Sent via U.S. mail and electronic mail

November 22, 2019

Kaitlyn Sutton
Florida Department of Environmental Protection
Division of Environmental Assessment and Restoration
2600 Blair Stone Road, Mail Station 6511
Tallahassee, Florida 32399-2400
Kaitlyn.Sutton@FLORIDADEP.gov

RE: Impaired Florida Waterbodies Due to Microplastics Pollution

Dear Ms. Sutton,

The Center for Biological Diversity appreciates the opportunity to submit data regarding microplastics to the Florida Department of Environmental Protection (DEP) as part of its Triennial Review of Florida's Water Quality Standards. By submitting this data on microplastic pollution in Tampa Bay and the Indian River Lagoon system, we hope to inform the DEP and public on the prevalence of microplastics and the urgent need for the state to reduce plastic pollution in Florida's waters.

I. Triennial Review

The Clean Water Act requires that the DEP conducts a Triennial Review of Florida's Water Quality Standards, which includes a comprehensive review of all water quality, a presentation of information on potential revisions to Florida's surface water quality standards, including consideration of U.S. EPA 304(a) criteria recommendations,[1] and all surface water quality standards in Florida Administrative Code (F.A.C.) chapters 62-302, 62-303, 62-304, 62-4.[2]

II. Water Quality Standards Applicable to Microplastic Pollution

All Florida waters, whether surface or ground, are public resources.[3] The state's water supply comes from rivers, streams, wetlands, lakes, springs, aquifers, and estuaries,[4] and the DEP and

[1] Florida Department of Environmental Protection, Triennial Review of Water Quality Standards, (Oct. 29, 2019 , 11:29 AM), https://floridadep.gov/dear/water-quality-standards/content/triennial-review-water-quality-standards.
[2] *Id.*
[3] Florida Water Resources Act, Chapter 373, F.S.
[4] Florida Department of Environmental Protection, Water Supply, (Aug. 29, 2019, 9:24 AM), https://floridadep.gov/water-policy/water-policy/content/water-supply.

five water management districts (Northwest Florida, Suwannee River, St. Johns River, Southwest Florida, and South Florida) oversee these resources.[5] Florida uses its fresh water in a variety of ways, including for public water supply, irrigation for agriculture, industrial use, and power generation.[6] Moreover, the natural environment needs water to function. The DEP is required to balance the public needs in consideration of an ever-growing population.[7]

To this end, Florida DEP lists certain marine, estuarine, and fresh waters as impaired as required by section 303(d) of the Clean Water Act (Act) when existing pollution controls are insufficient to meet state water quality standards.[8] According to the Act, Florida must include all water bodies that fail to meet "any water quality standard," which includes numeric and narrative criteria, water body uses, and antidegradation requirements, as impaired.[9] Sections 303(a)-(c) of the Act detail the elements to determine water quality standards by describing the desired condition of the water body in question.[10] These elements consist of (1)"designated uses," such recreation, fishing, or navigation; (2) "criteria," which specifies either numerically or narratively the amount of pollutants that do not impair a designated use; and (3) "antidegradation requirements," which provide protection and limitations on existing high quality waters.[11]

Florida enacted the Florida Air and Water Pollution Control Act so that "pollution of…waters…constitutes a menace to public health and welfare; creates public nuisances; is harmful to wildlife and fish and other aquatic life; and impairs domestic, agricultural, industrial, recreational, and other beneficial uses of air and water."[12] It is public policy to conserve, protect, maintain, and improve water quality for agricultural, industrial, and recreational as well as for the propagation of wildlife.[13]

Furthermore, the Florida Administrative Code clarifies the minimum and general criteria for surface water quality standards.[14] At a minimum, surface waters shall be free from "[d]omestic, industrial, agricultural, or other man-induced non-thermal components of discharges"[15] that either form nuisances such as debris, scum, and oil,[16] or pose a serious danger to public safety or welfare.[17] Surface water classification entails desginated use[18] with specific criteria for each classlification.[19] This methology arranges water quality classifications according to degree of protection with Class I having the highest standards and Class V having the least.[20] Classes I-III

[5] Fla. Stat. §373.069 (2019).
[6] Florida Department of Environmental Protection, Water Supply, (Aug. 29, 2019, 9:24 AM), https://floridadep.gov/water-policy/water-policy/content/water-supply.
[7] *Id.*
[8] 33 U.S.C. § 1313(d) (2018).
[9] 40 C.F.R. § 130.7 (b)(1),(3), & (d)(2) (2018).
[10] *See* 33 U.S.C. § 1313(a)-(c) (2018).
[11] *Id.*
[12] Fla. Stat. §403.011; Fla. Stat. § 403.021(1) (2019).
[13] Fla. Stat. § 403.021(2) (2019).
[14] Fla. Admin. Code r. 62-302.500(1)-(2) (2019).
[15] Fla. Admin. Code r. 62-302.500(1)(a) (2019).
[16] Fla. Admin. Code r. 62-302.500(1)(a)(2) (2019).
[17] Fla. Admin. Code r. 62-302.500(1)(a)(6) (2019).
[18] Fla. Admin. Code r. 62-302.400(1) (2019).
[19] Fla. Admin. Code r. 62-302.400(3) (2019).
[20] Fla. Admin. Code r. 62-302.400(4) (2019).

share criteria established to "protect fish consumption, recreation and the propagation and maintenance of a healthy, well-balanced population of fish and wildlife."[21]

Tampa Bay and Indian River Lagoon have Class II waters, meaning that shellfish propagation or harvesting is a designated use.[22]

The Florida Constitution requires state policy to conserve and protect natural resources and to abate water pollution for the same purpose.[23] The discharge of toxic pollutants in toxic amounts is prohibited,[24] as is pollution that "causes or contributes to new violations of water quality standards…harmful to the waters of this State."[25] However, it is recognized that activities outside of the state contribute to intrastate pollution. Therefore, the DEP, in its capacity as a water quality manager, must make reasonable efforts toward the abatement of pollution.[26] If any person causes pollution as to "harm or injure human health or welfare, animal, plant, or aquatic life or property," such activity is in violation of state statutory law.[27]

To this end, water quality management districts develop lists that prioritze significant water bodies within each district that is reviewed every five years.[28] Criteria for developing these lists include considerations for violations of existing standards, nutritent load, listed impared water bodies, water bodies with established total maximum daily loads (TMDLs), biological condition of the water, reduced fish and wildlife values, threats to water supplies and recreational opportunities, and public input.[29] Of concern in the South Florida District is Lake Okeechobee, Biscayne Bay, the Lake Worth Lagoon, and the Indian River Lagoon system and their tributaries,[30] and the Southwest Florida District gives priority to Tampa Bay and its tributaries.[31]

In consideration of relevant statutes and codes, Florida must evaluate the attainment status of its water quality standards with respect to microplastics pollution. To do so, Florida should evaluate all readily available information about microplastics pollution. There are increasingly comprehensive data sets that contain information on microplastics pollution, and Florida must evaluate these data sets to assess its freshwater, estuarine, and marine waters for impairment by microplastics.

III. Microplastics Threaten Water Quality and Ecosystem Health

Plastics are a group of manufactured materials derived from petrochemicals that are lightweight, inexpensive, and designed to be disposable. While the first plastic polymer (Bakelite) was developed in 1907, it was not until the 1940s, that plastic products became commercialized and

[21] Fla. Admin. Code r. 62-302.400(4) (2019).
[22] Fla. Admin. Code r. 62-302.400(2) (2019).
[23] Fla. Const. Art. II, § 7.
[24] Fla. Admin. Code r. 62-302.300(2) (2019).
[25] Fla. Admin. Code r. 62-302.300(15) (2019).
[26] Fla. Admin. Code r. 62-302.300(4) (2019).
[27] Fla. Stat. § 373.430(1)(a) (2019).
[28] Fla. Stat. § 373.453(1)(a) (2019).
[29] Fla. Stat. § 373.453(1)(b) (2019).
[30] Fla. Stat. § 373.453(1)(c)(1) (2019).
[31] Fla. Stat. § 373.453(1)(c)(1) (2019).

mass produced.[32] As the proliferation of plastic products endured over the decades, scientists began to report the presence of small plastic particles in our world's oceans in the 1970s. However, it was not until 2004 when a marine ecologist noted the impact of these particles and their distribution that the term "microplastics" entered scientific vernacular.[33]

Since then, there have been scientific studies on microplastics in marine coastal systems from the east and west coasts of North America, the Caribbean, southern Africa, the Mediterranean, Europe, Antarctica, and Asia.[34] The increasing amount of research on the sources and effects of microplastics show that these small particles contaminate waters from pole to pole and at every level of the water column.[35] Plastic pollution moves through the ocean by winds and surface current. In the northern hemisphere, long-term transport leads to plastic litter accumulation in ocean basin centers[36] and in coastal habitats such as marshes, seagrass beds, and reefs.[37] In 2010, between 4.8 and 12.7 million metric tons of plastic litter reached the world's oceans[38] and currently floating at sea is an estimated 5.25 trillion plastic particles weighing 268,940 tons.[39]

Microplastics come in a wide range of sizes smaller than 5 mm,[40] and the degradation process for plastic is slow. This means that plastics persist in environmental and become environmental hazards to flora and fauna. Plastic accounts for 92% of all encounters between organisms and debris with well-known effects of entanglement, ingestion, and death for macroplastics.[41] Moreover, while there are some manufactured microplastics, these small particles also come from microplastic fragmenting.[42] Sources of microplastics include acrylic, polyester, and polyamide fibers from textiles.[43] There is a variation in density dependent on source, and size and density determine position in the water column and the potential effects on flora and fauna, including ingestion.[44]

---

[32] Caitlin C. Wessel, et al., *Abundance and characteristics of microplastics in beach sediments: Insights into microplastic accumulation in northern Gulf of Mexico estuaries*, 109 MARINE POLLUTION BULLETIN 178–183 (2016).
[33] Chelsea M. Rochman, *Microplastics research—from sink to source*, sciencemag.org (Apr. 6, 2018), https://rochmanlab.files.wordpress.com/2018/09/rochman-2018-science.pdf.
[34] Caitlin C. Wessel, et al., *Abundance and characteristics of microplastics in beach sediments: Insights into microplastic accumulation in northern Gulf of Mexico estuaries*, 109 MARINE POLLUTION BULLETIN 178, 179 (2016).
[35] *Id.*
[36] Marcus Eriksen, et al., *Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea*, 9 PLoS ONE 1,10 (2014).
[37] Caitlin C. Wessel, et al., *Abundance and characteristics of microplastics in beach sediments: Insights into microplastic accumulation in northern Gulf of Mexico estuaries*, 109 MARINE POLLUTION BULLETIN 178, 178 (2016).
[38] *Id.*
[39] Marcus Eriksen, et al., *Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea*, 9 PLoS ONE 1,7 (2014).
[40] Caitlin C. Wessel, et al., *Abundance and characteristics of microplastics in beach sediments: Insights into microplastic accumulation in northern Gulf of Mexico estuaries*, 109 MARINE POLLUTION BULLETIN 178,178 (2016).
[41] Melissa B. Phillips & Timothy H. Bonner, *Occurrence and amount of microplastic ingested by fishes in watersheds of the Gulf of Mexico*, 100 MARINE POLLUTION BULLETIN 264, 264 (2015).
[42] *Id.*
[43] *Id.*
[44] *Id.*

Researchers have documented more than 180 animal species that ingest microplastics.[45] The synthetic nature of microplastics means they act as sponges and absorb toxins such as polychlorinated biphenyls (PCBs), and once swallowed, the negative effects on health are due to the toxic nature of the plastic itself and to other pollutants in the environment absorbed by plastic.[46] Microplastics also harm zooplankton and adhere to seaweed, fish, and eggs that marine animals eat and cause reduced growth, reproductive hinderance, and shortened lifespan.[47] Furthermore, microplastic ingestion leads to reduced predator avoidance, poor feeding ability, skin damage, and ulceration of internal layers of organs in marine vertebrates.[48] Microplastics also serve as vehicles for other pollutants and pathogens such as *Vibrio* spp, which causes food poisoning.[49]

More recently, researchers expanded their focus to include freshwater and terrestrial environments because of reports of microplastic contamination in freshwater animals, including insects, worms, clams, fish, and birds. An estimated 80% of microplastic pollution in the ocean comes from land, and rivers are one of the dominant pathways for microplastics to reach the oceans.[50] Additionally, the presence of plastic debris in the marine and freshwater environments have economic repercussions for tourism and industry.[51] On average, humans consume an estimated 70,000 and 121,000 particles per year, with rates rising up to 100,000 more for those who drink only bottled water.[52]

According to the World Economic Forum, global production of plastics grew from 1.7 million tons in the 1940s to 311 million tons by 2014. This amount will double again in the next 20 years.[53] By 2025, the ocean is expected to contain one ton of plastic for every three tons of fish and more plastics than fish by weight in 2050.[54]

---

[45] Jim Waymer, *Microplastics plague the lagoon*, FLORIDA TODAY (May 26, 2017, 5:22 PM) https://www.floridatoday.com/story/news/local/environment/2017/05/26/microplastics-plague-lagoon/349106001/.
[46] Melissa B. Phillips & Timothy H. Bonner, *Occurrence and amount of microplastic ingested by fishes in watersheds of the Gulf of Mexico*, 100 MARINE POLLUTION BULLETIN 264, 264 (2015).
[47] *Id.*
[48] Maia McGuire, et al, *Contaminants in the Urban Environment: Microplastics*, UF/IFAS EXTENSION 1.3 (Nov. 2015). https://edis.ifas.ufl.edu/pdffiles/SS/SS64900.pdf.
[49] John Meeker, *We are guinea pigs in a worldwide experiment on microplastics*, THE CONVERSATION (Aug. 14, 2018, 6.30 AM), http://theconversation.com/we-are-guinea-pigs-in-a-worldwide-experiment-on-microplastics-97514.
[50] Chelsea M. Rochman, *Microplastics research—from sink to source*, sciencemag.org (Apr. 6, 2018), https://rochmanlab.files.wordpress.com/2018/09/rochman-2018-science.pdf.
[51] Xubiao Yu, et. al., *Occurrence and distribution of microplastics at selected coastal sites along the southeastern United States*, 613–614 SCIENCE OF THE TOTAL ENVIRONMENT 298,299 (2018).
[52] Kieran D. Cox, et al., *Human Consumption of Microplastics*, 53 ENVIRON. SCI. TECHNOL.7068-7074 (Jun. 2019).
[53]Jim Waymer, *Microplastics plague the lagoon*, FLORIDA TODAY (May 26, 2017, 5:22 PM) https://www.floridatoday.com/story/news/local/environment/2017/05/26/microplastics-plague-lagoon/349106001/.
[54] Ellen MacArthur Foundation, *The New Plastics Economy: Rethinking the future of plastics*, 1,120 (2016), https://www.ellenmacarthurfoundation.org/assets/downloads/EllenMacArthurFoundation_TheNewPlasticsEconomy_Pages.pdf.

IV. Microplastics in the Southeastern Coastal Region and the Gulf of Mexico

Research by Xubiao Yu, et. al (2018) shows that microplastic abundance in the Southeastern United States is highly variable.[55] The study investigated the occurrence and distribution of microplastics in the southeastern coastal region by taking sand samples from eighteen National Park Service sites and isolating microplastics from the samples.[56] Despite protection from a variety of anthropogenic activities, National Park Service sites face many of the same issues as other coastal sites from marine debris.[57] Additionally, these sites ranged widely in distance from urbanized areas, which made them ideal to gain an understanding of the large scale distribution of microplastics while providing information about potential input of microplastics into their habitats.[58] Comparison of microplastic counts among sites and local geography gave rise to inferences about sources and modes of distribution.[59] In general, current defined the distribution of microplastics and how they moved and remained within a region. For example, microplastic from the cities in Texas and Louisiana remain in the Gulf of Mexico due to regional current. On the other hand, microplastics from Atlantic coastal cities such as east of Florida and South Carolina followed the Gulf Stream north.[60]

A study by Wessel et. al. (2016) examined the abundance, distribution, and composition of microplastics in Mobile Bay, Alabama to note the distribution and accumulation of microplastics along estuarine coastlines.[61] Researchers in this study samples from eighty-four quadrats across seven different shorelines.[62] Microplastics were prevalent throughout the bay and in all eight-four quadrats.[63] This was consistent with results that display how microplastics accumulate on shorelines at higher concentrations than in open waters.[64] If a location is directly exposed to marine current and tidal flow, it is likely to have a larger concentration of microplastic abundance and diversity in relation to locations that are less marine-influenced.[65] The Gulf of Mexico is vast, which "may allow for sustained degradation time and development of large pools of microplastics."[66] The results of this study show that a major determinant of microplastic

[55] Xubiao Yu, et. al., *Occurrence and distribution of microplastics at selected coastal sites. along the southeastern United States*, 613–614 SCIENCE OF THE TOTAL ENVIRONMENT 298, 298 (2018).
[56] *Id.*
[57] *Id.* at 299.
[58] *Id.*
[59] *Id.* at 298.
[60] Xubiao Yu, et. al., *Occurrence and distribution of microplastics at selected coastal sites. along the southeastern United States*, 613–614 SCIENCE OF THE TOTAL ENVIRONMENT 298, 304-305 (2018).
[61] Caitlin C. Wessel, et al., *Abundance and characteristics of microplastics in beach sediments: Insights into microplastic accumulation in northern Gulf of Mexico estuaries*, 109 MARINE POLLUTION BULLETIN 178, 179 (2016).
[62] *Id.*
[63] *Id.*
[64] *Id.* at 180-81.
[65] *Id.*
[66] *Id.* at 182.

accumulation along estuarine coastlines is current and tide.[67] Leeward areas with strong tidal influence then become critical and damaging for organisms.[68]

A different study by Phillips and Bonner (2015) focused on the occurrence of microplastic ingestion in the Gulf of Mexico.[69] The scientists in this study compared occurrence of microplastic ingestion by fish by percentage and by environment, such as ingestion among freshwater and marine fishes, between non-urbanized and urbanized streams, and among trophic guilds.[70]

Between freshwater and marine fishes, the study area was in the low range compared to other reports with an eight percent occurrence in freshwater fish and a ten percent occurrence in marine fish.[71] There was a five percent occurrence of microplastics ingested by fishes in nonurbanized streams, which was less than that of one urbanized stream.[72] Estimates within urbanized streams were seven to twenty-nine percent relative to the amount available in the environment.[73] In comparison of benthic and pelagic guilds, nineteen percent of fishes in benthic habitats ingested microplastics while only eight percent ingested microplastics in pelagic habitats.[74]

The sizes of the microplastics in the study bore similarity with those reported as the most abundant in the environment and in the stomach contents of fish at 5.5mm.[75] These results supported the hypothesis that land-based and water-based sources of plastics are entering and affecting freshwater and marine systems in the Gulf of Mexico.[76]

V. Microplastic Pollution in Florida

Plastic pollution has had persistent, negative effects in Florida's waters. For years, necropsies of dead baby sea turtles that wash up dead on Space Coast beaches show plastic in their stomachs, some with almost nothing but plastic.[77] In fact, results from study by Beckwith and Fuentes (2018) with the Loggerhead Recovery Unit in Florida showed microplastic exposure all of the

---

[67] *Id.*
[68] Caitlin C. Wessel, et al., *Abundance and characteristics of microplastics in beach sediments: Insights into microplastic accumulation in northern Gulf of Mexico estuaries*, 109 MARINE POLLUTION BULLETIN 178–183 (2016).
[69] Melissa B. Phillips & Timothy H. Bonner, *Occurrence and amount of microplastic ingested by fishes in watersheds of the Gulf of Mexico*, 100 MARINE POLLUTION BULLETIN 264,264 (2015).
[70] *Id.*
[71] *Id.*
[72] *Id.*
[73] *Id.*at 267.
[74] Melissa B. Phillips & Timothy H. Bonner, *Occurrence and amount of microplastic ingested by fishes in watersheds of the Gulf of Mexico*, 100 MARINE POLLUTION BULLETIN 264,264 (2015).
[75] *Id.* at 267.
[76] *Id.*at 268.
[77] Jim Waymer, *Microplastics plague the lagoon*, FLORIDA TODAY (May 26, 2017, 5:22 PM) https://www.floridatoday.com/story/news/local/environment/2017/05/26/microplastics-plague-lagoon/349106001/; *see also* Wilcox, C. et al. 2018. A quantitative analysis linking sea turtle mortality and plastic debris ingestion. Scientific Reports 8:12536.

ten "most important marine turtle nesting sites for the Northern Gulf of Mexico."[78] This was the first study to investigate microplastic concentrations at marine turtle nesting sites, and most of the samples of these small particles were in dunes where loggerheads nest.[79] The results of the study found a higher prevalence of microplastics abundance along the Florida coast compared to Wessel's study in Mobile Bay.[80] Additionally, concentrations of microplastic per nesting site, decreased from west to east sites. [81]This concurs with previous studies that sites in proximity to the loop current in the Gulf, such as the western sites, have higher probabilities of microplastic occurrence and abundance.[82] Another potential cause for the difference between eastern and western sites is the fact that nearshore currents in the Gulf of Mexico flow from east to west; therefore, the debris moves more readily toward the western sites.[83]

A citizen-lead initiative in Florida to address the recognized issues and harms surrounding microplastics, called the Florida Microplastic Awareness Project (FMAP) is funded by an outreach and education grant from National Oceanic and Atmospheric Administration's (NOAA) Marine Debris Program in 2015,[84] where Florida Sea Grant trained fifteen partners around the state as regional coordinators and educated them on "water sampling protocols, methods for analyzing water samples for microplastics, and isolating microplastics from personal care products."[85] These regional coordinators used their training to instruct and work with citizen science volunteers in coastal communities to collect and analyze monthly samples.[86] These citizen volunteers in twenty different locations collected data for four months to display the amounts of microplastics in various locations along Florida's coastline by recording the data on an online reporting form.[87] Florida Sea Grant created a map from this data, and the information from this Project continues to educate Floridians about the prevalence of microplastics in Florida waters.[88] An important goal of the Project is to increase public awareness plastics in local waterways and their connection to anthropogenic sources.[89]

In another survey at 352 locations around the state, 90% of the samples contained at least some plastic, with microfibers being the most common.[90]

---

[78] Valencia K. Beckwith & Mariana M.P.B. Fuentes, *Microplastic at nesting grounds used by the northern Gulf of Mexico loggerhead recovery unit*, 131 MARINE POLLUTION BULLETIN 32, 35 (2018).
[79] *Id.*
[80] *Id.*
[81] *Id.*
[82] *Id.*
[83] *Id.*
[84] OR&R's Marine Debris Program, *Citizen Scientists Research and Prevent Microplastics in Florida*, NOAA, (Nov.. 18, 2019, 1:55 PM) https://marinedebris.noaa.gov/prevention/citizen-scientists-research-and-prevent-microplastics-florida.
[85] UF/IFAS Extension, *Are You Plastic Aware? Florida Microplastic Awareness Project***,** (May, 28 2019, 4:27 EDT), http://sfyl.ifas.ufl.edu/flagler/marine-and-coastal/microplastics/.
[86] *Id.*
[87] *Id.*
[88] *Id.*
[89] Tampa Bay Estuary Program, *CHARTING THE COURSE: THE COMPREHENSIVE CONSERVATION AND MANAGEMENT PLAN FOR TAMPA*, 1, 53 (Aug. 2017).
[90] Florida Sea Grant 2017.

VI. Water Bodies to List as Impaired for Microplastic Contamination

Both Tampa Bay and the Indian River Lagoon suffer microplastic pollution. And since both are Class II waterbodies, DEP should review whether microplastics are impairing them. Fish and shellfish consume and respirate microplastics which then bioaccumulate and pose concern for human health.[91] Microplastic contamination in Florida shellfish has been documented,[92] and while the science on the impacts to wildlife and humans is emerging,[93] DEP should proactively work to protect Florida's waters from microplastic pollution.

1. Tampa Bay

Tampa Bay is Florida's largest open-water estuary.[94] Major tributaries of Tampa Bay include the Hillsborough River, which provides drinking water for the City of Tampa and surrounding areas, the Alafia River, the Little Manatee River, and the Manatee River.[95] Tampa Bay has a 400 square mile span, and drains nearly 2,400 square miles with its tributaries.[96] It is a highly urbanized watershed that supports one of the most active shipping ports in the United States.[97] Tampa Bay and surrounding barrier islands attract nearly 5 million visitors each year.[98] Tourists and residents visit because of clean beaches and recreational activities such as fishing, boating, kayaking and wildlife watching.[99] Forty thousand wading and shorebirds call Tampa Bay home

---

[91] Smith, M. 2018. Microplastics in Seafood and the Implications for Human Health. Curr. Environ. Health Rep. 2018, 5(3); Baechler, B. et al. 2019. Microplastic occurrence and effects in commercially harvested North American finfish and shellfish: Current knowledge and future direction. Limnology and Oceanography Letters/Early View; Moos, Nadia et al. 2012. Uptake and Effect of Microplastics on Cells and Tissue of the Blue Mussel *Mytilus edulis* L. after an Experimental Exposure. Environmental Science & Technology; Davidson, K. and S. Dudas. 2016. Microplastic Ingestion by wild and culturued manila clams from Baynes Sound, BC, Archives of Environmental Contamination and Toxicology, Vol. 71, Iss. 2.

[92] Watts, A. et al. 2014. Uptake and Retention of Microplastics by the Shore Crab *Carcinus maenas. Environmental Science and Technology*; Waite, H. et al. 2018. Quantity and types of microplastics in the organic tissues of the eastern oyster *Crassostrea virginica* and Atlantic mud crab *Panopeus herbstii* from a Florida estuary. Marine Pollution Bulletin Vol. 129, Iss. 1.

[93] Chua, E. et al. 2014. Assimilation of Polybrominated Diphenyl Ethers from Microplastics by the Marine Amphipod, *Allorchestes Compressa*. Environmental Science & Technology; Dehaur, A. 2016. Microplastics in seafood: Benchmark protocol for their extraction and characterization. Environmental Pollution. Vol. 215.; Naji, A. et al. 2018. Microplastics contamination in molluscs from the northern part of the Persian Gulf. Environmental Pollution. Vol. 235; Kazmiruk, T.N. et al. 2018. Abundance and distribution of microplastics within sediments of a key shellfish growing region of Canada, PLOS One; Setala, O et al. 2014. Ingestion and transfer of microplastics in the planktonic food web. Environmental Pollution. Vol. 185; Li, J. et al. 2015. Microplastics in commercial bivalves from China. Environmental Pollution. Vol. 207; Van Cauwenberghe, L. and C. Janssen. 2014. Microplastics in bivalves cultured for human consumption. Environmental Pollution. Vol. 193; Cluzard, M. et al. 2015. Intertidal concentrations of microplastics and their influence on ammonium cycling as related to the shellfish industry. Archives of Environmental Contamination and Toxicology. Vol. 69, Iss. 3.

[94] Tampa Bay Waterkeeper, Our Water, (2017), http://tampabaywaterkeeper.org/our-water/.

[95] *Id.*

[96] *Id.*

[97] Kinsley McEachern, et. al. *Microplastics in Tampa Bay, Florida: Abundance and variability in estuarine waters and sediments,* 148 MARINE POLLUTION BULLETIN, 97, 98 (2019).

[98] Tampa Bay Waterkeeper, Our Water, (2017), http://tampabaywaterkeeper.org/our-water/.

[99] *Id.*

along with one-sixth of the Gulf Coast population of Florida manatees and more than 200 species of fish.[100]

To this end, the Tampa Bay Estuary Program (TBEP) recognizes that microplastics are an "emerging contaminant of concern" in Tampa Bay with fibers that come from washing synthetic textiles as the most common type.[101] Preliminary research partially supported by a TBEP Bay Mini-Grant on the occurrence of microplastics in Tampa Bay displays an abundance of microfibers relative to microbeads.[102] The greatest accumulation occurs in Middle Tampa Bay with lower abundances at the mouth.[103] Microplastics were more abundant in filtered water samples than those collected in plankton nets, but there are no standardized methods for the collection, identification, and quantification of microplastics.[104] TBEP noted in this 2017 publication that more information is needed "to better understand how microplastics enter waterways, how they are distributed and what impacts they may have on aquatic organisms."[105]

A new study from McEachern, et. al (2019) presents new estimates from the University of South Florida St. Petersburg and Eckerd College that the waters of Tampa Bay contain four billion particles of microplastics.[106] This information raises new questions about the impact of pollution on marine life in this vital ecosystem.[107] The objective was to present the first reliable estimates of microplastics in Tampa Bay, including variations in microplastic values between the water column and surface sediments.[108] Like the study described by the TBEP, the predominant type of microplastic found were thread-like fibers generated from fishing lines, nets and washing clothes. The next largest source was macroplastic fragmentation, or the breakdown of larger plastics.[109] The results of this study demonstrates that microplastic accumulation in Tampa Bay is abundant and widespread.[110] On average, Tampa Bay sediment samples contained 290 microplastic particles/kg or 130 particles per pound of dry sediment.[111] The highest concentrations of microplastic found by this study close to industry and at the mouth of a major river.[112]

---

[100] *Id.*
[101] Tampa Bay Estuary Program, *CHARTING THE COURSE: THE COMPREHENSIVE CONSERVATION AND MANAGEMENT PLAN FOR TAMPA*, 1, 53 (Aug. 2017).
[102] *Id.*
[103] *Id.*
[104] *Id.*
[105] *Id.*
[106] Kinsley McEachern, et. al. *Microplastics in Tampa Bay, Florida: Abundance and variability in estuarine waters and sediments,* 148 MARINE POLLUTION BULLETIN, 97, 97 (2019).
[107] University of South Florida (USF Innovation), *Four billion particles of microplastics discovered in major body of Water,* SCIENCEDAILY (Sept. 12, 2019), https://www.sciencedaily.com/releases/2019/09/190912111819.htm.
[108] Kinsley McEachern, et. al., *Microplastics in Tampa Bay, Florida: Abundance and variability in estuarine waters and sediments,*148 MARINE POLLUTION BULLETIN, 97,98 (2019).
[109] University of South Florida (USF Innovation), *Four billion particles of microplastics discovered in major body of Water,* SCIENCEDAILY (Sept. 12, 2019), https://www.sciencedaily.com/releases/2019/09/190912111819.htm.
[110] Kinsley McEachern, et. al. *Microplastics in Tampa Bay, Florida: Abundance and variability in estuarine waters and sediments,* 148 MARINE POLLUTION BULLETIN 97,104 (2019).
[111] *Id.*
[112] *Id.*

This study affirms that that there is microplastic contamination in Tampa Bay, and the sediment values presented remain substantially higher than other coastal and estuarine environments.[113] The researchers hope that these findings provide necessary data to inform the debate around policies needed to reduce plastic contamination.[114]

2. Indian River Lagoon

In 2018, volunteers with FMAP discovered microplastics in sixteen of its eighteen sampling sites on the Treasure Coast.[115] One site contained forty-six pieces of plastic and two plastic fibers in a one-liter jar of water.[116] Mosquito Lagoon, part of the Indian River Lagoon system, contained microplastic fibers, fragments, and plastic beads.[117] Water samples from this area averaged fifteen to thirty-three microplastic pieces per liter with fiber as the most common type of microplastic and beads the least common.[118] Of those fibers, almost three-quarters were dark blue.[119] This suggests the source of the microplastic is from boat ropes and/or clothing fibers.[120] Out of the fragments found, about eighty-eight percent were clear.[121] The hypothesis here is that the clear fragments come from the degradation of water bottles, packaging, and other types of containers.[122] In comparison to other estuaries worldwide, microplastic density in Mosquito Lagoon is high.[123] This higher concentration might be because there are few openings in the Lagoon to the ocean for tides to flush out pollution.[124]

VII. Conclusion

The Center for Biological Diversity urges the DEP to recognize microplastics as a form of pollution in the impaired water bodies described in this letter. The DEP must consider all readily available data on the impacts of microplastics on the State of Florida's waters for CWA 303(d) water quality assessment standards and consider attainment status for relevant Florida waters. Additionally, due to the unique properties of microplastics, DEP should adopt a water quality criterion particular to microplastics. Finally, we urge the state to improve its own monitoring program so that it can detect microplastics-related water quality problems.

---

[113] *Id.*
[114] University of South Florida (USF Innovation), *Four billion particles of microplastics discovered in major body of Water,* SCIENCEDAILY (Sept. 12, 2019), https://www.sciencedaily.com/releases/2019/09/190912111819.htm.
[115] Tyler Treadway, *Microplastics: From your clothes to the Indian River Lagoon to your fish dinner*, TCPALM. (May 5, 2018, 9:22 AM), https://www.tcpalm.com/story/news/local/indian-river-lagoon/health/2018/05/05/microplastics-your-clothes-indian-river-lagoon-your-fish-dinner/389689002/.
[116] *Id.*
[117] Jim Waymer, *Microplastics plague the lagoon*, FLORIDA TODAY (May 26, 2017, 5:22 PM) https://www.floridatoday.com/story/news/local/environment/2017/05/26/microplastics-plague-lagoon/349106001/.
[118] *Id.*
[119] *Id.*
[120] *Id.*
[121] *Id.*
[122] Jim Waymer, *Microplastics plague the lagoon*, FLORIDA TODAY (May 26, 2017, 5:22 PM) https://www.floridatoday.com/story/news/local/environment/2017/05/26/microplastics-plague-lagoon/349106001/.
[123] *Id.*
[124] *Id.*

Please do not hesitate to contact Jalyn Lopez at jlopez@biologicaldiversity.org or 727-490-9190 with any questions or concerns about this letter. We have enclosed a cd of the works cited in this comment letter.

Respectfully,

Spring A. Gaines
Law Clerk
Center for Biological Diversity