Franklin Creek Cleanup – Litterati Data Collection Study

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Abstract

Trash pollution in our waterways can have detrimental effects on ecosystems and can be carried through creeks and streams and eventually make its way to the ocean. By studying patterns of litter pollution, the major types of litter pollutants can be identified and solutions can be created. Franklin High School's Plastic club gathered trash along Franklin Creek, geotagged the litter and tracked trash categories with the trash tracking platform Litterati. Then trash was sorted and weighed in order to determine the major types of trash. Plastics were identified as the major pollutant. We propose innovative solutions, such as a Trash Trail and other public awareness campaigns be implemented in order to make the public more aware of the trash problem that affects Franklin Creek.

Background

In the world's oceans and waterways, plastic pollution is becoming a huge problem. By the year 2300, the amount of plastic in the ocean is predicted to increase to around 300 million tons[1]. Almost every product you find today contains plastic. There are multiple types of plastics, most of which are not recyclable and are intended for single-use. The use of disposable plastics leads to a cycle of waste which contributes to significant pollution in the environment.

Plastic litter enters the waterways from many sources, such as urban landscapes. Urban runoff carries trash through storm-drains that empty into local canals, creeks, and streams, such as Franklin Creek. Franklin Creek was originally built as an agricultural drainage ditch for local ranchers and farmers. Franklin Creek drains into North Stone Lake, which is part of the Stone Lakes National Wildlife Refuge and the Sacramento-San Joaquin Delta. On the north side of the creek is a housing development and on the south side is Franklin High School and Bartholomew Sports Park. A walking trail runs alongside the creek next to the street Whitelock Parkway.

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[1] This estimate is derived from an activity in a massive open online course (MOOC) on marine litter led by the United Nations Environment Program, Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA), The Global Partnership on Marine Litter and the Open University in the fall of 2015. This course uses estimates from a recent study by Jambeck et al. (2015). In this study, Jambeck et al estimated that 192 coastal countries generated 275 million metric tonnes of plastic waste in 2010 of which 4.8 to 12.7 million metric tonnes entered the oceans. These figures were used as lower and upper emission estimates for our simulations, with 8 million metric tonnes as the most likely value. We used a mass balance model and assumed that plastics have been accumulating in our oceans since the 1950s with an average inflow rate of 2 million metric tonnes per year and an average half-life of 10 years. This half-life estimate was informed by a National Oceanic and Atmospheric Association infographic.

Once litter reaches Franklin Creek, it will either be deposited in the creek or it will be carried further downstream. For example, a plastic bottle can be carried from Franklin Creek to the San Joaquin Delta and then deposited into the ocean. From there, the bottle is carried by ocean currents and ultimately reaches the Great Pacific Garbage Patch, where it will reside indefinitely.

Pollution in the waterways poses a serious threat to wildlife because the animals are at risk of ingesting pollutants or getting entangled in them. It can also negatively impact wildlife habitat or transport invasive species downstream. For example, when pollution accumulates, it can slow water flow, making conditions more favorable for water hyacinth to grow large mats. Some forms of plastic debris can also absorb large concentrations of chemical pollutants including persistent organic pollutants or POPs. Once plastic absorbs POPs, the plastic becomes a more concentrated pollutant, which if ingested by the animal can be even more toxic than the plastic by itself. Litter can also directly affect human health and safety. Sharp objects, such as broken glass can be a hazard to swimmers and beachgoers and can carry pathogens and other contaminants.

Pollution also impacts the economy. It degrades habitats, water quality and impacts fisheries (*National Research Council 2008*). Excessive amounts of pollution can slow water flow and block waterways, which increases the likelihood of flooding in local areas. Local economies can also be affected because if enough pollution is in the waterway there can be a loss of recreational revenue streams.

Pollution is also an eyesore because it reduces the appeal of waterways, coastal areas and other bodies of water. The degradation of some coastal communities has so greatly increased that the public has become politically involved. Plastic, especially, has become such a significant problem that cities such as Santa Cruz, San Jose, and Monterey, have banned plastic bags and styrofoam which were the largest plastic pollutants found along their coastal waters.

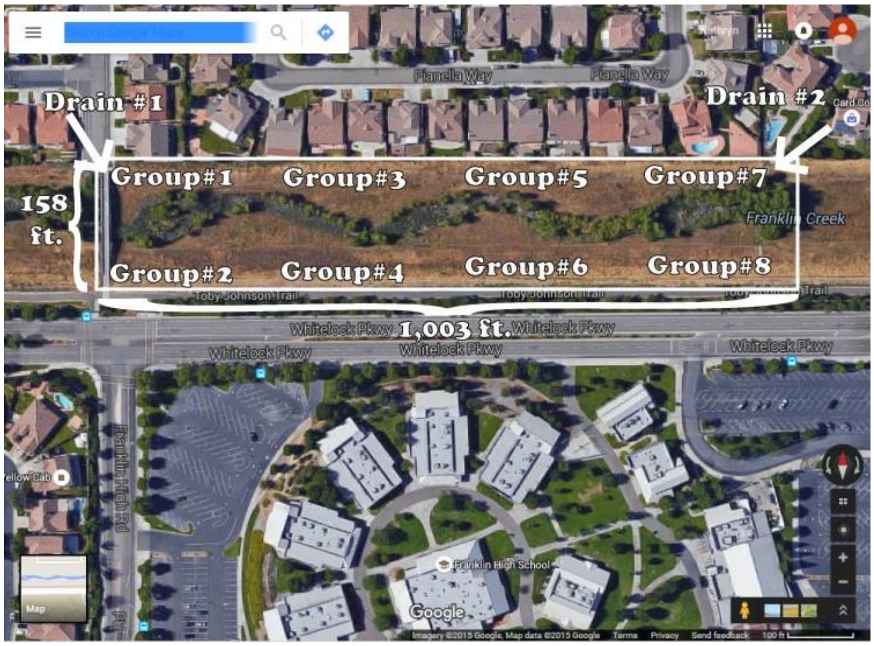
A powerful tool that informs the public to the problem of trash is the digital landfill site, Litterati. Using the Litterati app allows users to photograph trash and posts photos to the website with a geotag and timestamp. Using hashtags allow the user to create unique categories which allows people to see what items are being littered but also where, when, and how many times the item is being littered. Users can then bring up a map to identify pollution problems and inform solutions for their neighborhood litter problem, for example installing more garbage cans in an area or reaching out to a company whose brand products are repeatedly found in an area.

Purpose

The purpose of the study was to identify the amount and most common types of trash found in the Franklin Creek using Litterati. The data collected from this study is intended to inform the public about the trash pollution and how it is transported by urban runoff.

Methods

Students were divided into eight groups with three in each. Each member in the group chose a job to either pick up trash, tally the trash, or take a picture and add hashtag(s) of the trash using the Litterati app. The creek served as a barrier and four groups were assigned on each side and were encouraged to overlap. The area that was studied equaled 158,474 sq. ft *(Figure 1)*.



(Figure 1. Site Map)

The trash collected was photographed using the Litterati app, which recorded the GPS location and categorized it into the digital landfill by using unique hashtags (e.g. plastic wrapper, water bottle, plastic bags etc.). See *Attachment 1* for a map of the pollution collected. Each group had two different colored bags, which was ultimately separated into recyclables (e.g. glass, aluminum, and plastic bottles) and non-recyclables.

Afterwards the collected trash was separated into a plastic and a non-plastic category. The plastic category included plastic wrappers, water bottles, plastic bags, etc. Non-plastics consisted of aluminum cans, glass bottles, cigarette butts, etc. Students then used a luggage scale to calculate the weight of each categorized trash. The information was then recorded into multiple graphs that depicted the most and least common types of trash.

Results and Discussion of Results

For the raw data, see *Attachment 2*. In the Weight Graph *(Figure 2)*, the largest category was miscellaneous. It included items such as building materials, clothing, and electronics/appliances. Anything that was not made out of plastic, which did not fall into the other categories, was placed here. The results were anticipated because these items are larger and heavier. The second highest category by weight was miscellaneous plastic which was expected because our most tallied items fell under the plastic category. The third largest category by weight was aluminum/glass which was also expected, again, because of the heavier nature of the items.

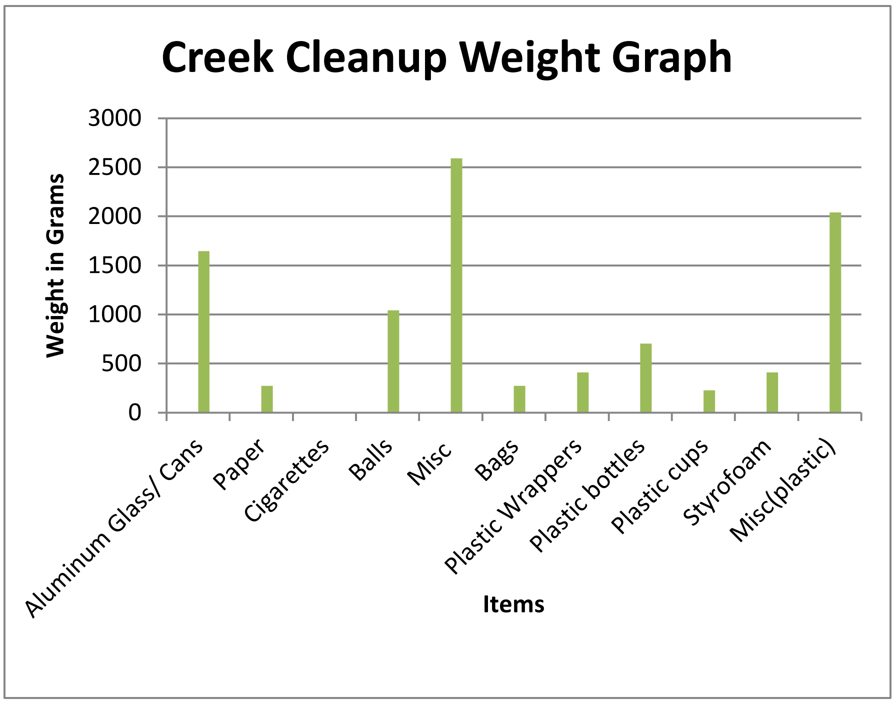


Figure 2. Creek Cleanup Weight Graph.

According to the Plastic Tally Graph *(Figure 3)*, plastic bags were tallied the most. Possible explanations for the large amount of bags include wind distribution or drain runoff. This outcome was expected because plastic bags are extremely lightweight and are easily carried by wind and water. The second highest tally was miscellaneous plastic pieces. The high number was expected because the longer plastic sits out in the sun, it begins to photodegrade and is easily dispersed due to its lightweight nature. Plastic wrappers were the third highest category which was also expected due to the nearby proximity of the school, park, and stripmall.

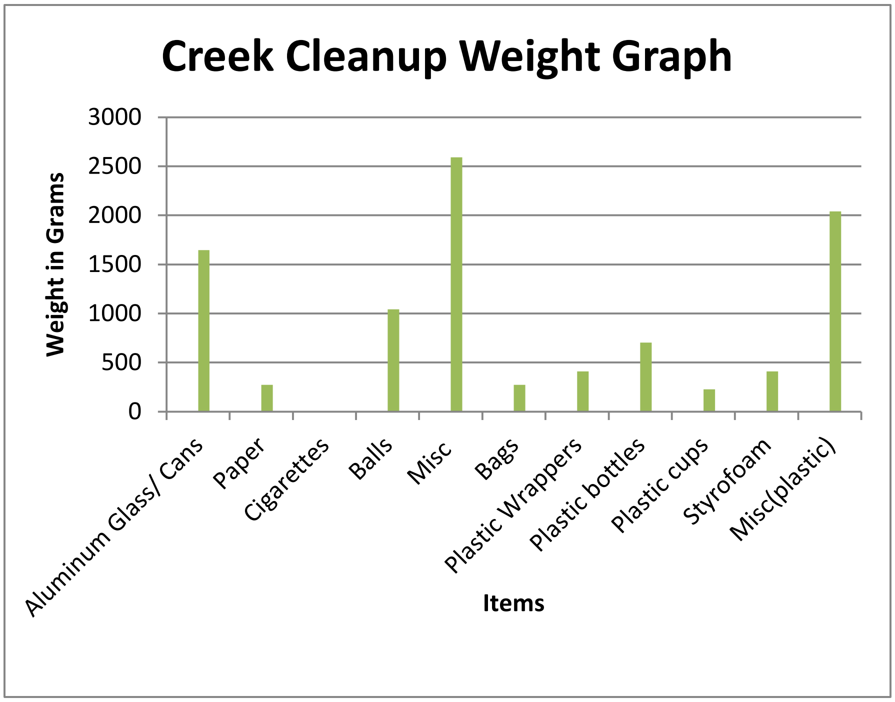


Figure 3. Weight Graph.

The Non-Plastic Tally Graph *(Figure 4)* shows that paper had the most tallies because it is lightweight and easily transported by wind and water just like plastic. The second highest tally under non-plastics was toys/ balls. Twenty one balls were collected. This was unexpected but they may have been carried through storm drains from the surrounding neighborhoods, thrown over by residents who live along the creek with children or dogs, or even from the sports park across the street.

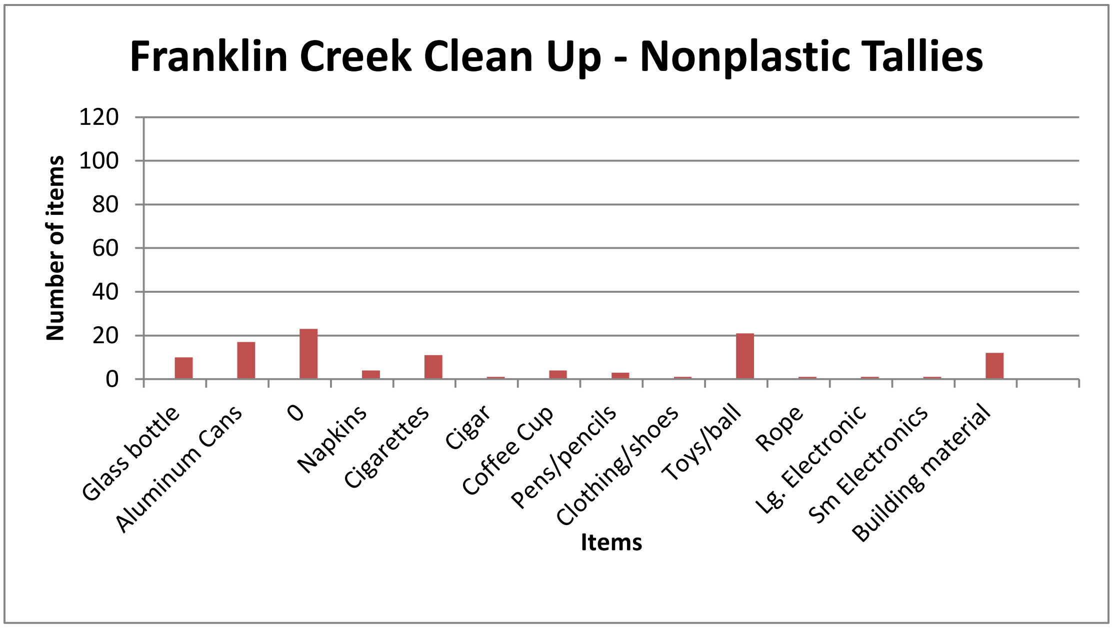


Figure 4. Non-Plastic Tally Graph.

Conclusion

The goal of the Franklin Creek Clean Up, using Litterati, was to identify the numerous types of environmental defilement. Items were collected to understand different types of waste that were deposited in creeks which lead to rivers and then eventually the ocean. There was 0.059 grams of trash collected per square foot in the area of study. This study showed that the most common type of trash was made out of plastic. Plastics bags were the most tallied plastic category and have become a problem everywhere. As mentioned earlier, some communities have begun to tax or ban plastic bags, which according to our data would be beneficial if implemented here in Elk Grove. A public awareness campaign about the benefits of using a reusable bag could also help decrease the number of plastic bags.

Since plastic bags, plastic pieces and food wrappers were the most tallied categories, creating a public awareness campaign targeting the foot traffic along the creek would be helpful. More trash cans need to be put along the walking trail so that students or others do not litter into the creek. Another solution is to possibly create a “Trash Trail” where maps and signage could be used to inform the public about problems associated with plastic pollution in waterways.

Twenty six students participated in the creek clean up. Collecting the trash allowed club members to further understand their roles in the Plastics Club and connected them to the pollution that they and their peers may have contributed to the environment. The students changing their habits can also influence peers and parents to change their bad habits. Encouraging more students to participate in cleanups will inspire environmental stewardship and hopefully decrease the amount of trash in Elk Grove waterways.

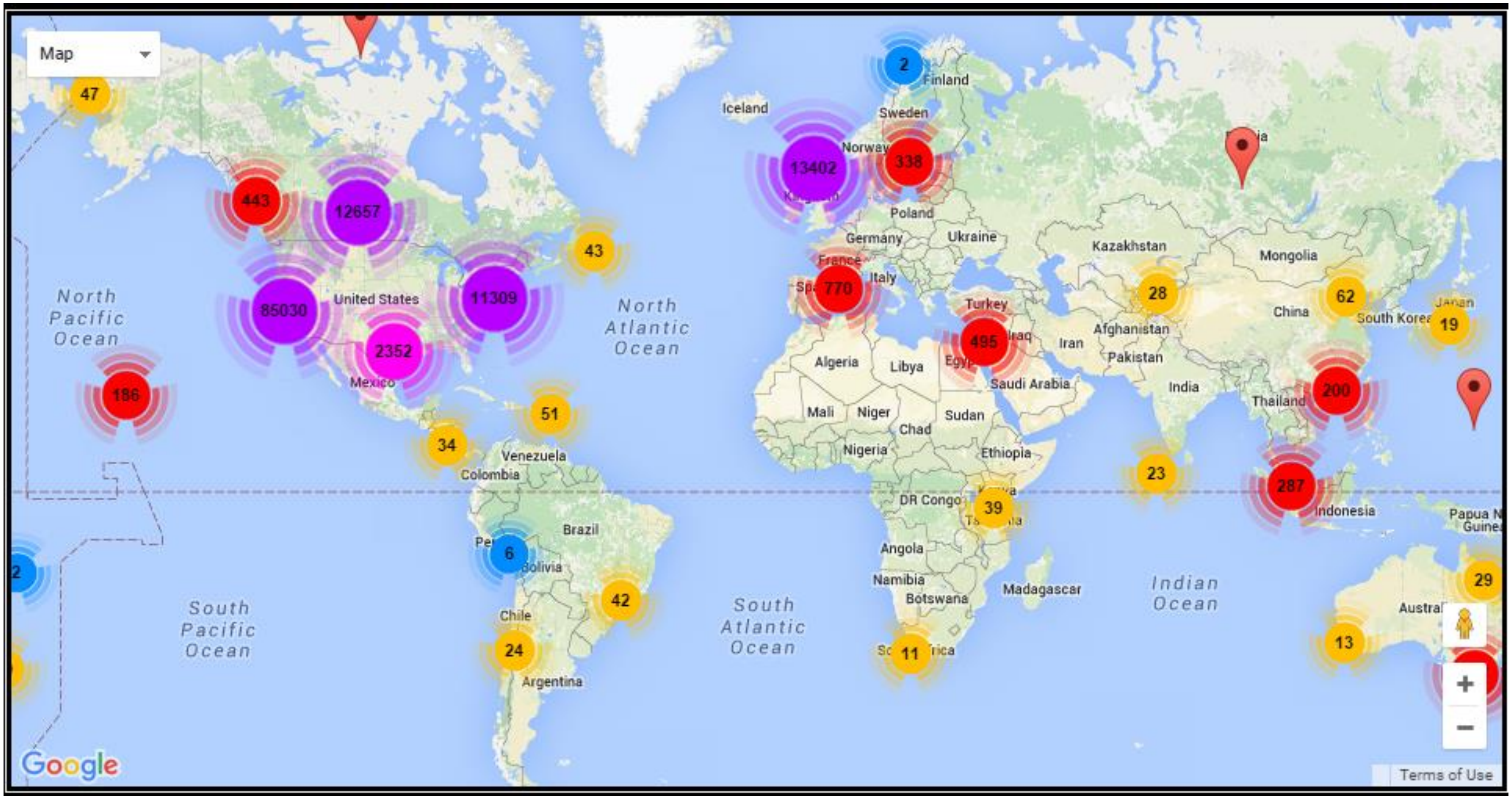
References:

National Research Council. (2008). *Tackling Marine Debris in the 21st Century*. Washington, DC: The National Academies Press.

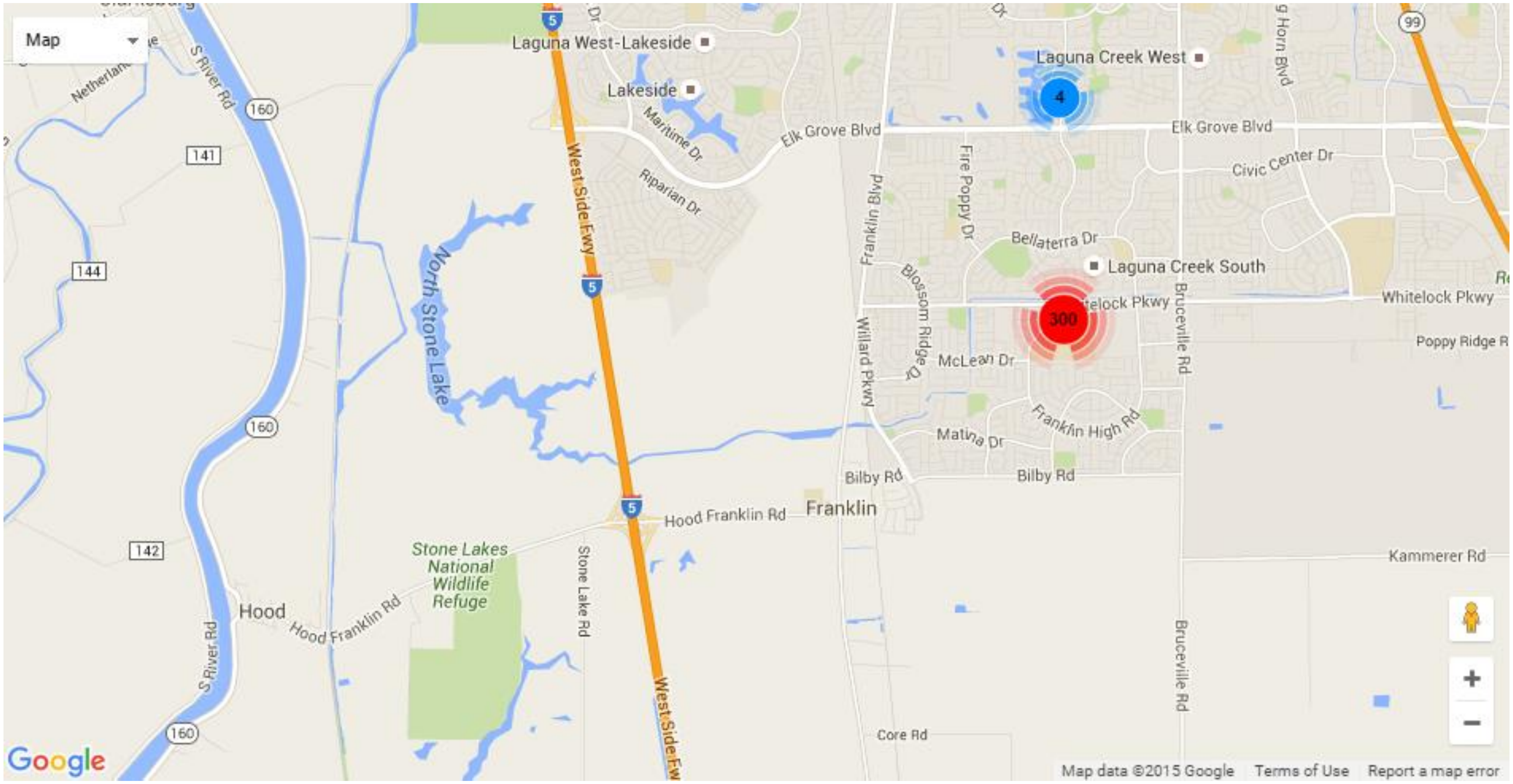
Jambeck, Jenna R., et al., (2015). Plastic waste inputs from land into the ocean. *Science.* 347(6223), 768-77. doi:10.1126/science.1260352.

Attachment 1 – Litterati Maps

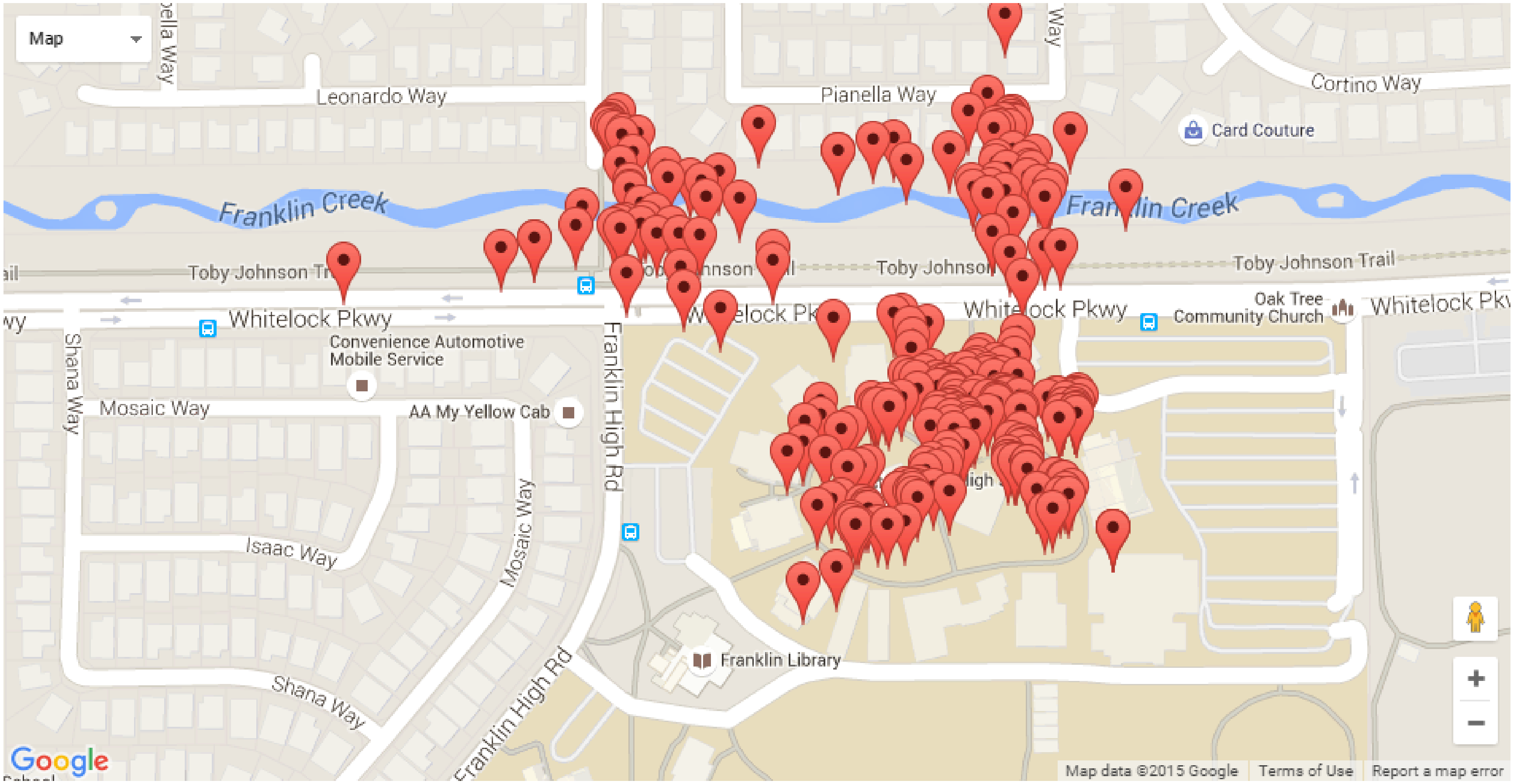
Map 1 – Global Map



Map 2 – Franklin High School Region



Map 3 – Franklin High School Geotagged Pollution Data



Attachment 2 – Raw Data

Table 1 – Franklin Creek Cleanup Weight

Items	***Weight in Grams***
Cigarettes	2
Paper	272.3
Aluminum Glass/ Cans	5
Bags	272.2
Water bottle	8
Styrofoam	408.2
Wrappers	408.2
Balls(21)	1043.3
Misc (plastic)	2041.2
Misc	2041.2
Aluminum	1642
Plastic bottles	694
Plastic cups	226.8
Misc	2590
Total	*11,654.4**

**This is equal to 11.7 kg or 25.7 lbs.*

Table 2 – Franklin Creek Cleanup Plastic Debris

Plastic bag	104
Plastic wrapper	44
Ziploc bag	8
Plastic cup	29
Water bottle	28
Other bev. bottle	13
Plastic bev. cap	11
Coffee lid	4
Styrofoam cup	21
Styro. container	4
Plastic take out	4
Plastic silverware	1
Straw	8
Straw wrapper	5
Plastic netting	1
Cleaner bottle	2
Petroleum bottle	1
Misc styrofoam pieces	22
Misc plastic bottle pieces	10
Misc platic pieces	62
Total	*382*

Table 3 – Franklin Creek Cleanup Non-Plastic Debris

Glass bottle	10
Aluminum Cans	17
Paper	23
Napkins	4
Cigarettes	11
Cigar	1
Coffee Cup	4
Pens/pencils	3
Clothing/shoes	1
Toys/ball	21
Rope	1
Lg. Electronic	1
Sm Electronics	1
Building material	12
Total	*110*

Attachment 3– Sample of Photos Submitted – Visible Online at Litterati.org