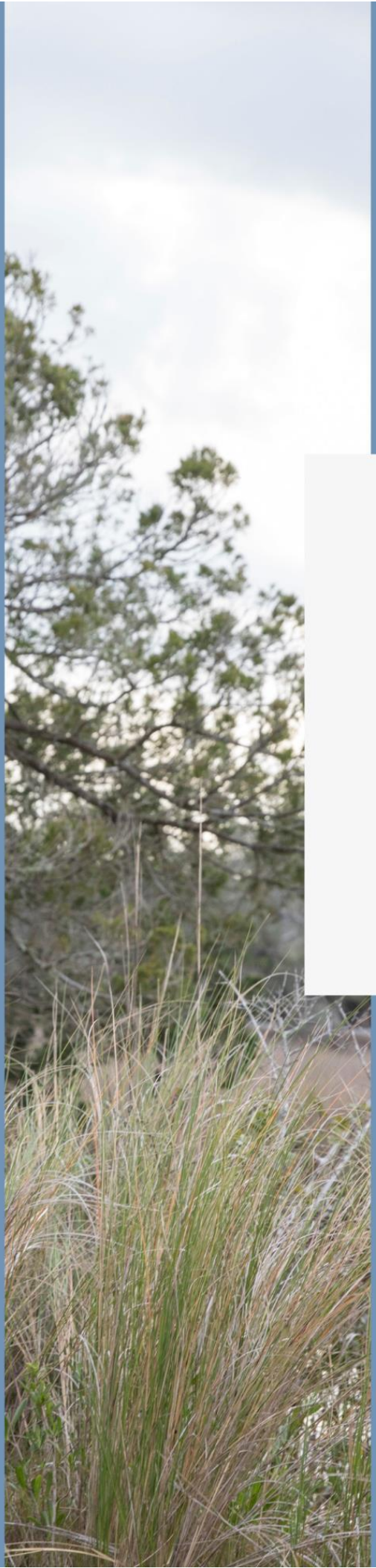

CIRCULARITY INFORMATICS LAB
UNIVERSITY OF GEORGIA

CIRCULARITY ASSESSMENT

Jekyll Island

JAMBECK RESEARCH GROUP

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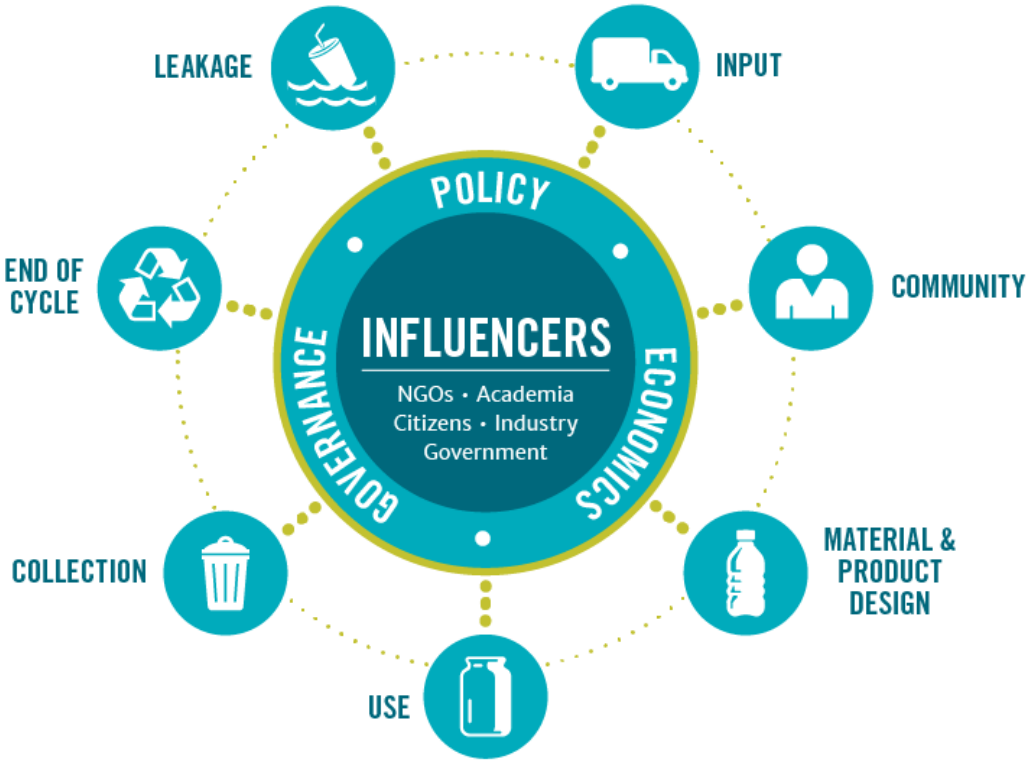
EXECUTIVE SUMMARY

Developed by the Circularity Informatics Lab at the University of Georgia, the Circularity Assessment Protocol (CAP) is a standardized assessment protocol to inform decision-makers through collecting community-level data on plastic usage. Grounded in materials flow and systems thinking concepts, the CAP uses a hub-and-spoke model to holistically characterize how consumer plastic flows into a community, is consumed, and flows out, either through waste management systems or leakage into the environment. The model, shown below, is comprised of seven spokes: input, community, material and product design, use, collection, end of cycle, and leakage. At the center, the system is driven by key influencing stakeholders such as industry and government and by influencing mechanisms such as policy as economics.



In February and August 2020, a team from the Circularity Informatics Lab conducted field work on Jekyll Island, a historic state park in coastal Georgia and popular tourist destination. The CAP was conducted with support from the Jekyll Island Authority. Field work included product and packaging assessments in stores across the island; key stakeholder interviews with government, industry, and non-profit organizations; material type characterizations for consumer plastic items; cost analysis of reusable products and alternatives to plastic available on the island; visual audits of recycling contamination; identification of public waste and recycling collection bins; waste characterization of hotel and public waste streams; and litter transects in densely populated areas. Key findings from each spoke are summarized in the following table.

KEY FINDINGS

INPUT	Consumer plastic from convenience items like beverages, candy, and snacks originates within the U.S., traveling on average 1,300 km to Jekyll Island.
COMMUNITY	While several stakeholders expressed that policy would not be a culturally appropriate lever to target plastic pollution on Jekyll Island, businesses across the island have voluntarily switched to products perceived as more environmentally friendly. Visitor responses and level of awareness around the issue are reported as mixed, with many stakeholders recognizing that plastic pollution is a problem globally but not perceiving it as a problem locally.
PRODUCT DESIGN	Although some businesses are using more expensive compostable alternatives to plastic, industrial composting facilities are not available on the island and these items will not biodegrade in the environment.
USE	Reusable products are available at many stores and gift shops across the island, but they often come at a price premium of over 200% more compared to single-use plastic. For both businesses and consumers, cost is a key barrier to switching to alternatives to plastic.
COLLECTION	Public recycling is available across the island, but bins often contain high levels of contamination. Many hotels do not provide guest recycling due to prohibitive costs, and some businesses that rely on the Jekyll Island Authority to manage their waste stream do not have access to recycling.
END OF CYCLE	Private haulers take waste and recyclables off the island. Waste generated on Jekyll Island has a particularly high fraction of organics and plastics, likely related to the transient tourist population on the island. Recyclables are taken to a materials recovery facility for processing; glass and #3-7 plastics have no resale markets for recycling.
LEAKAGE	Tobacco products and single-use plastic food packaging take the lead as primary litter categories, both in the community and in the environment.

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INTRODUCTION

This report documents work conducted by the Circularity Informatics Lab at the University of Georgia (UGA) in an agreement with Jekyll Island Authority (JIA). Background information and a literature review was conducted in January 2020. Field work was conducted on February 16-21, 2020, and on August 10-14, 2020.

For nearly ten years, the Georgia Sea Turtle Center (GSTC) has been monitoring the coast of Jekyll Island for marine debris, logging 11,073 items in 2020 alone. The program began with a grant from the University of Georgia Southeast Atlantic Marine Debris Initiative (funded by NOAA) in 2011 and has grown and been sustained with AmeriCorps volunteers, other grants (including from NOAA), and local volunteers. The GSTC has been one of the "Top Trackers" using the Debris Tracker citizen science app since its inception in 2011. Research from these litter tracking efforts have correlated types and locations of debris with Loggerhead Sea Turtle habitat[1]. Other analysis of citizen science litter data on Jekyll Island was completed in the Jambeck Research Group by Katherine Shayne, concluding that the majority of debris on the island came from local-sources.[2]

JIA is interested in ways to mitigate and reduce the quantity of litter (especially plastic) ending up in the environment. One of the most promising emerging solutions to the plastic pollution crisis is the circular economy, which aims to "decoupling economic activity from the consumption of finite resources" through designing waste out of the system and keeping products in use in a circular loop.[3] But what does circularity look like on the ground in a community? JIA collaborated with the Circularity Informatics Lab at UGA to conduct an assessment of the circularity on the island which can inform data-driven interventions to prevent plastic pollution.

The Circularity Informatics Lab at the University of Georgia has developed a Circularity Assessment Protocol (CAP), which is a standardized assessment protocol used to collect community-level data to inform decision-makers (http://circularityinformatics.org/). The CAP characterizes seven community components:

1. **Inputs** – What products are sold in the community and where do they originate?
2. **Community** - What conversations are happening and what are the stakeholders' attitudes and perceptions?
3. **Product_design** - What materials, formats, and innovations are found in products, particularly packaging?
4. **Use** – What are the community trends around use and reuse of product types?
5. **Collection** – How much and what types of waste are generated? How much is collected and what infrastructure exists?
6. **End-of-cycle** – How is waste disposed? What is the fate of waste once it is properly discarded? How is it treated?
7. **Leakage** - What waste ends up in the environment? How and why is it getting there?

Various influencing factors drive this system including governance, economics, policy, and legislation (e.g., bans, taxes). Furthermore, multiple stakeholders exist at every level of the CAP influencing the complex

[1] JM Martin, JR Jambeck, BL Ondich, TM Norton (2019). Comparing quantity of marine debris to loggerhead sea turtle (Caretta caretta) nesting and non-nesting emergence activity on Jekyll Island, Georgia, USA, Marine Pollution Bulletin, 139, 1-5.
[2] Shayne, K. (2018). Participatory sensing marine debris: estimates for amounts, types, and distribution using marine debris tracker data, Masters Thesis, University of Georgia, Athens, GA.
[3] What is a circular economy? A framework for an economy that is restorative and regenerative by design. Ellen MacArthur Foundation. https://www.ellenmacarthurfoundation.org/circular-economy/concept

system, and these include the public, government, industry, NGOs, and academia. While the hub and spoke model illustrates the CAP, it is a complex system with components inherently interconnected to each other and to life-cycle impacts beyond each spoke. The CAP is a framework approach to the flow of materials, in this case focusing on plastic and packaging, and the quantity and characterization of leakage from this sector will be characterized during litter assessments that can inform upstream interventions in the rest of the systems model. While CAP is underway in 26 cities in ten countries, comparable data is not yet publicly available online. The UGA team will conduct a workshop in 2021 to share CAP results with JIA, in which results from comparable sites can be discussed confidentially.

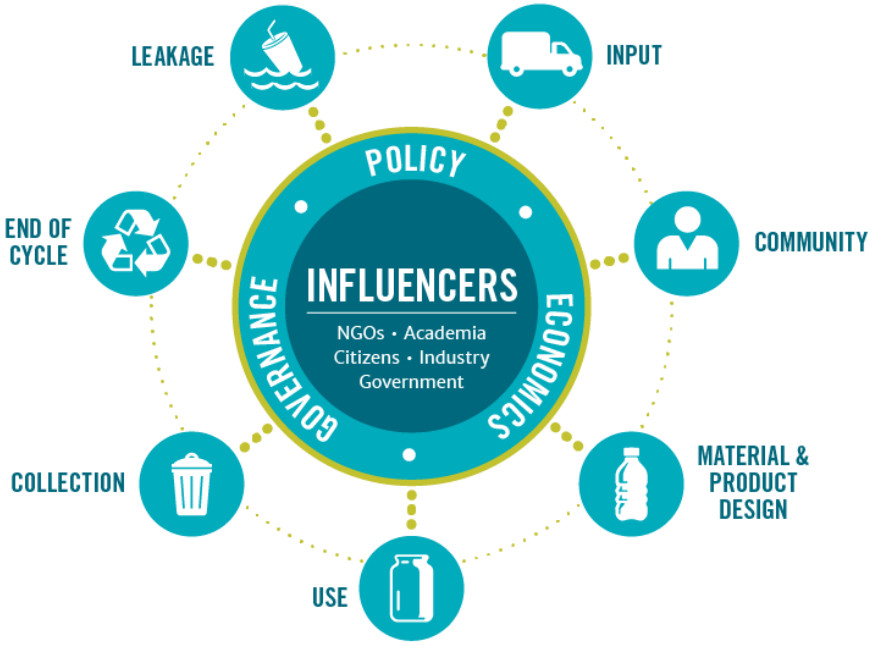

Figure 1: CAP hub and spoke model to characterize circularity in a community.

While a wealth of data on plastics in the environment exists thanks to the ongoing citizen science efforts of GSTC volunteers, CAP provides an additional layer of data by characterizing plastic flow, usage, and disposal in context, within the community. Existing data provides a valuable characterization of litter in environmental sinks, identifying plastic as a problem. CAP characterizes the system around consumer plastic that can lead to leakage into the environment.

This report documents the data collected in collaboration with JIA during the CAP conducted on Jekyll Island. It also includes recommendations discussed with Ben Carswell and Katie Doherty from JIA on November 6, 2020. Moving forward, there are opportunities for JIA to expand existing efforts on circularity (e.g., reuse and recycling), and intervene or make changes where desired to reduce plastic ending up in the environment and subsequently, the ocean. The report is split into the following sections of the CAP, which include results and discussion of each: Input, Community, Product Design, Use, Collection, End of Cycle and Leakage, followed by Recommendations.

Input

Grocery, convenience stores, and food vendors – key points of input for consumer plastics - are concentrated in the Beach Village and Historic District, with some dining options available in hotels across the island.

Samples of common convenience items (beverage, snacks, and candy) were collected from four stores on the island which sold food products; two were convenience or grocery stores, and two were gift shops which also sold snack food products. On average, stores had 28 beverage brands, 20 snack brands, and 23 candy brands for sale.

The top three brands across each common convenience item category were purchased; top brands were selected based on amount of shelf space occupied. The location of origin was determined from manufacturing locations listed on product packaging or, in some cases, desktop research on the brand parent company. Products categories mapped from Jekyll Island to the company of origin are shown in Figure 2 below. Beverages sampled included sodas, water, electrolyte drinks, and other to-go beverages. Candy included single-serve candies such as chocolate and candied nuts. Snacks included chips, cookies, and crackers.

Figure 2: Flow of products on to Jekyll Island from companies of origin across common convenience item categories. Distance is shown from center of Jekyll Island to center of city where company is headquartered.

Companies of origin were primarily US-based; beverages, candy, and snacks had a similar distribution, with an average of around 1,300 km between Jekyll Island and the company of origin, shown in the table below.

Smaller, regional brands were also present, mostly providing gourmet snack options found in smaller gift and souvenir stores.

Product Type	Average Distance from Store to Company of Origin (km)
Beverage	1,382
Candy	1,358
Snacks	1,317

Table 1: Distances from Jekyll Island to companies or origin. Distances are taken from center of Jekyll Island to the center of the city where company is headquartered projected using an Azimuthal Equidistant projection. Values are intended to be approximate.

Restaurants and stores we interviewed are typically using the same food service distributor to purchase food supplies and to-go containers and are therefore limited in packaging selection to options provided by that distributor. Other food products, such as the convenience items surveyed here, arrive pre-packaged by the manufacturer. Vendors of snack foods and beverages are often supplied by distributors specific to that brand (for example, Coca Cola or Frito-Lay) that run independent routes. Beer, wine, milk, and bread are supplied on a similar distribution model. For the grocery store we interviewed, other grocery products are supplied by a large grocery distributor that provides grocery products and some produce. These grocery supplies are typically delivered in stackable, plastic reusable bins that are unpacked and collected at the time of the next delivery. Produce and meat are also ordered from small, local suppliers.

Gift items and specialty food items in this store primarily come from the gift market in Atlanta. In addition, some specialty, gourmet food lines are distributed through a company-specific sales forces. These products typically come through a shipment service like UPS or FedEx, most often packaged in cardboard.

Community

To understand current attitudes and perceptions of plastic pollution, interviews were conducted with 15 key stakeholders, representing hotels, restaurants, stores, advocacy organizations, and the local government.

At the time of this study, Jekyll Island does not have regulations around consumer plastic use. There is an ordinance to attempt to control plastic leakage in new construction, specific to external installation and finishing systems. Glynn County has a local ordinance against littering with a $1,000 fine, as is typical of many communities in the U.S., but these have historically proven difficult to enforce.

When we asked key stakeholders if there were policies around plastic pollution they would like to see on the island, responses were mixed. Some businesses answered with complaints specific to the Jekyll Island Authority's (JIA) management of their waste stream; a restaurant owner mentioned that JIA does not provide them with recycling, even though that would like to recycle the large amount of cardboard waste they generate. Previously, when JIA aggregated recyclables at the island transfer station, the restaurant would bring their cardboard there. A hotel complained about JIA removal of trash cans from beach areas they previously serviced, saying they now have to send staff to clean up the beach area every morning, finding "liquor bottles… broken beach chairs, broken umbrellas, deflated beach balls…". However, one environmental organization told us that in a project on St. Simon's island, eliminating trash cans on the beach and establishing a "carry in, carry out" policy "dramatically decreased beach litter." Trash cans were no longer overflowing onto the beach and trash and recycling bins were instead made available in public parking lots. As a result of this policy, they have also seen less contamination of recycling bins; previously, people would use recycling containers when trash cans were full.

Specifically, some policy changes recommended by key stakeholders included: regulating what items can be brought on to the beach; reducing plastic straw use due to the sea turtle population; encouraging more recycling and less littering through better beach signage and outreach when visitors come on the island; placing more recycling bins on beach areas and ensuring coverage in more beach access areas; and implementing a plastic bag ordinance to encourage the switch to plastic bags. One business owner told us they had been considering a fee for plastic bags in their store but felt they could not implement on their own due to concern of consumer backlash from being outside the "norm" for the community. Instead, they opted to offer a reusable bag option for sale.

"We travel a good bit and I've been to other places where you're charged per bag for the plastic bag. And it's something that we have thought a lot about. We've tossed around... But I think it's one of those things that needs to be consistent with all of the merchants, not just one merchant. Because that is, I think, a great idea. But I think it would be tough."

Several interviewees emphasized that the cultural atmosphere of Jekyll Island was more suited to bottom-up change than top-down regulation. One restaurant manager, who had implemented several alternatives to plastic due to consumer preference, told us the following:

"...it's a very small community. I mean, that might go someplace in LA or New York city or someplace like that... I think we got enough of laws."

Others saw these same characteristics as an opportunity to implement policies. From a business working on alternatives to single-use plastics, we heard:

"Given that it's a small, insular environment and that it's surrounded by the ocean on all sides, this would be a perfect place to have some simple ordinances or requirements that go to diversion and recycling and/or maintenance of waste. And plastic may fit outside of the desired product, simply because they don't have a recycling center or processing center on the island."

This communal action is perhaps more easily said than done. In our interviews with different JIA departments, we heard concerns about the best strategies to reduce plastic re-iterated:

"I think it's hard to get everybody on the same page, and I don't know if that can happen just with community support or if it has to happen legally."

"I haven't felt like we'd be likely to have as much success trying to push a ban through and then trying to enforce a ban as we would try and to shift the culture and imposing what we can through existing processes, the design and the environmental review process and lease agreements rights."

However, even when businesses did not necessarily think policy was the best course of action for the community, many felt pressure from consumers to provide environmentally friendly products and waste management options. Businesses that have tried to implement alternatives have generally been met with positive responses. Businesses without recycling programs reported receiving comments from guests:

"Yeah, some people are downright like, "Where's your recycling?" Oh, I'll take it for you, ma'am."

"A lot of [visitors] are disappointed that we're not separating and recycling the plastic bottles and all of that but they don't understand the costs I guess. From what I understand it's gone sky high. Probably the only negative comment I get is where are the recyclable containers."

Many of the hotels we interviewed had some sort of internal collection program for their cardboard or office recyclables, but most were not offering recycling to their guests. Two of the five hotels interviewed were providing recycling bins in common areas rather than in guest rooms, although one was planning to launch an in-room recycling program for guests to comply with brand standards. However, there was a perception among some businesses that recycling was not necessarily worth the effort:

"If I were to go to Waste Management right now and say, "Why aren't they knocking on my door? If you have a need for plastics, or if you have a need for glass, just put a container here. I'll make it happen."... we suspect that if we put something in a separate container, it's just going to end up in the same place... I know I would be all for [recycling]. I'd be a supporter of it. I managed a hotel that had a cardboard baler, and that was probably 10 years ago when we were doing that. Just doesn't seem to be anyone championing it. And if I don't have someone in my face saying, "Hey, this is an opportunity for you." I'm too busy to seriously think about it."

Several hotels did participate in a recycling program for individual soap bottles called Clean the World[4]; one noted difficulty in recruiting housekeeping to collect and separate out the bottles.

When we asked key stakeholders if they felt environmental issues were a concern for customers and visitors, again responses were mixed. Estimates of levels of concern varied from only 10% of consumers at one restaurant to a definitive "yes" from some hotels that see the "natural, undeveloped" as a differentiating factor for why visitors chose Jekyll Island over other beaches. Many differentiated between tourists and long-term residents:

"I think [environmental awareness is] pretty high for the residents. But the people that visit... I mean they come to the beach, and they don't even know we have wildlife here. They don't know we have sea turtles, they don't know we have snakes. So I think it just depends."

"I think for the long-term residents, [environmental awareness is] extremely high. I think for the tourists, again, they're on vacation and it doesn't cross their mind... I don't think the average person on vacation thinks about it. I really don't."

One hotel differentiated between their long-term winter guests and their more transient summer visitors, noting that their recycling rates are much higher in the winter with long-term residents:

"Our winter guests, they're mature. Typically, they're retired. They're here for multi months so they're more aware of [environmental issues]. I think that's why the recycling... In the summer months [the recycling bins are] barely used."

However, several stakeholders also mentioned shifting visitor profiles, one noting that visitors from other parts of the country might expect more access to recycling than is currently available on Jekyll Island:

"In my estimation, even though we are a very environmental community, it seems that tourists are more environmentally savvy and paying attention than locals. So for instance, we have very few businesses in our community recycling. And so tourists come here and expect their hotel to recycle. They expect their restaurants to recycle, and it's just not happening."

Generally, most stakeholders spoke of the natural landscape and environment as important to Jekyll Island, especially given its designation as a state park. Many recognized that plastic pollution is a problem globally, although they did not necessarily feel it was a major issue on Jekyll Island specifically.

"As far as Jekyll is concerned, I think they do a remarkable job in what they do as far as the recycling is concerned and the trash pick-up. This isn't St. Simons."

From JIA, we heard a slightly different perspective where plastic pollution affects the island more directly. The pristine nature of Jekyll Island is maintained only through daily effort to collect litter:

"[The beach] is clean because we're out there from 9:00 PM till 6:00 AM cleaning it up…So if you're a visitor you notice it is pretty clean because we get it all."

Businesses too are conducting cleanup efforts to provide clean environments to visitors, such as hotels ensuring the beach-front areas their guests are using remain litter-free. From one outdoor attraction, we heard:

[4] https://cleantheworld.org/

"…at the end of every day, that's the first thing the [employees] do is get bags and gloves and we comb the park and the parking lot. We pick up all the trash that we see because we don't pollute our land, the marsh and the habitats that surround us…We do have small potato chip bags, the little foil bags, that'll get away from time to time so we do try to make a conscious effort to get all that stuff up… It's a nightmare after a Saturday. People don't care… They'll dump their stuff out on the side of the road. They'll dump it out on the parking lot just so it's not in their car. We do have waste containers throughout the parking lot and we do have a picnic area that has tons of waste containers but some people just don't care. I mean, I hate to say I like that but they just don't… And they're probably operating under the assumption that somebody'll get it. They'll be right. It's generally us but it's just a bad attitude which I don't like."

In our August field work, we saw additional impacts of the COVID-19 virus on the way plastics were being used on Jekyll Island. After the initial closure period, many businesses saw large increases in to-go orders when visitors returned to the island. One restaurant estimated that their deliveries were up six times compared to the previous year. Another restaurant told us that previously, they did very few to-go orders but are now reliant on them which they estimated to have quadrupled their plastic consumption.

"As far as Coronavirus, what it has done is, it has actually increased our usage obviously of to-go for plastic… if a restaurant is fully functional, then we use less package because more people prefer to dine in than to eat out."

Businesses that were previously using reusable china for dining have also switched to single-use plastic as a safety precaution. With additional demand, businesses reported price increases for to-go containers, and as a result many have had to switch away from more "environmentally-friendly" products.

"Well, before COVID became prevalent in the restaurant industry, food service industry was negatively impacted, a decent number of folks had converted to the more sustainable carry out items versus styrofoam. But with the advent of so many restaurants having to, for several months close their indoor dining and just do carryout and losing business, people just had to look at the bottom line and that's pretty much out the door everybody, most people have reverted back to styrofoam again."

This is despite a perception that expanded polystyrene (EPS, colloquially know by the brand name Styrofoam) is less preferable for consumers.

"We used to [use styrofoam], but we switched to plastic because in my opinion, the styrofoam is worse than the plastic… not only is it bad for the environment, it is definitely not a good presentation. It's a very cheap product."

Environmental organizations have also seen more COVID-related litter during cleanups.

"With the advent of COVID and all the PPE materials, the personal protective equipment, in our community… has seen the amount of that on the roadways and in parking lots exponentially increase. So the number of plastic gloves, number of masks, the number of the wipes, the antibacterial wipes has now taken a regular litter problem and exponentially increased it."

In general, the global pandemic seems to have exacerbated existing patterns of plastic usage and leakage on the island.

Product Design

To characterize material types used in common consumer plastics, samples of beverages, candy, and snacks were obtained as described under Input. Based on these samples of common convenience items collected from four stores, the average weight of plastic packaging across product categories is shown in the table below. Beverages were the highest average weigh of plastic packaging produced per unit.

Product Type	Number of Samples	Average Weight of Plastic Packaging (g)
Beverage	8	27.0
Candy	9	1.2
Snacks	9	5.8

Table 2: Average weight of plastic packaging for common convenience items.

Beverages were almost exclusively packaged in hard plastic, typically a polyethylene terephthalate (PET) bottle with a polypropylene (PP) cap and a film label. One example of a coated paperboard water box was observed. Candy and snacks were primarily packaged in multilayer film plastic; unlike PET beverage bottles, film packaging is not recyclable in most single-stream recycling streams.

Packaging weight was also compared to product weight, as shown in Figure 3. While the smallest in terms of average weight of plastic packaging, candy has the highest ratio of plastic packaging to product.

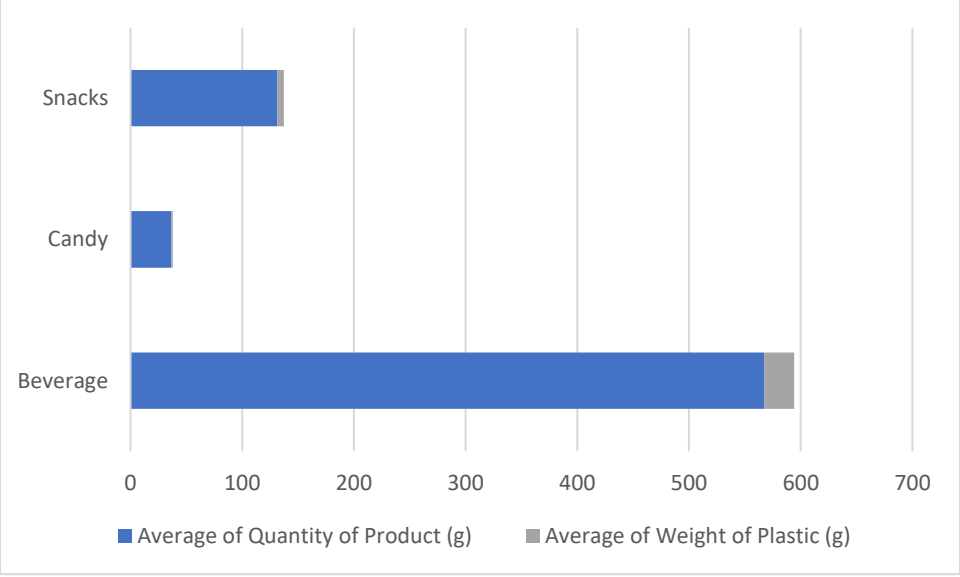

Figure 3: Product to plastic ratios, shown in grams.

In addition to stores, samples of to-go containers were collected from 11 restaurants and food and beverage vendors on the island. The average weight of plastic packaging is shown in the table below.

Product Type	Number of Samples	Average Weight of Plastic Packaging (g)
Cup	15	10.6
Straw	6	1.0
To-Go Container	10	16.8
Utensils	13	6.0

Table 3: Average weight of plastic to-go products in restaurants.

Plastic cups were typically a hard plastic such as PET or a coated paperboard; polylactic acid (PLA) and expanded polystyrene (EPS, commonly known as Styrofoam) were present, but less common. Straws were also typically a hard plastic, although one sample of biodegradable packaging made from PLA was present. To-go containers were primarily hard plastic, typically PP or PET, but there were also examples of EPS being used. Utensils were often provided in a packet which included the rigid plastic of the utensils contained in a plastic film wrapper. Again, there were a few examples of plastic labeled as "biodegradable"; the specific material type was not identified on the packaging. PLA is typically more expensive than traditional plastic polymers and is not biodegradable unless exposed to the temperature and moisture conditions of an industrial composting facility; no composting facilities are available on Jekyll Island.

We also sampled hotel single-use plastics in one location; the total plastic provided in one room upon arrival was approximately 38 g. This included rigid and film plastic from drink cups, individual shampoo and conditioner containers, a single-serve coffee pod, and the room key. Some major hotel chains are moving away from single use toiletries to reduce their environmental footprint. At the corporate level, IHG[5], Hilton[6], and Marriot[7] hotel chains – all of which are represented on Jekyll Island - have announced the transition to bulk personal care product dispensers.

[5]End of the road for bathroom miniatures as IHG opts for bulk-size amenities to reduce plastic waste. IHG. https://www.ihgplc.com/en/news-and-media/news-releases/2019/end-of-the-road-for-bathroom-miniatures-as-ihg-opts-for-bulk-size--amenities-to-reduce-plastic-waste

[6] Hilton Marks Global Handwashing Day by Expanding Soap Recycling Effort Around the World. Hilton. https://newsroom.hilton.com/brand-communications/news/hilton-bolsters-soap-recycling-efforts-for-global-handwashing-day

[7] Marriott International To Eliminate Single-Use Shower Toiletry Bottles From Properties Worldwide, Expanding Successful 2018 Initiative. Marriott International. https://news.marriott.com/news/2019/08/28/marriott-international-to-eliminate-single-use-shower-toiletry-bottles-from-properties-worldwide-expanding-successful-2018-initiative

Use

Some restaurants and businesses on Jekyll Island use or sell alternatives to single-use plastic, such as paper straws and reusable water bottles. In total, 42 alternatives to single-use plastic were recorded in 13 different convenience stores, gift shops, and restaurants across Jekyll Island. The most common items with available alternatives were straws (n=13), drink or coffee cups (n=6), and water bottles (n=5). Metal, paper, and glass were common material alternatives; in addition, thicker plastics intended for reuse such as in reusable carry bags were prevalent.

Alternatives to plastic straws came up often in our key stakeholder interviews; many businesses are using paper or "biodegradable" straw or have implemented a policy to provide straws only on requests. Some businesses reported consumer complaints about paper straws due to the taste and have subsequently switched to straws made of biodegradable plastic. One restaurant reported they pay twice the amount for biodegradable straws as they paid previously for traditional plastic straws.

There are also bio-based and compostable to-go containers being used on Jekyll Island; of the compostable products sampled, many did not have a specific material type label, but some were labeled as PLA. PLA requires the temperature and humidity conditions of an industrial composter to break down. We did not identify any composting waste management streams available for these "biodegradable" plastics.

There seems to be some confusion from business owners around types of plastic and the difference between biodegradable and recyclable. From one food vendor, we heard the following:

"...we get most of our water through Coke. I don't know if their bottles are biodegradable or what. I would think they would be coming from a company like Coca-Cola, but I know they're recyclable."

In gift shops, alternatives to plastic were often available as souvenirs, such as metal coffee cups with a Jekyll Island logo. Gift shop items are often sold at a price premium. Reusable coffee cups cost an average of $29.95; reusable straws averaged $8.81; and reusable water bottles averaged $32.47.

One store we interviewed said the reusable products they sell have been surprisingly popular, especially the metal drinking straws and reusable cooler bags. They also developed their own line of shampoo and conditioner bars that do not come in plastic packaging, demonstrating that plastic-free items can be good for business:

"I think one of the funnest things that we've done, and it's become one of our most requested items, is I had a line of shampoos and conditioners developed... They're the solid shampoos. And so these little shampoo bars are the equivalent of about 80 shampoos, which is roughly the equivalent of three bottles of shampoo and three bottles of conditioner. And so we finally had to put a sign up there that said, please buy more of these because you're going to call us and have them shipped to you. Because people will get home and they're like, "I didn't realize how much I was going to love this. Please send me more.""

Many locations did not offer both alternatives to plastic and traditional single-use plastic options. However, five samples where alternatives and traditional plastic materials were available in the same store were obtained. On average, the sponge, straw, toothbrush, and sandwich bag alternatives cost about 200% more than the traditional plastic alternatives. The reusable water bottle cost over 2,000% more than a single-use plastic water bottle.

Product Type	Alternative Material Type	Cost of Alternative	Cost of Traditional Plastic	Additional Cost of Alternative (%)
Water Bottle	Metal	$37.50	$1.69	**2,219%**
Toothbrush	Bamboo	$7.95	$2.99	**266%**
Sponge	Okra Fiber	$5.95	$2.99	**199%**
Sandwich Bag	Reusable Plastic	$7.95	$3.99	**199%**
Straw	Metal	$2.95	$1.99	**148%**

Table 4: Costs of alternatives to plastic.

24 gift shops, convenience stores, and restaurants were surveyed about the type of bags they use, with mixed results. 8 shops use only paper bags; 7 use only plastic; and 9 use a mix of plastic and paper. Four of the stores surveyed also gave away reusable bags when customers reached a certain price point, typically $50 or $100. One store we interviewed estimated that only two of every 100 customers bring in their own reusable bags.

Many hotels we spoke to seemed open to the idea of implementing more recyclable or reusable product but are limited by both consumer expectations and brand standards. Two hotels we spoke to told us their brands were planning to switch from individual toiletry bottles to wall-mounted dispenser unites within the next year. (See Input for more information on hotel policies on single-use toiletries.) Another hotel told us that due to the structure of their business they were unable to make this switch:

"One obstacle, there are some hotel chains I know that are converting to the wall-mounted gel dispenser, which is fine maybe for a corporate hotel environment. However, because all of these condos are all individually owned, we're really not in a position to dictate, "By the way, you're going to have to mount a single source big, bulk dispenser in the showers." That probably would save money in the long run and also reduce the waste… Personally, I find them to be a maintenance issue."

Our interviews also showcased examples of re-use happening on the island:

"…our homemade ice cream… [is] made over on St. Simons. And so it comes in a plastic tub and then we wash those and then they'll recycle. When they make the delivery, those go back, they fill them up with ice cream and then we send them back. And so A, it's a local supplier. B, it's fantastic ice cream and C, we don't have gillions of these ice cream tubs."

There does, however, seem to be some concern about customer perception of reuse. One hotel spoke to us about their hesitation to discontinue providing guests with single-use plastic cups:

"We're possibly looking at maybe discontinuing the plastic drink cups and going with the regular standard drinking glass that is available because of the kitchen… full China and silverware in every kitchen… People are still accustomed to plastic drinking cups."

Another hotel told us of cost-savings from switching to reusable laundry bags. The barriers to change might be lower for hotels when changes impact internal processes rather than guest experiences:

"Well, we were noticing how many trash bags we were going through- … because we used to put both clean and dirty laundry in trash bags to… transport it… so we have switched to reusable laundry bags. I mean it's been a huge saving. Because those heavy-duty black trash bag… very expensive."

Overall, in addition to consumer perception, cost came up repeatedly as a major barrier to exploring alternatives to plastic. One restaurant summarized it as:

"I'll explore anything as long as it's cost effective. And yes, I would like to be a little more responsible, but again, I've got 30 people that depend on this for a living"

Another obstacle identified by one environmental organization is the capacity of local business owners to take the time to research what products will work best in their local community, especially with confusion around compostable, biodegradable, and plant-based products.

"The other is a lot of these business owners don't have the time nor are they willing to take the time to investigate and research and find what's out there. If there was an easy accessible website or something that just piles a lot of what is truly biodegradable, what is truly compostable, or if it has to be at a specialized facility, have that marked."

Collection

Waste collection on the island occurs at the household and commercial levels and in public spaces, such as parks and along the beach. At the time of the study, residents pay $30.45/month to JIA for household trash pickup. This service is contracted out to Waste Management, which collects up to two cubic yards of waste per home on a weekly basis. Recycling is collected on a bi-weekly schedule and is single stream.

Most businesses on the island are managing their own waste disposal, typically contracting through Waste Management. Most hotels have switched to compactors rather than open-top dumpsters due to concerns about animal interference with waste. Businesses contracting their own waste management services are not required to implement any sort of recycling program; business recycling on the island is mixed, with many businesses having a specific cardboard dumpster for their commercial waste but not implementing a general recycling program for consumer goods such as bottles as cans.

Businesses in Beach Village share a waste and recycling dumpster managed by JIA, which also contracts through Waste Management for the management of this waste stream. Smaller businesses in the Historic District that receive waste management services through their leases with JIA are not provided recycling services at an appropriate scale for small business operations

We obtained waste management invoices from three hotels on the island. A total of 8 invoices were obtained, covering June 2019 to January 2020. Invoices were from both high and low season. Some hotels have compactors, in which case we were able to directly record waste tonnage measurements from the invoices. For hotels with open top dumpsters, waste tonnage was estimated based on the number of services and on the maximum capacity listed on Waste Management's website for the given container size[8]. All hotels that shared invoices with us were using Waste Management as their service provider. One hotel had both a waste and recycling compactor; the use of compactors has been advocated by JIA due to animal interference in open top dumpsters. One hotel had a waste compactor but did not offer recycling. The final hotel had open top dumpsters for both waste and recycling. The average waste or recycling management cost per ton for each type of system is given in Table 5 below.

System Type	Average Tonnage of Waste or Recyclables per Month	Average Monthly Cost	Average Cost Per Ton
Waste Compactor	14.9	$ 2,126.15	$ 183.87
Open Top Waste Dumpster	6.3	$ 913.95	$ 145.07
Recycling Compactor	0.7	$ 889.74	$ 1,253.15
Open Top Recycling Dumpster	0.9	$ 306.71	$ 340.79

Table 5: Average cost per ton of recycling and waste management with different dumpster types.

[8] Dumpster Size Comparison. Waste Management. https://www.wm.com/us/en/cpn/temp-dumpster

While waste compactors have a higher monthly cost due to the higher cost of renting, the average cost per ton is similar due to the higher capacity compared to open top dumpsters. Average monthly cost is skewed by the fact that the hotels that currently have compactors tend to be larger.

With hotel recycling, however, it seems hotels have been unable to reach appropriate economies of scale to make recycling cost-comparable to waste management. One hotel was diverting approximately 3.5% of their waste to recycling, while another was diverting approximately 12.5%. The hotel with a waste and recycling compactor is diverting less than one ton of waste monthly to recycling, while paying 680% more per ton compared to waste. The open top recycling dumpster is still 230% more per ton compared to open top waste dumpster but is significantly more affordable than a recycling compactor. Clean recyclables run less risk of animal interference than open top dumpsters for waste and may be a more cost-effective solution for hotels to establish recycling programs.

JIA collects waste from public waste bins – located in parks, roadsides, and along the beach – daily, sometimes more frequently during the high tourist seasons. Waste is taken to a transfer station on the island where an open-top dumpster on an 18-wheel truck is managed by Republic. Public recycling bins, in addition to recycling from the JIA offices, are taken to an open top dumpster located in the JIA maintenance are or put in one of the two recycling compactors on the island.

In February, a visual audit was also conducted on the JIA recycling dumpster located near the maintenance facilities. The open top dumpster was estimated to be approximately 75% full at the time of examination and primarily contained cardboard, in addition to three clear plastic bags labeled recycling that were filled with paper. There were also contamination items including black plastic trash bags with unclear contents, a hot water heater, and plastic organizational bins.

Figure 4: Jekyll Island Authority recycling dumpster.

A photographic survey of public waste and recycling bins was conducted on the island. Example photos of public waste and recycling bins are shown in Figure 5. Most bins observed were well maintained and looked to have been emptied recently with little visible litter or overflow in the immediate area. It was noted that some recycling bins have different labels; one had a sticker which read "Aluminum Cans Only." The majority featured the recycling symbol, or the word "recycle" without guidance on which materials to include in the bin.

Figure 5: Public waste and recycling bins on Jekyll Island.

We logged the locations of 285 public waste bins and 53 public recycling bins across the island, shown in Figure 6. While waste bins were accessible across the island, recycling bins were primarily available in the Beach Village, Historic District, and at parks along the beach front. An interactive version of the map of recycling and waste bins is available here.

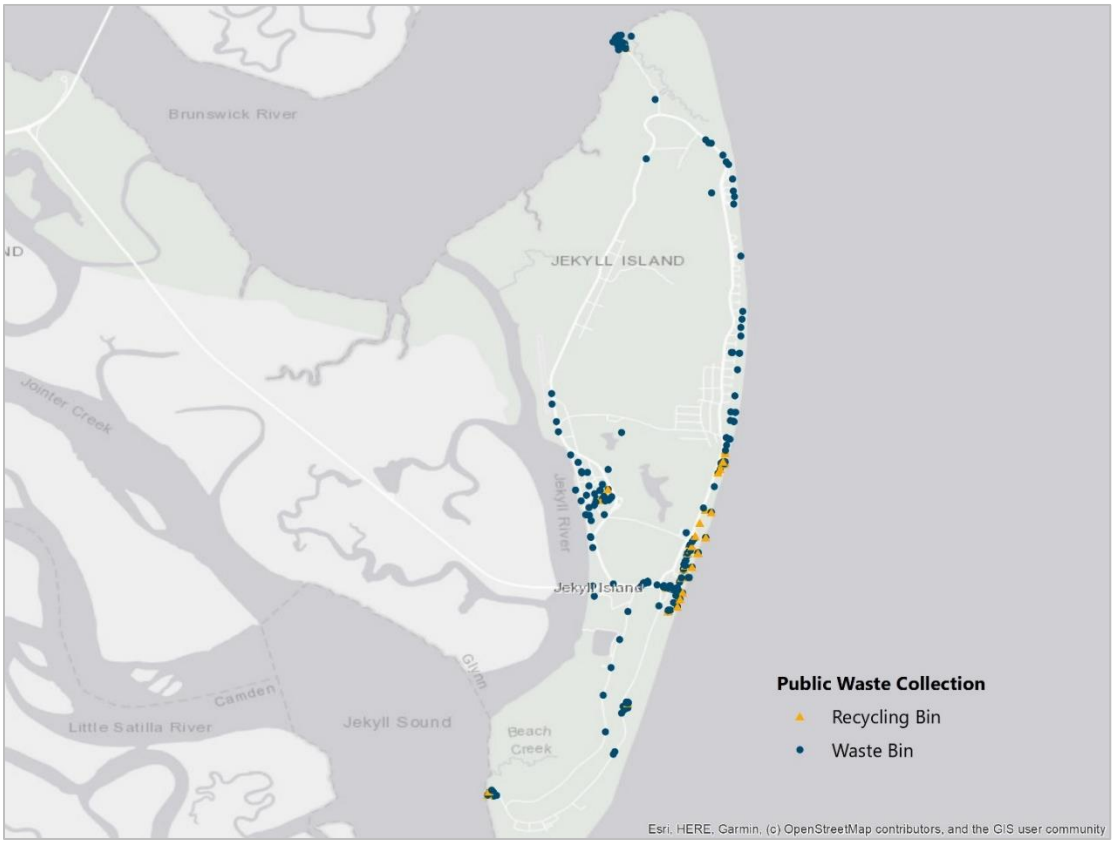

Figure 6: Locations of waste and recycling bins on the island.

In August, we conducted an evening audit of visual contamination in public recycling bins. 90 contamination items were identified across 30 recycling bins. 30 of the 31 recycling bins sampled contained some form of contamination; it should be noted that JIA maintenance stated that they divert extreme food contamination to waste and remove contamination items when evident. The most common contamination items recorded in the assessment are as follows:

Visible Contamination	Number of Observations
Plastic cup lid	11
Straws	10
Multilayer food wrapper	10
Coated paper cup	6
Food/drink residue	6
Multilayer juice pouch	5
Plastic bag	4
Clear plastic food wrapper	3
Napkin	3
EPS Cup	3

Table 6: Common contamination items visible in public recycling bins.

Together, these top ten items comprise 68% of the contamination items observed during the audit. In addition to visual identification of contamination items in the field, photos were taken of each bin.

Figure 7: Recycling bin contents on Jekyll Island.

Most bins were filled to less than 25% capacity, allowing for a visual assessment of field photos to approximate material composition. Two students were tasked with conducting visual estimates; results were averaged and are presented in Table 7 below. Average contamination was estimated to be 40%; PET bottles and aluminum cans made up the largest component of recyclables, together totaling over 47%.

	Average % Composition
PET Bottles	26.34%
Aluminum Cans	21.52%
Paper	2.73%
Cardboard	5.34%
Glass	1.81%
Contamination	40.69%

Table 7: Estimates of material composition in public recycling bins based on visual approximation.

End of Life

A waste characterization study was conducted in February. We collected waste from multiple streams including: JIA waste from public bins in parks and beaches; kitchen waste from meal preparation at the Convention Center; and guest waste from three hotels. Waste was manually sorted on a table with screen mesh openings that are two square inches in size. Items smaller than two square inches passed through the screen and are recorded below as screen passing; based on visual assessment, the screen passing was assumed to be primarily organic material. A full list of assumptions in the waste characterization are provided in the appendix. Waste composition based on mass percentages is shown in Table 8.

	% weight of total waste from source					
Category	**JIA**	**Convention Center**	**Hotel 1**	**Hotel 2**	**Hotel 3**	**Average**
Organic (food waste, yard)	26.95%	30.23%	22.33%	28.62%	16.78%	24.98%
Plastic: Film (clear and multilayer)	7.50%	18.80%	8.20%	11.27%	20.05%	13.17%
Paper/Paperboard	14.50%	1.88%	14.89%	10.30%	10.72%	10.46%
Screen Passing (presumed organic)	13.95%	9.26%	9.85%	2.49%	9.79%	9.07%
Cardboard	4.16%	31.24%	4.37%	1.84%	0%	8.32%
Glass	9.34%	0%	9%	14%	6.99%	7.95%
Liquid Waste	3.19%	1.01%	3.30%	10.08%	12.59%	6.03%
Personal Care/Medical	1.75%	0.00%	6.33%	12.47%	6.06%	5.32%
Plastic: All Other (Rigid and Foam)	5.64%	0.46%	4.64%	4.23%	6.99%	4.39%
Plastic: PET	2.41%	0.41%	2.90%	2.49%	6.06%	2.85%
Clothing, textiles, leather	0.52%	0.67%	10.56%	0.43%	0.00%	2.44%
Aluminum (Cans, Foil)	2.09%	0.10%	1.29%	0.54%	2.63%	1.33%
Plastic: HDPE	0.84%	3.47%	0.58%	0.54%	0%	1.09%
Other Metal	1.88%	2.46%	1.03%	0%	0.00%	1.07%
Dog Waste	1.73%	0%	0%	0.43%	0.59%	0.55%
Electronics (batteries, electronic parts)	1.74%	0%	0%	0%	0.74%	0.51%
C&D Debris (except wood)	0.92%	0%	0%	0%	0%	0.28%
Wood (dimensional lumber)	0.88%	0%	0%	0%	0%	0.18%

Table 8: Waste characterization results from various island waste streams by percent weight.

The percent of plastic in the assessed waste streams varied from 16.3% to 33.1% with an average of 21% across all waste streams. This is greater than the EPA estimated quantity of 13% for typical municipal solid waste streams (MSW) in the US[9]. It should be noted, however, that the waste streams assessed do not represent a full picture of MSW generated on Jekyll Island; they were, however, selected to capture the most likely end points for consumer plastic products. Compared to EPA data on typical MSW composition, Jekyll Island has more organic material and plastics, and less textiles, metal, and wood, as shown below.

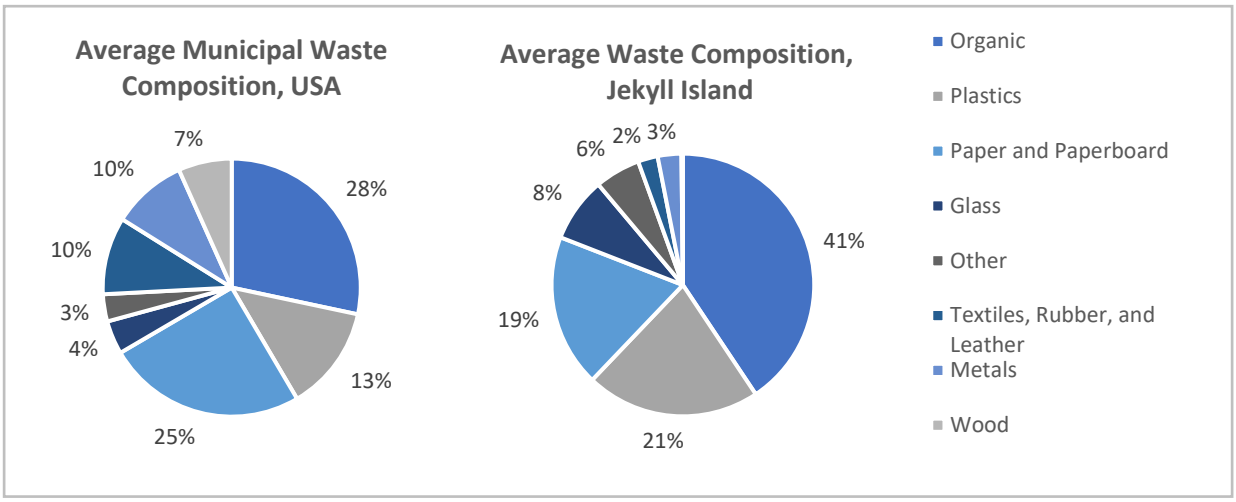

Figure 8: Average waste composition in Jekyll Island based on a February sampling event compared to average municipal waste composition in the U.S.

This finding is not surprising for a more transient tourist population as is typical on Jekyll Island. It is likely that the higher plastic and organic components are influenced by the transient population consuming more packaged food that normal and potentially having to dispose of food products before they are consumed in their entirety.

Plastics on average composed 21.5% of the waste characterized on Jekyll Island. Of the plastic fraction, the majority was film plastic, shown in the table below. Film plastic includes plastic bags, food wrappers, and other flexible plastic packaging. Other plastic included unlabeled hard plastics and foam, such as used in EPS take out containers. PET includes primarily beverage bottles and some take away containers, while HDPE is used often used for milk jugs and personal care product bottles. The recyclable fragment, PET and HDPE, totaled around 18%.

Category	Average Percent of Plastic Fraction
Plastic: Film (clear and multilayer)	61.2%
Plastic: All Other (Rigid and Foam)	20.4%
Plastic: PET (recyclable)	13.3%
Plastic: HDPE (recyclable)	5.1%

Table 9: Average percent of plastic fraction for various plastic types.

[9] National Overview: Facts and Figures on Materials, Wastes and Recycling. US EPA. https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials#Generation

As described in Collection, we obtained 8 waste management invoices from three hotels on the island. Invoices were from both high and low season, and hotel capacity in the month was approximated based on room count, typical guest count, and typical seasonal hotel capacity information obtained during interviews. Some hotels have compactors, in which case we were directly able to obtain waste tonnage measurements from the invoices. For hotels with open top dumpsters, waste tonnage was estimated based on the number of services and on the maximum capacity listed on Waste Management's website for the given container size[10]. Approximate per capita waste generation values are given in Table 10 below.

Approximate Guests per Day	Approximate Waste Tonnage per Month	Approximate Per Capita Waste Generation (kg/person per day)
306	21.0	2.01
306	18.6	1.78
270	13.4	1.46
144	6.4	1.30
236	6.3	0.81
236	6.3	0.78
166	6.3	1.11
166	6.3	1.11

Table 10: Approximate per capita waste generation rates based on hotel waste management invoices.

The average per capita waste generation in hotels based on this limited sample is 1.30 kg per day. The EPA estimates per capita MSW generation in the US at 2.22 kg per day[11]. This finding, although preliminary and approximate, suggests that roughly half of the waste generated by tourists on Jekyll Island is disposed of outside of their hotel, likely in the form of food packaging and food waste in restaurants or in public waste bins.

After leaving the island, recyclables are transported to Savannah and then to a materials recovery facility (MRF) in Conyers, Georgia. Recyclables enter the MRF in a single stream, meaning they are not separated by material type. According to an interview with a Waste Management employee in December 2020, materials are processed by a variety of equipment such as robotics, optical sorters, and hand sorting. Materials are being sold domestically to various processors by material type, as outlined below:

- **Carboard and paper** are taken to a mill next to the MRF in Conyers.
- **PET and HDPE plastics** (#1 and #2 plastics) are baled and sold to manufacturers that make new products such as carpet.
- **Polyvinyl chloride (PVC), low-density polyethylene (LDPE), polypropylene (PP), polystyrene (PS), and other plastics** (#3-7 Plastics) do not currently have viable markets for resale. The MRF disposes of #3-7 plastics in the gasifier whenever possible.
- **Metal cans** are baled and sold to other domestic manufacturers.

[10] Dumpster Size Comparison. Waste Management. https://www.wm.com/us/en/cpn/temp-dumpster
[11] National Overview: Facts and Figures on Materials, Wastes and Recycling. US EPA. https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials#Generation

- **Glass** received through single-stream programs currently has no viable markets for resale. Source-separated glass can be resold, but many programs still allow glass in their single-stream programs, which is not able to be sold to recyclers.
- **Aseptic cartons**, also known as coated paperboard, are accepted for processing at the MRF. These may include milk, juice, or broth cartons.

Contamination in recycling loads varies greatly, according to the interviewee, but Waste Management requests the JIA does not have more than 10% contamination in their recycling. When asked about communities that have successfully reduced contamination loads in their recycling streams, the interviewee shared the following best practices:

"…those communities have removed 3-7s plastics, and glass. Also, they closely monitor any trash thrown in too and continually reinforce to their subscribers the importance of keeping contamination out. Bottom line, the more education you send out, the better the contamination rates."

Recycling markets are evolving and often volatile. In further conversation with Waste Management, they clarified that although glass does not have a resale value, they are not requesting it be removed from the recycling stream at this time. Similarly, although #3-7 Plastics are not currently able to be resold, they are used in a gasifier to offset the energy needs of the recycled paper mill next to the MRF.

Leakage

In total, 2,476 litter items were recorded across 21 transects in 7 different square kilometers sampled in February and re-sampled in August. Litter transects covered a wide variety of land uses across the island.






Figure 9: Example litter transect areas. Land uses included residential, roadside, and bike path areas.

Litter transect locations were selected using a stratified random sampling method, in which transects were randomly selected in seven square kilometers which were isolated as the top fifth of population count sites based on LandScan ambient population data. Sites are purposefully selected in high population areas, thereby capturing active litter input from human activity rather than eventual environmental sinks.

On average, transects re-sampled in August had 420% more litter items than the same transects recorded in February. In both sampling events, tobacco products were the most common item category, followed by plastic fragments and food plastic, as shown in Figure 10 below. Food plastic includes both film and hard plastics related to food consumption, such as food wrappers and take out containers.

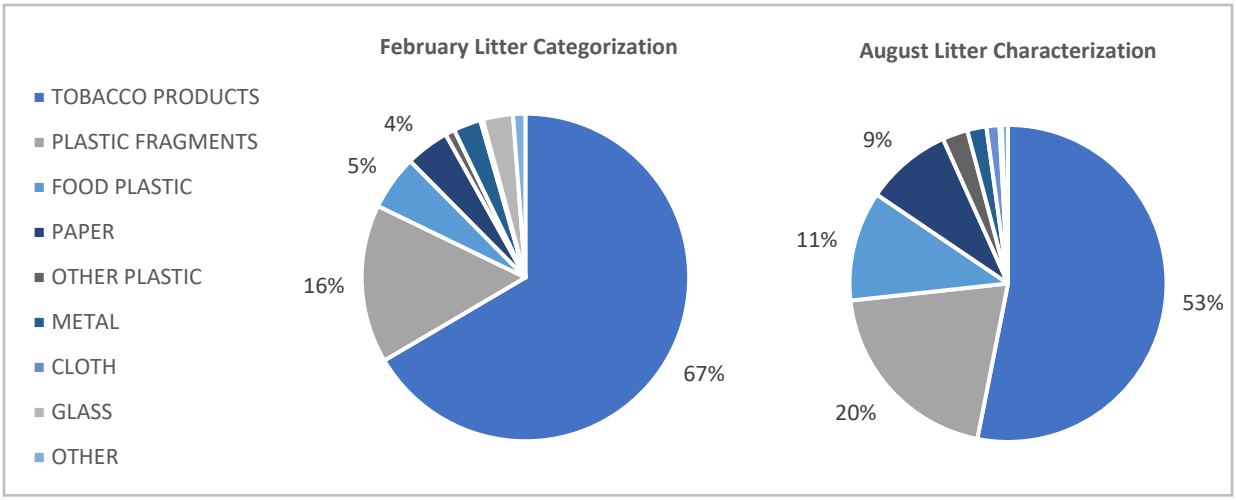

Figure 10: Material types of litter collected in February and August.

In total, 741 items were logged in February and 1,740 items were logged in August. The top litter items are shown in Table 11. As expected, many are plastic, related to food consumption or tobacco use. Hard, film, and foam fragments also represented a large proportion of the items logged, although they are of unclear origin. Fragments were especially prevalent in the transects along roadsides, suggesting that litter accumulates and remains in these locations.

Litter Item	February Count	August Count
Cigarettes	482	916
Hard Plastic Fragments	55	220
Plastic Food Wrapper	13	162
Paper	21	128
Film Fragments	46	101
Plastic String, Tape, or Packing Straps	10	32
Foam Fragments	15	29
Fabric Pieces	1	19
Non-coated Paper Food Wrapper	2	18
Straws	9	15

Table 11: Top litter items across all transects.

Litter density was calculated by counting the total number of litter items recorded in a transect and dividing by the transect area of 100 m^2. An average litter density for each of the seven square kilometers sampled was then calculating by averaging results from the three transects in each square kilometer. In both February and August, litter densities were relatively low, with median values of 0.29 and 0.70 items/m^2 during the two sampling events, as shown in the table below. Highest litter densities were found around the Beach Village, the Historic District, and the clustering of hotels in the center of the island.

	February Average Litter Density (items/m^2)	**August Average Litter Density (items/m^2)**
Minimum	0.01	0.06
Maximum	0.74	2.89
Median	0.29	0.70

Table 12: Litter densities sampled on Jekyll Island.

While comparable studies using the CAP sampling methodology have not yet been published, sampling or is occurring in 26 cities in 10 countries around the world. For relative comparison, the following litter sampling results are provided anonymously from a small island developing nation in the Indian Ocean, where the primary economic driver is tourism.

Description	**Top 5 Items**	**Litter Density (count/m^2)**
Urban, commercial	1) Cigarettes, 2) Metal Bottle Caps, 3) Plastic Food Wrappers, 4) Plastic or Foam Fragments, 5) Plastic Bottle or Container Caps	1.26
Urban, commercial	1) Plastic Food Wrappers, 2) Metal Bottle Caps, 3) Plastic or Foam Fragments, 4) Cigarettes, 5) Plastic Bags (for food items, not retail)	3.12
Tourist area	1) Plastic Food Wrappers, 2) Metal Bottle Caps, 3) Plastic or Foam Fragments, 4) Plastic Bottle or Container Caps, 5) Glass Bottle	0.91
Tourist beach	1) Plastic or Foam Fragments, 2) Plastic Food Wrappers, 3) Plastic Bags (for food items, not retail), 4) Foam or Plastic Cups, 5) Straws	0.12

Table 12: Litter density data from a small island developing nation.

On Jekyll Island, the highest litter densities were found around the Beach Village, the Historic District, and the clustering of hotels in the center of the island, shown in Figure 11 below.

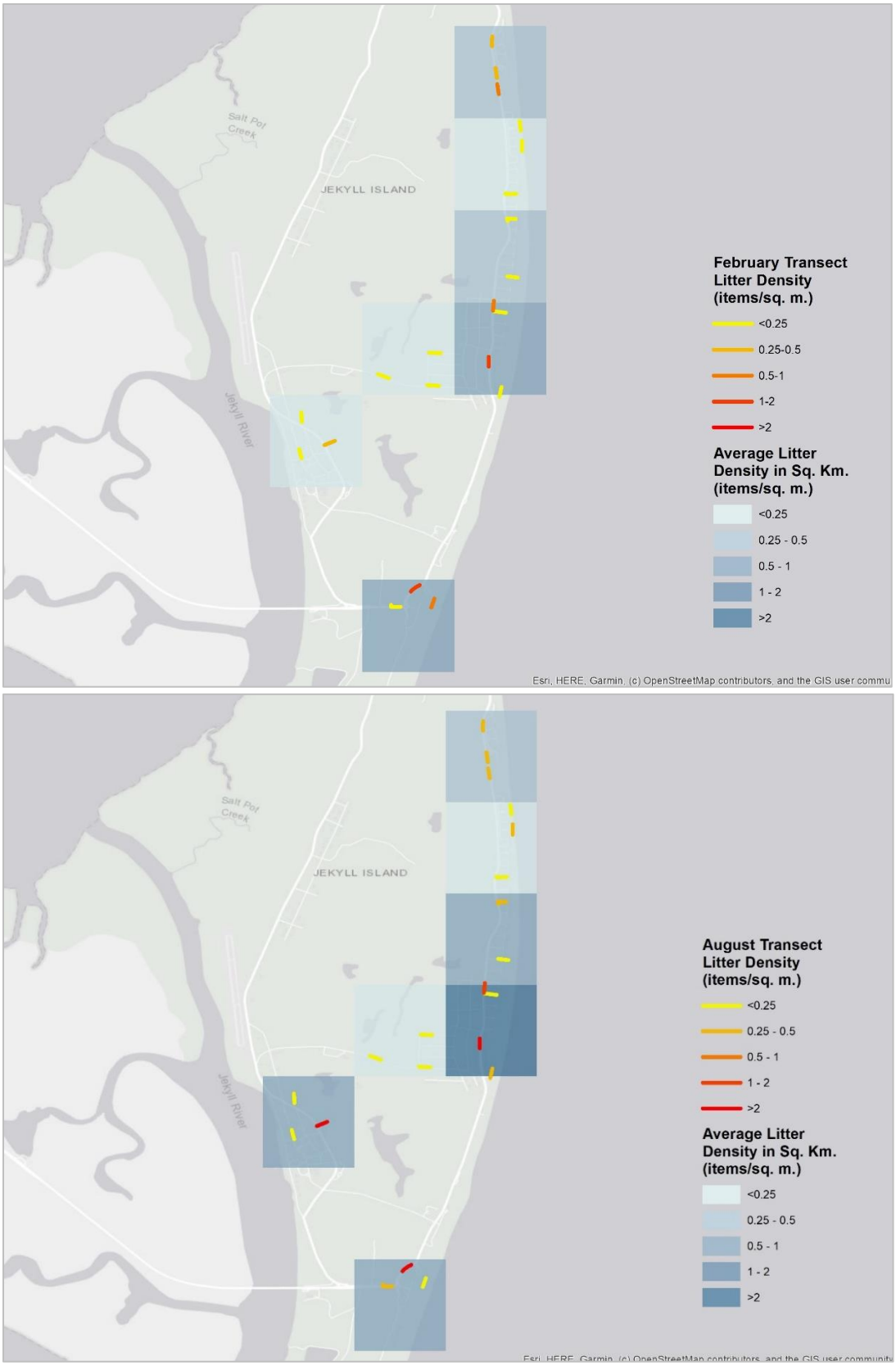

Figure 11: Litter densities sampled in February and August.

Among individual litter transects, highest densities were found in areas typically excluded from traditional beach cleanup or JIA landscaping activities. These include the opposite roadside from the bike path and Maintenance way.

As mentioned in the introduction, the GSTC has been cleaning and collecting data using Debris Tracker on marine debris found on the coast of Jekyll Island. The 2020 data was extracted from Debris Tracker for comparison with CAP litter results. As shown in Figure 12, the GSTC debris data collection locations are very complimentary to the CAP transects. In general, GSTC's focus has been on debris on the beach or in the natural environment, where it can directly impact turtle and other marine animal habitat.

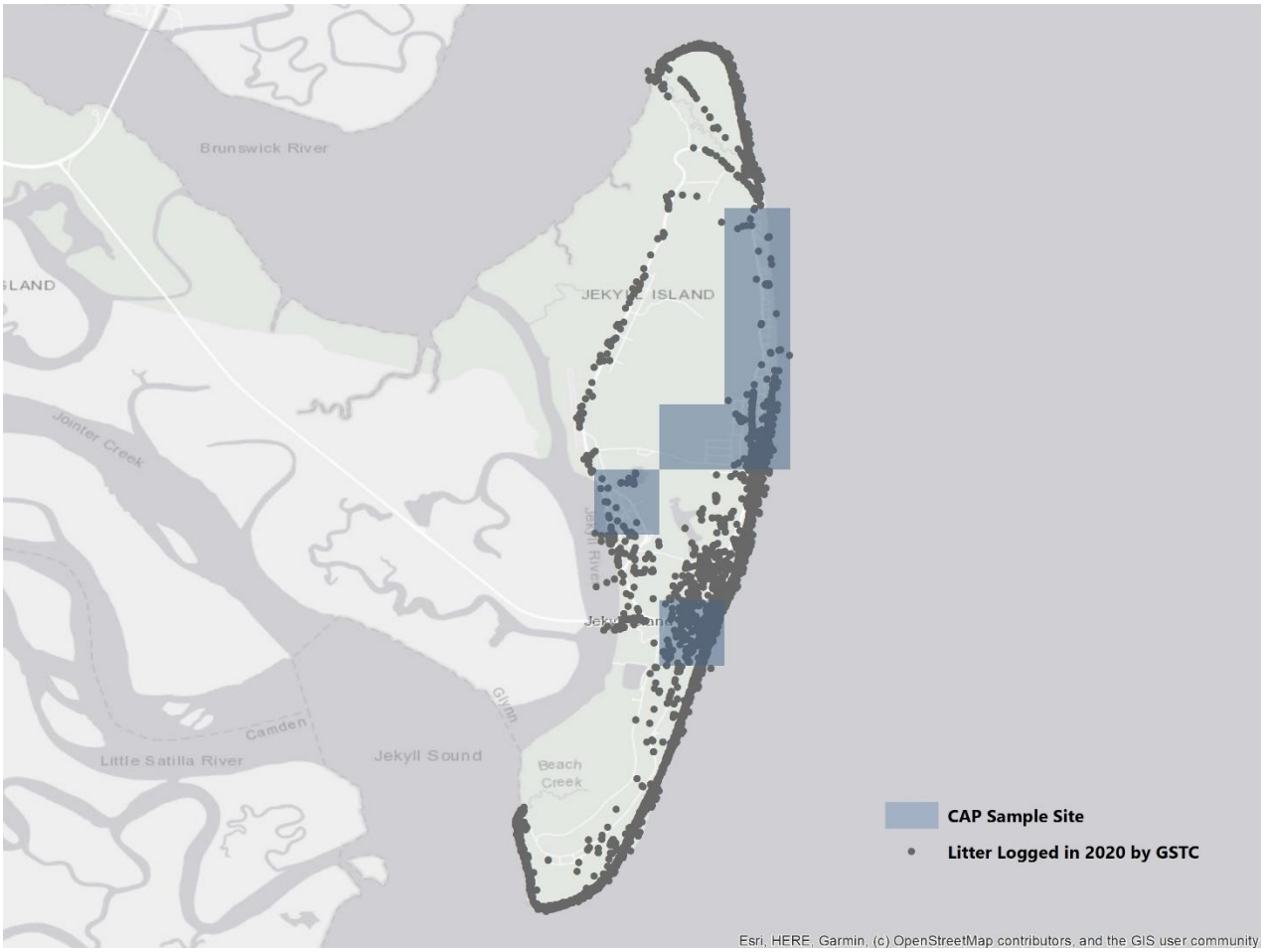

Figure 12: Comparison of CAP sample location and 2020 GSTC data collection points.

The compilation of GSTC data shows that 11,073 debris items were logged on the island in 2020 using the GSTC list on the Debris Tracker app. The material type breakdown is shown in Figure 13; unsurprisingly plastic/EPS is the most common category, followed by tobacco products.

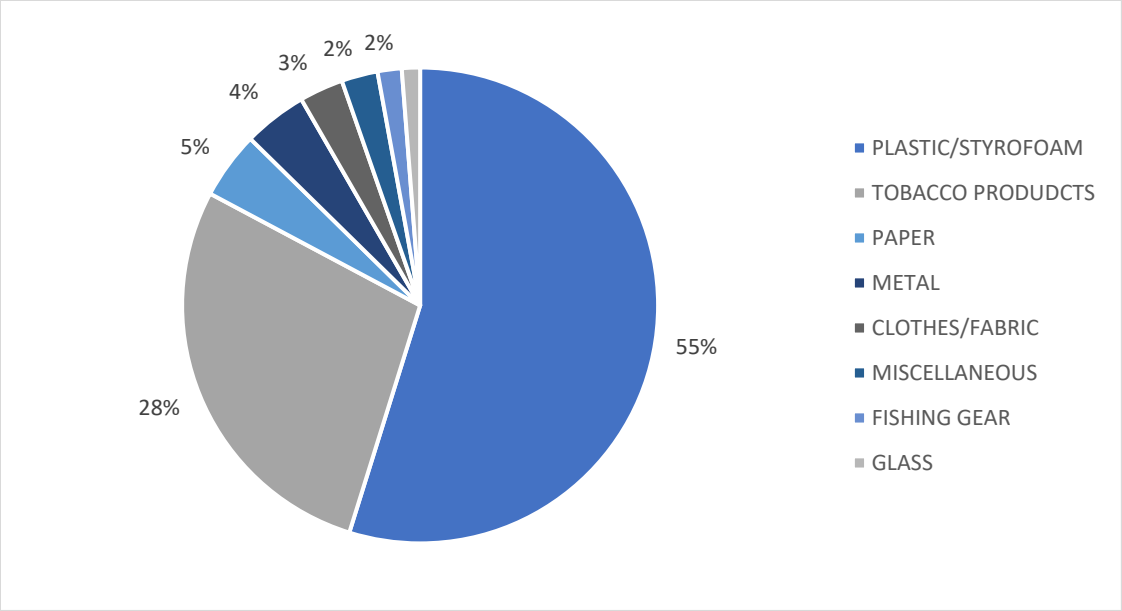

Figure 13: Material composition of GSTC 2020 litter data.

The top ten items in this dataset are show in Table 13. The top 3 items match directly with the top 3 items found with the CAP. Differences in the two data sets are evident in less dense items; bottles and caps are found on or near beaches, but not within the community. Infrastructure may play a role in this, as well as locations of use of items. While these two data collection strategies are different - GSTC samples mostly beaches and CAP samples the leakage from the daily activities in a community - it is evident that these items end up in the environment regardless of the initial point of entry or the eventual environmental sink on the island, and they can and should be targets of focus for strategies to reduce leakage into the environment.

Litter Item	2020 Total Count
Cigarettes	6483
Plastic or Foam Fragments	5536
Plastic Food Wrappers	1572
Plastic Bottle or Container Caps	1106
Plastic Bottle	1057
Aluminum or tin cans	886
Plastic Bags	770
Toys (plastic)	727
Foam or Plastic Cups and Plates	537
Nonfood related packaging	454

Table 13: Top items in GSTC 2020 litter data.

JEKYLL ISLAND AUTHORITY CURRENT PRACTICES

In order to maintain the anonymity of key stakeholders who agree to participate in interviews as part of the CAP process, names of individuals and businesses are not included in this report. Each spoke strives to characterize the use of consumer plastic on the island with a holistic lens, and thus data includes inputs from both JIA operations and private businesses. Per request of JIA, UGA is providing additional specifics on JIA operations.

It is unlikely that items sold in JIA gift shops are disposed of on the island as most items are intended as souvenirs. JIA gift shops all use paper bags rather than plastic. The primary waste consideration with gift shops is therefore in product packaging for shipment, such as cardboard boxes and plastic mailers. JIA is managing waste collection for several businesses on the island without making recycling available to them. The shops in the Historic District, for example, do not have access to cardboard recycling for the large amounts of cardboard generated through obtaining shipments of new products. Summer Waves Water Park also does not offer recycling.

The convention center and the Summer Waves water park are both offering compostable plastics like PLA, without a designated waste stream to manage compostable materials.

The open-top recycling dumpster behind the JIA maintenance area is reported to regularly be full or overflowing. Per our assessment, the dumpster seems to be primarily used for cardboard, which can be damaged when exposed to the elements.

We obtained three waste management invoices from JIA for the open-top dumpster that is filled up at the transfer station. As shown in Table 14 below, JIA is paying significantly less for waste management services than hotels on the island, with the average cost per ton at $65. During our waste characterization, we noted a family of racoons living in the dumpster; it is likely there is animal interference in the open-top dumpster.

Waste Tonnage	Cost	Cost per Ton
12.25	$826.04	$67.43
13.19	$814.35	$61.74
14.85	$985.49	$66.36

Table 14: Cost of waste disposal to JIA.

We also obtained waste management invoices from the Convention Center for February 2019 – January 2020. We then summed the total waste management cost for the year and total recycling cost for the year, plus the total waste tonnage and recycling tonnage in the year. We calculated an average cost for waste of $174/ton for 51.9 tons of waste, and an average cost for recyclables of $324 for 20.7 tons of recyclables. Based on 2019, the Convention Center is successfully diverting 28.5% of their waste to recycling. For comparison, the average recycling rate in the US is 32.1%, which includes both recycling and composting.[12] There are case studies of convention centers that have achieved 75% recycling rates.[13]

[12] National Overview: Facts and Figures on Materials, Wastes and Recycling. US EPA. https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials
[13] Oregon Convention Center Puts "Good Waste" to Use. US EPA. https://archive.epa.gov/wastes/conserve/tools/rogo/web/pdf/oregon.pdf

OPPORTUNITIES

Plastic pollution reduction can be targeted at multiple points along the plastic value chain, outlined in Figure 14 below.

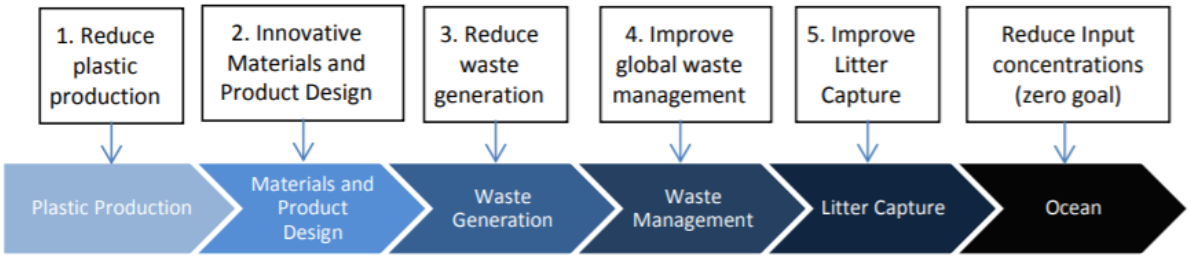

Figure 14: Interventions along the plastic value chain.

The following recommendations primarily focus on the role of JIA as a key influencer within the CAP model. Jekyll Island is in a unique position as a state park governed by the JIA with private businesses and residents living within JIA's jurisdiction. Although policy was often painted in a negative light in our interviews with key stakeholders on the island, JIA has a great deal of influence beyond direct policy. Interventions can range and include: voluntary changes on the part of businesses or citizens; guidance around best practices; education efforts; and policy interventions, such as a ban on plastic products ending up in the environment. The following recommendations were developed in collaboration with JIA officials and are targeted to areas of JIA influence, primarily without direct policy interventions.

a. There is little plastic production occurring on Jekyll Island. However, JIA has influence in procurement of products coming into their gift shops. Gourmet snack food products in particular are often packaged in plastic and are generally coming from small regional vendors that might be willing to explore options for alternative packaging in conjunction with JIA.

a. JIA could create a guide to recommend best practices of material use for businesses on the island. Some businesses do not have time to research which materials are best, and some are paying for expensive "biodegradables" like PLA when Jekyll Island does not have industrial composting. The guide could provide specific product recommendations and prices, as well as define common polymer types and biodegradability and composability.
b. Some businesses are still using expanded polystyrene (EPS, colloquially known by the brand name Styrofoam), mostly for take-out food and beverage containers. EPS is a particularly negative form of plastic, as it is typically not recyclable and tends to fragment; the small, light pieces can then be blown or carried into the environment through wind and water. JIA should consider discouraging

the use of EPS, although possible not in the current climate. Many businesses are reporting higher prices for take-out containers due to increase demand from the COVID-19 pandemic; several restaurants we interviewed on the island reported they are paying twice what they were in March. EPS, while environmentally negative, is one of the cheaper forms of take-out containers.

Waste Generation

a. Since reusable bottles cost significantly more than single-use water bottles on the island, JIA could consider additional messaging and promotion of the water refilling stations available on the island, possibly at the point of sale of these bottles. JIA could also consider providing a more affordable version of a reusable bottle in their gift shops.
b. More than half of the gift shops surveyed on the island are still using plastic bags for products. JIA could consider promoting a bring your own bag campaign, which might involve selling reusable bags that double as beach bags. Some stores interviewed also indicated that they would respond positively to a direct ban on plastic bags. The high prevalence of film fragments in the litter on the island could be tied to plastic bag consumption. Previous studies have shown that plastic bag bans do serve to reduce their prevalence in the environment.[14]
c. JIA could facilitate a discussion among hotels and other businesses on best waste management and recycling practices in the form of a sustainable business coalition.

Waste Management

a. Recycling bins with various types of labels, or the lack thereof, were seen across the island. The visual recycling audit conducted in August showed contamination in many bins; it is likely that Jekyll Island's transient tourist population is not familiar with what products are recyclable on the island. JIA should have cohesive labeling and consistent messaging on all recycling bins about what is recyclable and what is not.
b. In addition, JIA could consider working with business to provide recycling education to consumers at the time of purchase, such as a sign at the checkout counter for commonly purchased items. This could be particularly relevant for business selling non-recyclable items that are commonly ending up in JIA recycling bins, such as coated paperboard cups and food containers.
c. In interviews, several hotels which currently do not have recycling programs expressed interest in providing recycling. Hotels might be interested in partnering to figure out which recycling education schemes are most effective on the island. Hotels already providing recycling might be willing to have similar messaging on recyclable products as JIA in order to maintain continuity for Jekyll Island tourists.
d. JIA should encourage hotels to offer recycling in common areas as a minimum standard, rather than pushing for in-room recycling. Open-top dumpsters could be more cost efficient for starting recycling programs in hotels.

[14] T. Maes, J. Barry, H.A. Leslie, A.D. Vethaak, E.E.M. Nicolaus, R.J. Law, B.P. Lyons, R. Martinez, B. Harley, J.E. Thain, Below the surface: Twenty-five years of seafloor litter monitoring in coastal seas of North West Europe (1992–2017), Science of The Total Environment, Volume 630, 2018, Pages 790-798,

e. Consider simplifying recycling in some beachfront locations to cans and bottles only to reduce contamination. Cans and bottles composed approximately 47% of the recyclable materials observed in our audit, with roughly 40% contamination.
f. Further examine internal JIA recycling practices. Some contamination was observed in the JIA Maintenance Way open top dumpster; the dumpster was primarily full of cardboard, and we were informed in interviews that the dumpster is often full or overflowing. A cardboard compactor could significantly alleviate the load on the dumpster and keep recyclables out of the elements.
g. Consider piloting a composting effort with hotels, restaurants, or the convention center that have switched to biodegradables or build a partnership with an industrial composting facility locally where they can be transported. In-vessel or vermi-composting might provide less labor-intensive alternatives to traditional composting windrows. Additional resources for small-scale composting are provided in the appendix.
h. Maintain awareness of recycling markets in communication with Waste Management to ensure up-to-date best practices of materials entering the recycling stream.

Litter Capture

a. Encourage volunteer groups conducting cleanups to work in other parts of the island inland, not only the beachfront. Messaging around cleanups could be expanded to include inland areas.
b. JIA could consider messaging around environmental impacts of tobacco litter. Visitors might not be aware of the negative impacts of disposing of cigarette butts in the environment.

Ocean

The Circularity Informatics Lab team at the University of Georgia hopes the information and recommendations presented here will serve to help the Jekyll Island Authority understand the plastic system in their community and prevent plastic leakage into the environment.

APPENDIX

Waste Characterization Assumptions and Notes:

a. During the sort of the Jekyll Island Authority Waste Stream, only PET bottles were separated from other plastics. During the other waste sorts, all PET was segregated from other plastics.
b. Film plastics included both clear and colored film and multilayer packaging, such as chip wrappers and other food packaging.
c. Buckets were weighed at the beginning of the waste sort; weights were assumed to remain consistent throughout. This may have introduced a small amount of error, such as for the liquid waste bucket.
d. Saturated paper (such as napkins and paper towels) was classified as organic matter. Due to the weight fraction being primarily organic, film plastic wrappers that contained food waste and could not be separated were classified as organic. Plastic coffee pods containing coffee grounds were classified as organic.
e. Plastic containers were emptied of liquids and food waste as much as possible; however, all weights should be assumed to be wet weights.
f. Diapers, medical bottles, feminine hygiene products, and wet wipes were all classified as personal care/medical. Due to safety concerns, if visual inspection of a bag determined it to be primarily personal care/medical (such as bathroom trash), the entire bag was classified as such.
g. Residual fines passing the 2'' mesh were primarily organic matter and small pieces of plastic (such as plastic utensils and straws). No attempt was made to separate plastic items from the fines portion.
h. Cardboard measured as part of the Convention Center waste stream was diverted from recycling. Waste from the Convention Center was only kitchen waste from food prep for a 250-person breakfast the following day.
i. Hotel 1 waste was from one day of housekeeping. Hotel 1 includes continental breakfast.
j. Hotel 2 was from a half day during the afternoon. Waste did not include restaurant waste.
k. Hotel 3 waste was from a half day during the morning and did not include restaurant waste.
l. Jekyll Island Authority waste includes public trash cans, the campground, JIA offices, and some restaurants and businesses.

Resources for Small-Scale Composting:

Small-Scale Composting in Mediterranean Tourist Regions

Preventing Animal Nuisances in Small Scale Composting

Small Scale Co-Composting Process and Efficient Methods