

# Sanderling: A Sustainable, Accessible Litter Pick-up Tool

## Addressing the Impact of Visitor Recreation at Ohio State Parks

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### Introduction and Purpose

The Ohio Department of Natural Resources (ODNR) Division of Parks and Watercraft partnered with Ohio State Design to find solutions that aim to reduce the impact of recreation on state parks.

Ohio state parks face the challenge of balancing conservation and visitor recreation. One of the most harmful and pervasive impacts of recreation on the health of parks is littering, especially at park beaches. Wildlife—shorebirds in particular—suffer because they can't distinguish between trash and food. Litter also poses a threat not just to the experience of visitors at parks, but to their health as well.

This project aims to address the problem of existing litter on Alum Creek State Park Beach by providing an inexpensive, sustainable, and accessible litter pick-up tool that makes the process of picking up litter easier and more comfortable for a wider range of people.

The result is Sanderling: a recyclable, cardboard litter pick-up tool to be used as part of a littering reduction campaign. The tool, able to be assembled by state park staff or volunteers, gives a new life to used plastic bags by propping them open and using them to hold the litter picked up by volunteers at clean up events. The campaign takes a hopeful approach to the issue of litter at Ohio state parks by not only educating on the effects of littering, but most importantly encouraging empathy with local wildlife and fellow humans and offering a rewarding, engaging opportunity to enact change through clean-up events. It aims to change the culture around litter by bringing the community together in the effort of cleaning up parks, for the health and safety of wildlife and of one another.

### Methodology

The method for this project is Research through Design, which includes:

Secondary research, from sources not limited to existing academic research.

Design conjectures, which are concepts inspired by existing research; created for the purpose of identifying opportunities and limitations for design.

Survey, in this case of Ohio State Park Managers.

Site visits/place analysis, including observation and litter pick-up at state and metropolitan parks.

Ideation, including the creation of over 50 design concepts through brainstorming.

Iterative prototyping, in which models are made in succession and developed each time through observation and feedback.

Formative assessment, which is informal testing intended not to prove a hypothesis but rather identify areas for improvement or make decisions in a design.

### Secondary Research

It's very easy to harm plant life, wildlife and your immediate environment when visiting a park. The presence alone of a visitor is enough to alter the behavior of wildlife due to fear (Zaske, 2023). There are also many ways to reduce your impact, or 'leave no trace'. Leaving behind no trash, staying on official trails, and preventing the spread of invasive species are three crucial low-impact practices (York County Conservation District, 2021). Park et al. (2008) found that 'aggressive' implementation of indirect management practices (i.e. symbolic fencing, education/informational signage) are most effective in keeping visitors on official trails.

When you litter plastic, there's a good chance it'll end up in your very own organs, messing with important bodily functions (Greenpeace, 2025). Litter definitely ends up in the stomachs of shorebirds, not just because it's abundant but also because it smells like food to them (Perkins, 2016).

A study by Blenderman et al. (2017) found that most dog owners dispose of their dog's poop properly, and that those who don't feel that it's too difficult or inconvenient to do so. Maybe, like ODNR park managers noticed, easily accessible waste bins are the answer. Some people may feel a sense of entitlement to their space due to a lifetime of human-centered society (Long, 2024).

There have been several remarkable anti-littering campaigns across the world, whose successes may be due to appeals to local pride, eye-catching designs, and engaging interactive/gamified elements (Zero Waste Scotland, 2023). Interactive elements support education and information retention, but can easily muddle the message that's meant to be communicated if not carefully designed (Allen et al., 2004). Incentives could be part of the answer, by getting people emotionally engaged and breaking up larger waste management goals into attainable (and rewardable) tasks (Stolovich, 2002).

Visual design choices have a noticeable impact, too. In a study of graphic design in park signs, Rice et al. (2023) found that certain techniques are more effective in influencing visitor behavior: typography as image, high contrast between background and text, and a large scale shift from headline to the call-to-action.

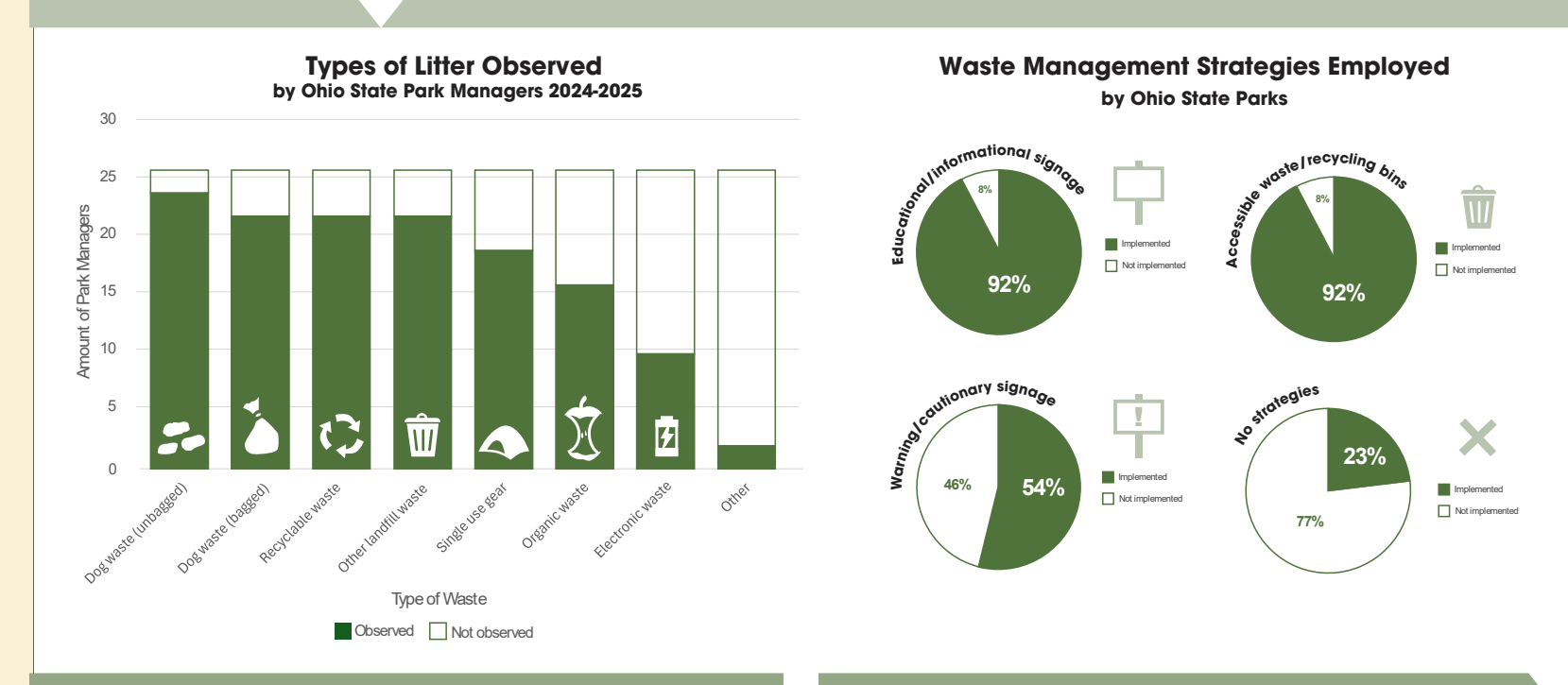
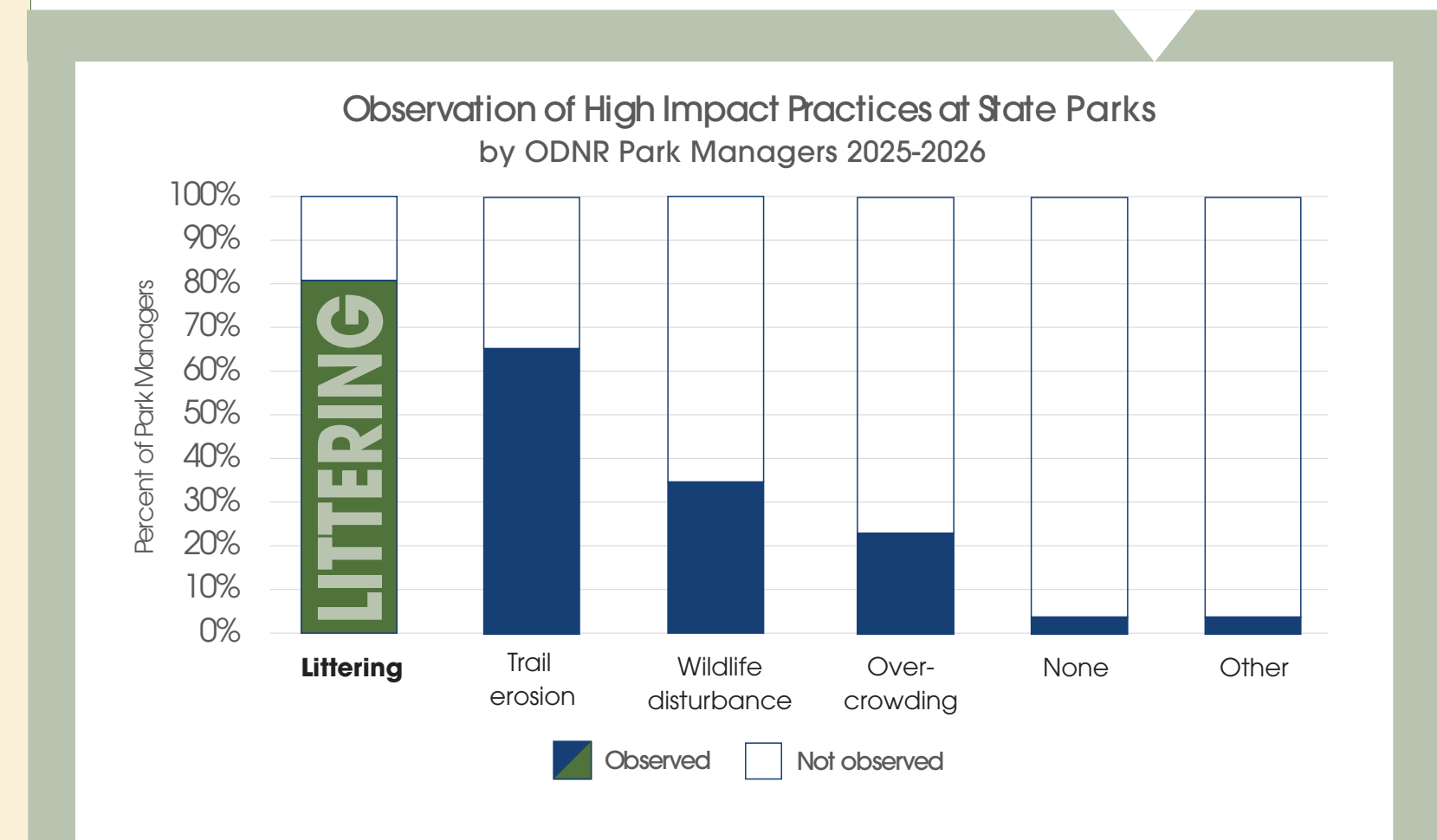
What about trash bins themselves? The design of trash bins has gone through many, many iterations, but even the most successful and innovative ones have profound faults. Some bins claim to solve all the problems, but are hard to maintain—which can end up making littering worse (Rinde, 2023). Not to mention the expensive cost of those innovative features (Bigbely, 2025).

### Primary Research

#### Survey

Our group collaborated on a survey which we sent out to 59 ODNR Park Managers, nearly half of which (47%, or 26 managers) responded. Nicole Li and I focused our questions on the topic of littering and waste management. My first question asked managers which of the high-impact practices, observed and described by Heather Bokman in ODNR's sustainability initiative, they noticed at the park(s) they manage in the last year. The majority observed littering (80%) and trail erosion (65%). These results align with my observation; every park I have visited during this project has had litter and user-created and widened trails.

When asked what has been most successful at preventing littering, park managers named accessible bins, law enforcement or other authority, and education and signage. When asked if there was anything park managers would like to see to improve waste management/littering, the overwhelming response was a desire for improvements to waste bins (including the addition of bins and bins that are easier for staff to collect from), systemic changes (budget, management, waste collection service), and more (and more effective) education/signage.



**Limitations**  
The results of this survey may not be representative of the park manager population because the sampling was voluntary response and not random. The survey was emailed to 59 ODNR park managers, 28 of which responded (47% of population). At 80% confidence, the margin of error would be 14%, though it's important to note that due to sampling error, any calculated margin of error may not be reliable (Dovetail 2023).

#### Site Visits/Place Analysis

From firsthand experience at the project kickoff, the UV night hike, and the Alum Creek State Park Beach, littering and improper waste disposal appeared to be the biggest problem at Ohio state parks. Our trail visits during the kickoff were littered with comments on litter. During the naturalist-led night-time hike at Alum Creek State Park, where we searched for fluorescent flora and fauna with UV flashlights, we discovered more trash than anything else. During a visit to the Alum Creek State Park Beach, Nicole and I picked up 234 pieces of trash (more than half of which was plastic) on just 6% of the beach despite the many trash bins present.

Comparatively, metro parks in Central Ohio such as Glacier Ridge, Highbanks, and the Columbus Garden of Roses are relatively litter-free. Throughout an entire hike at Highbanks Metro Park, I noticed less than 20 pieces of trash, most of which was concentrated in one area (a wooden overlook/rest platform with benches). There were only a few trash bins located at parking areas. Glacier Ridge Metro Park had even less litter: only about 3 pieces of trash and one rogue bit of dog waste. This park had several dog waste stations along the trail, each of which had a bag dispenser and a bin with some waste in it, and a trash bin at the only bench on the trail. Both parks had open-top bins, which can result in trash being blown out or accessed by wildlife.

#### Design Conjectures

The most relevant conjecture was of bins and signage that might help reduce litter at Alum Creek State Park Beach, inspired by the un-motivating and lacking in appeal Bigbely trash bins (Rinde, 2023), and the fact that animals (shorebirds in particular) will mistake trash for food (National Geographic Education, 2016). The Hungry, Hungry Trash Bins are meant to encourage people to throw away their trash by making an emotional connection (littering as equivalent to feeding animals trash), and being fun and motivating/rewarding (giving a task: feed the bins, and see the progress you've made). However, there remains the issue of bins being difficult or cumbersome for staff to empty. To the right of the trash bins are some sketches of signage that uses negative emotion to discourage behavior, which I decided to move away from because it is not in line with the ethos of Ohio state parks.



The conjecture to the right is the "End the Spread" phone-booth style cleaning station, to be placed at park entrances and exits, which would provide a spot to inspect your clothes and gear for any hitchhiking invasive species: bugs, seeds, or plant parts. The response to the concept was that having such a large and eye-catching station communicates the importance of cleaning off your gear to visitors, that it would be more effective to have two stations: one facing arriving visitors and one facing departing visitors, and that it's good that there's an explanation as to why visitors should clean/inspect their gear.

Below is my conjecture "Block This Way", in which large cast-iron statues of bugs and fruit local to Ohio would block the entrances/exits to user-created trails in the hope that visitors will be discouraged from using those trails, letting the plant life in that area regrow. This concept has a few possible problems: Due to their small size, they are more of a symbolic gesture, meaning that people can easily step over them (or trip over them and injure themselves). Or, walk around them, which would cause even more damage to the plant life. To address this, there could be signage to accompany the statues stating that they are there to block user-made trails, which can be unsafe and are damaging to the plant life. These signs could include information about the local bug or fruit represented by the statue, and tie it into a message on conservation for a connection to state pride. Of course, there is also the issue of cost and feasibility of production. And, bronze statues may invite visitors, particularly children, to climb on them. The Columbus Zoo, for example, has many bronze statues of animals that children are free to climb on.



#### Making a Design Brief

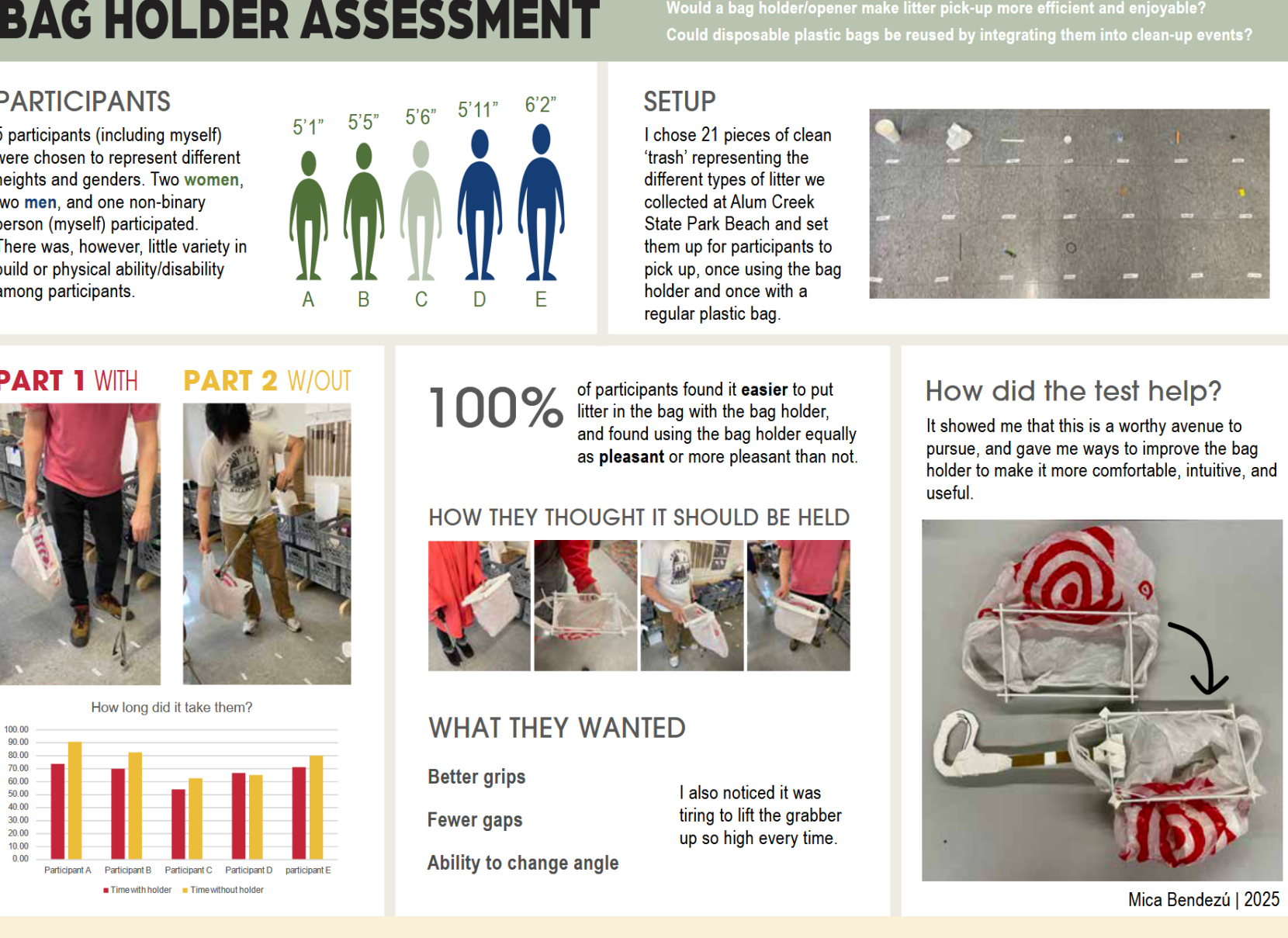
The transition between the observational/conjectural phase of research through design and the iteration/fabrication phase is marked by the distillation of everything learned so far into an actionable brief. The brief includes the project scope, target users, problem statement, goals, objectives, strategies, features, and attributes.

For this project, I narrowed the scope to Alum Creek State Park Beach, with target users being recreational visitors to the beach, park staff at Alum Creek State Park, and people other than visitors who would volunteer to pick up litter, such as birders and scouts. From my research up to this point, I inferred that litter is such a problem because people aren't motivated to dispose of their waste properly, either because it's too difficult or inaccessible, not rewarding, they have trouble empathizing with wildlife and fellow visitors, or they may not know how harmful litter is. I defined the goal for the remaining research: to change the culture around littering and address existing litter by making clean-up efforts easy, accessible, engaging, and rewarding. To make litter pick-up easier and more enjoyable, I identified the need for a physical component that itself is accessible, easy to use, and made of sustainable material. To make that part of a culture change, and to motivate people to use it, it would need to be accompanied by education and rewards that encourage empathy and appeal to local pride.

### Prototyping

I did several sessions of brainstorming, and came up with 50 ideas. However, none fit the brief I had set out well enough. So, I looked back on the observation, site visits, and experience of picking up litter at the beach and reflected on it further. This led me to looking into existing litter pick-up tools on the market. Grabbers tools are a huge help, but, alone, they're tiring to use. I looked for other litter pick-up tools to use with the grabbers, but they're hard to come by, expensive, awkward, and unsustainable. Most are plastic, and need you to buy specific plastic bags to use them. So, I set about trying to solve just one of those problems—incorporating the everyday shopping bags that a lot of people have saved up. I fabricated a prototype of a frame to prop them open, and conducted a formative assessment to gauge whether it would be more comfortable or efficient.

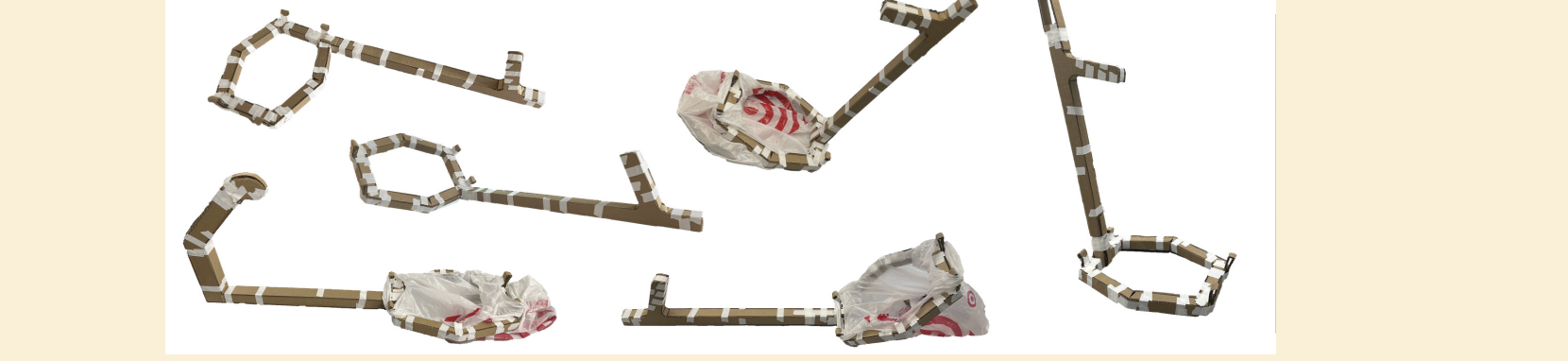
I chose 21 pieces of clean 'trash' representing the different types of litter we collected at Alum Creek State Park Beach and set them up at the centers of three rows of 6x6in floor tiles, with labels. The test had two parts. For part 1, the participant stood facing the tile with the piece of metal on it. They were given a litter grabber tool and the small plastic Target bag with the bag holder. I asked them to hold it how they thought it was meant to be held, took a picture, and then instructed them to hold it by the bag handle for the test to minimize the variables that change from test to test. Then, I instructed the participant to pick up the pieces of litter at a normal, unhurried pace while I recorded the time they took to pick up all the pieces. I noted the time, and reset the tiles with the litter. For part 2, the participant stood in the same way as part 1. This time, they were given the same type of plastic bag but without the bag holder, and the grabber tool. I instructed them to pick up the litter again while I recorded the time, and noted how long it took. During parts 1 and 2, I noted any difficulties they experienced, such as the grabber getting stuck on the bag or litter falling out of the bag, and any complaints they voiced. To finish, I asked them to fill out a survey reflecting on the activity. Participants who had not practiced with the grabber tool beforehand experienced a learning curve during the tests that may have influenced their time. The results are represented below.



I also got a lot of feedback and noticed some things that could change to make it more comfortable. I added a handle, and extended it downward, so that you have to do less work. There were gaps, and the rectangular shape meant the grabber got caught a few times. I experimented with the weight distribution, to try and make it even less tiring to use. I researched accessible, assistive devices and applied what I learned from those.



Throughout the iterative prototyping process, my classmates and professors tested the models as I tried out many different variations, trying to find a balance, and finally settled on the final geometry. Then, I tested out different options for the bag-to-holder connections.



Then, I had to figure out how exactly it could be fabricated. After a lot of thought, I decided on cardboard because it's recyclable, inexpensive, easy to work with, and can be very sturdy.



I had hopes that it could be assembled without any glue or tape, and I tried lots of different ways of doing so, but I wasn't able to get a sturdy enough result. It would be possible to make this method work, with more time and the help of someone like a paper engineer.

### Results and Conclusion

The result is Sanderling: a recyclable, cardboard litter pick-up tool to be used as part of a littering reduction campaign. The tool, able to be assembled by state park staff or volunteers, gives a new life to used plastic bags by propping them open and using them to hold the litter picked up by volunteers at clean up events. The campaign takes a hopeful approach to the issue of litter at Ohio state parks by not only educating on the effects of littering, but most importantly encouraging empathy with local wildlife and fellow humans and offering a rewarding, engaging opportunity to enact change through clean-up events. It aims to change the culture around litter by bringing the community together in the effort of cleaning up parks, for the health and safety of wildlife and of one another.

The tool can be laser-cut from, ideally, sheets of 1/8 in corrugated cardboard. For the arm and handle, the corrugation should be parallel to the long edge of the arm. The small markings on the foldable flaps should be engraved, and not cut, to maintain their structural integrity. Repurposed cardboard can be used, but will make for a weaker end product. The name Sanderling is a reminder of why we pick up litter—not just for humans, but for the creatures that also inhabit the spaces we visit—which could be a real motivating factor. Just as sanderlings flock together on beach shores to pick at the ground and forage for food, so too can we flock together to pick up litter. Any litter clean-up event should also have rewards that appeal to local pride and encourage empathy and provide food and water to participants.



Part of motivating people to pick up litter is educating them on the negative effects that littering has, and encouraging empathy with fellow park visitors and park wildlife. To the right are mock-ups I have made of signage that could be beneficial alongside the use of the Sanderling pick-up tool. This signage encourages empathy with local wildlife (landedlings, on the left) and fellow park visitors. They also include call-to-actions, encouraging optimism which can be leveraged towards clean-up events. To reach even more people, the signs should also be translated into Spanish.

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