

## CASE STUDIES

## Mobile Apps and Beach Clean-ups: Tapping Into New Technologies to Promote Local Environmental Stewardship

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**Abstract**

Local waterway programs and beach clean-ups are popular environmental stewardship projects engaging local communities. There has also been growing interest in use of citizen science in such projects, where non-professionals collect research data. This article recounts the methods, successes, and pros and cons of engaging volunteers in a stewardship project using a digital citizen science tool, the Ocean Conservancy's *Clean Swell* app. The project's purpose was to collect beach trash data along Coney Island Creek, the northern edge of Brooklyn's historic Coney Island neighborhood and amusement area. My experience developing and completing this project could be informative to others who wish to plan urban ecology stewardship events utilizing newer technologies.

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## **Introduction**

Many citizen science projects, including those featured in *Citizen Science: Theory and Practice*, focus on ecology and the environment (Silvertown, 2009). Specific topics investigated have ranged from climate change to flowering plants (Dickinson et al., 2012). Watershed ecology is popular among projects that seek to foster community engagement (Compas & Wade, 2018; Conrad & Hilchey, 2011; Shandas & Messer, 2008; Wyles, Pahl, Holland, & Thompson, 2017). However, at their time of writing, Cigliano, et al. (2015) reported fewer citizen science projects designed for marine and coastal research.

The practice of citizen science is evolving. Data collection practices range from use of paper data forms and physical info cards for volunteers (Marshall, Kleine, & Dean, 2012) to websites and mobile apps, such as *eBird* or *iNaturalist*. The watershed and marine/coastal research arena has transitioned into using digital media and technology to engage volunteers. For instance, researchers developed an app and device (made from off-the-shelf electronic components) to engage local water recreationists in water quality testing (Compas & Wade, 2018). In another study, researchers designed an app to track marine debris (Jambeck & Johnsen, 2015).

Non-profit environmental organizations have also created their own citizen science apps, focusing on activities directly related to their mission. In 2015, the Ocean Conservancy launched *Clean Swell*, a mobile app to collect worldwide beach trash data in conjunction with trash collection events (Harper, 2017; Ocean Conservancy, 2017; Simon, 2015). Interested community members can use the app to collect trash data from their own beach clean-ups and upload that data to a global database. This database is meant to help address the issue of astronomically high levels of trash that washes up onto the world's beaches, estimated to be in the millions of pounds (Ocean Conservancy, 2017). In addition to engaging volunteers in new ways, this data may contribute to a better understanding of marine pollution, leading researchers and decision makers to derive more informed solutions (Harper, 2017).

This article recounts the methods, successes, and feedback of engaging volunteers in a stewardship project using a citizen science app to collect beach trash data. The main goals for this stewardship activity involved engaging a set of community volunteers to use *Clean Swell*, to upload and examine the results of participants' beach trash data, and to obtain and reflect on feedback from participants about their engagement and use of *Clean Swell* during the activity. Hopefully, this article will help inform others who wish to plan a similar type of citizen science project with new mobile application tools.

### **Project Description**

Millions of people annually visit Coney Island, a jutting peninsula in Brooklyn, New York renowned for its amusement attractions and Atlantic Ocean beaches (NYC Parks, n.d.; NYC Parks, 2014). Due to Coney Island's location in a highly developed urban environment, there are critical environmental issues along its northern edge of Coney Island Creek, including sewage contamination (Spivack, 2016). Other troubling concerns include litter, plastics, and debris that washes up along the creek shoreline. These trash items, affecting a vast majority of coastal or marine areas worldwide, are known to be responsible for further contamination and other harmful effects on local environment and wildlife (Cózar et al., 2014; DiCaprio, n.d.; Parker, 2018). This issue is of concern to local residents regarding the environmental impact of city government plans to bring commuter ferry service to the creek (McShane, 2018).

To address the issues of beach and shoreline trash along the creek, and to investigate the use of new digital tools in aiding beach clean-ups, the Coney Island Creek Beach Clean-up Stewardship Project was organized on Saturday, July 7, 2018 on a stretch of beach on the eastern end of Coney Island Creek Park, located between Kaiser Park and the creek itself. This project sought to address the levels of litter in this iconic creek by engaging a local recreation community in a stewardship activity.

To develop this project, I utilized groups to whom I had existing connections. Tapping into my experience as an Ultimate Frisbee player, I decided to approach the local Ultimate Frisbee

community with which I was already familiar. Articles in the literature connect outdoor sports activities with a growing sense of connection to nature (Brymer, Downey, & Gray, 2009). Recreation is one way that people engage with the natural environment and develop environmental concern, although that link may be complex and is not fully understood (Berns & Simpson, 2009). Nevertheless, approaching a recreational community is not without precedent, and my past experiences with organizing Ultimate tournaments in Coney Island and the continued presence of players at regular pick-up games in the area encouraged me to select this as my audience. Although beaches along the creekside are not where this sport is played, I proposed that helping the creek ecosystem contributes to the local coastal ecosystem as a whole.

Beyond identifying target participants, the design and aim of this stewardship activity along the Coney Island Creek sought to address other important aspects of participant engagement. Certain watershed-related programs have noted the importance of giving local communities the chance to work on something close to where they live and to work towards a tangible result (Shandas, & Messer, 2008). Popular stewardship activities such as beach clean-ups may provide a sense of ownership and greater awareness of environmental issues (Wyles, Pahl, Holland, & Thompson, 2017).

Finally, although other local groups like the Coney Island Beautification Project had organized local creek clean-ups before, new technologies had yet to be used to examine their usefulness and impact at this particular location (Ocean Conservancy, n.d.). The intention of the Ocean Conservancy's *Clean Swell* mobile application is to not only log and categorize trash data, but to automatically map collected data and make it available online for research (Ocean Conservancy, n.d.).

## **Methods**

The goals I defined for this project were: 1) to organize a beach clean-up event for local beach sports enthusiasts with 10 participants, 2) that participants would collect enough trash to fill three to four 30-gallon trash bags, and 3) to incorporate *Clean Swell* as a component to this project, engaging participants in a citizen science activity through trash data collection. I was unsure what to expect in terms of the amount and weight of trash we would collect, nor the kind of trash items, other than lots of plastic (Cózar et al., 2014; DiCaprio, n.d.; Parker, 2018).

I began the process of planning and publicizing the event in early June of 2018. Over the course of a month, I went through steps to contact a local partner—the Coney Island Beautification Project—to clarify the event’s aim and get advice on suggested equipment and other needs.

To publicize the event to the local Ultimate community, I created an event flyer, which included photos to illustrate the area and need (see Appendix for flyer with map and photos). I emailed lists of players in some local leagues, attaching the event flyer, and I posted details about the event to relevant local Ultimate groups on Facebook and Meetup.com. I created a website with an online Wufoo sign-up form and waiver to obtain RSVPs for the event.

Certain strategies in the flyer and related communications aimed to address what volunteer motivation factors that some refer to as “stone age biases” (van Vugt, Griskevicius, & Schultz, 2014). These are postulated to be inherent human biases that work against people feeling motivated to change behavior or participate (van Vugt, Griskevicius, & Schultz, 2014). The photos included on the flyer showed photos of existing trash at the creek beach. Additionally, the event flyer promoted playing a form of Ultimate frisbee on a nearby beach after the event (such “pick-up” events normally take place on summer Saturdays). Via these strategies, I aimed to provide sensory awareness of the issue and provide a measure of an apparent behavior to imitate by drawing spatial connections between where players enjoy the beach and a local environment in need (the clean-up site) that is part of the same coastal ecosystem

As timing got closer to the date and sign-ups seemed few, I decided to expand my audience to attain the target goal of ten participants. I sent out word about the event to contacts at other recreational groups. This included two Brooklyn-based boating clubs, the Gowanus Dredgers and North Brooklyn Boating Club. Both organizations track watershed issues related to the Brooklyn waterways where they boat, the Gowanus Creek and the Newtown Creek.

I supplied equipment and other items to participants, including trash grabbers, garbage bags, disposable nitrile gloves, a luggage scale, a first-aid kit, hand sanitizer, and some free Ultimate frisbee t-shirts. Splitting into teams of two, our group picked trash, logged data into the *Clean Swell* app, weighed bags, took photos, packed up, and then proceeded to the beach pick-up Ultimate game nearby.

### **Brief Results**

The event achieved most of the goals I set during its planning stage. Participants in the event tallied seven people all together, including myself. All of the attendees were from the Ultimate community, and none attended from the boating community. In just over two hours, we collected enough trash to fill five, 30-gallon-capacity trash bags. We weighed each bag with a luggage scale and discovered a total weight of 79 pounds. We used *Clean Swell* to record the breakdown of trash items using categories supplied by the app. The total number of trash items collected came to **2,307** items. Plastic straws were the most collected (n=489), comprising more than 21% of items collected, followed by plastic/foam pieces, food wrappers, and plastic bottle caps. Figure 1 provides a generalized grouping of items in fewer categories to help interpret the data.

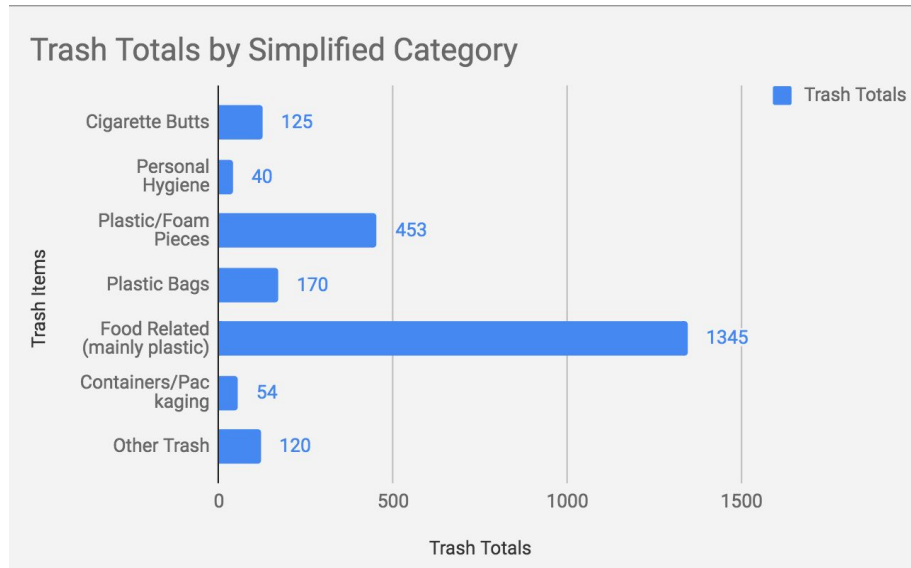


Figure 1: helps illustrate how much of the total that plastic, mainly food-related plastic, contributes to beach trash at this site.

## **Discussion**

### **Thoughts and Observations For Future Methodology**

My goals for this project involved the use of a mobile, citizen science app to enhance a beach clean-up activity because I am interested in the crossroads of technology and nature connections, environmental stewardship, and citizen science. Based on this aspect of this project, and the particular app used, there are several points to make that may aid the design of future beach clean-ups with a citizen science component.

Elements of the clean-up that worked well included: the activity itself of engaging in a beach clean-up, starting early on a weekend date to let participants feel like they had the rest of the day to do other things, having goals for collecting a certain amount of trash, and logging trash data with the very easy-to-use *Clean Swell* app. In an informal, post-activity audio interview with all participants as a group, positive comments bore out the above conclusions. Participants replied that the website sign-up was easy to use, that they felt satisfied to have collected the amount of garbage they did in a short time, and that it became clear why we started fairly early (8:00am) as

it left time to do other things. Given the pleasant weather we had for the clean up, it was suggested that we even could have worked longer.

Although local waterway projects and beach clean-ups are popular environmental stewardship projects engaging local communities (Shandas & Messer, 2008; Wyles, Pahl, Holland, & Thompson, 2017), motivations for participation as a steward or citizen scientist differ. Constructive comments from participants offered surprises that led to the above observation. Although the logging of trash data was conscientiously followed and was later called “interesting,” participants also said that it “slowed things down.” In effect, participants seemed to want to see more of the beach itself clean and to receive visual feedback than to contribute to citizen science. At the very least, participants stated that data collection would be better “if we could see the visualization of the end results somehow,” such as with graphs or pie charts. Instead of this result, the app rewards badges and maintains your collection history using visual icons for their collection categories. One participant proposed that data collection could be done for a “tiny chunk of beach” and those results then extrapolated for data purposes while the rest of the activity involves a bigger beach clean-up.

Along this same point, while the impacts in terms of actual trash collected and categorized appeared very tangible and meaningful, the participants wanted even more visual feedback of their accomplishment. In other words, they wanted to see, in person, a cleaner beach compared to when they started the activity. This may speak to the complexity observed by some researchers specifically regarding beach clean-up activities and their level of meaningfulness and restorative impact (Wyles, Pahl, Holland, & Thompson, 2017). Moving forward, and perhaps with more people, a similar project could offer the choice of data collection versus a straight clean-up, to cater to individual preferences.

### **Final Comments**

Overall, participants appeared satisfied with their participation and everyone played beach Ultimate frisbee afterwards—an advertised, connected activity to further tie-in their recreational



interests. However, while we achieved tangible results and collected data that can help inform researchers as part of a global effort, participants would have preferred more immediate, tangible feedback of seeing more of the beach itself cleaner, or perhaps more visual feedback from the mobile app to make the data collected less abstract.

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### **Appendix – Event Publicity Flyer**

# CONEY ISLAND CREEK BEACH CLEANUP & CITIZEN SCIENCE DATA COLLECTION

Saturday, July 7, 2018, 8:00am • Rain or Shine • Other dates may be added



## WHAT'S HAPPENING?

Let's contribute to a cleaner Coney Island coastal environment! We'll pick up some beach trash and also record data on what we've found.

Not far from where beach disc takes place, the shore along the Coney Island Creek needs help (see photos).

Ocean trash washes up along the Creek-side, and in 2012, contaminated water from this side flooded local residents during Hurricane Sandy.

Helping out a little here helps the whole local ecosystem that we Ultimate players enjoy, too. And if the weather is nice, there'll be time for beach disc after!



Help the environment, then play Ultimate!

## DETAILS

- When:** Saturday, July 7, 2018
- Time:** 8:00am - 9:30am
- Where:** See map at right
- Equipment:** Gloves, trash pickers, hand sanitizer, & garbage bags to be provided

**\*\* How to Sign Up \*\***  
Sign up by July 5th at:  
<http://www.coneyislandultimate.com>

In the meantime, for more info, email:  
[Lpwah1@gmail.com](mailto:Lpwah1@gmail.com)



*Coney Island Ultimate* organized the annual beach tournament in Coney Island from 2007–2012