Circularity Assessment Protocol
EPA Region 4 Rural Cohort

University of Georgia

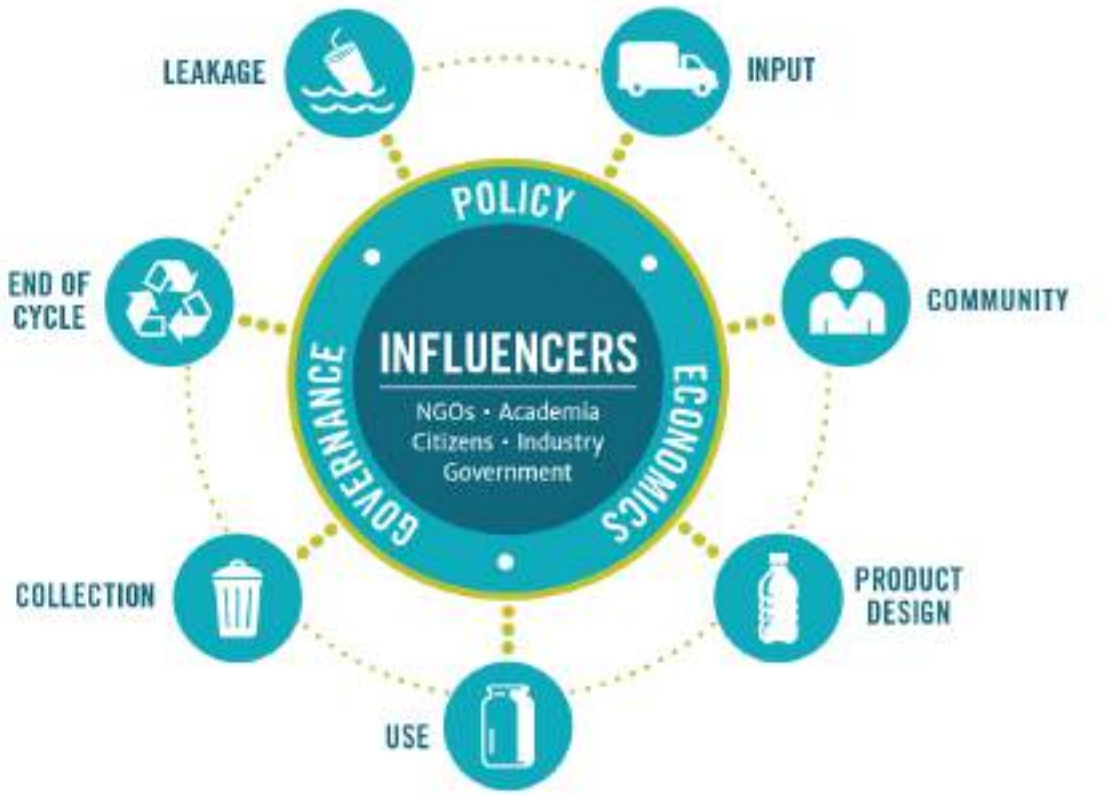
Circularity Informatics Lab

Report Date

New Materials Institute
UNIVERSITY OF GEORGIA

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 policy, economics and governance with key influencers including non-governmental organizations, industry, and government.



Fieldwork was conducted by the CIL team in September and November 2022 for Tifton, August 2022 and April 2023 for Cherokee County, and April to May 2023 for Georgetown County. This CAP project was sponsored by the US EPA.

Key Findings

INPUT

Findings: Data summary

Opportunities:

- Bullets

COMMUNITY

Findings: Data summary

Opportunities:

- Bullets

PRODUCT DESIGN

Findings: Data summary

Opportunities:

- Bullets

USE

Findings: Data summary

Opportunities:

- Bullets

COLLECTION

Findings: Data summary

Opportunities:

- Bullets

END OF CYCLE

Findings: Data summary

Opportunities:

- Bullets

LEAKAGE

Findings: Data summary

Opportunities:

- Bullets

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Introduction

2.2.3 | Rural Recycling

The environmental impacts associated with mismanaged waste are felt more by disadvantaged communities like rural communities (Tunnell, 2008; UNEP & International Solid Waste Association, 2024; US EPA, 2021a). This is due to lower access to services and limited development opportunities compared to urban areas (Mihai et al., 2021). However, there is a lack of studies on rural recycling, with most resources being white papers. Global studies report the gap between rural and urban waste collection coverage for each world region except North America (Kaza et al., 2018). Six years later, a study mentioned a 20% household waste collection rate difference between rural and urban areas in North America, showing the opportunity to increase rural recycling rates (Lloyd's Register Foundation, 2024). This is still on a continent scale and not about the US. This warranted further exploration to better understand rural areas' recycling challenges and address the disproportionate environmental impacts of mismanaged waste.

The few rural studies discuss the unique recycling problems faced: a low quantity of recyclables, volatile recycling markets, and economies of scale. These non-metropolitan areas account for 20.3% of the U.S. population but span 87.4% of the nation's land area (HSRA, n.d.). According to the HSRA, the three communities studied—Tifton in Georgia, Georgetown County in South Carolina, and Cherokee County in North Carolina—with varying populations are considered rural (Table X). The low population density leads to fewer recyclables being collected, making the curbside recycling method economically unfeasible due to a lack of economies of scale. This may prompt alternative collection methods (Jakus et al., 1996; National Academies of Sciences, Engineering, and Medicine, 2022).

Table X: July 2023 Population Estimates of Rural Communities
Reference: US Census Bureau, n.d.

Rural Community	Type of Community	Population
Tifton, Georgia	City	17,357
Cherokee County, North Carolina	County	29,959
Georgetown County, South Carolina	County	65,731

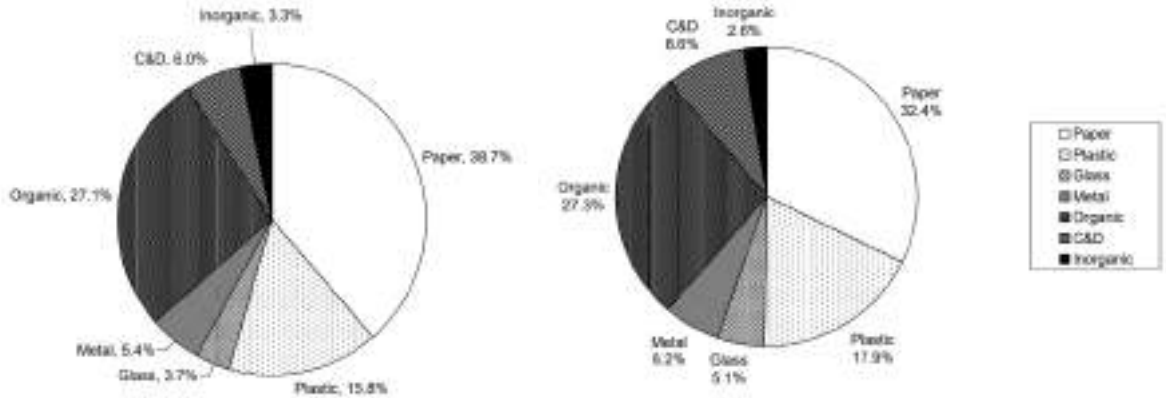
In addition to this, recycling markets are very volatile (The Recycling Partnership, 2024; UNEP & International Solid Waste Association, 2024). When the value of recovered materials falls below processing costs, it results in a loss of profit, often forcing rural communities to reduce the recycling services offered as they have limited public revenue (The Recycling Partnership, 2024; Tunnell, 2008). Economies of scale in recycling are achieved only at low recycling amounts, with the minimized cost occurring at 13,200 tons of recyclables per year, comparable to what 80,000 people generate (Bohm et al., 2010). Neighboring rural cities or counties can collaborate to increase the total quantity of recyclables, allowing them to leverage economies of scale. This is important because open burning or dumping rates increase when there is no curbside collection in rural areas (Tunnell, 2008).

There is no best form of collecting recyclables, as it depends on each community's needs and challenges (Lloyd's Register Foundation, 2024; UNEP & International Solid Waste Association, 2024). Arguments against curbside collection in rural communities consist of long driveways decreasing the desire to place the recycling bin on the main road. Drop-off areas provide a social experience for citizens (Wright et al., 2014). On the other hand, curbside recycling promotes the social norm of recycling as it is visible to their neighbors (Abbott et al., 2014). Drop-off areas burden residents due to increased time and effort (UNEP & International Solid Waste Association, 2024). Additionally, studies have found that the farther an individual travels to a drop-off area, the lower the recycling rate (Saphores et al., 2006; Sidique et al., 2010). However, rural residents may not view the distance as inconvenient if they also have to dispose of their household waste at the drop-off areas (Saphores et al., 2006).

2.3 | Waste Management in Georgia

The Georgia Environmental Protection Division (GEPD) regulates the state's waste management. The most recent waste characterization study was conducted in 2003-2004 when the population of Georgia was 8.6 million. The state's total MSW reported was 10.04 million lbs. The per capita MSW rate increased from 5.56 lbs/person/day in 1993 to 7.14 lbs/person/day. Figure X shows Georgia MSW's top categories, with paper and organics representing 67% together and plastics being the third largest category (15.8%) (Georgia Department of Community Affairs, 2005).

Figure X: Georgia (left) and South Georgia Region (right) MSW Characterization



Reference: Georgia Department of Community Affairs, 2005

The City of Tifton represents the Georgia rural community for this work. The South Georgia region includes Tift County, where Tifton is located, and eight other counties. This comprises 214,520 people who generated 226,382 tons of MSW, accounting for 2% of Georgia's total MSW. The top three MSW categories were the same as the state data, but compared to the state data, South Georgia generates 6.3% less paper and produces 2.1% more plastic (Figure X). The top three commonly recycled materials that were landfilled are corrugated cardboard, newspaper, and office paper. Other materials on this list were polyethylene terephthalate (PET) and HDPE bottles but at lower tonnage. The report has no information on the recycling rate for Georgia or the South Georgia region (Georgia Department of Community Affairs, 2005). Georgia has a large presence in the recycling industry. The Georgia paper industry recycles 8% of all paper in the U.S., and one-third of all plastic bottles recycled in North America are utilized in the carpet industry in Northwest Georgia (Georgia Department of Economic Development, n.d.).

Although the GEPD has published minimal information on recycling, reports from non-governmental organizations (NGO) and companies have provided some insights. The Recycling Partnership found that 62% of households have access to recycling, but only 19% of multi-family homes have access in Georgia, contributing to the 13% state-level recycling rate. 1.3 million tons of recyclables are lost to landfills (The Recycling Partnership, 2024). In a report for Ball Corporation, the recycling rate for packaging without fibers and flexible plastics (FFP) (PET, HDPE, rigid plastic #3-7, glass, aluminum, and steel cans) in Georgia was found to be 14%, ranking 31st in the US. The state recycling rate with FFP increased to 36% and increased the national ranking to 28. The highest recycling rate was for cardboard/paper packaging (52%), and the lowest was for polypropylene (PP) (3%). This resulted in $100 million in material recovery (Eunomia Research & Consulting Inc, 2023).

2.4 | Waste Management in North Carolina

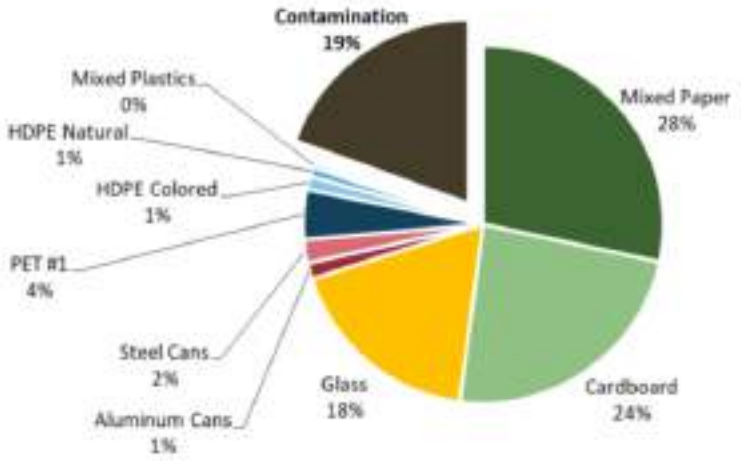
The North Carolina Department of Environmental Quality (NC DEQ) Division of Waste Management releases a yearly report outlining the state's SWM efforts, with the most recent for fiscal year (FY) 2022-2023. The total amount of MSW generated was 11.55 million tons. In Cherokee County, the rural area surveyed, less than 1% of the state's MSW is landfilled (NC Department of Environmental Quality, 2024). Almost half a million tons of MSW were exported to the surrounding states, so there is a possibility that Cherokee County exported waste as it borders both Tennessee and Georgia (NC Department of Environmental Quality, 2024b).

In North Carolina, 404,083 tons of commonly recycled goods were processed. Plastic recycling accounts for only 2.2% (34,148 tons). Nearly all recycled plastics were HDPE and PET bottles (NC Department of Environmental Quality, 2024b). This is mainly due to House Bill 1465, passed in 2009, which bans the disposal of plastic bottles in landfills. However, only 30% of PET bottles are recycled (NC Department of Environmental Quality, n.d.).

North Carolina's single-stream collection system, which handles 75% of all recyclables, can recycle 266,221 tons after accounting for a 19% contamination rate. Mixed paper and cardboard represent the largest categories, making up half of the recovered commingled recyclables. The following largest categories are glass and contamination (37.4%), which incur processing costs (Figure X). In the summer of 2023, aluminum ($1,340 per ton) and natural HDPE ($460 per ton) had the highest market values and have

been for the last ten years. However, these materials comprise only 2.2% of the total weight of recyclables, which limits potential profits. As a result, most MRFs charge a tipping fee, as the average blended material value of $51 per ton is insufficient to cover processing costs (NC Department of Environmental Quality, 2024b).

Figure X: North Carolina Commingled Recyclable Characterization



Reference: NC Department of Environmental Quality, 2024b

Three hundred three local governments offer curbside pickup, serving 2.25 million people or 20% of North Carolina's population. In addition, composting programs have diverted 18,469 tons of food waste. Forty-four counties participate in unique initiatives to reduce waste generation, including 26 public reuse, 44 backyard composting, and 61 source reduction programs (NC Department of Environmental Quality, 2024b). The NCDEQ created a website to connect recyclable material generators to recycling companies: https://recyclingmarkets.deq.nc.gov/.

Although the NCDEQ has published information on recycling, reports from NGOs and companies have provided further insights. The Recycling Partnership found that a quarter of households do not have access to recycling, with multi-family households having only 15% accessibility, contributing to a 19% recycling rate and 1.3 million tons of recyclables lost to landfills (The Recycling Partnership, 2024). In a report for Ball Corporation, the recycling rate for packaging without FFP is 17%, ranking 28th nationally. The state recycling rate with FFP increased to 50%, increasing the US ranking to 12th. The highest recycling rate was cardboard/paper packaging (72%), and the lowest was rigid plastics #3-7 (2%). This resulted in $113 million in material recovery (Eunomia Research & Consulting Inc, 2023). This is the highest recycling rate out of the three states.

2.5 | Waste Management in South Carolina

The South Carolina Department of Health and Environmental Control (SC DHEC) produces an annual report on the state's SWM. In FY 2023, 5.4 million tons of waste was generated. The average tipping fee in the state was $36/ton for Class II landfills and $43/ ton for Class III. The recycling rate

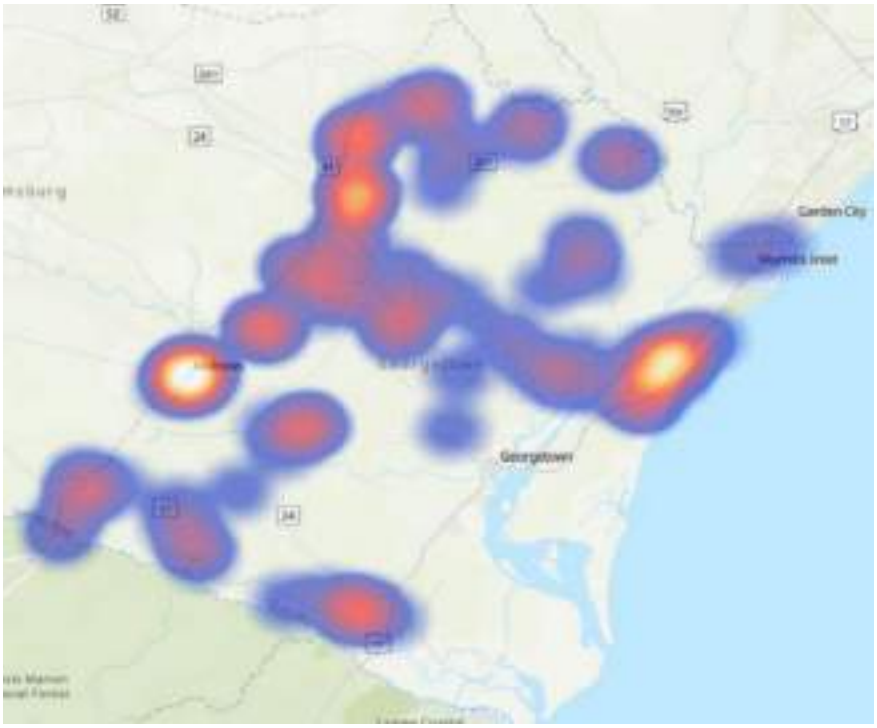
includes composting and was 20.9%. Among recycled materials, metals accounted for the largest amount (25%), while plastics had one of the lowest recycling rates (2%). Georgetown County, the rural area surveyed, generated about 0.73% of South Carolina's MSW and 1.13% of the amount recycled (SC Department of Health and Environmental Control, 2023)

South Carolina has set goals to reduce MSW to 3.25 lbs/person/day by recycling at least 50% of its MSW (SC Department of Health and Environmental Control, 2023). To support recycling, the South Carolina government has invested $5.4 billion into the recycling industry between 2018 and 2022, resulting in a $13.6 billion total annual economic impact. This is due to 301 recycling businesses throughout the state. Georgetown County has only a glass bunker, but neighboring counties Florence and Charleston each have 14 and 29 recycling businesses, respectively (Recycling Market Development Advisory Council, 2022). As of 2018, plastic manufacturing was the 10th largest employing job area in Georgetown County (Economic Leadership LLC, 2019). The SC DHEC created a website to connect recyclable material generators to recycling markets: https://www.recyclinginsc.com/directory/.

South Carolina's recycling is collected through 530 drop-off sites or 69 curbside programs (SC Department of Health and Environmental Control, 2023). However, the state faces issues with plastic bags stuck in sorting machines. Horry County, Georgetown's neighboring county, estimates fixing solid waste sorting machines from plastic bag damage to be $100k. Charleston County has stopped accepting plastic bags due to the damage they cause MRFs (Coastal Conservation League, 2017).

Several reports address Georgetown County's litter and SWM according to the Sustainable Development Goals supported by internships through the Georgetown RISE United Nations Youth Crops Initiatives. One of the 2022 reports, using Keep America Beautiful protocols, analyzed the county's yearly litter index and found hotspots at Andrews, Pawleys Island, and areas near rural highways (Figure X). Andrews has more litter than Pawleys Island due to lower income, decreased use of private waste companies, and less tourism, which encourages a cleaner community. Most of the litter found was alcohol-related, such as bottles and packaging. Common litter items include take-out packaging, aluminum cans, plastic bottles, and tires. From 2021 to 2022, thirty county-organized cleanups resulted in 29,404 lbs of litter removed from the environment, resulting in less litter than the 2021 litter index (Rainwater, 2022). Due to Georgetown County's location on the Winyah Bay and Atlantic Ocean, there is a greater risk that mismanaged waste, especially plastic, will end up in the ocean. Therefore, waste must be appropriately managed, and litter must be picked up to reduce the amount (Castleforte, 2022; UNEP & International Solid Waste Association, 2024).

Figure X: Georgetown County Litter Heat Map



Reference: Rainwater, 2022

Despite the large amount of information on recycling from the state and county levels, outside studies not affiliated with the municipal or state government find valuable insights. Multi-family households in South Carolina have only a 6% accessibility rate, contributing to a 15% recycling rate. 640k tons of recyclables are lost to landfills (The Recycling Partnership, 2024). According to a report for Ball Corporation, South Carolina's recycling rate for packaging without FFP is 6%, ranking it 46th in the US. The state recycling rate with FFP increased to 35%, increasing the national ranking to 30th. The highest recycling rate was for cardboard/paper packaging (56%), and the lowest was for PP (2%). This resulted in $43 million in material recovery (Eunomia Research & Consulting Inc, 2023).

The US EPA Region 4 includes eight states and six tribes, encompassing 66.9 million people, representing 20% of the US population (US EPA, 2021b). This work focused on two rural counties and one rural city in three states (Georgia, North Carolina, and South Carolina) in Region 4, a small sample size. Each rural community has its own unique situation and findings. This is the beginning of understanding the challenges that rural recycling faces in Region 4.

Figure X: Overview map of survey area in EPA Region 4: Tifton, GA; Cherokee County; and Georgetown County, SC

The Circularity Informatics Lab (CIL) at the University of Georgia (UGA) developed the Circularity Assessment Protocol (CAP) in 2018, which is a standardized assessment protocol used to collect community-level data to inform decision-makers (Figure XX). 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?

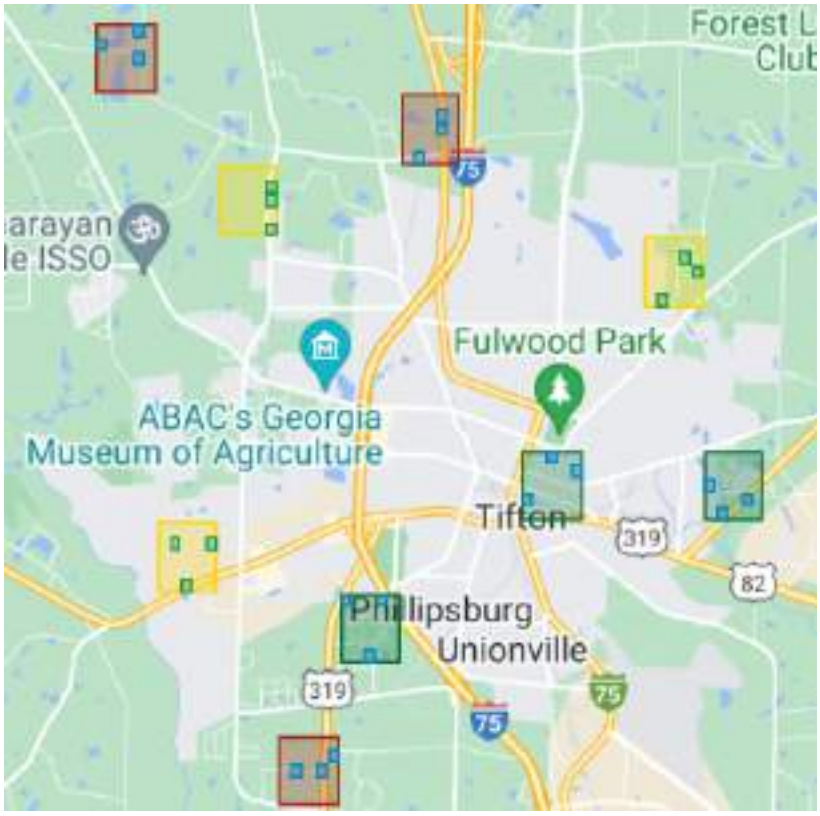
Figure XX; Circularity Assessment Protocol (CAP) hub-and-spoke model.

The CAP fieldwork was conducted in September and November 2022 for Tifton, August 2022 and April 2023 for Cherokee County, and April to May 2023 for Georgetown County. This CAP project was sponsored by the US EPA. The CAP report is split into the following sections, which include results and discussion of each: Input, Community, Product Design, Use, Collection, End of Cycle, and Leakage, followed by Opportunities. The intent is for the data in this report to inform ongoing stakeholder engagement around solutions to strengthen the circular economy and waste management in [rural communities throughout EPA Region 4].

Sampling Strategy

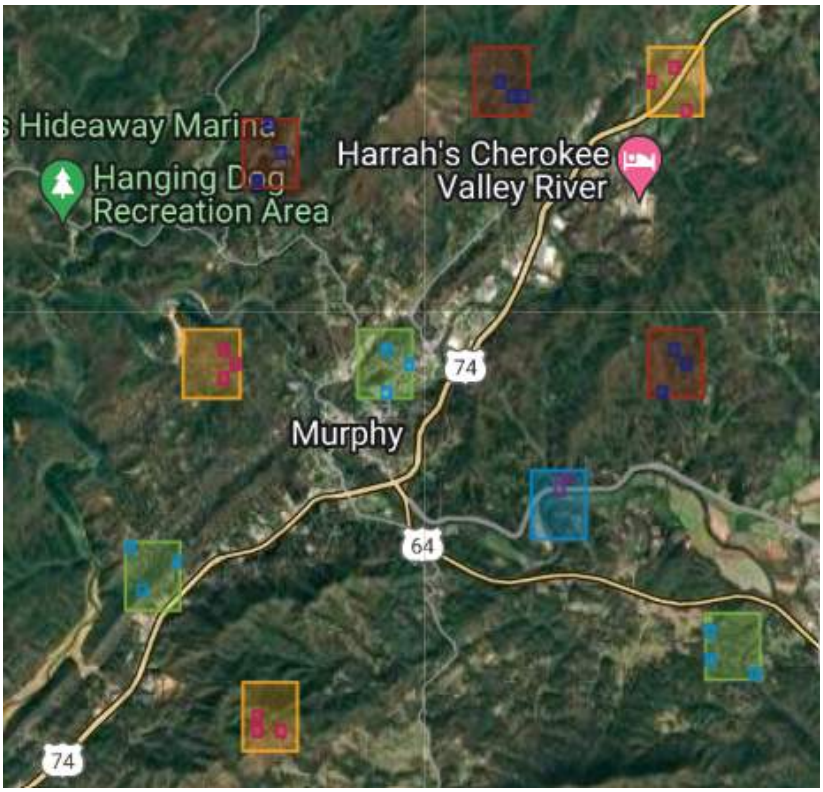
In order to randomly sample various locations in a city, the CAP typically identifies a 10 x 10km area over the city (with the center of the city in the center of the area). In this area, the ambient population is sectioned into tertiles (three groups) (Figure XX). Ambient population count can be described as "where people go" and "societal activity" — it is not population density of where people live. These three areas typically form samples of different land uses, etc.

Figure X: Population Tertiles and Survey Sites in Tifton, GA



Note: The green squares represent the high ambient population tertile, the yellow squares represent the medium ambient population tertile, and the red squares represent the low ambient population tertile.

Figure X: Population Tertiles and Survey Sites in Cherokee County, NC

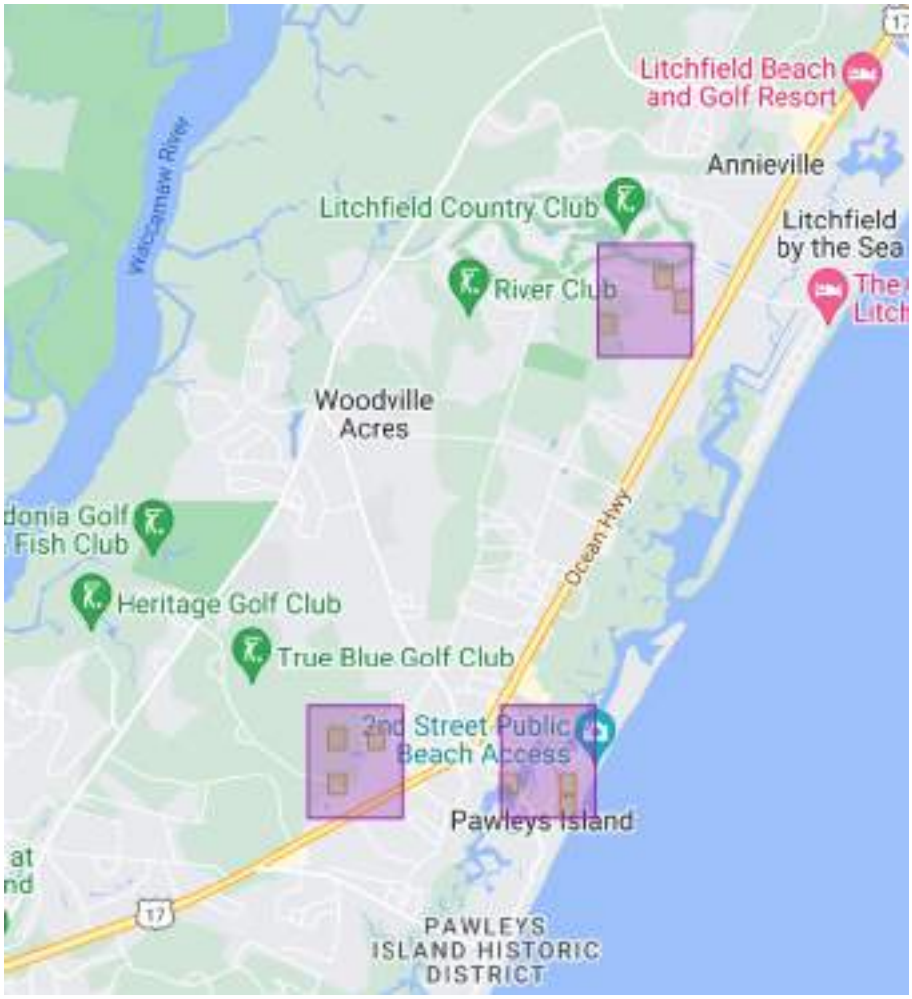


Note: The green squares represent the high ambient population tertile, the orange squares represent the medium ambient population tertile, and the red squares represent the low ambient population tertile. The red square on the right could not be accessed, so the blue square replaced it.

Figure X: Population Tertiles and Survey Sites in Georgetown County, SC

Note: The red squares represent the high ambient population tertile, the orange squares represent the medium ambient population tertile, and the yellow, blue, and green squares (the three squares on the left) represent the low ambient population tertile.

Figure X: Population Tertiles and Survey Sites in Pawleys Island, SC



Note: The red squares represent the high ambient population tertile, the orange squares represent the medium ambient population tertile, and the yellow, blue, and green squares (the three squares on the left) represent the low ambient population tertile.

Typically, three 1 x 1 km areas for surveying are randomly selected within each population tertile using NOAA's Sampling Design Tool, resulting in a total of nine 1km2 areas for surveying. In total, 9 sites were surveyed, four in the high population count tertile and three each in both the low and mid population count tertile.

Input

Tifton, Georgia:

The CIL team surveyed thirteen stores to collect and sample 446 fast-moving consumer goods, comprising 133 beverages, 229 candies, 63 chips, and 21 tobacco products. The top brands in Tifton consisted of the following:

- **Beverages**: Gatorade, Coca-Cola, and Mountain Dew
- **Candy**: Reese's, M&Ms, and Snickers
- **Chips**: Lays, Doritos, and Cheetos
- **Tobacco Products**: Marlboro, Newport, and L&M

Most FMCG were manufactured in the US at 93% (Figure X), with local bottling facilities in Tifton for Coca-Cola and Albany for PepsiCo. A majority (82%) of the FMCG parent company locations are also domestic (Figure X), with Pennsylvania, New York, Virginia, Georgia, and Texas being the top parent company states. The top three parent companies (Mars Inc, PepsiCo, and The Hershey Company) sourced 33% of all the FMCG. Products originating from global parent companies (18%) were predominantly in Europe and North America. However, some products were sourced from Ecuador, Japan, Peru, South Korea, and Turkey (Figure X).

Figure X: Tifton Manufacturer Locations by FMCG Type Map

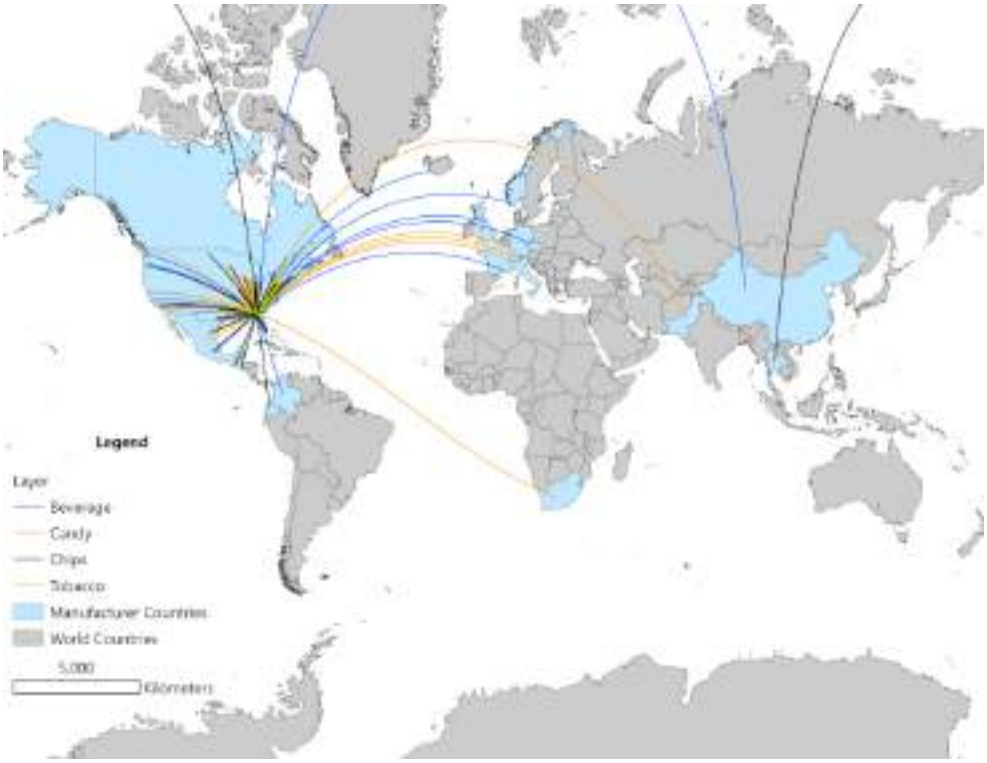


Figure X: Tifton Parent Company Locations by FMCG Type Map

Tobacco products showed the farthest average distance from parent companies yet had the closest distance to manufacturers (Table X). 41 FMCG were manufactured and/ or had a parent company location in Georgia, of which The Coca-Cola Company in Atlanta produced 73%. The lowest minimum distance to the parent company and manufacturer was candy (30 km) in Ocilla, GA. The closest beverage parent company/ manufacturer (116 km) was also located in Georgia in Arlington.

Table X: Distances between Tifton and Manufacturer and Parent Company Locations for FMCG

	*Length Store to Parent Company (km)			Length Store to Manufacturer (km)		
	Minimum	Maximum	Average	Minimum	Maximum	Average
Beverages	116	11,736	1,861	116	12,209	1,743
Candy	30	11,320	2,619	30	14,746	1,585
Chips	368	7,200	1,576	368	14,746	1,665

Tobacco Products	216	6,908	3,387	216	2,130	868

*Note: Distances were projected using an Azimuthal Equidistant projection. Values have been rounded to the nearest km.

The states neighboring Georgia manufactured 9% of the sampled FMCG in Tifton (Table X). North Carolina was the most popular state due to its tobacco industry, closely followed by Florida. PET was the primary beverage packaging material, but three manufacturers (Ingles Market Co., Milo's Tea Co., and Milkco Inc.) packaged them in HDPE. Both materials are recyclable and widely accepted.

Table X: Products Manufactured in Neighboring States and Distributed in Tifton

Neighboring State	Manufacturer	Product Category	Main Packaging Type
Alabama	Golden Flake Snack Foods	Chips	Multilayer Plastic Film
	Milo's Tea Co.	Beverages	HDPE
	Nantze Springs	Beverages	PET
Florida	Anastasia Confections Inc	Candy	Multilayer Plastic Film
	Barberi International	Chips	Multilayer Plastic Film
	Costa del Sol	Chips	Multilayer Plastic Film
	De Mi Pais	Beverages	PET
	Natalie's Juice Co.	Beverages	PET
	Polaris Trading Corp.	Chips	Multilayer Plastic Film
	Raindrops Enterprises LLC	Candy	Multilayer Plastic Film
	Swisher	Tobacco	Paperboard & plastic film
	Tropicana Manufacturing Co.	Beverage	PET

	Zephyrhills Public Water Supply	Beverage	PET
North Carolina	American Snuff Company	Tobacco	Paperboard & plastic film
	Food Lion LLC	Beverage	PET
	GoodMark Foods Inc	Chips	Multilayer Plastic Film
	Ingles Market Co.	Beverage	HDPE
	ITG Brands	Tobacco	Paperboard & plastic film
	Liggett Group	Tobacco	Paperboard & plastic film
	Milkco Inc	Beverage	HDPE
	Pepsi Bottling Group Inc	Beverage	PET
	RJ Reynolds Company	Tobacco	Paperboard & plastic film
	Snyder's Lance Inc	Chips	Multilayer Plastic Film
South Carolina	Deer Park	Beverage	PET
	Lowcountry Kettle	Chips	Multilayer Plastic Film
Tennessee	Charms LLC	Candy	Multilayer Plastic Film
	PepsiCo	Beverage	PET
	Standard Candy Co.	Candy	Multilayer Plastic Film

Cherokee County, NC:

The CIL team surveyed thirteen stores to collect and sample 414 fast-moving consumer goods, comprising 116 beverages, 163 candies, 127 chips, and 8 tobacco products. The top brands in Cherokee County consisted of the following:

- **Beverages**: Coca-Cola, Pepsi, Gatorade, and Mountain Dew
- **Candy**: M&Ms, Reese's and Hershey's
- **Chips**: Lays, Doritos, and Cheetos
- **Tobacco Products**: Marlboro, Newport, and L&M

Nearly all FMCG were manufactured domestically at 96% (Figure X). There are local PepsiCo bottling facilities throughout North Carolina, and Coca-Cola bottling facilities are located in nearby cities in Tennessee and Georgia. Most (89%) FMCG had domestic parent company locations. Pennsylvania, New York, Virginia, Georgia, and Texas were the top parent company states. The top three parent companies, The Hershey Company, PepsiCo, and The Coca-Cola Company, sourced 40% of the FMCG in Cherokee County. While few products originate from global parent companies (11%), they were predominantly from Europe and North America. However, some were sourced from Japan and Turkey (Figure X).

Figure X: Cherokee County Manufacturer Locations by FMCG Category Map

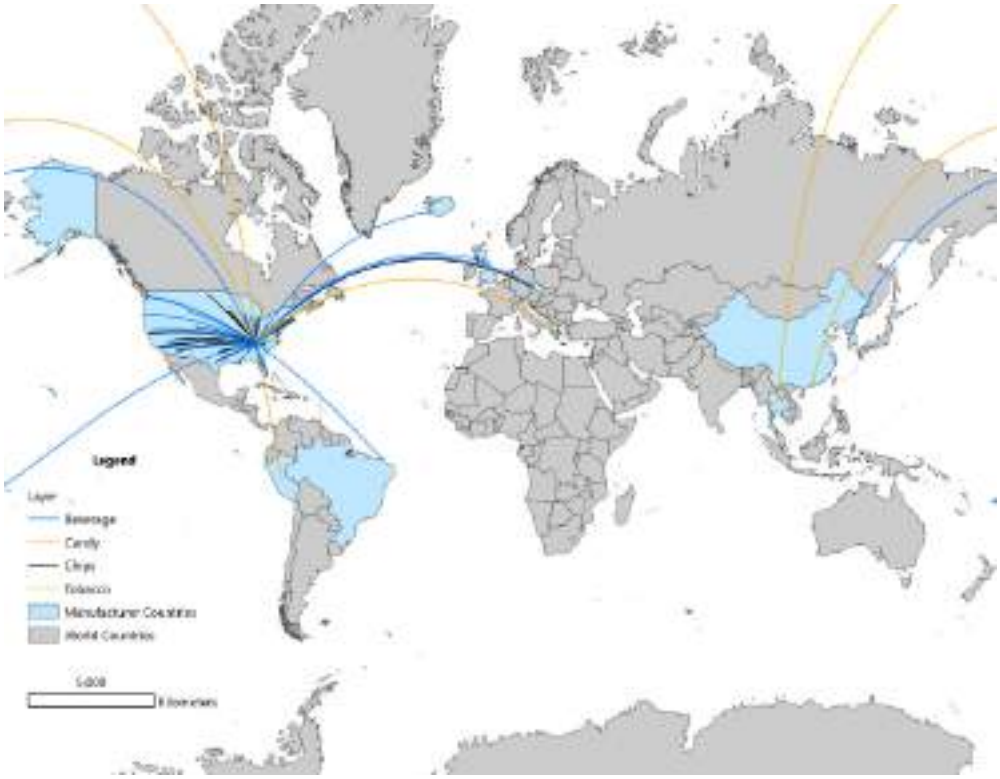
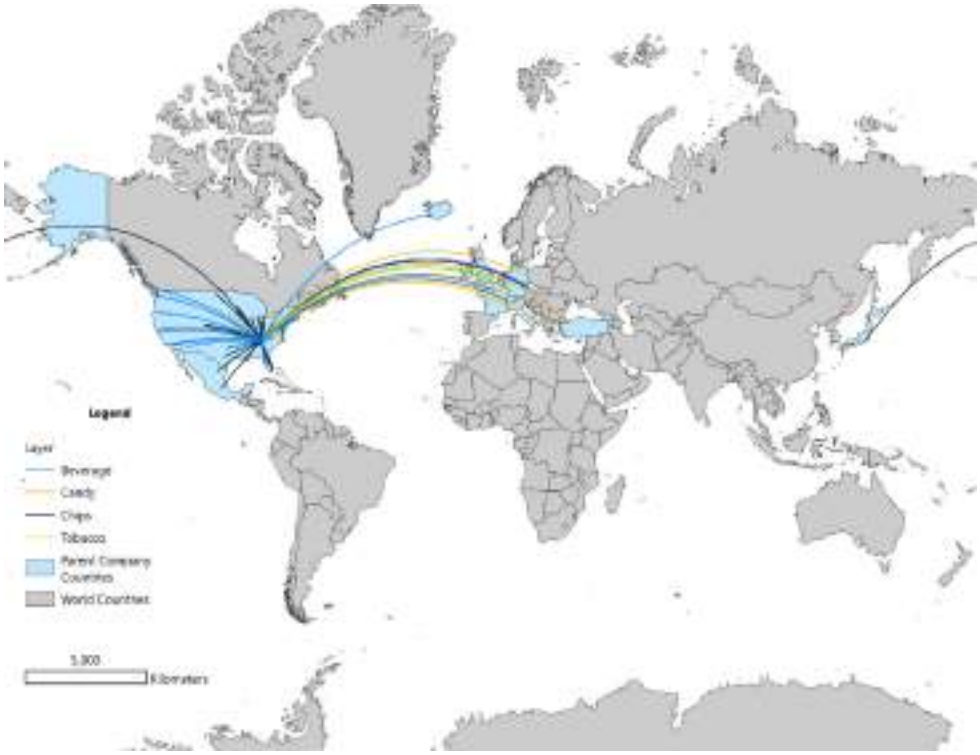


Figure X: Cherokee County Parent Company Locations by FMCG Category Map



Tobacco products had the greatest average distance from parent companies while maintaining the shortest distance to manufacturers (Table X). 23 products were manufactured and/ or had a parent company location in North Carolina. This can be seen in the minimum distance for the parent company for beverages, 147 km, located in Asheville, NC. Cherokee County's unique location allows several minimum distances to be in nearby states. For parent company locations, chips and candy have a minimum distance of 95 km and 275 km, respectively, for nearby Tennessee locations. The minimum manufacturer distances for chips (154 km) and candy (439 km) are in Georgia and Kentucky, respectively.

Table X: Distances between Cherokee County and Manufacturer and Parent Company Locations for FMCG

	*Length Store to Parent Company (km)			Length Store to Manufacturer (km)		
	Minimum	*Maximum*	*Average*	*Minimum*	*Maximum*	*Average*
Beverages	147	7,656	1,527	61	11,826	1,711
Candy	275	9,160	2,240	439	14,337	1,326

Chips	95	10,950	1,311	154	7,716	1,184
Tobacco Products	653	6,658	3,749	363	1,984	924

*Note: Distances were projected using an Azimuthal Equidistant projection. Values have been rounded to the nearest km.

The states neighboring North Carolina manufactured 8% of the sampled FMCG in Cherokee County (Table X). The majority were from Georgia due to the popularity of Coca-Cola products. While most beverages were packaged in PET, Mayfield Dairy Farms packaged them in HDPE.

Table X: Products Manufactured in Neighboring States and Distributed in Cherokee County

Neighboring State	Manufacturer	Product Category	Main Packaging Type
Georgia	Deep River Snacks	Chips	Multilayer Plastic Film
	good2grow	Beverage	PET
	The Coca-Cola Company	Beverage	PET
South Carolina	Deer Park Spring Water	Beverage	PET
Tennessee	Brim's Snack Foods	Chips	Multilayer Plastic Film
	Charms LLC	Candy	Paper / Paperboard
	Mayfield Dairy Farms	Beverage	HDPE
	PepsiCo Inc	Beverage	PET
Virginia	Bottling Group LLC	Beverage	PET
	Mars Inc	Candy	Multilayer Plastic Film
	Nestle USA Inc	Beverage	PET

	Sweet Smiles Candy	Candy	Multilayer Plastic Film

Georgetown County, SC:

The CIL team surveyed twenty stores in Georgetown County to obtain samples of 269 fast-moving consumer goods, comprising 111 beverages, 97 candies, 38 chips, and 23 tobacco products. In Pawleys Island, the CIL team surveyed nine stores. The same brands were found between inland and coastal Georgetown County, but there were some differences in the top brands (Table X). At least two top brands were the same for all the FMCG in both areas but were in different orders.

Table X: Top FMCG Brands found in Georgetown County and Pawleys Island

FMCG Category	Georgetown County Top Brands	Pawleys Island Top Brands
Beverages	1. Coca-Cola 2. Gatorade 3. Mountain Dew	1. Coca-Cola 2. Dasani 3. Gatorade / Sprite
Candy	1. Reese's 2. M&Ms 3. Hershey's	1. Hershey's 2. Reese's 3. M&Ms
Chips	1. Lays 2. Doritos 3. Cheetos	1. Lays 2. Takis 3. Doritos
Tobacco*	1. Marlboro 2. Newport 3. Pall Mall / Swisher Sweets	1. Marlboro 2. Newport 3. L&M

*Note: The top brands for tobacco were only identified and not purchased.

Due to the similarity of brands in Georgetown County's inland and coastal regions, the distance to manufacturer and parent company locations for FMCG was only calculated for the inland area. Most FMCG were domestically manufactured at 93% (Figure X), with local bottling facilities in South Carolina for PepsiCo and Coca-Cola. Most (83%) of the FMCG parent company locations are also domestic, with New York, Pennsylvania, Virginia, Texas, and Georgia being the top parent company states. A quarter of the FMCG came from the top three parent companies: PepsiCo, The Hershey Company, and The Coca-Cola

Company. Products originating from global parent companies (17%) were predominantly in Europe and North America. However, a few were sourced from Australia, Japan, and Turkey (Figure X).

Figure XX: Georgetown County Manufacturer Locations by FMCG Category Map

Figure XX: Georgetown County Parent Company Locations by FMCG Category Map

Tobacco products had the highest average distance to parent companies yet maintained the lowest average distance to manufacturers (Table X). Two products were manufactured and/ or had a parent company location in South Carolina. The beverage minimum distance for manufacturers is 161 km, and the chip minimum distance for manufacturers and parent company locations is 93 km, representing the in-state locations of Chesterfield County and Charleston, respectively.

Table XX: Distances between Georgetown County and Manufacturer and Parent Company Locations for FMCG

	*Length Store to Parent Company (km)			Length Store to Manufacturer (km)		
	Minimum	*Maximum*	*Average*	*Minimum*	*Maximum*	*Average*
Beverages	246	16,004	1,878	161	16,004	2,020
Candy	461	11,353	2,735	461	14,549	2,239
Chips	93	3,589	1,164	93	15,837	2,216

Tobacco Products	278	11,353	2,929	278	2,451	672

*Note: Distances were projected using an Azimuthal Equidistant projection. Values have been rounded to the nearest km.

The neighboring states of South Carolina manufactured 8% of the FMCG sampled in Georgetown County, dominated by The Coca-Cola Company in Atlanta, Georgia (Table XX). Beverages and tobacco were the most common products. North Carolina manufactures 39% of all the surveyed tobacco.

Table 19: Products Manufactured in Neighboring States and Distributed in Georgetown County

Neighboring State	Manufacturer	Product Category	Main Packaging Type
Georgia	The Coca-Cola Company	Beverage	PET
	Biolyte	Beverage	PET
	good2grow	Beverage	PET
	Lemon Perfect Company	Beverage	PET
	Tum-e Yummies	Beverage	PET
North Carolina	Brooklyn Bottling	Beverage	PET
	Carolina Beverage Corporation	Beverage	PET
	Cheyenne International	Tobacco	Paperboard & plastic film
	Food Lion, LLC	Beverage	PET
	GoodMark Foods Inc	Chips	Multilayer Plastic Film
	ITG Brands	Tobacco	Paperboard & plastic film
	John Boy & Billy Inc	Beverage	PET

Liggett Group	Tobacco	Paperboard & plastic film
OhFresh Brands	Beverage	PET
Pepsi Bottling Group Inc	Beverage	PET
RJ Reynolds Company	Tobacco	Paperboard & plastic film
Snyder's Lance Inc	Chips	Multilayer Plastic Film

Community

Policy Backdrop

Add any information on relevant local policy.

Tifton, Ga:

Eight key stakeholders shared their insights into the community's prevailing attitudes and perceptions about plastic waste and recycling (Table X). Conversations were held with three stakeholders from academia, two from facilities management, one from the regional recycling center, and two from waste management companies. It is important to note that the information gathered from stakeholders is not exhaustive, as the rural nature of the communities limited the number of participants. The stakeholders provided insights into Tifton's recycling system, highlighting strong community interest and significant challenges: past mismanagement, lack of resources and facilities, and high contamination. Addressing these issues through education, policy changes, and infrastructure improvements is key to rebuilding trust and improving their recycling system. The following insights are presented as closely as possible to the notes taken during stakeholder conversations.

Table X: Stakeholder Groups and Number of Stakeholders in Tifton

Stakeholder Group	Number of Stakeholders
Academia	3
Facilities Management	2
Regional Recycling Center	1
Waste Management Company	2

An academic stakeholder provided insight into Tifton's recycling history. In the 1990s, a progressive city council initiated recycling. Another push for recycling came from a progressive mayor. A facilities management stakeholder highlighted a shift in the relationship between Tifton and Tift County. In the past, there was a strong working relationship in which they collaborated with representatives from both the county and city boards. However, disagreements on splitting Special Purpose Local Option Sales Tax (SPLOST) money, a 1% sales tax that funds capital projects, resulted in a turf war between the city and county and, ultimately, lawsuits. As a result, collaboration to decrease costs and increase the volume of recyclables is unlikely.

Despite the political challenges, waste management companies have observed that many Tifton residents enjoy recycling. Academics also highlighted the city's many environmental activists, and the UGA Tifton campus participated actively when there was a recycling drop-off. While some in the community want to recycle, the community's trust in recycling has been damaged. An academic stakeholder shared that a past waste management company was dishonest and dumped recyclables in the trash.

Recycling in Tifton faces economic and facility challenges. A facilities management stakeholder noted that the market for recyclables has collapsed, and there is a need for funding and space to recycle more efficiently. Waste management companies shared that it is challenging to recycle economically because the low landfill tipping prices ($42/ ton) compete with the much higher recycling costs ($120/ ton). Additionally, Tifton lacks key facilities, such as a MRF or a transfer station, making transportation a major hurdle. Due to its rural location far from major cities, baled plastic must be hauled to Tallahassee, FL, 90 miles away, as it is the closest location. Colleges, a top employment sector in Tifton, would be willing to participate in recycling if they didn't have the burden of hauling recyclables themselves.

A waste management company stakeholder shared that single-stream recycling is great in philosophy due to its less space and convenience to residents. Still, it doesn't work on a human level because people contaminate it. They estimated that approximately 80% of the recycling is trash. This is particularly challenging with plastic. If it is not clean, it must go to another recycler. An academic stakeholder shared that many people are unwilling to work to sort their recycling properly, as seen with the campus cardboard recycling contaminated with Styrofoam. Thirty years ago, inmate labor was used to sort recycling to reduce contamination and keep costs low. This practice is no longer present in the community, possibly due to ethical concerns, particularly around fairness, consent, and the potential exploitation of a vulnerable population.

Tifton's large agricultural sector is also affected by the recycling system. Farmers are reluctant to take plastic mulch or liners to the landfill and instead store them in their fields. These plastics are exposed to weathering and can fragment and run off if it rains. Plastic can get entangled during tilling and in cotton-picking tractors, ending up in the tractor's threads, shared an academic stakeholder.

One way to address plastic pollution and increase recycling rates is through community education. A facilities management stakeholder believes it has been too long since recycling was a main option in SWM, so the campus and community need to be re-educated. An emphasis on why and how to recycle and the value of the land that is lost by sending all waste to the landfill is important to encourage the public to recycle. Waste management companies shared that education must start at a young age in

school. Recycling was previously part of the school curriculum, but stakeholders reported it no longer exists.

Waste management stakeholders suggested several policy changes to improve recycling in Tifton. The city could give residents smaller trash cans to increase recycling rates. It also needs to enforce clean recyclables or give waste management the power to do so. Finally, recycling could be incentivized. This could be a tax incentive for higher levels of recycled materials advertised on TV, the internet, and paper pamphlets when residents sign up for waste services.

Ultimately, Tifton's recycling system has been influenced by ongoing conflicts among city and county officials, community interests, and systemic challenges. While many residents and institutions support recycling, past mismanagement has weakened public confidence. A lack of resources and facilities, as well as contamination issues, decrease recycling rates. Furthermore, the city's agricultural sector faces specific challenges related to plastic waste. Education and awareness campaigns are crucial to improve recycling rates, alongside policy changes that encourage better waste management practices. Tifton can rebuild trust and establish a more sustainable city and efficient recycling system by educating the public, enforcing clean recycling, and offering incentives.

Cherokee County, NC:

Three key stakeholders shared the community's attitudes and perceptions about plastic waste and recycling (Table X). Cherokee County consisted of conversations with two recycling center employees and a semi-structured interview with an educator. Stakeholders highlighted challenges to recycling, like low collection rates, political obstacles, and illegal dumping. Limited resources further hinder waste management efforts. To address these issues, they suggest incentives for recycling, statewide funding support, and shifting towards biodegradable packaging. Insights from stakeholder conversations are presented as closely as possible to the notes taken.

Table X: Stakeholder Groups and Number of Stakeholders in Cherokee County

Stakeholder Group	Number of Stakeholders
Educator	1
Recycling Center	2

All stakeholders identified pollution as a major issue. A recycling center employee shared that some private properties accumulate waste outside, where solid waste ordinance laws can't be enforced. Another stakeholder expressed concerns about plastic pollution:

"... it appears to go away. It just breaks down into tiny little pieces and becomes microplastic."
- Educator

"Since endeavoring to work in this material, I have paid more attention to plastic, discarded plastic in general… Everything you buy now is sheathed in plastic, whether it's an apple or a pound of butter, or everything comes in a pouch or a shrink wrap." - Educator

" [My post-consumer recycled plastic art] is like a biome in the ocean of some sort of these creatures, and that sort of has a nexus with the idea of how plastics are affecting the environment." - Educator

Stakeholders highlighted several barriers to recycling in Cherokee County. There is low participation due to inconvenience. A recycling center employee shared that people don't recycle as much cardboard because it is easier to throw it away. Another interviewee pointed out that there is a lack of recycling bins where materials are commonly used:

"That's where the bottle gets emptied and discarded. They're not going to take it home and put it in their recycling at home." - Educator

Political and logistical challenges further limit recycling efforts. According to the recycling center employees, nearby counties have attempted to collaborate. Clay County and Graham County had intended to share costs, but they no longer communicate, and political issues hinder most counties from cooperating. Within Cherokee County, several convenience centers are located near areas where people can be aggressive, creating safety concerns.

Illegal dumping and tire disposal are costly, which is another frustration for recycling center employees. Many residents believe their taxes cover bulky waste disposal, such as mattresses, but the centers are only funded for MSW. While 99% of residents understand what can be recycled, non-residents contribute the most contamination. It is also harder to fine them, reducing a revenue stream. As for tires, the NC DEQ only allows Western North Carolina counties to use one tire disposal company, US Tire, to receive money back from the Scrap Tire Disposal Account Fund Grant Application. However, they only received an average of 10% of the requested funds. This causes Cherokee County to continuously pay about $25,000 to $30,000 every 6 months out of pocket to dispose of tires.

Stakeholders also identified a need for more funding and staff to improve recycling education and outreach. One stakeholder summarized the challenge:

"…the problem with rural recycling is it's spread so thin." - Educator

Despite these challenges, stakeholders offered ideas to improve recycling. One interviewee suggested using incentives:

"You're going to do a lot better with a carrot [incentive] than with a stick [punishment]." - Educator

"Okay, so at the grocery store, have 'em get some kind of modest discount or something for free, or you brought some plastics in, brought your detergent bottle back." - Educator

Recycling center employees expressed interest in a statewide fee that would create a reimbursement fee for waste management. Another stakeholder mentioned changing packaging:

"I'd like to see packaging made out of more biodegradable materials [rather than plastic]." - Educator

Beyond recycling, stakeholders noted that yard waste is accepted at the landfill, but only one person brings it. Most residents burn their yard waste, which could be composted. However, Cherokee County lacks a composting facility.

Stakeholders see pollution as a major issue and have identified multiple barriers to effective recycling in Cherokee County, such as low recycling collection rates, political obstacles, safety concerns, illegal dumping, and tire disposal. Resource limitations further impede outreach and educational efforts. Despite these obstacles, stakeholders suggested several solutions: incentives for recycling, statewide funding support, and a transition to biodegradable packaging. Furthermore, implementing composting infrastructure could effectively tackle the amount of yard waste burned.

Georgetown County, SC:

Five key stakeholders shared the community's attitudes and perceptions about plastic waste and recycling (Table X). One semi-structured interview was conducted with a NGO, and conversations were held with three government employees and another NGO. The conversation notes and interview responses gave insights into Georgetown County's SWM issues, which include limited funding, outdated recycling infrastructure, and low accessibility to recycling bins. Progress includes litter hotspot mapping, daily collection programs with opportunities for stronger recycling policies, NGO collaborations, composting programs, and targeting tourist rentals for better waste management. Insights from stakeholder conversations are presented as closely as possible to the notes taken.

Table 20: Stakeholder Groups and Number of Stakeholders in Georgetown County

Stakeholder Group	Number of Stakeholders
Government Employees	3
NGO	2

Overall, all stakeholders saw litter in the environment as a major problem. Government employees noted that many empty roads have high litter counts (Figure X), as low-population areas tend to have higher litter counts because of their limited collection capacity.

"And there's this joke … South Carolina must have the cleanest cars because the trash is all over the roads. So this is definitely something of concern." - NGO

Figure XX: Example of Litter Along Rural Road in Georgetown County

A way to address the high levels of littering would be to increase recycling. However, stakeholders identified several challenges. An NGO stakeholder mentioned the low amount of recyclables collected, constrained by limited accessibility to recycling bins. People are littering because there is no trash can or recycling bin present. Government employees are frustrated by the lack of support for writing and implementing grants. They also mentioned that there is limited staff, which inhibits the efficiency of the MRF. One interviewee mentioned the limited amount of money available:

"So the biggest challenge for Georgetown County is funding. They do not have a very large tax revenue and they have a very limited budget. They are strapped for cash." - NGO

While recent local environmental regulations have seen few updates, the Georgetown County government has begun taking measures. For example, they started a litter program that goes out daily and has collected 65,000 lbs in the last two years. Another initiative has been the Georgetown RISE program detailed below:

"... the Department of Public Works, their environmental services department ... worked with interns through the same program that we have, the Georgetown RISE Program, to do litter inventories, sort of mapping hotspots around the county. And so they have maps showing hotspots of litter, including Andrews and the North Santee area and South Santee." - NGO

Stakeholders presented diverse perspectives and recommendations regarding opportunities to increase recycling in Georgetown County. The first point brought up was passing policies:

"...There should be a requirement to have recycling at events ...So there needs to be a policy change there through ordinance language to require recycling at these big events because they produce a ton of waste." - NGO

"[We must] work with officials on enforceable litter laws....A high fine does not stop anyone from breaking the law. Law enforcement are more amenable to writing a ticket if it's a smaller fee, [such as when the] structure is by poundage." - NGO

Another identified opportunity was working with NGOs to make a change:

"For Palmetto Pride ... working with Winah Rivers Alliance for Education around boat landings to try to reduce litter and pollution around our waterways [has] had some success. They've put out the fishing line receptacles to try to reduce plastic getting into the river." - NGO

Plastic packaging is problematic, and changing packaging in stores and restaurants was an opportunity identified by several stakeholders:

"[I would want to see] goals and objectives come forward to ban single-use plastics starting with plastic bags transitioning to [reusable bags] or bringing in containers as well. That would be huge for all the restaurants to move away from Styrofoam and plastic containers. " - NGO

Messaging was identified as a key way to increase awareness and make tourists and locals care about waste entering the environment. One NGO mentioned that while traditional news advertisements reach many people, they do not necessarily reach people who litter. Many outreach opportunities exist, including expanding to new media, using existing groups, and wildlife messaging:

"The city of North Myrtle Beach is using the tourist bureau to spread awareness for the plastic bag ordinance, and they were even giving out reusable plastic bags… as marketing… I feel very confident that the Georgetown Chamber could do that as well.." - NGO

"I find that if you relate it back, because so many people in South Carolina are hunters or fishers, and they care about wildlife in the sense of a resource. And so if you can message litter and plastic as impacting your resources, people are really going to care more about it…" - NGO

Other opportunities mentioned by interviewees included composting and targeting tourist rentals to increase the amount of recyclables collected:

"We've talked about doing a composting program since Charleston County and Horry County both use a company called Smart Recycling to pick up composting. Horry County is using it for the school system, and then Coastal Carolina University uses it for the school system." - NGO

"One [opportunity] that has come up with my friend group [is] talking about recycling for the hotels and the rental properties - trying to [get them to] have recycling dumpsters. So a lot of them have trash dumpsters where if you rent a house for a week, you're supposed to take out your trash, but they don't necessarily have recycling dumpsters for people." - NGO

Stakeholders in Georgetown County identified litter in the environment as a significant issue, made worse by inadequate historical funding and insufficient infrastructure for recycling. They highlighted barriers to improving recycling, including limited funding and outdated facilities. Low accessibility to recycling bins hinders efforts to increase the collection of recyclables. However, the county is making progress by mapping litter hotspots and implementing daily litter collection programs. The stakeholders made many recommendations, including passing policies to enforce recycling and litter reduction, collaborating with NGOs for targeted initiatives, promoting packaging changes in businesses and restaurants, and leveraging wildlife-focused messaging to increase awareness. Additional opportunities lie in implementing composting programs and targeting tourist rentals to improve waste management.

Product Design

Tifton, Ga:

The CIL team analyzed 349 FMCG products and their packaging across 25 stores in Tifton. Beverages had the highest product and packaging mass compared to chips and candy (Table 5). This may be attributed to the high density of PET, a common packaging material for plastic bottles and beverages. Beverages had the highest packaging-to-product ratio (0.06), and candy and chips were close behind at 0.05. Thus, candy and chips produce the lowest packaging waste per product unit among the three categories. For comparison, samples taken in six US cities, known as the Walmart Foundation cohort, showed that the average chip packaging weight was 4.99 g, higher than the Tifton value (3.91 g). The average product weight was also higher at 80.1 g than Tifton's value (74.8 g) (New Materials Institute (NMI), 2024). Smaller product sizes encourage frequent purchases, resulting in lower individual costs than larger options. However, these small packages often carry a "poverty tax," a hidden cost that low-income individuals pay due to their financial situation, leading to a higher cost per unit and greater packaging waste.

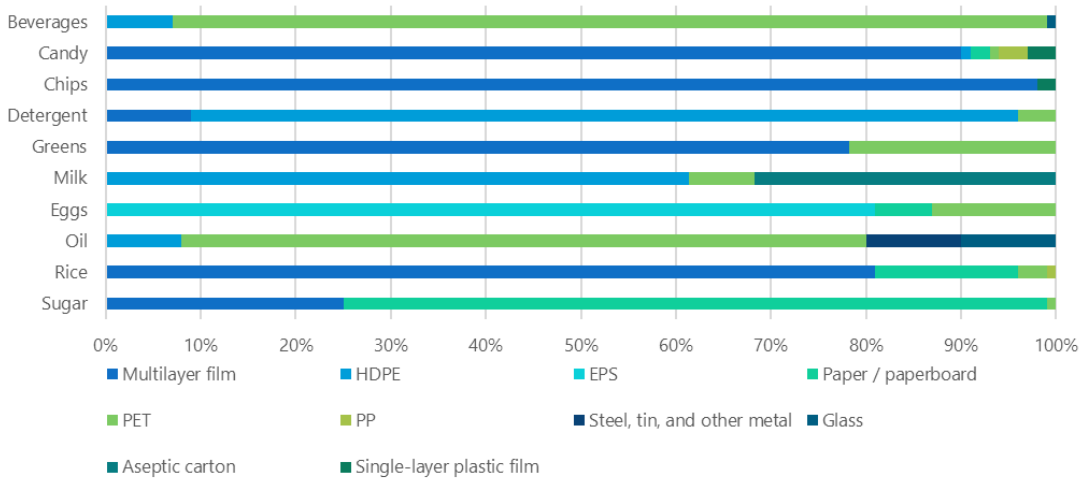
In this study, cigarette products were not purchased since they typically come in a standard size. Our previous findings indicate an average of approximately 10 g of plastic packaging for every 15 g of product. This relatively high packaging-to-product ratio of 0.67 is likely influenced by the cellulose acetate filters in cigarette butts, which usually weigh around one gram each.

Table X: Average Weight of Products and their Plastic Packaging for FMCG in Tifton

Category	Product Count	Average Quantity of product (g or ml)	Average Weight of packaging (g)	Packaging to Product Ratio
Beverage	111	528	34	0.06
Candy	181	63.5	3.13	0.05
Chips	57	74.8	3.91	0.05

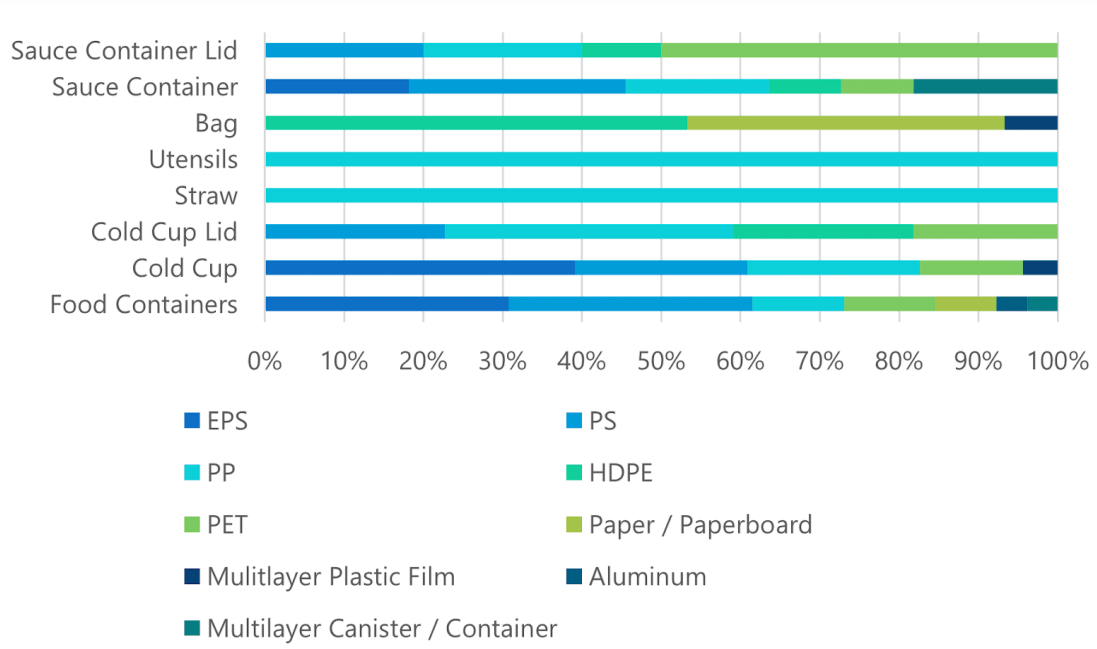
The majority of chips, candy, greens, and rice were packaged in multilayer plastic film, and eggs were packaged in expanded polystyrene (EPS), commonly known as Styrofoam (Figure X). These materials cannot be recycled and can easily leave the waste stream. In contrast, certain items primarily used recyclable packaging materials. Beverages and oil products were packaged in PET, milk and detergent in HDPE, and sugar was in paper. The following material types for oil packaging were steel, tin, or other metal and glass (10% each), all alternatives that can be recycled.

Figure XX: Material Breakdown of FMCG and Staple Goods in Tifton



The CIL team surveyed 24 restaurants in Tifton to identify the to-go items offered. PP was the primary material for straws, utensils, and cold cup lids (Figure X). EPS was the primary material for cold cups and tied with polystyrene (PS) for food containers. Bags are primarily made of soft HDPE, which can escape the waste stream. PP, EPS, PS, and soft HDPE are not widely recycled. The only to-go item primarily composed of recyclable materials was the sauce container lids, of which 50% were made from PET. Other items were made out of some recyclable materials. Bags (40%) and food containers (8%) were made of paper, while cold cup lids (23%) and sauce containers (9%) were produced from HDPE. The most common recyclable material was PET, which included food containers (12%), cold cups (13%), cold cup lids (18%), and sauce containers (9%). There were no to-go items made from alternative materials.

Figure XX: Material Breakdown of Restaurant To-Go Items in Tifton



Cherokee County, NC:

The CIL team analyzed 368 FMCG products and their packaging across the 13 stores in Cherokee County. Beverages had the highest product and packaging mass compared to chips and candy (Table X). This may be due to the high density of PET, a typical packaging material for plastic bottles and beverages. Beverages and chips had the highest packaging-to-product ratio (0.06), while candy had the lowest (0.04). Therefore, beverages and chips generate the most packaging waste per product unit out of the three categories. For comparison, samples taken throughout the Walmart Foundation cohort showed that the average packaging weight for candy was 4.22 g, whereas the Cherokee County value was lower (2.66 g). The average product weight was 63.5 g, lower than Cherokee County's value (65.4 g) (New Materials Institute (NMI), 2024). Smaller product sizes lead to more frequent purchases and are cheaper per unit than larger sizes. However, these smaller packages frequently incur a "poverty tax," meaning the cost per quantity is higher, and they generate more packaging waste in total.

In this study, cigarette products were not purchased as they come in standard sizes. Our earlier research shows about 10 g of plastic packaging for every 15 g product. This high packaging-to-product ratio of 0.67 is probably affected by the cellulose acetate filters in cigarette butts, which generally weigh nearly one gram each.

Table X: Average Weight of Products and their Plastic Packaging for FMCG in Cherokee County

Category	Product Count	Average Quantity of product (g or ml)	Average Weight of packaging (g)	Packaging to Product Ratio
Beverage	98	526	30.6	0.06

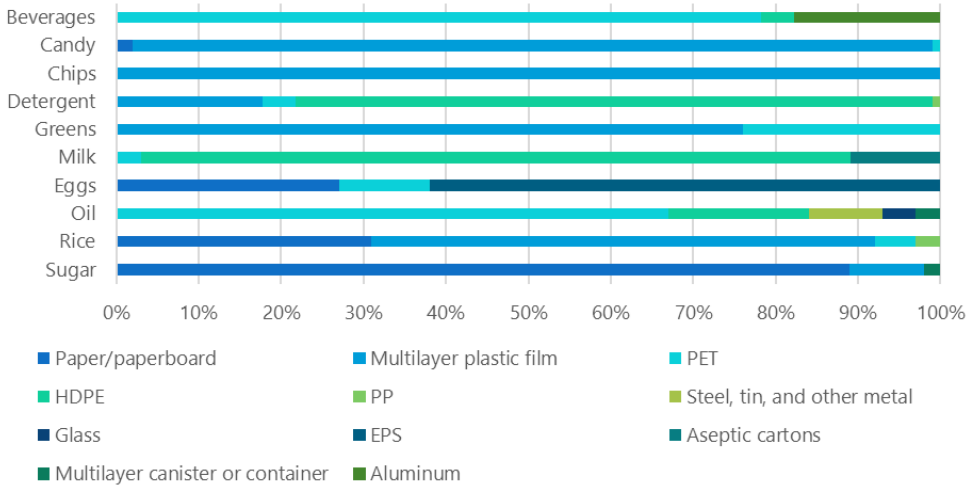
Candy	150	65.4	2.66	0.04
Chips	120	73.7	4.12	0.06

The packaging type was documented for the FMCG and staple goods. The majority of chips, candy, greens, and rice were packaged in multilayer plastic film, and eggs were packaged in EPS (Figure X). These materials are not recyclable and can easily escape the waste stream. A Cherokee County educator noticed the change in egg packaging from paper to EPS, even with locally produced eggs, and how Cherokee County can push for a sustainable change:

"Most of my concerns are their [egg producers] changing the packaging from recycled paper egg cartons. Right now, you buy eggs that also come in a Styrofoam egg carton, or they come in PET cartons…. Could you get the Cherokee County Egg Producers Association to establish a policy that says we're going to advocate that all of our members to be good members of good standing will use nothing that isn't paper cartons?" - Educator

Several items were mainly packaged in recyclable materials. Beverages and oil were packaged in PET, milk and detergent were in HDPE, and sugar was in paper. The second largest beverage packaging material was aluminum (17%), which can be infinitely recycled and has high profits.

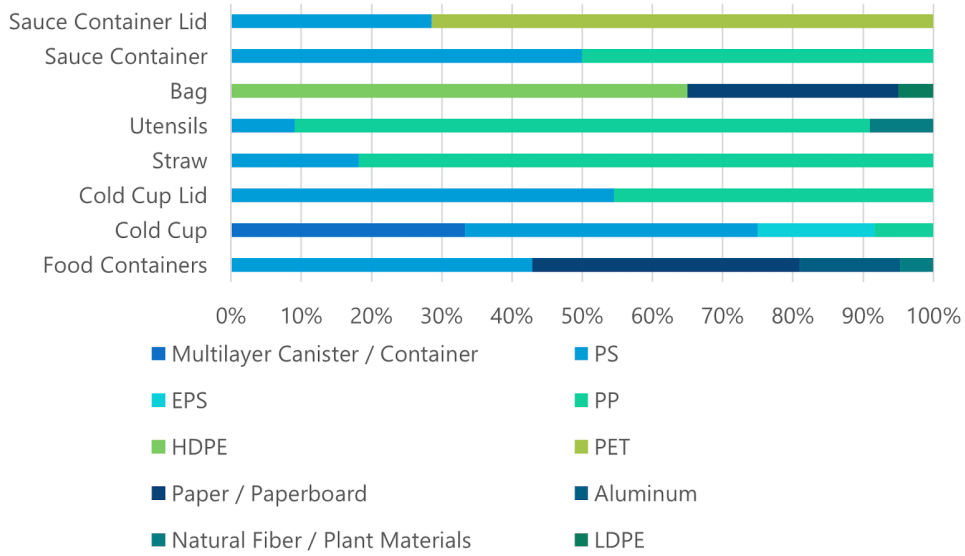
Figure X: Material Breakdown of FMCG and Staple Goods in Cherokee County



The CIL team surveyed 16 restaurants in Cherokee County to understand what to-go items were handed out at restaurants. PS was the main material for food containers, cold cups, and cold cup lids (Figure X). PP was the main material for straws and utensils. Sauce containers were evenly split between PP and PS as the most common material. Bags are primarily made of soft HDPE, which can escape the

waste stream. PS, PP, and soft HDPE are not widely recycled. The only to-go item mainly made of recyclable material was the sauce container lids, where 71% were made of PET. Other items were made out of some recyclable materials, with 38% of food containers, 30% of bags made out of paper, and 14% of food containers made of aluminum. Food containers were also made from natural fiber and plant materials (5%), an alternative material.

Figure X: Material Breakdown of Restaurant To-Go Items in Cherokee County



Georgetown County, SC:

The packaging and product mass of 99 FMCG were analyzed within the twenty stores surveyed in Georgetown County. Beverages had the highest product and packaging mass compared to chips and candy (Table X). This may be due to the high density of PET, a typical packaging material for plastic bottles and beverage liquids. Chips had the highest packaging-to-product ratio (0.07), while candy had the lowest (0.03). Therefore, chips generate the most packaging waste per product unit out of the three categories. For comparison, samples taken throughout the Walmart Foundation cohort showed that the average packaging weight for beverages was 31.1 mL, and the average product weight was 538 mL. The Georgetown County values for beverages and chips were lower than those of the Walmart Foundation cohort (New Materials Institute (NMI), 2024). Smaller product sizes encourage more frequent purchases that cost less individually than larger options. However, these small packages often come with a "poverty tax," resulting in a higher cost per quantity and increased packaging waste overall.

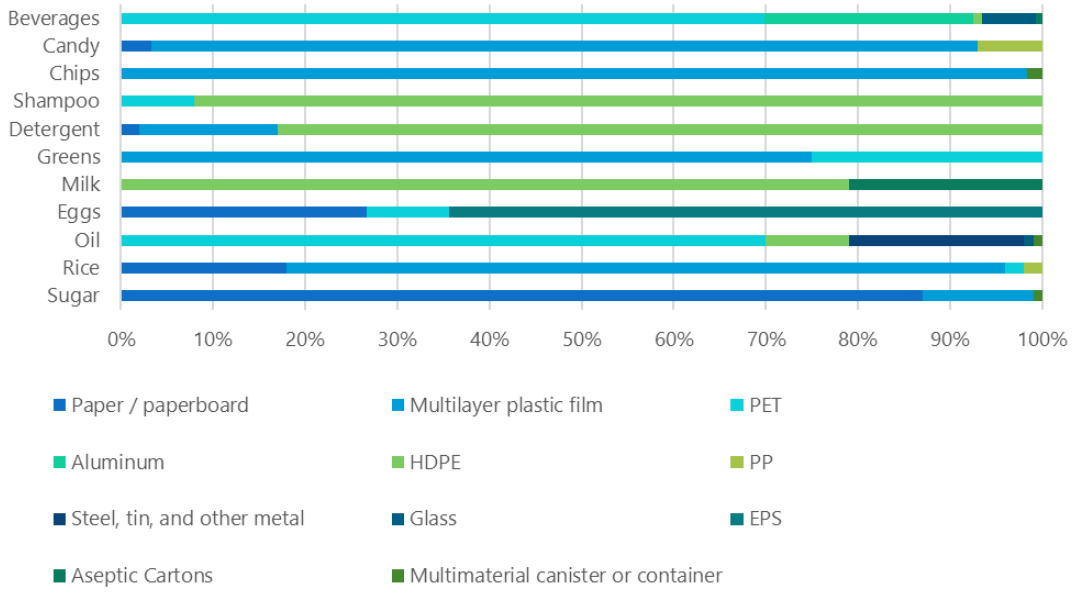
In this study, cigarette products were not purchased. This is because they usually come in a standard size. Our previous findings indicate an average of approximately 10g of plastic packaging for every 15g product. This relatively high ratio of product to packaging, 0.67, is likely influenced by the cellulose acetate filters in cigarette butts, which typically weigh close to one gram each.

Table X: Average Weight of Products and their Plastic Packaging for FMCG in Georgetown County

Category	Product Count	Average Quantity of Product (g or ml)	Average Weight of Packaging (g)	Packaging to Product Ratio
Beverage	41	547	29.9	0.05
Candy	27	76.6	1.96	0.03
Chips	31	59.2	4.37	0.07

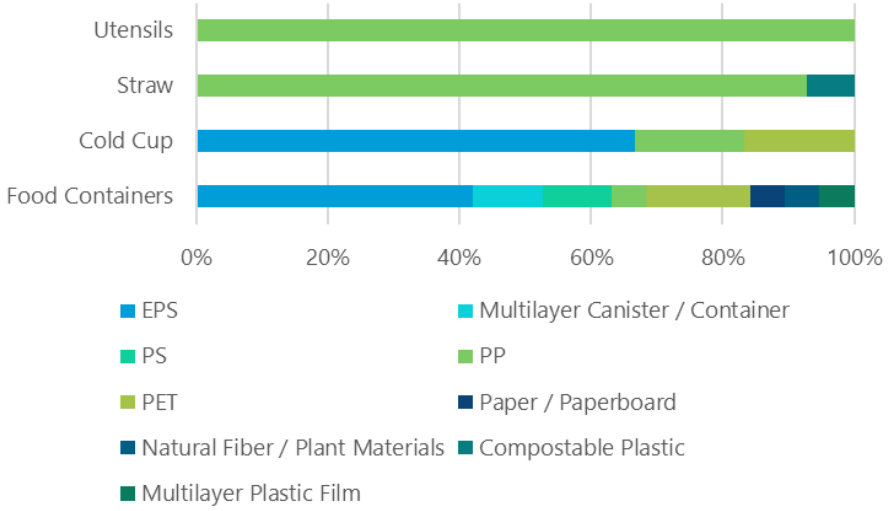
For each FMCG surveyed, the packaging type was documented, as was the packaging type for staple goods. The majority of chips, candy, greens, and rice were packaged in multilayer plastic film, and eggs were packaged in EPS (Figure X). These materials are not recyclable and can easily escape the waste stream. Several items were mainly packaged in recyclable materials. Beverages and oil were in PET, while most milk, shampoo, and detergent were packaged in HDPE and sugar in paper. There were no significant differences in the packaging type for FMCG and staple goods in Pawleys Island.

Figure X: Material Breakdown of FMCG and Staple Goods in Georgetown County



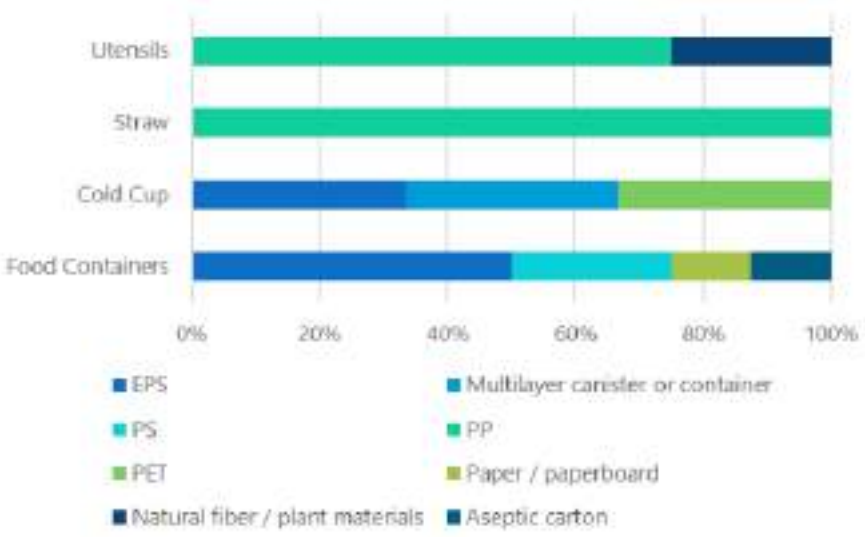
The CIL team surveyed 18 restaurants in Georgetown County to understand the to-go items handed out at restaurants. Most food containers and cold cups were made of EPS, commonly known as Styrofoam, which is not recyclable (Figure X). All utensils and most straws were made of PP. Only 25% of food containers and 16% of cold cups were packed in recyclable materials. Some items were packaged in alternative materials, with 5% of food containers made from natural fibers and plant materials and 7% of compostable plastic straws.

Figure X: Material Breakdown of Restaurant To-Go Items in Georgetown County



While the material packaging in stores was similar, the material breakdown for restaurant to-go items in Pawleys Island was different. The CIL team surveyed eight restaurants. Similarly, most food containers and cold cups were made of EPS. However, the number of items packaged in recyclable materials differed: 12.5% of food containers and 33% of cold cups. More items were packaged in alternative materials, with a quarter of the utensils made from natural fibers or plant materials (Figure X). The higher rate of to-go items packaged in alternative materials may be due to the proximity to the beach and tourists visiting from more affluent areas.

Figure X: Material Breakdown of Restaurant To-Go Items in Pawleys Island



Use

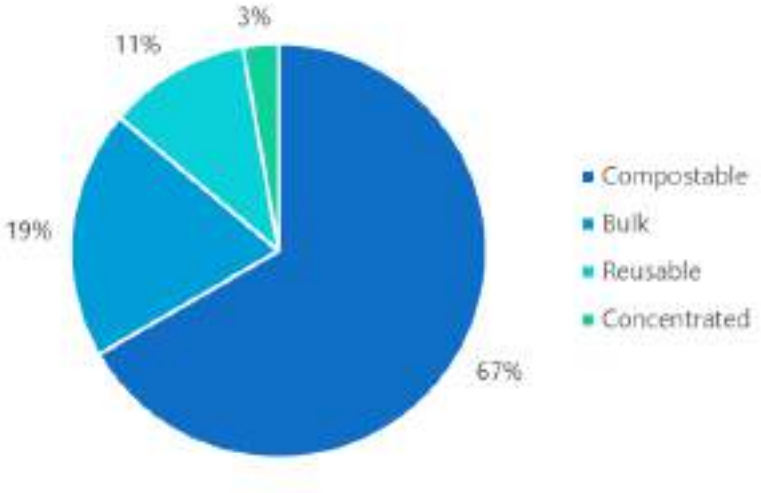
Tifton, Ga:

All 25 stores surveyed in Tifton provided single-use plastic bags. Reusable bags, cloth and non-woven laminated PP, were offered at 27% of stores (Figure X) for an average cost of $2.43. None of the stores provided paper bags for free or at a reduced price.

Figure X: Example of Reusable Bags Sold in Tifton Stores

Tifton sold household and picnicware alternatives in 32% of its stores. Compostable products were the most popular alternative use type (67%), followed by reusable products (19%) (Figure X). Many of these items can only be commercially composted, but Tifton has no infrastructure.

Figure X: Tifton Alternative Use Type Breakdown



A limited number of alternative household products were available, with only bulk laundry detergent having more than one option (Table X). Half of the alternatives were sold in bulk and less expensive (-77% to -12%) than their comparable SUP competitor. The Tifton stores only offered one concentrated alternative, but it was the most expensive household alternative: 74% more than their comparable SUP item.

Table X: Tifton Alternative Household Products Available

Product	Alternative Material(s) Found	Cost Difference for Alternative (n)
Dish Soap	Bulk	-12% (1)
Hand Soap	Bulk	-77% (1)
Large Trash Bags (33 gallons)	Compostable	56% (1)
Laundry Detergent	Bulk	-26% (2)
	Concentrated	74% (1)

Tall Trash Bags (13 gallons)	Compostable	-44% (1)
Wet Wipes	Compostable	17% (1)

Most picnicware alternatives were compostable (75%), and compostable plates were the most common (Figure X, Table X). Reusables were the costliest alternative, ranging from 4,390% more for straws with a breakeven point at 50 uses compared to a SUP item to 22,300% more for sandwich bags, which require 224 uses to break even. However, some consumers may not reuse these items enough to reach the breakeven point, ultimately making them a more expensive option. All bulk alternatives were less expensive than their comparable SUP item.

Figure X: Examples of Compostable Picnicware Items in Tifton Stores

Note: Left to right: Hefty plates, Nature's Promise Utensils, and Complete Home cups

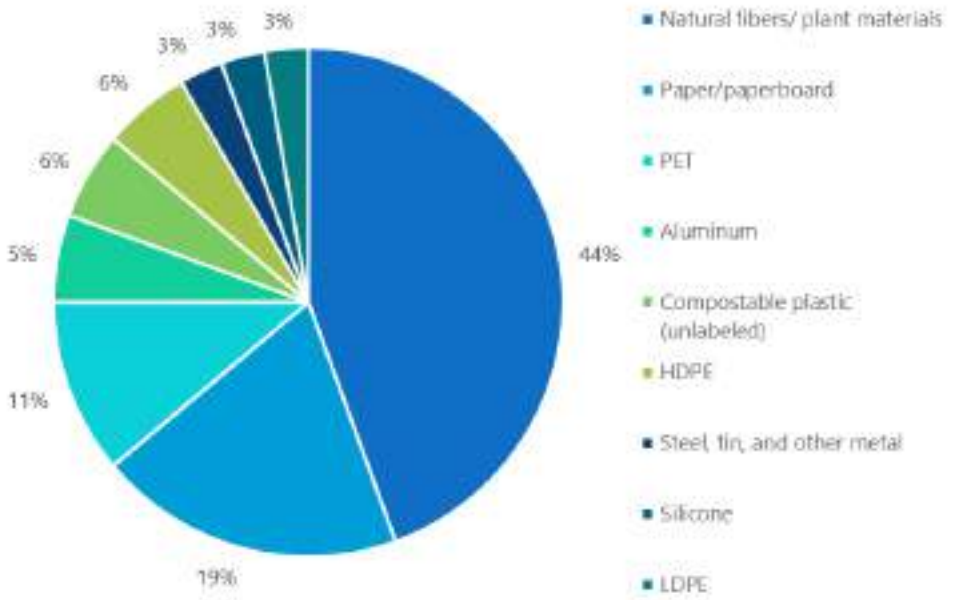
Table X: Tifton Alternative Picnicware Items Available

Product	Alternative Material(s) Found	Cost Difference for Alternative (n)
Bowls	Compostable	25% (2)
Cups	Bulk	-25% (2)
	Compostable	82% (3)

	Reusable	7,410% (2)
Plates	Compostable	155% (9)
Sandwich Bag	Bulk	-53% (1)
	Reusable	22,300% (1)
Straws	Compostable	158% (5)
	Reusable	4,390% (1)
Utensils	Compostable	-2% (2)

Nearly a third (32%) of Tifton stores offered alternatives of varying material types (Figure X), but none were personal care items. Among all usage types, bulk items were the only option that cost less than comparable SUP products (243% less). In contrast, reusable items were on average 420 times more expensive and required an average of 106 uses to break even. The large availability of compostable items (67%) costs, on average, 26 times more than SUP items. Despite concentrated alternatives being more economical, only one option was available. The presence of alternatives to plastic signifies that Tifton is actively working to diminish its dependence on single-use plastics.

Figure X: Tifton Alternative Material Type Breakdown



Cherokee County, NC:

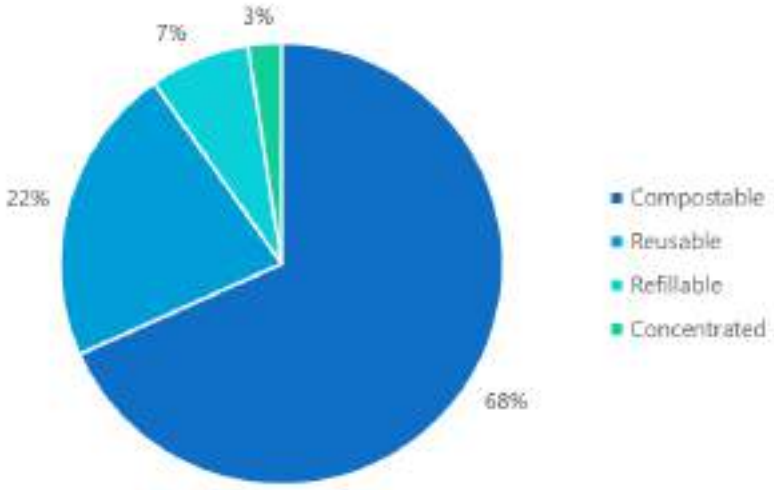
In the 13 stores surveyed in Cherokee County, all but one provided single-use plastic bags. Reusable bags, cloth and non-woven (laminated and non-laminated) PP, were offered at 54% of stores (Figure X) for an average cost of $1.31. Free paper bags were provided by 15% of the stores.

Figure X: Example of Reusable Bags Sold in Cherokee County Stores

Cherokee County sold household and picnicware alternatives to SUPs at 46% of the stores. Compostable products were the most popular alternative use type (68%), followed by reusable products

(22%) (Figure X). Many of these items can only be commercially composted, but Cherokee County has no infrastructure.

Figure X: Cherokee County Alternative Use Type Breakdown



Compostable trash bags were the most popular household alternative, but they were also the most expensive at 133% more than their SUP (Table X). Refillable products (hand soap and household cleaner) were less expensive (18%) than their single-use plastic competitors. Laundry detergent was the only concentrated alternative option found in Cherokee County (Figure XX).

Table X: Cherokee County Alternative Household Items Available

Product	Alternative Material(s) Found	Cost Difference for Alternative (n)
Hand Soap	Refillable	-18% (2)
Household Cleaner	Refillable	-18% (1)
Laundry Detergent	Concentrated	109% (1)
Trash Bags (13 gallons)	Compostable	133% (3)

Figure 31: Examples of Alternative Household Products in Cherokee County Stores

Note: Left to right: Mrs. Meyers refillable hand soap and Clean Cult concentrated laundry detergent

Although there were considerably more picnicware options than household alternatives, only compostable or reusable types were available (Figure X). Compostable plates were the stores' most common alternative (12) (Table X). Reusable sandwich bags were the most expensive alternative, costing 18,780% more than the comparable SUP items and requiring 189 uses to break even. No alternatives were found for picnicware items that were less costly than comparable SUPs.

Figure X: Examples of Alternative Picnicware Items in Cherokee County Stores

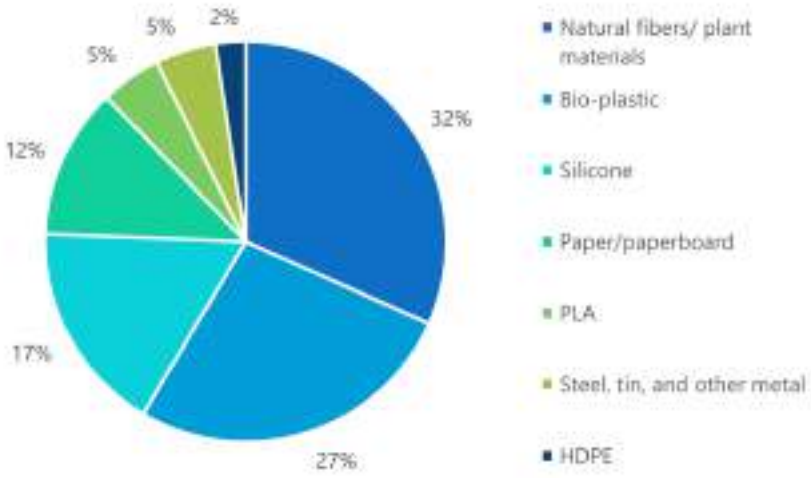
Note: Left to right: Hefty compostable bowls, Stasher reusable sandwich bags, and Repurpose compostable straws

Table X: Cherokee County Alternative Picnicware Items Available

Product	Alternative Material(s) Found	Cost Difference for Alternative (n)
Bowls	Compostable	91% (6)
Plates	Compostable	138% (12)
Sandwich Bags	Reusable	18,780% (7)
Straws	Compostable	271% (4)
	Reusable	9,711% (2)
Utensils	Compostable	143% (3)

While nearly half (46%) of Cherokee County stores offered alternatives made of various materials (Figure X), none were personal care items. Among all the usage types, refillable items were the only option less costly than comparable SUP products (18% less), while reusable items cost 168 times more. The large availability of compostable items averaged 2.46 times more than SUP items. There is a lack of bulk and concentrated items that tend to be more economical options. The availability of plastic alternatives indicates that Cherokee County is making efforts to reduce its reliance on single-use plastics.

Figure X: Cherokee County Alternative Material Breakdown



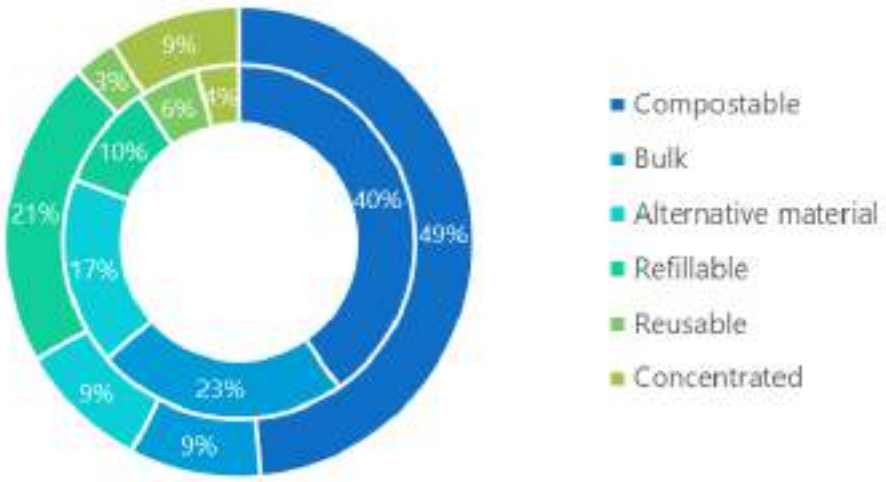
Georgetown County, SC:

In the same survey of twenty stores in Georgetown County, all but one provided single-use plastic bags. A quarter of the stores offered non-woven PP or cloth reusable bags (Figure X), with an average cost of $5.64, including a $23 fabric bag. The average cost of reusable bags is $1.31 without the fabric bag. The survey of nine stores in Pawleys Island found a higher rate of reusable bags offered (60%). The average cost of thick plastic reusable bags was slightly higher at $2.14. The coastal stores did not provide paper bags.

Figure X: Example of Reusable Bags Sold in Georgetown County Stores

The trend for a higher rate of alternatives in Pawleys Island remained true when looking at the survey of alternatives in household items, personal care products, and picnicware. About 67% of the coastal stores had alternatives to SUPs, while only 35% of inland stores had alternatives. In both areas, compostable products were the most popular alternative use type (Figure X). Many of these items are only commercially compostable. Despite this, there is no composting infrastructure in Georgetown County. The second most popular use type in the inland area was bulk, while Pawleys Island was refillable. Stores may offer fewer bulk items because of the limited time tourists visit.

Figure X: Georgetown County Alternative Use Type Breakdown



Note: The inner ring represents inland, and the outer ring represents coastal Georgetown County.

The price difference between alternatives and SUPs was compared to better understand the economics of buying alternatives in both inland Georgetown County and coastal Pawleys Island. When looking at alternative household products, buying hand soap in bulk was the most popular alternative found and was also less costly than its SUP counterpart in both areas. This remained true for all bulk household products: dish soap and cleaner. The costliest alternative was in Pawleys Island, where the one sample of hand soap made of alternative materials was 13,503% more expensive than its single-use plastic competitor. Across both areas, refillable household cleaner was the costliest alternative (Table X).

Table X: Inland and Coastal Georgetown County Alternative Household Products Available

Product	Alternative Material(s) Found	Inland Cost Difference for Alternative (n)	Coastal Cost Difference for Alternative (n)
Cleaning Wipes	Compostable	25% (1)	-
Dish Soap	Alternative Material	-	38% (1)
	Bulk	-35% (2)	-
	Refillable	-	9% (1)

Hand Soap	Alternative Material	-40% (1)	13,500% (1)
	Bulk	-41% (9)	-13% (1)
	Refillable	351% (1)	-20% (5)
Household Cleaner	Alternative Material	-23% (1)	-
	Bulk	-	- 93% (1)
	Concentrated	-28% (1)	2,097% (3)
	Refillable	64% (2)	3,183% (1)
Laundry Detergent	Alternative Material	-28% (1)	51% (1)
	Refillable	-93% (1)	-
Small Trash Bags	Compostable	109% (1)	-

Inland Georgetown County offered more alternative picnicware items than Pawleys Island. Compostable products were the most popular and were the only alternative material available for bowls and utensils (Figure X). Despite this, they ranged from 32% to 1,470% more expensive than its comparable SUP competitor. Reusable sandwich bags were the costliest alternative in both areas, costing 11,340% more with a 115-use break even in inland Georgetown County and 14,550% more with a 147-use break even in Pawleys Island. No alternatives were found for picnicware items that were less expensive than their comparable single-use product (Table X).

Figure X: Examples of Compostable Picnicware Items in Georgetown County Stores

Note: Left to right: Repurpose cups, Good & Smart plates, and Total Home utensils

Table X: Inland and Coastal Georgetown County Alternative Picnicware Items Available

Product	Alternative Material(s) Found	Inland Cost Difference for Alternative (n)	Coastal Cost Difference for Alternative (n)
Bowls	Compostable	140% (5)	32% (4)
Cups	Alternative Material	1,822% (2)	-
	Compostable	208% (2)	111% (2)
	Refillable	2,978% (1)	-
Plates	Compostable	219% (8)	103% (5)
	Reusable	2,204% (1)	-
Sandwich Bags	Reusable	11,340% (1)	14,550% (1)

Straws	Alternative Material	200% (1)	-
	Compostable	1,472% (1)	98% (2)
	Reusable	29,140% (1)	-
Utensils	Compostable	174% (3)	123% (3)

The final alternative group examined consisted of personal care products. None were located in Pawleys Island stores, but there were some found in inland stores. The scarce selection of alternative personal care products in Georgetown County suggests that this option is beginning to emerge in the market. All the alternatives (body wash, deodorant, toothbrush, and toothpaste) were less expensive than their comparable SUP competitors. The one sample of bulk body wash found that it was the least costly alternative product surveyed, 47% less than body wash packaged in plastic (Table X).

Table X: Inland and Coastal Georgetown County Alternative Personal Care Items Available

Product	Alternative Material(s) Found	Inland Cost Difference for Alternative (n)	Coastal Cost Difference for Alternative (n)
Body Wash	Bulk	- 47% (1)	-
Deodorant	Alternative Material	-19 (1)	-
Toothbrush	Alternative Material	-12 (2)	-
Toothpaste	Concentrated	-31 (1)	-

Georgetown County had more alternative items across all categories, but they were located at fewer stores than Pawleys Island. Inland stores offered about 75% more bulk items, 67% more alternative materials, and 24% more compostable products. Refillable products were the only alternative item more prevalent, 28% more, in coastal stores. The top three material types for alternatives in inland stores can be composted (47%) (Figure X). In contrast, only the top material in Pawleys Island, natural fibers/plant materials (28%), is compostable, while the next two materials are recyclable (Figure X).

Figure X: Georgetown County Alternative Material Type Breakdown

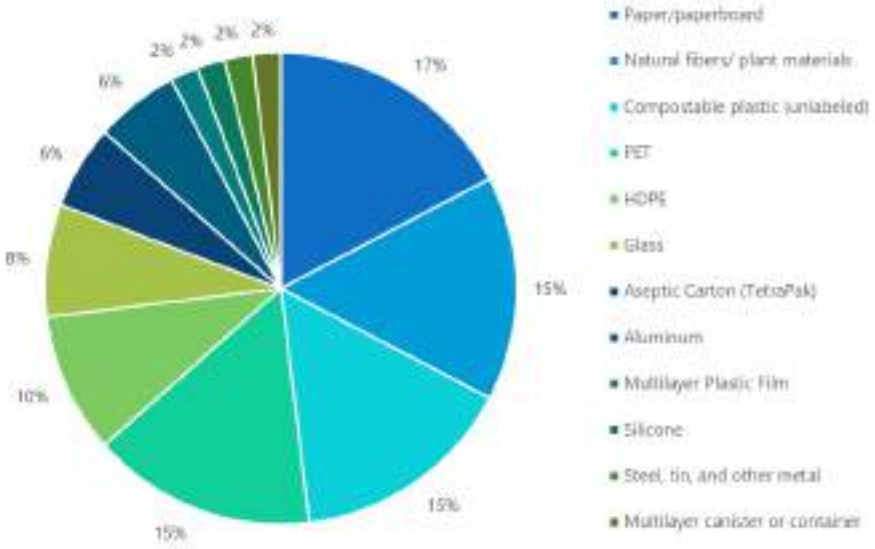
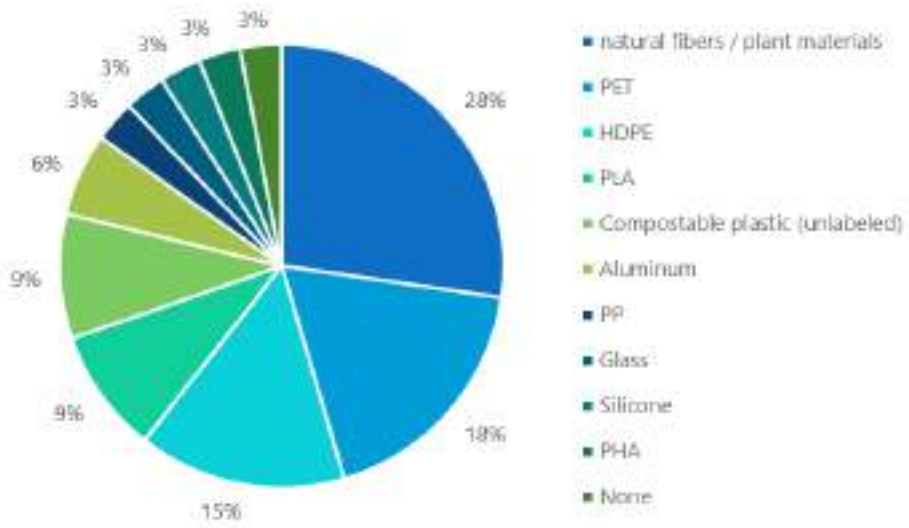


Figure X: Pawleys Island Alternative Material Type Breakdown



In both areas, bulk items were less costly than comparable single-use plastic products, and reusable items cost 427 times more. Concentrated items in inland stores were also more affordable. Tourism and long-term stays in Pawleys Island bring a less price-sensitive group that could use reuse or refill alternatives. The growing availability of plastic alternatives shows that Georgetown County is taking steps to move away from single-use plastics.

Collection

Tifton, Ga:

The City of Tifton has a separate trash and recycling system from Tift County. In 2021, the City of Tifton transitioned to Ryland Environmental for a five-year locked-in price of $19.33/ month. This price includes weekly curbside household waste (Figure X), yard waste, bulk items, and biweekly recycling pickup (Miller, 2020). Due to inflation, the City agreed to increase the monthly cost by $1, a 5.7% increase (Cobb, 2024).

Figure X: Tifton Trash Bins

The site visit and stakeholder conversations conducted in the second half of 2022 indicated that Ryland Environmental no longer collects recyclables through curbside. Despite the city having curbside recycling pickup for over 30 years, there was a shift to single-stream drop-off at Ryland Environmental's headquarters in Tifton during business hours only (Figure X). This happened because the MRF in Cordele, the closest one approximately 40 miles away, closed down, and although Tifton is close to processors, it lacks a transfer station. This made managing the recyclables collected curbside costly due to increased transportation.

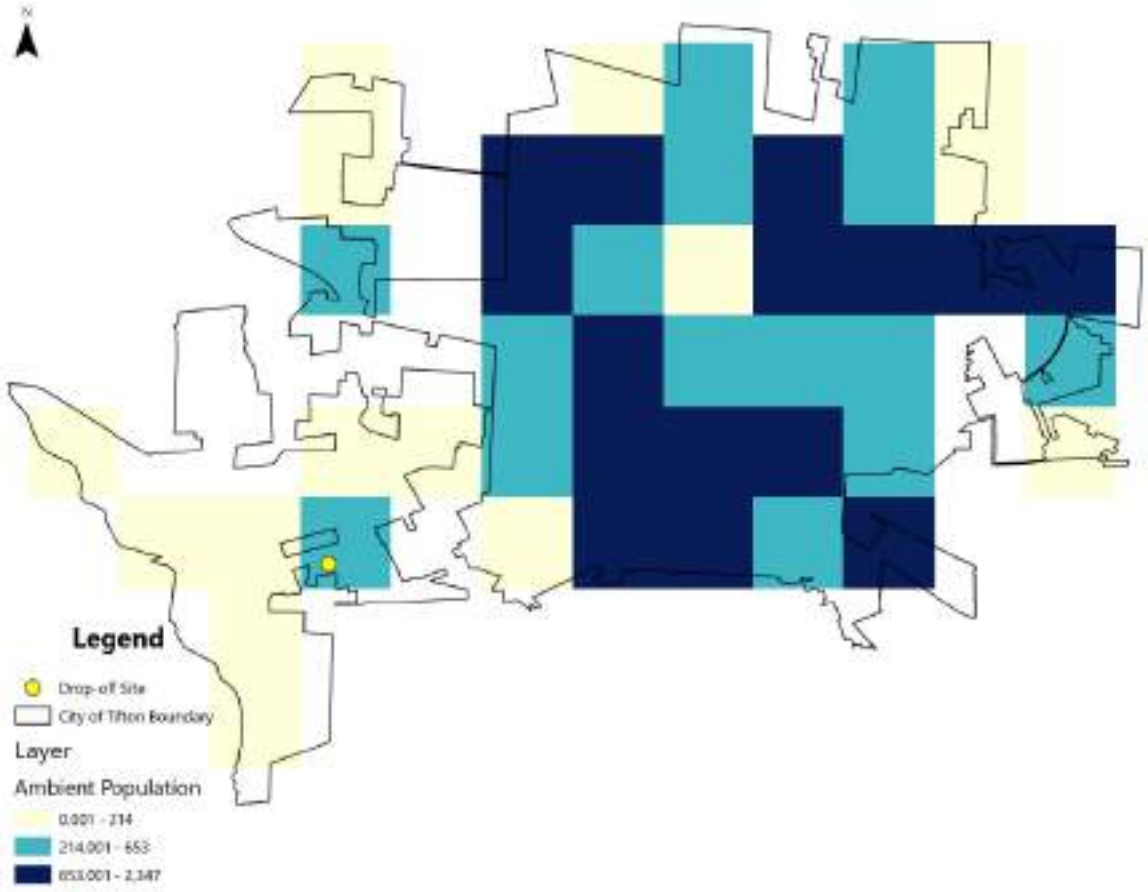
Figure X: Tifton Single-Stream Recycling Drop-off

Laminated flyers (Figure X) were placed on the bin, outlining what recyclables are accepted (cardboard, paper, plastic bottles, and cans) and which ones are not (plastic bags, food waste, glass, and Styrofoam). A waste management company shared that glass has not been collected since 2017 because it contaminates single-stream recycling. Also, the nearest location that accepts glass is south of Atlanta, over 150 miles away, which makes it too far to haul.

Figure X: Recycling Flyer at Tifton Drop-off Center

The recycling drop-off location was analyzed using the city's ambient population (Figure X). In a buffer zone 3 km from the convenience centers, 29% of the population is in the zone. Increasing the distance to 4 km covers more of the population (63%). This indicates that the singular drop-off location is out of the way (more than 4 km) for 37% of the population, resulting in decreased collection rates.

Figure X: Tifton Map of Ambient Population with Drop-off Location

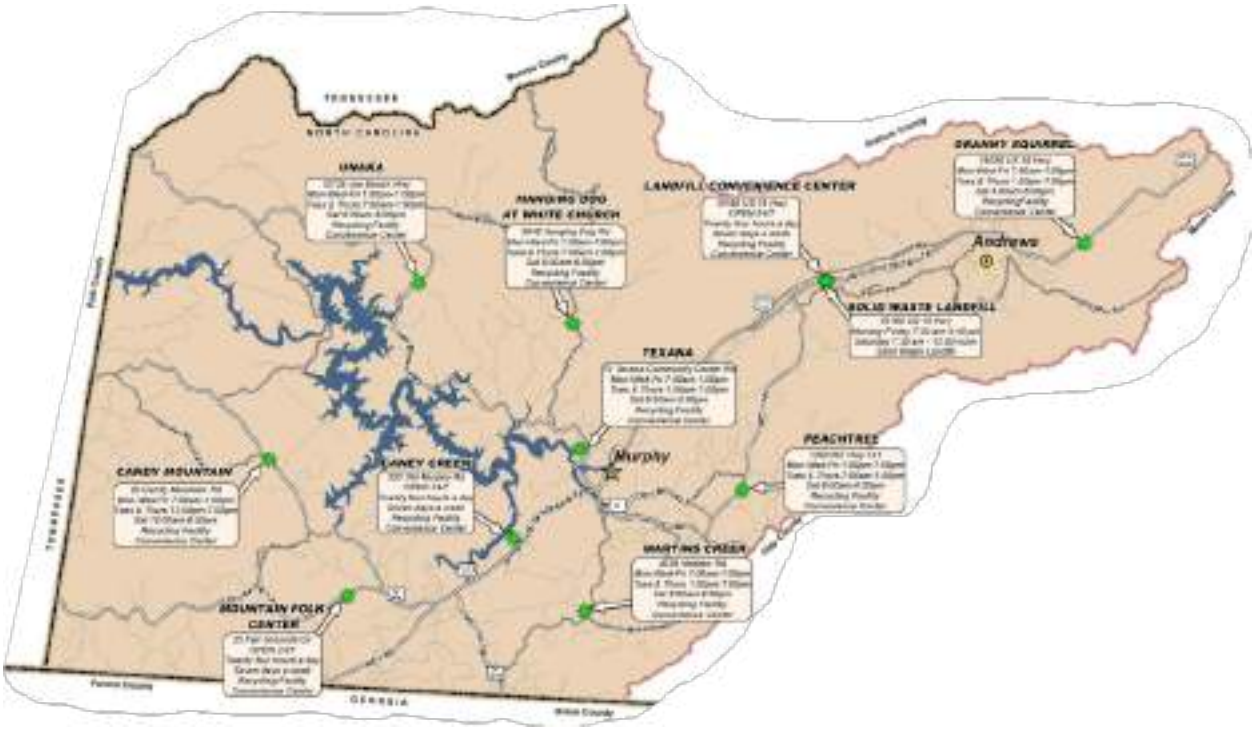


According to a waste management company stakeholder, contamination is a major issue with single-stream collection. They speculate that only 10% of people recycle correctly, and 80% is trash, resulting in limited recyclables. Additionally, the facilities management stakeholder shared that public awareness of the drop-off location is low, further reducing collection rates.

Cherokee County, Nc:

Cherokee County does not provide curbside trash or recycling pickup. Instead, it is collected through 10 controlled-access, source-separated convenience centers (Figure X). Three locations are open 24/7, while the remaining are open Monday through Saturday for at least six hours daily (Cherokee County NC, n.d.-a). According to a recycling center employee, these are the only convenience centers open 24/7 in the state. Also, most of these locations have swap shops, allowing any items dropped off to be reused or repurposed by another resident.

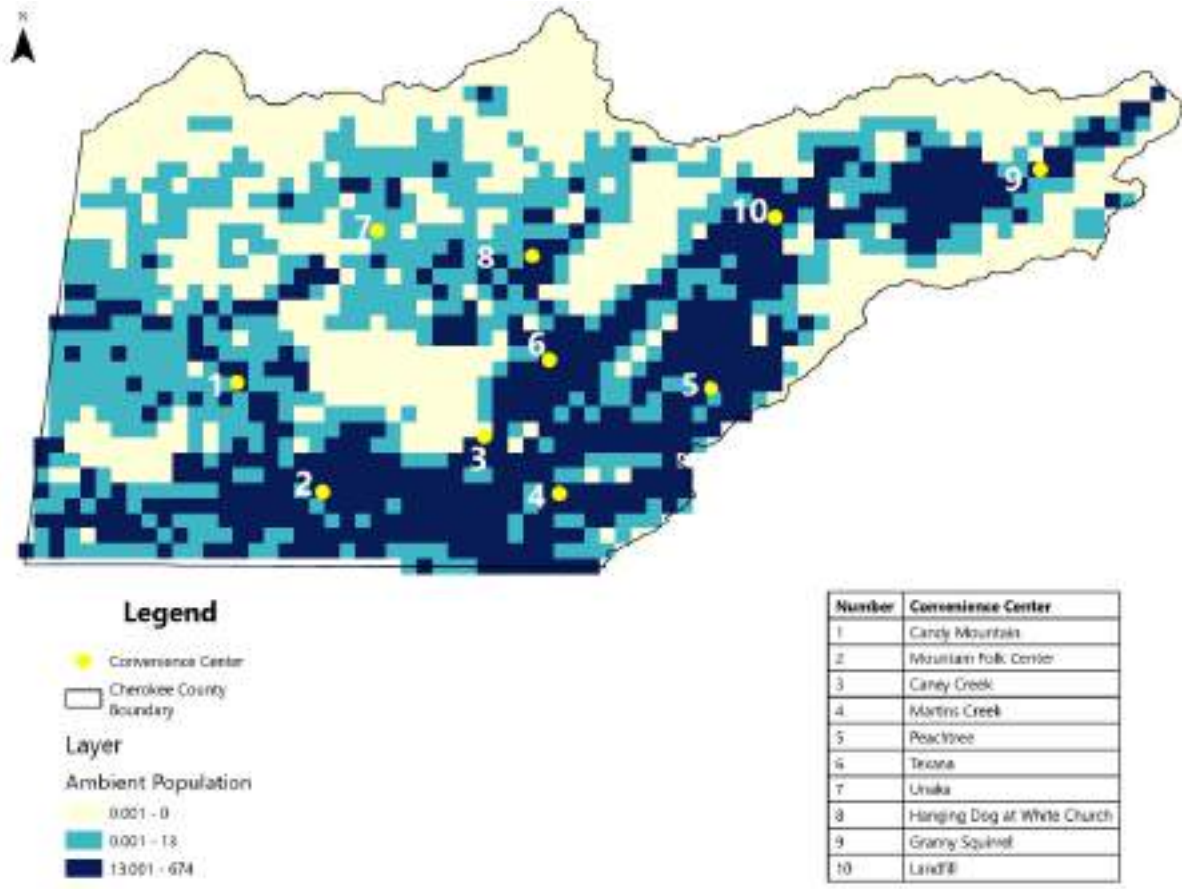
Figure X: Cherokee County Convenience Centers



Reference: Cherokee County NC, n.d.-a

The convenience center locations were analyzed using the county's ambient population (Figure X). In a buffer zone 5 km from the convenience centers, 80% of the population is in the zone. When the distance was increased to 6 km, nearly the entire population (92%) was covered. This indicates that the convenience centers are strategically positioned across Cherokee County.

Figure X: Cherokee County Map of Ambient Population with Convenience Center Locations



There is a 20.1 times difference in the amount of recyclables and MSW collected in Cherokee County (Table X). Despite the significantly higher amount of MSW, it is 1.68 times less expensive to manage than recyclables. The higher cost of managing recyclables puts pressure on ensuring they are sold at the highest price possible to minimize lost money. Cherokee County has two unique ways to minimize this price differential: baling methods and surveillance.

Table X: Cherokee County Collection Costs in FY24

Reference: Recycling Center Employee Conversation

Type of Waste	Amount Collected (Tons)	Total Cost ($)	Cost/Ton Managed ($/Ton)
MSW	18,000	388,400	21.6
Recyclables	894	654,500	36.4

The recyclables collected at the convenience centers are baled on-site (Figure X). This compaction increases the amount of recyclables that can be stored and minimizes the number of trips to the respective outlets.

Figure X: Cherokee County Baled Recyclables

Note: Left to right: plastics and aluminum/tin

The recycling center employees shared some rules and explained why they were in place (Figure X). All visitors must show their convenience center access card to prove their residency since they are tax-funded. Additionally, all waste and recycling must be disposed of properly. Video surveillance is continuously monitored, and notices and fines are issued to visitors who do not comply with the rules. Illegal dumping and maintaining a clean stream are significant challenges that video surveillance helps to address. Some people believe they can throw any waste, illegal dumping, at the convenience centers because they pay taxes to throw away their waste there. However, contamination decreases the cost of the recyclables being sold.

Figure X: Cherokee County Convenience Center Rules

The workers also expressed the need to replace or repair dumpsters at the convenience centers due to wear and tear over time (Figure X). However, there is a lack of money. There are grants available at the state level for new dumpsters if there are none in the area, but they do not cover repairs or replacements.

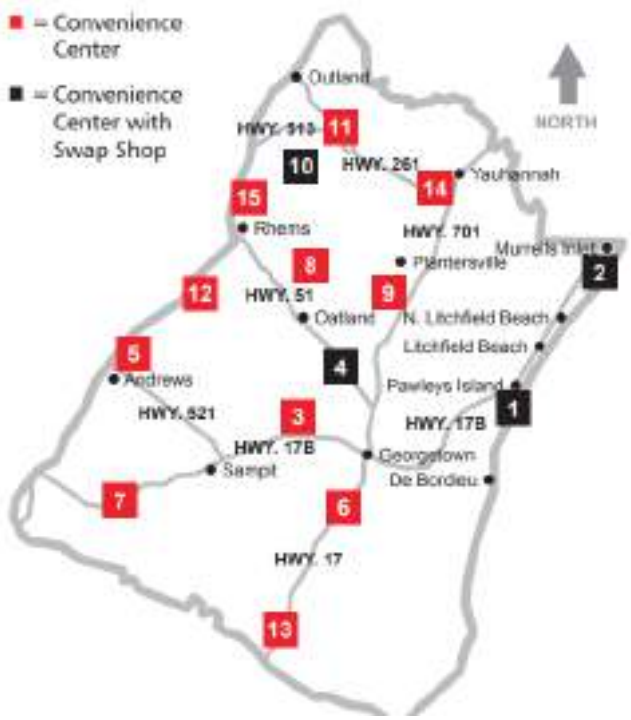
Figure X: Convenience Center Dumpsters in Cherokee County

Note: Left to right: source-separated recycling and household trash

Georgetown County, Sc:

The County of Georgetown does not provide curbside trash pickup. Instead, multi-stream drop-off is available at 15 manned convenience centers throughout the county for residential trash and recyclables (Figure X). Three convenience centers have swap shops allowing residents to repurpose, reuse, or donate unwanted items, diverting items from landfills (Georgetown County, n.d.-b).

Figure X: Map of Georgetown County Convenience Centers



Reference: Georgetown County, n.d.-a

Various recyclables are accepted (Figure X) and separated into containers at the centers: plastic, glass, newspaper, cardboard, etc (Figure X). By the end of 2024, receptacles were placed to collect plastic film, including grocery bags, produce bags, ziplocks, etc. There is a commercial recycling program that collects paper and cardboard weekly. However, a limited number of businesses can participate (Georgetown County, n.d.-b).

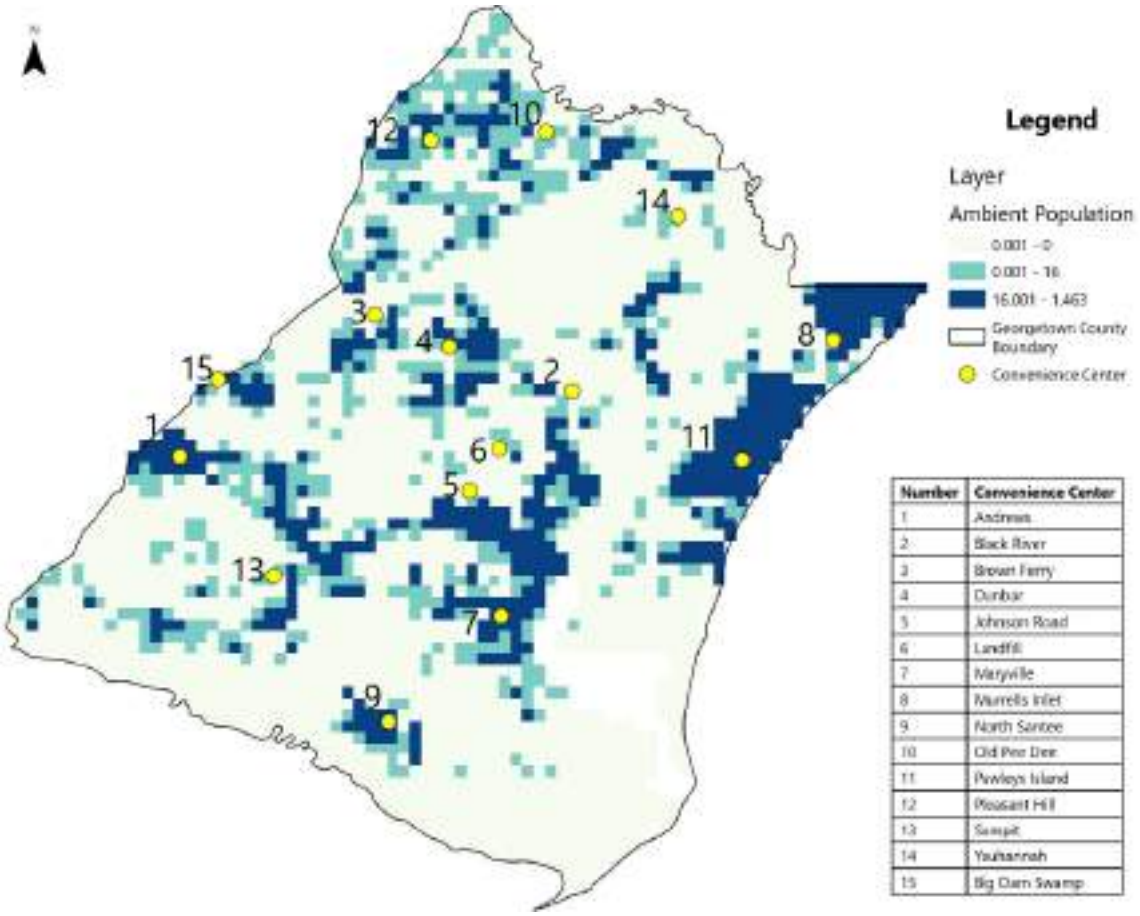
Figure X: List of Acceptable Recyclables at Georgetown Convenience Centers

Reference: Georgetown County, n.d.-c

Figure X: Georgetown County Convenience Center

The convenience center locations were analyzed using ambient population (Figure X). 71% of the ambient population is within the convenience centers' 5 km buffer zone. If the distance is increased to 6 km, nearly all the population is covered, at 93%. This shows that the convenience centers are well-located throughout Georgetown County.

Figure X: Georgetown County Map of Ambient Population with Convenience Center Locations



Number	Convenience Center
1	Andrews
2	Black River
3	Brown Ferry
4	Dunbar
5	Johnson Road
6	Landfill
7	Maryville
8	Murrells Inlet
9	North Santee
10	Old Pee Dee
11	Pawleys Island
12	Pleasant Hill
13	Sampit
14	Yauhannah
15	Big Dam Swamp

Issues with recycling collection limit the amount collected and recycled. One stakeholder mentioned that city and county recycling is not consistent. Confusion may arise regarding trash and recycling standards throughout the county since Georgetown City and Andrews offer separate curbside trash pickup for those within the city limits. Another issue is a gap in groups utilizing the convenience centers, decreasing the amount of recyclables collected. A stakeholder highlights a gap in recyclables collected at rentals or long-term stay locations:

"I think it's an obstacle because a lot of the rentals or hotels do not have recycling pickup. So that's a challenge with the tourists, especially during the summer, but the tourist season is all year now. So that's been an identified challenge … it's the rare tourist that's going to Google recycling centers and take their recycling to one of the centers that's not on the beach." - NGO

End of Cycle

Tifton, Ga:

From 2022 to 2023, the City of Tifton disposed of 65,004 tons of MSW and 8,467 tons of wood waste. The MSW is sent to the Tifton-Tift County Landfill. An expansion project will add 10 acres to the landfill, which is projected to be completed by 2027 or 2028 (City of Tifton, 2023). Without the expansion, the landfill would be full by 2027 (Cobb, 2023). The collected wood waste is taken to the inert landfill that accepts concrete and bricks, construction & demolition (C&D) materials. Both landfills are open Monday through Saturday (City of Tifton, n.d.).

Tifton recycled 89 tons of metal and 17 tons of tires (City of Tifton, 2023). However, no information is available on plastic recycling, which may indicate that plastic recycling is minimal or not formally tracked. This may be due to Tifton's lack of a MRF. Waste management stakeholders believe there will never be enough recyclables to build one in the city. As a result, recyclables are sent to the closest MRFs in Columbus, GA (126 miles) and Tallahassee, FL (90 miles). The Recycling Partnership's US Residential MRF Map reveals a gap in MRFs in South Georgia, with the southernmost MRF in Savannah (The Recycling Partnership, n.d.).

Waste management stakeholders shared that the cost to landfill is $42 per ton of waste, while the cost to send recyclables to a MRF is $120 per ton. This higher cost also includes a fee for contamination, a large problem that recycling faces. Recycling costs about 3 times more than landfilling, making it a less economical option. A facilities management stakeholder emphasized that recycling is not just an environmental effort in rural communities but must also be financially viable. They explained that profitability is key to vendors' willingness to engage in recycling programs.

Cherokee County, Nc:

The items collected from the convenience centers are either disposed of in landfills or processed for recycling. The Cherokee County Landfill, which opened in 1998 and is operated by the county, has approximately 40 years of space left (NC Department of Environmental Quality, 2024a). According to a recycling center employee, 142.66 tons of yard waste were disposed of in the landfill because there is no composting infrastructure. Bagged household trash and appliance disposal is covered in the $75 yearly fee per household. All other waste and all waste for businesses cost $4 per 100 lbs or $80/ton (Cherokee County NC, n.d.-b).

There is no MRF in Cherokee County. Instead, recycling center employees directly broker materials to processors, making recycling cost-neutral. They shared that 660 tons of recyclables were recycled from July 2023 to June 2024 (Table X). The largest category was cardboard (432 tons), and the lowest was aluminum (22.3 tons).

Table X: Cherokee County July 2023 - June 2024 Recycling Statistics

Reference: Recycling Center Employee Conversation

Recyclable	Quantity Recycled (tons)
Cardboard	432
Glass	142
Plastic	63.6
Aluminum	22.3
Total	**660**

Every recyclable has a different outlet (Table X). The community has found a local use for recycled glass in roadbeds or as fill. Instead of using gravel, it offsets the cost by about $20 per ton. According to recycling center employees, aluminum can bring up to $7,000 per truck, the highest value among all recyclables.

Table 16: Cherokee County Recyclables' Outlet

Reference: Recycling Center Employee Conversation

Recyclable	Outlet	Location
Glass	Roadbed / Fill	Cherokee County, NC
Plastic	Sonoco Recycling	Asheville, NC
Cardboard	Jackson Paper Manufacturing	Sylva, NC
Aluminum	Regional Recyclers	Regional

There are large costs associated with several items Cherokee County collects. The Recycling Center employees shared that cathode ray tube TVs cost $7,000 - $8,000 per 53' tractor-trailer load to dispose of them safely. It is a diminishing problem as less is collected, averaging one load per year. However, tires pose another large monetary challenge. Cherokee County must use US Tire, the only Western North Carolina tire disposal company approved by the NC DEQ, to receive state reimbursement, which is considerably less than disposal costs. According to a recycling center employee, this results in a $25,000 to $30,000 shortfall every six months that the county must cover with property taxes. The current system forces residents to pay twice, once at the point of sale and again through taxes, while failing to account for tourism-related tire waste. Due to the unfair and inefficient funding model, a convenience center worker would like a better way to dispose of tires.

Employees at the convenience center have reported that no initiatives are currently focused on waste reduction. Limited funding and staffing hinder investment in these programs.

Georgetown County, Sc:

The collected items from the convenience centers are either landfilled or recycled. In FY23, Georgetown County generated 52,600 tons of MSW, of which 39,800 tons were disposed of at the Class III landfill. It received a total of 1.3 million tons and has an estimated 23.3 years of space available. The Class II C&D landfill received 27,600 tons and has 18 years of space left (SC Department of Health and Environmental Control, 2023). The tipping fee at each landfill is $45 per ton (Georgetown County Environmental Services, n.d.).

Georgetown County recycled 12,800 tons of MSW in FY23, a 24% recycling rate that includes organics (Table X). The largest category was organics (61%), which consisted of yard trimmings turned into mulch. The recycling rate without organics was 11.2%. Metal, mainly mixed scrap metal, and paper, mainly cardboard, were the next largest amounts recycled. They received the largest amounts from non-residential sources. Plastics were the lowest category (145,06 tons), mainly HDPE and PET.

Table X: Georgetown County Recycling Data in Tons in FY23

Reference: SC Department of Health and Environmental Control, 2023

Commodities	Residential	Commercial/ Institutional	Industrial (office/ packaging)	Total
Glass	202	0.27	0.00	**202**
Metal	594	2.88	842	**1,440**
Paper	635	705	67.6	**1,410**
Plastic	46.1	0.43	98.4	**145**
Organics	7,800	11.5	0.00	**7,810**
Banned*	847	217	43.5	**1,100**
Miscellaneous	53.1	7.99	412	**473**
Commingled	135	18	110	**263**
Total	**10,300**	**963**	**1,570**	**12,800**

*Banned refers to items that can not be disposed of in landfills and must be recycled per SC laws (appliances, electronics, lead-acid batteries, used motor oil, and whole tires)

There are issues with recycling in Georgetown County. The MRF's infrastructure is outdated and undersized for community needs (Figure X). Government employees discussed the need for more staff and investment in balers to make the MRF more efficient. An interviewee mentioned the significant investments required:

"I forget the estimate that the county administrator gave, but I want to say it was like five to $8 million that it's going to take to improve the MRF …. it's over 30 years old. So getting newer technology, reducing the amount of hand sorting that they need to do and helping to increase their ability to recycle." - NGO

Figure X: Georgetown County MRF Sorting Line

The MRF's age and lack of upgrades lead to significant downtime, resulting in a backup of recyclables that accumulate (Figure X). This makes the MRF inefficient.

Figure X: Pile of Backed-Up Unsorted Recyclables at Georgetown County MRF

Composting is another end-of-cycle pathway that diverts food and yard waste. However, Georgetown County does not have commercial compost infrastructure. According to a government employee, commercial composting was available about 15 years ago but stopped because it was not profitable.

Leakage

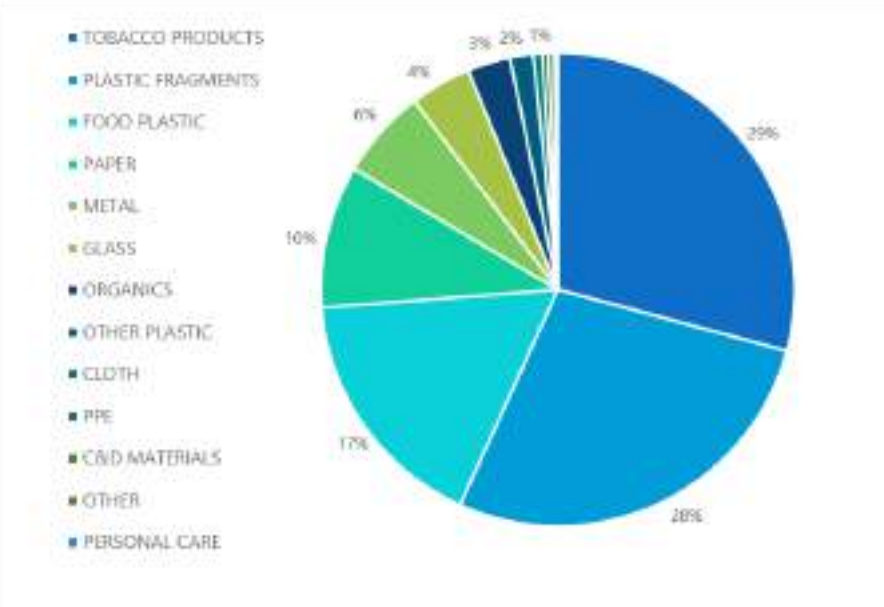
Tifton, Ga:

The CIL team recorded 2,464 litter items across the 27 litter transects in Tifton. The litter density in the transects ranged from 0.08 to 4.86 items/m^2, with an average of 0.91 items/m^2 (Figure X). This is higher than the US-modeled average of 0.47 items/m^2 (US EPA, 2024b) and higher than three of the six cities in the Walmart Foundation cohort (New Materials Institute (NMI), 2024).

Figure 21: Map of Litter Densities in Tifton

More than half (57%) of the litter consisted of tobacco products (29%) and plastic fragments (28%) (Figure X). Tobacco products have little to no recycling options, and plastic fragments show that plastics leak into the environment and degrade. A portion of the litter surveyed (20%) can be recycled if collected: paper (10%), metal (6%), and glass (4%).

Figure X: Tifton Litter Survey Material Breakdown



Cigarettes comprise 35% of the top 10 litter items (Figure X), and no local recycling market exists. This resembles the Walmart Foundation cohort where 83% of the cities also had cigarettes as the top litter item (New Materials Institute (NMI), 2024). Fragments such as film, hard plastic, foam, glass or ceramic, and other fragments dominated the top litter items (39%), emphasizing the shortcomings of current waste management and recycling systems in effectively capturing them. Two items in the top litter can be recycled: paper and aluminum/tin cans. Other organic waste came in the 10th most common litter item spot, which can be composted. Improving recycling collection would reduce the quantity of these items that escape into the environment (Figure X).

Figure X: Tifton Litter Survey Top Litter Items by Count

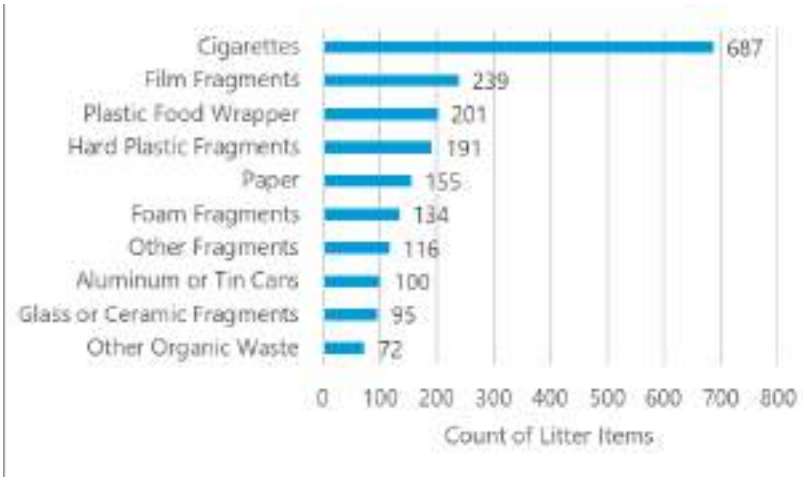
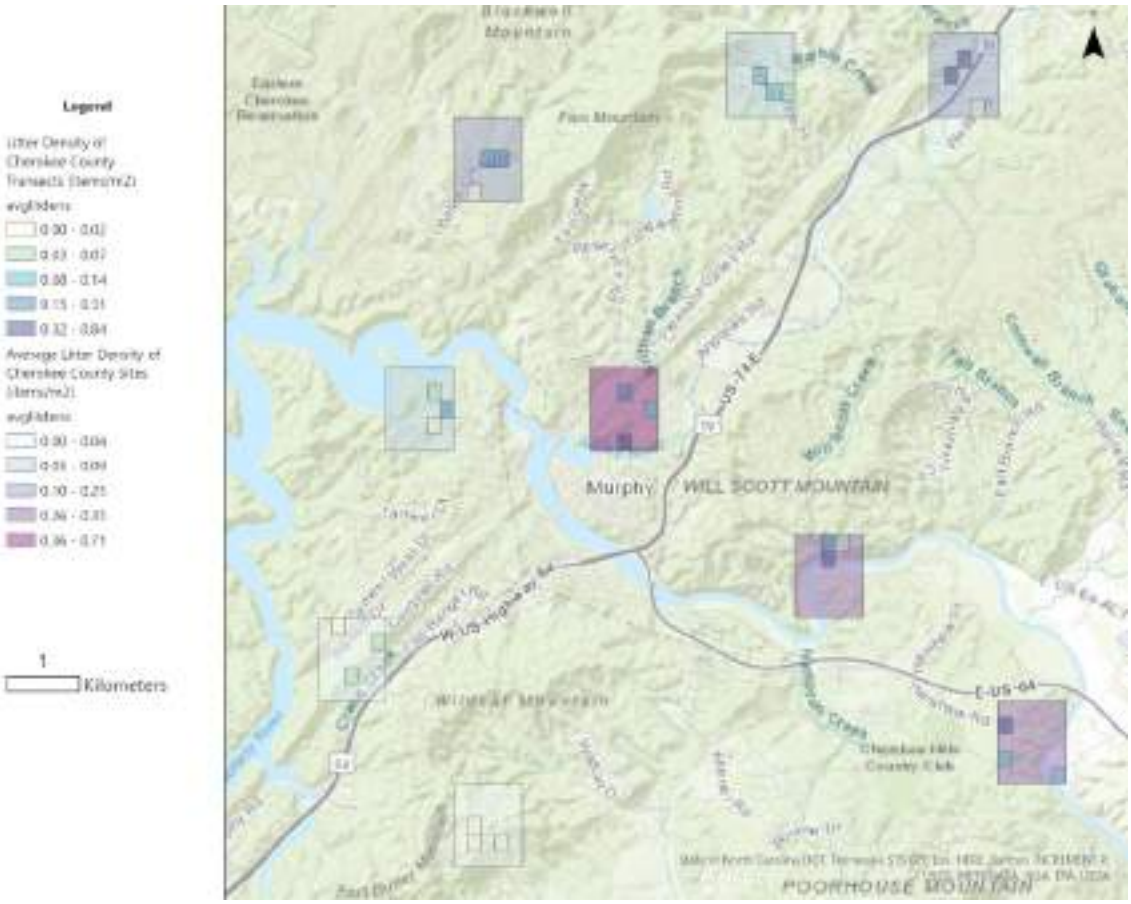


Figure X: Example of Litter in Tifton

Cherokee County, Nc:

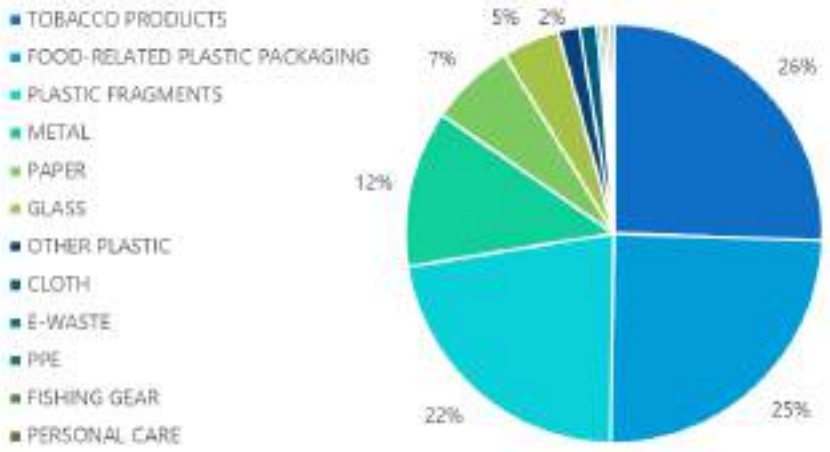
The CIL team recorded 603 litter items across the 27 litter transects in Cherokee County. The litter density in the transects ranged from 0.00 to 0.84 items/m^2, with an average of 0.24 items/m^2 (Figure X). This is lower than the US-modeled average of 0.47 items/m^2 (US EPA, 2024b) and lower than all the cities in the Walmart Foundation cohort (New Materials Institute (NMI), 2024).

Figure X: Map of Litter Densities in Cherokee County



Three materials dominated the litter survey, representing nearly 75% of all the litter: tobacco products (26%), food-related plastic packaging (25%), and plastic fragments (22%) (Figure X). These three materials have limited to no recycling capabilities. The remaining quarter of materials found in the litter survey can be recycled if collected: metal (12%), paper (7%), and glass (5%).

Figure X: Cherokee County Litter Survey Material Breakdown



Cigarettes are the most common item on the list of the top 10 litter items (Figure X), and there is currently no local recycling market. This is similar to the Walmart Foundation cohort, where 83% of the cities also listed cigarettes as the top litter item (New Materials Institute (NMI), 2024). Fragments such as film, hard plastic, glass or ceramic, and foam dominated the top litter items, highlighting that existing waste management and recycling systems are inadequate in capturing them. Two items could be recycled in the top litter: paper and aluminum/tin cans. Improving recycling collection would reduce the quantity of these items that escape into the environment (Figure X).

Figure 41: Cherokee County Litter Survey Top Litter Items by Count

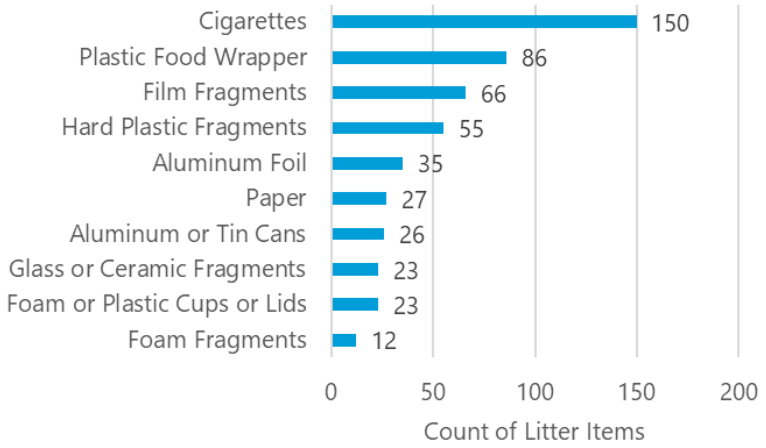


Figure X: Example of Litter in Cherokee County

Note: Left to right: Marlboro cigarette pack, Reese's plastic wrapper, and Coca-Cola aluminum can

Despite Cherokee County's relatively low litter density, recycling center employees shared that littering occurs on private properties where solid waste ordinances can not be enforced (Figure X). Mismanaged waste has negative environmental and health impacts.

Figure X: Mismanaged Waste on Cherokee County Private Property

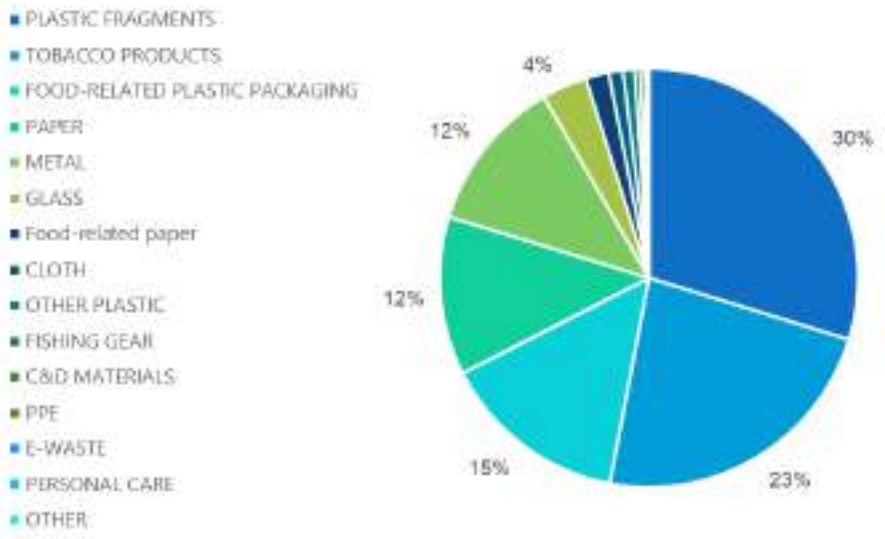
Georgetown County, Sc:

The CIL team recorded 2,460 litter items across the 27 litter transects in Georgetown County. The litter density in the transects ranged from 0.06 to 2.96 items/m^2, with an average of 0.91 items/m^2 (Figure X). This is higher than the US-modeled average of 0.47 items/m^2 (US EPA, 2024b) and higher than three of the six cities in the Walmart Foundation cohort (New Materials Institute (NMI), 2024).

Figure X: Map of Litter Densities in Georgetown County

Over half of the surveyed items were plastic fragments (30%) and tobacco products (23%) (Figure X). Both of these materials have limited to no recycling capabilities. The next top material found in the litter survey was food-related plastic packaging (15%), contributing to a high amount of plastic pollution in the environment. About 25% of the materials were paper (12%) and metal (12%), both recyclable.

Figure X: Georgetown County Litter Survey Material Breakdown



The top 10 litter items (Figure X) were led by cigarettes, for which no local recycling market exists. The most common litter items were fragments (hard plastic, film, paper, foam, glass/ceramic, and metal), indicating that current waste management and recycling systems are failing to capture these items. Some items could be recycled in the top litter items: aluminum or tin cans and plastic bottles (Figure X). Improving recycling collection would decrease the number of these items that leak into the environment.

Figure X: Georgetown County Litter Survey Top Litter Items by Count

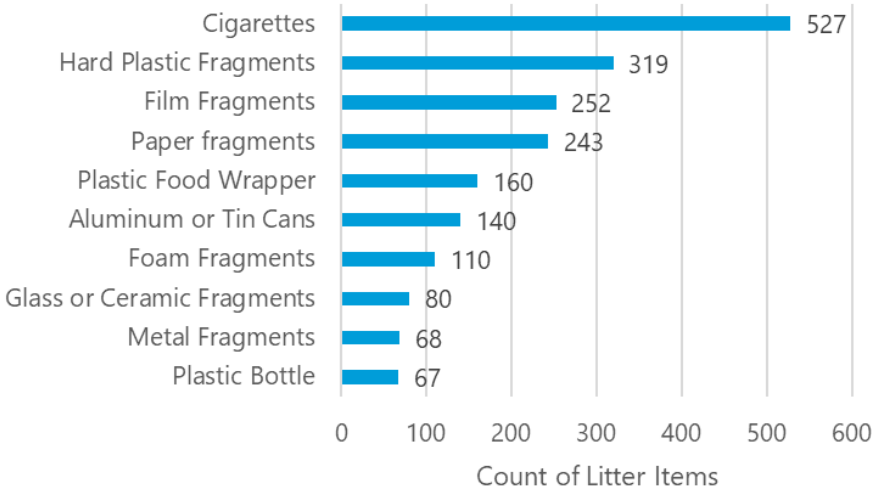


Figure X: Examples of Top Litter Items Leaked into the Environment

Note: Left to right: L&M cigarette pack, Arizona aluminum can, and Sunkist plastic bottle)

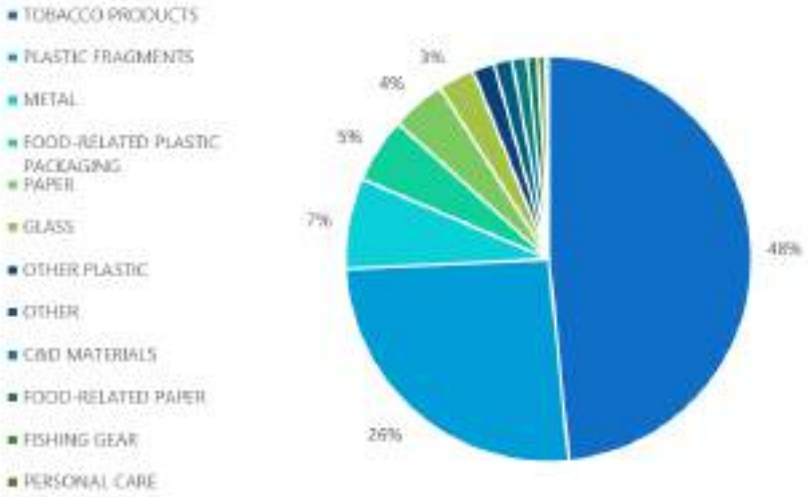
There has been some progress in reducing the leakage of cigarettes, the top litter item. According to an NGO, Keep America Beautiful and Altria have installed close to 500 cigarette receptacles and have seen a 50% reduction in cigarettes in the litter.

Pawleys Island has a different story. Across the nine litter transects, 345 litter items were recorded. The litter density ranged from 0.29 items/m^2 to 0.46 items/m^2, with an average of 0.38 items/m^2 (Figure X). This is lower than both the US-modeled average and Georgetown County.

Figure X: Map of Litter Densities in Pawleys Island

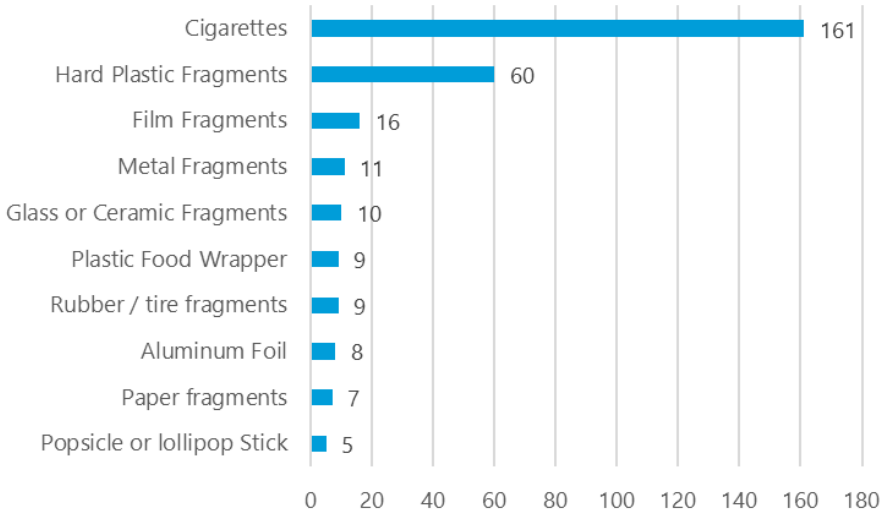
Almost half of the litter was tobacco products (48%), while plastic fragments accounted for 26% (Figure X). This is more tobacco products than the inland area.

Figure X: Pawleys Island Litter Survey Material Breakdown



Cigarettes dominated Pawleys Island's top 10 litter items, and fragments were also popular. Plastic food wrappers, aluminum foil, and popsicles or lollipop sticks were the remaining items (Figure X), indicating the presence of tourists socializing in the area. There were no recyclables in the top litter items.

Figure X: Pawleys Island Litter Survey Top Litter Items by Count



Pawleys Island had a lower litter density than Georgetown County. This may be due to the proximity to the ocean, which makes people care more about keeping the environment clean. Cigarettes were the top litter item in both areas. This resembles the Walmart Foundation cohort, where five of the six cities identified cigarettes as the leading litter item (New Materials Institute (NMI), 2024). Recyclables were present in Georgetown County's litter surveys, but none were found in Pawleys Island. Clearly, there are stark differences in the litter found in the environment between inland and coastal areas.

Opportunities

CIL found the following opportunities to expand and enhance circularity in [city name] based on the findings of this report. These opportunities are categorized based on the seven spokes of the CAP model. Stakeholder engagement with the partners of this project should take place to further expand, refine and prioritize these opportunities based on local context, impact, feasibility, and cost. It is important to note that the opportunities listed below are individualized based on the findings, but solutions cannot happen in a vacuum and are most impactful when strategically combined within a holistic system framework.

Tifton, Ga:

Input

Of the FMCG surveyed, 93% had manufacturers in the US, and 82% had domestic parent company locations. Nine percent of the FMCG in Cherokee County were manufactured in neighboring states. PepsiCo, a top parent company, has a local bottling facility in Albany, GA. The Coca-Cola Company dominates the products with manufacturers and/or parent company locations in Georgia (73%) and has a bottling facility in Tifton. Aluminum and tin cans were among the top items found in the litter data.

- Facilitate voluntary extended producer responsibility (EPR) schemes with nearby parent companies and manufacturers.
- Leverage reuse, refill, and deposit return schemes (DRS) with local bottling companies (ex. Coca Cola).

Community

Eight conversations were held with key stakeholders in Tifton. These conversations highlighted the community's challenges with past mismanagement, a lack of resources and facilities, and contamination. These have led to inefficiencies and a lack of public trust in the system.

- Leverage the large institutional presence interested in supporting recycling throughout campus and the city.
- Educate farmers on the benefits of recycling rather than storing plastic waste on-site. The Natural Resources Conservation Service could help do this.
- Re-integrate recycling into the school curriculum.
- Allow waste management companies to speak at schools or share videos on current recycling practices after materials are dropped off could help increase public trust in the system.
- Provide incentives for high amounts of recycling (tax incentive) or don't contaminate (i.e., a discount at a store/restaurant that offers alternatives).

Product Design

Five FMCG and staple goods were packaged in multilayer film or EPS in the 25 stores surveyed. In restaurants, PP and EPS were the top packaging materials. Sauce container lids were the only to-go item mainly packaged in recyclable material, PET. The packaging-to-product ratio was highest for beverages (0.06).

- Shift towards easier-to-recycle materials like PET, HDPE, and paper/ paperboard.
    - Incorporate discussion on egg packaging, a large Georgia industry, into the local agricultural-based university curriculum.
- Educate store owners and the public to purchase items/packaging that are locally recyclable.

- Improve product delivery efficiency by shifting towards minimal packaging design and/or increasing product quantities.

Use

32% of Tifton stores offered alternatives, but no alternative personal items were found. Despite no composting infrastructure, most alternatives (67%) were compostable. Bulk items were the only alternative use type that was less expensive than comparable SUP products (243% less). Reusable items cost the most, averaging 420 times more. There is a lack of concentrated items. Reusable bags are offered at 54% of stores.

- Educate store owners on the benefits and popularity of alternative personal care items.
- Provide more bulk and concentrated products that tend to be less expensive than single-use products.
- To support local businesses, the city could highlight efforts by local businesses to reduce plastic use.
- Promote the use of reusable bags.
- Promote only upon request policy at restaurants (straws, utensils, and bags).

Collection

Weekly trash pickup occurs, but recycling must be brought to the single-stream drop-off center. Four categories of recyclables were collected (cardboard, plastic, paper, and aluminum cans). The drop-off location is outside a 4km buffer for 37% of the population. There is low public awareness of the drop-off location. Contamination is an issue with single-stream recycling.

- Place more recycling drop-off areas throughout the city.
- Consider changing the City's waste management company contract to one that has higher recycling success rates.
- Consider source-separated collection.
- Glass products should be accepted at the drop-off center. Glass can be used for roadbeds or fill in the local community.
- Place a banner/ signage to increase awareness of the drop-off center.
- Provide pop-up locations to collect recyclables and educate the public on how and where to recycle.
- Educate the public to recycle the most profitable materials: aluminum, natural HDPE, & PET.
- Inform community members about local businesses that accept source-separated film plastic.
- Push for private haulers to separate recycling from waste (e.g., smaller trash cans, free days to recycle the most profitable recyclables). Pay-as-you-throw (PAYT) systems incentivize residents to throw away less trash and recycle.

- Monitor (e.g., cameras) the drop-off center and contact residents who recycle incorrectly.

End of Cycle

The Tifton-Tift County landfill is being expanded by 10 acres. Yard waste, concrete, and bricks are sent to the inert landfill. There is no MRF in Tifton. The closest ones are in Columbus, GA, or Tallahassee, FL. Recycling costs about 3 times more than landfilling, including a contamination fee.

- With a switch to a multi-stream drop-off center, recyclables can be sold directly to processors.
- Coordinate with nearby counties to build a new MRF and reach economies of scale.
- To decrease the price difference between landfilling and recycling, use outside sources for grant writing support, like US EPA's Regional Thriving Communities Technical Assistance Centers (TCTAC) Southeast Program, REACT4 at https://www.react4.org/.
- Invest in composting infrastructure as yard waste is collected and compostable alternatives are available. The end market is farmers in Tifton.

Leakage

Tifton's average litter density is 0.91 items/m^2. Cigarettes were the top litter item, followed by film fragments. Paper and aluminum or tin cans were also top litter items in Tifton's litter survey.

- Address upstream some of the top littered items (tobacco items) with additional policies and public campaigns.
- With continued litter monitoring, the County can identify gaps in convenience centers.
- Place yard signs or road signs throughout the county to remind people not to litter.
- Place trash cans and recycling bins at entrances of recreational areas (tourism/shopping centers/ parks).

Cherokee County, Nc:

Input

Of the FMCG surveyed, 96% had domestic manufacturers, and 89% had domestic parent company locations. The neighboring states manufactured 8% of the FMCG in Cherokee County. The top parent companies had local bottling locations, with PepsiCo throughout North Carolina and Coca-Cola in Cleveland, TN, and Jasper, GA. Aluminum and tin cans were among the top items found in the litter data.

- Facilitate voluntary EPR schemes with nearby parent companies and manufacturers.
- Leverage reuse, refill, and DRS with local bottling companies.

Community

Two conversations and one semi-structured interview were conducted in Cherokee County. The stakeholders provided insights on barriers to recycling, such as low collection rates, political obstacles, safety concerns, illegal dumping, and limited resources. They also highlighted several ways to improve recycling.

- Place recycling bins where recyclables are emptied outside the household (i.e., laundromats).
- Scan IDs to ensure that only residents use the convenience centers. This will also make it easier to track violators who are illegally dumping.
- Engage in conversations with nearby manufacturers on shifting to biodegradable packaging.
- Provide incentives for correctly recycling (i.e., a discount at a store/restaurant that offers alternatives).
- Work with nearby counties or organizations to discuss with the North Carolina government to increase financial support for recycling.

Product Design

Five FMCG and staple goods were packaged in multilayer film or EPS in the thirteen stores surveyed. In restaurants, PP and PS were the top packaging materials. There is a lack of recyclable packaging, with sauce container lids being the only takeout item mainly packaged in PET. The packaging-to-product ratio was highest for beverages and chips (0.06).

- Shift towards easier-to-recycle materials like PET, HDPE, and paper/ paperboard.
    - Engage with the Cherokee County Egg Producers Association and Dutt & Wagner to shift from EPS to paper pulp or PET egg packaging.
- Educate store owners and the public to purchase items/packaging that are locally recyclable.
- Improve product delivery efficiency by shifting towards minimal packaging design and/or increasing product quantities.

Use

46% of Cherokee County stores sold alternatives, but none were alternative personal items. Despite no composting infrastructure, most alternatives (68%) were compostable. Refillable items were the only less costly alternative than comparable SUP products (18% less). Reusable items cost the most, averaging 168 times more. There is a lack of bulk and concentrated items. Reusable bags are offered at 54% of stores.

- Tourism and long-term stays bring a less price-sensitive group that could use reuse or refill alternatives.

- Educate store owners on alternative personal care items and how they can appeal to nature enthusiasts who hike in Cherokee County.
- Provide more bulk and concentrated products that tend to be less expensive than single-use products.
- To support local businesses, the city could highlight efforts by local businesses to reduce plastic use.
- Promote the use of reusable bags.
- Promote only upon request policy at restaurants (straws, utensils, and bags).

Collection

Trash and recycling are collected through 10 drop-off convenience centers in Cherokee County. Four categories of recyclables were collected (cardboard, plastic, paper, and aluminum), with aluminum being the least collected recyclable (22.3 tons). A convenience center access card for county residents must be shown upon entrance, and video surveillance ensures no illegal dumping occurs. Fines and citations are given to those who don't follow the rules. Dumpsters collecting waste/recyclables or holding bailed materials are old and broken.

- Educate the public to recycle the most profitable materials: aluminum, natural HDPE, & PET.
- Inform community members about local businesses that accept source-separated film plastic.
- Consider further source-separated collection.
- Provide pop-up locations to collect recyclables and educate the public on how and where to recycle.
- Allow non-county residents, like tourists, to utilize convenience centers for a fee to collect money to replace or repair dumpsters.
- Push private haulers to separate recycling from waste (e.g., smaller trash cans, free days to recycle the most profitable recyclables). PAYT systems incentivize residents to throw away less trash and recycle.

End of Cycle

There is no MRF in Cherokee County. Instead, the materials are brokered directly to regional processors, making recycling cost-neutral. Aluminum is the highest-value material sold. Tire disposal results in a $30,000 deficit every six months. Insufficient funding and staffing hinder investment in waste reduction programs, and no composting infrastructure is available.

- Work with nearby counties to increase the supply of recyclables to reach economies of scale.
- Continue to compile deficit data from Western NC counties to advocate for a state policy change on tire disposal and/or form partnerships with private companies that use recycled tire materials.
- Invest in composting infrastructure as compostable alternatives are present.

- Consider utilizing volunteers and/or incarcerated individuals as a low-cost workforce to support the development of waste reduction programs, including education and awareness initiatives.
- Use outside sources for grant writing support for waste reduction programs like US EPA's Regional TCTAC Southeast Program, REACT4 at https://www.react4.org/.

Leakage

Cherokee County's average litter density is 0.24 items/m^2. Half of the litter was tobacco products (26%) and food-related plastic packaging (25%). Aluminum or tin cans and paper were the top litter items in Cherokee County's litter survey.

- Addressing upstream some of the top littered items (cigarettes) with additional policies and public campaigns
- With continued litter monitoring, the city can identify possible gaps in the convenience center locations and/or hours.
- Place yard signs or road signs throughout the county to remind people not to litter.
- Place trash cans and recycling bins at entrances of recreational areas (tourism/shopping centers/ parks).
- Partner with the John C Campbell Folk School to hold a trash art-making competition to increase littering and plastic waste awareness. Share winners in the newspaper.

Georgetown County, Sc:

Input

93% of FMCG manufacturers and 83% of FMCG parent company locations were domestic to the US. South Carolina's neighboring states manufactured 8% of the FMCG surveyed. PepsiCo and The Coca-Cola Company were the top parent companies, with local bottling locations in North Myrtle Beach and Bishopville, respectively. Plastic bottles were among the top items found in the litter data for the inland area.

- Facilitate voluntary EPR schemes with nearby parent companies and manufacturers.
- Leverage reuse, refill, and DRS with local bottling companies.
- Invest in water refill stations in government buildings and parks.

Community

Four conversations and one semi-structured interview were conducted with two different stakeholder groups. The participants provided insights on barriers to recycling, including lack of funding, old infrastructure, and accessibility challenges. They highlighted areas that could increase recycling rates.

- Work alongside NGOs that have initiatives to decrease the amount of litter in the environment.
- Work on passing policy addressing litter or increasing recycling rates.
- Expand education to social media.
- Utilize wildlife messaging to connect with the public.
- Use outside sources for grant writing support, such as the US EPA's Regional TCTAC Southeast Program, REACT4, at https://www.react4.org/.
- Visit K-12 locations to educate students and hand out brochures, trash art contests, etc.

Product Design

Twenty stores were surveyed, and five FMCG and staple goods were mainly packaged in multilayer film or EPS. In restaurants, EPS was the most popular packaging material for food containers and cold cups in the inland and coastal areas. The packaging-to-product ratio was highest for chips (0.07).

- Shift towards easier-to-recycle materials like PET, HDPE, and paper/ paperboard.
- Educate store owners and the public to purchase items/packaging that are locally recyclable.
- Improve product delivery efficiency by shifting towards minimal packaging design and/or increasing product quantities.

Use

85 alternative materials were found in the inland and coastal stores. Georgetown County had more alternative items but was located at fewer stores than Pawleys Island. Bulk items were less costly, while reusable items cost 140 times more. Compostable products were the most popular alternative (44%), but no commercial composting infrastructure was available. Pawleys Island had more stores offering reusable bags (60%) than Georgetown County (25%).

- Tourism and long-term stays bring a less price-sensitive group that could use reuse or refill alternatives.
- Invest in reusable foodware in schools to reduce waste (VYTAL reuse available in 2025 w/HQ in Atlanta).
- To support local businesses, the city could highlight efforts by local businesses to reduce plastic use.
- Promote the use of reusable bags.
- Promote only upon request policy at restaurants (straws, utensils, and bags).
- Increase awareness of existing commercial recycling programs.

Collection

Trash and recycling are collected through 15 drop-off convenience centers throughout Georgetown County. A 6 km buffer zone around the convenience centers indicates that 93% of the ambient population is covered. However, recycling collected from tourist areas is low.

- Educate the public to recycle aluminum and natural HDPE as they are the most profitable recyclable items.
- Expand awareness of convenience centers to tourist areas to address the gap in recyclables collected.
- Provide pop-up locations to collect recyclables and educate the public on how and where to recycle.
- Push for private haulers to separate recycling from waste (e.g. smaller trash cans, free days to recycle the most profitable recyclables). PAYT systems incentivize residents to throw away less trash and recycle.

End of Cycle

The MRF is outdated and undersized for community needs. Significant investment is needed to update the infrastructure and increase staff. A backup of recyclables at the MRF is typical. There is no composting infrastructure available.

- Work with nearby counties to increase the supply of recyclables to reach economies of scale.
- Invest in composting infrastructure as compostable alternatives are present.
- Invest in updating MRF for more efficient processing.
- Utilize volunteers and/or incarcerated individuals to help with tasks at the MRF.

Leakage

Georgetown County's average litter density is higher (0.91 items/m^2) than Pawleys Island (0.38 items/m^2). The top litter item for both areas is cigarettes. In Georgetown County's litter survey, aluminum or tin cans and plastic bottles were in the top litter items list.

- Addressing some of the top littered items (tobacco items) with additional policies and public campaigns upstream.

- Place trash & recycling bins according to CAP litter surveys or annual leakage data reports.
- Place yard signs or road signs throughout the county to remind people not to litter.
- With continued litter monitoring, the County can identify gaps in convenience centers.
- Place trash cans and recycling bins at entrances of recreational areas (tourism/shopping centers/ parks).

Glossary

CAP: Circularity Assessment Protocol

CIL: Circularity Informatics Lab

EPR: Extended Producer Responsibility

EPS: Expanded polystyrene

FMCG: Fast moving consumer goods

HDPE: high density polyethylene

MSW: municipal solid waste

PET: polyethylene terephthalate

PP: polypropylene

SUP: single-use plastic

UGA: University of Georgia

Add terms as needed.

Appendix

Table A1: Full List of Debris Tracker Litter Items and Associated Material Categories

Material	Items
C&D Materials	Aggregate & Brick Bolts, Nails, and Screws Building Materials Lumber Other C&D
Cloth	Clothing Towels or rags Fabric Pieces Other Cloth
E-Waste	Batteries E-Waste Fragments Wire Other E-Waste
Fishing Gear	Buoys and Floats Fishing Line Other Fishing Gear Plastic Net or Net Pieces Plastic Rope
Glass	Glass Bottle Glass or Ceramic Fragments Other Glass
Metal	Aluminum Foil Aluminum or Tin Cans Foil to-go container

	Metal Bottle Caps or Tabs Metal Fragments Other Metal
Organic Waste	Food Waste Other Organic Waste
Other	Other Popsicle or lollipop Stick
Other Plastic Products	Bulk Bags Flip Flops or shoes Plastic String, Tape, or Packing Straps Rubber Bands Trash bag Tires Balloons Plastic toys or balls Car Parts Hard plastic jugs or containers Other Plastic
Food-Related Paper	Paper cups Paper food box or container Paper plates or bowls Compostable paper cups Paper food wrapper Compostable food box or container Napkins Other Food-Related paper

Paper	Office paper and newspaper Tags, tickets, and receipts Corrugated Cardboard Paper fragments Other Paper
Personal Care Products	Blister Pack or other pill packaging Cotton Buds Ear plugs Personal Care Product Sachet or packet Toothbrushes Toothpaste or Other Product Tube Flossers Feminine products Needles and syringes Other Personal Care Product
Food-related plastic	Foam cups Plastic cups Compostable plastic cups Cup Lids Plastic Bottle Aseptic cartons Mini alcohol bottles Plastic Bottle Cap Plastic Food Wrapper Condiment packet or container Plastic Grocery Bag Sandwich or snack bags Plastic Utensils

	Straws Foam to-go container or clamshell Plastic to-go container or clamshell Compostable plastic container or clamshell Other Food-Related Plastic
Plastic Fragments	Film Fragments Foam Fragments Hard Plastic Fragments Rubber/ tire fragments Other Fragments
PPE	Disinfectant Wipes Disposable Gloves Face Masks Other PPE
Tobacco Products	Cigarette Packaging Cigarettes Tobacco Sachets or packets E-cigarettes and vaping Plastic cigar/cigarillo tips Lighters Cannabis-related waste Other Tobacco Product

Figure AXX: Litter densities in transects and sites surveyed in [city name].

Include an interactive web map such as in the example below.

An interactive web map version of this map is available at:
https://usg.maps.arcgis.com/apps/mapviewer/index.html?webmap=92d84e3251fa40f2a5a04c041ec718a7