

Microplastics in NJ Urban Waters

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Fate & Transport Panel

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Keyport Harbor – Raritan Bay



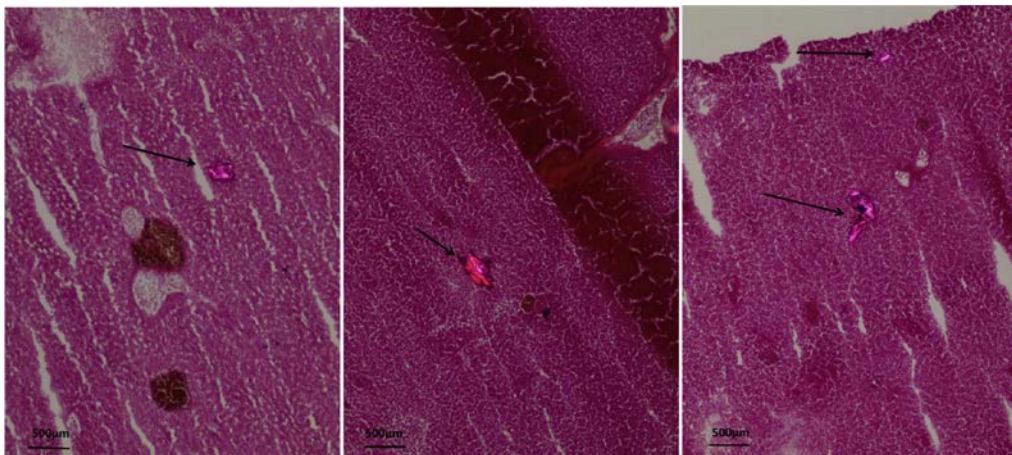


Photo Avio et al. 2015. Marine Environmental Research – Mullet liver

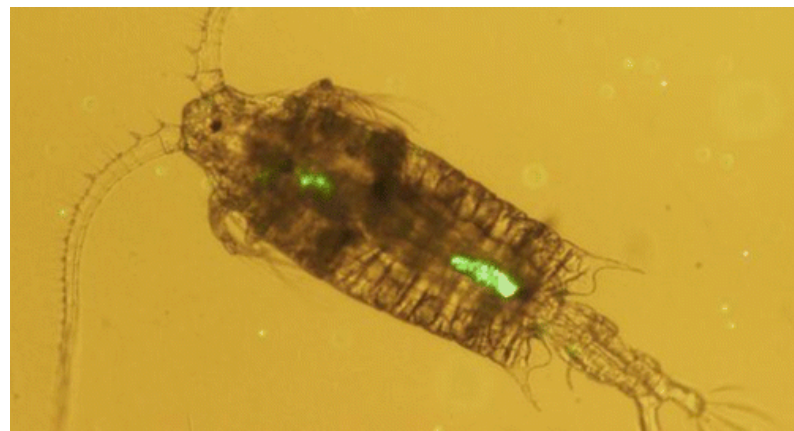


Photo Cole et al. 2015. Environmental Science & Technology - Crustacean

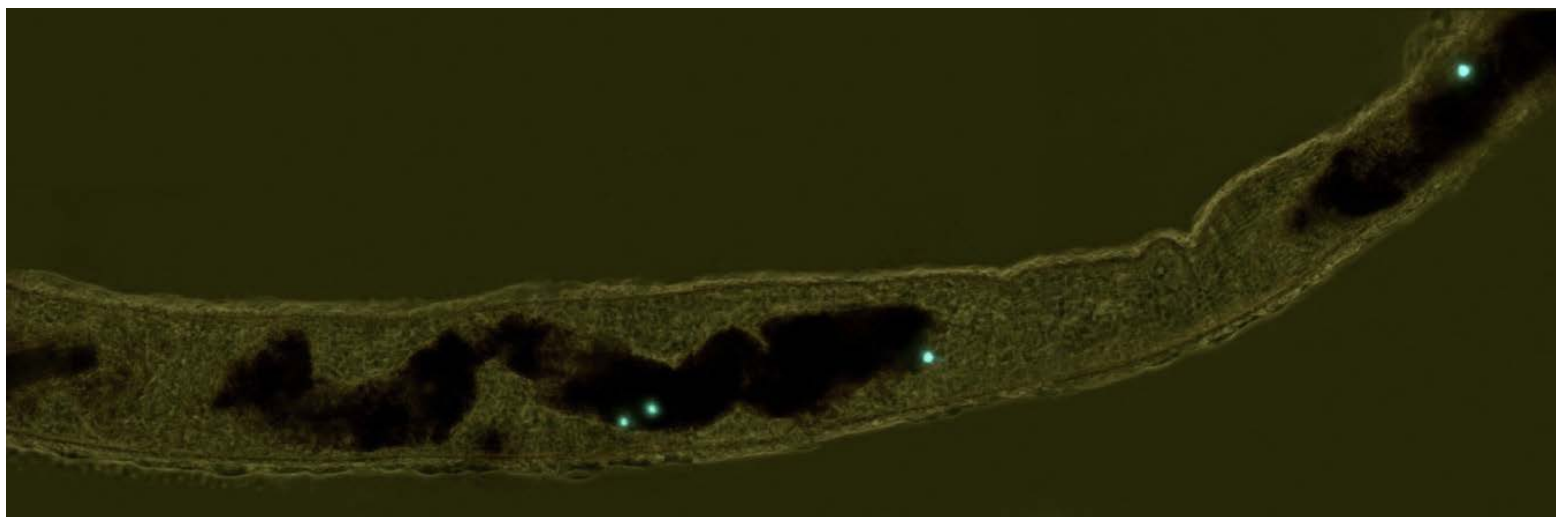
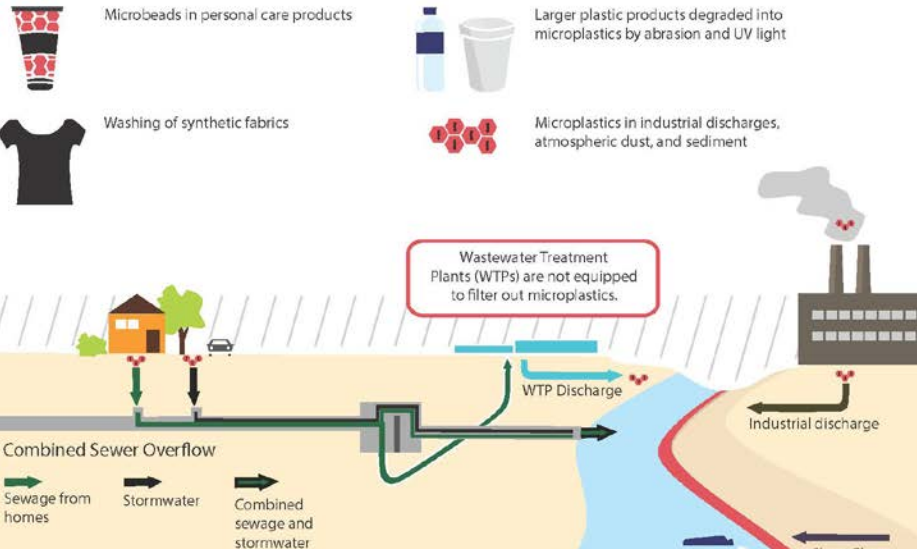


Photo Setälä et al. 2014. Environmental Pollution – Shrimp digestive tract

Sources, transport, and potential bioaccumulation

Microplastics in Surface Waters

SOURCES



ENVIRONMENTAL EFFECTS



Persistent Organic Pollutants (POPs) can attach to microplastics.



Animals can ingest microplastics and their attached POPs. These substances may bioaccumulate.



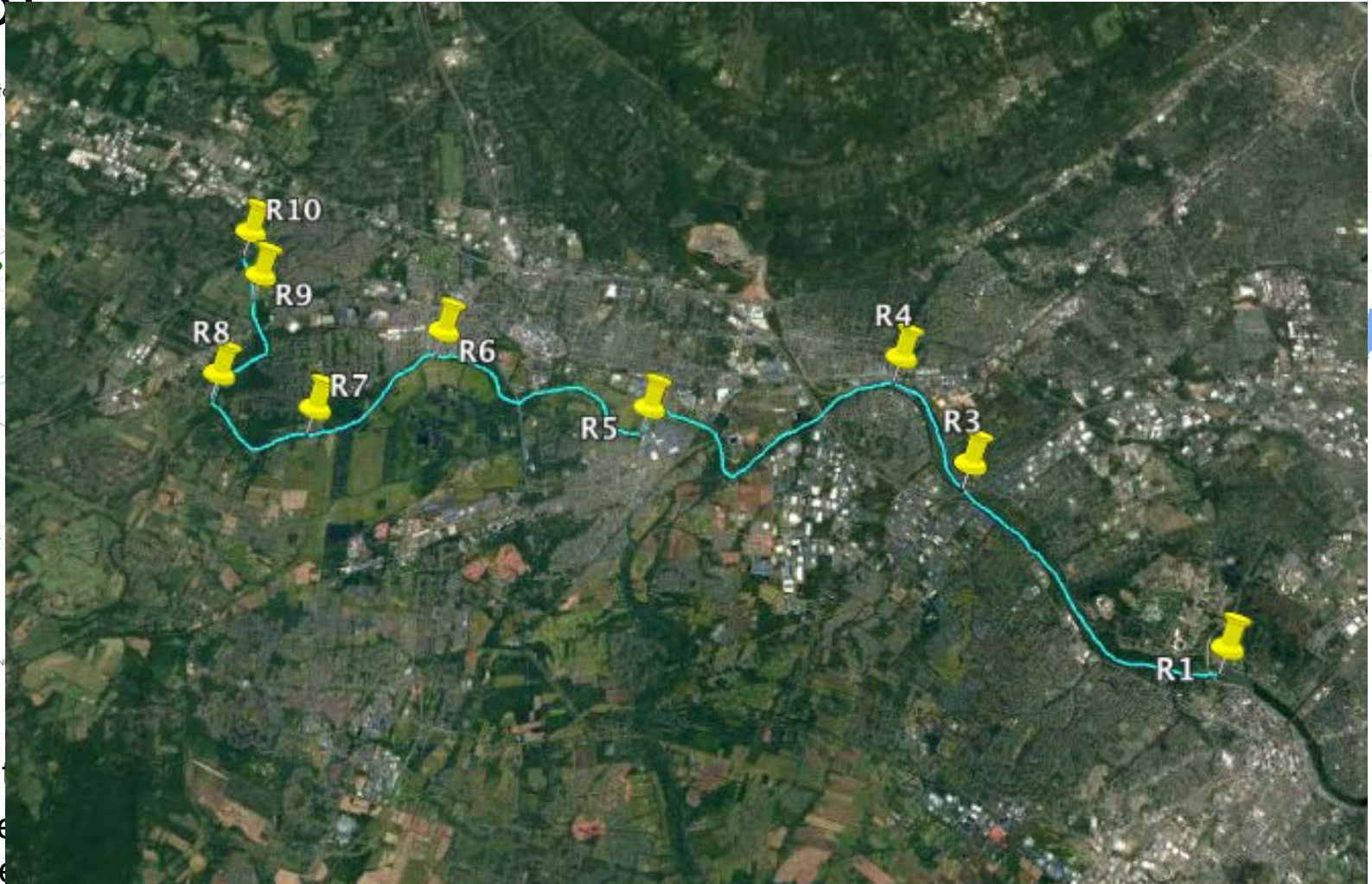
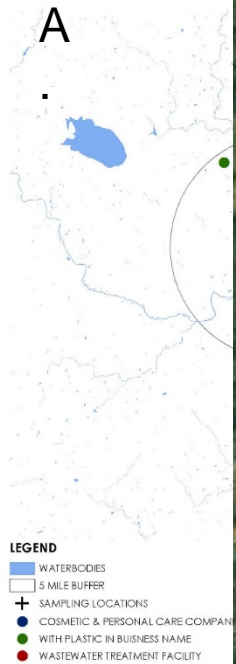
Microplastics and POPs may move up the food chain.

Research Hypothesis:
Freshwater microplastic density would increase downstream adjacent to Newark and Raritan Bays

- Distribution
- Persistent Organic Pollutants (POPs)

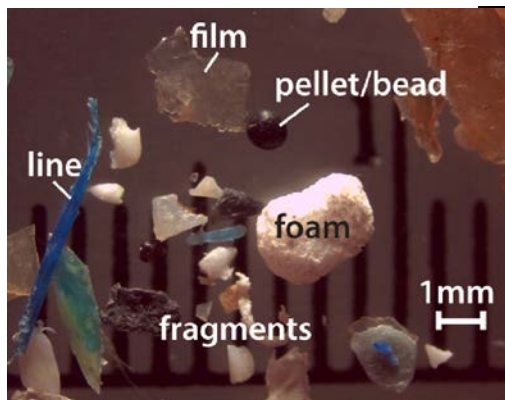
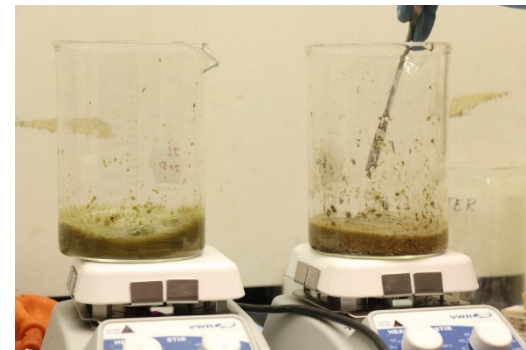
Study Areas: Freshwater to Tidal Transects (2016)

NJPEDS Permitted Rare

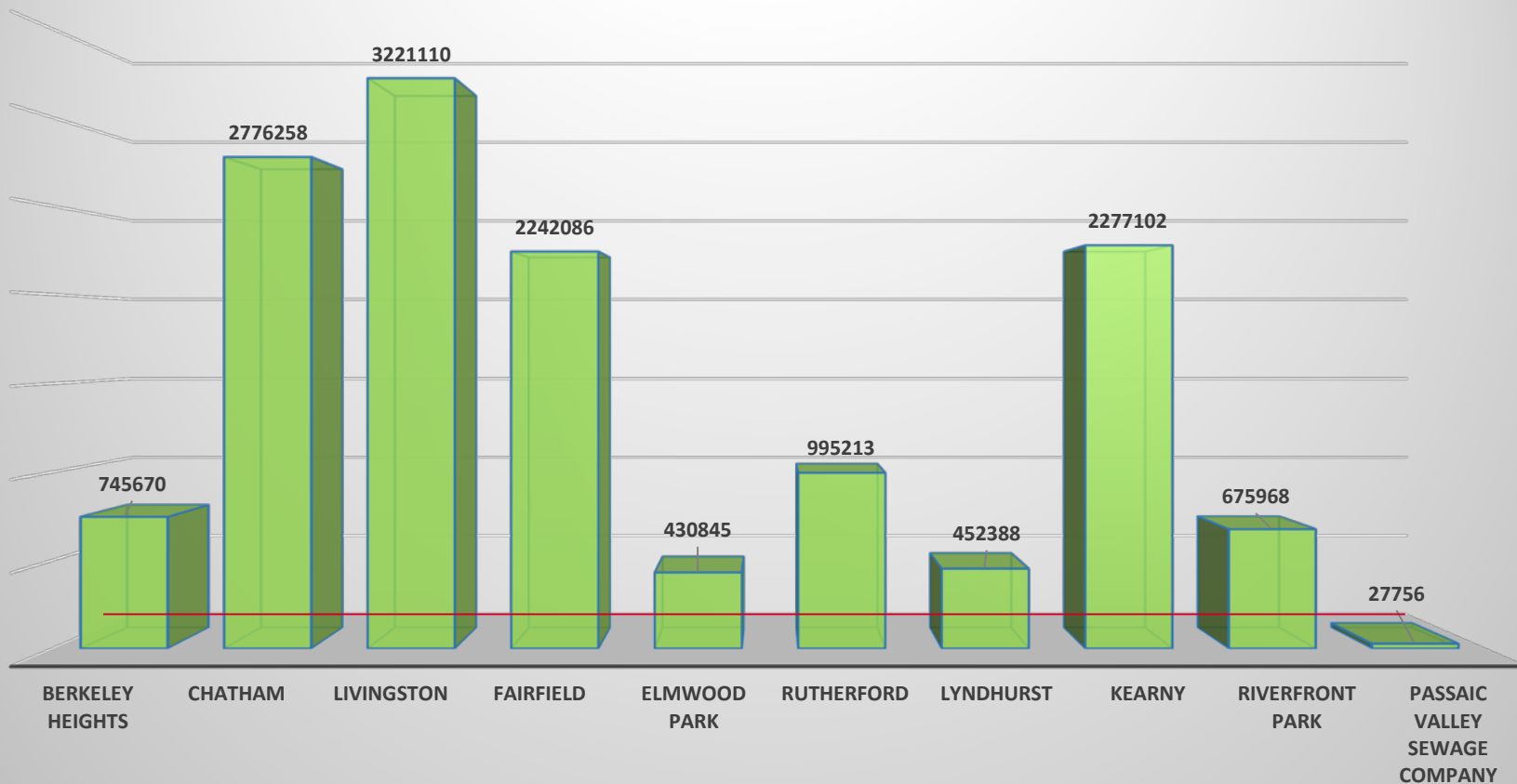


a) Rare
Facilities
identified
name, and red (waste water treatment plants) dots.

Sample Collection & Extraction

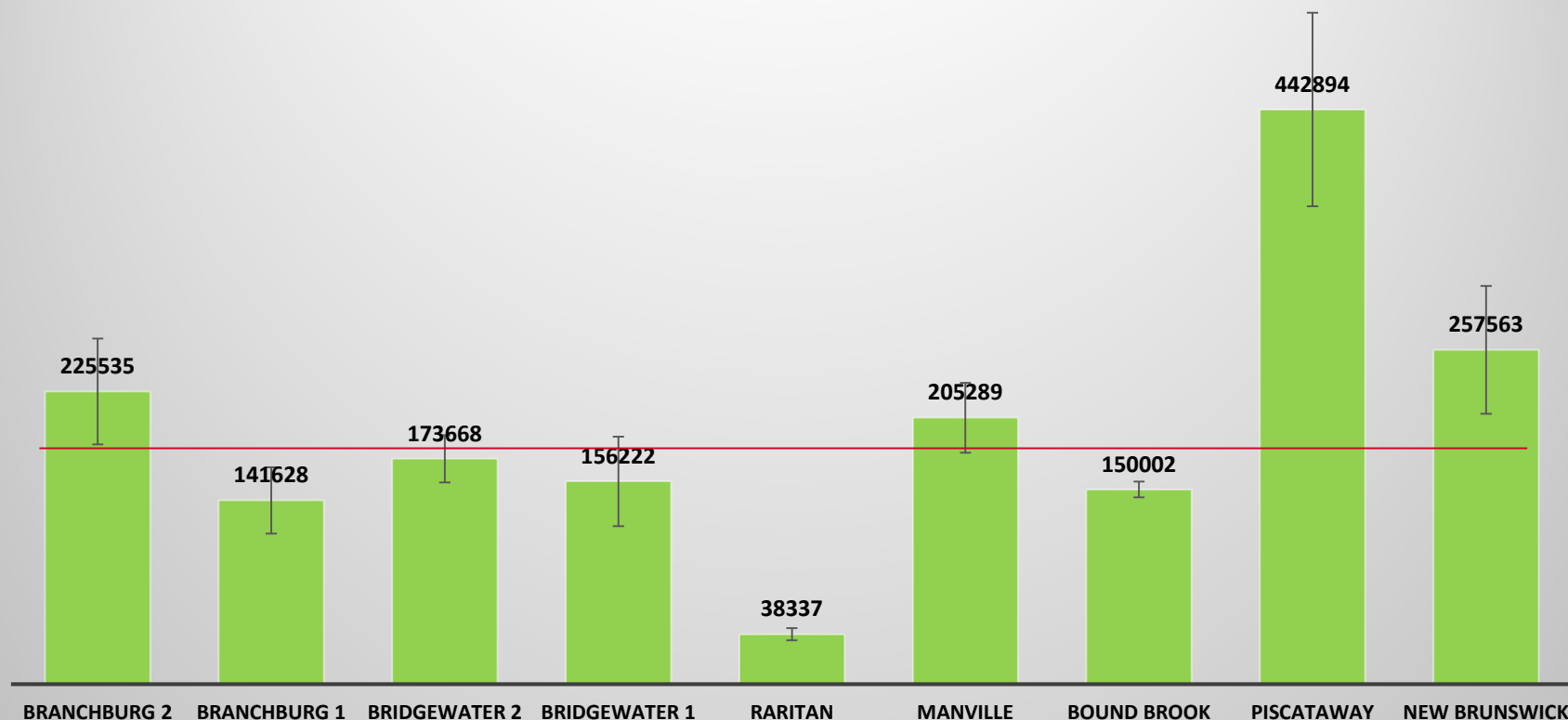


Passaic River Microplastic Density km^{-2} (2016, Dry Weather)



Upstream \longrightarrow Downstream

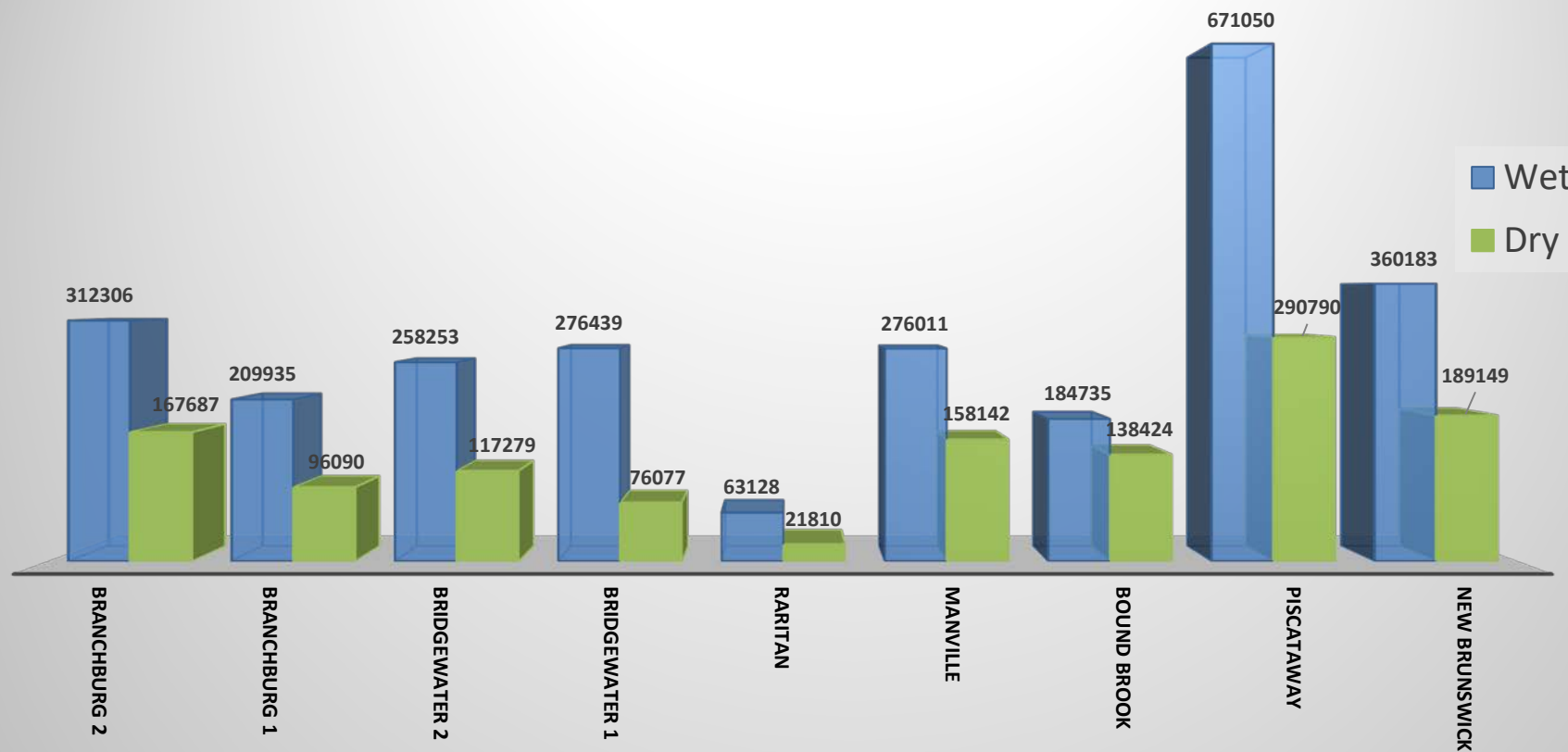
Raritan Microplastic Density km^{-2} (2017, Dry Weather)



Upstream



Downstream

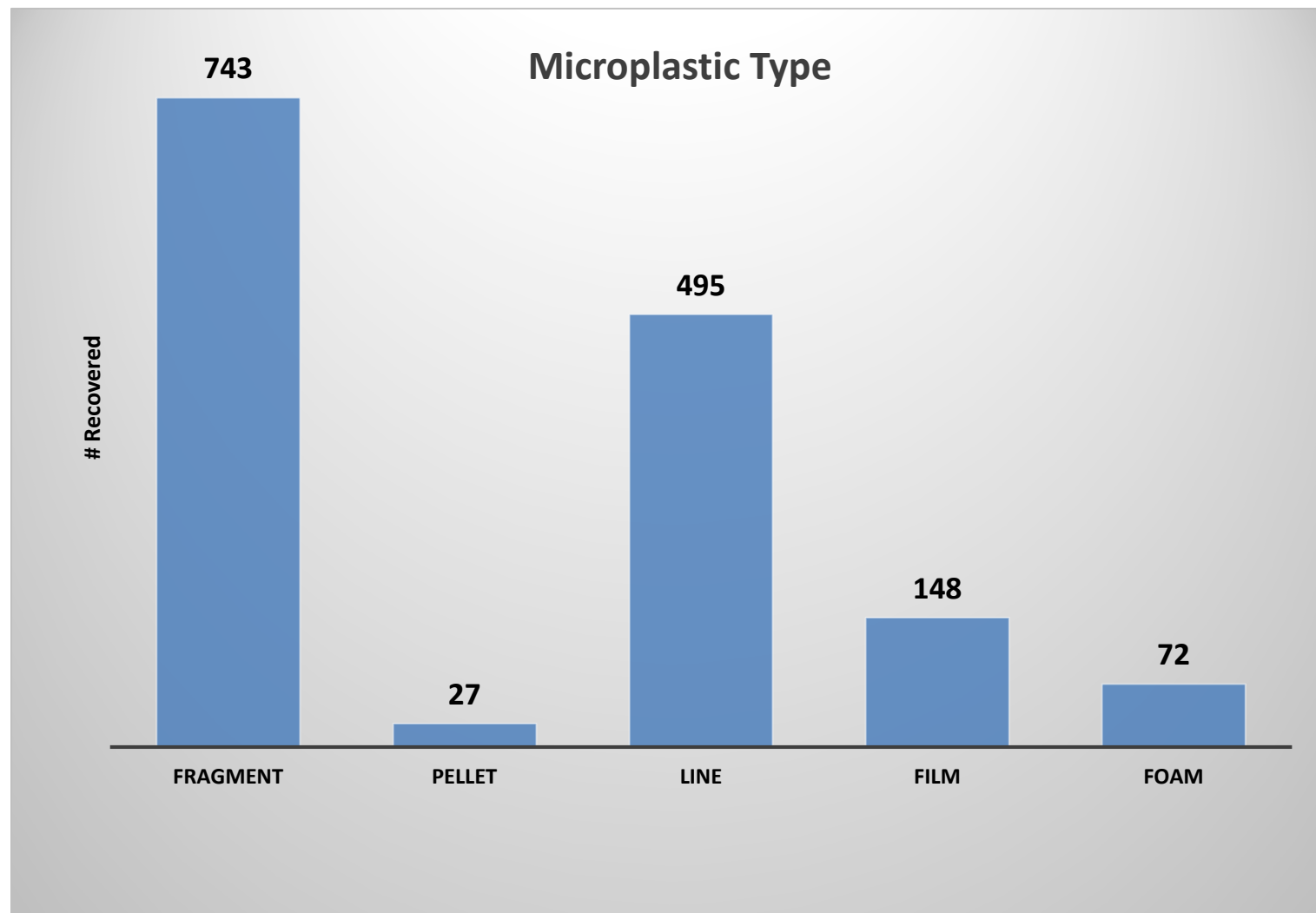


Upstream



Downstream

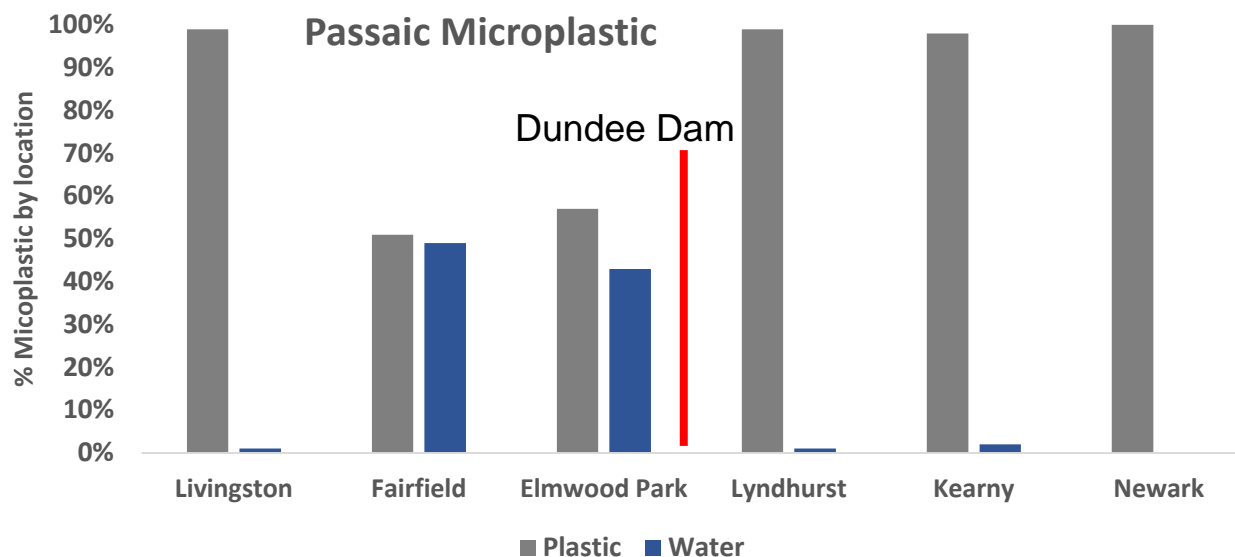
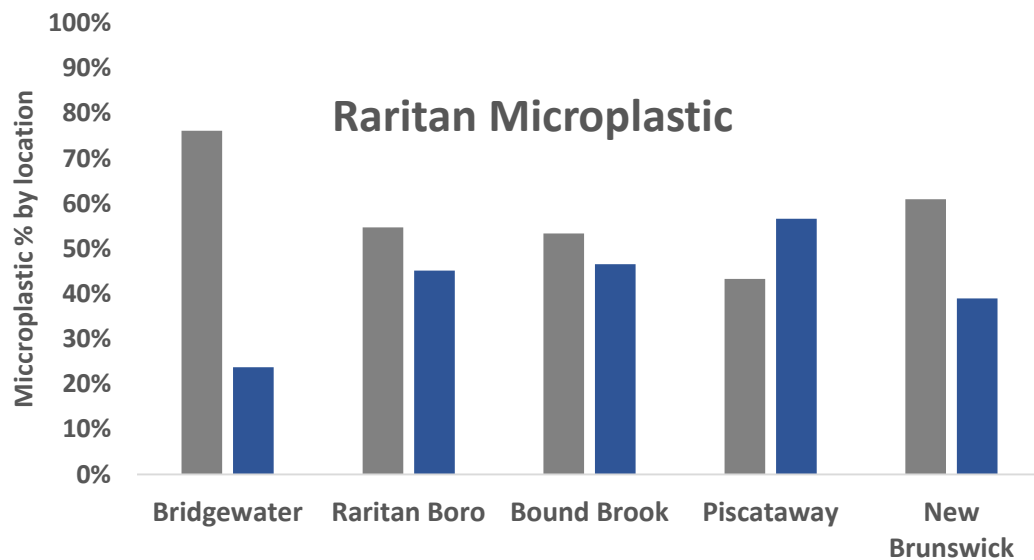
Raritan River Microplastics (2017)



Plastic-Water Column Associated Organics

TENTATIVELY IDENTIFIED COMPOUNDS (TICS)	RARITAN RIVER		PASSAIC RIVER		RARITAN/NEWARK BAYS	
	#	mass	#	mass	#	mass
Compounds Identified	255	1,746	299	732	81	197
TICS Identified (>10 ng)	16	1,443	23	148	5	67
Other Identified TICS (<10 ng)	236	303	271	584	74	130

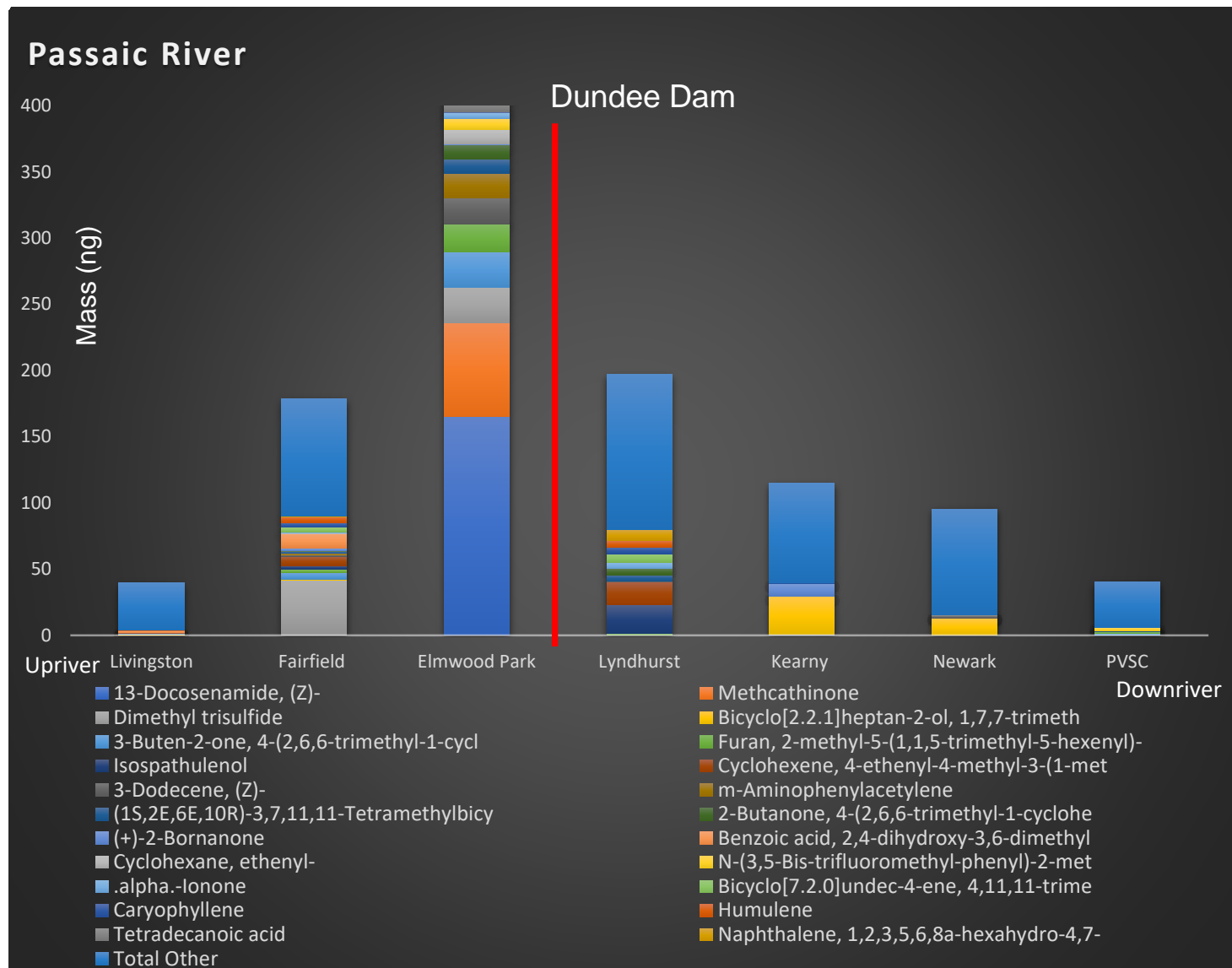
Organics: Plastic-Associated vs. Water Column



Tentatively Identified Compounds (TICs)

USE TYPE	# OF COMPOUNDS	% TOTAL
COSMETIC ADDITIVE	6	3%
FRAGRANCE	6	3%
INDUSTRIAL (1 PLASTICIZER)	12	7%
PHARMACEUTICAL/BIOMEDICAL	13	7%
FOOD ADDITIVE	20	11%
FLAVOR & FRAGRANCE	27	15%
LABORATORY/RESEARCH CHEMICAL	63	35%
NATURAL COMPOUND	73	41%

TICs by Location



Raritan River

Mass (ng)

Upriver Downriver

Methcathinone

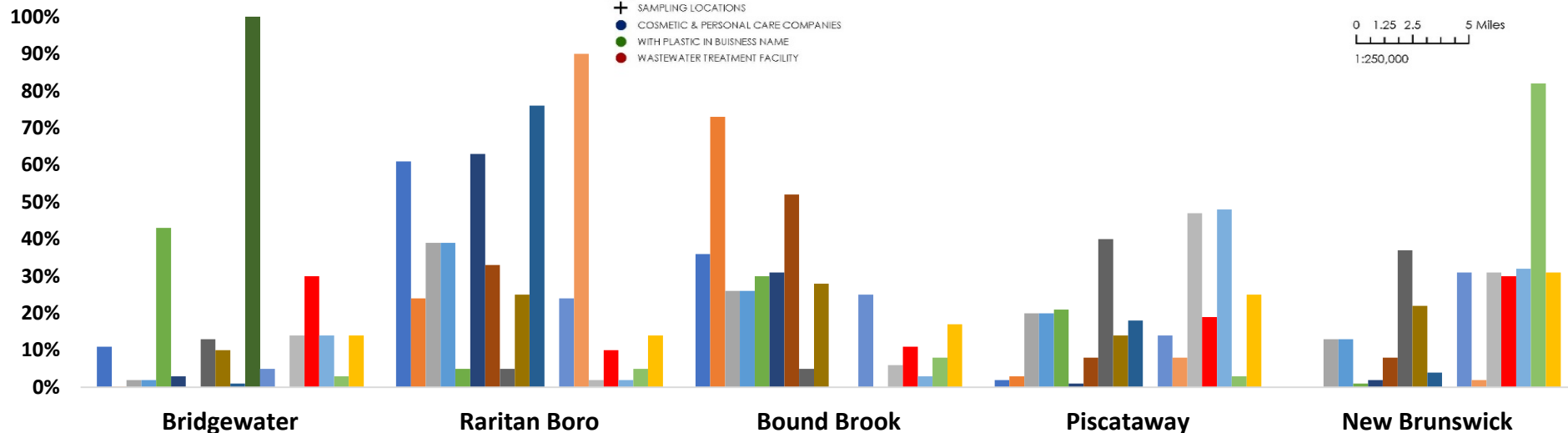
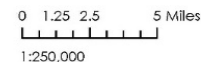
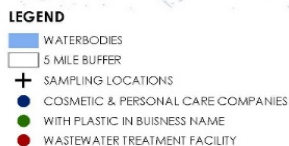
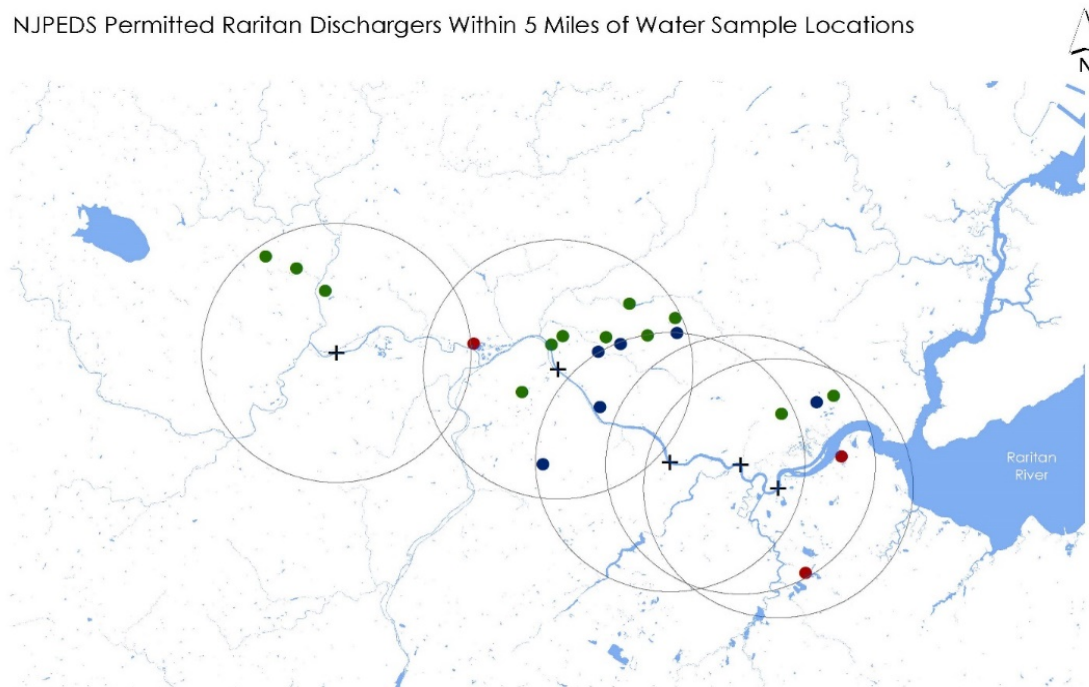
Legend:

- Total Other
- 1-Benzoxirene, 5a-[3-oxo-1-butenyl]perhy
- Bis(2-ethylhexyl) phthalate (plasticizers, PVC indicator)
- Furan, 2-methyl-5-(1,1,5-trimethyl-5-hexenyl)-
- 13-Docosenamide, (Z)-
- Z,Z-3,15-Octadecadien-1-ol acetate
- Cobalt, bis(1,3-diisopropylcyclopentadie
- 3-Dodecene, (Z)-
- Cephalotaxine, 11-(acetyloxy)-, acetate
- 3-Buten-2-one, 4-(2,6,6-trimethyl-1-cycl
- Tetrasulfide, dimethyl
- m-Aminophenylacetylene
- Pyrolo[3.2-d]pyrimidin-2,4(1H,3H)-dione
- 5-Thiazole carboxamide, N-(4-chloro-2,5-d (halogenated natural products)
- Indole, 3-methyl- (perfumes product)
- Methcathinone (psycotropic drug)

Location	Methcathinone (ng)	Indole, 3-methyl- (ng)	Pyrolo[3.2-d]pyrimidin-2,4(1H,3H)-dione (ng)	Other Chemicals (ng)	Total (ng)
Bridgewater	0	0	0	~130	~130
Raritan Boro	~370	~100	~10	~200	~780
Bound Brook	~220	~320	~40	~120	~790
Piscataway	~10	~20	~20	~170	~220
New Brunswick	~10	~10	~10	~130	~160

“Fingerprint” for Pollution Source Tracking?

NJPEDS Permitted Raritan Dischargers Within 5 Miles of Water Sample Locations



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Questions?

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References

Ravit et al. 2017. *Microplastics in urban New Jersey freshwaters: Distribution, chemical identification, and biological affects*. AIMS Environmental Science 4(6):809-826.

