Effects of Single-Use Plastic Bans on the Abundance, Types, and Ecology of Anthropogenic Litter: Info sheet for potential student researchers

Project Significance and Objectives

Plastic pollution is of growing worldwide concern. Plastic waste has a recycling rate of less than 10% and the amount of plastic manufactured has grown annually, to nearly 350 million tons in 2017[1]. Large quantities of plastic and low recycling rates result in a great deal of plastic waste and accumulation of plastic litter in the environment. In urban and suburban landscapes, this plastic litter accumulates in streams, where it can be transported to coastal and marine ecosystems as well as affect the ecology of these streams themselves.

With the goal of decreasing plastic pollution, several municipal governments in southeastern PA have enacted bans on the distribution of single-use plastics, such as shopping bags and drinking straws. However, the impact of such legislation on the abundance and types of plastic litter in streams has not been widely documented (but see [2]). This project hopes to answer the question:

How do single-use plastic bans affect the abundance and types of plastic litter in southeast PA streams?

We are using a replicated Before-After-Control-Impact design to test three non-exclusive alternative hypotheses:

a. Plastic bans decrease the amounts of the banned plastic in streams within municipalities that have bans as compared to those without.
b. Plastic bans decrease the total amount of banned plastic across the landscape even if there are no significant differences between municipalities with and without bans.
c. Municipalities with plastic bans have less plastic waste overall, including both banned and unregulated plastics.

Methods

To measure the effects of single-use plastic bans on the abundance and types of plastic litter in streams, we are studying the types and amounts of trash in nine different streams in southeastern PA: 3 that have had bans on single use plastics for more than one year, three with no bans, and three streams with bans that went into effect during the study period (in January 2024).

At each site, Team Trash collects all the trash we can find within four 5 m x 5 m quadrats on the stream bank and one 5 m long section of the stream bed. Then, we bring all the trash we have collected back to the lab, where we carefully separate and clean it before measuring and recording the size, mass, color, material, and use category (e.g., food, beverage, smoking product, etc.)[3] of each piece. After about 16 months of sampling (September 2023 through December 2024), we will compare how the abundance and types of trash change differ among streams and time periods[4].

<u>Field safety</u>: The entire team must work together to ensure the safety of all participants. The project managers (Dr. Fork and graduate student Victoria Moreira) are responsible for ensuring student researchers have the knowledge and skills to safely conduct research in the field. One or both project managers will always be in the field. We will also use best practices for field safety[5], including: 1) creating a written safety plan that includes emergency contact information, locations of nearest medical care, and explicit emergency

communication plans, 2) wearing high-visibility vests and bring first aid kits while in the field, 3) using a buddy system to make sure no students are left behind at the field site, and 4) requiring student leaders to "check-out" when they begin their field work and "check-in" upon return to campus or home. All student researchers and volunteers will be required to read and sign a safety and communication plan before participating in field work.

What you need to know before applying

Student researchers on this project are asked to work an average of 5-10 hours a week for most weeks of the summer (that is, vacations are totally fine, but please don't apply if you'll be away for more than 4 weeks in a row). Duties of student researchers will include:

1) *Participating in local stream clean-up fieldwork.* We collect trash from 9 research sites around southeastern Pennsylvania. We visit each site approximately monthly for about 2 hours and visit 3-4 sites in a given day. The fieldwork for this project consists of crouching, kneeling, or crawling on wet, muddy ground, sometimes with thorny or thick vegetation. We do not do fieldwork when it is raining, but you should expect to be outside wearing chest waders during hot weather. You will never work on your own; all members of the project will always work with a partner or group.
2) *Cleaning and cataloging trash found in streams according to scientific sampling methods.* You will also contribute to the laboratory processing of our trash samples. Specifically, you will help to clean and air dry each piece of trash, then measure and record it's mass, dimensions, color and other information on a hard copy data sheet. You will also carefully and accurately enter data into a shared Excel sheet.
3) *Maintaining field safety for themselves and others.* You will be expected to uphold agreed-upon safety standards in the field and lab to make sure that you and the people you are working with stay safe.

If selected, you will be paid $12/hr and will work about 5-10 hours per week on average. You will be provided with waders, safety equipment, and all the materials and training you need to do the work.

You will also have the chance to contribute as authors to any scientific papers and presentations generated from the research (which is a GREAT thing to have if you want to go to grad school someday). This could also lead to an opportunity to participate in independent research-for-credit (Bio391/491) in future semesters.

How to apply: Please access the application form on the lab website. Submit your application by email with the subject line "Team Trash Summer 2024" to mfork@wcupa.edu before April 15th, 2024.

References

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3. Hoellein, T. J., Westhoven, M., Lyandres, O. & Cross, J. Abundance and environmental drivers of anthropogenic litter on 5 Lake Michigan beaches: A study facilitated by citizen science data collection. *J. Gt. Lakes Res.* **41**, 78–86 (2015).
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5. Demery, A.-J. C. & Pipkin, M. A. Safe fieldwork strategies for at-risk individuals, their supervisors and institutions. *Nat. Ecol. Evol.* **5**, 5–9 (2021).