Making Watershed Science Useful for Communities: Creating the Mystic River Invasive Species and Water Pollution Zine

Amanda Paulak

EE538: Research for Environmental Organizations

12 December 2025

This semester, I got to work at the crossroads of science, education, and community organizing with the Mystic River Watershed Association (MyRWA). I worked on researching, writing, and improving an educational zine called "Invasive Species and Water Pollution in Our River" with the help of Alice Chou and Isaiah Johnson. It was made for people in the community and volunteers who care about the Mystic River. I met with Alice and Isaiah every other week to go over drafts, talk about what was really going on in the river and along its banks, and figure out what information would really help volunteers who are out there pulling invasive plants. This paper talks about that work, how it relates to my background in marine biology and macroalgae research, and what I learned about communication, nutrients, invasive species, and the realities of an urban watershed.

My undergraduate thesis in marine biology at UCLA was the beginning of this project. I looked at macroalgae and how their traits change in response to environmental factors like nutrients and canopy-forming species. That job taught me to think about how changes in nutrient levels and physical conditions can help some species more than others and change whole communities. I brought that lens with me to this semester. When I learned more about invasive plants in the Mystic and how nutrient pollution and stormwater runoff help them spread, it felt like the freshwater version of questions I had already been asking about algae: Who benefits when we overload ecosystems with nutrients? What happens to biodiversity when one or two species that are opportunistic take over? Because of this personal background, the zine was more than just an assignment. It turned into a way for me to turn the science I care about into something people could use in real life.

The zine is set up like a mini toolkit that teaches people about two problems that Boston area rivers like the Mystic, Charles, and Neponset are facing: invasive species and pollution in

the water. The first few pages set the stage by saying that climate change is making existing stressors worse by causing stronger storms and hotter summers. One article, "The Climate and Invasive Connection," talks about how more rain and higher temperatures can hurt native plants and help invasive species. The zine talks about plants like Water Chestnut, Japanese Knotweed, Phragmites, and Oriental Bittersweet. It explains how they quickly spread across land and water, take over native plants, and lower biodiversity. We put clear "Action Steps" at the bottom of the page, like supporting volunteer days to pull invasive plants and pushing for green infrastructure like native plant buffers, stormwater gardens, and tree plantings. Alice told me from the start to always connect information with specific, doable actions so that the zine would feel empowering instead of too much.

The zine's main part is a set of pages for each species that volunteers can use as quick references. The Water Chestnut page says that this plant was brought to Cambridge in the 1800s and now makes thick mats that float on the water and block sunlight, lower oxygen levels, and hurt aquatic life. We want to stress that one of the best ways to respond is to work together. For example, you can join the seasonal water chestnut pulls organized by MyRWA and the Charles River Watershed Association, and you can also push cities to buy mechanical harvesters for areas that are heavily infested. The Japanese Knotweed and Phragmites page shows how these plants do well along disturbed riverbanks, spread quickly, and outcompete native grasses and flowers that help stabilize soil and support pollinators. Based on Isaiah's experience in the field, we added an important warning for volunteers: they should only remove Knotweed and Phragmites on approved volunteer days or with permission from the landowner or municipality. They should also always follow staff instructions because removing these plants the wrong way can spread

them and make erosion worse. We stress replanting with native species after removal to keep the soil in place and stop new growth.

Isaiah told us that volunteers see Oriental Bittersweet a lot, so we added a new page about it. Bittersweet is a woody vine that climbs and wraps around trees and shrubs, according to that page. The vines can look pretty with their thick tangles and bright berries, but they wrap around trunks, break branches, and pull down trees. The zine says that people shouldn't plant bittersweet or use wild vines in wreaths or decorations. Instead, they should choose native plants. For big patches or places near water, we suggest that volunteers join organized MyRWA events or work with trained crews so that trees and soil don't get damaged when they are removed. To write this part, I had to combine my knowledge of ecology with practical advice. For example, how do you tell people that a pretty red berry wreath can be part of an ecological problem without making them feel bad, and how do you give them better choices?

Another big part of the zine is about stormwater, water pollution, and combined sewer overflows (CSOs). We say in one spread that more than half of the rivers and lakes in Massachusetts are "impaired," which means they don't meet state water quality standards. Stormwater pollution is especially bad for rivers in cities, like the Mystic, Charles, and Neponset. Stormwater carries harmful nutrients like phosphorus that help invasive plants grow, as well as oil, trash, and pet waste, into the rivers when it rains. "When It Rains It Pollutes," a later page, talks about how older parts of Greater Boston use combined sewers that carry both stormwater and sewage from homes in the same pipe. These systems are made to let a mix of stormwater and raw sewage flow into rivers during heavy storms to keep basements from flooding. We explain what CSOs are, how they are different from regular storm drains, and how overflows put raw human waste and household chemicals right where people boat, fish, and play. This is where my

interest in nutrients really showed through, since the same runoff that carries bacteria also brings the nutrients that help invasive plants grow.

The zine has a page called "Numbers Tell a Story" that links the ecological story to policy and advocacy. One important fact is that 1.9 billion gallons of untreated sewer water were released across the state in 2024. Heavy rain linked to climate change is making this happen more often. We also want to point out that health studies show that people who live near CSO discharge areas are more likely to get sick with gastrointestinal problems. We provide readers with specific legislative actions they can take, such as supporting H.R. 5730 (the Sewer Overflow and Stormwater Reuse Municipal Grants Reauthorization bill), pushing state and city officials to make CSO and stormwater funding a top priority, and calling for transparency and real-time CSO event maps. Another set of pages shows how to take care of your home every day, like using less lawn fertilizers and pesticides, picking up pet waste, disconnecting downspouts, making rain gardens, and using permeable surfaces. The last pages of the toolkit ask people to check out their local rivers, use simple kits to test the water quality, map surfaces that don't let water through, and join watershed groups like MyRWA, the Charles River Watershed Association, and the Neponset River Watershed Association.

We met every other week during the semester to work on the zine. Usually, I would bring a new draft or a revised spread, and Alice and Isaiah would respond as both teachers and people who know the river and the volunteer program very well. We talked about big structural issues sometimes, like how to balance the need for big investments in infrastructure with changes in how people act. At other times, we paid close attention to the exact words we used. We changed lines about invasive removals, for instance, to make sure that legal permissions and safety requirements were very clear. Many of these changes were made because of Isaiah's experience

on the ground. He helped us stay away from directions that seemed easy on paper but would be hard or dangerous in real life. Alice made me think about the layout, the language that was easy to understand, and the page flow so that middle school students, adult volunteers, and people in the community who were new to environmental topics could all follow the story.

The page on Indigenous stewardship and ecological knowledge was one of the most important things we worked on together. That spread acknowledges that the Mystic and nearby waters are situated on the ancestral territories of Indigenous nations, including the Massachusett, Wampanoag, and Nipmuc peoples, who have stewarded rivers, wetlands, fish runs, and forests for millennia. We say that their stewardship is based on giving and taking with the land and water, and we point out that Indigenous nations and groups are still leading the way in restoring rivers, making them more resilient to climate change, and protecting their rights to food and medicine. The action steps on that page are about getting Indigenous leaders' permission for restoration projects, helping Indigenous-led groups, and learning about the lands we live on. Adding this part helped me remember that invasive species and nutrient pollution aren't just technical issues. They are also the result of long histories of taking land away, making decisions about infrastructure, and whose knowledge is valued.

The zine was no longer just a document by the end of the semester. It was a project that I, Alice, Isaiah, and the larger Mystic River community worked on together. This project taught me how to turn my knowledge of macroalgae and nutrient ecology into something that volunteers can hold, take to the riverbank, and use to help them decide what to do. I also learned how much work goes into making educational materials that are correct, easy to use, and based on the real-life experiences of a place. The biweekly meetings taught me to see feedback as a normal part of the research process, whether it was Isaiah giving me details about species or Alice

asking me questions about the audience. I want to keep making tools like this that bring together science, policy, and community knowledge. This semester's work on the Mystic River zine taught me that I don't have to keep my interest in nutrients and invasive species in a lab notebook or a thesis. It can exist in a watershed, within the stewardship of volunteers, and through the minor yet significant transformations individuals enact when they are informed and empowered.