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Microplastics in Stormwater Ponds MaryElizabeth Crabbs and James Giering

ENSC 201

Introduction

- Microplastics are a major threat to almost all living organisms, This threat becomes even greater in urban locations, like however this threat is much stronger in marine ecosystems
- pollution is more common stormwater retention ponds and busy waterways, where
- The various health issues microplastics can cause organisms that ingest these particles eventually leads to their death
- concentration of microplastics in water. The purpose of this study is to determine how location affects the
- Three locations were chosen in Farmville, two on Longwood University property, and another an off site location off of 3rd
- St. in town. sample was taken from an area near Richmond, VA, a more These three ponds are to be compared to the James River, water
- populous area than farmville
- It was hypothesized that the busier the urban area is, then the Samples were taken once a week every friday for 5 weeks higher the concentration of microplastics in the water will be



Materials

The materials required for the sampling and experimentation are as

- follows: 15 Large bottles (at least 1L) to collect and store samples in
- Three sieves of different gradients, 5mm one for removing large items, branches, leaves, etc. A 1mm sieve to remove smaller
- 15 custom-made .25mm gradient sieves to separate microplastics particles that are too big to be microplastics and
- 15 500mL beakers from each sample separately.
- 30% Hydrogen Peroxide
- = 278.02g/mol, to 500mLof water and 3mL of concentrated .05 M Fe(II) solution that consisted of 7.5 g of FeSO₄ 7H20, FW
- Sodium Chloride (table salt) sulfuric acid
- Watchglass
- Metal spatulas
- Stir bar Disposable 3mL droppers
- Thermometer
- Forceps/Tweezers
- 15 glass vials
- Distilled water
- Analytical balance Hot plate
- Dissecting microscope with 40x magnification

Methods

gradient sieves beginning with the largest and moving to the middle at the same time. Each sample was put through the different At the end of the data collection period, all samples were analyzed

B to determine the mass of the total solids collected to the nearest 0.1 beakers boiling off any excess water as needed, and then reweighed Particles collected were scraped into preweighed and labeled

peroxide, this chemical reaction when heated to 75 degrees Celcius to each beaker of solids, as well as 20 mL of the 30% hydrogen dissolves increase the density of the solution, it is then heated until the salt Wet peroxidation was done by adding 20ml of the ferrous solution removes organic materials that may be present. Salt is added to

and dry overnight, individual custom sieves allowing particles to gather in each of them help the densities separate. The mixtures were put through their The wet peroxide solution was left to settle for another 24 hours to

collected from each sample . to the nearest 0.1mg to determine the total mass of the microplastics these particles then were placed in preweighed vials and reweighed and confirm microplastics left behind after the chemical reaction. Remaining solids were inspected under the microscope to separate

analyzed using RStudio. The concentration was then calculated and the data was statistically







Results

Discussion

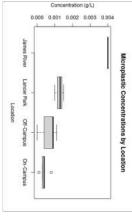
Shapiro-Wilk test for normality was conducted on each of the locations

For On-Campus, Off-Campus, and Lancer Park all locations produced

After the concentrations of microplastics in each sample was calculated, z

through various statistical tests. . samples, the concentrations of each were then calculated and put Once the mass of the microplastics was determined from the

microplastics. The local Farmville ponds that were tested have As shown below in the boxplot of Microplastic Concentrations by lower, yet similar concentrations. Location, the James River sample had the highest concentration of



Tukey Kramer HSD post hoc analysis was run

concentration are those compared to the James River

concentrations of the Farmville local ponds are insignificant This test provides sufficient evidence that the James River has These results determine that the differences between the mean and small p-values for those compared to the James River This test produced large p-values for the Farmville local comparisons As shown in the figure below, the greatest differences in mean

significantly different microplastic concentrations than the Farmville

In order to determine which means were different and by how much, a

- Produced a p-value of 0.0000192 which is less than the significant Since all but one sample was normally distributed, ANOVA was run-

to test, normally cannot be assumed

are normally distributed

p-values larger than .05

The James River sample however, because there was only one sample

This means that the concentrations of microplastics for these locations

Because the produced p-value is less than .05, this test provides

value of .05

sufficient evidence that at least one of the concentration means is

different from the others

post hoc analysis were run. To further analyze the results an ANOVA and Tukey Kramer HSD

- one another as shown in the figure below.
- determining the significances of the mean differences.

95% tamity-wise confidence level

npus-Off-Campus	npus-Lancer Park	npus-Lancer Park	וpus-James River	וpus-James River	Park-James River
snduu	r Park	r Park	River	River	River
-0.094]	T
-0.003					-
200.0-	7				
4.001					
0.000		-	57		

Off-Cam

Lancer F

Off-Can On-Cam

Mean Differences in Concentration Means between Locations

On-Can On-Can

References

marine environments.

order to learn everything possible that can be done to protect

studies on microplastics in waterways should be done in lot of effort to help clean our waterways of them. Continued Microplastics are a recurring problem thats going to need a study produced the results that were expected. and locations in order to further explore the hypothesis, his Although, the study should be repeated with more samples

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ponds

- The results of the ANOVA produced a p-value of 0.0000192
- intervals comparing the mean concentrations of each location to The Tukey Kramer HSD post hoc analysis produced confidence

Conclusion

- The post hoc analysis also produced p-values for each location,
- was supported. Due to our results and their interpretations our hypothesis

Farmville. concentrations of microplastics than the retention ponds Our results showed that the James River contained higher Ξ

urban than Farmville with more built environments.

This was expected because the Richmond area is much more