Circularity Assessment Protocols in Rural Communities in EPA Region 4

University of Georgia

Circularity Informatics Lab

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Location:
The University of Georgia
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Contact:
Dr. Jenna Jambeck
jjambeck@uga.edu

Contributing Authors:
Shelby Mendez, Kathryn Youngblood, and Jenna Jambeck

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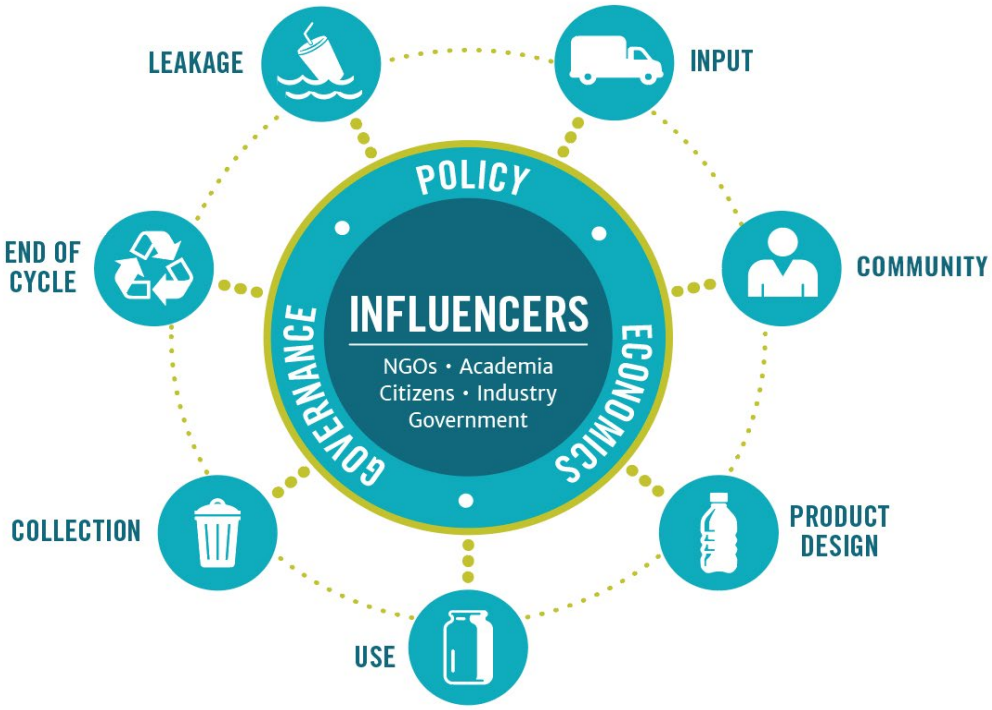
Executive Summary

Developed by the Circularity Informatics Lab (CIL) 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 and opportunities for each of the three communities are summarized in the tables below. Overall, despite proximity to end users of recyclables materials, rural areas in the southeast struggle with limited staff capacity and little cross-governmental collaboration to reach economies of scale. Costs to process recyclables at the MRF remain significantly higher than landfilling. Source-separation and directly brokering to end users is a viable financial model, but does have lower participation rates.

Key Findings: Tifton, Georgia

INPUT

Findings: Of the fast-moving consumer goods (FMCG) brands 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.

Opportunities:

- 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

Findings: Eight semi-structured interviews 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.

Opportunities:

- Leverage the large institutional presence interested in supporting recycling throughout campus and the city.
- Develop a program to capture and recycle agricultural plastics and educate farmers on the benefits, rather than storing plastic waste on-site.
- 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 to help increase public trust in the system.
- Provide incentives for dropping off high amounts of recycling.

PRODUCT DESIGN

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

Opportunities:

- Shift towards easier-to-recycle materials like PET, high density polyethylene (HDPE), and paper or 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

Findings: 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.

Opportunities:

- Educate store owners on the benefits and popularity of personal care items packaged without single-use plastic.
- 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

Findings: Weekly trash pickup occurs, but recycling must be brought to the single-stream drop-off centers. 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 locations. Contamination is an issue with single-stream recycling.

Opportunities:

- Place more recycling drop-off areas throughout the city.
- Consider changing the city's waste management company contract to reintroduce recycling.
- Consider source-separated collection.
- Add source-separated glass collection at the drop-off center. Glass can be used for roadbeds or fill in the local community.
- Place a banner or add 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.
- Incentivize separating recycling from waste (e.g., smaller trash cans, free days to recycle the most profitable recyclables). Pay-as-you-throw (PAYT) systems can encourage residents to throw away less trash and recycle, though illegal dumping enforcement must also be in place.
- Monitor (e.g., cameras) the drop-off center and contact residents who recycle incorrectly.

END OF CYCLE

Findings: 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.

Opportunities:

- 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.
- Invest in composting infrastructure as yard waste is collected and compostable alternatives are available. The end market is farmers in Tifton.

LEAKAGE

Findings: 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.

Opportunities:

- 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).

Key Findings: Cherokee County, North Carolina

INPUT

Findings: Of the FMCG brands 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.

Opportunities:

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

COMMUNITY

Findings: Three semi-structured interviews 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.

Opportunities:

- Place recycling bins where recyclables are emptied outside the household (i.e., laundromats).
- 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 share infrastructure and increase financial support for recycling.

PRODUCT DESIGN

Findings: 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).

Opportunities:

- Shift towards easier-to-recycle materials like PET, HDPE, and paper or 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

Findings: 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.

Opportunities:

- Tourism and long-term stays bring a less price-sensitive group that could use reuse or refill alternatives.
- Educate store owners on alternatively packaged 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 county 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).

Findings: 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.

COLLECTION

Opportunities:

- 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 or allow them to bring recyclables without charge.
- Push private haulers to separate recycling from waste (e.g., smaller trash cans, free days to recycle the most profitable recyclables). PAYT systems can incentivize residents to throw away less trash and recycle.

Findings: 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.

END OF CYCLE

Opportunities:

- 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.

Findings: Cherokee County's average litter density is 0.24 items/m2. 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.

LEAKAGE

Opportunities:

- Addressing upstream some of the top littered items (cigarettes) with additional policies and public campaigns
- With continued litter monitoring, the county 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.

Key Findings: Georgetown County, South Carolina

INPUT

Findings: 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.

Opportunities:

- 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

Findings: Five semi-structured interviews 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.

Opportunities:

- 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.
- Visit K-12 locations to educate students and hand out brochures, trash art contests, etc.

PRODUCT DESIGN

Findings: 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).

Opportunities:

- Shift towards easier-to-recycle materials like PET, HDPE, and paper or 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

Findings: 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%).

Opportunities:

- 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 will be available in 2025 with headquarters 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

Findings: 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.

Opportunities:

- 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

Findings: 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.

Opportunities:

- 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.

Findings: 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.

LEAKAGE

Opportunities:

- 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).

Table of Contents

Introduction

Addressing recycling in rural areas is key to meeting national recycling goals in the United States (U.S.). Non-metropolitan areas account for 20.3% of the U.S. population but span 87.4% of the nation's land area.0F0F[1] Three rural communities, as defined by the U.S. Health Resources & Services Administration (HRSA), were considered in the scope of this study to characterize challenges and opportunities for rural recycling in the southeastern US across varying populations and geographies – Tifton, Georgia (GA), Georgetown County, South Carolina (SC), and Cherokee County, North Carolina (NC) (Table 1).

Rural Recycling in the US

The environmental impacts associated with mismanaged waste are felt more by rural communities,[2, 3, 4] due to lower access to services and limited development opportunities compared to urban areas.[5] In North America, a 2024 study mentioned a 20% household waste collection rate difference between rural and urban areas, showing the opportunity to increase rural recycling rates.[6] Yet, there is a lack of academic literature and studies on rural recycling, with most available resources being white papers. Further exploration to better understand rural areas' recycling challenges and address the disproportionate environmental impacts of mismanaged waste is needed.

The few available studies discuss unique challenges to recycling problems faced by rural areas: a low quantity of recyclables, volatile recycling markets, and economies of scale. Generally, the low population density in rural areas 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 such as central drop-off points.[7, 8] Additionally, recycling markets are very volatile.[9] 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. Neighboring

[1] HSRA. (n.d.). How We Define Rural. Health Resources & Services Administration (HSRA). https://www.hrsa.gov/rural-health/about-us/what-is-rural

[2] Tunnell, K. (2008). Illegal Dumping: Large and Small Scale Littering in Rural Kentucky. Journal of Rural Social Sciences, 23. https://egrove.olemiss.edu/jrss/vol23/iss2/3.

[3] UNEP & International Solid Waste Association. (2024). Global Waste Management Outlook 2024 - Beyond an age of waste: Turning rubbish into a resource. https://doi.org/10.59117/20.500.11822/44939

[4] US EPA. (2021a). Climate Change and Social Vulnerability in the United States. US Environmental Protection Agency. https://www.epa.gov/system/files/documents/2021-09/climate-vulnerability_september-2021_508.pdf

[5] Mihai, F.-C., Gündoğdu, S., Markley, L. A., Olivelli, A., Khan, F. R., Gwinnett, C., Gutberlet, J., Reyna-Bensusan, N., Llanquileo-Melgarejo, P., Meidiana, C., Elagroudy, S., Ishchenko, V., Penney, S., Lenkiewicz, Z., & Molinos-Senante, M. (2021). Plastic Pollution, Waste Management Issues, and Circular Economy Opportunities in Rural Communities. Sustainability, 14(1), Article 1. https://doi.org/10.3390/su14010020

[6] Lloyd's Register Foundation. (2024). World Risk Poll 2024 Report: A world of waste: Risks and opportunities in household waste management (p. 9.6mb). https://doi.org/10.60743/FVDC-3985

[7] Jakus, P. M., Tiller, K. H., & Park, W. M. (1996). Generation of Recyclables by Rural Households. Journal of Agricultural and Resource Economics, 21(1), 96–108.

[8] National Academies of Sciences, Engineering, and Medicine. (2022). Reckoning with the U.S. Role in Global Ocean Plastic Waste (p. 26132). National Academies Press. https://doi.org/10.17226/26132

[9] The Recycling Partnership. (2024). State of Recycling: The Present and Future of Residential Recycling in the U.S. https://recyclingpartnership.org/wp-content/uploads/dlm_uploads/2024/05/SORR_Methodology-1-1.pdf

rural cities or counties can collaborate to increase the total quantity of recyclables, allowing them to leverage economies of scale and make recycling more financially viable.

Table 1: July 2023 Population Estimates of Rural Communities [10]

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

There is no widely practiced best form of collecting recyclables, as it depends on each community's needs and challenges. 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. [11] On the other hand, curbside recycling can promote the social norm of recycling as it is visible to neighbors. [12] Drop-off areas burden residents due to increased time and effort. Studies have found that the farther an individual travels to a drop-off area, the lower the recycling rate. [13] However, rural residents may not view the distance as inconvenient if they are accustomed to disposing of household waste at the drop-off areas and recycling and waste drop-off points are co-located. [14]

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 is currently home to more than 10 million people. The total municipal solid waste (MSW) generated in Georgia in 2003-2004 was reported to be 10.04 million lbs. The per capita MSW rate increased from 5.56 lbs/person/day in 1993 to 7.14 lbs/person/day in 2003-2004. Figure 1 shows Georgia

[10] US Census Bureau. (n.d.). QuickFacts Cherokee County, North Carolina; Georgetown County, South Carolina; Tifton city, Georgia. US Census Bureau: QuickFacts. https://www.census.gov/quickfacts/fact/table/cherokeecountynorthcarolina,georgetowncountysouthcarolina,tiftoncitygeorgia/PST045224

[11] Wright, C., Halstead, J. M., & Huang, J.-C. (2014). Household preferences for alternative trash and recycling services in small towns: Is single stream the future of rural recycling? In T. C. Kinnaman & K. Takeuchi (Eds.), Handbook on Waste Management. Edward Elgar Publishing. https://doi.org/10.4337/9780857936868.00011

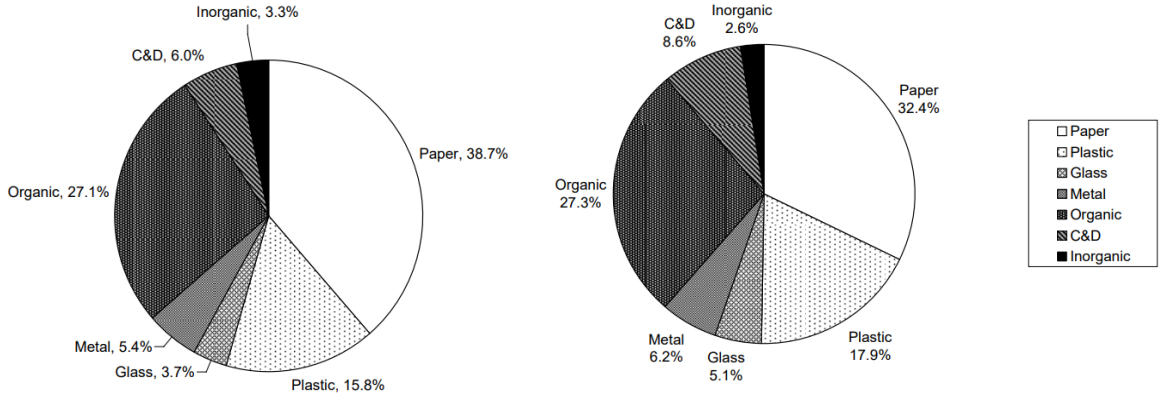
[12] Abbott, A., Nandeibam, S., & O'Shea, L. (2014). Is there a social norm to recycle? In T. C. Kinnaman & K. Takeuchi (Eds.), Handbook on Waste Management. Edward Elgar Publishing. https://doi.org/10.4337/9780857936868.00008

[13] Sidique, S. F., Lupi, F., & Joshi, S. V. (2010). The effects of behavior and attitudes on drop-off recycling activities. Resources, Conservation and Recycling, 54(3), 163–170. https://doi.org/10.1016/j.resconrec.2009.07.012

[14] Saphores, J.-D. M., Nixon, H., Ogunseitan, O. A., & Shapiro, A. A. (2006). Household Willingness to Recycle Electronic Waste: An Application to California. Environment and Behavior, 38(2), 183–208. https://doi.org/10.1177/0013916505279045

MSW's top categories, with paper and organics representing 67% together and plastics being the third largest category (15.8%). [15]

Figure 1: Georgia (left) and South Georgia Region (right) MSW Characterization[15]



The South Georgia region includes Tift County, where Tifton is located, and eight other counties. South Georgia was home to 214,520 people who generated 226,382 tons of MSW in the 2003-2004 study, 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 slightly less paper (6.3%) and produces slightly more plastic (2.1%) (Figure 1).

Many recyclable materials are not being diverted to recycling streams and instead enter landfills, an estimated 1.3 million tons in the state of Georgia each year. [16] The top three commonly recycled materials that were landfilled are corrugated cardboard, newspaper, and office paper by weight. Other materials on this list were polyethylene terephthalate (PET) and high-density polyethylene (HDPE) bottles but at lower tonnage.[15]

The Recycling Partnership found that 62% of households in Georgia have access to recycling, but only 19% of multi-family homes have access, contributing to the 13% state-level recycling rate.[16] In a report for Ball Corporation, the recycling rate for packaging, excluding fibers and film and flexible plastics (FFP), in Georgia was found to be 14%, ranking 31st in the US. (Packaging types included in the scope are PET, HDPE, rigid plastic #3-7, glass, aluminum, and steel cans.) 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%). Packaging recycling resulted in $100 million in material recovery. [17]

[15] Georgia Department of Community Affairs. (2005). Georgia Statewide Waste Characterization Study. https://epd.georgia.gov/sites/epd.georgia.gov/files/related_files/site_page/MSW_Study.pdf
[16] The Recycling Partnership. (2024). State of Recycling: The Present and Future of Residential Recycling in the U.S. https://recyclingpartnership.org/wp-content/uploads/dlm_uploads/2024/05/SORR_Methodology-1-1.pdf
[17] Eunomia Research & Consulting Inc. (2023). The 50 States of Recycling: A State-by-State Assessment of US Packaging Recycling Rates. Ball Corporation. https://www.ball.com/getmedia/dffa01b0-3b52-4b90-a107-541ece7ee07c/50-STATES_2023-V14.pdf

Despite Georgia low recycling rates compared to other states, 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.[18]

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 solid waste management (SWM) efforts, with the most recent for fiscal year (FY) 2022-2023. The total amount of MSW generated was 11.55 million tons.

Overall, across the state 404,083 tons of commonly recyclable materials goods were processed, including glass bottles and jars, plastic containers, metal cans, paper carton, and cardboard from 2022-2023 Plastic recycling accounts for about 8% of total recyclables by weight (34,148 tons), though plastics are often lightweight. Nearly all recycled plastics were HDPE and PET bottles.[19] House Bill 1465, passed in 2009, bans the disposal of plastic bottles in landfills, therefore encouraging recyclables in the state. Despite this legislation, however, only 30% of PET bottles are recycled.[20]

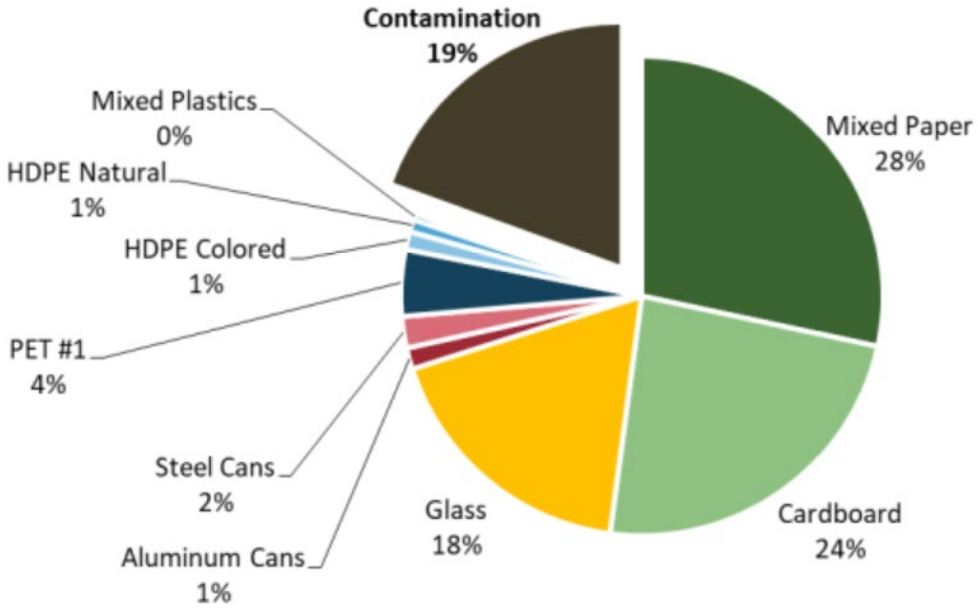
Three hundred three local governments in North Caroling offer curbside pickup for recyclables, serving 2.25 million people or 20% of North Carolina's population. North Carolina's single-stream collection system, which handles 75% of all recyclables, typically has a contamination rate of 19%. Mixed paper 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 2). 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 material recovery facilities (MRFs) charge a tipping fee, as the average blended material value of $51 per ton is insufficient to cover processing costs.[19] NCDEQ hosts a website to connect recyclable material generators to recycling companies to enable the recycling ecosystem in the state.[21]

The Recycling Partnership found that a quarter of households in North Carolina do not have access to recycling, with multi-family households having only 15% accessibility, contributing to a 19% state recycling rate and 1.3 million tons of recyclables lost to landfills.[22] The recycling rate for packaging excluding 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 for cardboard/paper packaging (72%),

[18] Georgia Department of Economic Development. (n.d.). Recycling and Sustainability in Georgia. https://georgia.org/center-of-innovation/recycling-and-sustainability
[19] NC Department of Environmental Quality. (2024). FY22-23 NC Solid Waste and Materials Management Annual Report. https://edocs.deq.nc.gov/WasteManagement/DocView.aspx?id=1838118&dbid=0&repo=WasteManagement
[20] NC Department of Environmental Quality. (n.d.). Plastic Bottles. North Carolina Environmental Quality. https://www.deq.nc.gov/conservation/recycling/plastic-bottles#:~:text=At%20least%2095%20percent%20of,this%20site%20to%20learn%20how.
[21] https://recyclingmarkets.deq.nc.gov/
[22] The Recycling Partnership. (2024). State of Recycling: The Present and Future of Residential Recycling in the U.S. https://recyclingpartnership.org/wp-content/uploads/dlm_uploads/2024/05/SORR_Methodology-1-1.pdf

and the lowest was for rigid plastics #3-7 (2%). This resulted in $113 million in material recovery,[23] and the highest recycling rate out of the three states included in this assessment.

Figure 2: North Carolina Commingled Recycling Characterization[24]



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 were generated. The average tipping fee in the state was $36/ton for Class II landfills and $43/ton for Class III. The recycling rate, which includes composting, was 20.9%. Among recycled materials, metals accounted for the largest amount by weight (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.[25]

South Carolina has set goals to reduce MSW generation to 3.25 lbs/person/day by recycling at least 50% of its MSW.[25] To support recycling, the South Carolina government invested $5.4 billion into the recycling industry between 2018 and 2022, resulting in a $13.6 billion total annual economic impact from 301

[23] Eunomia Research & Consulting Inc. (2023). The 50 States of Recycling: A State-by-State Assessment of US Packaging Recycling Rates. Ball Corporation. https://www.ball.com/getmedia/dffa01b0-3b52-4b90-a107-541ece7ee07c/50-STATES_2023-V14.pdf
[24] NC Department of Environmental Quality. (2024). FY22-23 NC Solid Waste and Materials Management Annual Report. https://edocs.deq.nc.gov/WasteManagement/DocView.aspx?id=1838118&dbid=0&repo=WasteManagement
[25] SC Department of Health and Environmental Control. (2023). South Carolina Solid Waste Management Annual Report: FY 2023. https://des.sc.gov/sites/des/files/media/document/OR-2508.pdf

recycling businesses throughout the state. Georgetown County lacks local recycling businesses, but neighboring counties Florence and Charleston each have 14 and 29 recycling businesses, respectively.[26] Similar to NC, the SC DHEC also hosts a website to connect recyclable material generators to recycling markets. [27]

South Carolina's recycling is collected through 530 drop-off sites and 69 curbside programs across the state.[26] Across the state, MRF operators report challenges with plastic bags stuck in sorting machines. Horry County, Georgetown's neighboring county, estimates fixing solid waste sorting machines from plastic bag damage to exceed $100,000 annually.[28] Multi-family households in South Carolina have only a 6% accessibility rate, contributing to a 15% recycling rate. 640,000 tons of recyclables are lost to landfills.[29] South Carolina's recycling rate for packaging excluding 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.[30]

Circularity Assessment Protocol

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 3). 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?

[26] Recycling Market Development Advisory Council. (2022). South Carolina Department of Commerce: 2022 Annual Report. https://www.scstatehouse.gov/reports/DeptofCommerce/2022%20Reycling%20Market%20Development%20Advisory%20Council%20Annual%20Report.pdf

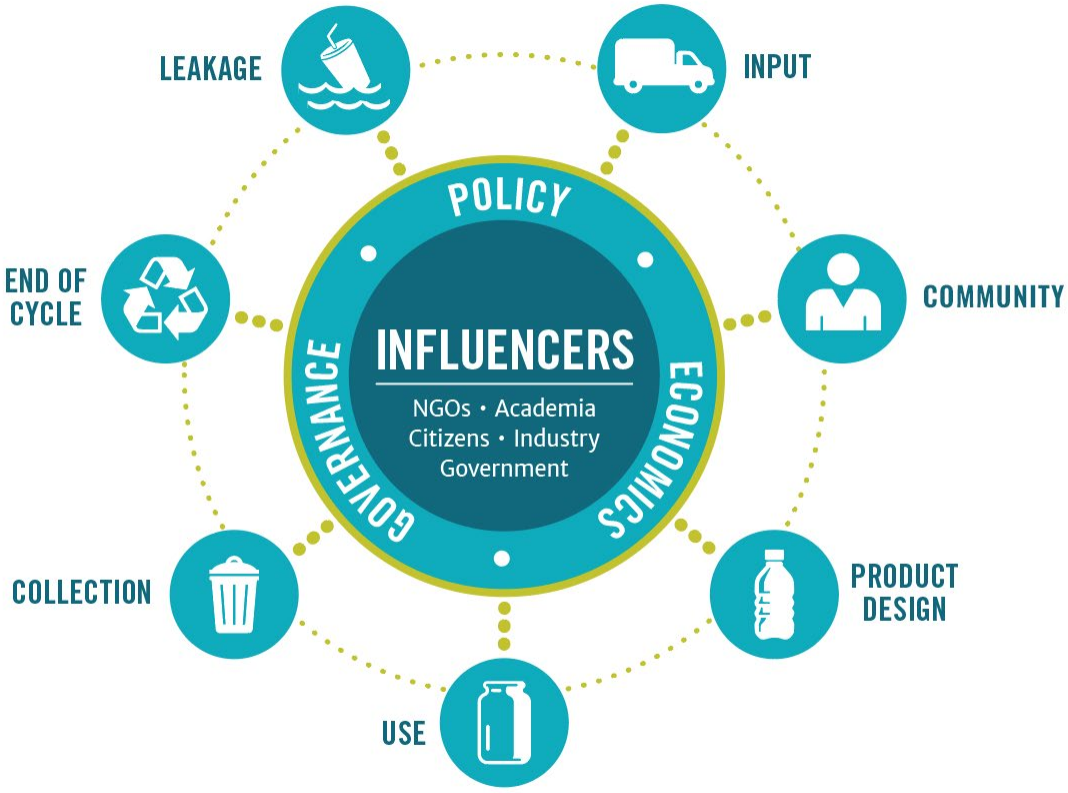
[27] https://www.recyclinginsc.com/directory/

[28] Coastal Conservation League. (2017). *Plastic Pollution in South Carolina*. Coastal Conservation League. https://www.coastalconservationleague.org/wp-content/uploads/2017/07/Coastal-SC-Plastics-Fact-Sheet-Chas.pdf

[29] The Recycling Partnership. (2024). State of Recycling: The Present and Future of Residential Recycling in the U.S. https://recyclingpartnership.org/wp-content/uploads/dlm_uploads/2024/05/SORR_Methodology-1-1.pdf

[30] Eunomia Research & Consulting Inc. (2023). The 50 States of Recycling: A State-by-State Assessment of US Packaging Recycling Rates. Ball Corporation. https://www.ball.com/getmedia/dffa01b0-3b52-4b90-a107-541ece7ee07c/50-STATES_2023-V14.pdf

Figure 3; 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 the southeastern U.S.

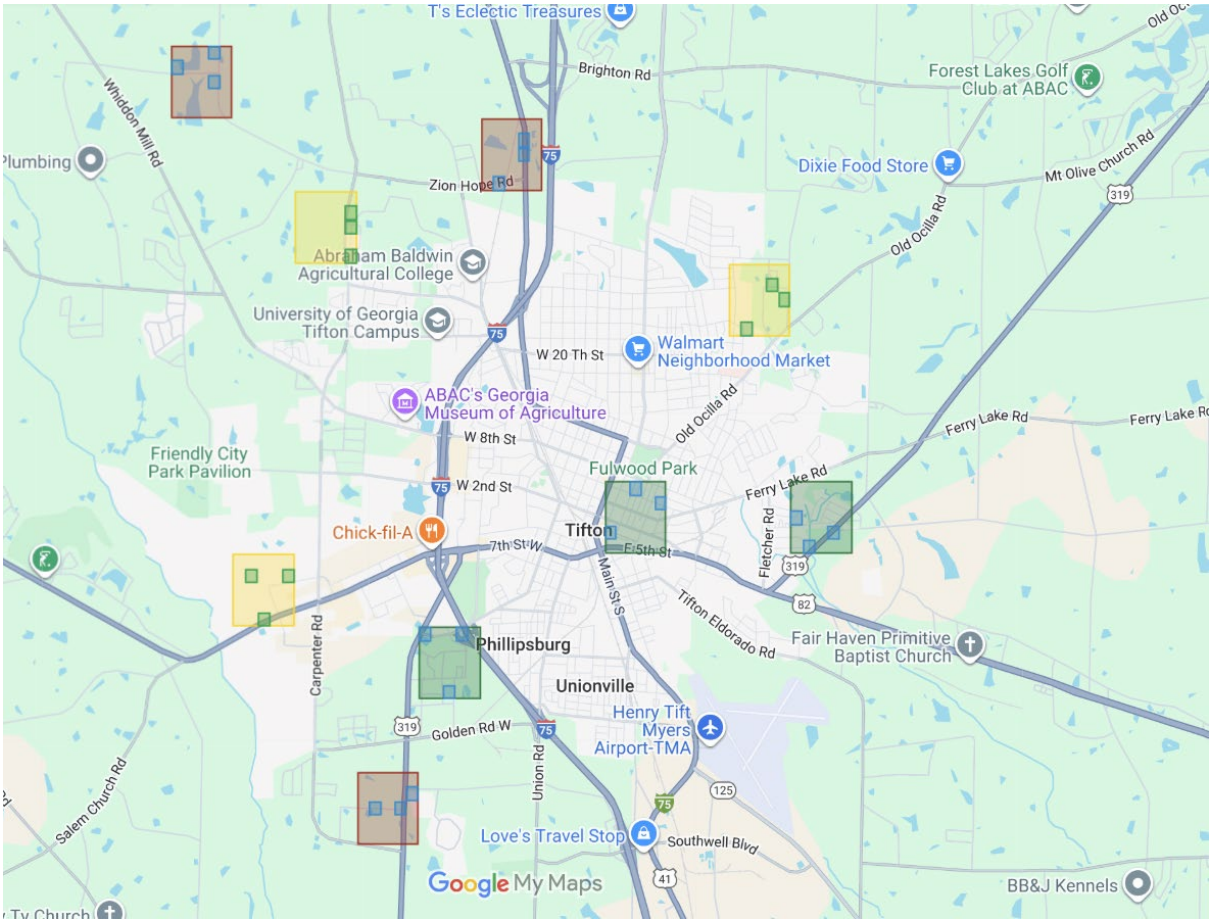
This study was supported by the U.S. Environmental Protection Agency (EPA) Region 4. The U.S. EPA Region 4 includes eight states and six tribes, encompassing 66.9 million people, representing 20% of the U.S. population. This work focused on two rural counties and one rural city in three states (Georgia, North Carolina, and South Carolina) in Region 4, a small sample size intended to provide in-depth case studies. Each rural community has its own unique situation and findings. This is the beginning of understanding the challenges to expanding rural recycling in the region.

Sampling Strategy

In order to randomly sample various locations in a city, the CAP typically identifies a 10 x 10km area over the community (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 4, 5, 6, and 7). 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.

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 each community. In total, 9 sites were surveyed, three in each population tertile, in each community. Additionally, three sites were selected in Pawley's Island to contract with mainland Georgetown County.

Figure 4: Population Tertiles and Survey Sites in Tifton, GA

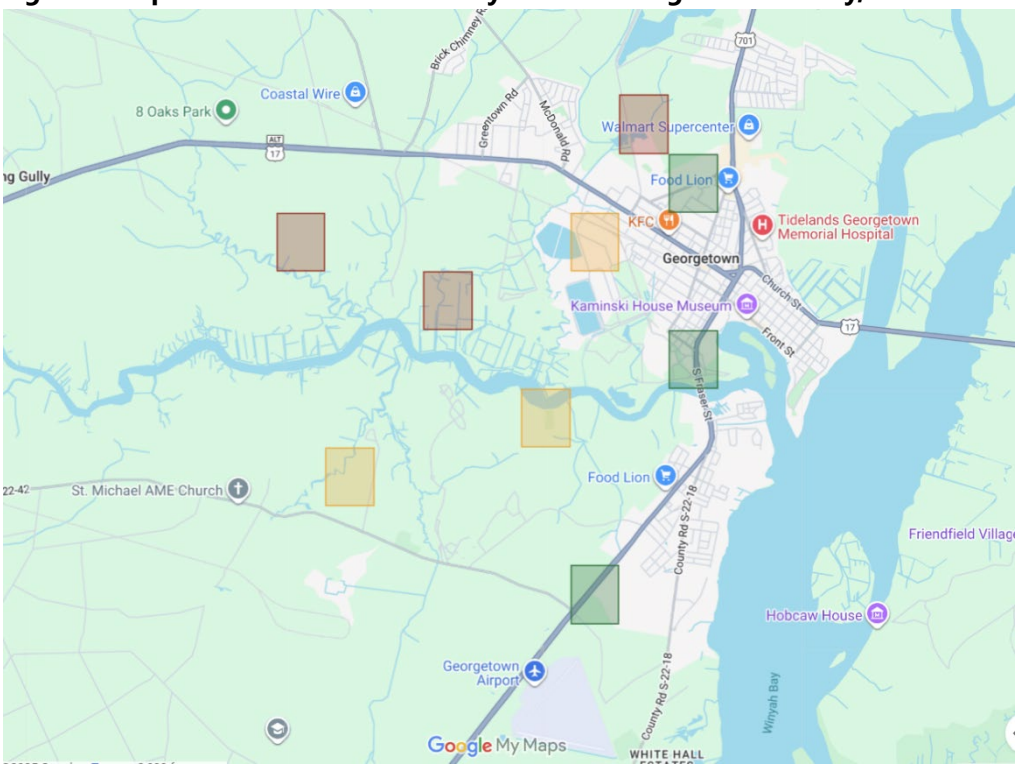


Note: The green squares represent the high ambient population tertile, the yellow squares represent the medium ambient population tertile, and the red squares represent the low ambient population tertile.

Figure 5: Population Tertiles and Survey Sites in Cherokee County, NC

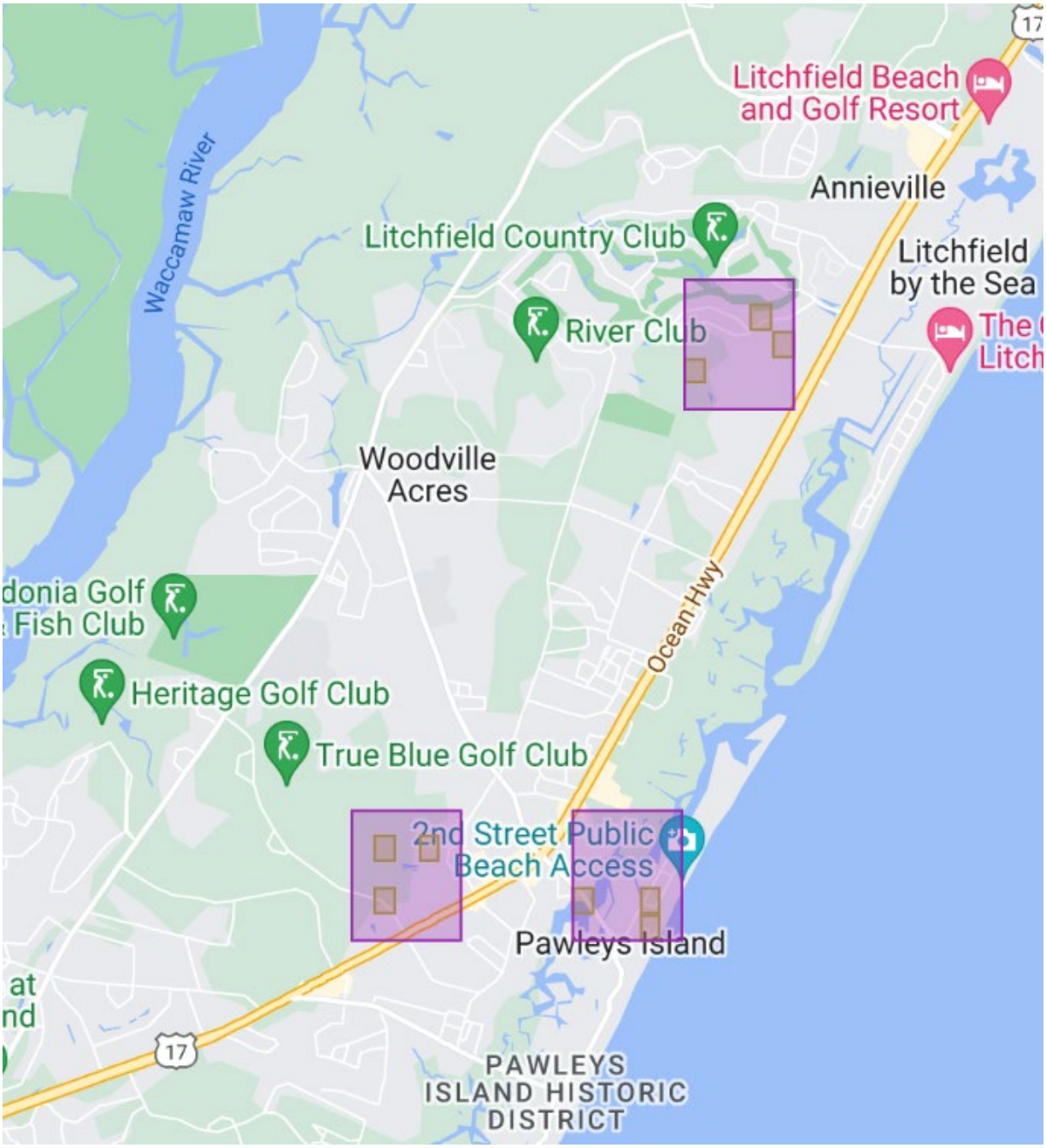
Note: The green squares represent the high ambient population tertile, the orange squares represent the medium ambient population tertile, and the red squares represent the low ambient population tertile. The red square on the right could not be accessed, so the blue square replaced it.

Figure 6: 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 7: Survey Sites in Pawleys Island, SC



Input

To get a snapshot of the scope, and source of common plastic packaged items in each community, surveys of brands of fast-moving consumer goods (FMCG) in three popular categories – beverages, candy, and chips – were taken within the survey area in each community. The team selected 10 – 20 convenience or grocery shops in each community, depending on prevalence of stores which was limited given the rural nature of the sites. In each store, all brands of FMCG packaged in single-use plastic (SUP) were recorded, along with the parent company if available on the product packaging. For other brands, parent companies were determined using desktop research. Parent company distances provided in the analysis below are intended to estimate the distance in kilometers between the approximate parent company headquarters location and the community in which the product was sold.

Tifton

The CIL team surveyed thirteen stores to collect and sample 446 unique brands of fast-moving consumer goods, comprised of 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 brands (93%) recorded in Tifton were manufactured in the US (Figure 8). Large local bottling facilities exist in Tifton for Coca-Cola and in nearby Albany for PepsiCo. A majority (82%) of the FMCG parent company locations are also domestic (Figure 9), 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 brands. Products originating from global parent companies (18%) were predominantly in Europe and North America. However, some products were from parent companies headquartered in Ecuador, Japan, Peru, South Korea, and Turkey.

Figure 8: FMCG manufacturer locations for brands surveyed in Tifton

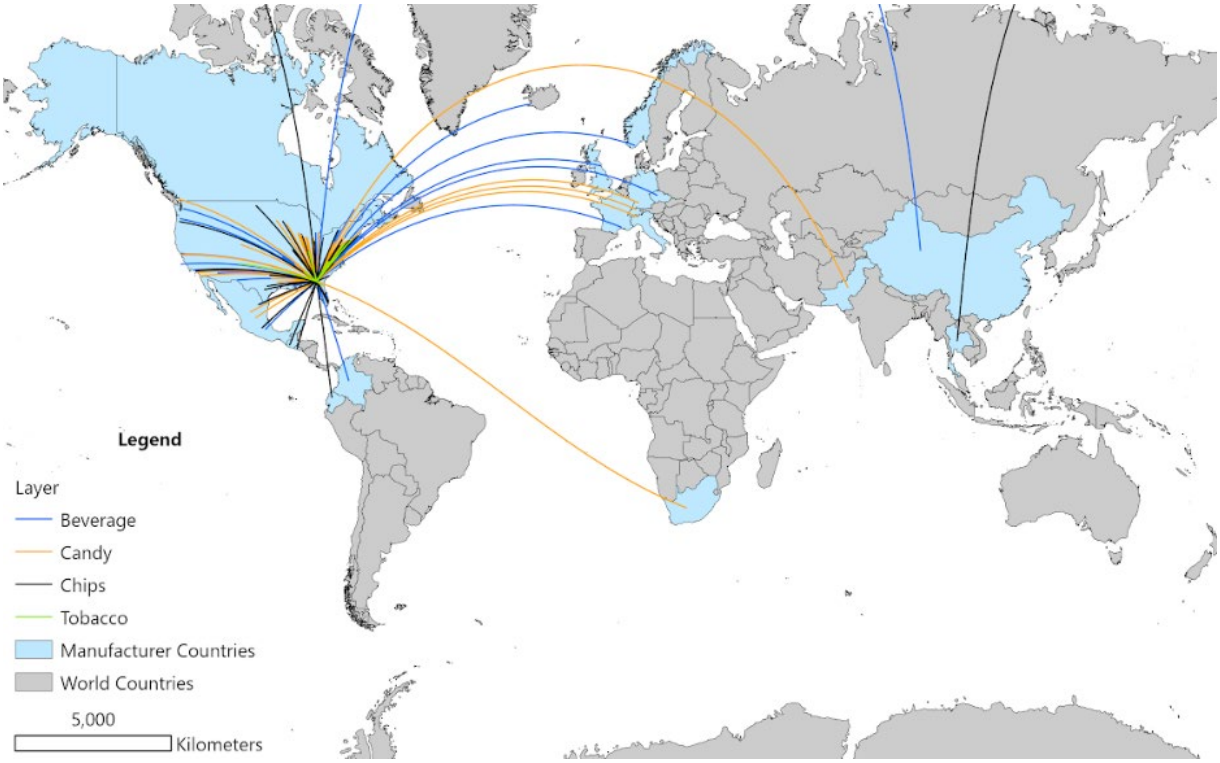
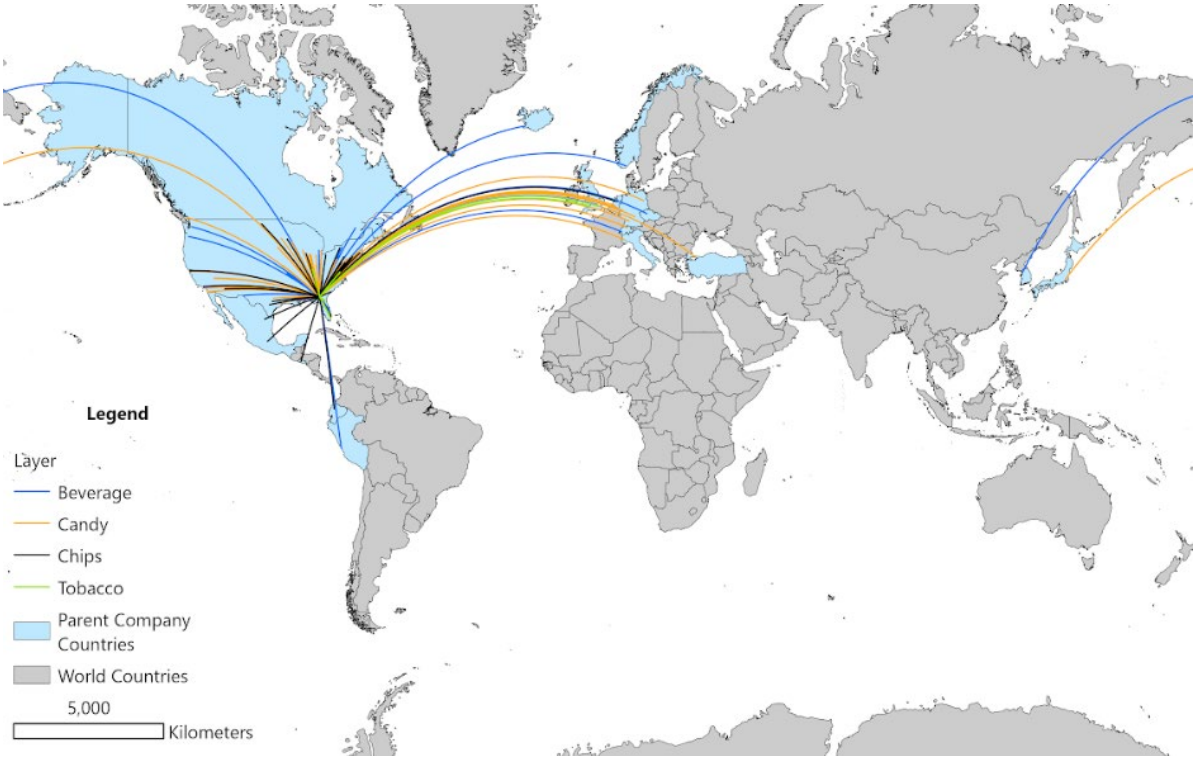


Figure 9: FMCG parent company locations for brands surveyed in Tifton



Tobacco products showed the farthest average distance from parent companies yet had the closest distance to manufacturers (Table 2). 41 FMCG brands 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 and manufacturer (116 km) was also located in Georgia in Arlington.

Table 2: Distances between Tifton and Manufacturer & Parent Company Locations for FMCG brands

	*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 brands in Tifton (Table 3). 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 3: 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

Neighboring State	Manufacturer	Product Category	Main Packaging Type
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

Neighboring State	Manufacturer	Product Category	Main Packaging Type
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

The CIL team surveyed thirteen stores to collect and sample 414 unique brands of fast-moving consumer goods, comprised of 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 brands surveyed were manufactured domestically at 96% (Figure 10). 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 brands 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 brands in Cherokee County. While few products originate from global parent companies (11%), they were predominantly from Europe and North America. However, some brands were from parent companies headquartered in Japan and Turkey (Figure 11).

Figure 10: FMCG manufacturer locations for brands surveyed in Cherokee County

Figure 11: FMCG parent company locations for brands surveyed in Cherokee County

Table 4: Distances between Cherokee County and Manufacturer & Parent Company Locations for FMCG brands

	*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.*

Tobacco products had the greatest average distance from parent companies while maintaining the shortest distance to manufacturers (Table 4). 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.

The states neighboring North Carolina manufactured 8% of the sampled FMCG brands in Cherokee County (Table 5). 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 5: 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

The CIL team surveyed twenty stores in Georgetown County to obtain samples of 269 unique brands of fast-moving consumer goods, comprised of 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 6). At least two top brands were the same for all the FMCG in both areas but were in different orders.

Table 6: 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 brands was only calculated for the inland area. Most FMCG brands were domestically manufactured at 93% (Figure 12), 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 located in Europe and North America. However, a few brands were headquartered in Australia, Japan, and Turkey (Figure 13).

Figure 12: FMCG manufacturer locations for brands surveyed in Georgetown County

Figure 13: FMCG parent company locations for brands surveyed in Georgetown County

Tobacco products had the highest average distance to parent companies yet maintained the lowest average distance to manufacturers (Table 7). 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 7: Distances between Georgetown County and Manufacturer and Parent Company Locations for FMCG brands

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

Table 8: 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

To understand current attitudes and perceptions of plastic waste and recycling, semi-structured interviews were conducted with key stakeholders in each of the three communities, including local solid waste management officials in each location.

Tifton

Eight key stakeholders shared their insights into the community's prevailing attitudes and perceptions about plastic waste and recycling (Table 9). 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 9: 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

One 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. Tifton had curbside co-mingled recycled for over 20 years before shifting economics forced the community to discontinue curbside collection in 2022.

Recycling in Tifton faces economic and facility challenges. Industry stakeholders 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.

Further exacerbating shifting economic values for recycling materials is the tense relationship between Tifton and Tift County. One stakeholder pointed out that, 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, stakeholders observed that many Tifton residents enjoy recycling. Some interviewees 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, and some stakeholders shared beliefs that previous curbside recycling had been redirected to the landfill.

Stakeholders shared that single-stream recycling is great in philosophy due to convenience to residents, but several mentioned challenges with contamination. Some stakeholders felt that many are unwilling to work to sort their recycling properly and highlighted examples like the campus cardboard recycling being frequently 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 in stormwater. Plastic can get entangled during tilling and in cotton-picking tractors, ending up in the tractor's threads, shared one stakeholder.

Community education was highlighted by several stakeholders as a key to increasing the recycling rate, especially since the curbside recycling programs has now been phased out. An emphasis on why and how to recycle and the value of the land that is lost by sending waste to the landfill were suggested by stakeholders as important messages to encourage the public to recycle. Stakeholders also suggested focusing on youth education and re-integrating recycling education into the school curriculum.

Stakeholders suggested several policy changes to improve recycling in Tifton. Some thought the city could give residents smaller trash cans to increase recycling rates, while others suggested providing

enforcement to reduce contamination levels in recycling. Others suggested that it would be more effective to incentivize recycling through some kind of payout when recyclables were dropped off.

Ultimately, Tifton's recycling system has been influenced by ongoing systemic challenges. While many residents and institutions support recycling, public confidence is weak and more education is needed. A lack of resources and facilities, as well as contamination issues, decrease recycling rates.

Cherokee County

Three key stakeholders shared the community's attitudes and perceptions about plastic waste and recycling (Table 10). Cherokee County consisted of conversations with two solid waste management authorities and a semi-structured interview with an educator. Stakeholders highlighted challenges with recycling, like low collection rates and illegal dumping. Limited resources further hinder waste management efforts. To address these issues, stakeholders suggest incentives for recycling, statewide funding support, and shifting towards biodegradable packaging.

Table 10: Stakeholder Groups and Number of Stakeholders in Cherokee County

Stakeholder Group	Number of Stakeholders
Educator	1
Waste Management Official	2

All stakeholders identified pollution as a major issue. Waste management officials reported that some private properties accumulate waste outside, where solid waste ordinance laws can't be enforced. Another stakeholder expressed concerns about plastic pollution, including downstream environmental impacts like microplastics entering waterways:

> **"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*

> **"… it appears to go away. It just breaks down into tiny little pieces and becomes microplastic."**
>
> *– Educator*

Stakeholders highlighted several barriers to recycling in Cherokee County. Because Cherokee County has recycling drop off locations rather than curbside collection, waste management officials felt that inconvenience was driving lower participation. Another interviewee pointed out that there is a lack of public 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*

Like in Tifton, limited collaboration around waste management and recycling infrastructure is occurring. Political issues hinder collaboration between neighboring counties. Across rural areas, inviting collaboration could serve to help rural recycling reach a more viable scale.

Illegal dumping and tire disposal are costly, which is another frustration for waste management officials. Many residents believe their taxes cover bulky waste disposal, such as mattresses, but the drop-off centers are only equipped to handle MSW and large bulky waste is frequently dumped on site. 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. As in Tifton, incentives for bringing back recyclables were suggested as a potential way to increase participation:

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

Beyond recycling, stakeholders noted that yard waste is accepted at the landfill, but most residents do not dispose of it there. Most residents burn their yard waste, which could be composted. Cherokee County lacks composting facilities. A small-scale composting program could be piloted by leveraging the infrastructure of the existing drop-off facilities.

Georgetown County

Five key stakeholders shared the community's attitudes and perceptions about plastic waste and recycling (Table 11). One semi-structured interview was conducted with a non-governmental organization (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.

Table 11: 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 14), as characterized in the quote below. However, litter laws are difficult to enforce, and some suggested that smaller fees might actually lead to officers writing tickets more frequently than the existing large but rarely enforced fines.

Figure 14: Example of Litter Along a Rural Road in Georgetown County

"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

One way to address the high levels of littering would be to increase recycling and recycling education. However, stakeholders identified several challenges. Stakeholders mentioned the low number of recyclables collected, constrained by limited accessibility to recycling bins, and some felt that people are littering because there is no trash can or recycling bin present.

Like many rural counties, Georgetown County struggles with limited staff capacity. Government officials 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.

Limited staff capacity is of course related to overall limited funding for the county:

> **"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*

Despite limited capacity, the Georgetown County government taken steps to address litter. 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 (Resilience, Innovation, and Sustainability through Education) program detailed below:

> **"... the Department of Public Works, their environmental services department ... worked with interns through the Georgetown RISE Program, to do litter inventories, sort of mapping hotspots around the county. And so they have maps showing hotspots of litter."**
>
> **–** *NGO*

Stakeholders presented diverse perspectives and recommendations regarding opportunities to increase recycling in Georgetown County. Policies suggested included requiring recycling at events like festivals and concerts:

> **"...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*

Other interviewees mentioned expanding access to recycling among tourists to Georgetown County. Tourists often have high waste generation rates, and many hotels and short-term vacation rentals do not offer recycling services:

> **"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*

Focusing efforts to reduce pollution at waterways was highlighted by some stakeholders as another strategy to raise awareness. Product specific receptacles, like those for fishing line, were also suggested:

> **"Working 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*

Besides waste management strategies, waste reduction was also suggested. Changing packaging in stores and restaurants was an opportunity identified by several stakeholders, especially to discourage commonly littered items like foam and plastic food containers:

> **"[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 and targeted 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*

> **"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*

Product Design

In each store surveyed in Tifton, Cherokee County, and Georgetown County, the team conducted visual surveys of packaging type for the three FMCG products (beverages, candy, and chips) and for a set of household and staple products (shampoo, rice, oil, and laundry detergent). Percentages of each material type were visually estimated for each product in stores where they were present. The range of product sizes was also recorded, in grams for solid products (candy, chips, and rice) and in milliliters for liquids (shampoo, laundry detergent, oil, and beverages).

In addition to surveying convenience and grocery stores, the team surveyed restaurants and food vendors in each community. Through visual assessments and discussions with restaurant owners, the team assessed the material type for to-go food items like containers, cups, utensils, and straws, present.

Tifton

The CIL team analyzed 349 FMCG brands and their packaging across 25 stores in Tifton. Beverages had the highest product and packaging mass compared to chips and candy (Table 12). 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, beverages produced the most packaging per amount of product delivered, suggesting the need to explore alternative product delivery systems. For comparison, samples taken in six U.S. 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).[31] Smaller product sizes encourage frequent purchases, resulting in overall more packaging waste compared to larger options. Additionally, 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.

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.

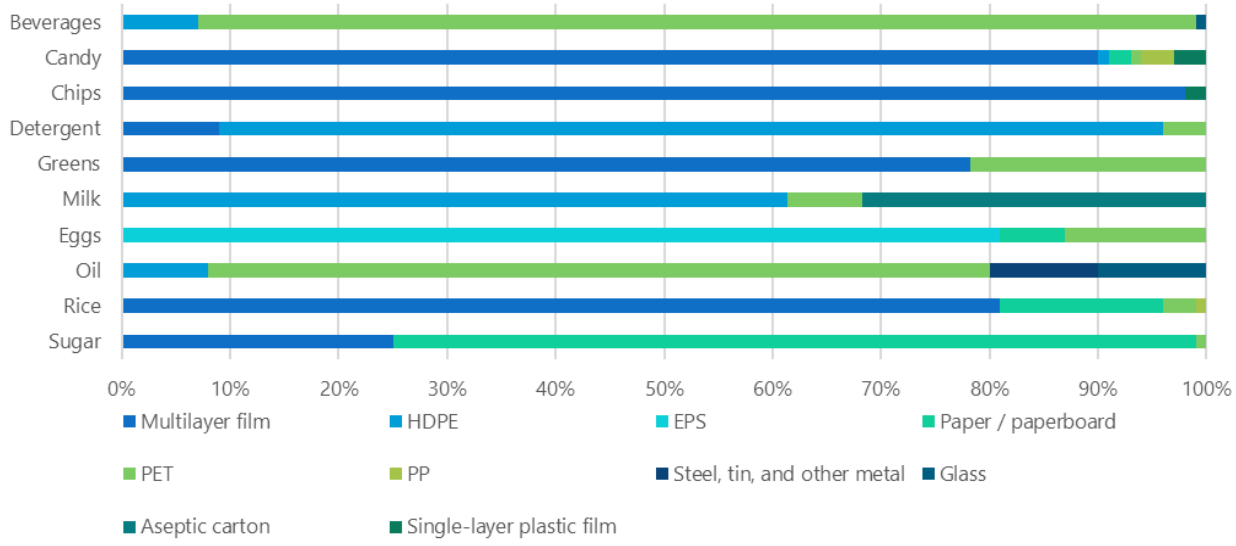
[31] New Materials Institute. (2024). Walmart Foundation Final Report. University of Georgia.

Table 12: 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 15). 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.

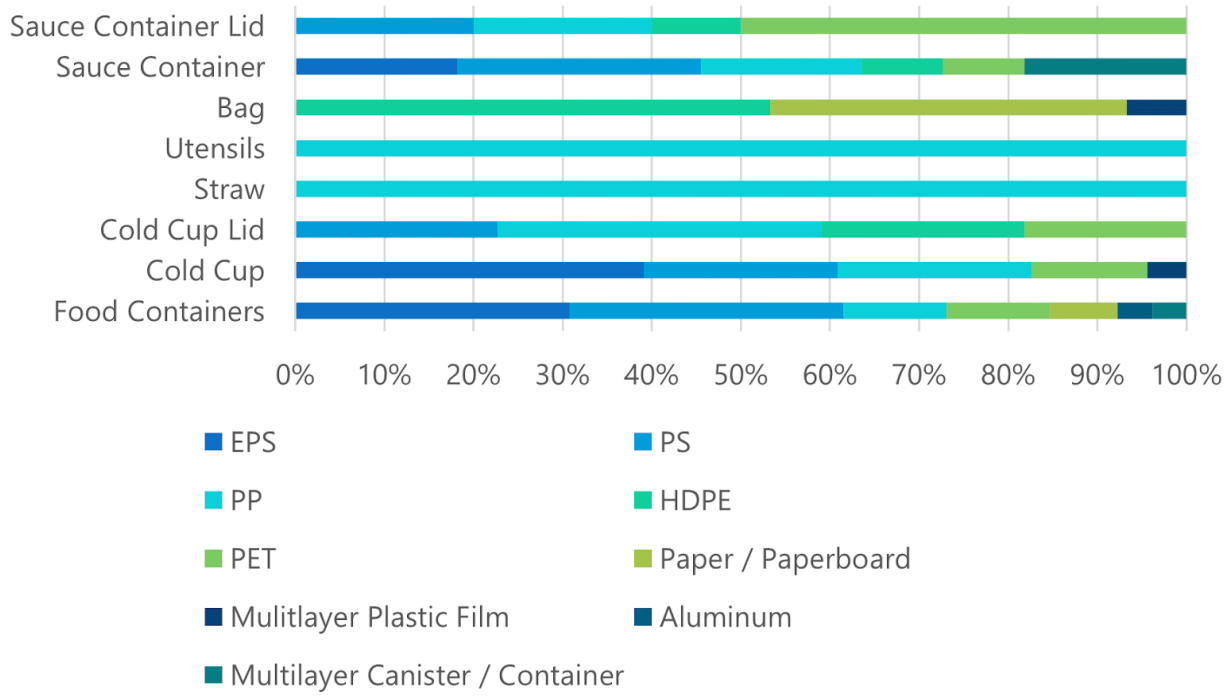
Figure 15: Material Breakdown of FMCG and Staple Goods in Tifton



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 16). 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, polystyrene (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 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 16: Material Breakdown of Restaurant To-Go Items in Tifton



Cherokee County

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 13). 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.

Table 13: 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 17). 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 suggested collaboration with local producers to shift to more sustainable packaging type:

> **"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.

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 18). 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 17: Material Breakdown of FMCG and Staple Goods in Cherokee County

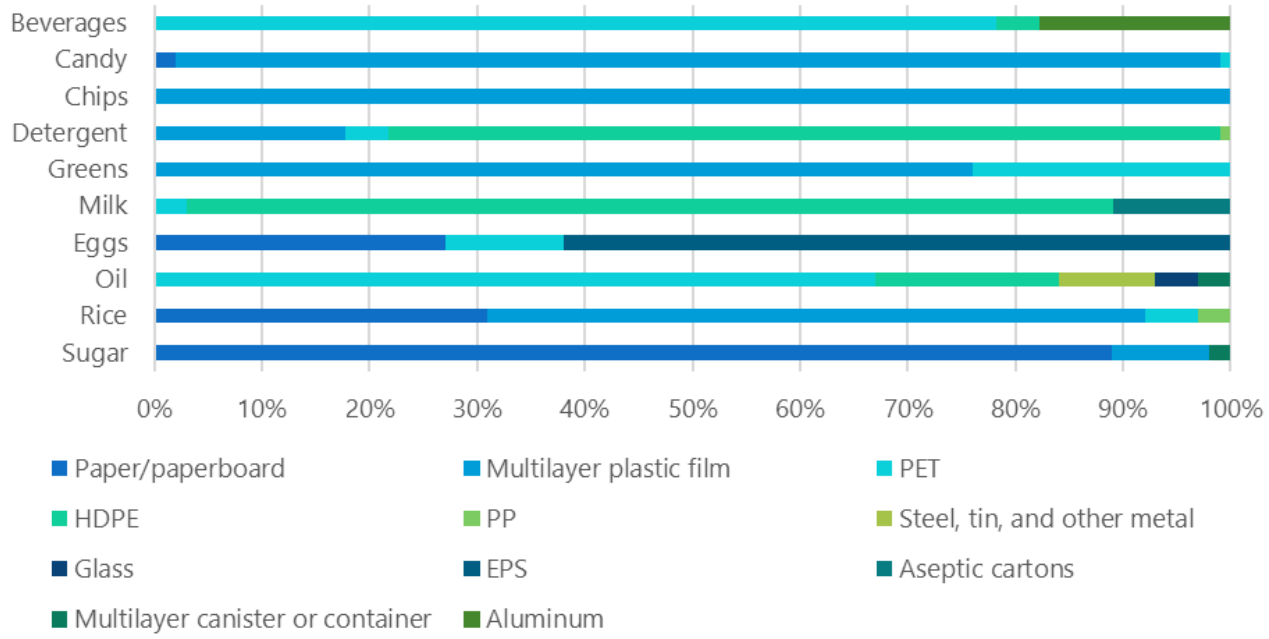
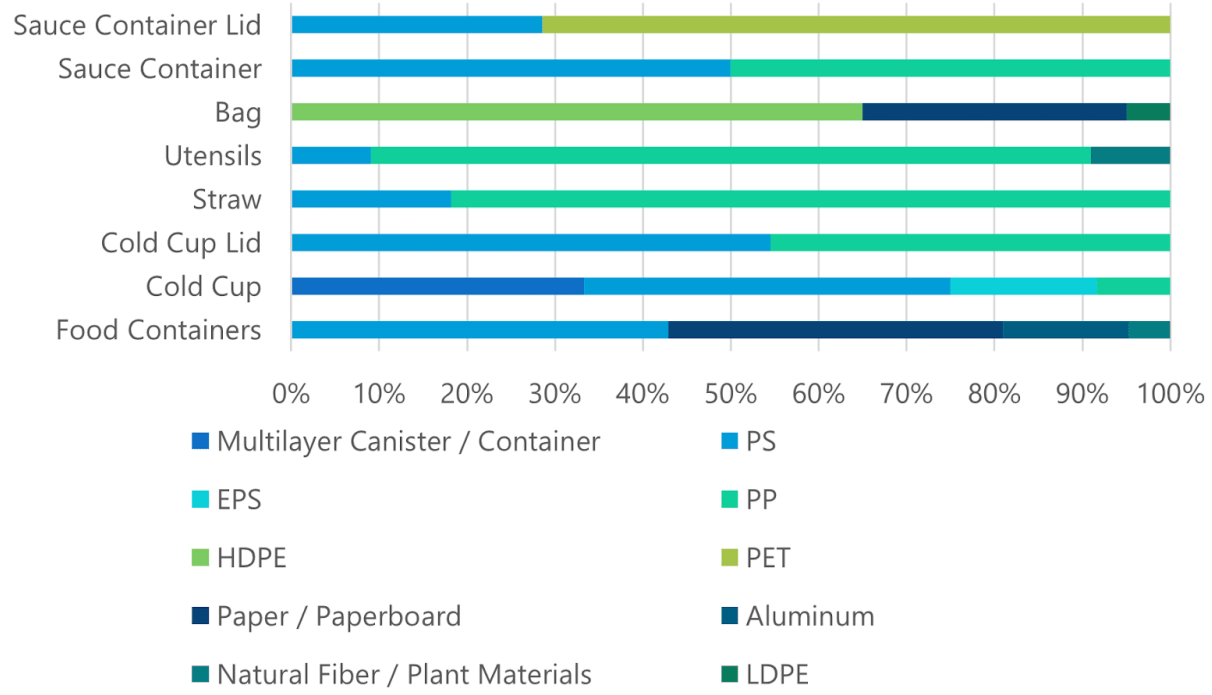


Figure 18: Material Breakdown of Restaurant To-Go Items in Cherokee County



Georgetown County

The packaging and product mass of 99 FMCG products were analyzed within the twenty stores surveyed in Georgetown County. Beverages had the highest product and packaging mass compared to chips and candy (Table 14). 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.

Table 14: 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 product 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 19). 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.

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 20). 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 19: Material Breakdown of FMCG and Staple Goods in Georgetown County

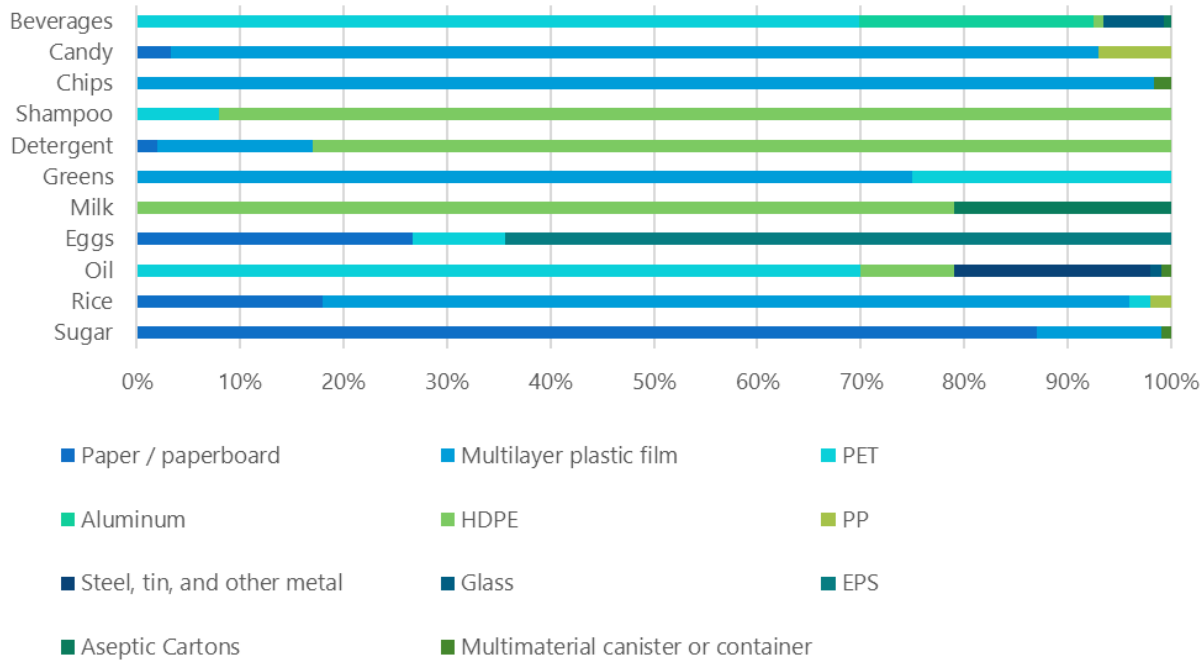
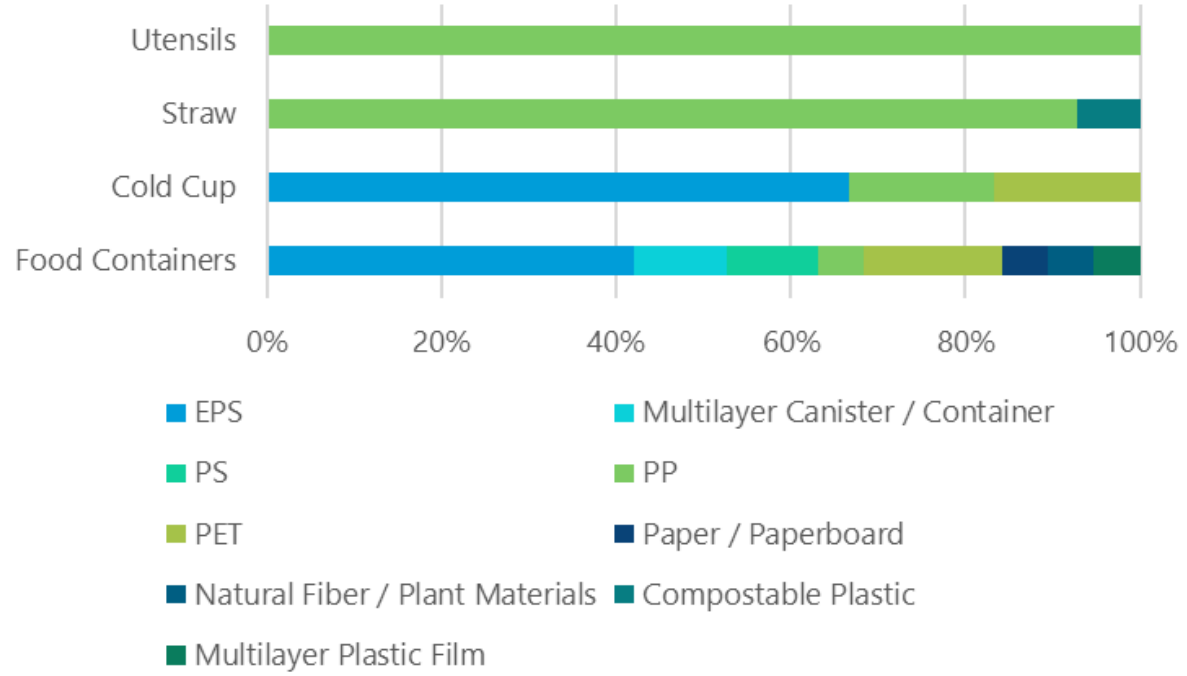
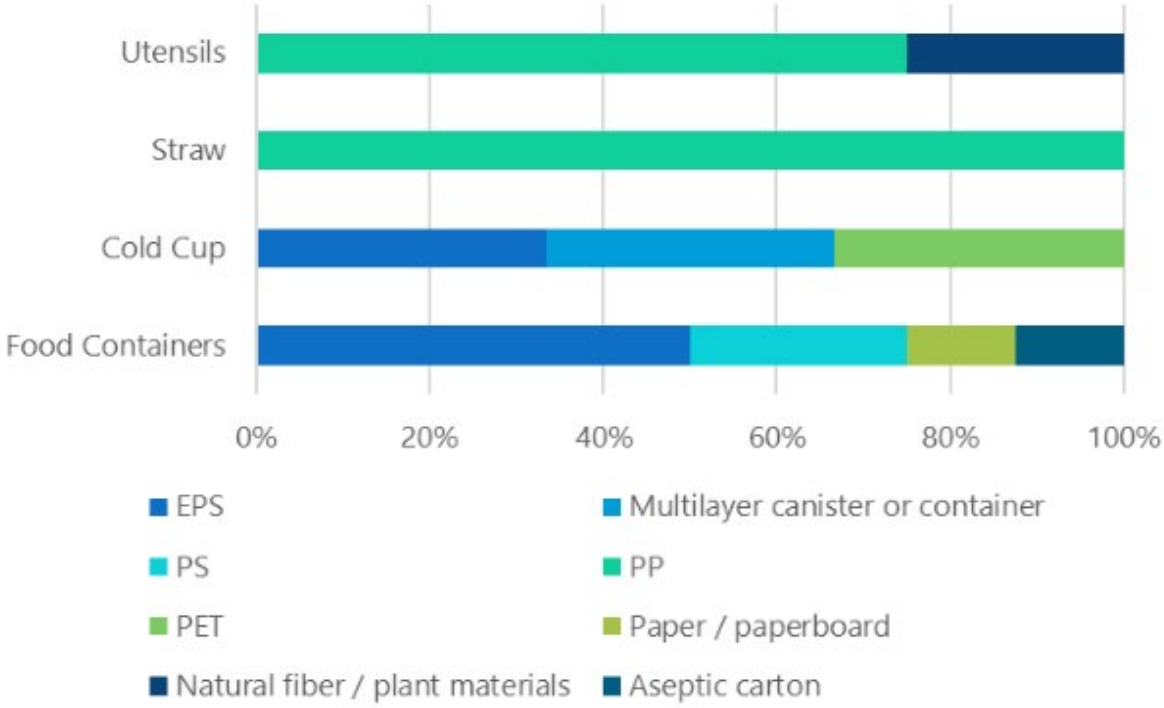


Figure 20: Material Breakdown of Restaurant To-Go Items in Georgetown County



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 21). 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 21: Material Breakdown of Restaurant To-Go Items in Pawleys Island



Use

To understand how products are typically used and any available reuse systems, household and personal care items were surveyed in stores in each community. Alternatives to plastic packaging were noted, along with the use type (reusable, alternative, compostable material), the cost per unit, and the cost per unit of a comparable SUP product. Bag types and availability of reusable bags were also recorded.

Tifton

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 22) for an average cost of $2.43. None of the stores provided paper bags for free or at a reduced price.

Figure 22: Example of Reusable Bags Sold in Tifton Stores

Household and picnicware alternatives were sold in 32% of stores in Tifton. Compostable products were the most popular alternative use type (67%), followed by reusable products (19%) (Figure 23). Many of these items can only be commercially composted, but Tifton has no composting infrastructure.

A limited number of alternative household products were available, with only bulk laundry detergent having more than one option (Table 15). Half of the alternatives were sold in bulk and less expensive (-77% to -12%) than their comparable SUP competitor. Tifton stores only offered one concentrated alternative, but it was the most expensive household alternative: 74% more than the comparable SUP item.

Figure 23: Tifton Alternative Use Type Breakdown

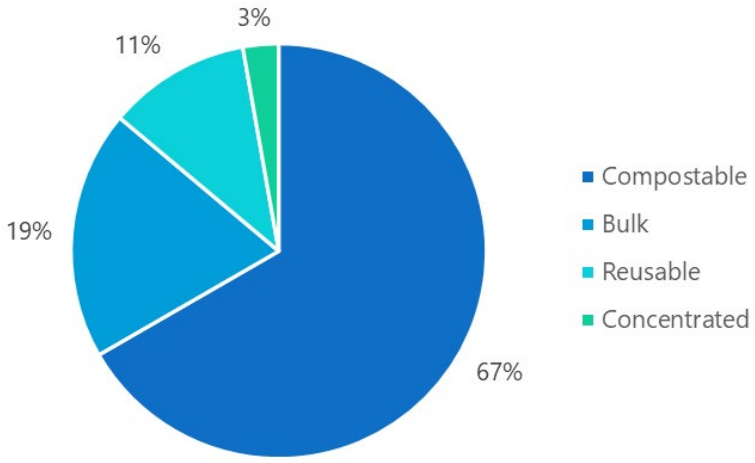


Table 15: Tifton Alternative Household Products Available

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 24, Table 16). 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.

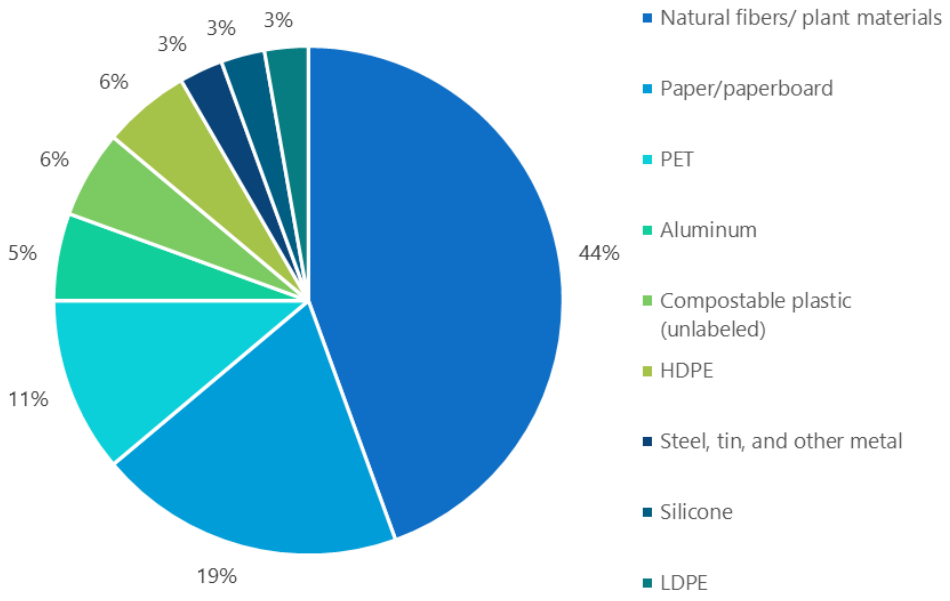
Figure 24: Examples of Compostable Picnicware Items in Tifton Stores

Table 16: 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 25), 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 24: Tifton Alternative Material Type Breakdown



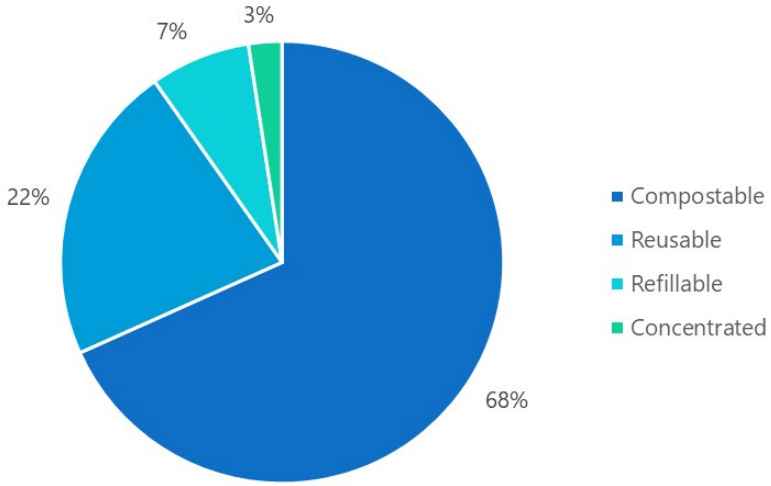
Cherokee County

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 25) for an average cost of $1.31. Free paper bags were provided by 15% of the stores.

Figure 25: 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 26). Many of these items can only be commercially composted, but Cherokee County has no composting infrastructure.

Figure 26: 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 17). 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 27).

Table 17: 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 27: Examples of Alternative Household Products in Cherokee County Stores

Although there were considerably more picnicware options than household alternatives, only compostable or reusable types were available (Figure 28). Compostable plates were the stores' most common alternative (12) (Table 18). 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.

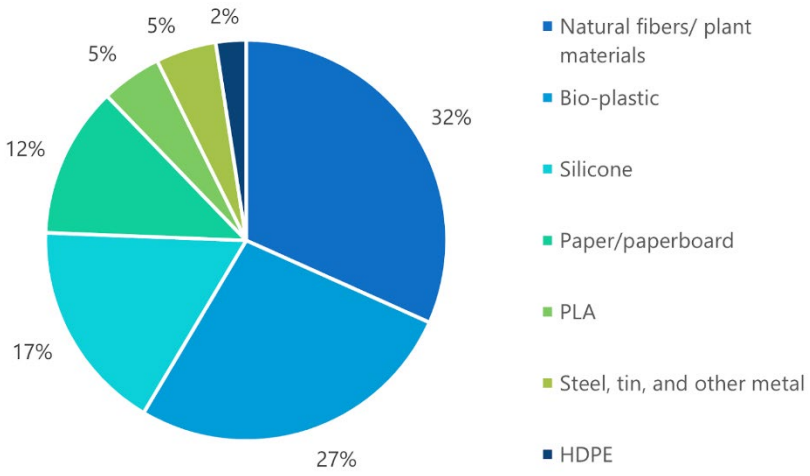
Figure 28: Examples of Alternative Picnicware Items in Cherokee County Stores

Table 18: 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 29), 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 29: Cherokee County Alternative Material Breakdown



Georgetown County

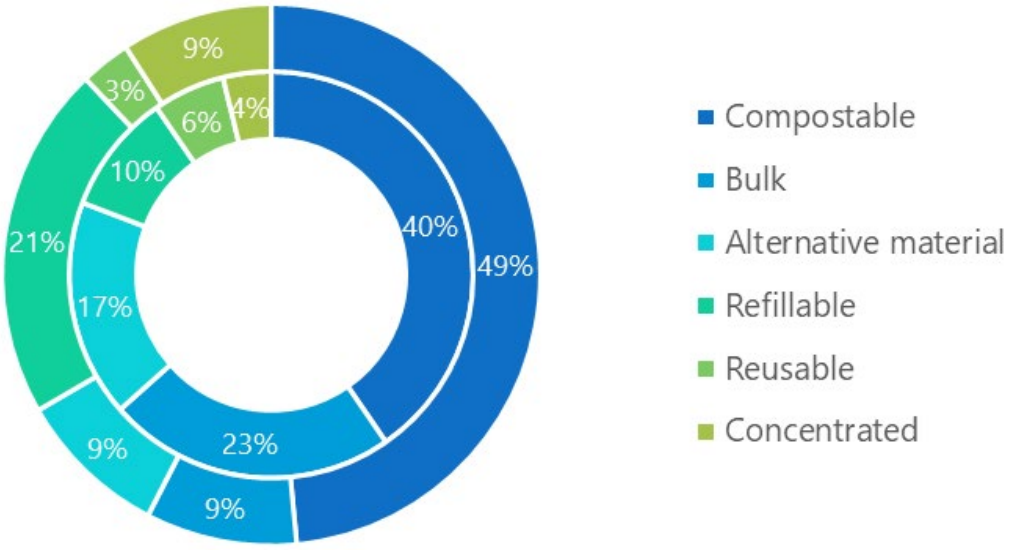
In the same survey of twenty stores in Georgetown County, all but one provided single-use plastic bags. A quarter of the stores offered non-woven PP or cloth reusable bags (Figure 30), with an average cost of $5.64, including a $23 fabric bag. The average cost of reusable bags is $1.31 without the fabric 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 30: 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 31). 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 31: 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 19).

Table 19: 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 32). Despite this, they ranged from 32% to 1,470% more expensive than the 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 20).

Figure 32: Examples of Compostable Picnicware Items in Georgetown County Stores

Table 20: 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)

Product	Alternative Material(s) Found	Inland Cost Difference for Alternative (n)	Coastal Cost Difference for Alternative (n)
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 21).

Table 21: 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 33). In contrast, only the top material in Pawleys Island, natural fibers/plant materials (28%), is compostable, while the next two materials are recyclable (Figure 34).

Figure 33: Georgetown County Alternative Material Type Breakdown

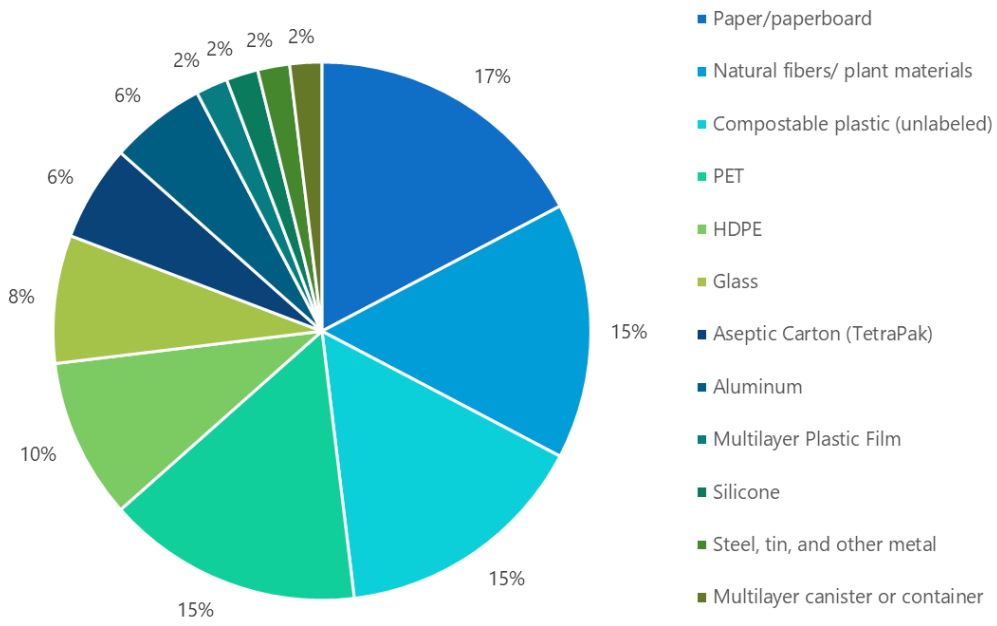
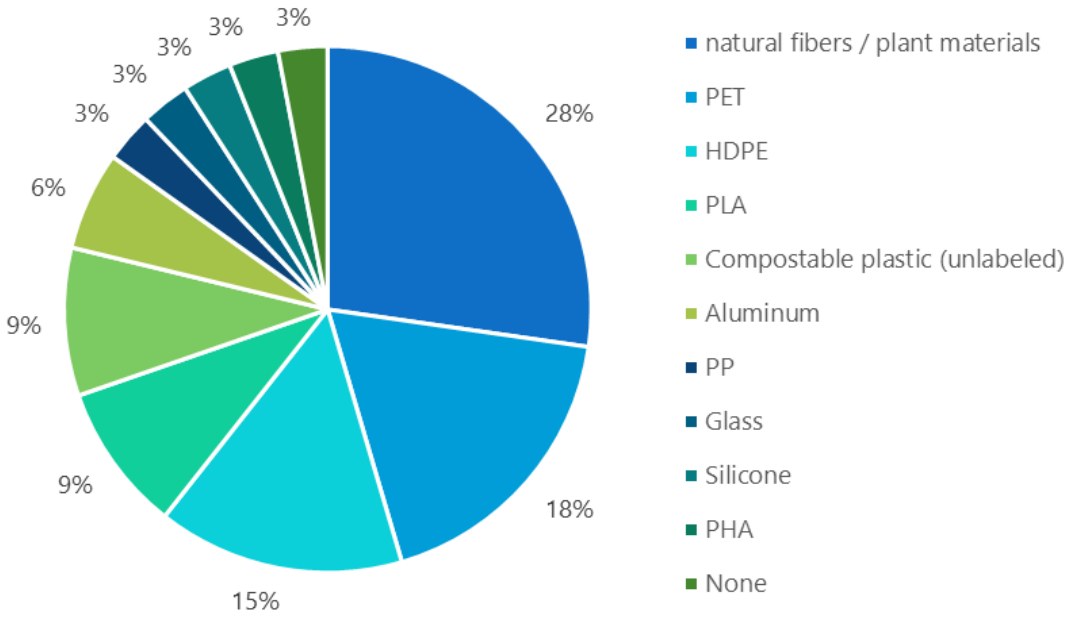


Figure 34: Pawleys Island Alternative Material Type Breakdown



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

Figure 35: Tifton Trash Bins

The City of Tifton has a separate trash and recycling system from Tift County. In 2021, the City of Tifton transitioned from the previous waste hauler to Ryland Environmental for a five-year locked-in price of $19.33/ month.[32] This price includes weekly curbside household waste (Figure 35), yard waste, bulk items, and biweekly recycling pickup. Due to inflation, the City agreed to increase the monthly cost by $1 in 2024, a 5.7% increase.[33]

Due to rising costs of collecting and processing recyclables, under this new contract Ryland Environmental ceased curbside recyclable collection in the city. Currently, Ryland offers single-stream recycling drop-off at their headquarters in Tifton during business hours (Figure 36).

Figure 36: Single-Stream Recycling Drop-off

Increasing costs of recycling, driving the city away from their 30 year track record of collecting curbside recyclables, is driven by the lack of available MRF facilities nearby. Previously, the city sent recyclables about 40 miles away to the MRF in Cordele, which has since closed down. Although Tifton is close to end users of recyclable materials, comingled recyclables must be sorted in a MRF before being brokered to end users. The city also lacks a transfer station to aggregate recyclables, and existing MRFs in Tallahassee, Florida, or Columbus, Georgia, are nearly 100 miles away. This shift made managing the recyclables collected curbside costly due to increased transportation. Stakeholders reported that landfilling rates run about $40/ton, while rates at the

[32] Miller, D. (2020, December 20). *City of Tifton transitions to new garbage collector*. WALB News 10. https://www.walb.com/2020/12/29/city-tifton-transitions-new-garbage-collector/
[33] Cobb, D. (2024, November 19). *City approves fee increases for landfill, Ryland*. The Tifton Gazette. https://tiftongazette.com/2024/11/19/city-approves-fee-increases-for-landfill-ryland/

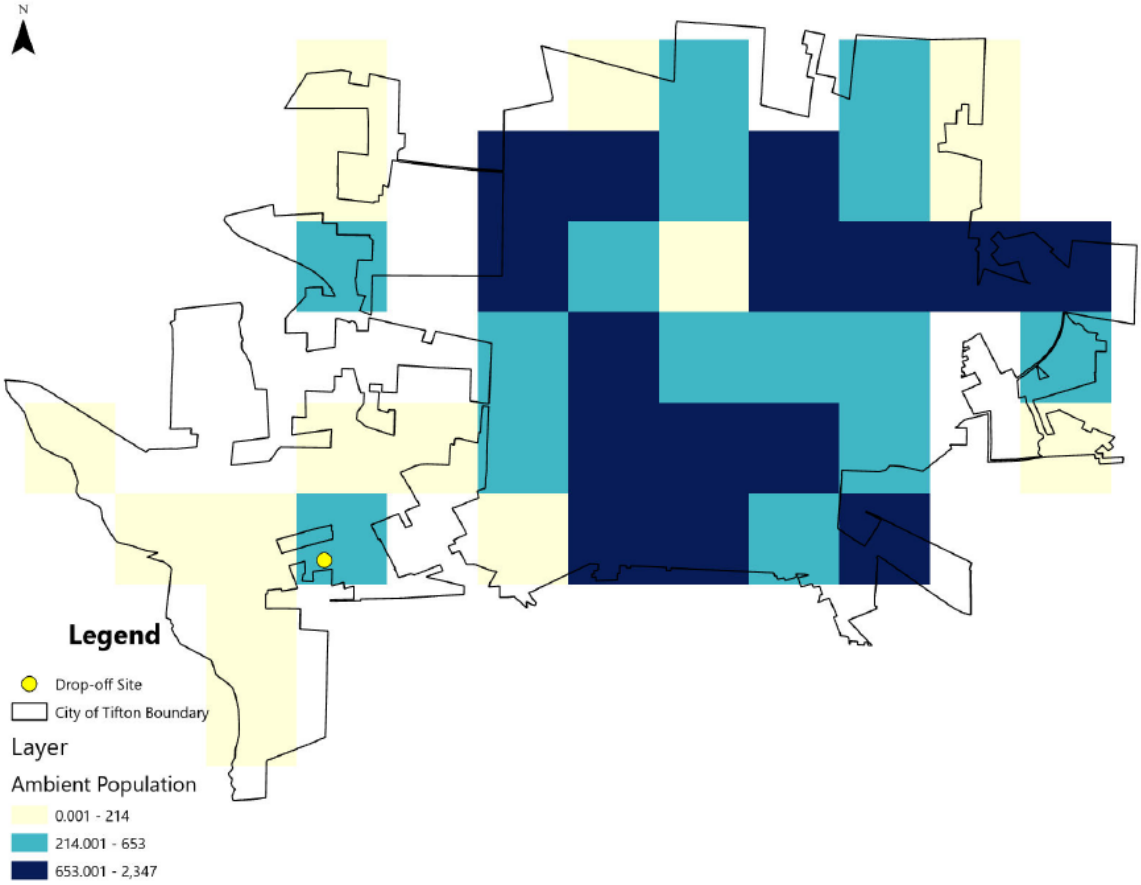
MRF can exceed $120/ton, making it almost three times more expensive to recycle compared to landfilling.

Laminated flyers (Figure 37) 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 37: Recycling Flyer at Tifton Drop-off Center

The recycling drop-off location was analyzed using the city's ambient population (Figure 38). 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 38: Tifton Map of Ambient Population with Drop-off Location

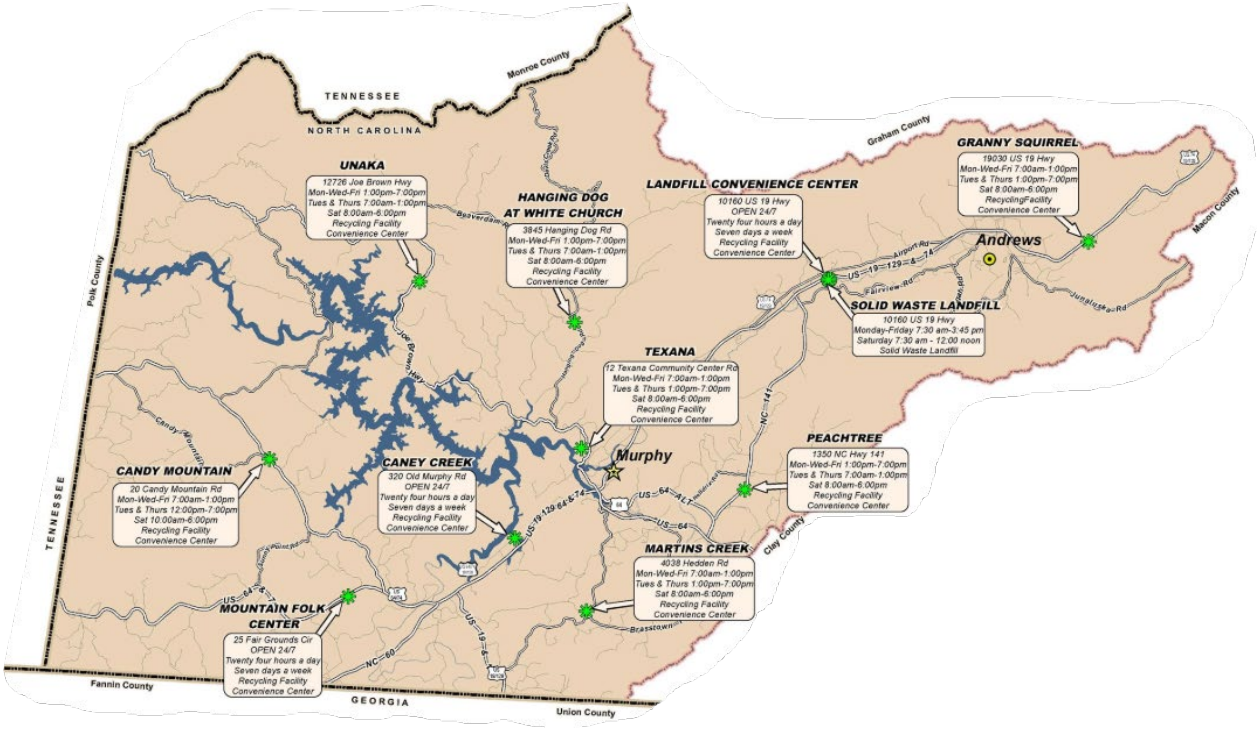


According to a waste management company stakeholder, contamination is a major issue with single-stream collection. They speculate that only 10% of people recycle correctly. Additionally, stakeholders shared that public awareness of the drop-off location is low, further reducing collection rates.

Cherokee County

Cherokee County does not provide curbside trash or recycling pickup. Instead, waste and recyclables are collected through 10 controlled-access, source-separated convenience centers (Figure 39). Three locations are open 24/7, while the remaining are open Monday through Saturday for at least six hours daily. According to waste management officials, these are the only convenience centers open 24/7 in the state. Additionally, many locations have swap shops, allowing any items dropped off to be reused or repurposed by another resident.

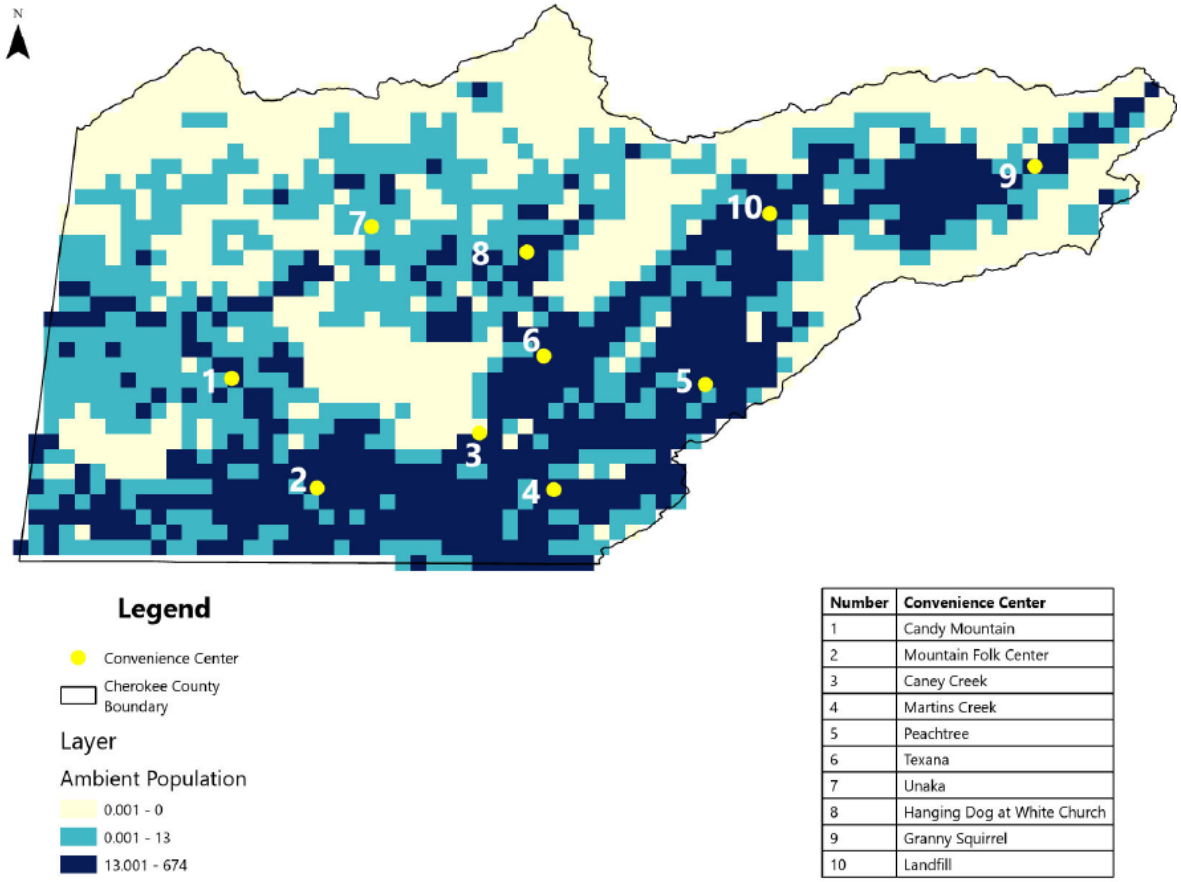
Figure 39: Cherokee County Convenience Centers [34]



The convenience center locations were analyzed using the county's ambient population (Figure 40). 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.

[34] Cherokee County NC. (n.d.-a). *Convenience Centers*. Cherokee County North Carolina Solid Waste Department. https://www.cherokeecounty-nc.gov/168/Convenience-Centers

Figure 40: Cherokee County Map of Ambient Population with Convenience Center Locations



Number	Convenience Center
1	Candy Mountain
2	Mountain Folk Center
3	Caney Creek
4	Martins Creek
5	Peachtree
6	Texana
7	Unaka
8	Hanging Dog at White Church
9	Granny Squirrel
10	Landfill

About 900 tons of recyclables are collected in Cherokee County annually, compared to 18,000 tons of MSW (Table 22). Additionally, waste is less expensive to manage – it is 1.68 times more expensive to manage recyclables instead of landfilling waste. This, however, is a mark of success for the program in Cherokee County, compared to the 3x cost of recycling in Tifton. Cherokee County is able to keep recycling costs lower by collecting source-separated recyclables and brokering their own materials to end users, though this does increase pressure for clean feedstocks and to ensure recyclables 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 22: Cherokee County Collection Costs in FY24

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

To combat limited economies of scale with recycling in the rural community, the recyclables collected at the convenience centers in Cherokee County are baled on-site (Figure 41). This compaction increases the amount of recyclables that can be stored and minimizes the number of trips to the respective outlets.

Figure 41: Cherokee County Baled Recyclables

Waste management officials in Cherokee County shared drop-off center rules and explained why they were in place (Figure 42). 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, including correct sorting of recyclables. 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 of recyclables for maximal profit are significant challenges that video surveillance helps to address.

Figure 42: Cherokee County Convenience Center Rules

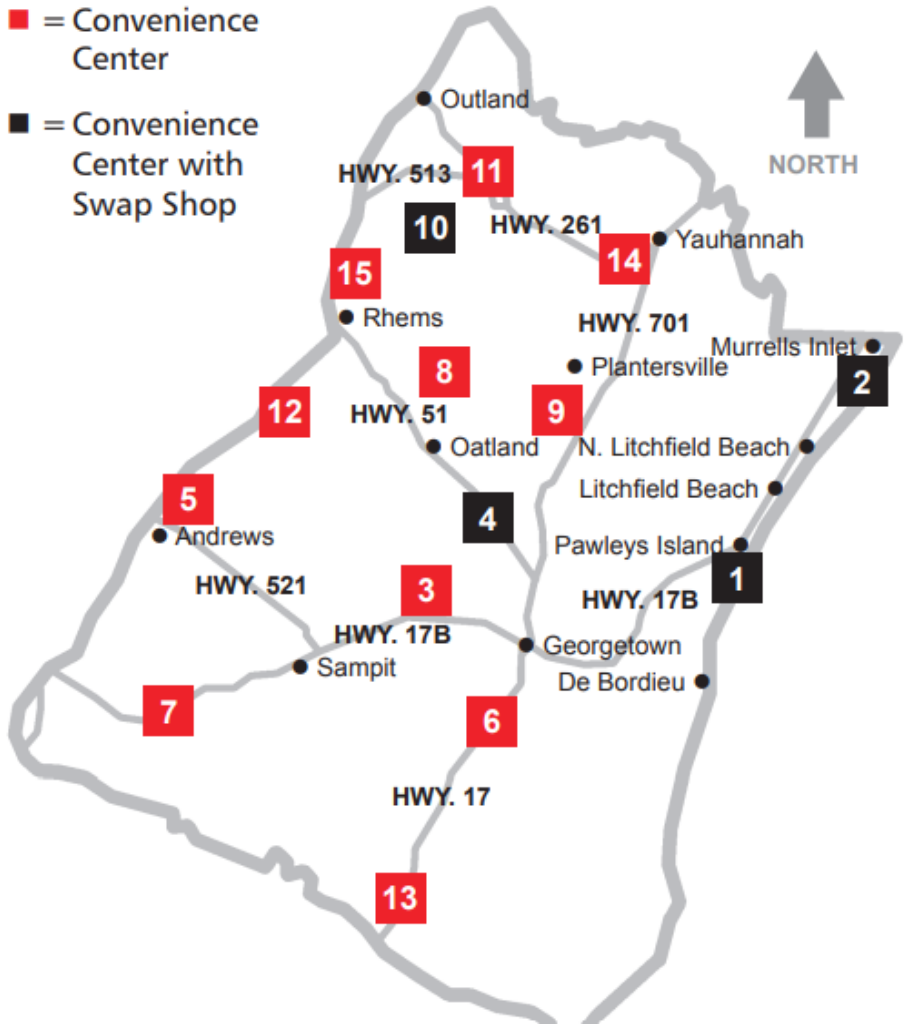
Waste management officials in the county also highlighted the need for ongoing maintenance of the drop-off centers, including the need to replace or repair dumpsters due to wear and tear over time (Figure 43). However, consistent funding streams remain an issue. There are grants available at the state level for new dumpsters if there are none in the area, but there is limited state support for ongoing maintenance.

Figure 43: Convenience Center Dumpsters in Cherokee County

Georgetown County

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 44). Three convenience centers have swap shops allowing residents to repurpose, reuse, or donate unwanted items, diverting items from landfills.[35]

Figure 44: Map of Georgetown County Convenience Centers



Various recyclables are accepted (Figure 45) and separated into containers at the centers: plastic, glass, newspaper, cardboard, etc. (Figure 46). Unlike in Cherokee County where all recyclables are source-separated, some streams in Georgetown are co-mingled – paper, cardboard, and newspaper are separated into one container, but plastics and aluminum cans are collected in a single-stream. By the end

[35] Georgetown County. (n.d.-b). Recycling. Georgetown County: Recycling. https://www.gtcounty.org/267/Recycling

of 2024, receptacles were placed to collect plastic film, including grocery bags, produce bags, Ziplock's, etc. There is a commercial recycling program that collects paper and cardboard weekly. However, a limited number of businesses can participate.

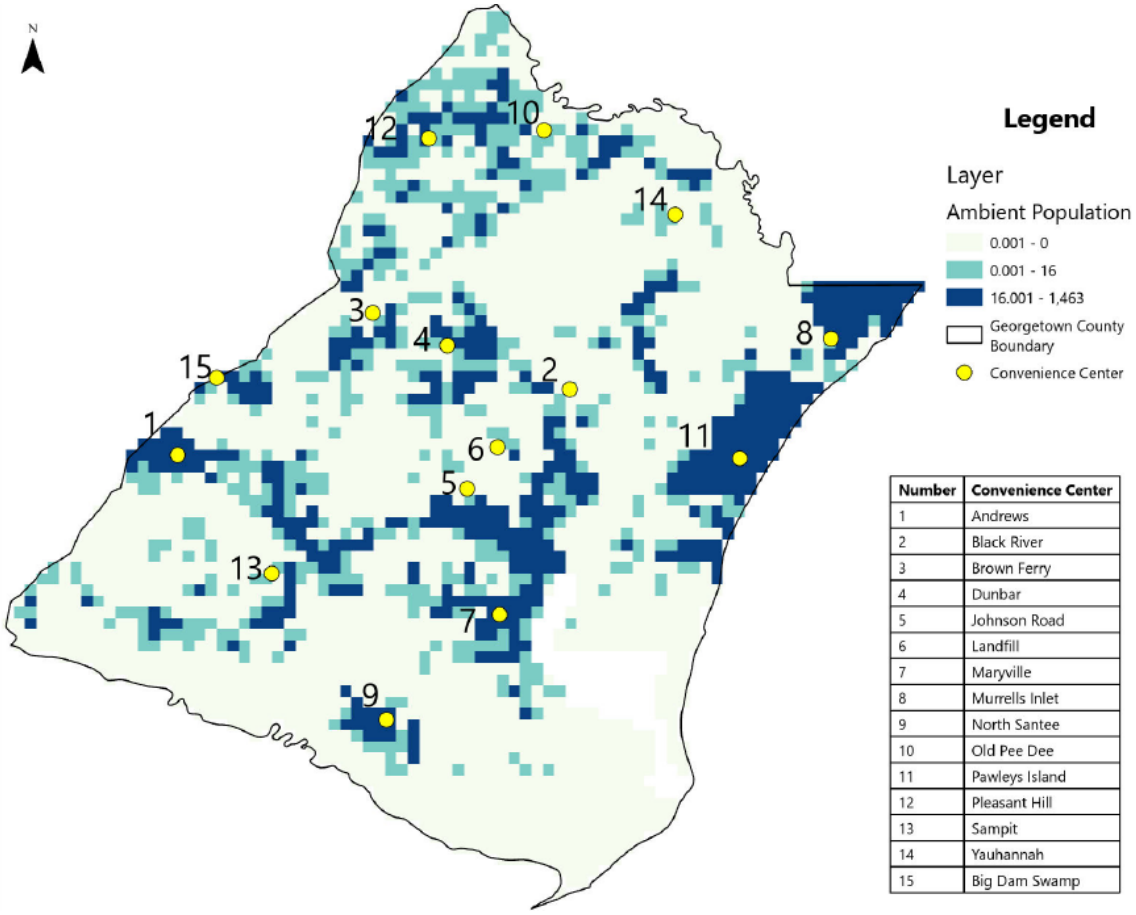
Figure 45: List of Acceptable Recyclables at Georgetown Convenience Centers [36]

Figure 46: Georgetown County Convenience Center

[36] Georgetown County. (n.d.-b). Recycling. Georgetown County: Recycling. https://www.gtcounty.org/267/Recycling

The convenience center locations were analyzed using ambient population (Figure 47). 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 47: 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 below. While visitors do not have to show an ID to visit convenience centers, they are technically only for residents of the county.

> **"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

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.[37] Without the expansion, the landfill would be full by 2027.[38] 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.[39]

Tifton recycled 89 tons of metal and 17 tons of tires.[37] 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. Some stakeholders felt that there will never be enough recyclables to build one in the city, though some suggested Tifton as a recycling bub for surrounding counties in south Georgia. 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.[40]

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. Stakeholders 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

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.[41] According to waste management officials in the county, 142.66

[37] City of Tifton. (2023). *City of Tifton 2022-2023 Annual Report*. https://tifton.net/DocumentCenter/View/1300/City-of-Tifton-2022-23-Annual-Report
[38] Cobb, D. (2023, February 19). *County-city landfill meeting proposed*. The Tifton Gazette. https://tiftongazette.com/2023/02/19/county-city-landfill-meeting-proposed/
[39] City of Tifton. (n.d.). *Landfill*. City of Tifton. https://www.tifton.net/231/Landfill
[40] The Recycling Partnership. (n.d.). *Map of Commingled Residential MRFs in the U.S.* The Recycling Partnership. https://recyclingpartnership.org/residential-mrfs/
[41] NC Department of Environmental Quality. (2024). *Fy 22-23 Annual Report: Landfill Capacity Data*. https://edocs.deq.nc.gov/WasteManagement/DocView.aspx?id=1830143&dbid=0&repo=WasteManagement&cr=1

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.[42]

There is no MRF in Cherokee County. Instead, waste management officials 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 23). The largest category was cardboard (432 tons), and the lowest was aluminum (22.3 tons).

Table 23: Cherokee County July 2023 - June 2024 Recycling Statistics

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

Every recyclable has a different outlet (Table 23). 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 24: Cherokee County Recyclables' Outlet

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

[42] Cherokee County NC. (n.d.). *Solid Waste Landfill*. Cherokee County North Carolina Solid Waste Department. https://www.cherokeecounty-nc.gov/facilities/facility/details/Solid-Waste-Landfill-2

Aluminum	Regional Recyclers	Regional

There are large costs associated with several items Cherokee County collects. Waste management officials reported 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.

Waste management officials reported that no initiatives are currently focused on waste reduction. Limited funding and staffing hinder investment in these programs.

Georgetown County

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.[43] The tipping fee at each landfill is $45 per ton,[44] again representing a very low fee that is difficult for recycling efforts to compete with financially.

Georgetown County recycled 12,800 tons of MSW in FY23, a 24% recycling rate that includes organics (Table 25). 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.

[43] SC Department of Health and Environmental Control. (2023). *South Carolina Solid Waste Management Annual Report: FY 2023*. https://des.sc.gov/sites/des/files/media/document/OR-2508.pdf
[44] Georgetown County Environmental Services. (n.d.). *Landfill Tipping Fees*. Landfill Tipping Fees. https://www.gtcounty.org/DocumentCenter/View/1029/Tipping-Fees-PDF?bidId=

Table 25: Georgetown County Recycling Data in Tons in FY23 [45]

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 48). 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*

[45] SC Department of Health and Environmental Control. (2023). *South Carolina Solid Waste Management Annual Report: FY 2023*. https://des.sc.gov/sites/des/files/media/document/OR-2508.pdf

Figure 48: Georgetown County MRF Sorting Line

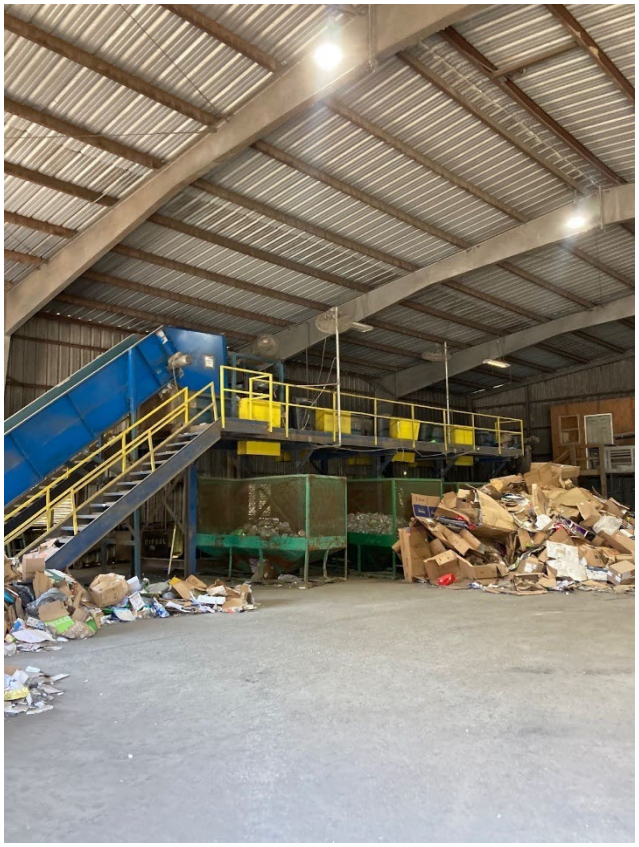


Figure 49: Pile of Backed-Up Unsorted Recyclables at Georgetown County MRF

The MRF's age and lack of upgrades lead to significant downtime, resulting in a backup of recyclables that accumulate (Figure 49). This makes the MRF inefficient.

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, composting was available about 15 years ago but stopped because it was not profitable.

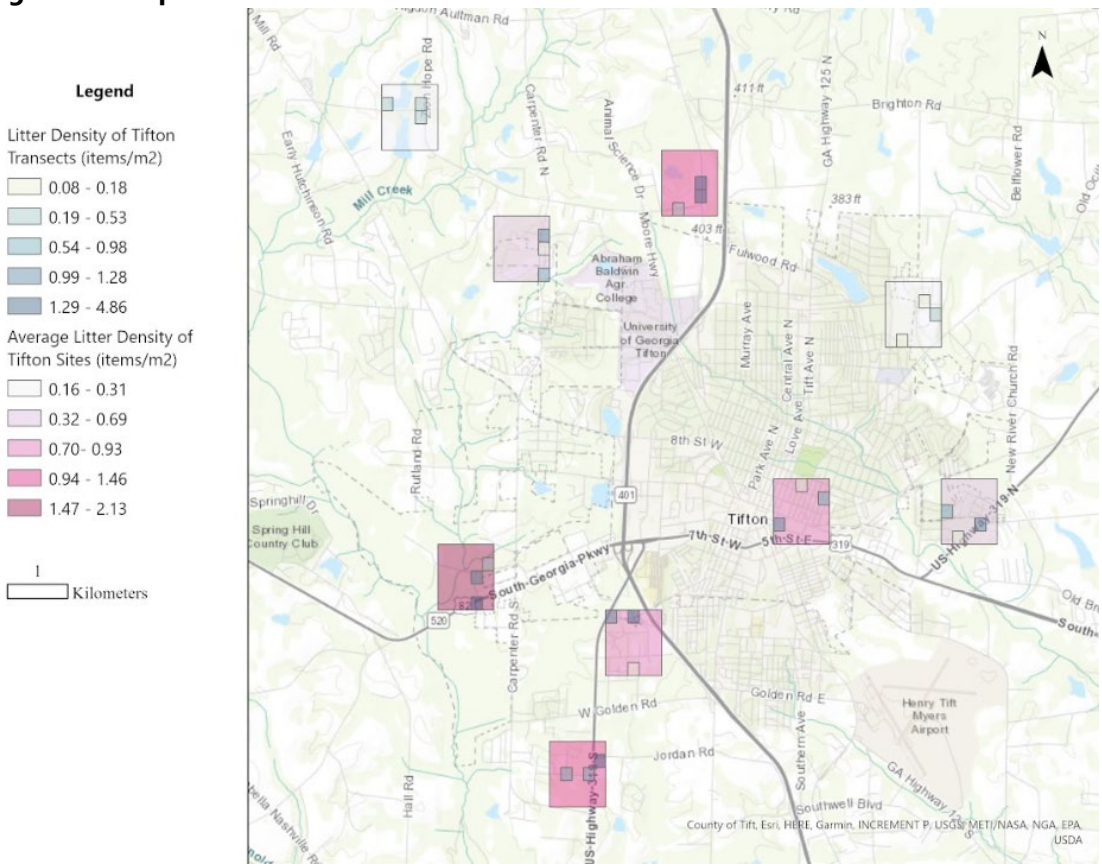
Leakage

To assess litter composition and densities across each community, randomized litter surveys were conducted in Tifton, Cherokee County, and Georgetown County. Summaries for each location and general trends are included below. Transect locations were selected using a stratified random sampling method, in which transects were randomly selected in ten square kilometers which were distributed across three groups of population count (upper, middle, lower) based on LandScan ambient population data. Litter items were recorded using the open-source Marine Debris Tracker app. A full list of items available in the app and their associated material categories as well as a map of sample sites and their surveyed litter densities can be found in the Appendix.

Tifton

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 50). This is higher than the US-modeled average of 0.47 items/m^2.[46] and higher than three of the six cities in the Walmart Foundation cohort.

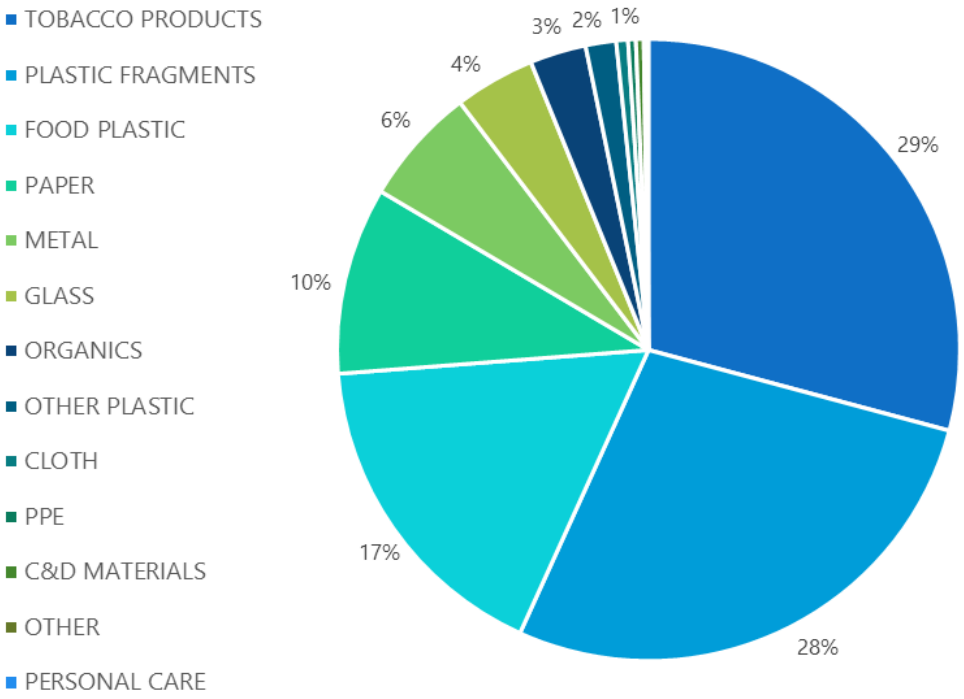
Figure 50: Map of Litter Densities in Tifton



[46] US EPA. (2024, September). *Escaped Trash Risk Map*. https://www.epa.gov/trash-free-waters/escaped-trash-risk-map

More than half (57%) of the litter consisted of tobacco products (29%) and plastic fragments (28%) (Figure 51). 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 51: Tifton Litter Survey Material Breakdown



Cigarettes comprise 35% of the top 10 litter items (Figure 52). This resembles the Walmart Foundation cohort where 83% of the cities also had cigarettes as the top litter item. 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 53).

Figure 52: Tifton Litter Survey Top Litter Items by Count

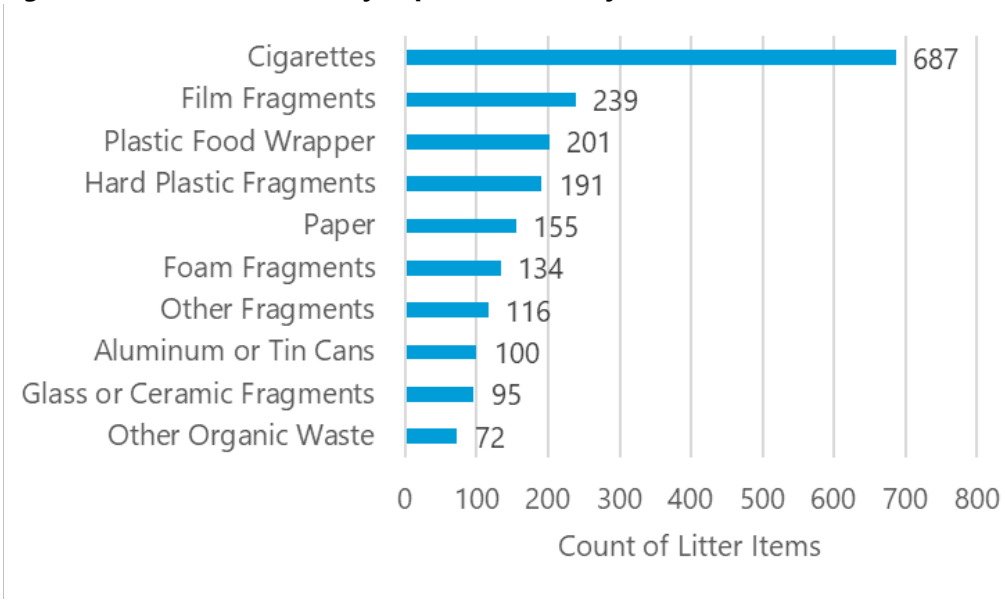
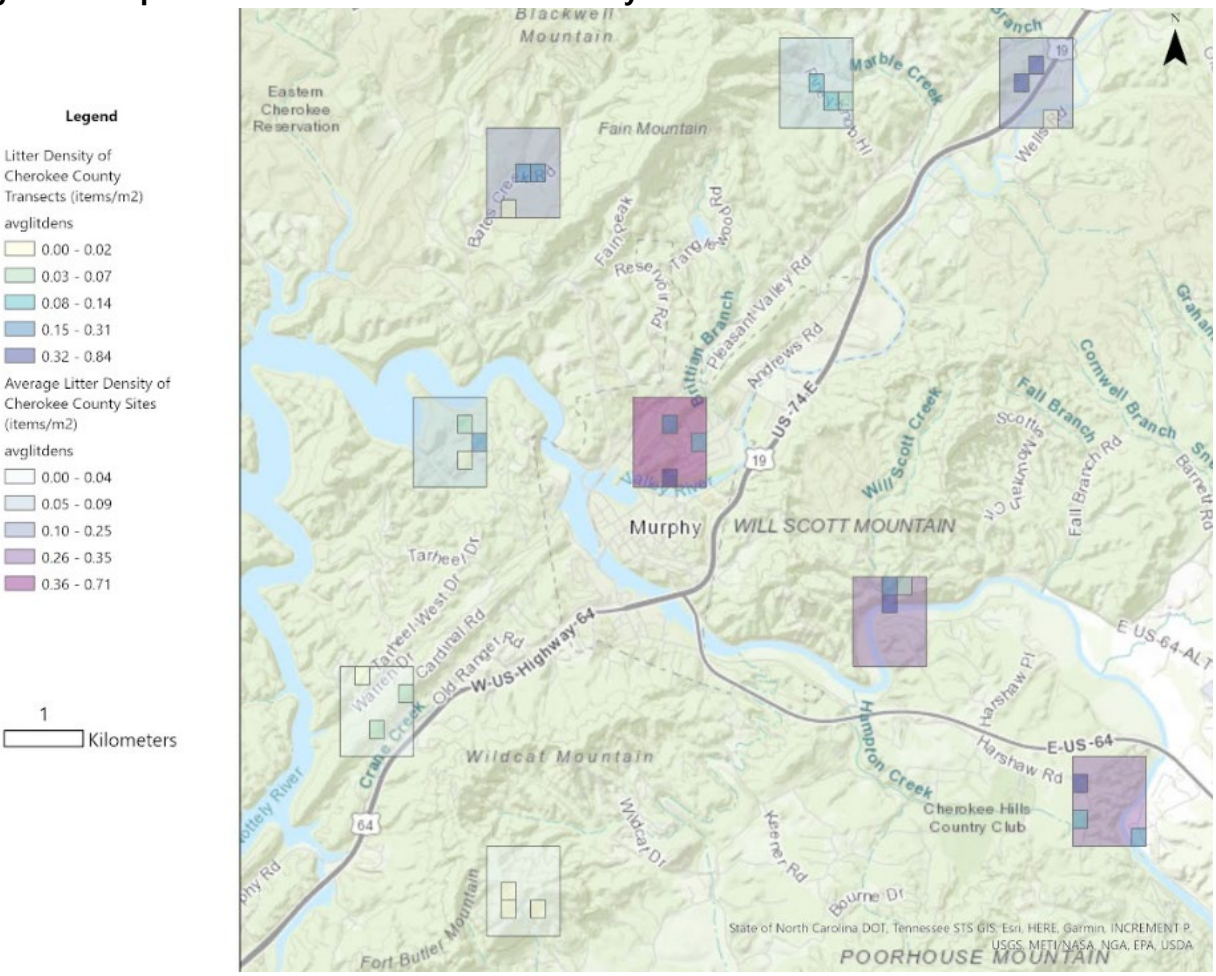


Figure 53: Example of Litter in Tifton

Cherokee County

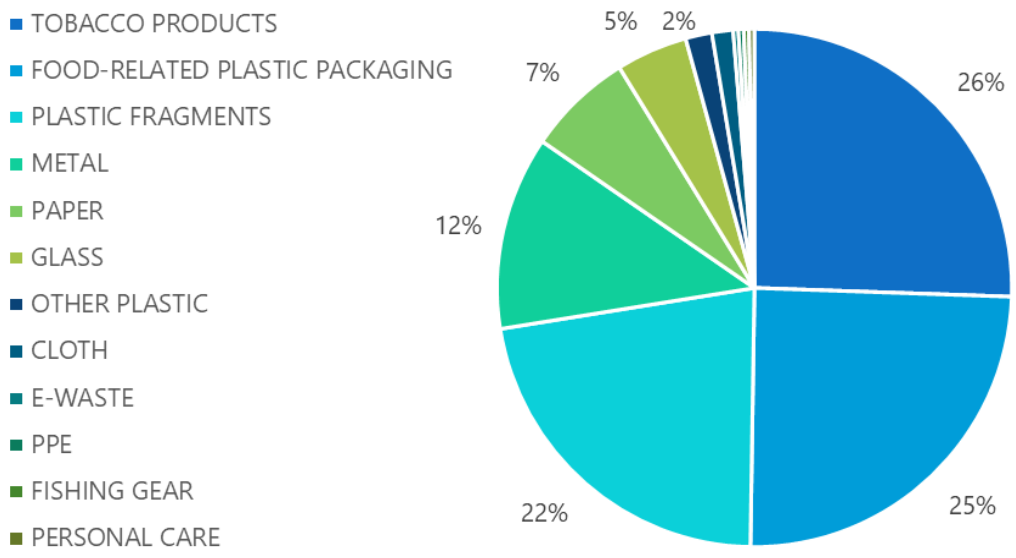
The CIL team recorded 603 litter items across the 27 litter transects in Cherokee County. The litter density in the transects ranged from 0.00 to 0.84 items/m^2, with an average of 0.24 items/m^2 (Figure 54). This is lower than the US-modeled average of 0.47 items/m^2 and lower than all the cities in the Walmart Foundation cohort.

Figure 54: 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 55). 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 55: Cherokee County Litter Survey Material Breakdown



Cigarettes are the most common item on the list of the top 10 litter items (Figure 56). This is similar to the Walmart Foundation cohort, where 83% of the cities also listed cigarettes as the top litter item. 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 57).

Figure 56: Cherokee County Litter Survey Top Litter Items by Count

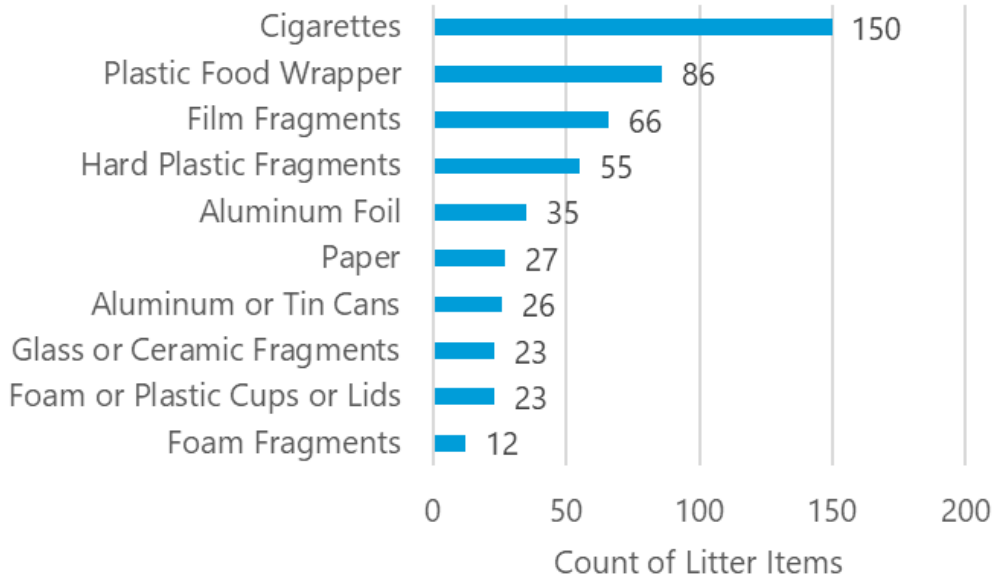


Figure 57: Example of Litter in Cherokee County

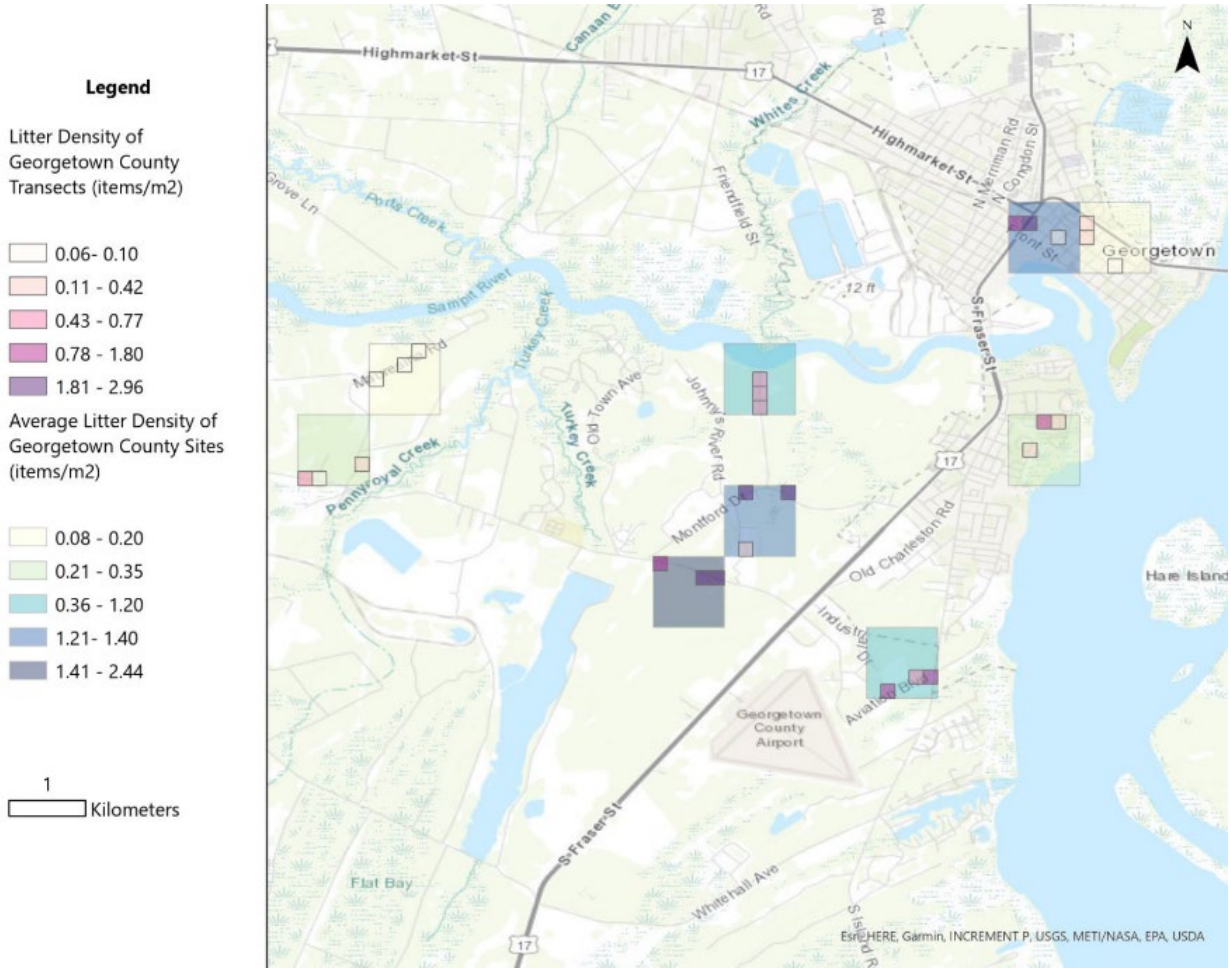
Despite Cherokee County's relatively low litter density, waste management officials shared that littering and dumping occurs on private properties where solid waste ordinances cannot be enforced (Figure 58).

Figure 58: Mismanaged Waste on Cherokee County Private Property

Georgetown County

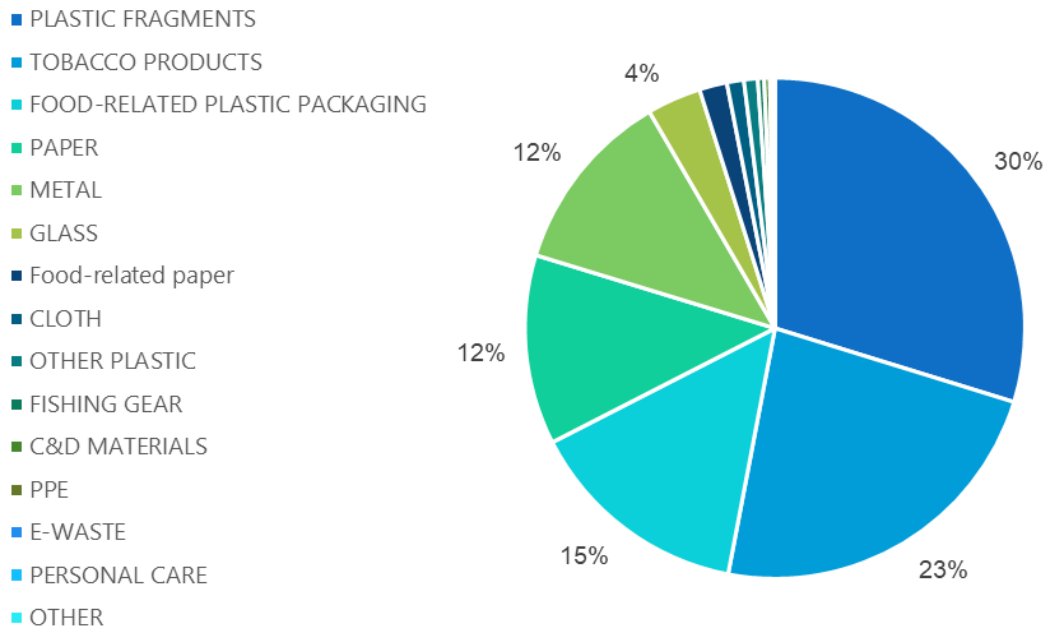
The CIL team recorded 2,460 litter items across the 27 litter transects in Georgetown County. The litter density in the transects ranged from 0.06 to 2.96 items/m^2, with an average of 0.91 items/m^2 (Figure 59). This is higher than the US-modeled average of 0.47 items/m^2 and higher than three of the six cities in the Walmart Foundation cohort.

Figure 59: Map of Litter Densities in Georgetown County



Over half of the surveyed items were plastic fragments (30%) and tobacco products (23%) (Figure 60). 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 60: Georgetown County Litter Survey Material Breakdown



The top 10 litter items (Figure 61) 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 62). Improving recycling collection would decrease the number of these items that leak into the environment.

Figure 61: Georgetown County Litter Survey Top Litter Items by Count

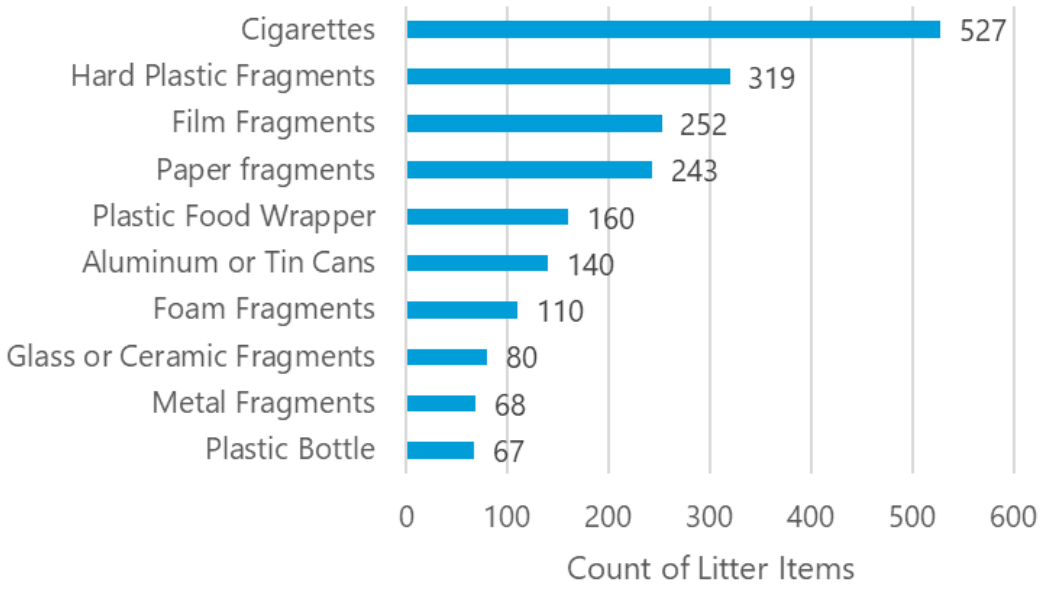


Figure 62: Examples of Top Litter Items Leaked into the Environment

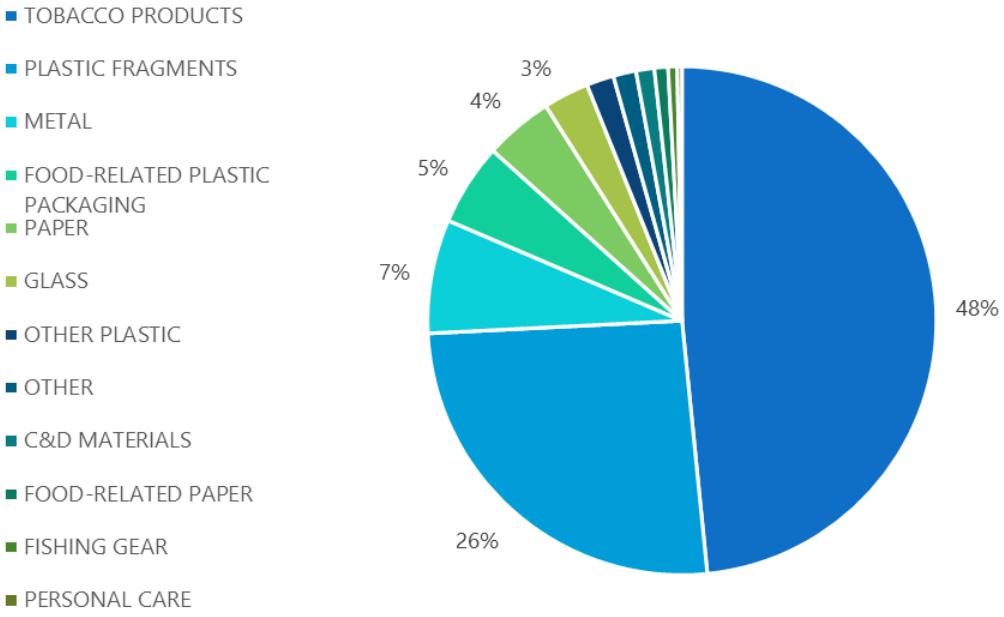
There has been some progress in reducing the leakage of cigarettes, the top litter item. According to an NGO, Keep America Beautiful and Altria have installed close to 500 cigarette receptacles and have seen a 50% reduction in cigarettes in the litter.

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 63). This is lower than both the US-modeled average and Georgetown County.

Figure 63: Map of Litter Densities in Pawleys Island

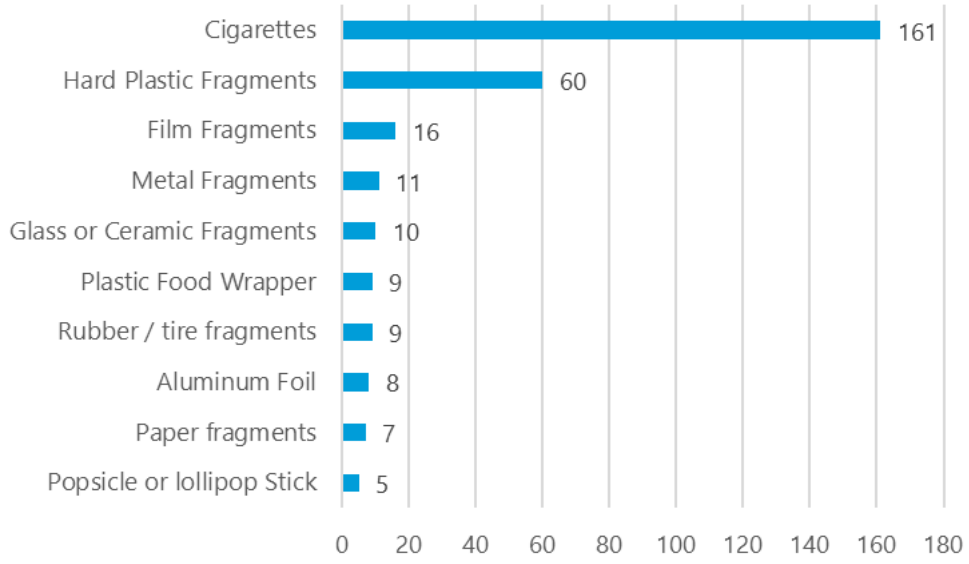
Almost half of the litter in Pawley's Island was tobacco products (48%), while plastic fragments accounted for 26% (Figure 64). This is more tobacco products than the inland area.

Figure 64: 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 65), indicating the presence of tourists socializing in the area. There were no recyclables in the top litter items.

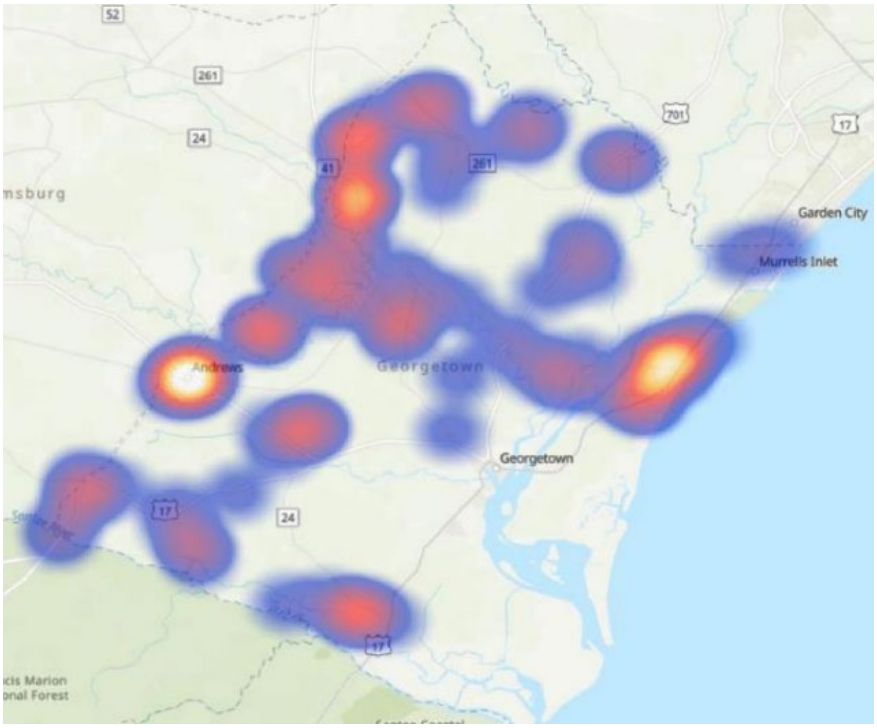
Figure 65: Pawleys Island Litter Survey Top Litter Items by Count



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. Recyclables were present in Georgetown County's litter surveys, but fewer were found in Pawleys Island. Clearly, there are stark differences in the litter found in the environment between inland and coastal areas.

In addition to the CAP surveys, 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 66). Similar to the findings from CAP, these surveys showed that 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.

Figure 66: Georgetown County Litter Heat Map[47]



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.[47] 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.[48]

[47] Rainwater, N. (2022). *Georgetown County Environmental Services Office 2022 Spring Litter Index United Nations Youth Corps Internship*. Coastal Carolina University. https://digitalcommons.coastal.edu/cgi/viewcontent.cgi?article=1001&context=goal-6-clean-water

[48] Castleforte, C. (2022). *Litter Clean-Ups in Georgetown and the SDGs*. Coastal Carolina University. https://digitalcommons.coastal.edu/cgi/viewcontent.cgi?article=1005&context=goal-12-responsible-consumption

Opportunities

CIL found the following opportunities to expand and enhance circularity in each community 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

Input

- 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

- Leverage the large institutional presence interested in supporting recycling throughout campus and the city.
- Develop a program to capture and recycle agricultural plastics and educate farmers on the benefits rather than storing plastic waste on-site.
- 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 to help increase public trust in the system.
- Provide incentives for dropping off high amounts of recycling.

Product Design

- Shift towards easier-to-recycle materials like PET, HDPE, and paper or 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

- Educate store owners on the benefits and popularity of personal care items packaged without single-use plastic.
- 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

- Place more recycling drop-off areas throughout the city.
- Consider changing the City's waste management company contract to reintroduce recycling.
- Consider source-separated collection.
- Add source-separated glass collection at the drop-off center. Glass can be used for roadbeds or fill in the local community.
- Place a banner or add 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.
- Incentivize separating recycling from waste (e.g., smaller trash cans, free days to recycle the most profitable recyclables). Pay-as-you-throw (PAYT) systems can encourage residents to throw away less trash and recycle, though illegal dumping enforcement must also be in place.
- Monitor (e.g., cameras) the drop-off center and contact residents who recycle incorrectly.

End of Cycle

- 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.
- Invest in composting infrastructure as yard waste is collected and compostable alternatives are available. The end market is farmers in Tifton.

Leakage

- 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

Input

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

Community

- Place recycling bins where recyclables are emptied outside the household (i.e., laundromats).
- 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 share infrastructure and increase financial support for recycling.

Product Design

- Shift towards easier-to-recycle materials like PET, HDPE, and paper or 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

- Tourism and long-term stays bring a less price-sensitive group that could use reuse or refill alternatives.
- Educate store owners on alternatively packaged 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 county 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

- 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 or allow them to bring recyclables without charge.
- Push private haulers to separate recycling from waste (e.g., smaller trash cans, free days to recycle the most profitable recyclables). PAYT systems can incentivize residents to throw away less trash and recycle.

End of Cycle

- 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.

Leakage

- Addressing upstream some of the top littered items (cigarettes) with additional policies and public campaigns
- With continued litter monitoring, the county 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

Input

- 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

- 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.
- Visit K-12 locations to educate students and hand out brochures, trash art contests, etc.

Product Design

- Shift towards easier-to-recycle materials like PET, HDPE, and paper or 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

- 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 will be available in 2025 with headquarters 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

- 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

- 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

- 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

C&D: Construction and demolition

CAP: Circularity Assessment Protocol

CIL: Circularity Informatics Lab

DRS: deposit return schemes

EPA: Environmental Protection Agency

EPR: Extended Producer Responsibility

EPS: Expanded polystyrene

FFP: film and flexible packaging

FL: Florida

FMCG: Fast moving consumer goods

FY: fiscal year

GA: Georgia

GEPD: Georgia Environmental Protection Division

HDPE: high density polyethylene

HRSA: Health Resources & Services Administration

MRF: material recovery facility

MSW: municipal solid waste

NC: North Carolina

NC DEQ: North Carolina Department of Environmental Quality

NGO: non-governmental organization

PAYT: pay-as-you-throw

PET: polyethylene terephthalate

PP: polypropylene

PS: polystyrene

RISE: Resilience, Innovation, and Sustainability through Education

SC: South Carolina

SC DEHC: South Carolina Department of Health and Environmental Control

SPLOST: Special Purpose Local Option Sales Tax

SUP: single-use plastic

SWM: solid waste management

TN: Tennessee

UGA: University of Georgia

U.S.: United States

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