

Abstract

This project investigates how Cal Poly Pomona's waste disposal systems tie into globalized systems and reflect trends in human behavior and consumption. I analyze waste data from the on-going CPP Garbage Project, as well as newly acquired garbage from Buildings 5, 9, 97, 19, 162, 163, 35, 52, and 72. I systematically recorded and analyzed 28 bags of trash in a database of attributes from trash collected in 2023 and 2024 totaling over 3,000 artifacts. I explored what artifact analysis and geographic spatial analysis reveal about the patterns in the disposal of recyclables and single-use packaging across-campus. I then linked these patterns to larger socio-economic implications and provide ideas for how to promote sustainability within our campus and beyond through non-normative recycling methods.

Introduction & Background

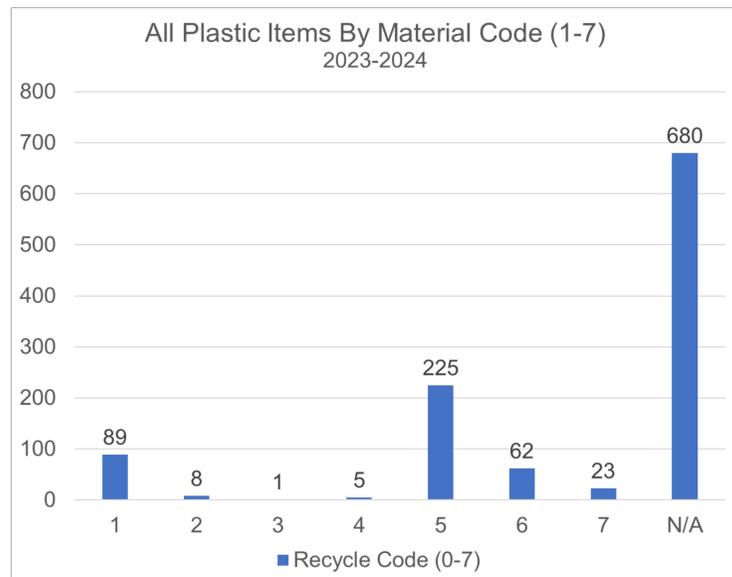
Over the past 150 years, archaeology has primarily been concerned with refuse from societies of the past. Archaeologists use methodical research techniques to systematically sort, catalogue, and process various artifacts and sites in order to discern information about various populations, cultures, environments, and rituals both past and present. Over time, some archaeologists posited that if researchers could learn about prehistoric and historic societies by sifting through what is essentially ancient garbage, we could apply those same methods on present day refuse patterns to better understand and promote a more sustainable and equitable society.

Over the past two years, Cal Poly Pomona's Anthropology department has been researching CPP's waste behaviors in the CPP Garbage Project. Headed by Dr. Annie Danis, students collaborate with Facilities Management and Planning to sort and analyze waste on campus to answer questions concerning caffeine consumption, physical labor, recycling behavior, and potential illegal/contraband items on campus. Analyzing artifact data from campus trash expands our understanding of refuse habits on this campus and inspires ways to encourage proper disposal methods. Here I analyze this data holistically for the first time, comparing consumption patterns across years and between buildings, and investigating choice artifacts journeys from raw material through production, use, and disposal.

Contemporary archaeological waste studies originate with the 1973 Garbage Project, which investigated the amount of specific types of waste accumulation within garbage facilities in Tucson, Arizona (Rathje & Murphy 2001; Lehmann 2015). The project excavated and analyzed fresh refuse from landfills and households to study food waste, diets, recycling, and environmental and physical health impacts. They were able to study consumer behaviors directly from material in trash and were able to showcase what items contributed the most towards landfill packing, which influenced more sustainable solid waste management practices and increased awareness about how materials are processed and move through various waste streams and into U.S. landfills. The CPP Garbage Project also contributes to discard studies, a branch of waste analysis that aims to deconstruct refuse patterns as processes under inefficient infrastructure and socio-economic strata, as well as struggles against power structures (Arefin 2021; Lau 2023; Libirion & Lepawsky 2022).

Part of the framework for my research builds upon the method of creating object itineraries (Dunn, Earl, Foka, & Wootton, 2019) to understand the complicated and intricate processes of our globalized waste networks. An object itinerary is essentially a constructed narrative that traces the 'life' and use of an object to understand the (global) spatial relations/circulations and impact an 'ordinary' object can have on our world, global relations, and our lives (Joyce & Gillespie, 2015). In an effort to work within a post-processual, sustainable mindset, it is important to understand how the geospatial conceptions behind digital narratives can influence an object's accessibility, context, and important historical and cultural significance. Researchers have constructed various digital landscapes with object itineraries (Joy, 2009; Dannehl, 2017; Burström, 2014), placing specific emphasis on how understanding the circumstances in which an object is constructed and utilized, as well as the ways objects that are often seen as inert exact force and have impacts on us, can allow us to understand the role we play in the broader scale of excess creation and disposal during the Anthropocene epoch.

By engaging with new materialistic theory and environmentally critical mindsets, we can begin to construct physical and digital landscapes with GIS technology that allow us to analyze waste and discard as objects that exist in liminal spaces of utmost importance, whether that be the body, households, city scapes, or nationally (Arefin, 2021). By tracking how our waste is created, where the resources for our everyday products are coming from, how these items are utilized, and where these items end up after we use them, we're able to understand the incredibly complicated and intricate 'life' an object goes through and all the people and parts necessary to create the items we often place zero value and meaning into.



Materials and Methods

During the 2023 and 2024 CPP Garbage Project, the ANT 4300 class collaborated with Facilities Planning & Management to obtain a total of 30 bags of waste: one bag of trash and one bag of recycling were collected from outside Buildings 5, 9, 97, 72, 15, 162, 163, 35, and 52, resulting in 15 total bags of trash, 15 total bags of recycling. Our class assigned each bag a number, recorded which building it came from, whether it was from a trashcan or recycling bin, and the collection date. Each individual bag was weighed before it was sorted and then students separated food waste or food-contaminated artifacts from the artifacts that could be washed. Students collected food waste and liquids in a bucket that was then weighed and disposed of. Food contaminated trash that could not be washed was recorded by material type and number in the artifact database and then disposed of. Durable artifacts were washed, sorted, and tagged with a unique ID. These IDs followed a naming convention: building #-unique artifact number-recycling or trash (15-245R). We observed the following characteristics for each artifact and recorded them in an online spreadsheet: Disposal Condition, Material Type, Recycle Code, Receptacle Type, In Correct Receptacle (Y/N), Brand, Function, Package Form, Caffeine content (mg) (when applicable), Beverage container size (oz) (when applicable), Sugar content (mg) (when applicable), Beverage type (when applicable), and Caffeine type (when applicable). Proper disposability was assessed on two counts: 1) by material type (paper, plastic, metal), and 2) by recycle codes, which are used to identify the type of plastic an item is made out of. Only types 1 and 2 plastic are actually recyclable on campus; types 3-7 are harder to break down and reuse, and aren't universally collected in local recycling programs (Ho 2022).

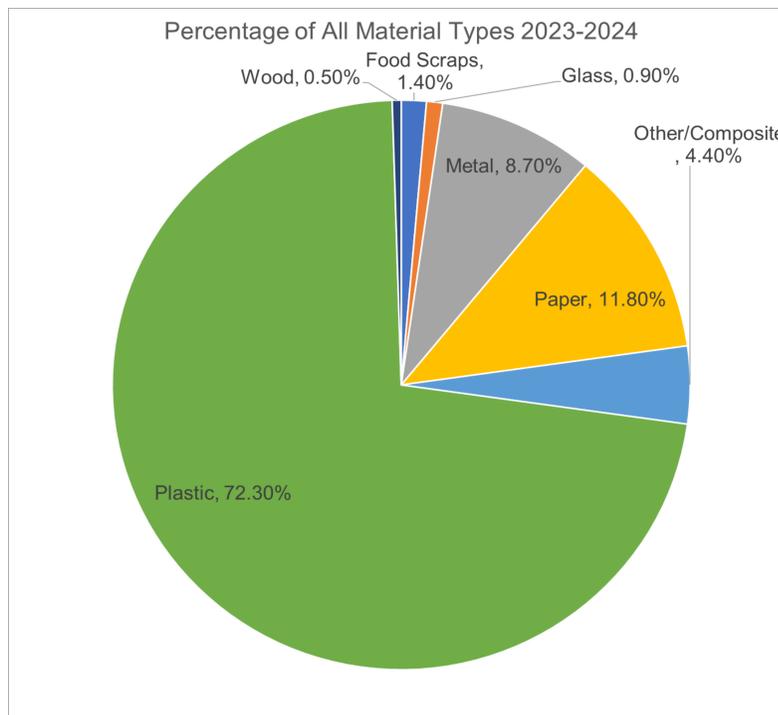
Another component of this project focuses on the spatial relation of objects associated with waste in correlation with various contemporary human behaviors and global consumerism. Using GIS technology, I mapped trash receptacles around campus, including solid waste bins, recycling bins, and compost bins, as well as the BigBelly trash can locations in public, high-traffic areas; BigBelly trash cans are Smart waste receptacles that are designed to hold up to 1.7x the weight of a regular capacity trash can and can sense and lock shut if that capacity has been met. I also mapped active and inactive trash facilities across LA County and San Bernardino County within a 25 mile radius of Cal Poly Pomona. The layers will be available for use as an interactive web app, where students can locate various trash receptacles close to them based on trash can type and building number/location. I linked the artifact data to each trash can and was able to conduct density analysis in order to determine whether we have a proportional ratio of trash cans to students across campus; assess whether high-traffic areas on campus are receiving acceptable care and attention in mitigation efforts to encourage proper waste disposal habits; and understand what cities are undertaking the largest burden of trash collection/processing and resulting pollution in an effort to promote sustainability by inspiring proper disposal methods. Utilizing ArcGIS Pro and ArcGIS Online user apps, I've borrowed from museum archival practices and online collections to construct spatial narratives through digital object itineraries and have created a biography that shows the interconnected web of the 'life' of each object. In order to build this understanding and create platforms that easily disseminate this knowledge, I chose three of the most prevalent prominent artifact types of garbage from within the assemblage. Use the QR code below to see a more detailed spatial analysis and the full object itinerary on the assemblage, as well as a more complete breakdown of my methodology and process

Results

Over the past 2023/2024 academic years, we collected a total of 3,018 individual pieces of garbage. 1,889 pieces were collected during the Fall 2023 academic semester, and 1,129 pieces were collected during the Fall 2024 academic semester. Out of the entire assemblage, the majority of the waste was made up of plastic (72.3%, 2,094 items), with the next largest category being paper (10.9%, 320 items). We found that out of the 1,704 total items placed in landfill bins, only 447 total pieces of trash were properly disposed of; this means that 73.7% of the garbage thrown away was disposed of incorrectly. As for the recyclables, we found that out of the 1,314 total recyclables, 806 pieces were disposed of properly; this means that only 38.7% of the recyclable material thrown away was disposed of incorrectly.

In 2023, 54.6% of the assemblage (1,032 pieces) were collected from landfill bins and 45.4% (857 pieces) were collected from recycling bins. Out of the 1,889 total artifacts, the majority of the waste was made up of plastic (70.8%, 1,337 items), with the next largest category being made up of paper (12.2%, 231 items), followed up closely by metals (9.6%, 182 pieces). Over the entire assemblage, 40.4% of garbage was properly disposed of, and 59.6% were not. 897 items within this assemblage did not have spatial data attached to them (lack of Building #), which did not impact assessment of disposability but did hinder a complete analysis of disposability based on location in 2023 compared to 2024. Across Buildings 5, 9, and 97, we found there was consistently more garbage disposed of improperly. In Building 5, only 13% of items were disposed of properly. In Building 9, only 5%. In Building 97, 6% of the items were disposed of properly. Overall, we found that only 8.6% of garbage was disposed of properly across all three buildings and both can types, with an overwhelming 91.4% being disposed of incorrectly. Additionally, we found that out of our total plastic assemblage, plastic that was not overtly labeled with a recycling code, as well as types 5, 6, and 1 were the most prevalent in our garbage. We found Type 1 plastic made up 12% of our waste, Type 2 plastic made up .88% of our waste, Type 3 plastic made up .22% of our waste, Type 4 plastic made up 1.1%, Type 5 plastic made up 26% of our waste, Type 6 plastic made up 6% of our waste, and non-labeled plastic made up 53% of our waste.

In 2024, 59.5% of the assemblage (672 pieces) were collected from landfill bins and 40.5% (457 pieces) were collected from recycling bins. Out of the 1,129 total artifacts, the majority of the waste was made up of plastic (66.7%, 753 items). The next largest category was made of composite materials: things like wrappers, which are made up of aluminum and plastic or paper and plastic (11.5%, 130 items). The smallest material type present were metals (9.9%, 112 pieces). Due to the increased amount of food waste in our assemblage this year, a majority of our paper waste was soiled. We decided to weigh and dispose of these items due to their lack of feasible storage longevity. Paper weight amounted to a total of 32.56 kg, with the majority of the waste occurring from single use plates, cups, and take-out containers. Over the entire assemblage, 68.5% of the items were properly disposed of and 31.5% were not properly disposed of. Overall, trash in Buildings 5, 52, 162, and 72 have the highest rates of garbage and the highest percentages of properly disposed and improperly disposed of trash.



Link to my Garbage Project Storymap:
An interactive digital platform that connects the physical work of the garbage project, the geographic spatial analysis of local trash facilities and waste bins, detailed object itineraries, and extra media resources about waste!



Discussion

When comparing 2023 to 2024, I found that there were higher rates of improperly disposed trash in 2023 than in 2024. In 2024, Buildings 5, 35, 163, and 97 had the heaviest landfill trash bags with the greatest excess of weight from food waste. This data tracks with my hypothesis that higher traffic areas on campus (areas with larger populations of students, buildings with food centers, etc.) would have higher amounts of trash than buildings in areas that are less traversed with no food centers. Each of these trash cans and buildings only have combined Landfill and Recycling as opposed to the new three-bin sorting system of landfill, recycling, and compost; I believe a lock of compost bin contributes to improper sorting and unconscious disposing of goods. Conversely, I collected and surveyed trash and recycled material from cans outside of Building 162; this area had a landfill, recycling, and compost bin, and the results were varied compared to the other trash cans which only had landfill and recycling bins. Not only were the bags much lower in weight (2.9 kg for the recycling bag, with only 1.3 kg being made up of food waste, and 3.0 kg for landfill, with only 1.9 kg being made up of food waste), but this was by far the lowest overall weight and food waste weight across all of the bags surveyed this year.

I believe that when students are presented with easy access to alternative correct disposal methods, they're more inclined to take the extra time and step to properly dispose of their waste. If we continue implementing this bins around campus, and especially in high traffic areas close to food vendors and building entrances, I believe the mass amounts of food waste in both recycling and landfill bins, as well as the overall weight from items that should be separately hauled through compost or food disposal bins, can be better dealt with. Additionally, understanding the 'life cycle' of where our products are sourced from; the time, effort, and labor necessary to create these items; where they go after their disposal; and the environmental/public health effects of our consumption both local and global can cause an important shift in the way we understand our relationship to everyday objects and the consequences of our globalized waste network.

Broader Impacts

We can further mitigate improper disposal of food waste by incorporating micro changes to our campus's waste system, as well as the way we perceive systemic waste streams both locally and globally. Greater education and information surrounding proper recyclability and disposal habits at CPP could help individuals on campus make more informed and sound decisions in terms of disposal. Additionally, understanding the various waste streams and labor efforts it takes to manage our garbage could lessen apathy and improper disposal habits. The campus administration could make an effort to incorporate further compost and food waste bins around campus and post images and/or lists about acceptable forms of garbage by each receptacle around campus.

If possible, the BigBelly trash cans should be used to their full capacities. As previously mentioned, BigBelly trash cans are Smart waste receptacles that are designed to hold up to nearly twice the weight of regular capacity trash can and can sense and lock shut if that capacity has been met. If all the trash cans were able to lock or signify when they're full or above a specific weight capacity, then students wouldn't be able to overload the trash, causing harm to facility workers who manage the garbage. Additionally, we should add more compost bins to the Landfill and Recycling bins. Due to the vast amount of paper waste that is being produced on campus (and the physical harm created by the heavy build up of such materials), it would be beneficial to have a greater number of these receptacles around campus for students to dispose of items like handouts, flyers, newspapers, etc. that they might not even know can be put towards our green waste recycling efforts. Additionally, we could begin testing specific bins and receptacles to hold food waste and liquid waste to further aid in proper sorting of waste, better recyclability, and assist in alleviating some of the unnecessary physical burden from our facilities members.

On a local level as well, we can work towards continuing to educate ourselves and others on how our behavior plays into wider and broader industrial systems of excess waste as a profitable business model and oppressive force. We must begin to truly understand and engage with the price of our convenience beyond a superficial understanding of the waste streams around us. By understanding the broader scale that our personal and individual actions play into, we can begin to make change. We can use these ideas as a foundation to probe further into where and why certain places are the prime targets for the majority of the industrialization and creation of products we use in our daily lives, as well as the greater toll our excess consumption takes on others and our planet. This understanding will allow for further research surrounding questions of social justice, marginalization, and sustainability in regards to trash as both an instigator and threat to traditional ways of understanding the world.

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