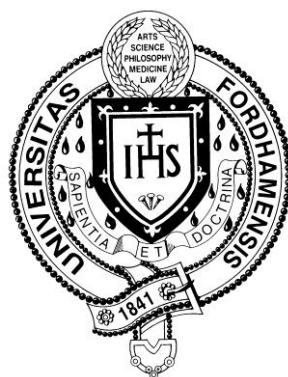


FORDHAM ENVIRONMENTAL LAW REVIEW



TEXTILES AS A SOURCE OF MICROFIBER POLLUTION
AND POTENTIAL SOLUTIONS

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TEXTILES AS A SOURCE OF MICROFIBER POLLUTION AND POTENTIAL SOLUTIONS

LEA M. ELSTON¹

ABSTRACT

This paper will explore the environmental problem surrounding microplastics pollution generated by the textile industry developing in the United States and globally. Microplastics are pieces of plastic so small they are best visible through use of a microscope with the pieces usually having a diameter of 5 millimeters or less. Plastic is used in numerous products today but the shedding of synthetic microplastics in textile materials have created unique and challenging problems because like all plastics they do not biodegrade naturally, and additionally are much easier ingested by wildlife as well as have the ability to easily absorb other toxins. For the most part current water regulations have not solved the problems and this paper will dive into the history of the various regulations surrounding the matter, as well as suggest proposals that countries need to consider adopting.

INTRODUCTION

Pollution caused by synthetic textiles shedding microscopic fibers is a growing problem in the United States and around the world. This paper will explore the shortfalls of the current environmental regulations governing the textile industry. It will propose a multi-part solution to mitigate microfiber pollution without incentivizing manufacturers to move to jurisdictions that lack regulation. Part I will

¹ J.D. Candidate, Fordham University School of Law, 2021; B.A. politics, New York University, 2011. Many thanks to Professor Susan Scafidi for her guidance and mentorship, and a resounding thanks to the staff of the Environmental Law Review, Volumes XXXI and XXXII for their insights and careful edits. Thanks to Evelyn Reis, whose brief advice at a Fordham symposium improved this paper enormously. Thanks to Nate Elston for having faith in me and for being my best sounding board. Finally, thanks to Ira Rosh and my former colleagues at Paragon Sports for sparking my interest in sustainable textile manufacturing.

outline the history of water waste regulation in the United States. It will provide context for the recent interest in microplastic pollution and summarize the steps that have been taken by the Environmental Protection Agency, by individual states, and abroad. Part II will contrast microplastic pellets and microfiber filaments and will lay out the major features of textile regulation in the United States. Part III will propose a solution in two steps. The first step concerns wastewater regulations on washing machine filters, wastewater treatment plants, and other sources of microplastic pollution. The second step discusses textile regulations limiting production methods to the least polluting method possible. This second part would primarily affect imported materials to the United States and would be more effective than any other solution in reducing microfiber pollution abroad. Part IV will briefly conclude.

I. THE HISTORY OF WATER WASTE REGULATION IN THE UNITED STATES

Microplastics are plastics so tiny they are only visible by microscope—less than 5 millimeter in diameter or length.² Plastic is used in countless industries today, and is commonly used in textiles because of its durability and improved performance over traditional textiles.³ When plastic breaks down over time it creates microplastics.⁴ These microplastics have become a problem because they find their way into aquatic ecosystems and do not biodegrade, leading to a buildup of plastic polluting our water supply.⁵ These microplastic particles then absorb toxic chemicals already found in our waterways at hundreds of times the level found in seawater.⁶ Current water

² Nicholas J. Schroeck, *Microplastic Pollution in the Great Lakes: State, Federal, and Common Law Solutions*, 93 UNIV. DETROIT. MERCY L. REV. 273 (2016).

³ *Properties and Uses of Synthetic Fiber*, FIBER2APPAREL (May 24, 2018), <https://www.fiber2apparel.com/2018/05/synthetic-fiber-properties-uses.html> (last visited Dec. 2, 2019).

⁴ Niko L. Hartline, Nicholas J. Bruce, Stephanie N. Karba, Elizabeth O. Ruff, Shreya U. Sonar & Patricia A. Holden, *Microfiber Masses Recovered from Conventional Machine Washing of New or Aged Garments*, *Envtl. Sci. & Technol.* Sept. 30, 2016, 50, 21, 11532-11538.

⁵ *Id.*

⁶ *Microplastic Marine Debris Fact Sheet*, U.S. DEPARTMENT OF COMMERCE, NAT'L OCEANIC AND ATMOSPHERIC ADMIN. [NOAA] (Nov. 20, 2020), <https://marinedebris.noaa.gov/fact-sheets/microplastic-marine-debris-fact-sheet> (last updated Oct. 4, 2020); Staley Prom, *State Legislation Survey - What's Trending: Microbead Bans*, SURFRIDER FOUND. (Mar. 27, 2015),

pollution regulations are not solving this problem in the United States, and no other country's regulations have provided an effective model for the United States to follow.⁷

This history of water pollution regulation highlights the difficulties of removing microplastics from the water supply or preventing new microplastics from entering the water supply. The Clean Water Act ("CWA") is the primary American federal law governing water pollution.⁸ As amended in 1972, the CWA gave the "EPA the authority to implement pollution control programs such as setting wastewater standards for industry".⁹ It addressed "point source pollution", waste resulting from one specific pollution source like a manufacturing plant or sewage treatment facility,¹⁰ which was seen as the greater threat to the environment in 1972, and addressed the need to plan to combat "nonpoint source pollution," which generally results from many diffuse sources like land runoff, precipitation, or drainage, in the future.^{11,12}

Over the past five decades, the public has gained greater understanding of the challenges in reducing nonpoint source pollution. Revisions to the CWA underscore the persistency of nonpoint source pollution and its effect on human health.¹³ Although the CWA has been effective in reducing water pollution from the biggest point sources, many waterways have not reached the quality standards set

<https://www.surfrider.org/coastal-blog/entry/state-legislation-survey-whats-trending-microbead-bans> (specifying microplastics absorb DDT, PCBs, PAHs, and flame retardants); Brian Lo, *An Obvious Environmental Problem from an Unobvious Source*, SOFTLINES SGS (July 9, 2018),

<https://www.sgs.com/en/news/2018/07/an-obvious-environmental-problem-from-an-unobvious-source> (specifying microplastics absorb phthalates and lead).

⁷ Arthur Nelson, *EU proposes ban on 90% of microplastic pollutants*, THE GUARDIAN (Jan. 30, 2019),

<https://www.theguardian.com/environment/2019/jan/30/eu-european-union-proposes-microplastics-ban-plastic-pollution> (describing draft regulation in European Union regarding microplastics).

⁸ Federal Water Pollution Control Act 33 U.S.C. §§ 1281a, 1251 [hereinafter Clean Water Act].

⁹ *History of the Clean Water Act*, U.S. ENVIRONMENTAL PROTECTION AGENCY [EPA] (June 15, 2020), <https://www.epa.gov/laws-regulations/history-clean-water-act> (last visited Dec. 2, 2019).

¹⁰ *Id.*

¹¹ *Id.*

¹² Claudia Copeland, Cong. Research Ser., RL30030, *Clean Water Act: A Summary of the Law*, 1, 3, (2016).

¹³ *See generally, Id.* at 4.

by the EPA.¹⁴ In order to reach those quality standards, nonpoint source pollution must also be reduced.¹⁵ The EPA and individual states share ownership of CWA enforcement, and states have developed various partnerships with the EPA to solve issues unique to their specific waterways and ecological problems.¹⁶ The EPA sets a ‘floor’ regarding water quality standards, and each state, if they so wish, is able to enforce a higher standard.¹⁷ For example, some states have focused on certain polluting industries, others have focused explicitly on microplastic pollution, while a third group of states have refrained from targeting any specific industries causing water pollution or delegated enforcement authority to the EPA.¹⁸

The recent interest in microplastic pollution has been stoked by the controversy surrounding microbeads, which are manufactured plastic pellets used in face or body washes.¹⁹ Now, the public is becoming increasingly familiar with the idea that microbeads wash down the drain and pass through water treatment facilities without being trapped.²⁰ But the problem is much wider-ranging than microbeads. Microplastic pollution is caused by nonpoint sources as varied as housing construction, degrading road tires, or textile waste.²¹ There is growing evidence that microplastics are ingested by plankton and fish, and eventually by humans.²² Researchers are studying this

¹⁴ See generally, *Id.* at 3.

¹⁵ See generally, *Id.* at 6.

¹⁶ *Id.* at 2.

¹⁷ *Id.*

¹⁸ *Id.*; Prom *supra* note 6.

¹⁹ Schroeck, *supra* note 2; *Marine Debris Program*, NOAA (Nov. 20, 2020), <http://marinedebris.noaa.gov/discover-issue/types-and-sources>.

²⁰ Prom, *supra* note 6; Sharon Oosthoek, *Americans consume some 70,000 microplastic particles a year*, SCIENCE NEWS FOR STUDENTS (Aug. 23, 2019, 5:45 AM), <https://www.sciencenewsforstudents.org/article/americans-consume-some-70000-microplastic-particles-year>.

²¹ Shirin Estahbanati & N.L. Fahrenfeld, *Influence of Wastewater Treatment Plant Discharges on Microplastic Concentrations in Surface Water*, 162 CHEMOSPHERE 277, 283 (2016), <http://www.sciencedirect.com/science/article/pii/S004565351630981X>; Sean Dixon, Zachary Lees, Andrea Leshak, *The Big Apple's Tiny Problem: A Legal Analysis of the Microplastic Problem in the N.Y./N.J. Harbor*, 22 ROGER WILLIAMS U. L. REV. 385, 431 (2017).

²² Lisbeth Van Cauwenberghe & Colin R. Janssen, *Microplastics in Bivalves Cultured for Human Consumption*, ELSEVIER, 65-70 (2014), <https://www.expeditionmed.eu/fr/wp-content/uploads/2015/02/Van-Cauwenberghe-2014-microplastics-in-cultured-shellfish1.pdf>; see also Leah Messinger, *How Your Clothes are Poisoning Our Oceans and Food Supply*, THE

evidence to determine whether there is a link between human ingestion of microplastics and cancer.²³ But the EPA has not yet set a water quality standard regarding a ‘safe’ level of microplastics in the water.²⁴

The public widely regards microbeads as unnecessarily polluting.²⁵ Because of the controversy surrounding microbeads, Congress amended the Food, Drug and Cosmetic Act (“FDCA”) to ban some uses of plastic microbeads through the Microbead-Free Waters Act of 2015.²⁶ At least nine states have bans on non-biodegradable microbeads, and many other states have introduced legislation on microbeads.²⁷ Fifteen other countries have also recently passed legislation banning production and sale of non-biodegradable microbeads in cosmetics.²⁸ But other types of microplastic pollution have not been regarded by the public with such outrage, leaving a significant gap in regulation of synthetic fibers, which generate far more pollution than microbeads.²⁹

Microfibers are plastic fibers of the same size as microplastic pellets that either start out at that size or result from degradation of synthetic textiles such as polyester.³⁰ For clarity, this paper will refer

GUARDIAN (Jun. 20, 2016),

<https://www.theguardian.com/environment/2016/jun/20/microfibers-plastic-pollution-oceans-patagonia-synthetic-clothes-microbeads> (speculating why fish found in Indonesia have been found with microplastic particles and fish in the United States have been found with microfiber filaments).

²³ Oosthoek, *supra* note 20 (quoting researcher Sam Athley “We don't yet know enough to determine the risk of consuming microplastics” and noting that PVC, PCB and DDT are all carcinogenic).

²⁴ See generally, *Textile Mills Effluent Guideline*, EPA (Apr. 1, 2020), <https://www.epa.gov/eg/textile-mills-effluent-guidelines>; 40 C.F.R. § 410.00-97 (2020).

²⁵ Guy Graney, *Slipping Through the Cracks: How Tiny Plastic Microbeads Are Currently Escaping Water Treatment Plants and International Pollution Regulation*, 39 FORDHAM INT'L L.J. 1023, 1044 (2016); see, e.g., *Results, International Campaign Against Microbeads in Cosmetics*, BEAT THE MICROBEAD (2020) [hereinafter *Campaign Against Microbeads in Cosmetics*], <http://www.beatthemicrobead.org/en/results> (last visited Dec. 2, 2019) (presenting 2012 - 2016 timeline showing increasing awareness of microbead pollution and bans on the substance).

²⁶ Microbead-Free Waters Act, Pub.L. No. 114, § 1, Dec. 28, 2015, 129 Stat. 3129.

²⁷ Prom, *supra* note 6.

²⁸ *Campaign Against Microbeads in Cosmetics*, *supra* note 25.

²⁹ *Marine Debris Program*, *supra* note 19.

³⁰ *Id.*

to ‘microfibers’ when referring to fibers specifically, and ‘microplastic pellets’ when referring to other deteriorated plastic waste such as microbeads. This paper will use ‘microplastics’ when referring to the general category containing both microfibers and microplastic pellets. Studies have shown that microfibers have the same impact on fish and wildlife as other forms of microplastic.³¹ Microfibers are ingested by fish and this can negatively impact the food chain in ways we do not yet understand.³²

But beyond the microbead legislation, the EPA and the federal government have focused regulation primarily on larger pieces of plastic rather than microplastic. In 2018 Congress passed the “Save Our Seas Act,”³³ and in 2020 they followed up by passing the “Save Our Seas 2.0 Act”, designed to combat marine debris like plastic bags or plastic straws.³⁴ That Act reauthorized the Marine Debris Program run by the National Oceanic and Atmospheric Administration (“NOAA”) and “require[d] the . . . NOAA. . . to work with: (1) other agencies to address both land-and sea-based sources of marine debris, and (2) the Department of State and other agencies to promote international action to reduce the incidence of marine debris.”³⁵ The proposed follow-up legislation is more likely to raise awareness than to actually reduce the amount of plastic entering the marine food chain.³⁶

Although the states can pass more stringent regulations than the EPA, only a few states have passed microfiber or general microplastic regulations that are unrelated to microbeads. Notably, in January 2020, Connecticut implemented a labeling requirement that new clothing sold in Connecticut containing 50% or more synthetic material must warn on the removable hang-tag that “[t]his garment

³¹ Cauwenberghe, *supra* note 22.

³² Prom, *supra* note 6; Cauwenberghe, *supra* note 22.

³³ Save Our Seas Act, Pub. L. No. 115-265, 132 Stat. 3742 (2018).

³⁴ Jeff Watters, *Save Our Seas 2.0 Act Just Passed the Senate—Here’s Why It Matters*, OCEANS CURRENTS BLOG (Jan. 20, 2020), <https://oceanconservancy.org/blog/2020/01/16/save-seas-2-0-act-just-passed-senate-heres-matters/>.

³⁵ Congress.gov, Pub. L. No. 115-265, <https://www.congress.gov/bill/115th-congress/senate-bill/3508?q=%7B%22search%22%3A%5B%22save+our+seas%22%5D%7D&s=6&r=1>

³⁶ Save Our Seas 2.0 Act, S. 1982, 116th Cong. (2019); *see also* Watters, *supra* note 34 (illustrating the awareness-raising function of this legislation).

sheds plastic microfibers when washed, which contributes to marine plastic pollution.”³⁷ The Connecticut legislature indicated that their intent was to “[r]ecognize the emerging threat that microfibers pose to the environment and water quality and provide information to the general public about the sources of microfiber pollution[, and r]educe the amount of microfiber that enters the environment and is subsequently consumed by wildlife.”³⁸ Legislators in New York and California each proposed similar textile labeling bills that have not been passed by their legislatures.³⁹

While California has not succeeded in passing their labeling bill, they are one of the only states that has moved to create drinking water standards for microplastics. Rather than dissuading customers from purchasing synthetic clothing, they have asked their State Water Resources Control Board to set a standard for safe levels of microplastics in the water.⁴⁰ This amendment to the California Safe Drinking Water Act requires the Control Board define microplastics by July 2020, and to adopt a methodology to test drinking water for microplastics by July 2021.⁴¹ This long timeframe illustrates the difficulties of preventing harm caused by microplastic water pollution when that harm is not yet fully understood.

International or multi-national agreements on microplastics or

³⁷ Conn. Gen. Stat § 1. § 22a-208i (2018),

<https://www.cga.ct.gov/2018/ACT/pa/2018PA-00181-R00HB-05360-PA.htm>

³⁸ *Id.*

³⁹ Cal. Civ. Assembly Bill No. 2379,

http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB2379; NY Assembly Bill 10599,

https://assembly.state.ny.us/leg/?default_fld=&bn=A10599&term=2017&Summary=Y&Actions=Y&Text=Y&Committee%2526nbspVotes=Y&Floor%2526nbspVotes=Y; see Preetha Chakrabarti & Siri Rao, *New Labeling Requirements: How States and Industry are Tackling Microfibers*, Crowell & Moring Oct. 15, 2018.

⁴⁰ Cal. Health & Safety § 1 § 116376

http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB1422

⁴¹ *Id.*; see also *Proposed Definition of Microplastics in Drinking Water*, CALIFORNIA WATER BOARDS, 2-3 (Mar. 9, 2020), https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/microplastics/stffrpt_def_mcrplstcs.pdf (defining microplastics as “solid polymeric materials to which chemical additives or other substances may have been added, which are particles which have at least two dimensions that are greater than 1 and less than 5,000 micrometers (µm). Polymers that are derived in nature that have not been chemically modified (other than by hydrolysis) are excluded” (footnotes omitted)).

microfibers have made little headway either. In the European Union, the European Chemicals Agency (“ECHA”) has drafted a law that “would remove 36,000 tonnes a year of intentionally added microplastic fibres and fragments, starting in 2020” that ECHA views as unnecessary and harmful to marine life.⁴² The details are still being reviewed by the ECHA’s scientific committees after a notice period solicited industry concerns.⁴³ If the scientific committees sign off, the proposal would still need to be sent to the European Commission and then ratified by member states.⁴⁴ Outside of this proposed EU regulation, there are no multi-national agreements addressing the problem of microplastics.⁴⁵

II. THE CONTRAST OF MICROPLASTIC PELLET POLLUTION WITH THE PROBLEMS POSED BY MICROFIBER POLLUTION

Microfibers and microplastic pellets must be treated differently because microfibers are more difficult to trap in traditional wastewater treatment facilities. Compared to microplastic fragments or pellets, microfibers are more likely to end up in oceans or streams.⁴⁶ Traditional wastewater treatment facilities are not designed to remove microfiber filaments.⁴⁷

A. *The Problem with Microfibers*

More scientific research is needed to understand where most

⁴² Arthur Neslen, *EU proposes ban on 90% of microplastic pollutants*, THE GUARDIAN (Jan. 30, 2019 5:41 AM), <https://www.theguardian.com/environment/2019/jan/30/eu-european-union-proposes-microplastics-ban-plastic-pollution>.

⁴³ *Restriction proposal for intentionally added microplastics in the EU – update*, EUROPEAN CHEMICALS AGENCY [ECHA] (July 25, 2019), <https://echa.europa.eu/-/restriction-proposal-for-intentionally-added-microplastics-in-the-eu-update>.

⁴⁴ *Id.*

⁴⁵ *Microfiber Pollution Caused by Domestic Laundering of Synthetic Garments*, SGS (Apr. 12, 2017), <https://www.sgs.com/en/news/2017/04/safeguards-06117-microfibre-pollution-caused-by-domestic-laundering-of-synthetic-garments>.

⁴⁶ Prom, *supra* note 6; *accord Marine Debris Program*, *supra* note 19.

⁴⁷ Corporation of the City of Guelph, Canada, *Introduction to Wastewater Treatment*, CORP. OF THE CITY OF GUELPH 6 <http://guelph.ca/wp-content/uploads/IntroductionToWastewater.pdf> (last visited Dec. 2, 2019)

microplastics, including microfibers, enter the environment.⁴⁸ Recent studies indicate microfibers enter the environment at two points: either when a textile or fiber is produced, or when it is washed.⁴⁹ Synthetic microfibers slough off both during production of the textile, and when textiles are washed in commercial washing machines.⁵⁰ Those microfibers are then diverted into wastewater treatment facilities, just like any other wastewater from manufacturing or personal laundry.⁵¹ But microfibers may also enter the environment when rain falls on textiles that are used outdoors, such as technical athletic apparel made of polyester-spandex.⁵²

Microplastic pollution has been regulated to some extent by individual states, as described in Part I of this paper. Congress has reacted to the public outcry against microplastic beads, as have many states.⁵³ Connecticut, New York and California have debated labeling requirements to create greater consumer awareness about marine pollution caused by microfibers.⁵⁴ Congress has acted regarding the problem of general plastic pollution in the ocean.⁵⁵ But microfiber pollution keeps getting worse, evidencing that this type of pollution has yet to be effectively regulated.⁵⁶

Groundbreaking studies have shown that synthetic textiles are the largest source of non-point microfiber pollution.⁵⁷ In the United States, polyester is the most widely used synthetic textile.⁵⁸ Polyester is used for many consumer purposes including fiberglass, carpets,

⁴⁸ See Cauwenberghe, *supra* note 22 (illustrating lack of consensus on how microplastics enter the environment).

⁴⁹ Hartline, *supra* note 4.

⁵⁰ *Microfiber Pollution Caused by Domestic Laundering of Synthetic Garments*, *supra* note 45.

⁵¹ Corporation of the City of Guelph, *supra* note 47, at 1.

⁵² Copeland, *supra* note 12.

⁵³ Microbead-Free Waters Act, *supra* note 26; Save Our Seas Act, NY Assemb. Bill 10599; Save Our Seas Act, *supra* note 33.

⁵⁴ Conn. Gen. Stat § 1. § 22a-208i, *supra* note 37; Cal. Civ. Assembly Bill No. 2379; Chakrabarti et al., *supra* note 39.

⁵⁵ Save Our Seas Act, *supra* note 33; First Step Act of 2018, *supra* note 35; see also *supra* note 34.

⁵⁶ See *Microplastic Marine Debris Fact Sheet*, *supra* note 6; see also Estahbanati, *supra* note 21.

⁵⁷ *Id.*

⁵⁸ Cal. Civ. Assembly Bill No. 2379, *supra* note 39 (stating “Polyester is the most widely used fiber in the textiles industry and accounts for about 50 percent of the total fiber market.”).

upholstery, ropes, sails, thread, and seat belts.⁵⁹ But by far the most common purpose for polyester is apparel.⁶⁰ A study from University of California at Santa Barbara determined that synthetic fleece jackets release 1.7 grams of microfibers each time they are washed.⁶¹ A study from the State University of New York at Fredonia tested effluent from wastewater treatment plants and found “85 percent of the plastic it contained was fibers, whereas beads and other fragments only made up 13 percent.”⁶²

But if washing machines are causing microfibers to shed more rapidly, what is the solution? Technology is still developing that would trap more microfibers at the individual home level.⁶³ And at the wastewater treatment plant level, microfibers continue to slip past the treatment mechanisms.⁶⁴ Current water treatment facilities are designed to remove most contaminants from water in a multi-stage process.⁶⁵ The first stage removes solid waste particles like sand, glass, and litter, which can be screened out and disposed of separately.⁶⁶ The second stage puts the remaining wet sludge mixture through a sedimentary tank so that biological waste, including germs, organisms, and human waste, can be separated from the rest of the effluent sewage.⁶⁷ In most cities, this sewage then goes through a secondary treatment process which can remove remaining suspended organic matter.⁶⁸ These basic waste treatment processes do not filter out some substances, which then flow out to the receiving waters such as lakes, streams or rivers.⁶⁹ Among the substances ordinary waste treatments

⁵⁹ *Id.*

⁶⁰ *Id.*

⁶¹ *Microplastic Marine Debris Fact Sheet*, *supra* note 6; Prom, *supra* note 6; Lo, *supra* note 6; *see also* Messinger, *supra* note 22.

⁶² Mary C. O'Connor, *The Invisible Nightmare in Your Fleece*, OUTSIDE ONLINE (July 30, 2015), <https://www.outsideonline.com/1998166/plastics>.

⁶³ Andrea D. Steffen, *This Is The First Ever Microplastics Filter For Washing Machines!*, INTELLIGENT LIVING (Sept. 12, 2019), <https://www.intelligentliving.co/microplastics-filter-washing-machines/> (describing a PlanetCare brand aftermarket washing machine microfiber filter currently in development).

⁶⁴ EPA Office of Water, *How Wastewater Treatment Works. . . The Basics*, 833-F-98-002 EPA 1, 4 (May, 1998), <https://www3.epa.gov/npdes/pubs/bastre.pdf>.

⁶⁵ *Id.* at 2.

⁶⁶ *Id.*

⁶⁷ City of Guelph, *supra* note 47.

⁶⁸ *Id.*

⁶⁹ *Id.*

facilities fail to remove are heavy metals, chemical compounds, and microfibers.⁷⁰

Advanced waste treatment options exist that could filter out microfibers and other microplastics, but, unless they are required to do so by law, they are prohibitively expensive for treatment facilities to implement.⁷¹ Some estimates put the cost of filtering all microfibers at three times as expensive as current waste treatment.⁷² As it is, the infrastructure in many cities is aging and even systems that were effectively removing small plastic particles once may not effectively remove small plastic as their use becomes more pervasive.⁷³

Microfiber pollution from the textile manufacturing process is also a concern, but in the United States, manufacturing pollution is somewhat mitigated by EPA guidelines on effluent waste generated by textile mills.⁷⁴ At the manufacturing level, mills produce synthetic fibers and manufacture those fibers into yarns, fabric textiles to be made into apparel, and other products like carpets.⁷⁵ Creating synthetic fiber requires chemical processes, and dyeing synthetic textiles requires chemicals that need to be washed off before the textile reaches the consumer.⁷⁶ In the United States, effluent guidelines require that mills divert this water waste generated by production to be pre-treated before it is released.⁷⁷ Some mills release their wastewater into a sewer system that joins the municipal water treatment process, but many mills release their wastewater directly into receiving rivers, lakes or

⁷⁰ *Id.* at 7.

⁷¹ Copeland, *supra* note 12, at 5 (“The most recent estimate indicated that, as of 2012, \$271 billion more would be required to build and upgrade municipal wastewater treatment plants in the United States and for other types of water quality improvement projects that are eligible for funding under the [clean water] act. . .”).

⁷² *Id.*; see generally, *How Much Does a Wastewater Treatment System Cost? (Pricing, Factors, Etc.)*, SAMCO (May 18, 2016) [hereinafter SAMCO], <https://www.samcotech.com/cost-wastewater-treatment-system/>.

⁷³ *Water Security*, EPA (Jan. 19, 2017), <https://www.epa.gov/homeland-security-research/water-security>.

⁷⁴ EPA Office of Research and Development, *Manual Best Management Practices for Pollution Prevention in the Textile Industry*, EPA/625/R-96/004 EPA 1, 1 (Sept. 1996), <https://nepis.epa.gov/Exe/ZyPDF.cgi/30004Q2U.PDF?Dockey=30004Q2U.PDF>.

⁷⁵ *Id.* at 169.

⁷⁶ *Id.* at 125.

⁷⁷ *Id.*

streams.⁷⁸ Current guidelines focus on aquatic toxicity and the content of metals or oxygen in the water to indicate pollution levels, but do not reference plastic pollution explicitly.⁷⁹

To be successful, any regulation of microfiber pollution must necessarily incorporate a solution for the microfibers generated by polyester clothing. The list of types of clothing that use polyester or other synthetic textiles is constantly growing.⁸⁰ Of all apparel manufacturers, the outdoor apparel industry especially has marketed their intent to determine the extent to which fleece and other outdoor apparel adds to microfibers in oceans, rivers and streams.⁸¹

B. Other Textile Regulations:

Because the amount of microfiber in our water is exacerbated to a great extent by polyester and other synthetic textiles, a study of the framework of current textile regulations is useful to consider how microfiber textiles might be regulated.

Textiles are regulated in the United States for various safety issues either by regulating manufacturing directly, in the case of textiles made within the United States, or by regulating manufacturing indirectly, by limiting or banning import of textiles that do not meet United States safety or manufacturing standards. These regulations primarily affect the fashion industry as 75% of all textiles imported to the United States are apparel products.⁸²

Textiles are restricted from use for certain purposes because they might pose a public danger. For example, the Consumer Product

⁷⁸ *How Much Does a Wastewater Treatment System Cost? (Pricing, Factors, Etc.)*, *supra* note 72.

⁷⁹ See EPA Office of Research and Development, *supra* note 74 at 125.

⁸⁰ Neal Kimberly, *Donald Trump's 'America First' approach risks eroding US dollar supremacy amid trade war with China*, SOUTH CHINA MORNING POST (Jun. 9, 2020 10:00 AM), <https://www.scmp.com/business/article/3088039/donald-trumps-america-first-approach-risks-eroding-us-dollar-supremacy>; Sheng Lu, *Pattern of U.S. Textile and Apparel Imports (Updated: February 2018)*, FASH455 GLOBAL APPAREL & TEXTILE TRADE AND SOURCING (Feb. 16, 2020), <https://shenglufashion.com/2020/02/16/patterns-of-u-s-textile-and-apparel-imports-updated-february-2020/>.

⁸¹ See generally, Messinger, *supra* note 22; see also Patagonia, *infra* note 112.

⁸² Messinger, *supra* note 22; Lu *supra* note 80.

Safety Commission mandates that textiles be independently tested for flammability.⁸³ After testing, the textile is then sorted by burn time into one of 3 classes. Textiles that fall into Class 3 (Rapid Flammability) are forbidden from sale in the United States.⁸⁴ To protect children from burns, textiles intended for children's sleepwear in the United States are held to an even more rigorous flammability standard.⁸⁵ In addition, sleepwear that meets those flammability standards "must have a permanent label with instructions on how to take care of the garment to protect it from chemicals or other treatments that can reduce its flame resistance".⁸⁶ This type of textile classification and restrictions on use could be extrapolated and applied to a microfiber regime.

While children's sleepwear standards are the most famous, other agencies have also mandated certain textile limitations in order to ensure public safety or to affect trade. Textiles used in food manufacturing and packaging are regulated both by the US Food and Drug Administration ("FDA") and by US Customs and Border Protection.⁸⁷ The FDA requires that any textiles that are used in single or repeated contact with food be safe for human consumption.⁸⁸ For imports, Customs enforces tariff prices imposed by the Federal Trade Commission ("FTC"). And Customs and the FTC often partner to regulate textiles via tariffs or import duties.⁸⁹ While Customs enforces

⁸³ 16 C.F.R. § 1610.1 (Electronic Code of Federal Regulations, Current through Oct. 28, 2020).

⁸⁴ *Uncompromising Flammability Regulations for the U.S. Apparel Marke*, QIMA (2020), <https://www.qima.com/testing/textile-fabric/textile-flammability-testing>.

⁸⁵ See 16 C.F.R. § 1615 (Electronic Code of Federal Regulations, Current through Oct. 28, 2020); 16 C.F.R. § 1616 (Electronic Code of Federal Regulations, Current through Oct. 28, 2020).

⁸⁶ Children's Sleepwear Regulations, U.S. CONSUMER PRODUCT SAFETY COMMISSION, <https://www.cpsc.gov/Business--Manufacturing/Business-Education/Business-Guidance/Childrens-Sleepwear-Regulations/> (last visited Dec. 3, 2019).

⁸⁷ See *Food Casings Classified as Made-Up Textile Products, Court Says*, SANDLER, TRAVIS & ROSENBERG, P.A. (Nov. 8, 2017) [hereinafter ST&R], <https://www.strtrade.com/news-publications-classification-food-casings-CIT-court-110817.html>; 21 C.F.R. § 177 (2019).

⁸⁸ 21 C.F.R. § 177.1590 (2019).

⁸⁹ *Kalle USA, Inc. v. United States*, 273 F. Supp. 3d 1319, 1332 (Ct. Int'l Trade 2017), *aff'd*, 923 F.3d 991 (Fed. Cir. 2019) (An importation company disputed the tariff rate set by Customs for its sausage casing, which was a woven textile on one side filled with a plastic backing. The Court determined the tariff rate should be the rate for textiles because the packaging matched the characteristics of a textile more closely than the characteristics of a plastic.).

the tariff rate, it is set by the FTC in coordination with the World Trade Organization.⁹⁰ This type of rate-setting, which can vary based on consumer safety, like in the flammability context, can be used to affect the amount of any specific textile that is imported.

Notably when compared to American regulators, European regulators have taken a much stronger stance against potentially harmful textile dyes. In the European Union, Directive 2002/61/EC prohibited the use of some azodyes in textile and leather articles.⁹¹ Less than 4% of this type of leather and textile dye might release cancer-causing aromatic amines.⁹² But with the prolonged contact that textiles have against human skin, European regulators sought to prevent harm by outlawing those dyes.⁹³ Since that directive went into effect in 2003, most manufacturers avoid those azodyes, even for products intended for the United States market.⁹⁴

Microfiber ingestion by fish and other wildlife is a public issue that we are just beginning to understand. As with other public health issues addressed by existing textile regulations, the EPA and other American agencies should ensure the safety of Americans by regulating how much synthetic textile is allowed and for what purposes. There are many ways to accomplish regulation of textile microfibers.

⁹⁰ *Textile and Apparel Products*, U.S. CUSTOMS AND BORDER PROTECTION (May 29, 2014), <https://www.cbp.gov/trade/nafta/guide-customs-procedures/provisions-specific-sectors/textiles>.

⁹¹ A. Püntener & C. Page, *European Ban on Certain Azo Dyes*, TFL (Jan. 5, 2004), https://web.archive.org/web/20120813054055/http://www.tfl.com/web/files/eubana_zodyes.pdf (last visited Dec. 3, 2019).

⁹² *Id.*; P. Piccinini, C. Senaldi, E. Buriova, *European survey on the presence of banned azodyes in textiles*, JRC SCIENTIFIC AND TECHNICAL REPORTS (2008), https://publications.jrc.ec.europa.eu/repository/bitstream/JRC44198/eur_23447_en_fr_aa.pdf.

⁹³ Püntener et al., *supra* note 91.

⁹⁴ Piccinini et al., *supra* note 92.

III. THE TWO TYPES OF REGULATION THAT ARE MOST LIKELY TO SUCCEED IN SOLVING THE PROBLEM OF MICROFIBER POLLUTION IN AMERICAN AQUATIC ECOSYSTEMS

A. *The Two Regulations That are Most Likely to Succeed*

This paper's proposal to reduce microfiber pollution in the environment involves two major prongs: 1) enforcement of a series of specific regulations limiting the allowable microfiber pollution from personal washing machines, wastewater treatment plants, and other sources of microfiber textile pollution and 2) regulations on the manufacturing process of textiles sold in the United States. While there has been limited documented proof of the harm caused by microfiber pollution, in order to reduce the harm that we will likely discover in time, these regulations should be implemented immediately. Regulations on fabric and textiles that require the least-polluting processes for manufacturing could successfully reduce the amount of microfiber released when textiles are made, no matter where they are made. Because most textiles are made outside of the United States, this would primarily affect imported textiles. Using restrictions on imported textiles has significant implementation and enforcement benefits over a possible multi-national agreement enacted between the United States and its trade partners.

B. *Specific Regulations on Washing Machines*

If Congress passed legislation requiring the CPSC to enforce regulations mandating individual laundry washing machines to meet a threshold of microfiber 'lint trapping,' it would reduce the amount of microfiber that flows to wastewater treatment centers for disposal. Traps that effectively stop microfiber shedding at the individual machine level are being developed by multiple firms, most notably by the Rozalia Project.⁹⁵ This type of trap could be integrated into the machine's water filters. Technology already exists for this type of water filtration at the macro level, but it is not required to be used. While more effective, less expensive microplastic filtration feasible for household use has yet to be developed, Congress has the authority to mandate development of technology that would enhance consumer

⁹⁵ *A human-scale solution to the biggest pollution problem facing our ocean: Microfibers*, ROZALIA PROJECT [hereinafter ROZALIA], <http://rozaliaproject.org/stop-microfiber-pollution/> (last visited Dec. 3, 2019) (describing the Cora Ball filter).

safety without regard to the cost it would impose on washing machine companies.⁹⁶

The public cannot rely on manufacturers to adopt microfiber filtration as a standard unless it were enforced by an agency like the Consumer Products Safety Commission. If washing machine manufacturers such as LG, Samsung, Whirlpool and Kenmore were required to include effective microfiber filtration in their washing machines for the United States market, it would cause a significant reduction in the amount of synthetic textile microfiber that is shed and washed out to wastewater treatment facilities.⁹⁷ But developing effective microfiber filtration will be costly. If microfiber filtration were already integrated into washing machines, consumers would not have to undertake a positive action to install the trap or purchase existing after-market traps on the market.⁹⁸

Consumers would be likely to continue to use integrated microfiber filters and maintain them as needed. Consumers already remove lint from clothing dryers, and consumers understand water filters from their kitchen appliances such as ice machines or water pitchers. Sales for aftermarket filters show there is appetite for environmentally conscious and health-conscious water filtration in the market.⁹⁹ Positive public opinion toward washing machine regulations would help Congress pass such an act.

However, it is unlikely that Congress can implement such a measure as a safety requirement without additional campaigning and public awareness education. If Congress were to draft such a requirement without increasing the level of public awareness, the requirement would meet lobbying resistance from large appliance manufacturers. Consumers today simply do not realize the harm from ubiquitous microfiber filaments in aquatic ecosystems. Major manufacturers like Whirlpool and GE that produce their machinery in the United States may frame their opposition to increasing regulation

⁹⁶ U.S. CONST. art. I, § 8, cl. 3.

⁹⁷ See Abayomi Jegede, *Top 10 Best Washing Machine Brands in the World*, THE DAILY RECORDS (Jan. 1, 2019), <http://www.thedailyrecords.com/2018-2019-2020-2021/world-famous-top-10-list/highest-selling-brands-products-companies-reviews/best-washing-machine-brands-world-front-loader-japanese/12897/>

⁹⁸ See ROZALIA, *supra* note 95.

⁹⁹ *Id.*; See Steffen *supra* note 63.

as an attack on American employers.¹⁰⁰ In this ‘America first’ trade climate, this could be fatal to a bill that would raise manufacturing costs, even where the ultimate goal of the regulation is protecting American public health.¹⁰¹

C. Specific Regulations on Wastewater Treatment Plants

The EPA or Congress should pass regulations that require wastewater treatment plants around the country to use tertiary water treatment to remove microfiber particles from water before it is released into oceans, lakes, or rivers. The EPA could do this by setting a ‘safe’ allowable level of microplastic in the water or Congress could pass an amendment to the Safe Drinking Water Act. Either Congress or the EPA would have a greater effect on water quality than any individual state acting alone to set that same allowable level. Research has not confirmed how much microplastic can be ingested before it causes health repercussions in humans.¹⁰² But the EPA is obligated to protect human health and the environment, so they should rely on the few studies that have been done that suggest microfibers are harmful in order to set a limit, without waiting for further harm to occur.¹⁰³ Even if the ‘safe’ allowable level of microplastic in the water is set at the current level of microplastic pollution, setting the standard would be a positive change, because the EPA could then impose fines if the current amount of microplastic pollution is exceeded by any wastewater treatment plant.

If water treatment facilities were obligated to meet a microplastic standard before releasing the treated water, filtration would cost much more. Many facilities in the United States already cost more to run and maintain than their state budgets can afford. Even if this standard were adopted, it would be implemented unevenly throughout the country. In some places, microplastic filtration is already possible but the additional treatment would add to daily operating costs.¹⁰⁴ In others, microplastic filtration is not possible without upgrading the water treatment plant. The Surfrider Foundation

¹⁰⁰ *Top 5 Washing Machines Made in USA (2018)*, BIZVIBE (Apr. 11, 2018), <https://www.bizvibe.com/blog/electricals-and-lighting/top-5-washing-machines-made-in-usa-2018/>.

¹⁰¹ Kimberly, *supra* note 80.

¹⁰² *Marine Debris Program*, *supra* note 19.

¹⁰³ *History of the Clean Water Act*, *supra* note 9.

¹⁰⁴ *See City of Guelph*, *supra* note 47.

has advocated for installing movable reuse filtration systems next door to traditional wastewater treatment centers, which would bring water up to a potable standard and filter out all microfibers.¹⁰⁵ So in addition to a higher daily operating cost, these treatment facilities would need funds available to undertake a capital project that could cost over \$1 million.¹⁰⁶ These estimated costs vary widely because microplastic pollution is not currently filtered by wastewater treatment plants and has been insufficiently studied.

Despite the cost, this type of systems upgrade is still the most likely to be implemented of all possible solutions. If this solution were implemented alone, it would make some progress in reducing the amount of microfiber pollution in marine ecosystems. If this solution were implemented in conjunction with regulations on individual washing machines, it would be even more effective. Wastewater treatment regulation has the advantage of placing the solution where government is already involved at the municipal level rather than at the consumer level. Water safety is a top governmental concern given the ongoing water quality crises in America.

But this solution is unlikely to be implemented until after the current presidential administration by either Congress or the EPA. America's Water Infrastructure Act of 2018 was passed recently, so Congress may feel that they have made enough progress on water for the moment.¹⁰⁷ Under the current presidential administration, the EPA's planned budget for FY 2021 is \$2.399 billion less than the enacted FY 2020 budget.¹⁰⁸ Given this reduction in proposed budget, it is unlikely that the EPA would have the available funding to enact a new microplastic regulation or the available funding to partner with the states to enforce them.

¹⁰⁵ Katie Day, *Plastic Microfibers: Recent Findings and Potential Solutions*, SURFRIDER FOUNDATION (May 19, 2017), <https://www.surfrider.org/coastal-blog/entry/plastic-microfibers-recent-findings-and-potential-solutions>.

¹⁰⁶ SAMCO, *supra* note 72.

¹⁰⁷ America's Water Infrastructure Act of 2018, S. 3021, 115th Cong. (2018) (funding water infrastructure improvements throughout the country for flood control and navigable waterways).

¹⁰⁸ *FY 2021 Budget*, EPA (Apr. 5, 2019), <https://www.epa.gov/planandbudget/cj>.

D. Regulations on Non-Point Source Microfiber *Pollution*

Part I indicated that non-point source microfiber pollution is a significant problem. Regulations on microplastics at the washing machine level or at the wastewater treatment facility level will not affect the amount of microfiber pollution entering the environment from other non-point sources. While it is possible to reduce non-point source microfiber pollution, this type of reduction faces barrier costs of research and public education.

Along with regulating wastewater treatment facilities and washing machine filters, the EPA and individual states should partner to regulate other sources of non-point source microfiber pollution as they learn what those sources are. Continuing research is needed to understand the major sources of diffuse microfiber pollution in order to craft an effective regulation to limit those sources. The outdoor apparel industry, for example, understands that durable water repellants (“DWRs”) sprayed onto outdoor gear like rain jackets can create microplastic pollution.¹⁰⁹ The construction industry understands that housing textiles like insulation also create microplastic pollution, especially during demolition.¹¹⁰ But no one understands yet whether those are major sources, minor sources, or somewhere in between.

The government should also fund scientific studies of microfiber pollution in order to ensure they are targeting the biggest non-point sources of microfiber pollution in their regulations. Without government-funded research, this type of study is more likely to take place for some industries than for others. Groups that already prioritize the environment will make efforts to investigate the developing problem of microfiber pollution.¹¹¹ Patagonia’s investment into research and development for microfiber pollution is one such example

¹⁰⁹ *Properties and Uses of Synthetic Fiber*, *supra* note 3.

¹¹⁰ *History of the Clean Water Act*, *supra* note 9.

¹¹¹ See *Cross Industry Agreement for the prevention of microplastic release into the aquatic environment during the washing of synthetic textiles*, (Dec. 13, 2017), https://www.aise.eu/documents/document/20180116153055-cross_industry_agreement_prevention_of_microplastic_release_into_aquatic_environment_during_washing_of_synthetic_textiles_13jan2018.pdf (agreement signed by A.I.S.E. (International Association for Soaps, Detergents and Maintenance Products) CIRFS (European Man Made Fibres Association) EOG (European Outdoor Group) EURATEX (European Textile and Apparel Confederation) FESI (Federation of the European Sporting Goods Industry)).

of an interested player that already prioritizes the environment.¹¹² In contrast, other fashion industry players may not want research into microfibers to reveal that they have produced more pollution than they intended—imagine manufacturers of plastic sequins or plasticized glitter accessories—because it could harm business. Since microfiber pollution has generated relatively little public outcry, it is unlikely that a complete picture of microfiber pollution would be developed without pressure from the EPA or from individual states.

Regulations on washing machines, regulations on wastewater treatment plants, and regulations on other non-point sources of microfiber pollution would be effective within the United States. But research has shown that microplastic pollution can travel extreme distances via ocean currents.¹¹³ We all ultimately share one ecosystem. Domestic regulation would not affect the pollution that occurs elsewhere in the world, even when that pollution affects American public health. It will take a concerted, worldwide commitment to not only understand the harm of microfiber pollution, but to find a remedy.

E. Restrictions on Manufacturing Standards for Imported Textiles

The second prong of this paper's recommendation relies on regulating the manufacturing process of any synthetic textile sold in the United States. In order to reduce harmful microfiber waste, this paper recommends that Congress require any textile sold in the United States, including imported textiles, to be manufactured in a facility that measures and limits its microfiber waste. American manufacturing is a minor component of textile production worldwide so this would primarily affect the textiles that are imported to the United States from major textile production centers in China, India and Vietnam.¹¹⁴ In regulating imports to the United States, Congress would draw on its commerce clause power.¹¹⁵ The regulations would be enforced by Customs and the FTC. The content of the regulations should be informed by ongoing research as to the specific microfibers released by different textiles and how those microfibers affect human health.

¹¹² *An Update on Microfiber Pollution*, PATAGONIA (Feb. 3, 2017) <https://tcl.patagonia.com/2017/02/an-update-on-microfiber-pollution/>; Messinger, *supra* note 22.

¹¹³ Cauwenberghe, *supra* note 22; Marine Debris Program, *supra* note 19.

¹¹⁴ Sheng Lu, *supra* note 80.

¹¹⁵ U.S. CONST. art. I, § 8, cl. 3, *supra*, note 96.

Regulations already exist for other imported materials that might affect public health.¹¹⁶ Microfiber-shedding textiles might pose a similar public health risk. Already, some toxic chemicals are not allowed to be used in textiles no matter where they are produced.¹¹⁷ Extremely flammable textiles are not allowed to be imported at all.¹¹⁸ As study continues, synthetic textiles might be classified by the quantity of microfiber they shed prior to importation, much like textiles are already classified by flammability. Import of certain synthetic textiles that shed the most might be banned. But current scientific understanding indicates that the best way to limit microfiber pollution is to regulate the process of manufacturing: requiring mills to use secondary or tertiary water treatment to filter microfibers out of their effluent waste.¹¹⁹

In the current political climate, if enough public attention is drawn to the problem of microfiber pollution, this type of regulation is likely to be implemented. The most effective regulations would hold domestic and foreign manufacturers to the same standards. Foreign manufacturers, producing more textile overall than American textile manufacturers, would see the most increased costs to their waste management at textile mills.¹²⁰ But this cost might not hinder its implementation. During this ‘America first’ political era, increased cost could be framed as encouraging American manufacturing over foreign manufacturing. The government might find it appealing to find a way to increase costs for foreign businesses while also improving American public safety because it could contribute pressure to the escalating trade war.¹²¹ Public attention is still needed so that the public understands the benefits of these import regulations and how they outweigh the costs.

¹¹⁶ 16 C.F.R. § 1610.1, *supra* note 83; 16 C.F.R. § 1615, *supra* note 85; 16 C.F.R. § 1616 *supra* note 85.

¹¹⁷ Piccinini, *supra* note 92 (banning azodyes in the EU leading to fewer azodyes used in the United States).

¹¹⁸ 16 C.F.R. § 1610.1, *supra* note 83.

¹¹⁹ City of Guelph, *supra* note 47.

¹²⁰ Kimberly, *supra* note 80.

¹²¹ *Id.*

F. Specific Import Regulations

The specific import requirements would need to consider both current industry practice and the feasibility of inspections for compliance. Mills for synthetic textile operate differently depending on the type of textile, *i.e.*, whether the mill produces polyester, nylon, or other fibers. The FTC or Customs must be able to prove compliance for the import regulations to make a difference to the problem of microfiber pollution. With so many types of production, compliance might look different for each material or each finished product. Without effective compliance control, importers could make fake attestations to meet whatever goal is set. Current industry practices should therefore inform the requirements. Successful regulation should balance the cost of improved waste management against the lost profit that regulation would incur in order to dissuade manufacturers from evading the requirements altogether.

The import requirements should not ban synthetic textile or even limit the types of synthetics that may be sold or used in the United States. Instead, the import requirements should be based on the textile mill using the best process available to create a product that sheds less microfiber into the water both during production and when it is washed by the consumer after purchase. The emphasis of the requirements should be on providing the best products available; the most useful, but also the safest. Requiring the highest standard of production and durability is preferable to an outright ban that would stifle innovation and shrink the fashion industry.

Manufacturers could build their mills to have the same type of filtration as wastewater treatment plants that can filter out microfiber particles. Mandating that synthetic textiles sold in the United States be produced at mills that use this technology when textiles are dyed or washed would reduce the amount of microfiber entering receiving waters from these sources. This would require setting a 'safe' level for microfibers in the wastewater. As this problem is so new, it is unclear how much microfiber pollution is caused at the manufacturing level. But some studies have indicated that microfiber particles are more numerous downstream of manufacturing plants or their wastewater treatment centers, so this step could be taken even as the problem is

still being researched.¹²²

If researchers can determine what types of synthetic textile shed less fiber, import regulations could also mandate that only textiles that shed the least are sold in the United States. Industry groups or manufacturers may sponsor studies that relate to their products in order to comply with their regulatory burden or to sway the public. Even if these studies are sponsored by an interested party, this information would benefit the public. Less shedding could indicate greater durability which would benefit consumers. These import restrictions may also lead to innovation on the part of manufacturers to decrease microfiber shedding or to find safer synthetic textiles. Currently researchers hypothesize that lower quality polyester sheds more than high quality polyester in consumer use, but it has not been proven.¹²³

These proposed import regulations face some drawbacks but are more likely to make a difference than any other scheme aimed at curbing foreign microfiber pollution. These proposals assume that many gaps in our scientific understanding will be bridged, and that Congress can coordinate with the FTC or US Customs to enforce a regulation that serves a nearly invisible purpose. Microfibers are tiny. Their buildup in our wildlife and in our water supply is less intuitively harmful than visible particulate in a glass of water. These recommendations also assume that the American textile industry would accept these regulations even begrudgingly and would not launch a public relations campaign against these regulations. By framing the regulations as affecting primarily imports, it may reduce the impetus for American manufacturers to protest these measures. But this type of regulation would be costly, and the public would need to understand the harm of microfiber pollution in context in order to see their value.

G. Exploring a Multi-National Agreement

This paper argues that enforcement of specific wastewater regulations on washing machines, wastewater treatment facilities and other sources of microplastic pollution, along with restrictions on the manufacturing processes of imported textiles will reduce microfiber pollution more effectively than any other measure. Why would any

¹²² Cal. Civ. Assembly Bill No. 2379, *supra* note 59; *Marine Debris Program*, *supra* note 19.

¹²³ *An Update on Microfiber Pollution*, *supra* note 112.

other measure be less successful?

Textile pollution is diffuse. A patchwork of different countries acting individually incentivizes free ridership by less wealthy countries. If the United States enforces regulations only domestically, then other countries continue to cause microfiber pollution unabated. Waiting for other countries to agree that microfiber pollution must be reduced would solve the free ridership problem but waiting would allow pollution to grow into a bigger problem than it has already become. It is tempting to suggest that the United States could lead its trade partners to enact a multi-national agreement through the World Trade Organization to reduce microfiber pollution. But this would not be successful.

Global or multi-national agreements would have implementation and enforcement issues that make it no better than a United States-focused solution. Agreements made by organizations such as the World Trade Organization and the United Nations indicate that multi-national agreements are incredibly difficult to enact, and even more difficult to implement once they are enacted.¹²⁴

A multi-national agreement to reduce microfiber pollution would suffer implementation issues because holdouts would continue polluting and reduce the effectiveness of the agreement. Anti-pollution regulation is costly, and the benefits are difficult to quantify. Because the benefits of anti-pollution regulation are difficult to measure, many countries would choose to save their money and not regulate. Further, the current presidential administration has emphasized their unwillingness to work with the World Trade Organization or to work collaboratively with other countries on other pressing collective action problems.¹²⁵

¹²⁴ *Paris Agreement*, UNITED NATIONS CLIMATE CHANGE (2020), <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>.

¹²⁵ Barbara Moens, *EU sets up WTO court with group of countries without US*, POLITICO (Jan. 20, 2020), <https://www.politico.eu/article/eu-sets-up-wto-court-with-group-of-countries-without-us/>; see e.g. William Booth, Caroline Johnson, and Carol Morello, *The world came together for a virtual vaccine summit. The U.S. was conspicuously absent*, THE WASHINGTON POST (May 4, 2020), https://www.washingtonpost.com/world/europe/the-world-comes-together-for-a-virtual-vaccine-summit-the-us-is-conspicuously-absent/2020/05/04/ac5b6754-8a5c-11ea-80df-d24b35a568ae_story.html.

Assuming a global or multi-national microfiber pollution measure could be enacted, it would be unlikely that every country would abide by the measure simultaneously. If even one country holds out from enforcing the hypothetical microfiber pollution measure, it would incentivize manufacturing in that country. Abiding by any pollution regulation reduces profits. Large companies in the textile or fashion industry can shift production to cheaper locations in order to maximize profits when they are threatened with greater regulation. In this hypothetical, textile manufacturing would move to the holdout countries where the pollution regulation is not implemented. Those holdout countries would welcome the industry. And the textile industry would benefit from finding the cheapest place to manufacture amid rising costs due to regulation elsewhere.

Finally, environmental-social-governance (“ESG”) criteria and similar corporate citizenship movements can mitigate the incentives for textile manufacturers or fashion companies to produce in an unregulated, polluting environment, but corporate citizenship would not go far enough.¹²⁶ Hugely profitable companies that rely on synthetic textiles, like Nike, have shown willingness to spend more on avoiding pollution even where it is not mandated by law.¹²⁷ But the problem of microfiber pollution must be solved with more force than merely the goodwill of large companies. In order to solve the worsening problem of microfiber pollution, import regulations would be the most effective international solution.

CONCLUSIONS

The problem of microfiber pollution deserves a solution even now while its scientific effects are not yet well understood. Imposing regulations on washing machine filters and wastewater treatment facilities would reduce the amount of microfiber entering the environment within the United States. Because microfiber filaments can travel widely in the ocean, the best solution will also reduce the amount of microfiber entering the environment from outside of the

¹²⁶ James Chen, *Environmental, Social, and Governance (ESG) Criteria*, INVESTOPEDIA (May 10, 2019), <https://www.investopedia.com/terms/e/environmental-social-and-governance-esg-criteria.asp>.

¹²⁷ *Microfibers*, NIKE (2020), <https://purpose.nike.com/microfibers> (last visited Dec. 3, 2019); see generally, *An Update on Microfiber Pollution*, *supra* note 112.

United States. Enacting a multi-national agreement would pose implementation and enforcement issues. Instead, regulations on the production (and perhaps also on the shedding classification) of any synthetic textiles sold in the United States would affect both domestic-produced and foreign-produced textiles. Finally, the government should fund study into other non-point sources of microfiber pollution and regulate them on an ongoing basis as more is understood about microfibers and their effects.