



Florida Stormwater Challenges

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- BS Business Management
- In Stormwater (retention / detention and water quality)(2000)
- 2017 -Hydro International (just water quality)
- Member of FSA and on the education Committee
- Working on CPSWQ (in training)



A photograph showing a concrete curb on the right side of a road. A metal stormwater drain grate is visible in the foreground, with water flowing over it. The water is white and turbulent as it moves down the drain. The background is a blurred view of a road and some greenery.

Florida Stormwater Challenges

Why Remove Pollutants from Stormwater?

Failure to remove pollutants can result in impaired waterways which, can affect aquatic ecosystems, health issues and create an eyesore.



Trash



Oil



Nutrients



Sediment



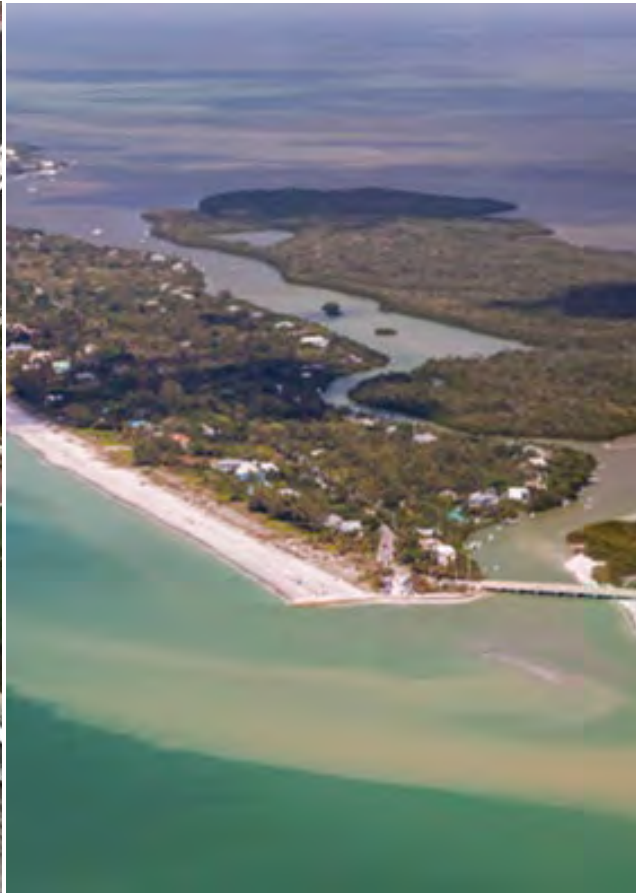


Sediment AKA TSS

Sediment Pollution in Florida



Fort Lauderdale River



Shore of Captiva (left) and
Sanibel Island



Panama City



Haulover Canal in the
northern Indian river lagoon

Should we worry about TSS

- Sediment pollution is **the single most common source of pollution in U.S. waters**. Approximately 30% is caused by natural erosion, and the remaining 70% is caused by human activity. Construction activity is the most common source of sediment pollution.
- Over \$16 Billion on environmental damages annually stated by EPA
- Both inorganic and organic



Impact of Stormwater - Sedimentation

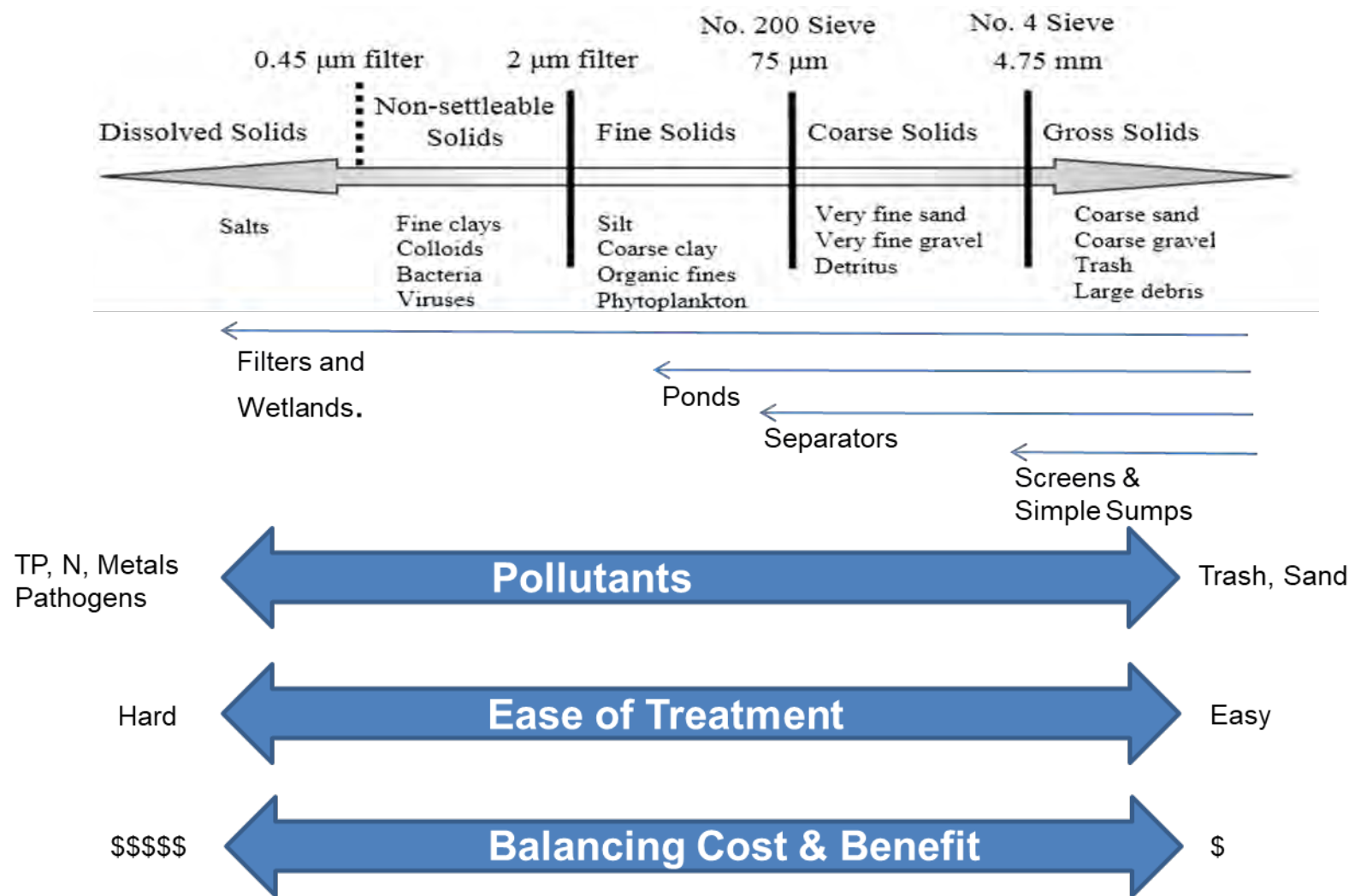
- Aquatic insects, fish and other wildlife
- Clouds water so animals cannot see food sources
- Block light and affect growth of aquatic plants.
- Settles at the bottom of the stream – disturbing aquatic insects
- Smother insect larvae and fish eggs
- Clogs fish gills

In Addition

- It fills up the stream or pond
- Can alter the flow and reduce the depth



Pollutants



Practical Limits of Design for Settling

**Effects of Decreasing Size
of Spheres on Settling**

Diameter of Particle		Order of Size	Time required to Settle (SG=2.65)	Time required to Settle (SG=1.2)
mm	microns			
10	10,000	Gravel	0.4 sec	1.2 sec
1	1,000	Coarse Sand	3.0 sec	9 sec
0.1	100	Fine Sand	34 sec	5 min
0.01	10	Silt	56 mins	8 hours
0.001	1	Bacteria	4 days	32 days
0.0001	0.1	Colloidal	1 year	9 years
0.00001	0.01	Colloidal	>50 years	>50 years
0.000001	0.001	Colloidal	>50 years	>50 years

Separators

>50 μm

<50 μm

Filters

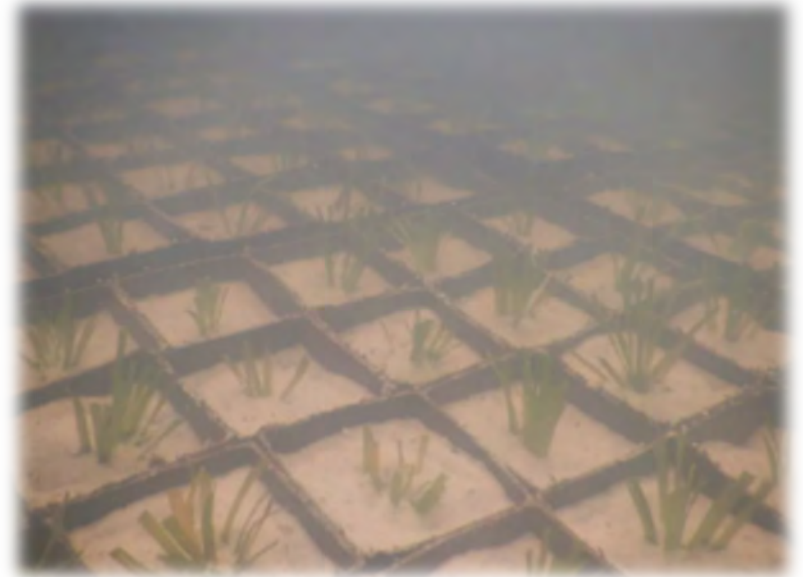
Environment

Water Quality: Gov. Ron DeSantis is asking for nearly \$1 billion to restore Florida's Everglades system and improve the quality of the state's water bodies. The bulk of that money would go toward ongoing efforts to restore the Everglades. Some \$195 million would be targeted for water quality improvement projects across the state, another \$35 million would be spent on more general water quality improvement efforts and help mitigate the effects of toxic algae blooms and red tide clean up, both of which have plagued the state in recent years.

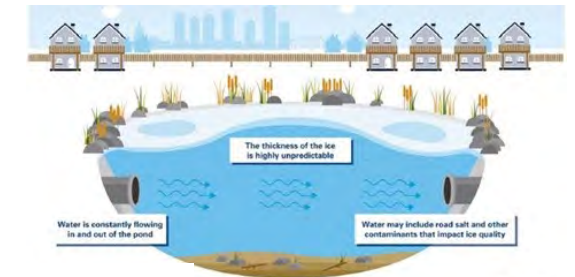
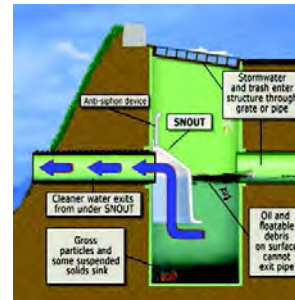
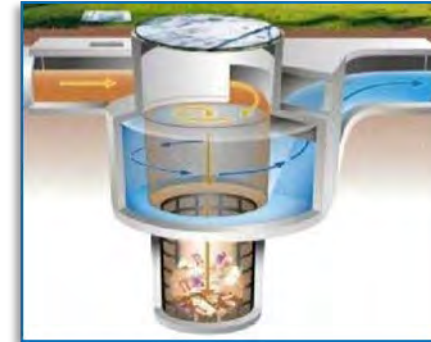
Manatees: More than 1,000 of Florida's gentle, aquatic mammals have died this year mostly because of starvation, making 2022 the deadliest year on record for sea cows. Most of those deaths have been recorded in the Indian River Lagoon, where the Washington Post reports, "96 percent of 77,000 acres of seagrass have disappeared." The Florida Fish and Wildlife Conservation is asking for nearly \$4 million to aid the manatees; Florida Agriculture Nikki Fried has asked the U.S. Fish and Wildlife Service to re-classify the species as "endangered," and there's an effort in Congress to fast-track that listing. Federal and state wildlife officials have launched a manatee feeding program.

Florida Gov. Ron DeSantis committed \$53 million in grants to improve the lagoon's water quality.

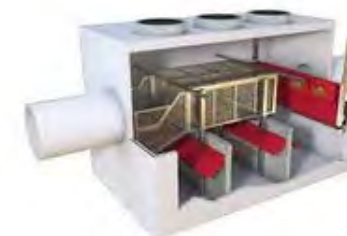
Hydro
International 



Options to help capture TSS



Source: EPCOR





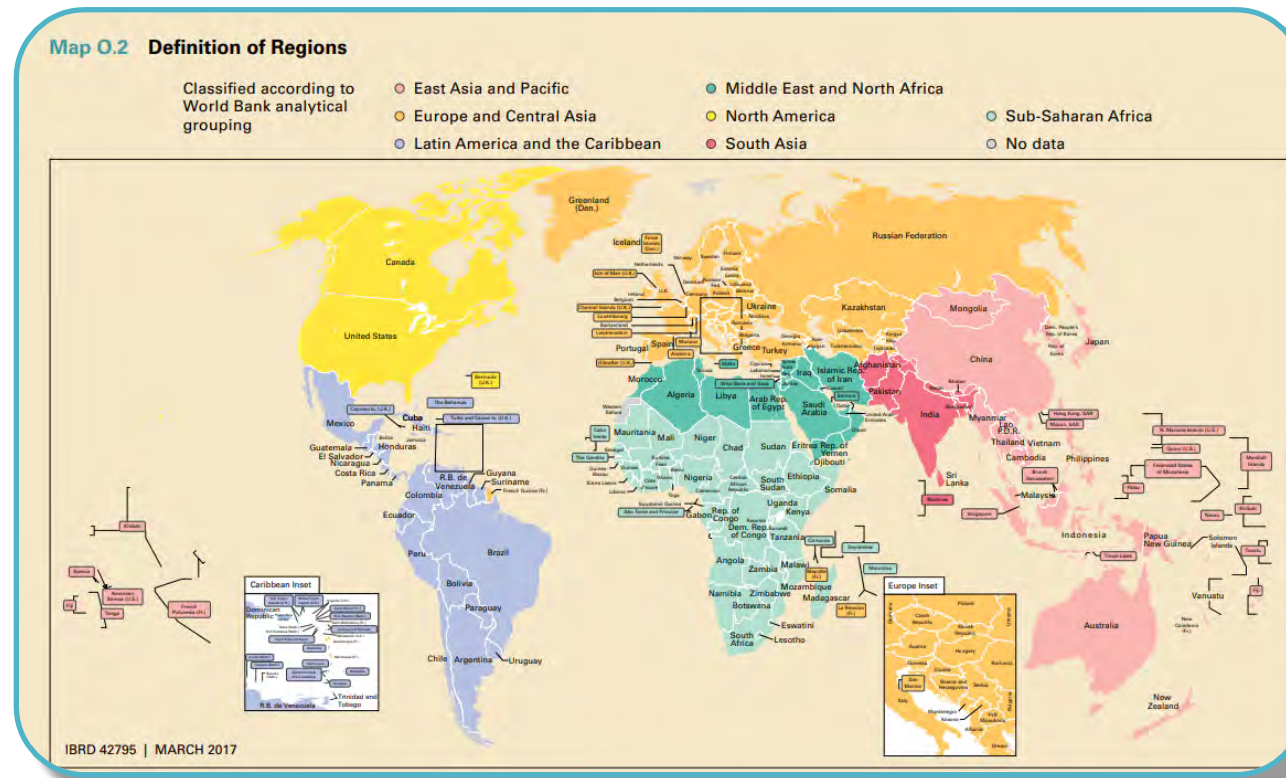
Talking Trash



Municipal Solid Waste (MSW) Production

(Residential, Commercial, & Institutional)

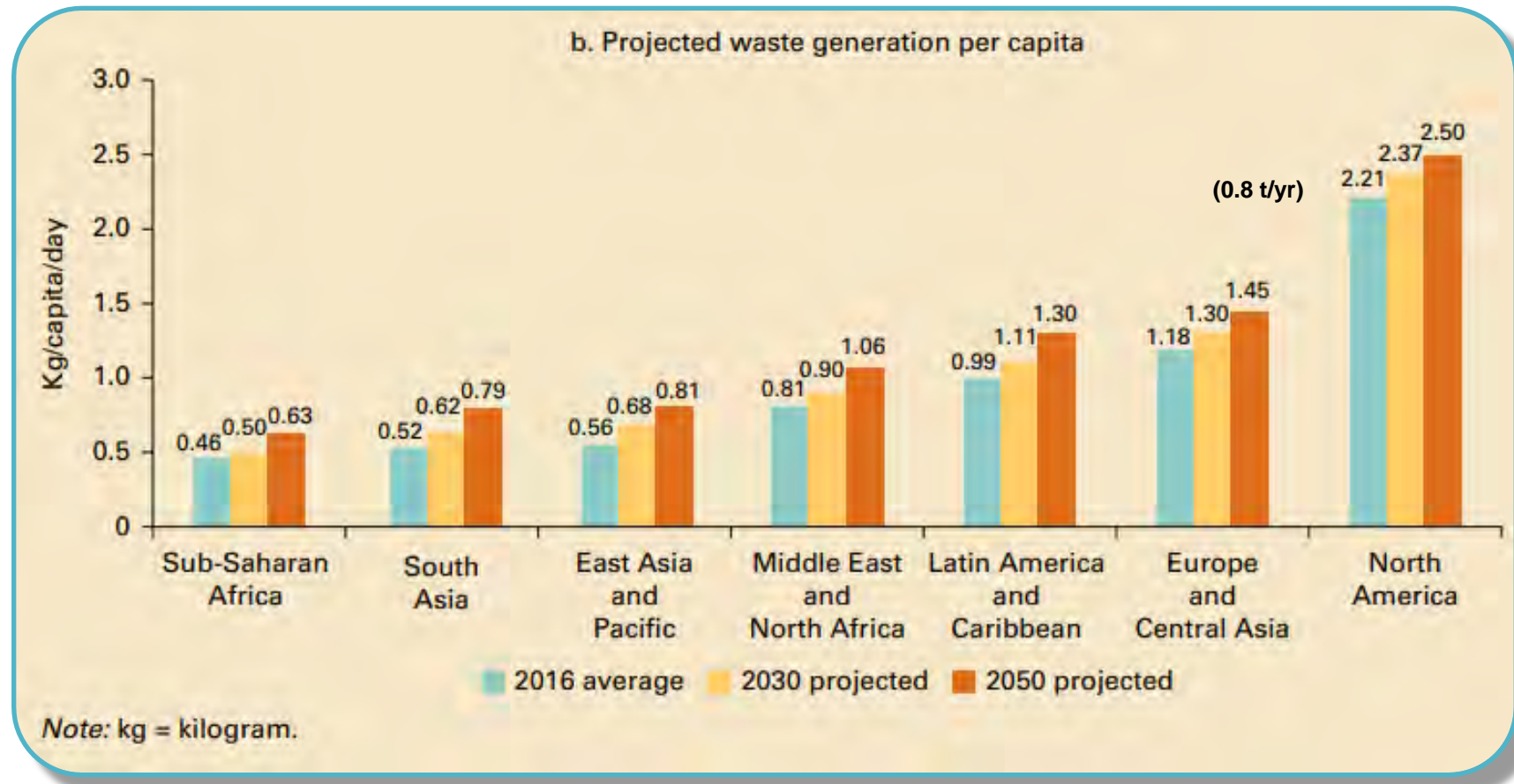
- What region produces the most MSW?
 - Middle East and North Africa
 - Latin America and Caribbean
 - North America
 - East Asia and Pacific



MSW By Region



MSW Per Capita

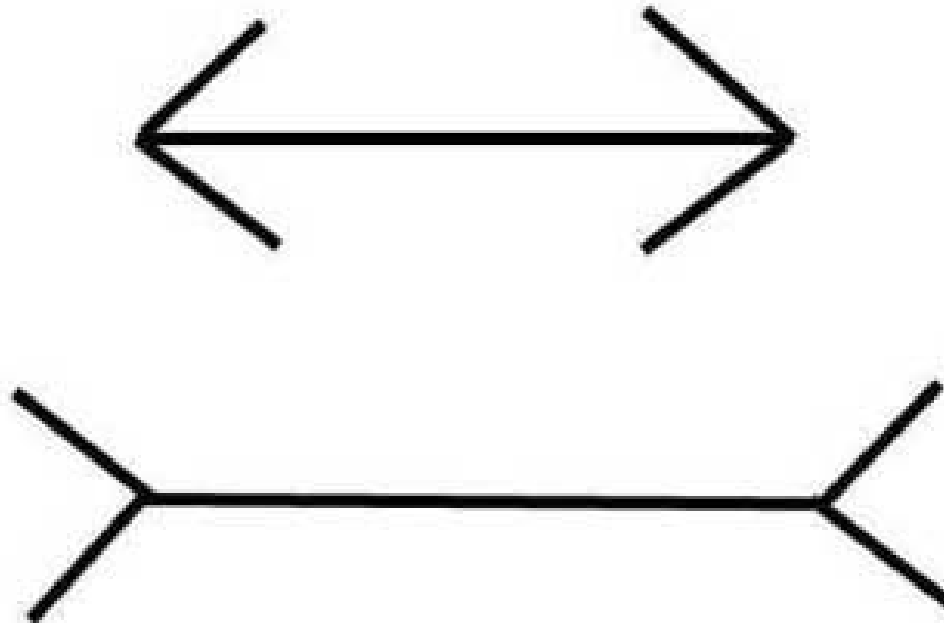


Municipal Solid Waste (MSW)

2010 - 2020

Country	Income	Population	MSW Tons	Tons/Capita/yr	Rank
Virgin Islands (U.S.)	HIC	105784	146500	1.38	1
Bermuda	HIC	64798	82000	1.27	2
Faroe Islands	HIC	48842	61000	1.25	3
Monaco	HIC	37783	46000	1.22	4
Puerto Rico	HIC	3473181	4170953	1.20	5
Moldova	LMC	3554108	3981200	1.12	6
Channel Islands	HIC	164541	178933	1.09	7
British Virgin Islands	HIC	20645	21099.19	1.02	8
Cayman Islands	HIC	59172	60000	1.01	9
Mongolia	LMC	3027398	2900000	0.96	10
Liechtenstein	HIC	36545	32382	0.89	11
Guam	HIC	159973	141500	0.88	12
Greenland	HIC	56905	50000	0.88	13
Aruba	HIC	103187	88132.0167	0.85	14
Denmark	HIC	5818553	4910858.5	0.84	15
United States	HIC	326687488	265224528	0.81	16
Luxembourg	HIC	619896	490337.75	0.79	17
Hong Kong SAR, China	HIC	7305700	5679816.465	0.78	18
Norway	HIC	5347896	4149967.25	0.78	19
New Zealand	HIC	4692700	3405000	0.73	20
China	UMC	1400050048	395081376	0.28	118
Lesotho	LMC	1965662	73457	0.04	215

Optical Illusions



What's the Problem with Trash?

- Degrades habitats
- Poses health threats
- Economically harmful
 - Costs coastal/eco tourism \$Millions
 - Shoreline communities spend \$Millions in clean-up and prevention costs



On a hike 2 miles in KY



- 12% of all MSW is plastic (2016 data)
 - London Marathon (2018) – 919,000 plastic bottles
 - Boston Marathon (2016) – 62,000 plastic bottles
- The US has the safest fresh water supplies in the world yet consumes more bottled water per capita than anywhere else.

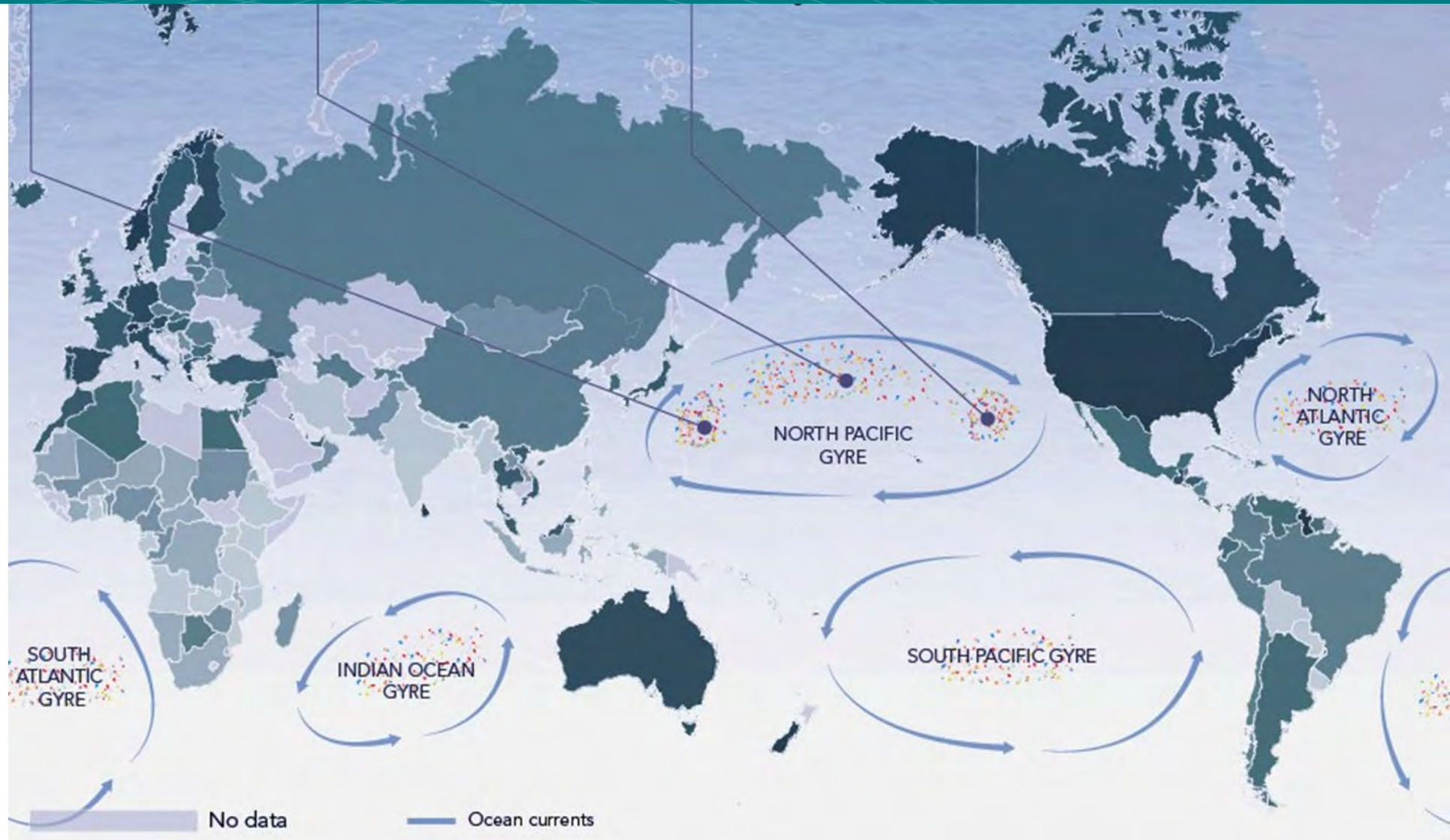


Plastic has no TMDL Limit



- The amount of “trash” that can be safely assimilated into an aquatic environment is ZERO
 - “0 Trash” TMDLs in Los Angeles, San Francisco, Baltimore

By 2050 there will be more plastic than fish



Aquatic Wildlife



Trash Pollutants



PALM BEACH COUNTY SHERIFF'S OFFICE

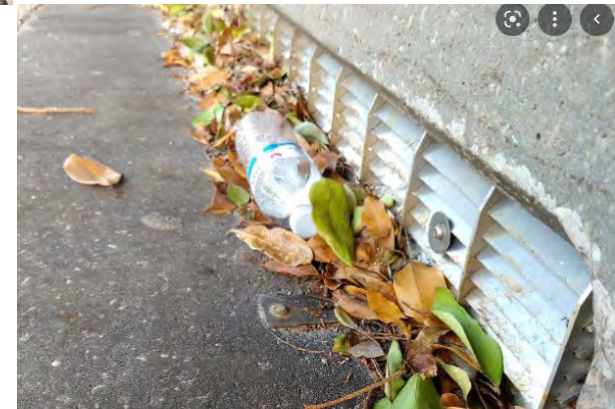
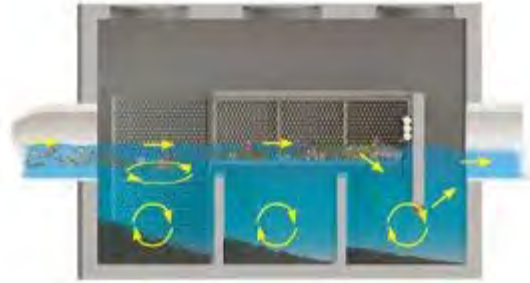
CORONA VIRUS

LET'S KEEP OUR COUNTY CLEAN

Solution : Capture More Trash

Prevent more trash on land from getting into water where it's more difficult to remove:

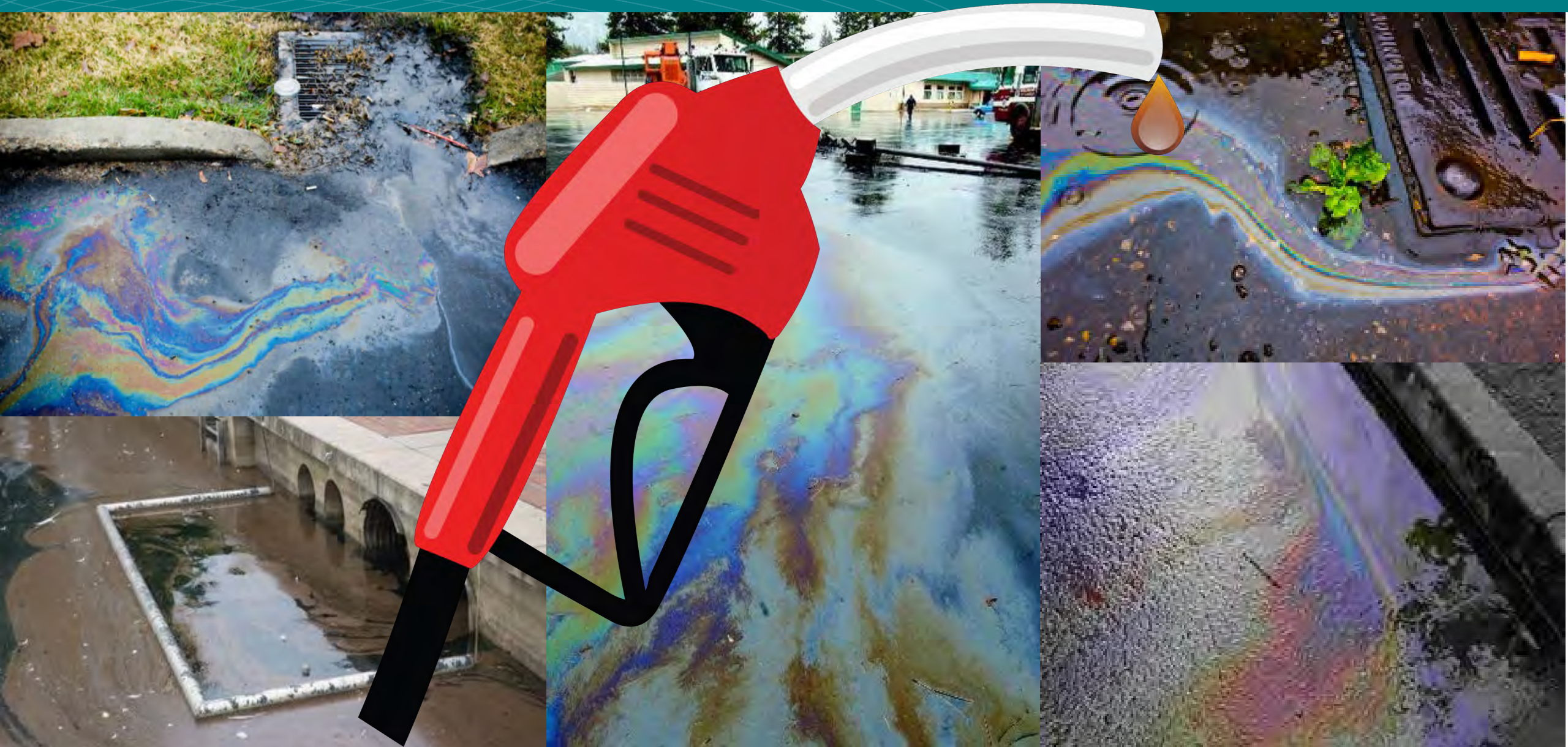
- Enact stormwater trash TMDLs
- Make maintenance part of the permitting process





Hydrocarbons

Hydrocarbon Pollutants



Where is it coming from

- Dripping lawn mowers
- Washing your car in your driveway
- Gas Stations
- Improper disposal
- Streets, gutters, neighborhoods, industrial sites , parking lots and construction site

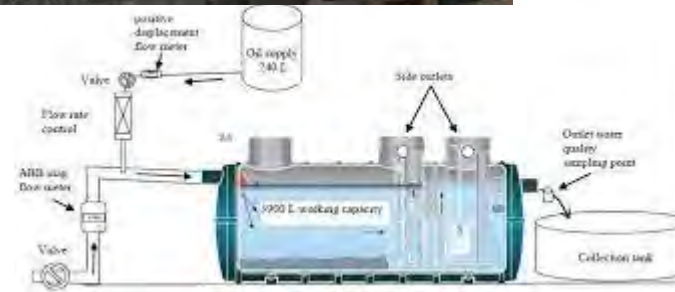
Facts

- One oil change can pollute up to one million gallon of fresh water
- EPA estimates that American households dump 193 Million gallons of use oil ever year that is almost equivalent to 17 Exxon Valdez oil spills
- Stormwater is untreated and flows directly to a lake, river, or the ocean.
- It is Toxic to the environment, wildlife and humans
- There is nothing good about it in Stormwater
- And I think we all have experience Florida ICE

<https://www3.epa.gov/region9/water/npdes/stormwater-feature.html>



Capture that Oil





Nutrient Pollution Tp & Tn