ADMIN. MARINE DEBRIS PROGRAM, *supra* note 15, at 37-38.

²⁰ *Id.*

²¹ UNITED NATIONS ENV’T PROGRAMME, VALUING PLASTIC: THE BUSINESS CASE FOR MEASURING, MANAGING AND DISCLOSING PLASTIC USE IN THE CONSUMER GOODS INDUSTRY 18 (2014), <http://wedocs.unep.org/bitstream/handle/20.500.11822/9238/-Valuing%20plastic%20the%20business%20case%20for%20measuring%20and%20disclosing%20plastic%20use%20in%20the%20consumer%20goods%20industry-2014Valuing%20plasticsF.pdf?sequence=8&isAllowed=y>.

²² *Id.*, (citing MCILGORM, A., CAMPBELL, H. & RULE, M., UNDERSTANDING THE ECONOMIC BENEFITS AND COSTS OF CONTROLLING MARINE DEBRIS IN THE APEC REGION (2008)).

²³ For example, if submitting data to The Ocean Conservancy’s TIDES: Trash Information and Data for Education and Solutions database, a collector would submit the following sample basic information. Location: Arlington County, Virginia, GPS: 38.88308, -77.11253, Clean-Up Type: Land (beach, shoreline and inland), Date: 3/25/2019, People: 3, Pounds: 1.25, Miles: .179. Then they would quantify the total number of items collected and how many of each item they collected, such as Cigarette Butts: 6, Food Wrappers: 15, Take-Out Containers (Plastic): 4. *TIDES: Trash Information and Data for Education and Solutions*, OCEAN CONSERVANCY, <https://www.coastalcleanupdata.org/reports> (filter Cleanup Dates: All of 2019, follow “Virginia, USA” then “Detailed Summary” and find Cleanup ID: 67636) (last visited June 7, 2020).

²⁴ REGISTER, MCKAY, DEVELOPING A MARINE DEBRIS REDUCTION PLAN FOR VIRGINIA, *supra* note 5, at 16.

mission “is to inspire and educate people . . . to beautify their community environment,” has dedicated itself to eradicating cigarette litter.²⁵ However, the other sources of marine debris are not being addressed as comprehensively. The following section will explore the various methods of tracking marine debris.

When it comes to tracking marine debris there are several options available to individuals, organizations, and localities who wish to track their clean-ups. There are material-specific reporting opportunities; for example, Clean Virginia Waterways launched the Virginia Balloon Study (the “Study”) as a means to collect data on balloon debris.²⁶ An individual or group can make a report about a single balloon, with information including where it was found, what type of string was attached, and any photographs to document the finding.²⁷ Since the Study launched in 2012, there have been over 1,000 reports of balloon debris found across Virginia.²⁸

Various institutions have undertaken efforts to compile databases of collected marine debris data. The Ocean Conservancy database is international in scope, but can be narrowed to show reports about clean-ups in specific states or countries across the world.²⁹ The Virginia report for 2019 alone has nearly 500 entries, each detailing the location of the clean-up, the pounds of trash collected, and the amount of each material found.³⁰ NOAA also has a marine debris tracker; “the app records the debris location through GPS, allows you to select your favorite debris item(s), add a description to an item(s), attach photos of debris items to document with your log, and view the data on your phone.”³¹ This tracker is in the form of a mobile app that allows individuals to check-in when they collect trash anywhere in the country, to ensure that the data is collected.³²

These trackers can be used by local organizations not only to track the debris they intercept during clean-ups, but also to understand what debris is most prevalent in their community and, therefore, what policies need to be implemented to reduce the amount of debris. By narrowing the collection data to their specific coordinates, a group can determine marine debris numbers for their tributary. For example, the James River Association could use these tracking databases to determine the most widespread sources of marine debris along the James River and its tributaries and inform their State of the James Report that summarizes ongoing efforts to bring the river back to full health, including reducing the amount of pollution entering the James.³³ Or the Virginia General Assembly could draw on this data to support efforts to regulate plastic bags and single-use plastics.

²⁵ *Mission & History*, KEEP AMERICA BEAUTIFUL, <https://kab.org/about/approach/mission-history/> (last visited June 7, 2020).

²⁶ Clean Va. Waterways of Longwood Univ., VA. BALLOON STUDY, <https://sites.google.com/site/virginiaballoonstudy/home?authuser=0> (last visited June 7, 2020).

²⁷ *Id.*

²⁸ *Id.*

²⁹ *TIDES: Trash Information and Data for Education and Solutions*, *supra* note 23.

³⁰ *Id.*

³¹ Nat’l Oceanic and Atmospheric Admin., *Marine Debris Tracker App*, MARINE DEBRIS PROGRAM, <https://marinedebris.noaa.gov/partnerships/marine-debris-tracker> (last updated June 6, 2020).

³² *Id.*

³³ *The State of the James*, JAMES RIVER ASS’N (2019), <https://thejamesriver.org/stateofthejames/>.

Tracking marine debris is also an issue of international concern. Birmingham University in the United Kingdom founded the 100 Plastic Rivers Project, which studies the accumulation of plastic in river sediment, where the plastics create a long-lasting pollution legacy, to understand how plastics are transported.³⁴ The 100 Plastic Rivers Project engages scientists to sample water and sediment in rivers in over 60 locations across the world.³⁵

V. METHODS TO COMBAT MARINE DEBRIS

There are numerous methods for solving the problem of marine debris. The problem must be addressed from both the top, by reducing the production of plastics, and from the bottom, by reducing individual consumption of plastic and ensuring that when plastic is used it is disposed of properly to ensure it does not enter the marine environment. While interception and clean-up are critical actions to undertake, they are less efficient and effective than source reduction and prevention.³⁶ The public costs associated with clean-ups and interception actions like litter capture devices make efforts to reduce marine debris at its source, by reducing plastic consumption, necessary to truly address the problem.³⁷ It is more costly to address marine debris by cleaning up the endless influx of waste than by reducing the waste stream in the beginning. By lessening our consumption of common sources of marine debris we also reduce future interception costs.

A. Source Reduction

In formulating the MDRP, Virginia experts from state agencies and academic institutions identified the following four categories as the sources of marine debris that could most likely be reduced in a socially, politically, and economically achievable way:

1. Plastic bags;
2. Cigarette butts and smoking-related litter;
3. Balloons from intentional mass releases; and
4. Beverage containers, straws, and food-related packaging.³⁸

In its 2020 session, Virginia's General Assembly made significant strides in efforts to address these sources of marine debris. A plastic bag tax was passed by the Virginia General

³⁴ Univ. of Birmingham, *Tracking the Sources of Plastic Pollution*, EUREKALERT! (Apr. 9, 2019), https://www.eurekalert.org/pub_releases/2019-04/uob-tts040419.php.

³⁵ *Id.*

³⁶ CAL. OCEAN PROT. COUNCIL & NAT'L OCEANIC AND ATMOSPHERIC ADMIN. MARINE DEBRIS PROGRAM, *supra* note 15, at 14. See also Hugo Kugiya, *Hoovering the Ocean: Plastic Pollution Threatens Marine Life, Humans and Ecosystems. Enter FRED, a Future Vacuum of the Seas*, WASH. POST (May 13, 2020), https://www.washingtonpost.com/climate-solutions/2020/05/13/climate-solutions-plastics/?arc404=true&utm_campaign=wp_post_most&utm_medium=email&utm_source=newsletter&wpisrc=nl_most ("Many scientists and activists consider mitigation efforts to be among the least effective ways of attacking the problem. Dianna Cohen is chief executive of the [Plastic Pollution Coalition](#), a global nonprofit organization linking individuals, organizations, policymakers and companies. She says a lasting solution will require producers, not consumers, to shoulder the responsibility and cost of managing plastic waste.").

³⁷ CAL. OCEAN PROT. COUNCIL & NAT'L OCEANIC AND ATMOSPHERIC ADMIN. MARINE DEBRIS PROGRAM, *supra* note 15, at 14.

³⁸ REGISTER, MCKAY, DEVELOPING A MARINE DEBRIS REDUCTION PLAN FOR VIRGINIA, *supra* note 5, at 30.

Assembly and approved by the Governor.³⁹ The Virginia bill provides cities and counties with the authority to implement a \$0.05 plastic bag tax.⁴⁰ A portion of the tax will be retained by the retailer collecting the tax, which helped to ensure retailers' support for the bill.⁴¹ The remaining revenue derived from this tax "shall be appropriated for the purposes of environmental cleanup, providing education programs designed to reduce environmental waste, mitigating pollution and litter, or providing reusable bags to recipients of Supplemental Nutrition Assistance Program (SNAP) or Women, Infants, and Children Program (WIC) benefits."⁴²

Such a tax has proved effective in other locations. The District of Columbia implemented its \$0.05 plastic bag tax in 2010.⁴³ In 2013, the District Department of Environment provided funding to the Alison Ferguson Foundation and the Anacostia Watershed Society to conduct a survey to quantify changes in bag use since the implementation of the bill.⁴⁴ They concluded that "80% of District residents reduced their use of disposable bags since the law took effect."⁴⁵ The survey also found 50% of businesses reported having saved money as a result of the bill and "83% of residents and 90% of businesses either support or are indifferent to the Bag Bill."⁴⁶

This initiative was taken a step further in California jurisdictions where a plastic bag ban has been initiated in several localities.⁴⁷ California found that, on average, areas with a plastic bag ban had 1/3 of the number of plastic bags entering the coastal waterways as those localities without such a ban.⁴⁸ Thus, a ban on the distribution of plastic bags was a significant means of obtaining a meaningful reduction in marine debris.

The Virginia General Assembly also succeeded in passing an increased litter tax in 2020, doubling the tax from \$10 to \$20 for manufacturers, wholesalers, distributors, or retailers of enumerated products and increasing the tax from \$15 to \$30 for those making or selling groceries, soft drinks, and carbonated waters, and beer and other malt beverages.⁴⁹ By targeting manufacturers and distributors of soft drinks and other beverages, this increased tax will effectively address the fourth most reducible source of marine debris in Virginia: beverage containers, straws, and food-related packaging, by imposing a cost to producing these sources of marine debris.⁵⁰

Efforts to reduce balloon and packaging debris have not received the same level of support in the Virginia General Assembly as the bag tax. A 2020 bill intending to decrease the number of

³⁹ VA. CODE ANN. §§ 58.1-1745 to 58.1-1748 (2020).

⁴⁰ *Id.*

⁴¹ *Id.*

⁴² *Id.*

⁴³ D.C. CODE § 8-102.03 (2020).

⁴⁴ U. S. ENVTL. PROT. AGENCY, TRASH-FREE WATERS PROGRAM: AQUATIC TRASH PREVENTION NATIONAL GREAT PRACTICES COMPENDIUM 11 (2016), https://www.epa.gov/sites/production/files/2017-02/documents/aquatic_trash_prevention_national_great_practices_compendium_december_2016.pdf [hereinafter EPA, COMPENDIUM].

⁴⁵ *Id.*

⁴⁶ *Id.* at 12.

⁴⁷ CAL. OCEAN PROT. COUNCIL & NAT'L OCEANIC AND ATMOSPHERIC ADMIN. MARINE DEBRIS PROGRAM, *supra* note 15, at 14.

⁴⁸ *Id.*

⁴⁹ VA. CODE ANN. § 58.1-1707 (2011).

⁵⁰ REGISTER, MCKAY, DEVELOPING A MARINE DEBRIS REDUCTION PLAN FOR VIRGINIA, *supra* note 5, at 30.

balloons that can be released in an hour from the forty-nine allowed by current law to one was continued until the next session.⁵¹ A prohibition on expanded polystyrene containers passed, but must be reenacted next year to become effective.⁵² If enacted, it will not apply to food chains until 2023 and all food vendors until 2025.⁵³ Civil penalties derived from violations will be deposited into the Litter Control and Recycling Fund or the treasury of the locality, depending on the entity that initiates the action.⁵⁴ A 2020 bill to provide localities with the authority to adopt an ordinance to prohibit or tax expanded polystyrene (Styrofoam) was stricken in the Senate.⁵⁵ The General Assembly did establish a Plastic Waste Prevention Advisory Council that will “study all aspects of plastic pollution problems in the Commonwealth.”⁵⁶ The Council’s mission is to “advise the Governor on policy and funding priorities to eliminate plastic waste impacting native species and polluting the Commonwealth’s environment and to contribute to achieving plastics packaging circular economy industry standards.”⁵⁷ They will have access to federal, state, or local agency data on plastic pollution and shall develop a plan and submit a report. The first report, due November 1, 2020, will provide “recommendations on legislation to accelerate the elimination of plastic bags and polystyrene packaging used or sold in the Commonwealth.”⁵⁸ Hopefully, recommendations proposed by this Council will be successful in future legislative sessions.

B. Interception

Interception of marine debris can be orchestrated through community river and bay clean-ups. It can also be coordinated on a local or city level. Baltimore’s Alley Cleaning Initiative is an example of a city taking the initiative to intercept litter before it enters the waterways.⁵⁹ “Alleys in Baltimore are the main collection sites for trash and tend to be small, compact, and close together. As such, alleys are natural magnets and conduits for trash and litter.”⁶⁰ To address this problem, the city invested in three alley cleaning machines.⁶¹ The city also encourages individual buy-in by dispatching the machines when dirty alley service requests are made by residents.⁶² Not only did this program reduce the amount of litter, but it also fostered a sense of individual pride in having a clean community.

Interception efforts can also be headed by non-governmental organizations. In 2009, the District of Columbia implemented a grant program called the Demonstration of Trash Reduction Technologies. This program funded non-profit organizations’ efforts to intercept trash in local tributaries.⁶³ The Anacostia Watershed Society and Earth Conservation Corps received grants to

⁵¹ S.B. 318, 2020 Sess. (Va. 2020).

⁵² H.B. 533, 2020 Sess. (Va. 2020).

⁵³ *Id.*

⁵⁴ *Id.*

⁵⁵ S.B. 193, 2020 Sess. (Va. 2020).

⁵⁶ VA. CODE ANN. §§ 2.2-2699.8 to 2.2-2699.10 (2020).

⁵⁷ *Id.*

⁵⁸ *Id.* Act of Apr. 7, 2020, ch. 798, 2020 Va. Acts, <https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP0798+pdf>.

⁵⁹ EPA, COMPENDIUM, *supra* note 44, at 3.

⁶⁰ *Id.*

⁶¹ *Id.* at 4; the machines were purchased for \$551,526 and the annual operating cost approximated \$180,000.

⁶² *Id.*

⁶³ *Id.* at 5.

install in-stream devices to capture trash in the Anacostia River and its tributaries.⁶⁴ The grants were funded through Washington D.C.'s \$0.05 plastic bag tax and analysis of the intercepted trash showed a decline in the amount of plastic bags since the initiation of the tax.⁶⁵ Since the installation of the trash traps, over 25,000 pounds of trash have been caught.⁶⁶

Baltimore's Water Wheel Trash Interceptor has been similarly effective, intercepting trash at a cost of \$430 per ton.⁶⁷ Implemented by the Waterfront Partnership's Healthy Harbor Initiative, "Mr. Trash Wheel" is a giant trash skimmer with googly eyes.⁶⁸ The Healthy Harbor Initiative staff spent most of their messaging time "cultivating Mr. Trash Wheel's image," and there are even local beers and t-shirts honoring him.⁶⁹ Not only has this initiative cleaned up the harbor, but it also has raised the community's awareness about the issue of marine debris.

Interception efforts also can, and should, be encouraged on an individual level. The Stash Your Trash Program, which is administered by the Missouri Department of Conservation's Stream Team Program, provides free mesh trash bags to river recreationists.⁷⁰ This encourages individuals enjoying the water to not only properly dispose of their trash, but also to collect any trash they see floating about.⁷¹ "It is estimated that this program has potentially prevented more than 25,000 tons of trash from entering Missouri waterways in 18 years."⁷²

A trash Total Maximum Daily Load (TMDL) could also be considered an interception action. The Clean Water Act requires a TMDL to be developed for impaired waterways. Because trash impairs water quality, it can be the basis for a TMDL.⁷³ Maryland and Washington D.C. established a trash TMDL for the Anacostia River in 2010.⁷⁴

A TMDL for a water body is determined by adding the individual wasteload allocations ("WLAs") for point sources that discharge into that water body with load allocations ("LAs") for nonpoint sources and natural background conditions.⁷⁵ The TMDL must also include a margin of safety ("MOS") which accounts for "any uncertainty in the relationship between pollutant loads

⁶⁴ *Id.*

⁶⁵ *Id.* at 6.

⁶⁶ *Id.*

⁶⁷ *Id.* at 7.

⁶⁸ Fedor Kossakovski, *Mr. Trash Wheel Cleans Up Baltimore Harbor with a Dash of Humor*, PBS (Apr. 9, 2018), <https://www.pbs.org/newshour/science/mr-trash-wheel-cleans-up-baltimore-harbor-with-a-dash-of-humor>.

⁶⁹ *Id.*

⁷⁰ EPA, COMPENDIUM, *supra* note 44, at 35.

⁷¹ *Id.*

⁷² *Id.*

⁷³ 33 U.S.C. § 1313(d) (2018).

⁷⁴ MD. DEP'T OF THE ENV'T & D.C. DEP'T OF THE ENV'T, TOTAL MAXIMUM DAILY LOADS OF TRASH FOR THE ANACOSTIA RIVER WATERSHED, MONTGOMERY AND PRINCE GEORGE'S COUNTIES, MARYLAND AND THE DISTRICT OF COLUMBIA (Aug. 2010), https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/Final_Anacostia_Trash_TMDL.pdf. "A TMDL establishes the amount of a pollutant that a waterbody can assimilate without exceeding the water quality standard for that pollutant. TMDLs provide the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and nonpoint sources to restore and maintain the quality of the state's water resources." *Id.* at viii.

⁷⁵ *Id.*

and the quality of the receiving waterbody.”⁷⁶ The Anacostia River trash TMDL “was developed through a cooperative agreement between EPA Region 3, the District’s Department of the Environment and the Maryland Department of the Environment.”⁷⁷ For the Anacostia River trash TMDL, the MOS was an additional 5% of the baseline load that must be removed.⁷⁸ The “WLAs are assigned to municipal separate storm sewer systems (MS4s), combined sewer overflows (CSOs), and other regulated land areas. . . [T]he LA is assigned to larger trash and debris that are attributed to activities such as dumping.”⁷⁹

The Anacostia trash TMDL is broken up into different sections of the waterway, each receiving a different TMDL number.⁸⁰ For example, the annual requirement for the Montgomery County portion of the Anacostia watershed is 324,660 pounds of trash removed per year.⁸¹ These numbers are designed to be met by implementing appropriate storm drain capture technologies, addressing illicit dumping, and employing “[r]egulatory and voluntary approaches to trash removal and prevention.”⁸² Because Maryland and Washington, D.C. successfully submitted a trash TMDL to the EPA for approval, these jurisdictions may have valuable information that could assist Virginia in submitting a trash TMDL for an impaired water body. As of the most recent EPA report, 278 miles of rivers and streams and 2 square miles of bays and estuaries in Virginia are impaired by trash.⁸³ A TMDL would be an effective starting point because the requirement to comply with the TMDL would motivate comprehensive actions by regulated entities to remove and prevent marine litter.

C. Social Marketing and Education

Individuals must understand the impact they have on their environment. In fact, awareness of a problem tends to lead to an effort to rectify the problem; a survey of Americans done by the Shelton Group in 2019 indicated that as individuals became more aware of single-use plastic bans, they too became more concerned about plastic in the oceans and were, therefore, more likely to make a conscious effort to reduce their plastic use.⁸⁴ Individuals surveyed similarly believed plastic waste to be the issue they can personally impact the most.⁸⁵ And 50% of the people surveyed said they have already made changes in their lives regarding single-use plastic, while 58% have a more positive view of brands that limit the use of plastic.⁸⁶ Finally, when the question was, “Who’s responsible for policing the production and use of single-use plastics?” the responses were almost evenly split between government, consumers, and companies.⁸⁷ The examples below

⁷⁶ *Id.*

⁷⁷ *Id.*

⁷⁸ *Id.* at xi.

⁷⁹ *Id.*

⁸⁰ *Id.* at ix.

⁸¹ *Id.*

⁸² *Id.* at xi.

⁸³ *Specific State Causes of Impairment that Make Up the Regional Trash Cause of Impairment Group*, U.S. ENVTL. PROT. AGENCY,

https://ofmpub.epa.gov/waters10/attains_region_cy.cause_detail?p_region=3&p_cause_group_name=TRASH (last visited June 7, 2020).

⁸⁴ SHELTON GRP., *supra* note 1, at 9.

⁸⁵ *Id.* at 16.

⁸⁶ *Id.* at 18, 26.

⁸⁷ *Id.* at 30.

demonstrate different ways to approach education and social marketing, by emphasizing enforcement, targeting specific groups, promoting pride in the waterway, and educating children.

Virginia can learn from various states, cities, and organizations that have undertaken efforts to educate the population about the importance of marine debris reduction. For example, the Alice Ferguson Foundation partnered with the National Park Service and the Metropolitan Washington Council of Governments to designate April as Litter and Illegal Dumping Enforcement Month. This designation is intended “to raise awareness of litter, illegal dumping, and related crimes; the laws associated with them; and their social and environmental effects on our communities, our economy, and the Potomac River.”⁸⁸ This program educated law enforcement officers in Washington on their authority to enforce litter laws, and the public “about the effects of litter and the legal ramifications of being caught” littering.⁸⁹ The Alison Ferguson Foundation also created the Regional Litter Prevention Campaign (the “Campaign”) to further educate the population in the Potomac watershed:⁹⁰

The Campaign allowed communities and jurisdictions to build awareness of residents and local businesses to the harmful nature of litter, to help drive behavior change among litterers in their area. The end goal of the Campaign was to create a lasting reduction of litter in the Potomac watershed by educating and inspiring a positive change in littering behavior.⁹¹

The Campaign was effective in that regard; direct observations of pedestrians showed a “45% reduction in the number of litterers and a 77% increase in the number of people throwing trash into litter cans,” after the Campaign was in place.⁹² This Campaign shows the benefits to be achieved from targeting a message to the general public and ensuring there are real consequences for littering.

Media campaigns can also change individual behavior by more targeted messaging. For instance, the Port of New Orleans introduced the Keep it Clean Campaign in an effort to increase water pollution literacy and change the littering behavior of the population.⁹³ The campaign focused on the tagline “Your Port • Your Water • Your NOLA” and placed signage with that language in specific areas shown to have high volumes of roadside debris on the Port’s property.⁹⁴ The tagline was “intended to give ownership and responsibility to the reader: readers should take pride in keeping the Port clean.”⁹⁵ Prior to the campaign’s inception, the Port spent approximately 800 labor hours or \$30,000 annually collecting trash. Since the majority of the trash originated from truck drivers, the campaign included signs along the Truckway indicating the distance to the

⁸⁸ EPA, COMPENDIUM, *supra* note 44, at 16.

⁸⁹ *Id.* at 17.

⁹⁰ *Id.* at 30.

⁹¹ *Id.*

⁹² *Regional Litter Prevention Campaign Seeks New Images to Target Millennials*, ALISON FERGUSON FOUND. (Mar. 6, 2015), <https://fergusonfoundation.org/regional-litter-prevention-campaign-seeks-new-images-to-target-millennials/>.

⁹³ EPA, COMPENDIUM, *supra* note 44, at 24.

⁹⁴ *Id.*

⁹⁵ *Id.* at 24-25.

nearest dumpster, for which the Port received positive feedback from the trucking industry.⁹⁶ The campaign's multi-faceted approach demonstrated a visible reduction of roadway litter and resulted in fewer hours spent picking up roadway litter in the year since the campaign began.⁹⁷ This high-visibility messaging proved effective and cost-efficient since the signage totaled only \$7,000.⁹⁸ Not only does this action provide an example of targeted signage, but it also capitalized on the sense of pride people develop in their waterways and used that to motivate change.

The final example is critical because it focuses on attempting to foster environmentally conscious behavior in children. The Trash Free Schools Project, created by the Alice Ferguson Foundation, educates students in twelve Maryland K-12 schools on how to reduce their school's waste.⁹⁹ As with all of these educational campaigns, a key factor is creating a sense of agency and environmental pride on an individual level. Participating schools in Maryland and Washington, D.C. self-assess using Trash Free Schools Report Cards.¹⁰⁰ Schools can implement new initiatives each year in order to improve their grade.¹⁰¹ Children participating in the program are endowed with a sense of pride in their school's performance and are given the chance to engage with environmental issues.

VI. SUGGESTIONS FOR VIRGINIA

If Virginia hopes to successfully address the issue of marine debris it would be beneficial to work closely with Maryland and Washington D.C., perhaps forming a regional group to implement solutions together because debris is carried in waterways across state boundaries. One way Virginia could benefit from this partnership is by receiving guidance on how to recreate successful initiatives that began in Maryland or Washington D.C., such as the Anacostia River Trash TMDL, the Trash Free Schools Program, and Litter and Illegal Dumping Enforcement Month.

A. Ban and Tax Legislation

Virginia also could pursue its source reduction goals by implementing more product bans and taxes.¹⁰² As the United Nations Environment Programme has noted, "Policies and laws need to address not only the removal of litter but are generally more successful when they govern the production, use, and disposal of products that would otherwise become marine litter."¹⁰³ There are

⁹⁶ *Id.*

⁹⁷ *Id.* at 25.

⁹⁸ *Id.*

⁹⁹ *Id.* at 39.

¹⁰⁰ *Id.* at 40. For the report card, see ALICE FERGUSON FOUND., TRASH FREE SCHOOLS GUIDEBOOK 37 (Sept. 2015), (available for download at: <https://fergusonfoundation.org/mdocs-posts/trash-free-schools-guidebook/>).

¹⁰¹ EPA, COMPENDIUM, *supra* note 44, at 40.

¹⁰² Efforts to establish a mandatory deposit for bottles and cans sold in Virginia date back to 1972. S.B. 60, 1972 Sess. (Va. 1972). Despite multiple attempts, these efforts have not been successful. *See, e.g.*, Bob Kemper, *Senate Foes Put Cork in Bottle Deposit Bill*, DAILY PRESS (January 23, 1991), <https://www.dailypress.com/news/dp-xpm-19910123-1991-01-23-9101240059-story.html>.

¹⁰³ CARL BRUCH ET AL., UNITED NATIONS ENV'T PROGRAMME, MARINE LITTER LEGISLATION: A TOOLKIT FOR POLICYMAKERS viii (2016), <https://www.eli.org/sites/default/files/eli-pubs/marine-litter-legislation-toolkit-policymakers.pdf>.

endless examples of successful single-use plastic and polystyrene product bans that Virginia can model.¹⁰⁴ It is also crucial to consider regulating non-recoverable items like plastic microbeads which are too small to be intercepted. Until wastewater treatment technology can effectively filter these particles, it is necessary to prevent their introduction to the marine environment by reducing their creation and use.¹⁰⁵ The Virginia General Assembly considered legislation prohibiting the manufacturing of products containing microbeads in 2015 but the bill was left in committee because Congress was considering a similar bill.¹⁰⁶

When implementing any of these policies or regulations the government should ensure there is time, before execution, to educate the public about the new scheme “to increase public understanding of the initiative, the reason for it, its benefits, and what is required to comply with the requirements.”¹⁰⁷ Not only does this improve compliance and enforcement, but it provides the community with a sense of knowledge and involvement that will help the program succeed.

B. Reinterpret or Update Existing Legislation

Some existing legislation can be used to help localities effectively administer marine debris reduction programs. For example, Section 15.2-939 of the Code of Virginia gives a locality the power to request a report detailing “waste generation, waste management, and recycling” from nonresidential solid waste generators and companies that recycle or otherwise manage waste.¹⁰⁸ This information can be used to understand the largest sources of debris in that locality and identify what sources are not effectively being disposed of or recycled. This data can also enable a jurisdiction to execute new policies to incentivize companies to recapture waste to form a circular economy.¹⁰⁹

Marine debris reduction goals can be incorporated into existing legislation. For example, waste management is regulated by the Virginia Waste Management Board which regulates “all aspects of solid waste management including waste reduction, recycling and reuse, storage, treatment, and disposal and shall require that consideration be given to the handling of all types of nonhazardous solid waste generated in the region or locality.”¹¹⁰ The Board can issue credits toward annual minimum recycling rates for good waste management practices, such as a credit for each ton of waste material that is reused.¹¹¹ This authority could be used to manage litter and could even designate credits that can be earned through localities’ marine debris reduction efforts, such as a credit for every trash interception tool¹¹² implemented.

¹⁰⁴ See *supra* Section V(A) Source Reduction.

¹⁰⁵ BRUCH ET AL., UNITED NATIONS ENV’T PROGRAMME, *supra* note 103, at ix.

¹⁰⁶ H.B. 1697, 2015 Sess. (Va. 2015); 21 U.S.C. § 331(ddd) (2018).

¹⁰⁷ BRUCH ET AL., UNITED NATIONS ENV’T PROGRAMME, *supra* note 103, at x.

¹⁰⁸ VA. CODE ANN. § 15.2-939 (1997).

¹⁰⁹ A circular economy is a system “in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life.” *WRAP and the Circular Economy*, WRAP, <http://www.wrap.org.uk/about-us/about/wrap-and-circular-economy> (last visited June 7, 2020).

¹¹⁰ VA. CODE ANN. § 10.1-1411 (2012).

¹¹¹ *Id.*

¹¹² See, e.g., tools discussed *supra* Section V(B) Interception.

Virginia already has the authority to execute some of the debris reduction actions that other states have undertaken. The state has a duty to support local efforts to address litter: “The Department (of Environmental Quality) shall support local, regional, and statewide programs to control, prevent, and eliminate litter from the Commonwealth and to encourage the recycling and beneficial use of discarded materials to the maximum practical extent.”¹¹³ The goal of this Litter Control Program is to increase and coordinate litter control, removal and recycling efforts.¹¹⁴ Money collected via Virginia’s litter tax and soft drink tax is deposited into the Litter Control and Recycling Fund.¹¹⁵ In 2018, \$1,782,129 was distributed from this fund to 309 of 324 localities.¹¹⁶ This money funded clean-ups, youth education, and public education efforts.¹¹⁷ The Program distributes annual grants to localities and works with them to raise awareness of the damaging effects of litter.¹¹⁸

Some existing provisions that are currently optional could be made mandatory. The state has the power to create litter bags with an anti-litter symbol and have them distributed at the Department of Motor Vehicles and points of entry to the Commonwealth, free of charge.¹¹⁹ If this program were executed with a marine debris theme, it would be a relatively inexpensive but effective method of educating the public about marine debris and encouraging individual interception. Virginia could model this program on Missouri’s Stash Your Trash Program,¹²⁰ which provided mesh bags to those enjoying the waterways.

A more substantial change would be to make the green schools program established in Section 22.1-212.1:2 of the Code of Virginia mandatory.¹²¹ Under the provision as it currently exists, school boards have the option to “cooperate with environmental groups, other relevant state agencies, such as, but not limited to, the Department of Environmental Quality and the Department of Health, and other stakeholders in the development of a green schools program for Virginia.”¹²² Such programs focus on waste reduction through recycling and educate students to be more energy efficient.¹²³ This type of program would not only “help schools contain costs and to reduce waste” but it also gives students the tools and knowledge to make sustainable changes when they return home.¹²⁴ Making this program mandatory would help Virginia achieve its marine debris reduction goals by educating the younger generation and culminate in reducing the waste stream. However, consideration should also be given to whether mandating implementation of the program would result in increased costs to the schools.

¹¹³ VA. CODE ANN. § 10.1-1415 (2018).

¹¹⁴ *Id.*

¹¹⁵ VA. CODE ANN. §§ 10.1-1422.01 (2009), 58.1-1702 (2002), 58.1-1707.

¹¹⁶ VA. DEP’T OF ENVTL. QUALITY, LITTER AND RECYCLING GRANT PROGRAM ANNUAL PERFORMANCE AND ACCOUNTING SUMMARY REPORT, FISCAL YEAR 2018 2 (2018), <https://www.deq.virginia.gov/LinkClick.aspx?fileticket=bNzbbA3w24c%3D&portalid=0>.

¹¹⁷ *Id.* at 3-5.

¹¹⁸ *Recycling, Litter Prevention and Tax Credits Programs Overview*, VA. DEP’T ENVTL. QUALITY, <https://www.deq.virginia.gov/Programs/LandProtectionRevitalization/RecyclingandLitterPreventionPrograms.aspx> (last visited June 7, 2020).

¹¹⁹ VA. CODE ANN. § 10.1-1420 (1988).

¹²⁰ *See supra* Section V(B) Interception.

¹²¹ VA. CODE ANN. § 22.1-212.1:2 (2004).

¹²² *Id.*

¹²³ *Id.*

¹²⁴ *Id.*

Legislation also has conferred a duty on public institutions of higher education and state agencies to “establish programs for the use of recycled materials and for the collection, to the extent feasible, of all recyclable materials used or generated by such entities.”¹²⁵ This duty could be fulfilled by establishing a program to mandate the use of compostable or non-disposable products. The state also has vast authority over state parks and could mandate the use of compostable or non-disposable cutlery and plates in state park dining establishments by amending Virginia Code § 10.1-200.1.¹²⁶

Localities can apply for litter prevention and recycling grants¹²⁷ to implement any of the suggestions detailed in this paper. There is a Litter Control and Recycling Fund Advisory Board which reviews grant applications.¹²⁸ Localities can submit applications for a competitive or non-competitive grant which can be used for “implementing statewide and regional litter prevention and recycling educational programs and pilot projects.”¹²⁹ The non-competitive grants are based on population and road miles and all localities are eligible if they have litter prevention or recycling programs.¹³⁰ Along with the proceeds of the Litter Tax, some of this funding comes from the Soft Drink Excise Tax, which while not environmental in focus does have the effect of discouraging the sale of single-use plastic bottles.¹³¹ Local governments can also apply to the Virginia Solid Waste or Recycling Revolving Fund with their project ideas.¹³² This Fund provides loans or grants to local governments executing waste and recycling projects.¹³³ The Virginia Waste Management Board in its discretion “may approve the use of money in the Fund to make grants to local governments to pay the cost of any project,”¹³⁴ and localities in the Commonwealth should take advantage of this funding opportunity when developing their recycling programs.

VII. CONCLUSION

Marine debris is a serious problem for our environment, economy, and communities. It is, however, a problem with clear solutions. There are many ways Virginia can address the problem of marine debris and ensure a cleaner future for the Commonwealth. First, Virginia can make a positive impact by implementing new legislation and interpreting existing legislation to foster source reduction, trash interception, and education on all levels. Second, Virginia can look to its neighboring states for concrete examples of successful and inexpensive marine debris reduction projects. Maryland and Washington, D.C. are valuable partners to have in this process and can

¹²⁵ VA. CODE ANN. § 10.1-1425.6 (1990).

¹²⁶ VA. CODE ANN. § 10.1-200.1 (1988).

¹²⁷ *Litter Prevention and Recycling Grant Programs*, VA. DEP’T ENVTL. QUALITY, <https://www.deq.virginia.gov/Programs/LandProtectionRevitalization/RecyclingandLitterPreventionPrograms/LitterPreventionandRecyclingGrantPrograms.aspx> (last visited June 7, 2020).

¹²⁸ VA. CODE ANN. § 10.1-1422.02 (1995).

¹²⁹ *Litter Prevention and Recycling Grant Programs*, *supra* note 127.

¹³⁰ VA. DEP’T OF ENVTL. QUALITY, GUIDELINES FOR THE VIRGINIA LITTER PREVENTION AND RECYCLING GRANTS 1 (Feb. 2018), https://townhall.virginia.gov/L/GetFile.cfm?File=C:\TownHall\docroot\GuidanceDocs\440\GDoc_DEQ_2282_v4.pdf.

¹³¹ VA. CODE ANN. §§ 10.1-1422.02, 10.1-1422.04, 58.1-1705 (1995).

¹³² VA. CODE ANN. §§ 62.1-241.1, 62.1-241.7 (1992).

¹³³ VA. CODE ANN. §§ 62.1-241.6 to 62.1-241.7 (1992).

¹³⁴ VA. CODE ANN. § 62.1-241.7.

share their expertise and collaborate to address transboundary impacts. Third, Virginia can analyze existing data on the most prevalent sources of marine debris in the Commonwealth and use that information to assist decision makers in formulating policy options to make the most impact.