BURNS McDONNELL

INITIAL REPORT

KEEP AMERICA BEAUTIFUL 2020 NATIONAL LITTER STUDY

SUBMITTED TO

KEEP AMERICA BEAUTIFUL

MARCH 2021

TEAMING PARTNER

CASCADIA CONSULTING GROUP

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EXECUTIVE SUMMARY

Keep America Beautiful® is the nation's leading community improvement nonprofit organization. For more than 65 years, Keep America Beautiful has cleaned and beautified public spaces for the benefit of humanity and the world around us by mobilizing millions of volunteers and participants through its network of hundreds of affiliates. The organization's legacy is built on education, partnerships, and its science-based Model for Change. This combination of expertise and grassroots engagement makes Keep America Beautiful a truly unique and trusted force for community improvement. Through the organization's efforts to end litter and create vibrant green spaces, Keep America Beautiful works to ensure **Everyone in America Lives in a Beautiful Community**.

A key part of the organization's work is a rich history of conducting research about litter and littering in America to inform new and innovative solutions that individuals, partners, policy makers, and Keep America Beautiful affiliates can implement across the United States. The Keep America Beautiful 2020 National Litter Study builds on the organization's landmark research studies from 1969 and 2009 and, in doing so, is the most extensive research conducted in U.S. history to estimate the scope, scale, causes, and impacts of litter.

The Keep America Beautiful 2020 National Litter Study incorporates a survey examining public attitudes about litter, a visible litter survey that provides an estimate of the litter across the United States, behavioral observations that shed light on littering behavior in public, and a survey that estimates the public costs of litter in the United States. In a major expansion of the scope of litter research, the Keep America Beautiful 2020 National Litter Study provides the first scientific national estimate of the litter along U.S. waterways. Together, the components of the Study provide a comprehensive view of Litter in the United States today.

The Keep America Beautiful 2020 National Litter Study estimates that the scale of the litter problem is significant, with nearly 50 billion pieces of litter along U.S. roadways and waterways at the time of the Study. That equates to 152 pieces of litter for every U.S. resident.

The first national estimate of litter near our waterways shows that the problem of litter is slightly greater on waterways than it is on roadways.[1] However, significant progress has been made reducing litter on roadways in the past decade. The Keep America Beautiful 2020 National Litter Study estimates litter on America's roads was down 54 percent since 2009. That decrease builds on the 2009 National Visible Litter Survey that estimated that

[1] Litter on roadways and waterways comes from many sources and, over time, can move around the environment. This Study examines litter where it is discovered along roadways and waterways with the understanding that litter may have moved from one environment to another because of many factors including wind, rain, and other natural and man-made phenomena. Alongside waterways in particular, litter may have floated downstream or come from storms drains, nearby roads or other human activities.

visible litter had been reduced 61 percent between 1969 and 2009. Furthermore, major progress has been made in reducing litter in several key product categories, including fast-food packaging, soft drink (soda) containers, and construction debris. However, no single change in litter is more impactful than the estimate that cigarette butt litter has decreased from 18.6 billion cigarette butts in 2009 to 5.7 billion cigarette butts today. While cigarette butts are still by far the single most littered item in America, the Keep America Beautiful 2020 National Litter Study shows significant progress in reducing cigarette butt litter. With the decline in cigarette butt litter, other items made from plastic emerge as the largest group of littered material in the United States.[2]

The Keep America Beautiful 2020 National Litter Study finds key points of variability in the composition and distribution of litter across the United States. Nine out of ten pieces of litter on the ground in the U.S. were under four inches in size. Though smaller litter may be less visible, it remains the dominant type of litter in the United States.

For the first time, the Keep America Beautiful 2020 National Litter Study compares litter in regions of the United States with bottle deposit legislation and areas without such legislation. The Study estimates there was substantially more deposit-material litter per capita in non-bottle bill states than in bottle bill states, by a difference of a two-to-one ratio. There was also more non-deposit litter per capita in non-bottle bill states, though the difference in litter per capita for these non-deposit items in non-bottle bill versus bottle bill states was significantly less than for deposit materials.

These highlights are among the many important estimates that emerge from the Keep America Beautiful 2020 National Litter Study. The remainder of the Executive Summary expands upon these and other key findings in the report.

This report summarizes the initial findings from the Keep America Beautiful 2020 National Litter Study. In the coming months, deeper analyses of the various components of the Study will be completed, and further research products will be released that explore the meaning of the data and how the data can inform solutions to ending littering and litter.

Keep America Beautiful retained Burns & McDonnell, Cascadia Consulting Group, Salinas-Davis LLC, and the Docking Institute of Public Affairs, collectively referred to as the Burns & McDonnell Project Team, to conduct the Keep America Beautiful 2020 National Litter Study.

[2] Throughout the report, litter is described by both the type of material from which the product was made (e.g., paper, plastic, metal, glass) and the product and material category that the litter represents (e.g., cardboard, glass beer bottle). See Sections 1 and 2 for a further description. Because of their ubiquity as litter, cigarette butts are discussed as both a material type and as product category.

NATIONAL LITTER SURVEY KEY HIGHLIGHTS

- **Nearly 50 billion pieces of litter along United States roadways and waterways.** Overall, there was more litter near waterways (25.9 billion pieces on 10.7 million miles) than on roadways (23.7 billion on 8.3 million miles) though, proportionally, roadway and waterway litter represent similar quantities of the total litter items discarded nationwide (47.8 percent and 52.2 percent respectively).
- **There were 152 items of litter for each US resident**. Roadways and waterway litter items per capita were comparable (73 and 80 litter items per capita, respectively).
- **More than 2,000 pieces of litter per mile.** Roadways had more litter items per mile than waterways (2,857 and 2,411 litter items per mile on average respectively).
- **Plastics and cigarette butts compose the majority of litter material types.** Of the total litter along United States roadways and waterways, 19.2 billion (38.6 percent) were pieces of plastic followed by 9.7 billion (19.6 percent) cigarette butts. In addition to being the most littered materials when combining roadways and waterways, plastic and cigarette butts were determined to be the most prevalent littered items on both roadways and waterways when examined separately.
- **Great majority of litter was smaller in size but, at 6 billion pieces, larger items were both prevalent and highly visible.** Most litter (43.6 billion pieces or 87.9 percent) across United States roadways and waterways collectively were four inches or smaller in size. However, larger, and often more visible litter still represented a significant quantity (6.0 billion pieces or 12.1 percent) of litter.
- **Majority of litter found in rural areas, but urban areas had more litter per mile.** Most littered items discarded near United States roadways and waterways were located in rural areas (87.1 percent). However, urban roadways and waterways had significantly more littered items per mile than rural roadways and waterways.
- **On a per capita basis, there were less deposit materials and non-deposit materials littered in bottle bill states than in states without bottle bills.** The Study found substantially less deposit material litter in bottle bill states than in non-bottle bill states (four and eight litter items per capita in bottle bill and non-bottle bill states, respectively). The Study also found there was less non-deposit litter per capita in bottle bill states (111 littered items per capita) than in non-bottle bill states (158 littered items per capita), though the size of that difference was proportionally smaller than for littered items covered by deposit legislation.

ROADWAY LITTER SURVEY KEY HIGHLIGHTS

- **Nearly 24 billion pieces of litter along United States roadways.** An estimated 23.7 billion pieces of litter were along 8.3 million miles of United States roadways.
- **Freeways and expressways had the most litter items per mile.** Freeways and expressways had the most litter per mile (12,764 litter items per mile on average). Arterial, collector, and local roads had substantially fewer littered items per mile (5,035; 3,708; and 2,085 litter items per mile on average, respectively).
- **Local roads had the most total litter items.** Local roads account for the great majority (almost 70 percent) of total roadway miles in the U.S. Although local roads had the lowest littered items per mile (2,085 litter items per mile on average), local roads had the most total littered items in aggregate (11.9 billion litter items).
- **Plastics and cigarette butts compose most litter items on roadways.** Of the total litter near United States roadways, 8.2 billion (34.7 percent) were pieces of plastic followed by 5.7 billion (24.1 percent) cigarette butts. The composition of litter was comparable across roadway types for plastics, metal, glass, and organics but varied for paper, cigarette butts, and tire treads.
- **Majority of litter was smaller, but larger items contribute to the roadway litter issue as well.** Most of the litter (20.7 billion pieces or 87.5 percent) across United States roadways collectively were four-inches or smaller in size. However, larger, and often more visible, litter still represented a significant quantity (3.0 billion pieces or 12.5 percent) of litter.
- **Motorists were the leading source of litter for all roadway types.** Motorists were identified as the leading source of litter on roadways (collectively 70.1 percent). Pedestrians were the second largest source of litter for local, collector, and arterial roadways. Vehicle debris was the second largest source of litter for freeways and expressways. Improperly secured loads and overflowing containers were a larger source of litter on local roads than all other roadway types.
- **More roadway litter in aggregate in rural region, but urban region had more roadway litter per mile.** More litter was discarded near United States roadways in rural areas than urban areas (56.9 and 43.1 percent of total roadway litter respectively). However, urban roadways had significantly more littered items per mile than rural roadways.
- **On a per capita basis, residents littered less deposit materials along roadways in bottle bill states.** The Study estimated residents littered substantially less deposit materials along roadways in bottle bill states than non-bottle bill states (2.5 and 4.4 litter items per capita in bottle bill and non-bottle bill states respectively). There also were more non-deposit material litter items per capita across roadways in non-

bottle bill states than in bottle bill states, but the relative difference was significantly smaller than for deposit materials.

WATERWAY LITTER SURVEY KEY HIGHLIGHTS

- **Nearly 26 billion pieces of litter along United States waterways.** An estimated 25.9 billion pieces of litter were along the shores of 10.7 million center miles of United States waterways.
- **Large perennial waterways had the most litter items per mile.** Large perennial waterways had the most litter per mile (3,654 litter items per mile on average). Small perennial and intermittent waterways had fewer littered items per mile (3,141 litter items and 1,960 litter items per center mile on average respectively).
- **Intermittent waterways had the most total litter items.** Intermittent waterways account for more than half the total waterway miles. Although intermittent waterways had the lowest littered items per mile (1,960 litter items per mile on average), intermittent waterways had the most total littered items in aggregate (13.6 billion litter items).
- **Plastics and cigarette butts compose most litter items along waterways.** Of the total litter discarded near United States waterways, 10.9 billion (42.2 percent) were pieces of plastic followed by 4.0 billion (15.4 percent) cigarette butts. The composition of litter was comparable across waterway types for plastics, organics, and tire treads but varied for paper, metal, and cigarette butts.
- **Majority of waterway litter was smaller, but larger items contribute to the waterway litter issue as well.** Like roadway litter, most of the litter on United States waterways (22.8 billion pieces or 88.2 percent) were four inches or smaller in size. Approximately 3.1 billion pieces greater than four inches were littered near United States waterways.
- **Pedestrians were the leading source of litter along waterways.** Pedestrians were identified as the leading source of litter on waterways (collectively 42.9 percent). For waterways, pedestrians include persons not in vehicles on roadways such as persons on the shore, in a boat, etc. Motorists were still a significant source of litter near waterways because many roads intersect or roughly parallel the paths of waterways, or have storm drains on the roads that lead to nearby waterways.
- **More waterway litter in aggregate in rural region, but urban region had more waterway litter per mile.** More than 95 percent of waterway litter in the United States was discarded in rural areas. However, urban waterways had more litter items per center mile than rural waterways.

- **On a per capita basis, individuals littered less deposit materials along waterways in bottle bill states.** The Study estimated residents littered substantially less deposit materials in bottle bill states than non-bottle bill states (1.6 and 4.1 litter items per capita in bottle bill and non-bottle bill states respectively) and less non-deposit material (52 and 85 litter items per capita in bottle bill and non-bottle bill states, respectively).

PRODUCT-SPECIFIC LITTER KEY HIGHLIGHTS

- **Over 800 million pieces of fast-food packaging were littered on United States roadways and waterways.** An estimated 394.7 million fast-food cups and 423 million other fast-food packaging items were littered along United States roadways and waterways.
- **An estimated 2.6 billion food packaging film items (which include products like snack bags and candy wrappers) were littered along United States roadways and waterways, making food packaging film the second most littered item after cigarette butts.** Approximately half (55.3 percent) of all food packaging film was along roadways and the other half (44.7 percent) was along waterways.
- **Nearly 350 million plastic bags were littered on United States roadways and waterways.** The vast majority (94.6 percent) of plastic bags littered were not trash bags, but other types of bags (i.e., retail store plastic bags).
- **An estimated 207 million PPE items were littered on United States roadways and waterways.** The study estimated 149.2 million PPE gloves and 57.9 million PPE masks were littered on United States roadways and waterways.

COMPARISON OF 2009 AND 2020 ROADWAY LITTER SURVEY KEY HIGHLIGHTS

- **Decrease of 54 percent in litter along United States roadways.** In 2009, Keep America Beautiful conducted a national litter research study to document the quantity, composition, and sources of litter on United States roadways. Approximately 51.2 billion pieces of litter were estimated along United States roadways in 2009. The Keep America Beautiful 2020 National Litter Study estimated approximately 23.7 billion pieces of litter along United States roadways in 2020.
- **Significant decrease in smaller roadway litter.** Most of the decrease in roadway litter from the 2009 to current study was a decrease in the quantity of litter items four inches or smaller in size (a decrease of 25.8 billion pieces or 93.9 percent).

- **Litter in most product material categories went down from the 2009 to current study.** However, those decreases were not uniform across all categories, and there is still much work to be done in eliminating litter in the United States. Notably, several high-profile litter categories, including cigarette butts, fast food, and soft-drink containers, saw large decreases in the number of littered items from 2009 to 2020. Several key material categories saw increases in the amount of litter from 2009 to 2020 including cardboard, beer containers, food packaging film, sports drinks containers, and water containers.

NON-ROADWAY LITTER SURVEY KEY HIGHLIGHTS

- **The density of litter varied significantly across non-roadway sites.** At mass transit sites, there were 123.6 pieces of litter per 1,000 square feet. That number decreased to 94 litter pieces at construction sites and 44.5 litter pieces per 1,000 square feet at local recreation sites.
- **Cigarette butts were a major litter item at all non-roadway sites.** Cigarette butt litter was a major contributor to overall litter composition observed at non-roadway sites. It ranged from 8.9 percent at coastline sites to 47.4 percent of total litter at retail sites.
- **Retail shopping sites exhibited a large amount of cigarette butts and paper litter items.** These two material groups together represented about two thirds of all retail shopping site litter (67.1 percent).
- **Local recreation sites had the highest prevalence of pedestrian litter.** Pedestrians were identified as the majority source of litter at local recreation sites (collectively 98.2 percent).
- **Construction sites had the highest percent litter composition of tire treads.** Tire treads represented 17.4 percent of all litter at construction sites.
- **Storm drains had the smallest percentage of smaller litter (under four inches).** While storm drains can capture smaller as well as larger littered items at least temporarily, significant amounts of smaller litter are passing through storms drains.
- **Coastline sites exhibited the most glass litter by total percent composition.** Glass litter, mostly broken glass or ceramic, made up nearly half of all coastline litter (45.5 percent).

BEHAVIORAL OBSERVATIONS KEY HIGHLIGHTS

- **Coronavirus (COVID-19) resulted in a decrease in the number of persons at each site and disposal activity at each site.** In comparison to the 2009 study, fewer observations and less disposal activity was observed at sites.

- **Littering rate consistent with prior study.** For the current study, 62 of the total 300 observed disposals were littering (20.7 percent). This is similar to the 2009 study which reported 342 of the total 1,962 observed disposals were littering (17.4 percent).

PUBLIC ATTITUDE SURVEY KEY FINDINGS

- **Citizens believe that litter is a problem in their state.** Over 90 percent of U.S. residents reported litter is a problem.
- **Litter negatively impacts communities.** Large majorities of U.S. residents reported they believe the presence of litter has an impact on the environment, waterways, property taxes, home values, tourism and businesses, quality of life, and health and safety.
- **U.S. residents identified motorists and pedestrians as the primary source of litter.** The public's opinion is consistent with the findings of the visible litter survey.
- **Fast-food packaging, beverage containers, plastic bags, and tobacco products waste were perceived to be the most littered items.** U.S. residents' perceptions were somewhat in line with the visible litter survey findings, as these four categories were among the most identified litter items along roadways.
- **U.S. residents indicated they have seen others litter most when there is no trash can nearby, when they are disposing of a cigarette butt, or when the area is already littered.** Also, over two-thirds of residents believe people litter because they do not care about the effects of litter.
- **Minimal perceived consequences for littering.** Almost 95% of residents answered "No" when asked if they have heard of anyone they know being caught or fined for littering.
- **Respondents supported "refundable deposit" or "rebate incentive" to increase recycling**. Across all respondents (nationally, in bottle-bill states, and in non-bottle bill states), over 75% of respondents supported the implementation of these policies within their state.

1.0 INTRODUCTION

With the Keep America Beautiful 2020 National Litter Study, Keep America Beautiful builds on a long history of conducting landmark research studies that examine the scope, scale, and causes of the litter and littering problem in the United States, and provides the foundation for new and innovative solutions for ending litter and littering in America.[3] Significantly reducing, and eventually ending, littering and litter is key to developing clean, beautiful, sustainable, healthy, and more prosperous communities across the United States.

Litter is improperly managed waste. It includes waste that is intentionally and improperly disposed by humans, such as cigarette butts, food packaging, and other trash discarded by pedestrians and motorists. Litter also includes waste that is unintentionally improperly disposed, such as overflowing containers (e.g., trash from overflowing litter cans), improperly secured loads (e.g., trash from garbage trucks or pick-up truck beds), and vehicle debris (e.g., trash from vehicle accidents). Whether intentional or unintentional, litter negatively impacts humans and our natural environment daily and poses a threat to our future. Litter affects environmental, community, and individual health, as well as quality of life, economic development, the circularity of the economy, the safety of our water, community justice, and climate.

This Study uses several approaches to examine litter and littering. Building on the 2009 study, the Keep America Beautiful 2020 National Litter Study documents the quantity, composition, and sources of litter, attitudes toward litter and littering, observations of littering, and an accounting of the cost of litter in the United States. The result is a deep and broad set of data and insights that will support new solutions and strategies to ending litter and littering. In addition to its highly structured scientific methodology, the Study incorporates processes and data architecture to replicate the study across time and geographies to allow for comparisons, to improve our response to litter, and to track the impact that Keep America Beautiful and its network of nearly 700 affiliates have on litter reduction and prevention in the United States. For the first time ever, the Keep America Beautiful 2020 National Litter Study provides a valid, national estimate of litter in America's waterways.

Keep America Beautiful retained Burns & McDonnell, Cascadia Consulting Group, Salinas-Davis LLC, and the Docking Institute of Public Affairs, collectively referred to as the Burns & McDonnell Project Team, to conduct the Keep America Beautiful 2020 National Litter Study using this enhanced methodology.

[3] See www.kab.org/research for an overview. Please direct questions about the Keep America Beautiful 2020 National Litter Study to David Scott, Ph.D., Senior Director, Research, Monitoring, and Evaluation, Keep America Beautiful (dscott@kab.org).

1.1 PROJECT OBJECTIVE

The objective of this Study is to gain a comprehensive understanding of the quantity, composition, and sources of litter, the factors that impact littering and litter, the cost of litter, as well as gauge the public's attitude towards litter issues in the United States. A comprehensive understanding of the litter issue in the United States is key to the development of tailored strategies and initiatives to combat litter, littering, and mismanaged waste. In addition, the Study provides a standardized methodology and infrastructure for future measurement of progress towards reducing litter by Keep America Beautiful, its national network of affiliates, and key partners.

1.2 PROJECT APPROACH

The Burns & McDonnell Project Team in collaboration with Keep America Beautiful developed the following key tasks that provided the foundation for the Study. The methodology for the Study is described in Section 2.

Public Attitudes Survey

Conducted in the fall and winter of 2019-2020, the public attitudes survey provides an understanding of U.S. residents' opinions about the effects of litter, prevalence of litter, littering behavior, consequences of littering, and litter prevention and abatement in the United States. The Burns & McDonnell Project Team conducted a national survey, applying random sampling techniques to both telephone and web survey data collection methods (incorporating listed sampling and address-based sampling). Consequently, the results of the survey are representative of the attitudes of U.S. residents as a whole. A total of 1,145 usable cases were collected; the sampling error (margin of error) for those cases is +/- 2.9%. Section 10 presents the results of the public attitude survey.

Visible Litter Survey

Conducted in the late summer and early fall of 2020, the Visible Litter Survey provides a comprehensive understanding of the quantity, composition, and sources of litter on roadways, waterways, and non-roadway sites. Roadway, waterway, and non-roadway sites were selected using a stratified random sampling methodology based on available national datasets. The Burns & McDonnell Project Team conducted visible litter surveys at over 600 sites nationwide, including both roadway and waterway components, and produced generalizable data that are representative of those sites across the nation. As such, we can estimate the amount and types of litter on America's roadways and waterways at the time of the Study. At each site, the Burns & McDonnell Project Team categorized litter into six material groups that were subdivided into 86 product material categories. In addition, the Burns & McDonnell Project Team assigned each litter item to one of five

sources. Section 3 presents the aggregate visible litter survey results for roadways and waterways across the United States, Section 4 presents the roadway results, Section 5 presents the waterway results, and Section 8 presents the non-roadway results.

Behavioral Observations

In the late summer and early fall of 2020, the Burns & McDonnell Project Team conducted behavioral observations at over 120 sites with traditionally high traffic and density of consumer and recreational behavior, including retail shopping areas, local recreation areas, gas stations, mixed use developments, coastal areas, and outside of bars and restaurants. The Keep America Beautiful 2020 National Litter Study replicates the observation methodology developed by Dr. P. Wesley Schultz for the 2009 study to understand the behavior of littering and to address questions of who litters, where they litter, how they litter, and how the context of the behavior affects littering. Section 9 of the report presents the results of the behavioral observations.

Financial Cost of Litter Survey

The Financial Cost of Litter Survey is the final component of the Keep America Beautiful 2020 National Litter Study and is underway in the early months of 2021. The Financial Cost of Litter Survey will provide an estimate of the costs incurred by the public and social sectors across the United States to educate the public about litter, on activities designed to prevent litter and those required to clean up litter and illegal dumps, and the costs of enforcement. The results of this ongoing survey will be included in future reports.

1.3 THE INITIAL REPORT

Through the four components of the Study described in the Project Approach above, the Keep America Beautiful 2020 National Litter Study includes a deep and broad set of information that provides critical insights on the problem of litter and littering in America.

This Initial Report provides a thorough description of the summary data for the first three components of the study—Public Attitude Survey, Behavioral Observations, and Visible Litter Survey.[4] It provides the largest overview of what litter and littering look like in the United States, where and how litter occurs, and what the public believes about the problem of litter and littering and the solutions to the problem.

In the coming months, deeper analyses of the various components of the Study will be completed and further research products will be released that explore the meaning of the data and how the data can inform solutions

[4] Future reports will examine the Financial Cost of Litter survey.

to ending littering and litter. This initial report is not intended to provide explanatory or predictive analyses or answer the many questions that emerge from the data. However, by providing a broad review of the data in the Study, this Initial Report provides the foundation for future explanatory and predictive analyses.

1.4 STRUCTURE OF THE REPORT

The Initial Report is designed to provide a comprehensive description of the problems of litter and littering in the United States. Section 2 describes the methodology use to conduct the Study. Each subsequent section is written to provide the interested observer a comprehensive picture on that section's topic of interest. As such, a common structure is applied to multiple sections of the report. In several sections of the report, findings are examined by key subgroups (e.g., regional type) to provide greater clarity about the section topic.

Section 3 describes litter in the aggregate in the United States by examining litter on America's roadways and waterways. Section 4 provides a roadway-only view while Section 5 looks at America's waterways. Section 6 examines several areas of litter research interest related to key types of consumer products. Section 7 compares the roadway results of the Keep America Beautiful 2020 National Litter Study to the 2009 Study to provide estimates of the dynamics of litter in America. Section 8 presents the results of the non-roadway litter surveys which provide insights about how litter and littering varies in some key public areas. The results of the behavioral observations are presented in Section 9. The report concludes with the public attitudes survey in Section 10, where public opinion about the prevalence and effects of litter, causes of littering behavior, consequences of littering, and litter prevention are discussed.

2.0 METHODOLOGY

Historically, the methodology for conducting litter research has varied between different studies. As part of the Study, Keep America Beautiful sought to develop an enhanced methodology for conducting litter surveys, behavior observations, and public attitude surveys that could be replicated. This section of the report provides an overview of the methodology for conducting the Study.

2.1 VISIBLE LITTER SURVEY METHODOLOGY

The Burns & McDonnell Project Team conducted visible litter surveys at 240 roadway sites, 189 waterway sites, and 181 non-roadways sites throughout the United States in late Summer and early Fall 2020. This section provides an overview of the key components of the visible litter survey methodology, which includes:

- Material groups, categories, and definitions;
- Litter sources;
- Sampling plan and weighting; and
- Survey protocol.

Material Groups, Categories and Definitions

For the visible litter surveys, the Burns & McDonnell Project Team categorized litter into six material groups that were subdivided into 86 material categories. The material categories were developed based on the 2009 Keep America Beautiful National Litter Research Study and expanded to account for changes in waste generated (e.g., portable electronics such as cell phones) and public interest (e.g., plastic drinking straws). Table 2-1 presents the material groups and categories. A list of the material groups and material categories with material category definitions is included in Appendix A.

Table 2-1: List of Visible Litter Survey Material Groups and Categories

Groups	Categories	
Paper	Fast-food paper bags	Office paper/ mail
	Fast-food paper cups	Newspaper/ inserts
	Other paper fast-food service items	Magazines
	Cardboard	Books
	Kraft bags	Aseptic/ gable top containers
	Receipts	Beverage carriers/ cartons
	Political signs	Paper home food packaging
	Other advertising signs	Other paper
Plastic	Soda	Other beverage packaging
	Single-serve wine & liquor	Plastic trash bags
	Other wine & liquor	Other plastic bags
	Sports & energy drinks	Food packaging film
	Juice	Other film
	Tea & coffee	Plastic food service items
	Still water	Expanded polystyrene food service items
	Other water	Other expanded polystyrene
	Other plastic beverage bottles	Other plastic food packaging
	Fast food plastic cups	Other plastic
	Plastic straws	
Metal	Beer	Other metal beverage bottles
	Soda	Other beverage packaging
	Sports & energy drinks	Still water
	Juice	Other water
	Tea & coffee	Other metal
Glass	Beer	Still water
	Soda	Other water
	Single-serve wine & liquor	Other glass beverage bottles
	Other wine & liquor	Broken glass or ceramic
	Sports & energy drinks	Other glass food packaging
	Juice	Other glass
	Tea & coffee	
Organics	Pet waste	Other food waste
	Human waste	Other organics
	Confection	
Other	Medical waste	Electronic cigarettes
	PPE gloves	Other tobacco-related products & packaging
	PPE masks	Toiletries/ personal hygiene products
	Hazardous waste	Entertainment items
	Vehicle debris	Flat screen TV and computer monitors
	Tires	CRT televisions and computer monitors
	Tire tread	Portable electronics
	Construction and demolition debris	Electronic cords
	Textiles/ small rugs	Other electronics
	Bulky items	Other items
	Cigarette butts	

Understanding the source of litter is key to developing strategies to reduce litter in a community. The Burns & McDonnell Project Team field crews determined the likely litter source based on the material category and visual observations, including characteristics of the litter and the site. The Burns & McDonnell Project Team categorized litter sources into the following six groups:

- **Motorists:** Includes drivers and passengers improperly discarding trash from vehicles.
- **Pedestrians:** includes persons improperly discarding trash while walking or cycling.
- **Improperly secured loads:** Includes improperly discarded trash from inadequately secured loads, (e.g., trash from garbage trucks or pick-up truck beds).
- **Overflowing containers:** Includes improperly discarded trash in the immediate vicinity of trash and recycling containers (e.g., overflowing litter receptacles).
- **Vehicle debris:** Includes improperly discarded trash resulting from transportation corridors (e.g., tire tread and vehicle accident debris).
- **Unknown:** Includes other litter for which the source cannot be reasonably determined.[5]

Guidelines for determining the source of litter by material category are included in Appendix A.

Sampling Plan

The Burns & McDonnell Project Team and Keep America Beautiful developed detailed sampling plans to randomly select samples that would allow for the generation of national estimates that are generalizable and representative of the entire United States. Samples were allocated amongst 41 metropolitan statistical areas (MSAs), stratified by region (e.g., Midwest, Northeast, South, and West), urban and rural areas, and bottle bill and non-bottle bill states.[6] Following data collection, data cleaning, and quality control steps, the raw data collected by the stratified random sampling methodology were weighted by mileage estimates (i.e., a process of linear extrapolation).

The following provides an overview of the roadway, waterway, and non-roadway sampling plans.

Roadway Sampling Plan. The Federal Highway Administration (FHWA) provides roadway data collected through the Highway Performance Monitoring System (HPMS) based on roadway function (e.g., interstate, freeway and expressway, other principal arterial, minor arterial, major collector, minor collector, and local road). For the

[5] During the quality assurance/quality control process, unknown was reallocated based on the source of other litter at the site and the site type.

[6] Urban and rural per U.S. Census.

Study, the Burns & McDonnell Project Team combined the seven roadway functions defined in HPMS data into the following four roadway types, which were further subdivided into rural and urban subtypes:

- **Freeways and Expressways:** Includes interstates and other freeways and expressways highway functional classifications. These roadways are designed for mobility and long-distance travel.
- **Arterials:** Includes other principal arterials and minor arterials highway functional classifications. Arterials provide a high degree of mobility. Unlike freeways and expressways, abutting land uses can be served directly.
- **Collectors:** Includes major and minor collectors highway functional classifications. Collectors are roadways that gather traffic from local roads and funnel them to the arterial roadways.
- **Local Roads:** Includes local roads highway functional classifications. Roadways that are not intended for long distance travel. Local roads are often designed to discourage through traffic.

The Burns & McDonnell Project Team allocated 15 samples per roadway type per region (e.g., Midwest, Northeast, South, and West). Next, the samples were divided equally between urban and rural regions. The Burns & McDonnell Project Team allocated 20 samples per roadway type to bottle bill states and the remaining 40 samples per roadway type to non-bottle bill states.

Waterway Sampling Plan. The United States Geological Survey (USGS) maintains the National Hydrography Dataset (NHD), a modeled geospatial database that catalogs the presence of potential surface waters across the United States. For the Study, the Burns & McDonnell Project Team included only the waterways from two main categories of surface waters and therefore did not include ephemeral streams or coastlines. The three types analyzed are defined as follows:

- **Large Perennial Streams:** Includes FCode 46006 (perennial) and 55800 (artificial path) with stream order number associated with the stream segments in the USGS's NHDPlus HR database of five to 10.
- **Small Perennial Streams:** Includes FCode 46006 (perennial) and 55800 (artificial path) with stream order number associated with the stream segments in the USGS's NHDPlus HR database of one to five.
- **Intermittent streams:** Includes FCode 46003 (intermittent).

The Burns & McDonnell Project Team allocated 30 samples per large perennial and small perennial and 35 samples per intermittent streams. Waterway sites were stratified amongst the regions (e.g., Midwest, Northeast, South, and West) and urban/rural as well as coastline/inland. Like roadways, approximately one-third of the samples were allocated to bottle bill states.

Non-roadway Sampling Plan. Non-roadway sites were identified and defined based on the 2009 Keep America Beautiful National Litter Research Study and amended based on public interest (e.g., marine litter). The six types analyzed are defined as follows:

- **Retail Shopping Sites:** Includes shopping centers, strip malls, and convenience stores.
- **Local Recreation Sites:** Includes recreation areas (e.g., playground, basketball parks, soccer fields, etc.) at municipal parks.
- **Mass Transit Sites:** Includes bus stops or entrances to subways or other means of mass transit.
- **Construction Sites:** Includes active residential and commercial construction sites.
- **Storm Drains:** Includes drains designed to collect excess rain from streets and other paved areas.
- **Coastline Sites:** Includes areas on the coast which are utilized (e.g., congregating, fishing, boating, etc.) by persons.

The Burns & McDonnell Project Team allocation 30 samples per non-roadway type, distributed among regions (e.g., Midwest, Northeast, South, and West) and urban/rural areas. Like roadways and waterways, approximately one-third of the samples were allocated to bottle bill states with the remainder conducted in non-bottle bill states.

Field Survey Protocol

The following steps outline the visible litter field survey methodology the field teams used when surveying litter along roadways, waterways, and non-roadway sites:

1. Proceed to the designated site.
2. Pull over at a safe distance from the road or non-roadway site with NO barriers or hazards blocking you or the sample area. If the designated roadway sampling site is not safe or has a barrier (e.g., bridge, construction), proceed to the closest point following the designated site that is appropriate for sampling. If the designated non-roadway sampling site is not safe or has a barrier (e.g., fence, construction), contact the project manager and proceed to the nearest alternative site of same site type based on Google Maps.
3. Prior to exiting the vehicle, confirm field teams are equipped with all necessary PPE.
4. Prior to exiting the vehicle, retrieve the survey from the electronic data collection application.
5. Record site information in the Survey Site Overview as completely as possible, noting weather, influencing factors, etc.

6. Measure and mark (e.g., stake flags) the ends of the full sampling area and the sub-sample area. Refer to the field survey protocol for demarcating the litter survey area.
7. Perform a "meander count" of the full sampling area to tabulate the items that are four inches or larger. Record counts on the Full Survey Electronic Form. Refer to Appendix A for material definitions and likely sources.
8. Perform a "cross section sub-count" of the sub sampling area to tabulate items that are less than four inches. Record counts on the Sub Survey Electronic Form.
9. Photographs should be taken of the site and litter. Do not take pictures of specific individuals. If individuals are included inadvertently in the picture, it is acceptable. The following is an overview of pictures that should be taken at each site.
    - *Photograph the site.* A minimum of five pictures should be taken per site. For roadway sites, pictures should be taken at the (i) beginning of the site toward the end of the site (photograph 1); (ii) approximately every 75 feet facing toward the end of the site (photograph 2, 3, and 4); and (iii) at the end of the site facing toward the beginning of the site (photograph 5). For non-roadway sites, pictures should be taken as to fully capture the site.
    - *Photograph litter.* A minimum of five pictures of litter should be taken per site. The pictures should capture the quantity, type, and location of litter at the site. The pictures should include common or unique items littered, litter location, etc. If a site has minimal or no litter, the pictures should document the lack of litter at the site.
    - *Photograph litter and anti-smoking signage.* Pictures should be taken of any anti-litter signage and non-smoking signage.
10. Confirm all sampling equipment has been collected from the site. Recommend the person conducting the full sample collect the site demarcating flags as to maintain visual boundaries of the site.
11. Confirm all electronic forms are completed and uploaded prior to leaving the site.
12. Proceed to the next site.

2.2 BEHAVIORAL OBSERVATIONS METHODOLOGY

The Burns & McDonnell Project Team conducted behavioral observations at 126 sites throughout the United States. This section provides an overview of the key components of the visible litter survey methodology, which includes:

- Material groups, categories, and definitions

- Sampling plan
- Survey protocol

Material Groups, Categories and Definitions

The Burns & McDonnell Project Team consolidated the material categories from 86 material categories for the visible litter survey to 39 material categories for the behavioral observations. The behavioral observations material categories reflect materials that were likely to be observed at behavioral observation sites and could likely be identified from a distance. Table 2-2 presents the material groups and categories. A list of the material groups and material categories with material category definitions is included in Appendix A.

Table 2-2: List of Visible Litter Survey Material Groups and Categories

Groups	Categories	
Paper	Fast-food paper bags	Beverage carriers/ cartons
	Fast-food paper cups	Paper home food packaging
	Receipts	Other paper
	Aseptic/ gable top containers	
Plastic	Plastic bottles	Food packaging film
	Other plastic containers	Plastic food service items
	Fast food plastic cups	Expanded polystyrene food service items
	Plastic straws	Other expanded polystyrene
	Plastic trash bags	Other plastic food packaging
	Other plastic bags	Other plastic
Metal	Metal can	Metal food packaging
	Other beverage packaging	Other metal
Glass	Glass beverage bottles	Other glass
	Other glass containers	
Organics	Pet waste	Other food waste
	Confection	Other organics
Other	PPE gloves	Electronic cigarettes
	PPE masks	Other tobacco-related products & packaging
	Vehicle debris	Other items
	Tires	Unknown
	Cigarette butts	

Sampling Plan

The Burns & McDonnell Project Team allocated behavioral observations amongst 25 of the 41 metropolitan statistical areas (MSAs) providing representation by region (e.g., Midwest, Northeast, South, and West) and bottle bill and non-bottle bill states. Behavioral observation sites were identified and defined based on the 2009

Keep America Beautiful National Litter Research Study and amended based on public interest (e.g., marine litter). The seven types analyzed are defined as follows:

- **Retail Shopping Sites:** Includes shopping centers, strip malls, and convenience stores.
- **Local Recreation Sites:** Includes recreation areas (e.g., playground, basketball parks, soccer fields, etc.) at municipal parks.
- **Gas Stations:** Includes establishments retailing automotive fuels (e.g., gasoline, diesel fuel, gasohol) and automotive oils and retailing these products in combination with convenience store items (NAICS Code 447).
- **Mixed Use Developments:** Includes a real estate project with planned integration of some combination of retail, office, residential, hotel, recreation, or other functions. It is pedestrian-oriented and contains elements of a live-work-play environment. It maximizes space usage, has amenities and architectural expression, and tends to mitigate traffic and sprawl.
- **Coastal Sites:** Includes areas on the coast which are utilized (e.g., congregating, fishing, boating, etc.) by persons.
- **Bars and Restaurants:** Food and drink may be consumed on premises, taken out, or delivered to the customer's location. Some establishments may also sell alcoholic beverages with food (NAICS Code 722513). Also includes bars, taverns, nightclubs, or drinking places primarily serving alcoholic beverages for immediate consumption (NAICS Code 722410).
- **Fast Food:** Includes restaurants serving fast food cuisine and has minimal table service.[7]

The Burns & McDonnell Project Team allocated samples equally per behavioral observation type distributed amongst region (e.g., Midwest, Northeast, South, and West), urban/rural, and bottle bill/non-bottle bill state.

Field Survey Protocol

The following steps outline the behavioral observation field survey methodology the field teams used when conducting observations:

1. Proceed to the designated site.

[7] Behavioral observations were conducted at four fast food sites. Remaining fast food sites were reallocated to other site types due to no or low observations of fast-food sites because of COVID-19 restrictions. Based on the results of previous research, fast food sites should be included in future studies.

2. Define the observation field (e.g., open field, restricted field, variable field) and boundaries. Refer to field survey protocol for definition of behavior observation field.
3. Identify where to conduct observation (e.g., inside car, inside private establishment, outside on bench) as to remain safe and unobtrusive while making the observation.
4. If the site is not safe or has a barrier (e.g., fence, construction), contact the project manager and proceed to the nearest alternative site of same site type based on Google Maps.
5. Prior to commencing the observation, confirm field teams are equipped with all necessary PPE.
6. Prior to commencing the observation, retrieve the survey from the electronic data collection application.
7. Record site information in the Survey Site Overview as completely as possible, noting weather, influencing factors, etc.
8. Perform "general survey" of the first person entering the site. Observe the person until (i) person exits the site or (ii) a maximum of five minutes. Upon conclusion of observation of person, observe next person to enter the site. Record observation on the General Survey Electronic Form. Refer to Appendix A for material definitions.
9. Perform "cigarette and vaping survey" of each person smoking or vaping on site. Record observations on the Cigarette Vaping Survey Electronic Form. Refer to Appendix A for material definitions.
10. Upon conclusion of 30 general observations or maximum of two hours, conclude observations at the site.[8]
11. Photographs should be taken of the site and litter. Do not take pictures of specific individuals. If individuals are included inadvertently in the picture, it is acceptable. The following is an overview of pictures that should be taken at each site.
    - *Photograph the site.* A minimum of five pictures should be taken per site. Pictures should be taken as to fully capture the site.
    - *Photograph litter.* A minimum of five pictures of litter should be taken per site. The pictures should capture the quantity, type, and location of litter at the site. The pictures should include common or unique items littered, litter location, etc. If a site has minimal or no litter, the pictures should document the lack of litter at the site.
    - *Photograph litter and anti-smoking signage.* Pictures should be taken of any anti-litter signage and non-smoking signage.

[8] Protocol was amended due to low traffic to conduct behavioral observations for two hours at all sites even if 30 observations were obtained.

12. Confirm all electronic forms are completed and uploaded prior to leaving the site.
13. Proceed to the next site.

2.3 PUBLIC ATTITUDE SURVEY METHODOLOGY

The Burns & McDonnell Project Team contacted people from a sample of residential land line and mobile telephone numbers in the late Fall and Winter of 2019-2020. Respondents were also offered the option to complete a web-based questionnaire. An online survey supplement was implemented to further increase responses. At the conclusion of the survey, a total of 1,145 interviews were completed. The margin of error is +/- 2.9 percent. The margin of error for the 369 cases from bottle bill states is +/- 5.1 percent.

The Burns & McDonnell Project Team targeted completions within region (e.g., Midwest, Northeast, South, and West) and bottle bill and non-bottle bill states. Each phone number was attempted up to 10 times, and phone numbers were called during varying times throughout the day (10 AM to noon, 2 PM to 4 PM, and 5 PM to 9 PM local time) and varying days through the week (Monday through Saturday). The survey was conducted in English and Spanish. When an English-speaking interviewer reached a probable Spanish-speaking respondent, the respondent was called back by a bilingual interviewer.

The public attitude survey results were reported in aggregate as to provide a targeted margin of error. The public attitude survey results were weighted for gender, age, and race using percentages of each provided by the U.S. Census American Fact Finder and American Community Survey.[9, 10]

[9] American Fact Finder located at https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml
[10] American Community Survey located at https://www.census.gov/programs-surveys/acs

3.0 NATIONAL LITTER SURVEY RESULTS

At the time of the Study, it is estimated approximately 49.6 billion pieces of litter were discarded near United States roadways and waterways.[11] Overall, there was more litter near waterways (25.9 billion pieces on 10.7 million miles) than on roadways (23.7 billion on 8.3 million miles) though, proportionally, roadway and waterway litter represent similar quantities of the total litter items discarded nationwide (47.8 percent and 52.2 percent respectively).[12] However, roadways had more litter items per mile than waterways (2,857 and 2,411 litter items per mile on average respectively). At the population level, 49.6 billion pieces of litter equates to 152 littered items for each resident of the United States at the time the study was conducted. Tables 3-1, 3-2, and 3-3 present the estimated count of roadway and waterway litter in aggregate, per mile, and per capita broken down by material group.[13] Throughout the report, we use these material groups for identification purposes. In addition to paper, plastic, metal, glass, and organics, we include cigarette butts and tire treads because of their historical prevalence or role as key types of litter. In later sections of the report, we also breakout several product categories (e.g., fast-food litter) and examine the dynamics of litter in these categories.

Table 3-1: Aggregate Count of Litter by Material Group, Roadway and Waterway

Material Group	Roadway Litter Items	Waterway Litter Items	Total Litter Items
Paper	4,335,691,200	3,179,030,200	7,514,721,300
Plastic	8,227,849,400	10,931,907,400	19,159,756,800
Metal	1,813,443,600	2,098,123,100	3,911,566,700
Glass	1,171,458,900	2,390,239,000	3,561,698,000
Organics	397,136,200	871,670,800	1,268,807,000
Cigarette butts[1]	5,703,542,200	3,994,110,000	9,697,652,100
Tire treads[1]	338,714,300	253,978,800	592,693,200
Other	1,690,190,700	2,175,959,600	3,866,150,300
Total	**23,678,026,500**	**25,895,018,900**	**49,573,045,400**

1. Cigarette butts and tire treads material categories were the majority of other material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other. Cigarette butts and tire treads are excluded from the other count above.

[11] The estimates provided in this study are point-in-time estimates of litter on the ground in the Continental United States and not an annual estimate. As litter gets picked up and/or washes away, it may be replaced by newly littered items. As such, any annual estimate of litter would be significantly higher than 49.6 billion pieces of litter.

[12] See Section 2 for definition of roadways and waterways.

[13] Litter quantities in tables are rounded to nearest hundred and, consequently, the sum of individual items may not equal the totals reported.

Table 3-2: Aggregate Count of Litter per Mile, Roadway and Waterway

	Roadway	Waterway	Total
Total Litter Items	23,678,026,500	25,895,018,900	49,573,045,400
Miles[1]	8,287,647	10,740,317	19,027,963
Litter Items Per Mile	**2,857**	**2,411**	**2,605**

1. Source: Roadway distance based on Federal Highway Administration (FHWA) Highway Performance Monitoring System (HPMS). Waterway distance based on U.S. Geological Survey (USGS) National Hydrography Dataset Plus High Resolution (NHDPlus HR).

Table 3-3: Aggregate Count of Litter per Capita, Roadway and Waterway

	Roadway	Waterway	Total
Total Litter Items	23,678,026,500	25,895,018,900	49,573,045,400
Population[1]	325,386,357	325,386,357	325,386,357
Litter Items Per Capita	**73**	**80**	**152**

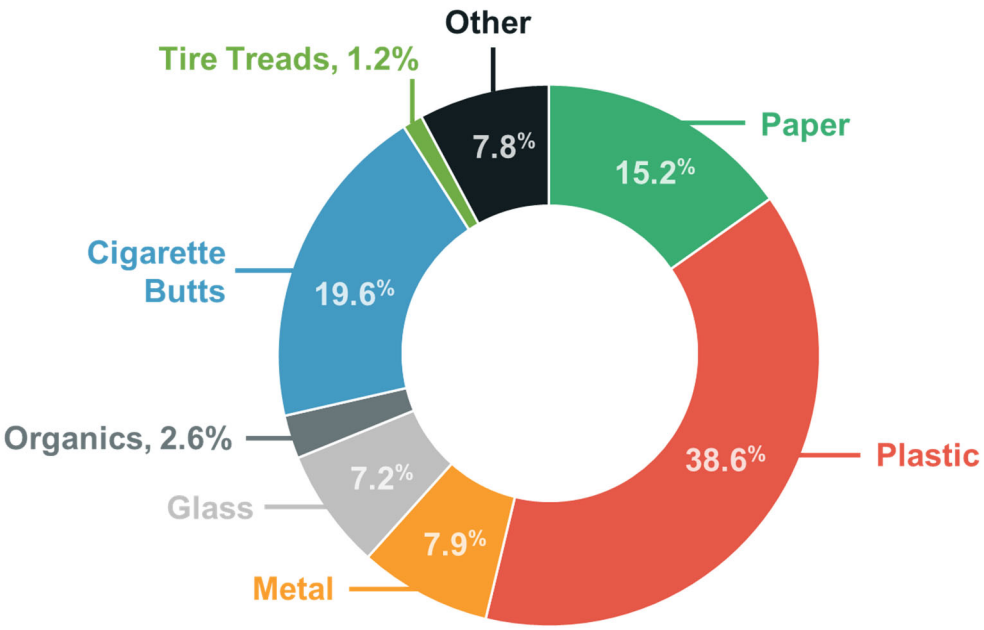
1. Source: U.S. Census 2020

Section 3 provides a comprehensive understanding of the quantity and composition of litter on United States roadways and waterways. A detailed analysis of roadway and waterway litter survey results is presented in Section 4 and 5, respectively. An evaluation of litter-by-litter research interest (i.e., fast-food products, plastic bags, and personal protective equipment (PPE)) is discussed in Section 6.

3.1 AGGREGATE QUANTITY AND COMPOSITION

Of the total litter along United States roadways and waterways, 19.2 billion (38.6 percent) were pieces of plastic followed by 9.7 billion (19.6 percent) cigarette butts. Figure 3-1 presents the aggregate composition of litter items by material group.

Figure 3-1: Aggregate Composition of Litter by Count, Roadway and Waterway



* Cigarette butts and tire treads were the majority of other litter material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other for above figure.

In addition to being the most littered items when combining roadways and waterways, plastic and cigarette butts were determined to be the most prevalent littered material types on both roadways and waterways when examined separately. Proportionally, plastics accounted for more littered materials along waterways than roadways (42.2 percent and 34.7 percent along waterways and roadways respectively). Cigarette butts accounted for proportionately more littered items in roadways than waterways (24.1 percent and 15.4 percent in roadways and waterways respectively). Faster degrading materials such as paper and cigarette butts composed a smaller percentage of litter along waterways than they did along roadways while metal and glass composed a larger percentage. Figures 3-2 and 3-3 presents the composition of litter items on roadways and waterways by item and material group.

Figure 3-2: Aggregate Composition of Litter by Count, Roadway

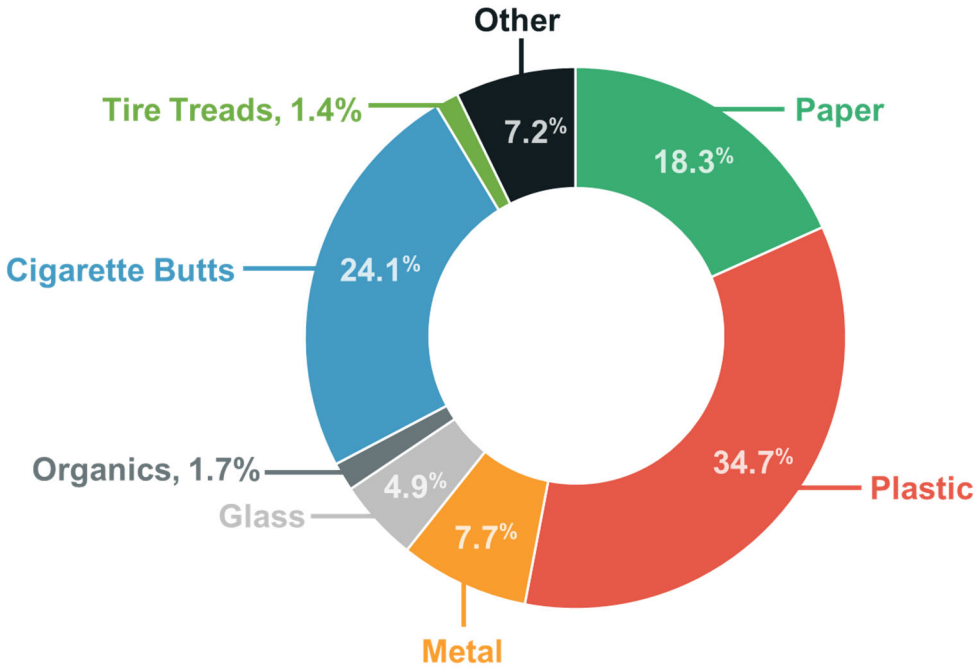
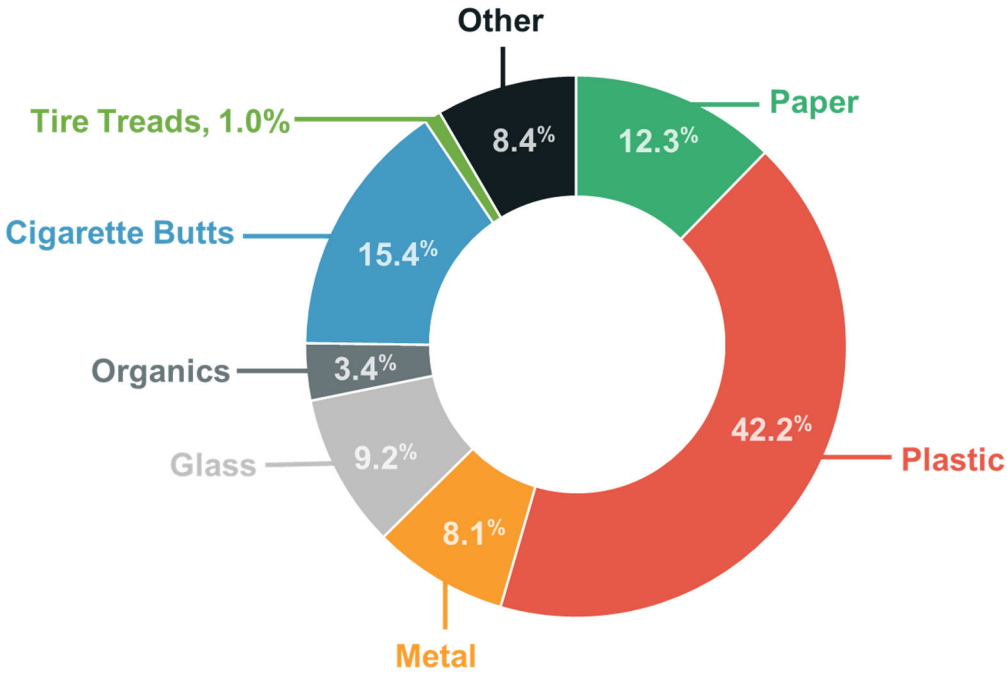


Figure 3-3: Aggregate Composition of Litter by Count, Waterway



* Cigarette butts and tire treads were the majority of other litter material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other for above figure.

Table 3-4 presents the composition of litter by roadways, waterways, and aggregate by material groups and the eighty-six product material categories that were tracked in the Study.

Table 3-4: Aggregate Composition of Litter by Count, Roadway and Waterway

	Categories	Roadway	Waterway	Total Count	Percent of Total
Paper	Fast-food paper bags	57,104,900	25,748,400	82,853,200	0.2%
	Fast-food paper cups	46,086,000	57,928,600	104,014,600	0.2%
	Other paper fast-food service items	244,792,500	188,640,800	433,433,300	0.9%
	Cardboard	185,754,400	47,290,400	233,044,800	0.5%
	Kraft bags	6,920,200	3,475,000	10,395,200	0.0%
	Receipts	89,817,700	74,921,200	164,738,800	0.3%
	Political signs	122,400	21,500	144,000	0.0%
	Other advertising signs	9,406,600	119,000	9,525,600	0.0%
	Office paper/ mail	98,398,500	210,144,800	308,543,300	0.6%
	Newspaper/ inserts	249,109,000	16,584,300	265,693,300	0.5%
	Magazines	2,399,100	398,300	2,797,500	0.0%
	Books	734,800	-	734,800	0.0%
	Aseptic/ gable top containers	3,747,500	29,400	3,777,000	0.0%
	Beverage carriers/ cartons	22,059,200	4,189,500	26,248,700	0.1%
	Paper home food packaging	35,608,400	72,425,100	108,033,500	0.2%
	Other paper	3,283,630,000	2,477,113,800	5,760,743,700	11.6%
	Subtotal Paper	**4,335,691,200**	**3,179,030,200**	**7,514,721,300**	**15.2%**
Plastic	Soda	56,981,800	32,781,400	89,763,200	0.2%
	Single-serve wine & liquor	244,512,800	80,963,800	325,476,500	0.7%
	Other wine & liquor	4,976,300	388,500	5,364,900	0.0%
	Sports & energy drinks	42,393,900	41,150,000	83,543,900	0.2%
	Juice	16,786,800	2,306,000	19,092,800	0.0%
	Tea & coffee	4,695,900	3,514,800	8,210,600	0.0%
	Still water	98,475,000	176,897,600	275,372,600	0.6%
	Other water	18,068,700	3,099,400	21,168,100	0.0%
	Other plastic beverage bottles	31,364,600	18,632,900	49,997,500	0.1%
	Fast food plastic cups	86,919,000	110,411,000	197,330,100	0.4%
	Plastic straws	135,613,600	85,891,800	221,505,400	0.4%
	Other beverage packaging	206,239,700	380,836,300	587,076,000	1.2%
	Plastic trash bags	4,069,600	13,342,700	17,412,400	0.0%
	Other plastic bags	125,201,000	182,164,600	307,365,600	0.6%
	Food packaging film	1,424,362,100	1,150,247,600	2,574,609,700	5.2%
	Other film	1,173,815,800	1,665,670,900	2,839,486,700	5.7%
	Plastic food service items	68,064,200	127,934,000	195,998,200	0.4%
	Expanded polystyrene food service items	184,746,400	398,489,200	583,235,600	1.2%
	Other expanded polystyrene	319,254,000	1,037,210,400	1,356,464,400	2.7%
	Other plastic food packaging	252,332,300	397,355,600	649,688,000	1.3%
	Other plastic	3,728,975,800	5,022,618,800	8,751,594,600	17.7%
	Subtotal Plastic	**8,227,849,400**	**10,931,907,400**	**19,159,756,800**	**38.6%**

Table 3-4: Aggregate Composition of Litter by Count, Roadway and Waterway

	Categories	Roadway	Waterway	Total Count	Percent of Total
Metal	Beer	401,334,300	246,614,200	647,948,500	1.3%
	Soda	143,062,500	93,814,400	236,876,900	0.5%
	Sports & energy drinks	38,382,300	23,853,900	62,236,200	0.1%
	Juice	6,658,300	21,500	6,679,800	0.0%
	Tea & coffee	2,998,200	6,001,100	8,999,400	0.0%
	Other metal beverage bottles	100,263,100	80,905,300	181,168,300	0.4%
	Other beverage packaging	178,007,900	203,783,800	381,791,700	0.8%
	Still water	365,200	-	365,200	0.0%
	Other water	3,148,000	51,000	3,199,000	0.0%
	Other metal	939,223,800	1,443,077,800	2,382,301,500	4.8%
	Subtotal Metal	**1,813,443,600**	**2,098,123,100**	**3,911,566,700**	**7.9%**
Glass	Beer	126,131,000	353,533,400	479,664,400	1.0%
	Soda	6,061,600	10,114,500	16,176,100	0.0%
	Single-serve wine & liquor	30,825,500	6,959,100	37,784,500	0.1%
	Other wine & liquor	8,837,200	22,090,900	30,928,000	0.1%
	Sports & energy drinks	42,400	1,044,300	1,086,700	0.0%
	Juice	662,500	21,500	684,100	0.0%
	Tea & coffee	1,073,300	243,700	1,317,000	0.0%
	Still water	-	-	-	0.0%
	Other water	236,600	-	236,600	0.0%
	Other glass beverage bottles	39,345,300	130,116,100	169,461,400	0.3%
	Broken glass or ceramic	855,631,400	1,515,466,900	2,371,098,300	4.8%
	Other glass food packaging	1,966,100	26,444,700	28,410,800	0.1%
	Other glass	100,646,100	324,204,000	424,850,100	0.9%
	Subtotal Glass	**1,171,458,900**	**2,390,239,000**	**3,561,698,000**	**7.2%**
Organics	Pet waste	65,963,600	90,467,200	156,430,800	0.3%
	Human waste	175,000	5,852,200	6,027,200	0.0%
	Confection	10,312,400	67,563,400	77,875,700	0.2%
	Other food waste	281,227,000	647,520,300	928,747,300	1.9%
	Other organics	39,458,300	60,267,700	99,726,000	0.2%
	Subtotal Organics	**397,136,200**	**871,670,800**	**1,268,807,000**	**2.6%**
Other	Medical waste	2,486,200	3,846,500	6,332,700	0.0%
	PPE gloves	48,098,900	101,180,000	149,279,000	0.3%
	PPE masks	31,615,000	26,248,300	57,863,200	0.1%
	Hazardous waste	546,300	-	546,300	0.0%
	Vehicle debris	339,971,000	356,626,500	696,597,400	1.4%
	Tires	64,805,700	5,376,300	70,182,000	0.1%
	Tire tread	338,714,300	253,978,800	592,693,200	1.2%
	Construction and demolition debris	368,440,300	163,595,500	532,035,800	1.1%
	Textiles/small rugs	362,780,500	496,451,800	859,232,300	1.7%
	Bulky items	425,300	388,300	813,600	0.0%
	Cigarette butts	5,703,542,200	3,994,110,000	9,697,652,100	19.6%
	Electronic cigarettes	865,200	29,400	894,700	0.0%
	Other tobacco-related products & packaging	241,412,900	150,582,300	391,995,200	0.8%
	Toiletries/personal hygiene products	25,186,600	83,394,500	108,581,200	0.2%

Table 3-4: Aggregate Composition of Litter by Count, Roadway and Waterway

	Categories	Roadway	Waterway	Total Count	Percent of Total
	Entertainment items	216,600	2,329,000	2,545,600	0.0%
Other	Flat screen TV and computer monitors	-	-	-	0.0%
	CRT televisions and computer monitors	-	-	-	0.0%
	Portable electronics	836,800	-	836,800	0.0%
	Electronic cords	11,327,000	68,955,200	80,282,200	0.2%
	Other electronics	20,928,700	28,909,600	49,838,200	0.1%
	Other items	170,247,600	688,046,500	858,294,200	1.7%
	Subtotal Other	**7,732,447,200**	**6,424,048,400**	**14,156,495,600**	**28.6%**
Total		**23,678,026,500**	**25,895,018,900**	**49,573,045,400**	**100.0%**

The vast majority of litter (43.6 billion pieces or 87.9 percent) across United States roadways and waterways collectively were four inches or smaller in size. However, larger, and often more visible, littered items still represented a significant quantity (6.0 billion pieces or 12.1 percent) of litter. As shown in Figures 3-4 and 3-5, plastic composed much of both larger and smaller litter (47.6 and 37.4 percent respectively). Table 3-5 provides a detailed breakdown of larger versus smaller littered items by material category. In doing so, it shows many of the larger littered items, which often are the face of public litter, were overwhelmed in number by smaller items. For instance, there are over two and one-half times as much food packaging film litter (such as snack bags and wrappers) as there are littered plastic beverage containers, but 85 percent of the food packaging film is smaller and less perceptible to the human eye than the beverage containers.[14]

[14] When examining the negative visual impact that litter has on communities and the work needed to abate the litter, counts are the relevant metric. In this example of two different types and sizes of littered items (food packaging film and beverage containers), both need to be picked up or cleaned in another method (e.g., street sweeping). For other impacts of litter (e.g., how it degrades in the environment), the mass of the litter becomes an important metric.

Figure 3-4: Composition of 4-inch-plus Litter by Count, Roadways and Waterways

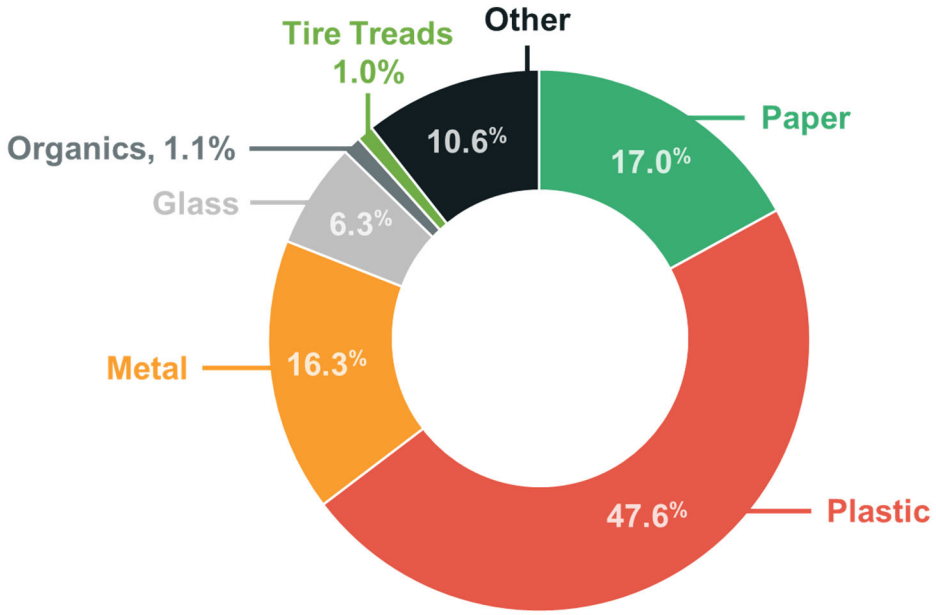
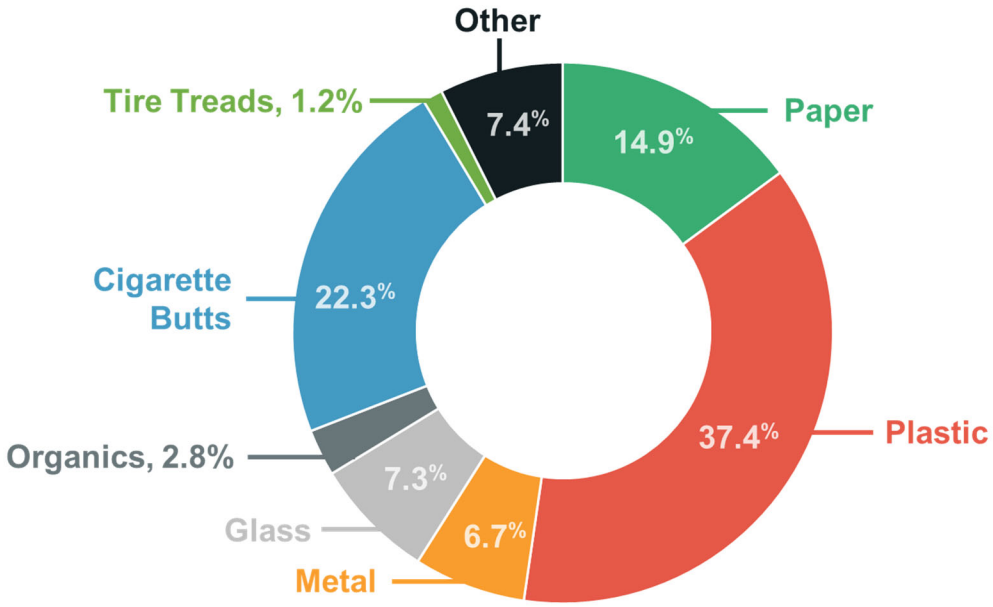


Figure 3-5: Composition of 4-inch-less Litter by Count, Roadways and Waterways



* Cigarette butts and tire treads were the majority of other litter material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other for above figure.

Table 3-5: Aggregate Composition of Litter by Size and Count, Roadway and Waterway

Groups	Categories	4-inch plus	4-inch less	Total Count	Percent of Total
Paper	Fast-food paper bags	37,885,400	44,967,800	82,853,200	0.2%
	Fast-food paper cups	102,561,700	1,453,000	104,014,600	0.2%
	Other paper fast-food service items	117,269,300	316,164,000	433,433,300	0.9%
	Cardboard	78,857,700	154,187,100	233,044,800	0.5%
	Kraft bags	5,663,300	4,731,900	10,395,200	0.0%
	Receipts	27,775,200	136,963,600	164,738,800	0.3%
	Political signs	144,000	-	144,000	0.0%
	Other advertising signs	5,264,500	4,261,200	9,525,600	0.0%
	Office paper/ mail	23,714,700	284,828,600	308,543,300	0.6%
	Newspaper/ inserts	31,417,400	234,275,900	265,693,300	0.5%
	Magazines	1,760,900	1,036,600	2,797,500	0.0%
	Books	734,800	-	734,800	0.0%
	Aseptic/ gable top containers	3,777,000	-	3,777,000	0.0%
	Beverage carriers/ cartons	5,365,600	20,883,100	26,248,700	0.1%
	Paper home food packaging	18,571,900	89,461,600	108,033,500	0.2%
	Other paper	561,053,300	5,199,690,400	5,760,743,700	11.6%
	Subtotal Paper	**1,021,816,500**	**6,492,904,800**	**7,514,721,300**	**15.2%**
Plastic	Soda	89,763,200	-	89,763,200	0.2%
	Single-serve wine & liquor	38,904,700	286,571,800	325,476,500	0.7%
	Other wine & liquor	5,364,900	-	5,364,900	0.0%
	Sports & energy drinks	81,416,300	2,127,600	83,543,900	0.2%
	Juice	19,092,800	-	19,092,800	0.0%
	Tea & coffee	8,210,600	-	8,210,600	0.0%
	Still water	221,465,600	53,907,100	275,372,600	0.6%
	Other water	18,176,700	2,991,400	21,168,100	0.0%
	Other plastic beverage bottles	38,906,500	11,091,100	49,997,500	0.1%
	Fast food plastic cups	152,886,700	44,443,400	197,330,100	0.4%
	Plastic straws	143,324,700	78,180,800	221,505,400	0.4%
	Other beverage packaging	84,501,400	502,574,600	587,076,000	1.2%
	Plastic trash bags	12,481,700	4,930,700	17,412,400	0.0%
	Other plastic bags	214,254,000	93,111,600	307,365,600	0.6%
	Food packaging film	380,645,900	2,193,963,800	2,574,609,700	5.2%
	Other film	337,180,900	2,502,305,700	2,839,486,700	5.7%
	Plastic food service items	45,743,000	150,255,200	195,998,200	0.4%
	Expanded polystyrene food service items	118,537,200	464,698,400	583,235,600	1.2%
	Other expanded polystyrene	83,537,600	1,272,926,800	1,356,464,400	2.7%
	Other plastic food packaging	75,517,100	574,170,900	649,688,000	1.3%
	Other plastic	692,546,000	8,059,048,500	8,751,594,600	17.7%
	Subtotal Plastic	**2,862,457,400**	**16,297,299,400**	**19,159,756,800**	**38.6%**

Table 3-5: Aggregate Composition of Litter by Size and Count, Roadway and Waterway

Groups	Categories	4-inch plus	4-inch less	Total Count	Percent of Total
Metal	Beer	493,804,900	154,143,600	647,948,500	1.3%
	Soda	174,837,600	62,039,400	236,876,900	0.5%
	Sports & energy drinks	33,546,000	28,690,200	62,236,200	0.1%
	Juice	6,679,800	-	6,679,800	0.0%
	Tea & coffee	8,410,400	589,000	8,999,400	0.0%
	Other metal beverage bottles	51,819,800	129,348,600	181,168,300	0.4%
	Other beverage packaging	23,632,900	358,158,700	381,791,700	0.8%
	Still water	365,200	-	365,200	0.0%
	Other water	3,199,000	-	3,199,000	0.0%
	Other metal	185,276,100	2,197,025,400	2,382,301,500	4.8%
	Subtotal Metal	**981,571,800**	**2,929,994,800**	**3,911,566,700**	**7.9%**
Glass	Beer	167,894,200	311,770,200	479,664,400	1.0%
	Soda	16,176,100	-	16,176,100	0.0%
	Single-serve wine & liquor	8,125,100	29,659,400	37,784,500	0.1%
	Other wine & liquor	30,402,600	525,400	30,928,000	0.1%
	Sports & energy drinks	1,086,700	-	1,086,700	0.0%
	Juice	684,100	-	684,100	0.0%
	Tea & coffee	1,317,000	-	1,317,000	0.0%
	Still water	-	-	-	0.0%
	Other water	236,600	-	236,600	0.0%
	Other glass beverage bottles	16,641,400	152,820,000	169,461,400	0.3%
	Broken glass or ceramic	73,057,800	2,298,040,400	2,371,098,300	4.8%
	Other glass food packaging	28,410,800	-	28,410,800	0.1%
	Other glass	35,474,800	389,375,300	424,850,100	0.9%
	Subtotal Glass	**379,507,100**	**3,182,190,900**	**3,561,698,000**	**7.2%**
Organics	Pet waste	14,965,000	141,465,800	156,430,800	0.3%
	Human waste	3,587,800	2,439,400	6,027,200	0.0%
	Confection	-	77,875,700	77,875,700	0.2%
	Other food waste	21,120,000	907,627,200	928,747,300	1.9%
	Other organics	24,229,300	75,496,700	99,726,000	0.2%
	Subtotal Organics	**63,902,200**	**1,204,904,800**	**1,268,807,000**	**2.6%**
Other	Medical waste	5,130,700	1,202,100	6,332,700	0.0%
	PPE gloves	57,774,500	91,504,500	149,279,000	0.3%
	PPE masks	31,726,300	26,136,900	57,863,200	0.1%
	Hazardous waste	546,300	-	546,300	0.0%
	Vehicle debris	70,571,300	626,026,100	696,597,400	1.4%
	Tires	8,822,000	61,360,000	70,182,000	0.1%
	Tire tread	61,149,500	531,543,700	592,693,200	1.2%
	Construction and demolition debris	70,803,700	461,232,100	532,035,800	1.1%
	Textiles/ small rugs	108,250,500	750,981,800	859,232,300	1.7%
	Bulky items	813,600	-	813,600	0.0%
	Cigarette butts	1,124,300	9,696,527,800	9,697,652,100	19.6%
	Electronic cigarettes	894,700	-	894,700	0.0%
	Other tobacco-related products & packaging	97,852,100	294,143,100	391,995,200	0.8%
	Toiletries/ personal hygiene products	106,527,200	2,054,000	108,581,200	0.2%
	Entertainment items	1,944,500	601,000	2,545,600	0.0%
	Flat screen TV and computer monitors	-	-	-	0.0%

Table 3-5: Aggregate Composition of Litter by Size and Count, Roadway and Waterway

Groups	Categories	4-inch plus	4-inch less	Total Count	Percent of Total
Other	CRT televisions and computer monitors	-	-	-	0.0%
	Portable electronics	836,800	-	836,800	0.0%
	Electronic cords	8,098,200	72,184,000	80,282,200	0.2%
	Other electronics	9,792,900	40,045,300	49,838,200	0.1%
	Other items	58,211,200	800,083,000	858,294,200	1.7%
	Subtotal Other	**700,870,300**	**13,455,625,300**	**14,156,495,600**	**28.6%**
Total		**6,010,125,400**	**43,562,919,900**	**49,573,045,400**	**100.0%**

3.2 QUANTITY AND COMPOSITION BY REGION TYPES

The quantity and composition of litter varies by region types. This section provides an overview of the quantity and composition of litter in urban versus rural and bottle-bill versus non-bottle bill regions.[15]

Urban and Rural

Most of litter discarded near United States roadways and waterways were in rural areas (87.1 percent). However, when accounting for the higher amount of roadway and waterway miles in rural areas, urban roadways and waterways had significantly more littered items per mile than rural roadways and waterways. Tables 3-6 and 3-7 present the estimated count of roadway and waterway litter in aggregate and per mile by urban and rural region. Sections 4 and 5 provide additional detail as to the quantity and composition of litter along roadways and waterways by urban and rural region.

Table 3-6: Aggregate Count of Litter by Material Group, Urban and Rural

Material Group	Urban Litter Items	Rural Litter Items	Total Litter Items
Paper	2,050,100,500	5,464,620,800	7,514,721,300
Plastic	3,525,595,400	15,634,161,400	19,159,756,800
Metal	627,559,900	3,284,006,800	3,911,566,700
Glass	565,770,300	2,995,927,600	3,561,698,000
Organics	100,864,500	1,167,942,500	1,268,807,000
Cigarette butts[1]	3,615,579,500	6,082,072,600	9,697,652,100
Tire treads[1]	133,517,800	459,175,400	592,693,200
Other	737,780,000	3,128,370,400	3,866,150,300
Total	**11,356,767,800**	**38,216,277,500**	**49,573,045,400**

1. Cigarette butts and tire treads material categories were the majority of other material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other.

[15] See Section 2 for definition of rural and urban and bottle-bill versus non-bottle bill.

Table 3-7: Aggregate Count of Litter per Mile, Urban and Rural

	Roadway		Waterway	
	Urban	**Rural**	**Urban**	**Rural**
Total Litter Items	10,204,225,600	13,473,800,900	1,152,542,300	24,742,476,600
Miles[1]	2,425,331	5,862,316	278,991	10,461,325
Litter Items Per Mile	**4,207**	**2,298**	**4,131**	**2,365**

1. Source: Roadway distance based on Federal Highway Administration (FHWA) Highway Performance Monitoring System (HPMS). Waterway distance based on U.S. Geological Survey (USGS) National Hydrography Dataset Plus High Resolution (NHDPlus HR).

Consistent with the overall national estimates, plastic and cigarette butts were the most prevalent littered items in both urban and rural regions. However, plastics accounted for proportionately more littered items in rural regions than urban regions (40.9 percent and 31.0 percent in rural and urban regions respectively). As a proportion, cigarette butts accounted for substantially more littered items in urban than rural regions (31.8 percent and 15.9 percent in urban and rural regions respectively). Figures 3-6 and 3-7 presents the composition of litter items by material group for urban and rural regions.

Figure 3-6: Aggregate Composition of Litter by Count, Urban

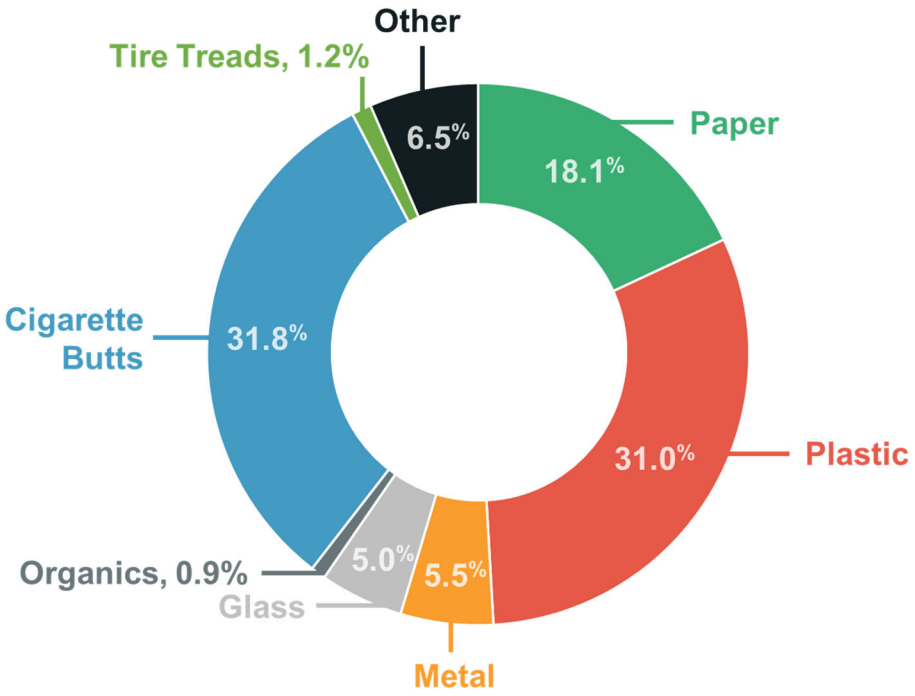
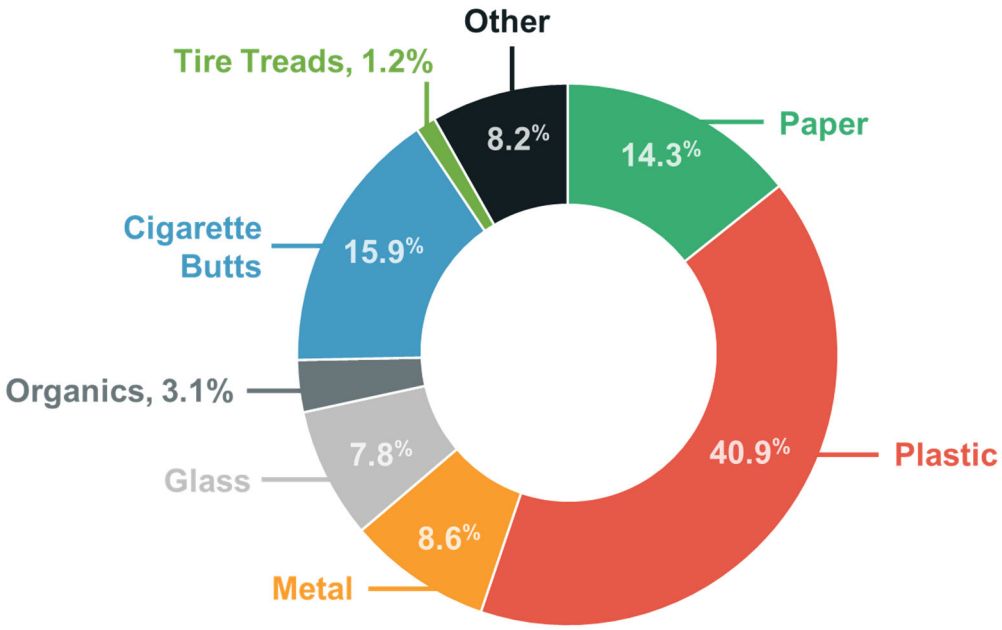


Figure 3-7: Aggregate Composition of Litter by Count, Rural



* Cigarette butts and tire treads were the majority of other litter material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other for above figure.

Bottle Bill and Non-Bottle Bill

Bottle bills, or beverage container deposit laws, have been enacted in 10 states. Bottle bills require the consumer to pay a deposit upon purchase of a beverage and the consumer receives a refund when the beverage container is returned for recycling. Bottle bill regulations vary from state to state though all bottle bills cover soda and beer containers. Many bottle bills cover other beverage containers shown in the tables and figures in this subsection. For this national Study, the products listed in Table 3-8 are considered "beverage containers" and "deposit material" while items not included in this list are considered "non-deposit material."

This Study estimates nearly 2.4 billion beverage containers were improperly discarded near United States roadways and waterways, which accounts for approximately 4.8 percent of all litter in the United States. Nearly half (47.6 percent) of all beverage container litter were beer cans and bottles. The next largest contributor to beverage container litter was single-serve wine and liquor (15.3 percent). Examined as individual product categories, all non-alcoholic beverage containers comprised a smaller amount of the national litter than beer and single-serve wine and liquor. Litter from non-alcoholic beverage containers (e.g., soda, sports drinks, and water) equate to approximately one-half of the alcoholic beverage containers that were found littered.

On a per capita basis, there was substantially less deposit-material litter in bottle bill states than in non-bottle bill states (four and eight litter items per capita in bottle bill and non-bottle bill states respectively). When we examine differences between other littered items (non-deposit) between states with bottle deposit legislation and those without such legislation, we find that there was also less non-deposit litter per capita in bottle bill states (111 littered items per capita) than in non-bottle bill states (158 littered items per capita). However, the difference between per capita litter of these non-deposit items in non-bottle bill versus bottle bill states was significantly less (42 percent greater [158:111]) than it was for deposit items (105 percent greater [8.45:4.12]).

Tables 3-8 and 3-9 present the estimated count of roadway and waterway litter of the types of items covered in deposit laws in aggregate and per capita by bottle bill and non-bottle bill region.[16]

[16] See Sections 4 and 5 for litter per mile measures.

Table 3-8: Aggregate Count of Roadway Deposit Material Litter by Product Type, Bottle Bill and Non-Bottle Bill

Product Type	Bottle Bill	Non-Bottle Bill	Total Bottles
Soda	37,753,100	305,063,200	342,816,300
Beer	181,741,500	945,871,400	1,127,612,900
Single-serve wine & liquor	67,205,900	296,055,200	363,261,100
Other wine & liquor	3,069,800	33,223,200	36,293,000
Sports & energy drinks	16,034,000	130,832,900	146,866,900
Still water	42,070,100	233,667,700	275,737,800
Other water	5,359,200	19,244,500	24,603,700
Other plastic beverage bottles	12,472,200	37,525,300	49,997,500
Total	**365,705,800**	**2,001,483,400**	**2,367,189,200**

Table 3-9: Aggregate Count of Roadway Litter per Capita, Bottle Bill and Non-Bottle Bill

	Bottle Bill	Non-Bottle Bill	Total
Deposit Material Litter Items	365,705,800	2,001,483,400	2,367,189,200
Non-deposit Material Litter Items	9,867,790,500	37,338,065,700	47,205,856,200
Total Litter Items	10,233,496,300	39,339,549,100	49,573,045,400
Population[1]	88,751,439	236,634,918	325,386,357
Deposit Material Litter Items Per Capita	**4**	**8**	**7**
Non-deposit Material Litter Items Per Capita	**111**	**158**	**145**
Litter Items Per Capita	**115**	**166**	**152**

1. Source: U.S. Census 2020

Proportionally, soda containers accounted for slightly more (4.9 percentage points (pp)) littered containers in non-bottle bill states than in states with bottle bills. In contrast, beer and single-serve wine and liquor accounted for slightly more containers in bottle bill states (2.4 and 3.6 pp more respectively). Figures 3-8 and 3-9 presents the composition of litter items by material group for bottle bill and non-bottle bill states.

Figure 3-8: Aggregate Composition of Deposit Material Littered by Count, Bottle Bill State

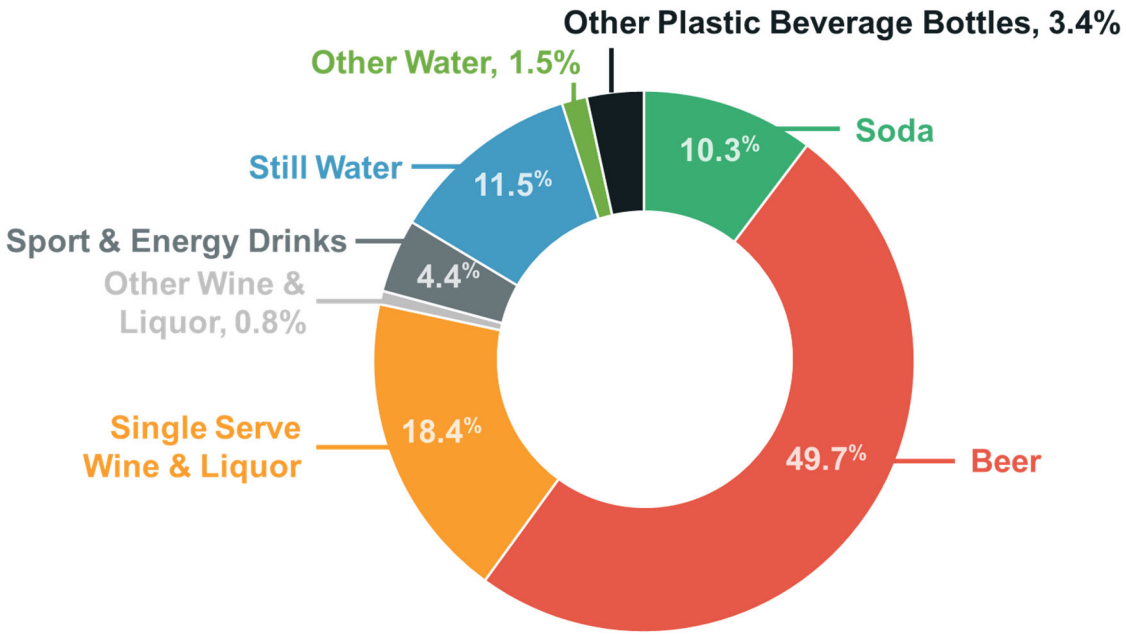


Figure 3-9: Aggregate Composition of Deposit Material Littered by Count, Non-Bottle Bill State

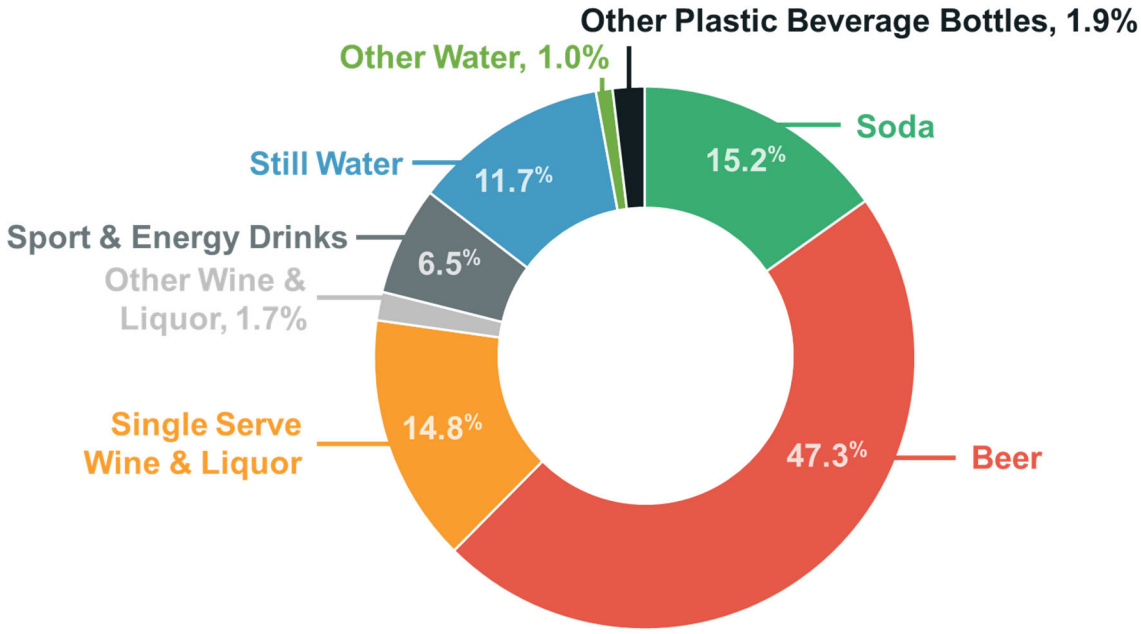


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Table 3-10 presents the composition of litter by bottle bill state, non-bottle bill state and aggregate by deposit and non-deposit material littered.

Table 3-10: Aggregate Composition of Deposit and Non-Deposit Material Category by Count, Bottle Bill and Non-Bottle Bill

	Groups	Material Categories	Bottle Bill	Non-Bottle Bill	Total Count	Percent of Total
Deposit Material	**Plastic**	Soda	4,940,200	84,823,000	89,763,200	0.2%
		Single-serve wine & liquor	49,343,400	276,133,200	325,476,500	0.7%
		Other wine & liquor	326,600	5,038,300	5,364,900	0.0%
		Sports & energy drinks	10,303,700	73,240,200	83,543,900	0.2%
		Still water	42,059,800	233,312,800	275,372,600	0.6%
		Other water	4,037,700	17,130,400	21,168,100	0.0%
		Other plastic beverage bottles	12,472,200	37,525,300	49,997,500	0.1%
		Subtotal Plastic	**123,483,600**	**727,203,200**	**850,686,800**	**1.7%**
	Metal	Beer	78,183,000	569,765,500	647,948,500	1.3%
		Soda	32,104,200	204,772,700	236,876,900	0.5%
		Sports & energy drinks	5,360,200	56,876,100	62,236,200	0.1%
		Still water	10,300	354,900	365,200	0.0%
		Other water	1,249,700	1,949,300	3,199,000	0.0%
		Subtotal Metal	**116,907,400**	**833,718,500**	**950,625,900**	**1.9%**
	Glass	Beer	103,558,500	376,105,900	479,664,400	1.0%
		Soda	708,700	15,467,500	16,176,100	0.0%
		Single-serve wine & liquor	17,862,500	19,922,000	37,784,500	0.1%
		Other wine & liquor	2,743,200	28,184,900	30,928,000	0.1%
		Sports & energy drinks	370,100	716,600	1,086,700	0.0%
		Still water	-	-	-	0.0%
		Other water	71,800	164,800	236,600	0.0%
		Subtotal Glass	**125,314,800**	**440,561,700**	**565,876,500**	**1.1%**
Non- Deposit Material	**Paper**	Fast-food paper bags	13,495,100	69,358,100	82,853,200	0.2%
		Fast-food paper cups	24,757,500	79,257,100	104,014,600	0.2%
		Other paper fast food service	92,235,700	341,197,600	433,433,300	0.9%
		Cardboard	61,179,700	171,865,100	233,044,800	0.5%
		Kraft bags	2,135,400	8,259,700	10,395,200	0.0%
		Receipts	51,964,000	112,774,800	164,738,800	0.3%
		Political signs	81,400	62,600	144,000	0.0%
		Other advertising signs	3,198,700	6,327,000	9,525,600	0.0%
		Office paper/ mail	77,226,100	231,317,200	308,543,300	0.6%
		Newspaper/ inserts	35,535,200	230,158,200	265,693,300	0.5%
		Magazines	1,309,800	1,487,700	2,797,500	0.0%
		Books	251,200	483,600	734,800	0.0%
		Aseptic/ gable top containers	624,800	3,152,200	3,777,000	0.0%
		Beverage carriers/ cartons	12,292,200	13,956,400	26,248,700	0.1%
		Paper home food packaging	11,909,800	96,123,600	108,033,500	0.2%
		Other paper	1,053,098,600	4,707,645,200	5,760,743,700	11.6%
		Subtotal Paper	**1,441,295,200**	**6,073,426,100**	**7,514,721,300**	**15.2%**

Table 3-10: Aggregate Composition of Deposit and Non-Deposit Material Category by Count, Bottle Bill and Non-Bottle Bill

	Groups	Material Categories	Bottle Bill	Non-Bottle Bill	Total Count	Percent of Total
	Plastic	Juice	3,560,200	15,532,600	19,092,800	0.0%
		Tea & coffee	2,416,600	5,794,000	8,210,600	0.0%
		Fast-food plastic cups	38,805,500	158,524,500	197,330,100	0.4%
		Plastic straws	45,875,900	175,629,600	221,505,400	0.4%
		Other beverage packaging	154,295,200	432,780,800	587,076,000	1.2%
		Plastic trash bags	5,906,400	11,506,000	17,412,400	0.0%
		Other plastic bags	66,102,400	241,263,200	307,365,600	0.6%
		Food packaging film	396,979,800	2,177,629,900	2,574,609,700	5.2%
		Other film	492,854,300	2,346,632,300	2,839,486,700	5.7%
		Plastic food service items	40,637,400	155,360,800	195,998,200	0.4%
		Expanded polystyrene food	46,042,000	537,193,700	583,235,600	1.2%
		Other expanded polystyrene	174,773,200	1,181,691,200	1,356,464,400	2.7%
		Other plastic food packaging	138,148,300	511,539,700	649,688,000	1.3%
		Other plastic	1,968,698,300	6,782,896,300	8,751,594,600	17.7%
		Subtotal Plastic	**3,575,095,500**	**14,733,974,600**	**18,309,070,100**	**36.9%**
	Metal	Juice	1,048,400	5,631,400	6,679,800	0.0%
		Tea & coffee	1,301,300	7,698,100	8,999,400	0.0%
		Other metal beverage bottles	35,572,400	145,595,900	181,168,300	0.4%
		Other beverage packaging	82,134,100	299,657,500	381,791,700	0.8%
		Other metal	403,124,200	1,979,177,400	2,382,301,500	4.8%
		Subtotal Metal	**523,180,400**	**2,437,760,300**	**2,960,940,700**	**6.0%**
	Glass	Juice	99,900	584,200	684,100	0.0%
		Tea & coffee	228,700	1,088,300	1,317,000	0.0%
		Other glass beverage bottles	39,360,400	130,101,000	169,461,400	0.3%
		Broken glass or ceramic	572,417,800	1,798,680,500	2,371,098,300	4.8%
		Other glass food packaging	139,200	28,271,600	28,410,800	0.1%
		Other glass	129,318,300	295,531,800	424,850,100	0.9%
		Subtotal Glass	**741,564,300**	**2,254,257,400**	**2,995,821,700**	**6.0%**
	Organics	Pet waste	44,612,400	111,818,400	156,430,800	0.3%
		Human waste	1,753,600	4,273,600	6,027,200	0.0%
		Confection	5,384,800	72,490,900	77,875,700	0.2%
		Other food waste	245,381,500	683,365,800	928,747,300	1.9%
		Other organics	31,539,300	68,186,700	99,726,000	0.2%
		Subtotal Organics	**328,671,600**	**940,135,400**	**1,268,807,000**	**2.6%**
	Other	Medical waste	408,600	5,924,200	6,332,700	0.0%
		PPE gloves	9,828,800	139,450,200	149,279,000	0.3%
		PPE masks	16,885,000	40,978,300	57,863,200	0.1%
		Hazardous waste	149,500	396,800	546,300	0.0%
		Vehicle debris	133,774,600	562,822,900	696,597,400	1.4%
		Tires	10,851,600	59,330,300	70,182,000	0.1%
		Tire tread	153,771,200	438,922,000	592,693,200	1.2%
		Construction and demolition	119,319,700	412,716,100	532,035,800	1.1%
		Textiles/small rugs	212,636,200	646,596,100	859,232,300	1.7%
		Bulky items	445,000	368,600	813,600	0.0%
		Cigarette butts	2,289,424,100	7,408,228,100	9,697,652,100	19.6%

Table 3-10: Aggregate Composition of Deposit and Non-Deposit Material Category by Count, Bottle Bill and Non-Bottle Bill

	Groups	Material Categories	Bottle Bill	Non-Bottle Bill	Total Count	Percent of Total
		Electronic cigarettes	289,100	605,600	894,700	0.0%
		Other tobacco-related products	72,485,400	319,509,800	391,995,200	0.8%
		Toiletries/personal hygiene	30,518,300	78,062,900	108,581,200	0.2%
		Entertainment items	827,500	1,718,100	2,545,600	0.0%
		Flat screen TV and computer	-	-	-	0.0%
		CRT televisions and computer	-	-	-	0.0%
		Portable electronics	264,200	572,600	836,800	0.0%
		Electronic cords	25,483,000	54,799,200	80,282,200	0.2%
		Other electronics	10,746,200	39,092,000	49,838,200	0.1%
		Other items	169,875,600	688,418,600	858,294,200	1.7%
		Subtotal Other	**3,257,983,600**	**10,898,512,400**	**14,156,495,600**	**28.6%**
	Total		**10,233,496,400**	**39,339,549,600**	**49,573,045,600**	**100.0%**

Metal beverage containers composed the plurality of beverage containers littered (950.6 million or 40.2 percent) across United States roadways and waterways collectively, but plastic and glass containers represented a significant quantity (850.7 million and 565.9 million respectively) of beverage container litter.

3.3 KEY HIGHLIGHTS

- **Nearly 50 billion pieces of litter along United States roadways and waterways.** Overall, there was more litter near waterways (25.9 billion pieces on 10.7 million miles) than on roadways (23.7 billion on 8.3 million miles) though, proportionally, roadway and waterway litter represent similar quantities of the total litter items discarded nationwide (47.8 percent and 52.2 percent respectively).
- **More than 2,000 pieces of litter per mile.** Roadways had 18.5% more litter items per mile than waterways (2,857 and 2,411 litter items per mile on average respectively).
- **There were 152 items of litter for each U.S. resident**. Roadways and waterway litter items per capita were comparable (73 and 80 litter items per capita, respectively).
- **Plastics and cigarette butts compose most litter material types.** Of the total litter along United States roadways and waterways, 19.2 billion (38.6 percent) were pieces of plastic followed by 9.7 billion (19.6 percent) cigarette butts. In addition to being the most littered materials when combining roadways and waterways, plastic and cigarette butts were determined to be the most prevalent littered items on both roadways and waterways when examined separately.
- **Great majority of litter was smaller in size but, at six billion pieces, larger items were both prevalent and highly visible.** Most litter (43.6 billion pieces or 87.9 percent) across United States roadways and

waterways collectively were four inches or smaller in size. However, larger, and often more visible, litter still represented a significant quantity (6.0 billion pieces or 12.1 percent) of litter.

- **Majority of litter in rural region, but urban region had more litter per mile.** Most littered items discarded near United States roadways and waterways were in rural areas (87.1 percent). However, urban roadways and waterways had significantly more littered items per mile than rural roadways and waterways.
- **On a per capita basis, there were less deposit materials and non-deposit materials littered in bottle bill states than in states without bottle bills.** The Study found substantially less deposit material litter in bottle bill states than in non-bottle bill states (four and eight litter items per capita in bottle bill and non-bottle bill states respectively). The Study also found there was less non-deposit litter per capita in bottle bill states (111 littered items per capita) than in non-bottle bill states (158 littered items per capita), though the size of that difference was proportionally smaller than for littered items covered by deposit legislation.

4.0 ROADWAY LITTER SURVEY RESULTS

An estimated 23.7 billion pieces of litter were along 8.3 million miles of United States roadways, which represents a 54 percent decrease in litter from the landmark 2009 Litter in America study from Keep America Beautiful. A detailed comparison of the 2020 Study results to the results of the 2009 Litter in America study is presented in Section 7 and the methodology for the roadway litter survey is presented in Section 2.

As shown in Table 4-1, accounting for almost 70 percent of total roadway miles, local roadways had the most total littered items followed by collector and arterial roadways. Freeways and expressways had less total litter than the other roadway types nationwide. However, freeways and expressways had more litter items per mile than all other roadway types (12,764 litter items per mile on average). Tables 4-1 and 4-2 present the estimated count of roadway litter in aggregate and per mile in the United States.[17]

Table 4-1: Aggregate Count of Litter by Material Group, Roadway

Material Group	Freeways & Expressways	Arterial	Collector	Local	Total Litter Items
Paper	217,468,700	660,924,300	1,321,270,900	2,136,027,200	4,335,691,200
Plastic	537,290,800	1,237,861,600	2,133,325,700	4,319,371,300	8,227,849,400
Metal	101,916,200	206,238,700	557,021,400	948,267,300	1,813,443,600
Glass	60,402,000	222,013,400	241,223,000	647,820,600	1,171,458,900
Organics	19,408,900	22,653,600	104,184,000	250,889,700	397,136,200
Cigarette butts[1]	470,519,400	1,325,866,200	1,177,273,600	2,729,882,900	5,703,542,200
Tire treads[1]	151,645,400	99,851,600	63,817,800	23,399,500	338,714,300
Other	121,021,700	253,603,800	421,645,200	893,920,100	1,690,190,700
Total	**1,679,673,100**	**4,029,013,200**	**6,019,761,500**	**11,949,578,700**	**23,678,026,500**

1. Cigarette butts and tire treads material category were the majority of other material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other.

Table 4-2: Aggregate Count of Litter per Mile, Roadway

	Freeways & Expressways	Arterial	Collector	Local	Total
Total Litter Items	1,679,673,100	4,029,013,200	6,019,761,500	11,949,578,700	23,678,026,500
Miles[1]	131,598	800,187	1,623,373	5,732,488	8,287,647
Litter Items Per Mile	**12,764**	**5,035**	**3,708**	**2,085**	**2,857**

1. Source: Roadway distance based on Federal Highway Administration (FHWA) Highway Performance Monitoring System (HPMS).

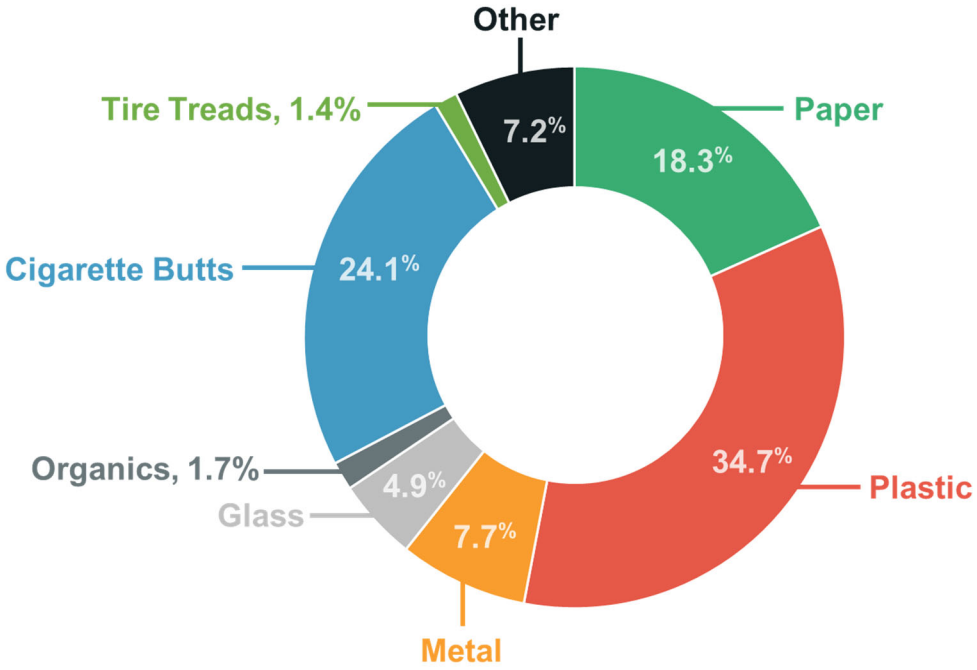
This section provides a comprehensive understanding of the quantity, composition, and sources of litter found across the United States.

[17]Litter per capita was not calculated here because it is not a useful measure for specific roadway types. See Section 3 for aggregate count of litter per capita measures.

4.1 AGGREGATE QUANTITY AND COMPOSITION

Of the total litter discarded near United States roadways, 8.2 billion (34.7 percent) were pieces of plastic followed by 5.7 billion (24.1 percent) cigarette butts.[18] The composition of litter was comparable across roadway types for plastics, metal, glass, and organics but varied in different ways for paper, cigarette butts, and tire treads, which has implications for how litter studies are conducted along roadways and selecting a range of roadway types (Table 4.3). Figure 4-1 presents the aggregate composition of litter items by material group across all roadway types.[19]

Figure 4-1: Composition of Total Litter by Count, Roadway



* Cigarette butts and tire treads were the majority of other litter material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other for above figure.

[18] As previously noted, while cigarette butts are a material category and not a material group, they are included in the analyses of material groups because of their historically high proportion of all litter.

[19] See Section 2 for definition of roadway types. See Appendix A for definitions of material groups, categories, and litter sources.

Table 4-3: Composition of Litter by Material Group, Roadway Type

Material Group	Freeways & Expressways	Arterial	Collector	Local	Total Litter Items
Paper	12.9%	16.4%	21.9%	17.9%	18.3%
Plastic	32.0%	30.7%	35.4%	36.1%	34.7%
Metal	6.1%	5.1%	9.3%	7.9%	7.7%
Glass	3.6%	5.5%	4.0%	5.4%	4.9%
Organics	1.2%	0.6%	1.7%	2.1%	1.7%
Cigarette butts[1]	28.0%	32.9%	19.6%	22.8%	24.1%
Tire treads[1]	9.0%	2.5%	1.1%	0.2%	1.4%
Other	7.2%	6.3%	7.0%	7.5%	7.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

1. Cigarette butts and tire treads material category were the majority of other material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other.

As with waterway litter, most of the litter on United States roadways (20.7 billion pieces or 87.5 percent) were four inches or smaller in size. Approximately 3 billion pieces greater than four inches in size were littered on United States roadways. As shown in Figures 4-2 and 4-3, plastic composed much of both larger and smaller litter (46.2 and 33.1 percent respectively). In addition, cigarette butts represented more than 28 percent of the smaller litter on roadways.

Figure 4-2: Aggregate Composition of 4-inch-plus Litter by Count, Roadway

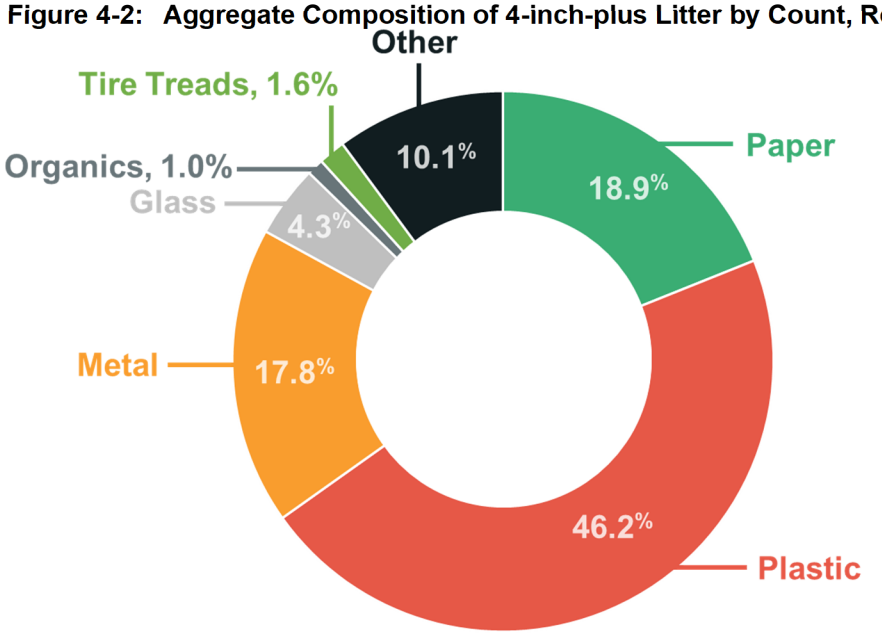
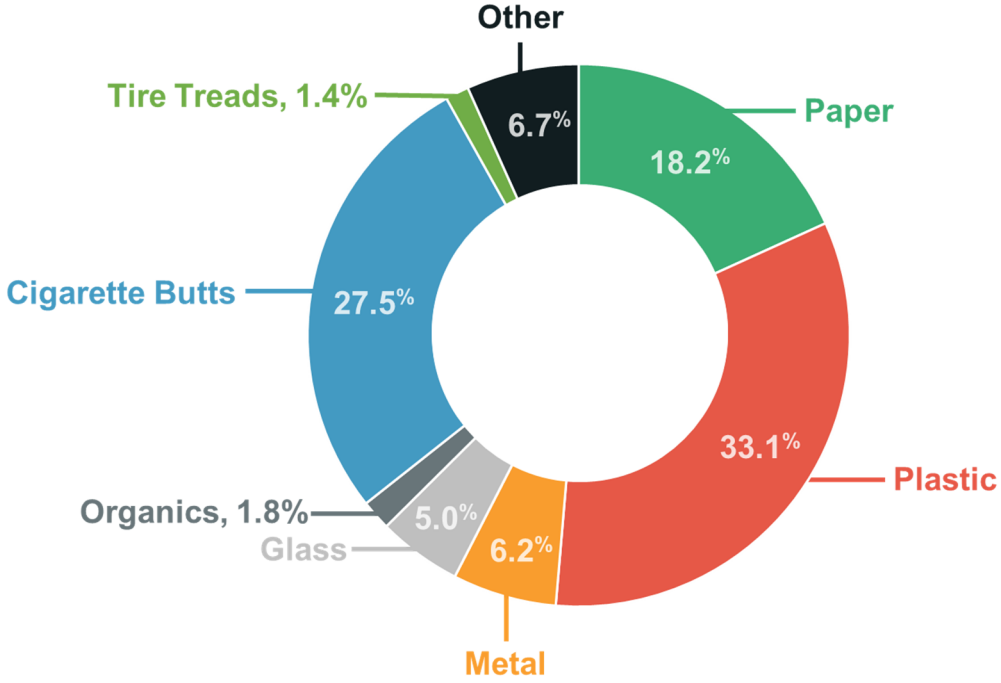


Figure 4-3: Aggregate Composition of 4-inch-less Litter by Count, Roadway



* Cigarette butts and tire treads were the majority of other litter material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other for above figure.

Table 4-4 presents the composition of roadway litter by size by material category.

Table 4-4: Aggregate Composition of Litter by Count, Roadway

Groups	Categories	4-inch-plus	4-inch-less	Total Count	Percent of Total
Paper	Fast-food paper bags	12,137,000	44,967,800	57,104,900	0.2%
	Fast-food paper cups	44,633,000	1,453,000	46,086,000	0.2%
	Other paper fast-food service items	52,591,700	192,200,800	244,792,500	1.0%
	Cardboard	44,920,700	140,833,700	185,754,400	0.8%
	Kraft bags	2,188,300	4,731,900	6,920,200	0.0%
	Receipts	8,192,500	81,625,100	89,817,700	0.4%
	Political signs	122,400	-	122,400	0.0%
	Other advertising signs	5,145,500	4,261,200	9,406,600	0.0%
	Office paper/ mail	5,248,900	93,149,600	98,398,500	0.4%
	Newspaper/ inserts	17,418,500	231,690,600	249,109,000	1.1%
	Magazines	1,362,600	1,036,600	2,399,100	0.0%
	Books	734,800	-	734,800	0.0%
	Aseptic/ gable top containers	3,747,500	-	3,747,500	0.0%
	Beverage carriers/ cartons	3,641,400	18,417,800	22,059,200	0.1%
	Paper home food packaging	8,759,700	26,848,600	35,608,400	0.2%
	Other paper	347,883,800	2,935,746,200	3,283,630,000	13.9%
	Subtotal Paper	**558,728,400**	**3,776,962,700**	**4,335,691,200**	**18.3%**
Plastic	Soda	56,981,800	-	56,981,800	0.2%
	Single-serve wine & liquor	33,344,800	211,168,000	244,512,800	1.0%
	Other wine & liquor	4,976,300	-	4,976,300	0.0%
	Sports & energy drinks	40,488,500	1,905,400	42,393,900	0.2%
	Juice	16,786,800	-	16,786,800	0.1%
	Tea & coffee	4,695,900	-	4,695,900	0.0%
	Still water	88,778,700	9,696,300	98,475,000	0.4%
	Other water	15,077,300	2,991,400	18,068,700	0.1%
	Other plastic beverage bottles	20,273,500	11,091,100	31,364,600	0.1%
	Fast food plastic cups	50,041,800	36,877,300	86,919,000	0.4%
	Plastic straws	65,516,200	70,097,500	135,613,600	0.6%
	Other beverage packaging	47,523,100	158,716,600	206,239,700	0.9%
	Plastic trash bags	4,069,600	-	4,069,600	0.0%
	Other plastic bags	79,123,400	46,077,600	125,201,000	0.5%
	Food packaging film	207,546,400	1,216,815,700	1,424,362,100	6.0%
	Other film	156,144,600	1,017,671,200	1,173,815,800	5.0%
	Plastic food service items	24,381,300	43,682,900	68,064,200	0.3%
	Expanded polystyrene food service items	64,815,400	119,931,000	184,746,400	0.8%
	Other expanded polystyrene	40,557,800	278,696,200	319,254,000	1.3%
	Other plastic food packaging	34,524,500	217,807,800	252,332,300	1.1%
	Other plastic	309,472,100	3,419,503,700	3,728,975,800	15.7%
	Subtotal Plastic	**1,365,119,800**	**6,862,729,600**	**8,227,849,400**	**34.7%**

Table 4-4: Aggregate Composition of Litter by Count, Roadway

Groups	Categories	4-inch-plus	4-inch-less	Total Count	Percent of Total
Metal	Beer	303,972,100	97,362,200	401,334,300	1.7%
	Soda	81,023,100	62,039,400	143,062,500	0.6%
	Sports & energy drinks	11,449,800	26,932,500	38,382,300	0.2%
	Juice	6,658,300	-	6,658,300	0.0%
	Tea & coffee	2,998,200	-	2,998,200	0.0%
	Other metal beverage bottles	23,462,700	76,800,400	100,263,100	0.4%
	Other beverage packaging	19,260,200	158,747,700	178,007,900	0.8%
	Still water	365,200	-	365,200	0.0%
	Other water	3,148,000	-	3,148,000	0.0%
	Other metal	73,172,600	866,051,200	939,223,800	4.0%
	Subtotal Metal	**525,510,200**	**1,287,933,300**	**1,813,443,600**	**7.7%**
Glass	Beer	57,027,100	69,104,000	126,131,000	0.5%
	Soda	6,061,600	-	6,061,600	0.0%
	Single-serve wine & liquor	3,895,300	26,930,100	30,825,500	0.1%
	Other wine & liquor	8,311,700	525,400	8,837,200	0.0%
	Sports & energy drinks	42,400	-	42,400	0.0%
	Juice	662,500	-	662,500	0.0%
	Tea & coffee	1,073,300	-	1,073,300	0.0%
	Still water	-	-	-	0.0%
	Other water	236,600	-	236,600	0.0%
	Other glass beverage bottles	10,342,700	29,002,600	39,345,300	0.2%
	Broken glass or ceramic	14,867,000	840,764,400	855,631,400	3.6%
	Other glass food packaging	1,966,100	-	1,966,100	0.0%
	Other glass	23,123,900	77,522,200	100,646,100	0.4%
	Subtotal Glass	**127,610,200**	**1,043,848,700**	**1,171,458,900**	**4.9%**
Organics	Pet waste	3,238,800	62,724,700	65,963,600	0.3%
	Human waste	175,000	-	175,000	0.0%
	Confection	-	10,312,400	10,312,400	0.0%
	Other food waste	18,861,300	262,365,700	281,227,000	1.2%
	Other organics	7,660,900	31,797,300	39,458,300	0.2%
	Subtotal Organics	**29,936,100**	**367,200,100**	**397,136,200**	**1.7%**
Other	Medical waste	2,486,200	-	2,486,200	0.0%
	PPE gloves	24,157,800	23,941,100	48,098,900	0.2%
	PPE masks	18,659,600	12,955,400	31,615,000	0.1%
	Hazardous waste	546,300	-	546,300	0.0%
	Vehicle debris	39,622,400	300,348,600	339,971,000	1.4%
	Tires	3,445,700	61,360,000	64,805,700	0.3%
	Tire tread	48,473,800	290,240,500	338,714,300	1.4%
	Construction and demolition debris	33,595,000	334,845,300	368,440,300	1.6%
	Textiles/ small rugs	45,269,900	317,510,700	362,780,500	1.5%
	Bulky items	425,300	-	425,300	0.0%
	Cigarette butts	1,098,200	5,702,443,900	5,703,542,200	24.1%
	Electronic cigarettes	865,200	-	865,200	0.0%
	Other tobacco-related products & packaging	74,549,500	166,863,400	241,412,900	1.0%
	Toiletries/ personal hygiene products	23,733,700	1,453,000	25,186,600	0.1%
	Entertainment items	216,600	-	216,600	0.0%
	Flat screen TV and computer monitors	-	-	-	0.0%

Table 4-4: Aggregate Composition of Litter by Count, Roadway

Groups	Categories	4-inch-plus	4-inch-less	Total Count	Percent of Total
Other	CRT televisions and computer monitors	-	-	-	0.0%
	Portable electronics	836,800	-	836,800	0.0%
	Electronic cords	8,000,600	3,326,400	11,327,000	0.0%
	Other electronics	1,997,700	18,930,900	20,928,700	0.1%
	Other items	21,654,300	148,593,400	170,247,600	0.7%
	Subtotal Other	**349,634,600**	**7,382,812,500**	**7,732,447,200**	**32.7%**
Total		**2,956,539,400**	**20,721,487,000**	**23,678,026,500**	**100.0%**

Other paper, beer metal cans, and other plastic was the most common item littered of larger items. Cigarette butts were the most common item littered of smaller items. Some material categories, such as other plastic, food packaging film, and other film were within the top ten materials for larger and small litter items. Figures 4-4 and 4-5 present the top 10 litter material categories by size of litter.

Figure 4-4: Top 10 Aggregate Litter Items of 4-inch-plus Litter by Count, Roadway

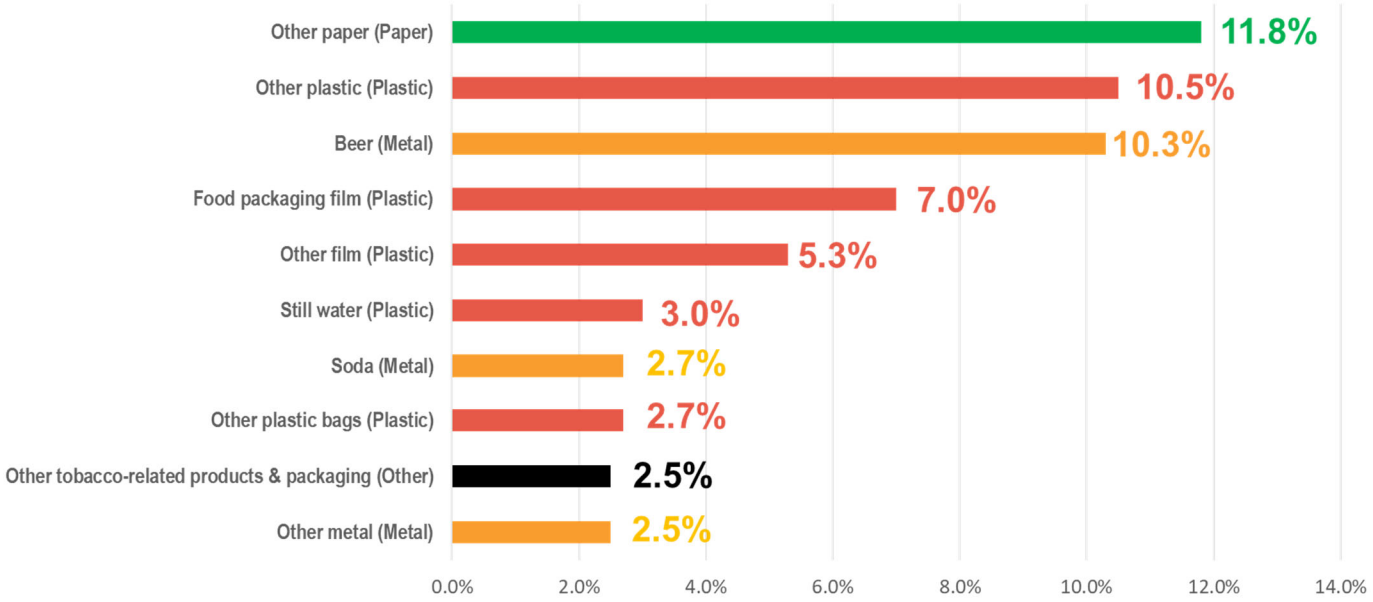
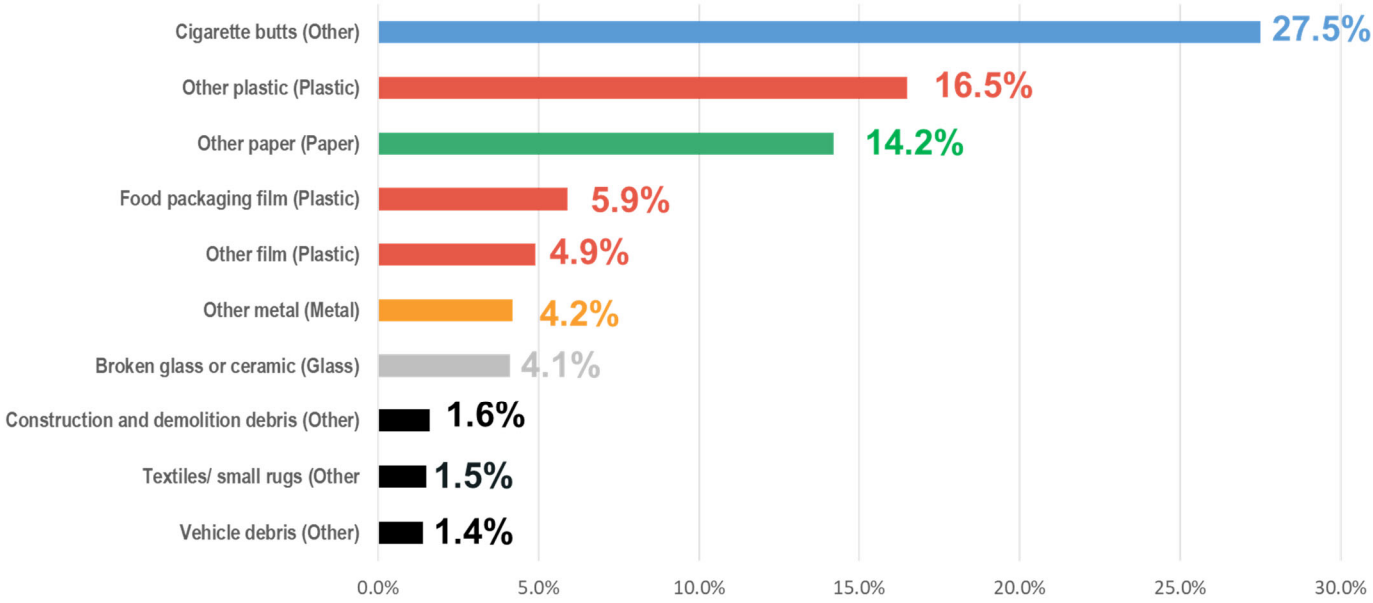


Figure 4-5: Top 10 Aggregate Litter Items of 4-inch-less Litter by Count, Roadway

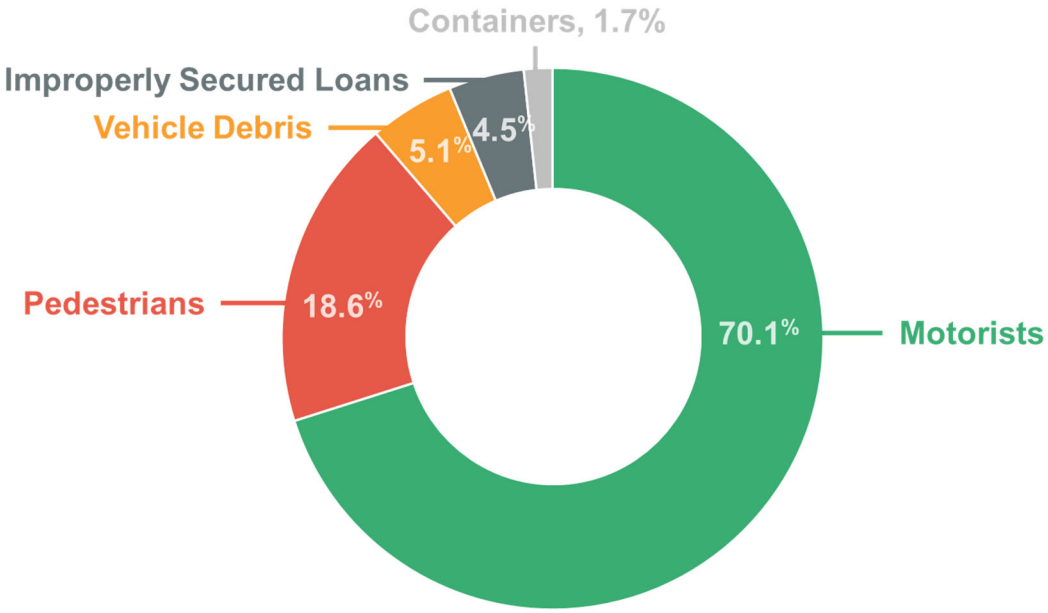


4.2 SOURCES OF ROADWAY LITTER

Motorists were identified as the leading source of litter on roadways (collectively 70.1 percent). As noted in the behavioral observations (see Section 8), the Study observed lower frequency of individuals congregating in groups likely resulting in less pedestrian litter as a proportion of all litter. Figure 4-6 presents the sources of litter

items found on United States roadways.[20] Figure 4-7 presents the source of litter by material group for each roadway type.

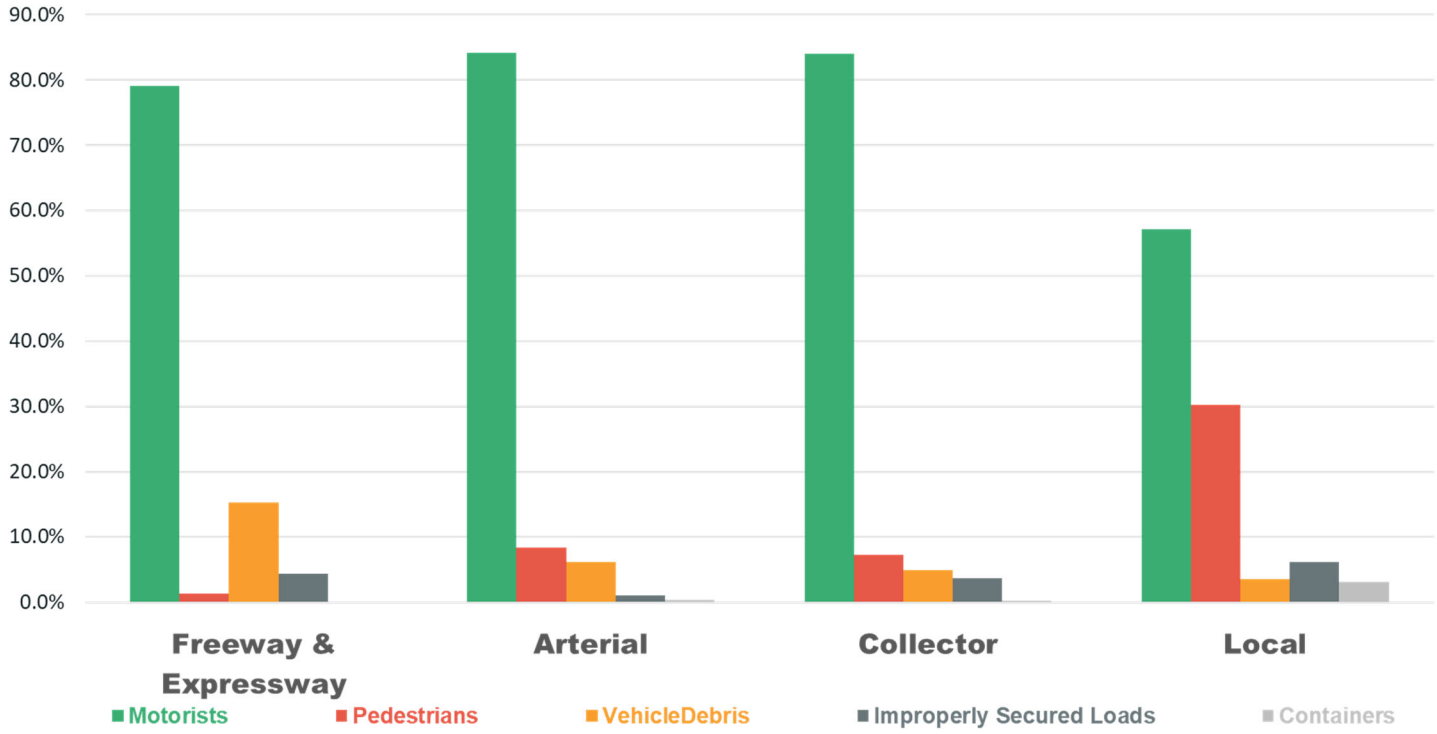
Figure 4-6: Source of Litter by Count, Roadway



Motorists were the leading source of litter for all roadway types. Pedestrians were the second largest source of litter for local, collector, and arterial roadways. Vehicle debris was the second largest source of litter for freeways and expressways. Improperly secured loads and litter from overflowing containers were a more significant source of litter on local roadways than any other roadway type. Figure 4-7 presents the sources of litter items found on United States roadways.

[20] See Section 2 for the definition of different sources of litter (motorists, pedestrians, vehicle debris, improperly secured loads, and containers).

Figure 4-7: Source of Litter by Count by Roadway Type, Roadway



4.3 ROADWAY LITTER BY REGION TYPE

The quantity and composition of roadway litter varies by region type. This section provides a comprehensive understanding of the quantity and composition of roadway litter in urban versus rural and bottle-bill versus non-bottle bill regions.

Urban and Rural

More litter was discarded near United States roadways in rural areas than urban areas (56.9 and 43.1 percent of total roadway litter respectively). However, urban roadways had significantly more littered items per mile than rural roadways. Tables 4-5 and 4-6 present the estimated count of roadway litter in aggregate and per mile by urban and rural region.

Table 4-5: Aggregate Count of Roadway Litter by Material Group, Urban and Rural

Material Group	Urban Litter Items	Rural Litter Items	Total Litter Items
Paper	1,944,671,400	2,391,019,800	4,335,691,200
Plastic	2,982,878,000	5,244,971,400	8,227,849,400
Metal	591,391,700	1,222,051,900	1,813,443,600
Glass	367,799,100	803,659,800	1,171,458,900
Organics	88,820,600	308,315,600	397,136,200
Cigarette butts[1]	3,417,742,000	2,285,800,200	5,703,542,200
Tire treads[1]	130,619,700	208,094,600	338,714,300
Other	680,303,100	1,009,887,600	1,690,190,700
Total	**10,204,225,600**	**13,473,800,900**	**23,678,026,500**

1. Cigarette butts and tire treads material categories were the majority of other material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other.

Table 4-6: Aggregate Count of Roadway Litter per Mile, Urban and Rural

	Urban	Rural	Total
Total Litter Items	10,204,225,600	13,473,800,900	23,678,026,500
Miles[1]	2,425,331	5,862,316	8,287,647
Litter Items Per Mile	**4,207**	**2,298**	**2,857**

1. Source: Roadway distance based on Federal Highway Administration (FHWA) Highway Performance Monitoring System (HPMS).

As was found with the aggregate composition of litter, plastic and cigarette butts were determined to be the most prevalent littered items on roadways in both urban and rural regions. However, plastics accounted for proportionately more littered items in rural regions than urban regions (38.9 percent and 29.2 percent in rural and urban regions respectively). In contrast, cigarette butts accounted for proportionately more littered items in urban than rural regions (33.5 and 17.0 percent in urban and rural regions respectively). Figures 4-8 and 4-9 present the composition of litter items by material group for urban and rural regions.

Figure 4-8: Aggregate Composition of Roadway Litter by Count, Urban

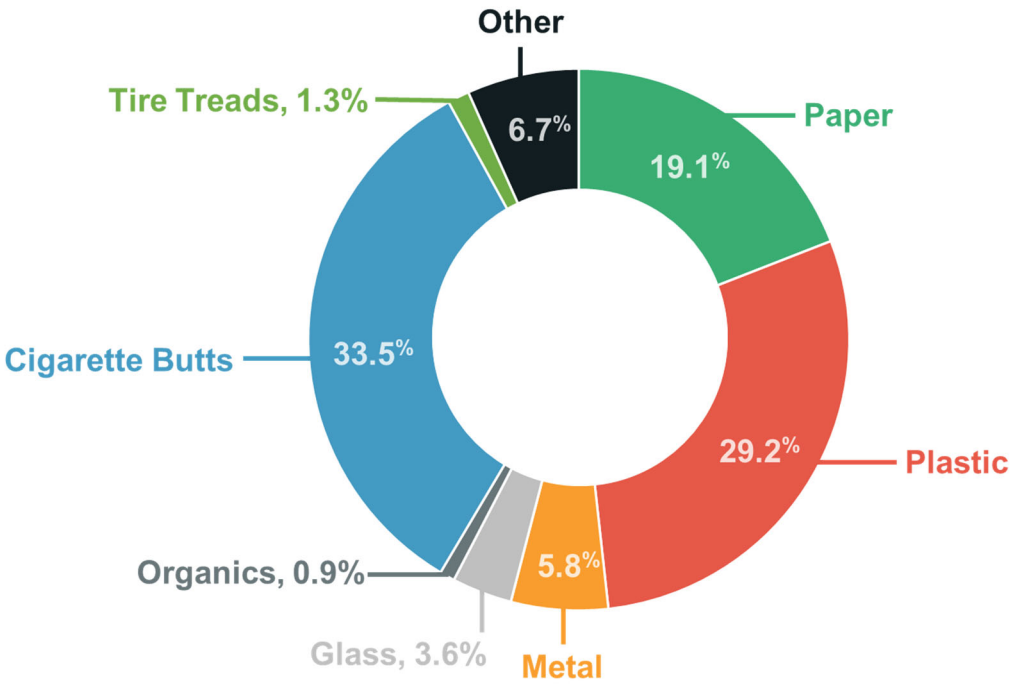
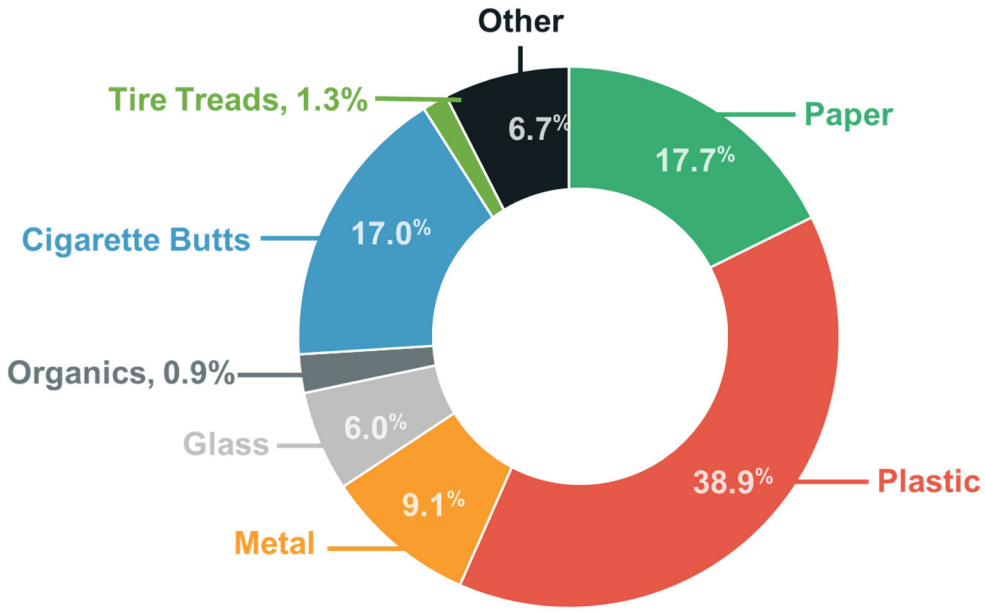


Figure 4-9: Aggregate Composition of Roadway Litter by Count, Rural



* Cigarette butts and tire treads were the majority of other litter material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other for above figure.

Bottle Bill and Non-Bottle Bill

An estimated 1.3 billion beverage containers were discarded near United States roadways. Roadways in non-bottle bill states had more deposit material litter items per mile than bottle bill states (156 and 134 litter items per mile in non-bottle bill and bottle bill states respectively). In contrast, there was more non-deposit material litter items per mile in bottle bill states than in non-bottle bill states, partially a function of population density.

On a per capita basis, bottle bill states had less deposit material litter than non-bottle bill states (2.5 and 4.4 deposit material litter items per capita in bottle bill and non-bottle bill states respectively). As found in the aggregate analysis in Section 3, there also was more non-deposit material litter items per capita across roadways in non-bottle bill states than in bottle bill states but, again, the difference was significantly smaller than for deposit materials on a relative basis.

Tables 4-7, 4-8, and 4-9 present the estimated count of roadway litter in aggregate and per mile by bottle bill and non-bottle bill regions.

Table 4-7: Aggregate Count of Roadway Deposit Material Litter by Product Type, Bottle Bill and Non-Bottle Bill

Product Type	Bottle Bill	Non-Bottle Bill	Total Bottles
Soda	29,163,100	176,942,800	206,105,900
Beer	84,304,300	443,161,100	527,465,400
Single-serve wine & liquor	61,811,000	213,527,300	275,338,300
Other wine & liquor	2,315,200	11,498,400	13,813,600
Sports & energy drinks	10,038,000	70,780,600	80,818,600
Still water	18,735,800	80,104,400	98,840,200
Other water	4,639,700	16,813,600	21,453,300
Other plastic beverage bottles	9,600,700	21,763,900	31,364,600
Total	**220,607,800**	**1,034,592,100**	**1,255,199,900**

Table 4-8: Aggregate Count of Roadway Litter per Mile, Bottle Bill and Non-Bottle Bill

	Bottle Bill	Non-Bottle Bill	Total
Deposit Material Litter Items	220,607,800	1,034,592,100	1,255,199,900
Non-deposit Material Litter Items	5,253,561,800	17,169,264,800	22,422,826,600
Total Litter Items	5,474,169,600	18,203,856,900	23,678,026,500
Miles[1]	1,643,248	6,644,400	8,287,647
Deposit Material Litter Items Per Mile	**134**	**156**	**151**
Non-deposit Material Litter Items Per Mile	**3,197**	**2,584**	**2,706**
Litter Items Per Mile	**3,331**	**2,740**	**2,857**

1. Source: Roadway distance based on Federal Highway Administration (FHWA) Highway Performance Monitoring System (HPMS).

Table 4-9: Aggregate Count of Roadway Litter per Capita, Bottle Bill and Non-Bottle Bill

	Bottle Bill	Non-Bottle Bill	Total
Deposit Material Litter Items	220,607,800	1,034,592,100	1,255,199,900
Non-deposit Material Litter Items	5,253,561,800	17,169,264,800	22,422,826,600
Total Litter Items	5,474,169,600	18,203,856,900	23,678,026,500
Population[1]	88,751,439	236,634,918	325,386,357
Deposit Material Litter Items Per Capita	**2**	**4**	**4**
Non-deposit Material Litter Items Per Capita	**59**	**73**	**69**
Litter Items Per Capita	**62**	**77**	**73**

1. Source: U.S. Census 2020

Beer and soda accounted for 4.6 and 3.9 percentage points more littered containers on roadways in non-bottle bill states than states with bottle bills, respectively. Single-serve wine and liquor accounted for 7.4 percentage points more containers in bottle bill states. Figures 4-10 and 4-11 present the composition of litter items by material group for bottle bill and non-bottle bill states.

Figure 4-10: Aggregate Composition of Deposit Material Littered on Roadways by Count, Bottle Bill

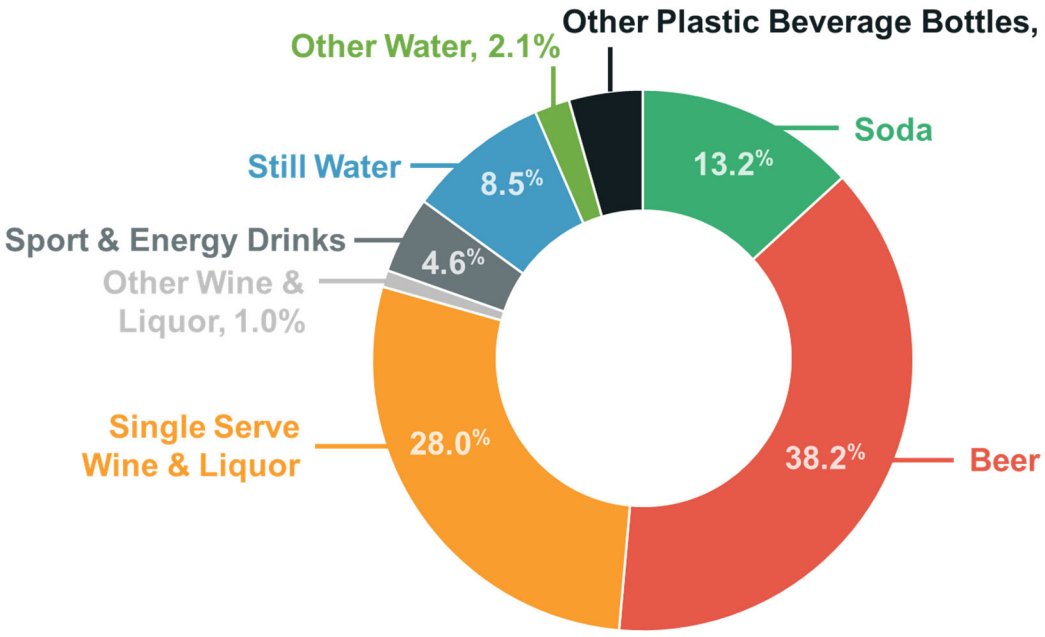
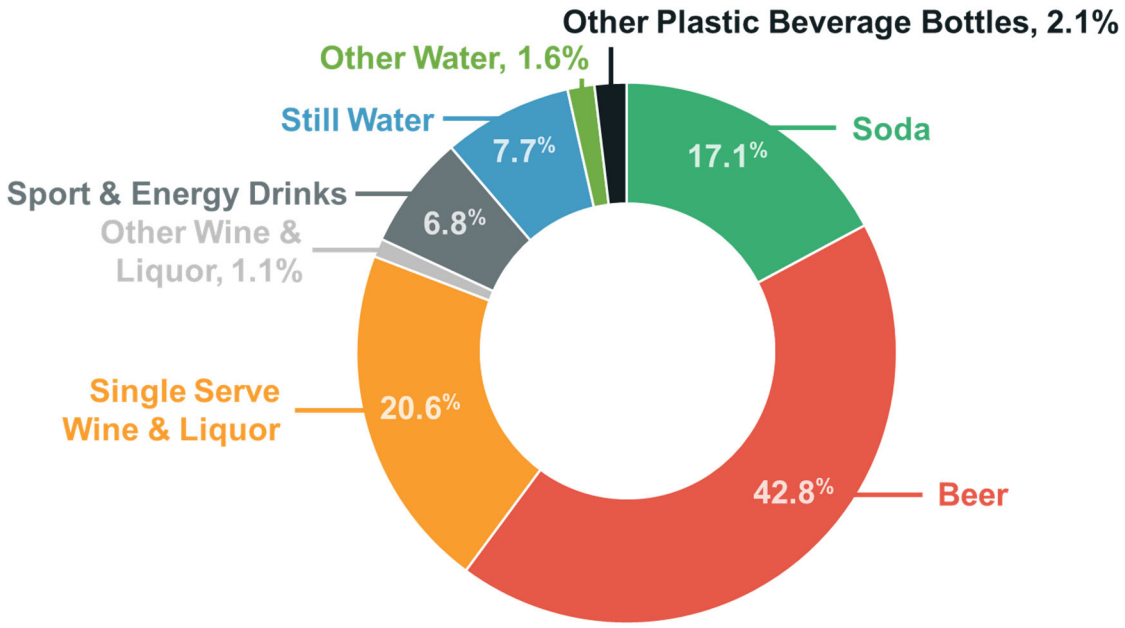


Figure 4-11: Aggregate Composition of Deposit Material Littered on Roadways by Count, Non-Bottle Bill



* Cigarette butts and tire treads were the majority of other litter material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other for above figure.

Table 4-10 presents the composition of deposit and non-deposit material litter by bottle bill state, non-bottle bill state, and aggregate by deposit material littered.

Table 4-10: Roadway Litter Composition of Deposit and Non-Deposit Material Category by Count, Bottle Bill and Non-Bottle Bill

	Groups	Deposit Material Categories	Bottle Bill	Non-Bottle Bill	Total Count	Percent of Total
Deposit Material	**Plastic**	Soda	3,325,000	53,656,800	56,981,800	0.2%
		Single-serve wine & liquor	44,516,500	199,996,300	244,512,800	1.0%
		Other wine & liquor	227,600	4,748,800	4,976,300	0.0%
		Sports & energy drinks	7,870,200	34,523,700	42,393,900	0.2%
		Still water	18,725,500	79,749,500	98,475,000	0.4%
		Other water	3,347,300	14,721,400	18,068,700	0.1%
		Other plastic beverage bottles	9,600,700	21,763,900	31,364,600	0.1%
		Subtotal Plastic	**87,612,800**	**409,160,400**	**496,773,100**	**2.1%**
	Metal	Beer	54,441,000	346,893,300	401,334,300	1.7%
		Soda	25,358,800	117,703,700	143,062,500	0.6%
		Sports & energy drinks	2,144,800	36,237,500	38,382,300	0.2%
		Still water	10,300	354,900	365,200	0.0%
		Other water	1,220,600	1,927,400	3,148,000	0.0%
		Subtotal Metal	**83,175,500**	**503,116,800**	**586,292,300**	**2.5%**
	Glass	Beer	29,863,300	96,267,800	126,131,000	0.5%
		Soda	479,300	5,582,300	6,061,600	0.0%
		Single-serve wine & liquor	17,294,500	13,531,000	30,825,500	0.1%
		Other wine & liquor	2,087,600	6,749,600	8,837,200	0.0%
		Sports & energy drinks	23,000	19,400	42,400	0.0%
		Still water	-	-	-	0.0%
		Other water	71,800	164,800	236,600	0.0%
		Subtotal Glass	**49,819,500**	**122,314,900**	**172,134,300**	**0.7%**
Non-Deposit Material	**Paper**	Fast-food paper bags	11,800,400	45,304,500	57,104,900	0.2%
		Fast-food paper cups	11,398,800	34,687,200	46,086,000	0.2%
		Other paper fast-food service	50,363,800	194,428,600	244,792,500	1.0%
		Cardboard	51,371,200	134,383,200	185,754,400	0.8%
		Kraft bags	1,881,800	5,038,400	6,920,200	0.0%
		Receipts	28,120,100	61,697,600	89,817,700	0.4%
		Political signs	69,400	53,100	122,400	0.0%
		Other advertising signs	3,143,900	6,262,700	9,406,600	0.0%
		Office paper/ mail	25,257,700	73,140,800	98,398,500	0.4%
		Newspaper/ inserts	34,445,100	214,664,000	249,109,000	1.1%
		Magazines	1,100,800	1,298,300	2,399,100	0.0%
		Books	251,200	483,600	734,800	0.0%
		Aseptic/ gable top containers	607,700	3,139,900	3,747,500	0.0%
		Beverage carriers/ cartons	10,574,800	11,484,400	22,059,200	0.1%
		Paper home food packaging	10,005,200	25,603,200	35,608,400	0.2%
		Other paper	632,583,700	2,651,046,200	3,283,630,000	13.9%
		Subtotal Paper	**872,975,600**	**3,462,715,700**	**4,335,691,200**	**18.3%**

Table 4-10: Roadway Litter Composition of Deposit and Non-Deposit Material Category by Count, Bottle Bill and Non-Bottle Bill

	Groups	Deposit Material Categories	Bottle Bill	Non-Bottle Bill	Total Count	Percent of Total
	Plastic	Juice	2,711,100	14,075,700	16,786,800	0.1%
		Tea & coffee	1,252,700	3,443,200	4,695,900	0.0%
		Fast-food plastic cups	20,553,400	66,365,600	86,919,000	0.4%
		Plastic straws	28,438,500	107,175,200	135,613,600	0.6%
		Other beverage packaging	50,380,900	155,858,800	206,239,700	0.9%
		Plastic trash bags	1,450,000	2,619,600	4,069,600	0.0%
		Other plastic bags	25,187,300	100,013,700	125,201,000	0.5%
		Food packaging film	248,453,100	1,175,909,000	1,424,362,100	6.0%
		Other film	232,094,800	941,720,900	1,173,815,800	5.0%
		Plastic food service items	22,753,200	45,311,000	68,064,200	0.3%
		Expanded polystyrene food	24,401,200	160,345,200	184,746,400	0.8%
		Other expanded polystyrene	89,713,400	229,540,600	319,254,000	1.3%
		Other plastic food packaging	76,612,700	175,719,600	252,332,300	1.1%
		Other plastic	926,724,000	2,802,251,800	3,728,975,800	15.7%
		Subtotal Plastic	**1,750,726,300**	**5,980,349,900**	**7,731,076,200**	**32.7%**
	Metal	Juice	1,036,400	5,621,900	6,658,300	0.0%
		Tea & coffee	893,500	2,104,700	2,998,200	0.0%
		Other metal beverage bottles	14,881,200	85,381,800	100,263,100	0.4%
		Other beverage packaging	27,461,900	150,546,000	178,007,900	0.8%
		Other metal	213,022,800	726,201,000	939,223,800	4.0%
		Subtotal Metal	**257,295,800**	**969,855,400**	**1,227,151,200**	**5.2%**
	Glass	Juice	87,900	574,600	662,500	0.0%
		Tea & coffee	137,200	936,000	1,073,300	0.0%
		Other glass beverage bottles	12,640,800	26,704,500	39,345,300	0.2%
		Broken glass or ceramic	210,530,400	645,100,900	855,631,400	3.6%
		Other glass food packaging	139,200	1,827,000	1,966,100	0.0%
		Other glass	29,062,600	71,583,500	100,646,100	0.4%
		Subtotal Glass	**252,598,100**	**746,726,500**	**999,324,600**	**4.2%**
	Organics	Pet waste	19,409,000	46,554,600	65,963,600	0.3%
		Human waste	23,800	151,200	175,000	0.0%
		Confection	5,384,800	4,927,500	10,312,400	0.0%
		Other food waste	64,532,900	216,694,100	281,227,000	1.2%
		Other organics	15,938,000	23,520,200	39,458,300	0.2%
		Subtotal Organics	**105,288,500**	**291,847,600**	**397,136,200**	**1.7%**
	Other	Medical waste	0	2,486,200	2,486,200	0.0%
		PPE gloves	6,074,300	42,024,600	48,098,900	0.2%
		PPE masks	10,768,800	20,846,200	31,615,000	0.1%
		Hazardous waste	149,500	396,800	546,300	0.0%
		Vehicle debris	77,646,900	262,324,100	339,971,000	1.4%
		Tires	10,496,600	54,309,100	64,805,700	0.3%
		Tire tread	71,818,400	266,895,900	338,714,300	1.4%
		Construction and demolition	93,200,100	275,240,200	368,440,300	1.6%
		Textiles/small rugs	81,542,600	281,238,000	362,780,500	1.5%
		Bulky items	241,600	183,800	425,300	0.0%
		Cigarette butts	1,566,129,400	4,137,412,700	5,703,542,200	24.1%

Table 4-10: Roadway Litter Composition of Deposit and Non-Deposit Material Category by Count, Bottle Bill and Non-Bottle Bill

	Groups	Deposit Material Categories	Bottle Bill	Non-Bottle Bill	Total Count	Percent of Total
		Electronic cigarettes	271,900	593,300	865,200	0.0%
		Other tobacco-related products	44,401,800	197,011,100	241,412,900	1.0%
		Toiletries/personal hygiene	6,470,500	18,716,100	25,186,600	0.1%
		Entertainment items	49,700	166,900	216,600	0.0%
		Flat screen TV and computer	0	0	0	0.0%
		CRT televisions and computer	0	0	0	0.0%
		Portable electronics	264,200	572,600	836,800	0.0%
		Electronic cords	2,772,100	8,554,900	11,327,000	0.0%
		Other electronics	3,962,300	16,966,300	20,928,700	0.1%
		Other items	38,416,500	131,831,100	170,247,600	0.7%
		Subtotal Other	**2,014,677,200**	**5,717,769,900**	**7,732,447,200**	**32.7%**
	Total		**5,474,169,300**	**18,203,857,100**	**23,678,026,500**	**100.0%**

Metal containers composed most of the containers littered (586.3 million or 46.7 percent) across United States roadways. Although fewer, plastic and glass containers represented a significant quantity (496.8 million and 172.1 million respectively) of litter.

4.4 KEY HIGHLIGHTS

- **Nearly 24 billion pieces of litter along United States roadways.** An estimated 23.7 billion pieces of litter were along 8.3 million miles of United States roadways.
- **Freeways and expressways had the most litter items per mile.** Freeways and expressways had the most litter per mile (12,764 litter items per mile on average). Arterial, collector, and local roads had substantially fewer littered items per mile (5,035; 3,708; and 2,085 litter items per mile on average respectively).
- **Local roads had the most total litter items.** Local roads account for the great majority (almost 70 percent) of total roadway miles in the U.S. Although local roads had the lowest littered items per mile (2,085 litter items per mile on average), local roads had the most total littered items in aggregate (11.9 billion litter items).
- **Plastics and cigarette butts compose most litter items on roadways.** Of the total litter near United States roadways, 8.2 billion (34.7 percent) were pieces of plastic followed by 5.7 billion (24.1 percent) cigarette butts. The composition of litter was comparable across roadway types for plastics, metal, glass, and organics but varied for paper, cigarette butts, and tire treads.

- **Majority of litter was smaller, but larger items contribute to the roadway litter issue as well.** Most of the litter (20.7 billion pieces or 87.5 percent) across United States roadways collectively were four inches or smaller in size. However, larger, and often more visible, litter still represented a significant quantity (3.0 billion pieces or 12.5 percent) of litter.
- **Motorists were the leading source of litter for all roadway types.** Motorists were identified as the leading source of litter on roadways (collectively 70.1 percent). Pedestrians were the second largest source of litter for local, collector and arterial roadways. Vehicle debris was the second largest source of litter for freeways & expressways. Improperly secured loads and overflowing containers were a larger source of litter on local roads than all other roadway types.
- **More roadway litter in aggregate in rural region, but urban region had more roadway litter per mile.** More litter was discarded near United States roadways in rural areas than urban areas (56.9 and 43.1 percent of total roadway litter respectively). However, urban roadways had significantly more littered items per mile than rural roadways.
- **On a per capita basis, residents littered less deposit materials along roadways in bottle bill states.** The study estimated residents littered substantially less deposit materials along roadways in bottle bill states than non-bottle bill states (2.5 and 4.4 litter items per capita in bottle bill and non-bottle bill states respectively). There also were more non-deposit material litter items per capita across roadways in non-bottle bill states than in bottle bill states but the relative difference was significantly smaller than for deposit materials.

5.0 WATERWAY LITTER SURVEY RESULTS

An estimated 25.9 billion pieces of litter were along the shores of 10.7 million center miles of United States waterways.[21] As shown in Table 5-1, intermittent waterways represent the great majority of center miles in the population of streams that the Study covered and, consequently, had the most total littered items followed by small and large perennials. However, large perennial waterways had more litter items per center mile than all other waterway types (3,654 litter items per center mile on average). Tables 5-1 and 5-2 present the estimated count of waterway litter in aggregate and per mile in the United States.[22]

Table 5-1: Aggregate Count of Litter by Material Group, Waterway

Material Group	Large Perennial	Small Perennial	Intermittent	Total Litter Items
Paper	251,139,200	1,047,033,000	1,880,858,000	3,179,030,200
Plastic	1,053,377,200	3,935,538,600	5,942,991,500	10,931,907,400
Metal	261,510,600	1,296,737,700	539,874,800	2,098,123,100
Glass	171,849,200	842,038,200	1,376,351,600	2,390,239,000
Organics	67,891,300	458,697,000	345,082,400	871,670,800
Cigarette butts[1]	480,558,800	1,191,281,200	2,322,270,000	3,994,110,000
Tire treads[1]	4,180,400	249,305,900	492,600	253,978,800
Other	297,779,400	671,545,000	1,206,635,200	2,175,959,600
Total	**2,588,286,000**	**9,692,176,800**	**13,614,556,100**	**25,895,018,900**

1. Cigarette butts and tire treads material category were the majority of other material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other.

Table 5-2: Aggregate Count of Litter per Mile, Waterway

	Large Perennial	Small Perennial	Intermittent	Total
Total Litter Items	2,588,286,000	9,692,176,800	13,614,556,100	25,895,018,900
Miles[1]	708,360	3,086,074	6,945,882	10,740,317
Litter Items Per Mile	**3,654**	**3,141**	**1,960**	**2,411**

1. Source: Waterway distance based on U.S. Geological Survey (USGS) National Hydrography Dataset Plus High Resolution (NHDPlusHR).

This section provides a comprehensive understanding of the quantity, composition, and sources of litter found across the United States.

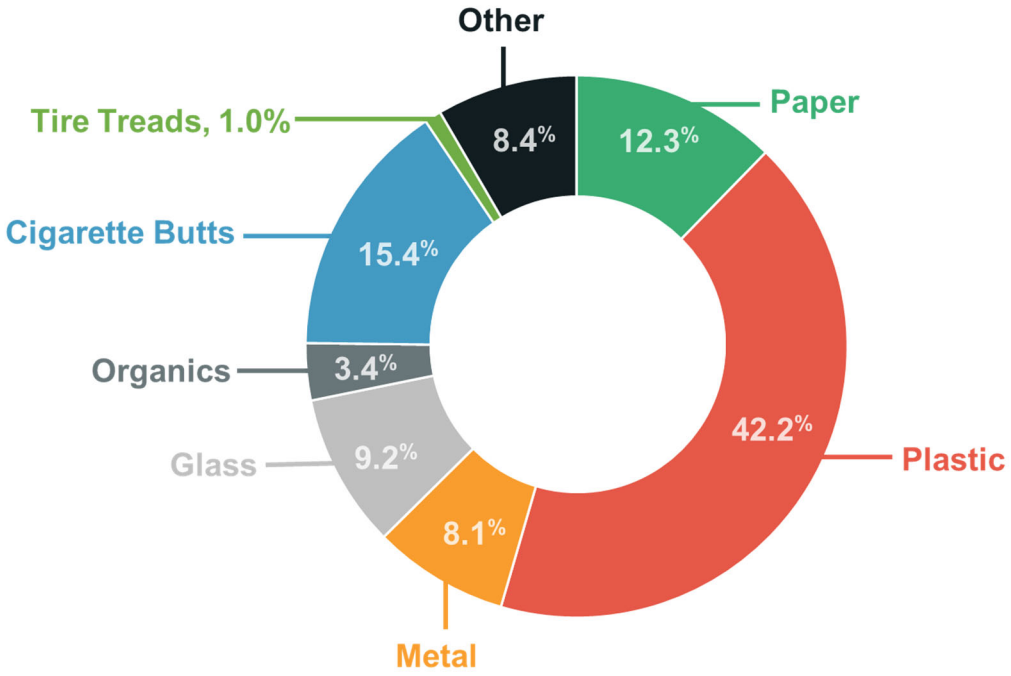
[21] For this study, waterways included only the waterways from two main categories of surface waters (perennial and intermittent streams) and therefore did not include ephemeral streams or coastlines. See Section 2 for a description of the waterway sampling methodology.

[22] Litter per capita was not calculated here because it is not a useful measure for specific waterway types. See Section 3 for aggregate count of roadway litter per capita measures.

5.1 AGGREGATE QUANTITY AND COMPOSITION

Of the total litter discarded near United States waterways, 10.9 billion (42.2 percent) were pieces of plastic followed by 4.0 billion (15.4 percent) cigarette butts. Litter from material types that degrade faster—namely paper and cigarette butts—represent a smaller proportion of litter on waterways than on roadways (see Figure 4-1 for a comparison). The composition of litter was comparable across waterway types for plastics, organics, and tire treads but varied in different ways for paper, metal, and cigarette butts. Figure 5-1 presents the aggregate composition of litter items by material group. Table 5-3 presents the composition of litter by material group for each waterway type.

Figure 5-1: Composition of Total Litter by Count, Waterway



* Cigarette butts and tire treads were the majority of other litter material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other for above figure.

Table 5-3: Composition of Litter by Material Group, Waterway Type

Material Group	Large Perennial	Small Perennial	Intermittent	Total Litter Items
Paper	9.7%	10.8%	13.8%	12.3%
Plastic	40.7%	40.6%	43.7%	42.2%
Metal	10.1%	13.4%	4.0%	8.1%
Glass	6.6%	8.7%	10.1%	9.2%
Organics	2.6%	4.7%	2.5%	3.4%
Cigarette butts[1]	18.6%	12.3%	17.1%	15.4%
Tire treads[1]	0.2%	2.6%	0.0%	1.0%
Other	11.5%	6.9%	8.9%	8.4%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

1. Cigarette butts and tire treads material category were the majority of other material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other.

Like roadway litter, most of the litter on United States waterways (22.8 billion pieces or 88.2 percent) were 4-inches or smaller in size. Approximately 3.1 billion pieces greater than 4-inches were littered near United States waterways. As shown in Figures 5-2 and 5-3, plastic composed most of the larger and smaller litter (49.0 and 41.3 percent respectively). In addition, cigarette butts represented more than 17.5 percent of the smaller litter on waterways.

Figure 5-2: Aggregate Composition of 4-inch-plus Litter by Count, Waterway

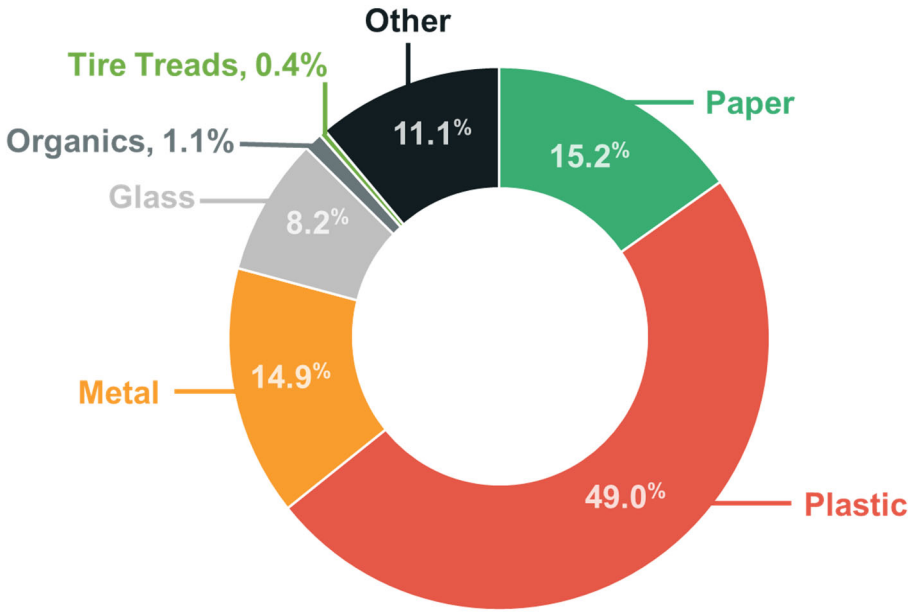
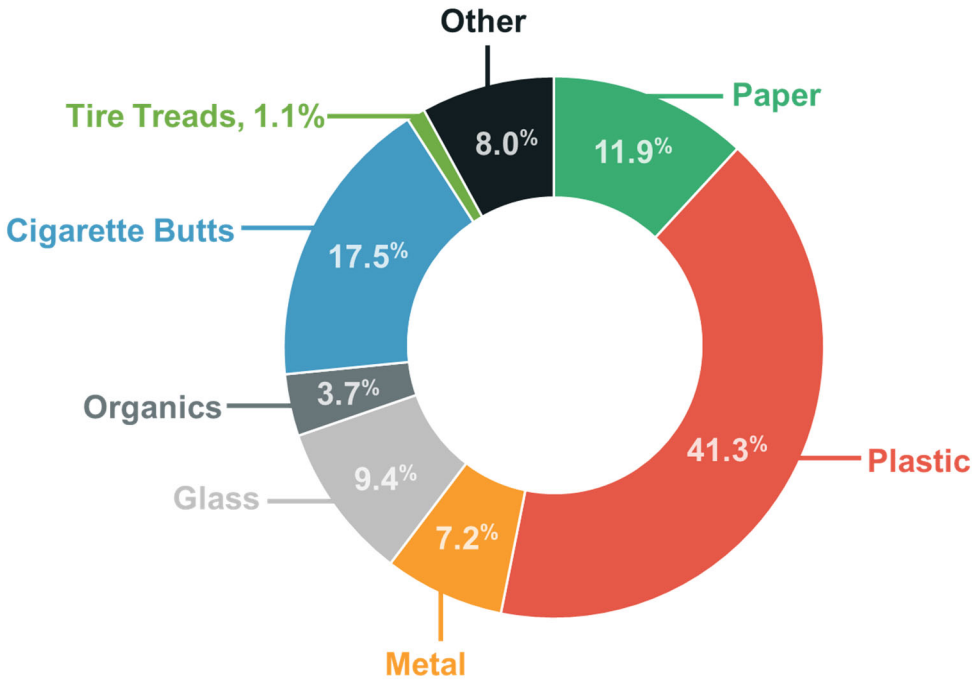


Figure 5-3: Aggregate Composition of 4-inch-less Litter by Count, Waterway



* Cigarette butts and tire treads were the majority of other litter material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other for above figure.

Table 5-4 presents the composition of waterway litter by size by material category.

Table 5.4: Aggregate Composition of Litter by Count, Waterway

Groups	Categories	4-inch-plus	4-inch-less	Total Count	Percent of Total
Paper	Fast-food paper bags	25,748,400	-	25,748,400	0.1%
	Fast-food paper cups	57,928,600	-	57,928,600	0.2%
	Other paper fast-food service items	64,677,600	123,963,200	188,640,800	0.7%
	Cardboard	33,937,000	13,353,500	47,290,400	0.2%
	Kraft bags	3,475,000	-	3,475,000	0.0%
	Receipts	19,582,600	55,338,500	74,921,200	0.3%
	Political signs	21,500	-	21,500	0.0%
	Other advertising signs	119,000	-	119,000	0.0%
	Office paper/ mail	18,465,800	191,679,000	210,144,800	0.8%
	Newspaper/ inserts	13,999,000	2,585,300	16,584,300	0.1%
	Magazines	398,300	-	398,300	0.0%
	Books	-	-	-	0.0%
	Aseptic/ gable top containers	29,400	-	29,400	0.0%
	Beverage carriers/ cartons	1,724,200	2,465,300	4,189,500	0.0%
	Paper home food packaging	9,812,200	62,613,000	72,425,100	0.3%
	Other paper	213,169,500	2,263,944,300	2,477,113,800	9.6%
	Subtotal Paper	**463,088,100**	**2,715,942,000**	**3,179,030,200**	**12.3%**
Plastic	Soda	32,781,400	-	32,781,400	0.1%
	Single-serve wine & liquor	5,559,900	75,403,900	80,963,800	0.3%
	Other wine & liquor	388,500	-	388,500	0.0%
	Sports & energy drinks	40,927,800	222,300	41,150,000	0.2%
	Juice	2,306,000	-	2,306,000	0.0%
	Tea & coffee	3,514,800	-	3,514,800	0.0%
	Still water	132,686,900	44,210,700	176,897,600	0.7%
	Other water	3,099,400	-	3,099,400	0.0%
	Other plastic beverage bottles	18,632,900	-	18,632,900	0.1%
	Fast-food plastic cups	102,844,900	7,566,100	110,411,000	0.4%
	Plastic straws	77,808,500	8,083,300	85,891,800	0.3%
	Other beverage packaging	36,978,300	343,858,000	380,836,300	1.5%
	Plastic trash bags	8,412,100	4,930,700	13,342,700	0.1%
	Other plastic bags	135,130,600	47,034,000	182,164,600	0.7%
	Food packaging film	173,099,500	977,148,100	1,150,247,600	4.4%
	Other film	181,036,300	1,484,634,600	1,665,670,900	6.4%
	Plastic food service items	21,361,800	106,572,300	127,934,000	0.5%
	Expanded polystyrene food service items	53,721,800	344,767,400	398,489,200	1.5%
	Other expanded polystyrene	42,979,800	994,230,600	1,037,210,400	4.0%
	Other plastic food packaging	40,992,500	356,363,100	397,355,600	1.5%
	Other plastic	383,073,900	4,639,544,900	5,022,618,800	17.2%
	Subtotal Plastic	**1,497,337,600**	**9,434,569,800**	**10,931,907,400**	**42.2%**

Table 5.4: Aggregate Composition of Litter by Count, Waterway

Groups	Categories	4-inch-plus	4-inch-less	Total Count	Percent of Total
Metal	Beer	189,832,800	56,781,400	246,614,200	1.0%
	Soda	93,814,400	-	93,814,400	0.4%
	Sports & energy drinks	22,096,300	1,757,700	23,853,900	0.1%
	Juice	21,500	-	21,500	0.0%
	Tea & coffee	5,412,200	589,000	6,001,100	0.0%
	Other metal beverage bottles	28,357,100	52,548,200	80,905,300	0.3%
	Other beverage packaging	4,372,800	199,411,000	203,783,800	0.8%
	Still water	-	-	-	0.0%
	Other water	51,000	-	51,000	0.0%
	Other metal	112,103,500	1,330,974,300	1,443,077,800	5.6%
	Subtotal Metal	**456,061,600**	**1,642,061,500**	**2,098,123,100**	**8.1%**
Glass	Beer	110,867,200	242,666,300	353,533,400	1.4%
	Soda	10,114,500	-	10,114,500	0.0%
	Single-serve wine & liquor	4,229,800	2,729,300	6,959,100	0.0%
	Other wine & liquor	22,090,900	-	22,090,900	0.1%
	Sports & energy drinks	1,044,300	-	1,044,300	0.0%
	Juice	21,500	-	21,500	0.0%
	Tea & coffee	243,700	-	243,700	0.0%
	Still water	-	-	-	0.0%
	Other water	-	-	-	0.0%
	Other glass beverage bottles	6,298,700	123,817,400	130,116,100	0.5%
	Broken glass or ceramic	58,190,800	1,457,276,100	1,515,466,900	5.9%
	Other glass food packaging	26,444,700	-	26,444,700	0.1%
	Other glass	12,350,900	311,853,100	324,204,000	1.3%
	Subtotal Glass	**251,896,900**	**2,138,342,100**	**2,390,239,000**	**9.2%**
Organics	Pet waste	11,726,200	78,741,000	90,467,200	0.3%
	Human waste	3,412,800	2,439,400	5,852,200	0.0%
	Confection	-	67,563,400	67,563,400	0.3%
	Other food waste	2,258,700	645,261,600	647,520,300	2.5%
	Other organics	16,568,400	43,699,300	60,267,700	0.2%
	Subtotal Organics	**33,966,100**	**837,704,700**	**871,670,800**	**3.4%**
Other	Medical waste	2,644,500	1,202,100	3,846,500	0.0%
	PPE gloves	33,616,700	67,563,400	101,180,000	0.4%
	PPE masks	13,066,700	13,181,600	26,248,300	0.1%
	Hazardous waste	-	-	-	0.0%
	Vehicle debris	30,949,000	325,677,500	356,626,500	1.4%
	Tires	5,376,300	-	5,376,300	0.0%
	Tire tread	12,675,600	241,303,200	253,978,800	1.0%
	Construction and demolition debris	37,208,800	126,386,700	163,595,500	0.6%
	Textiles/ small rugs	62,980,600	433,471,200	496,451,800	1.9%
	Bulky items	388,300	-	388,300	0.0%
	Cigarette butts	26,100	3,994,083,800	3,994,110,000	15.4%
	Electronic cigarettes	29,400	-	29,400	0.0%
	Other tobacco-related products & packaging	23,302,600	127,279,700	150,582,300	0.6%
	Toiletries/ personal hygiene products	82,793,500	601,000	83,394,500	0.3%
	Entertainment items	1,727,900	601,000	2,329,000	0.0%
	Flat screen TV and computer monitors	-	-	-	0.0%
	CRT televisions and computer monitors	-	-	-	0.0%

Table 5.4: Aggregate Composition of Litter by Count, Waterway

Groups	Categories	4-inch-plus	4-inch-less	Total Count	Percent of Total
Other	Portable electronics	-	-	-	0.0%
	Electronic cords	97,600	68,857,500	68,955,200	0.3%
	Other electronics	7,795,200	21,114,400	28,909,600	0.1%
	Other items	36,556,900	651,489,600	688,046,500	2.7%
	Subtotal Other	**351,235,700**	**6,072,812,700**	**6,424,048,400**	**24.8%**
Total		**3,053,586,000**	**22,841,432,900**	**25,895,018,900**	**100.0%**

Plastics comprised six out of the top 10 larger littered items observed on waterways. In a significant difference from roadway litter, other plastics slightly exceeded cigarette butts as the most common item littered of smaller items. Some material categories, such as other plastic, other paper, other film, and food packaging film were within the top ten materials for both larger and small litter items. Figures 5-4 and 5-5 present the top 10 litter material categories by size of litter.

Figure 5-4: Top 10 Aggregate Litter Items of 4-inch-plus Litter by Count, Waterway

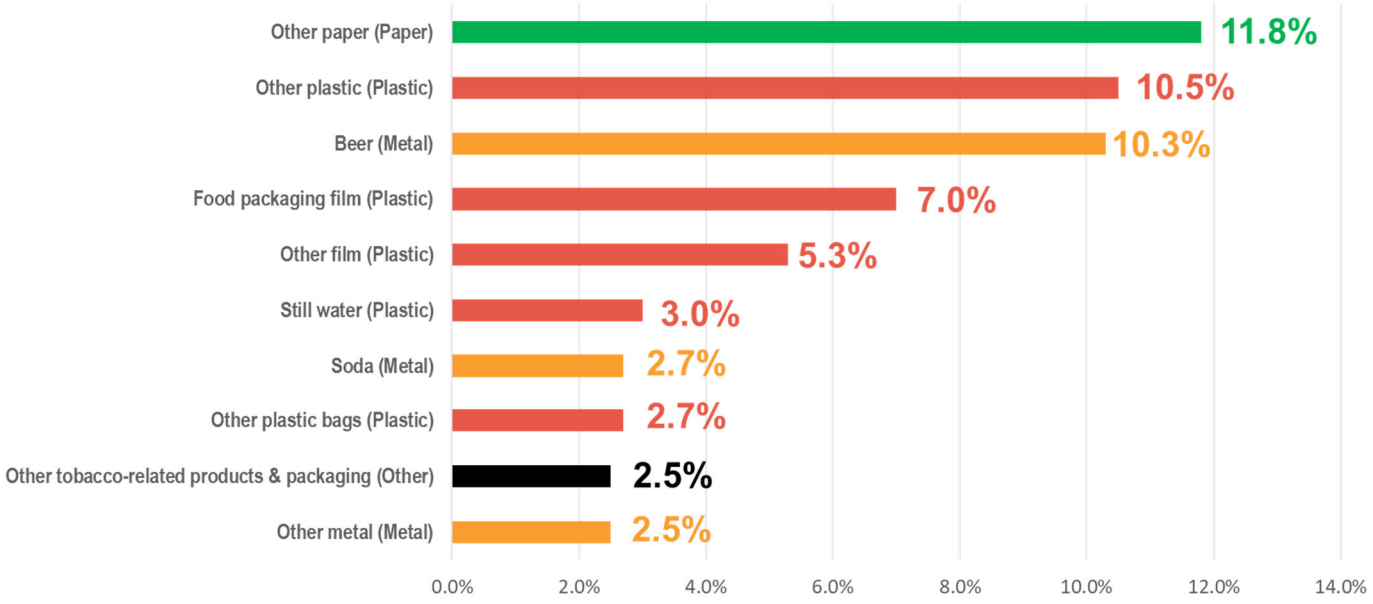
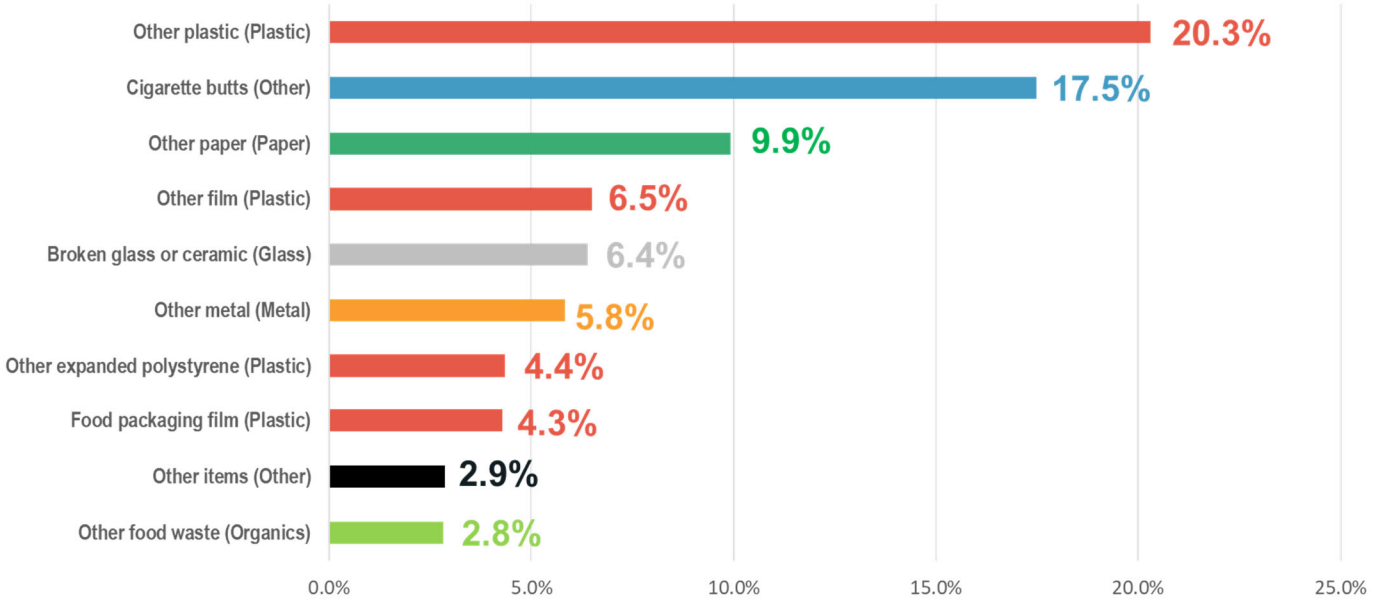


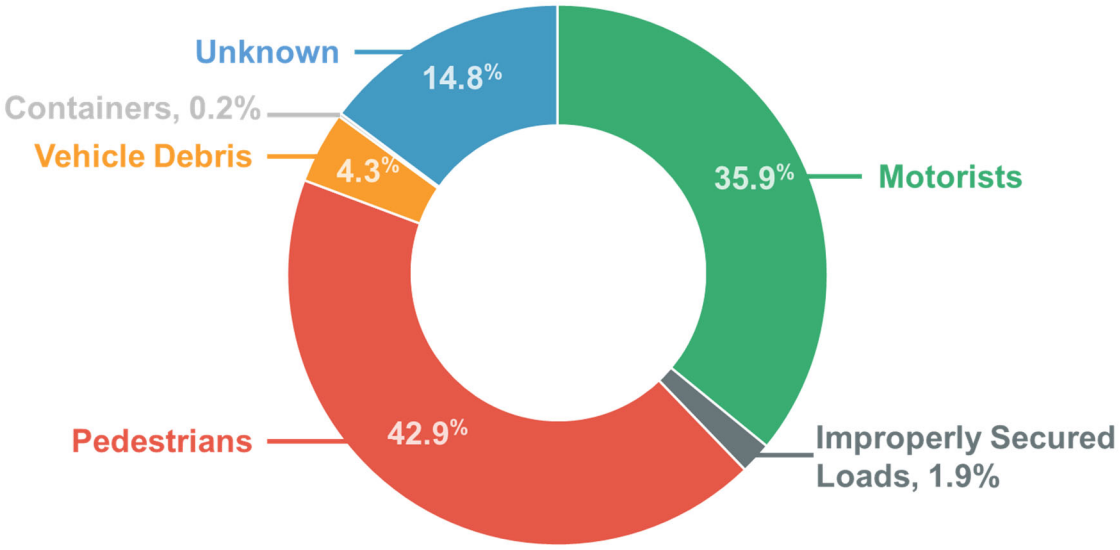
Figure 5-5: Top 10 Aggregate Litter Items of 4-inch-less Litter by Count, Waterway



5.2 SOURCES OF WATERWAY LITTER

Pedestrians were identified as the leading source of litter on waterways (collectively 42.9 percent). For waterways, pedestrians include persons not in vehicles on roadways, such as persons on the shore, in a boat, etc.[23] Motorists were still a significant source of litter near waterways because many roads intersect or roughly parallel the paths of waterways, or have storm drains on the roads that lead to nearby waterways. Figure 5-6 presents the sources of litter items found on United States waterways. Figure 5-7 presents the source of litter by material group for each waterway type.

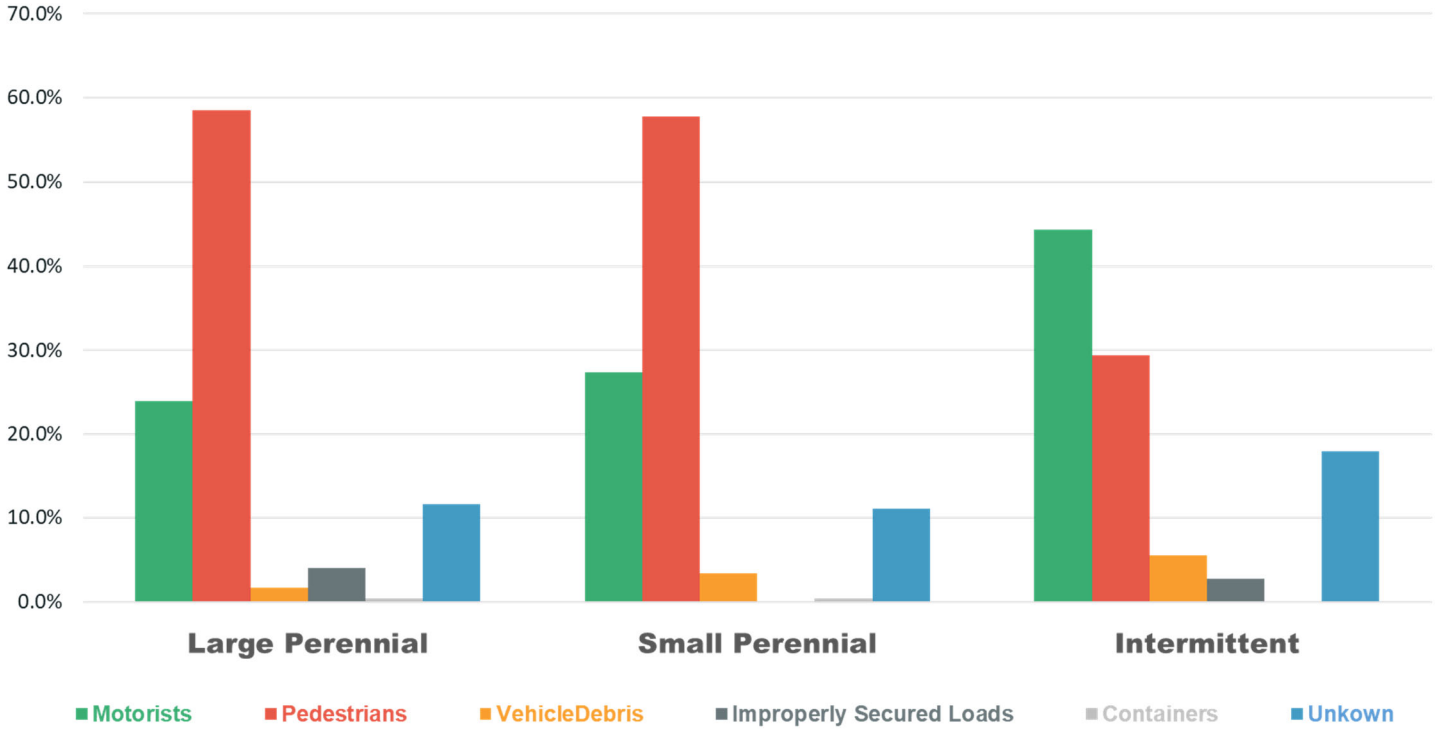
Figure 5-6: Source of Litter by Count, Waterway



Excluding intermittent waterways, pedestrians were the leading source of litter for both perennial waterway types based on field surveyors' observations. Motorists were the largest source of litter for intermittent waterways. Figure 5-7 presents the sources of litter items found on United States waterways.

[23] As previously noted, litter on waterways comes from many sources and, over time, can move around the environment. This Study examines litter where it is discovered along waterways with the understanding that litter may have moved from one environment to another because of many factors including wind, rain, and other natural and man-made phenomena. Along waterways in particular, litter may have floated downstream or come from storms drains, nearby roads or other human activities.

Figure 5-7: Source of Litter by Count by Waterway Type, Waterway



5.3 WATERWAY LITTER BY REGION TYPES

The quantity and composition of litter varies by region type. This section provides a comprehensive understanding of the quantity and composition of waterway litter in urban versus rural and bottle-bill versus non-bottle bill regions.

Urban and Rural

More than 95 percent of waterway litter in the United States was located in rural areas; a significant difference from roadway litter which was more closely split between urban and rural regions. However, as with roadways, urban waterways had more litter items per center mile than rural waterways. Tables 5-5 and 5-6 present the estimated count of waterway litter in aggregate and per center mile by urban and rural region.

Table 5-5: Aggregate Count of Waterway Litter by Material Group, Urban and Rural

Material Group	Urban Litter Items	Rural Litter Items	Total Litter Items
Paper	105,429,100	3,073,601,000	3,179,030,200
Plastic	542,717,300	10,389,190,000	10,931,907,400
Metal	36,168,300	2,061,954,800	2,098,123,100
Glass	197,971,200	2,192,267,800	2,390,239,000
Organics	12,043,800	859,626,900	871,670,800
Cigarette butts[1]	197,837,600	3,796,272,400	3,994,110,000
Tire treads[1]	2,898,100	251,080,800	253,978,800
Other	57,476,900	2,118,482,800	2,175,959,600
Total	**1,152,542,300**	**24,742,476,600**	**25,895,018,900**

1. Cigarette butts and tire treads material categories were the majority of other material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other.

Table 5-6: Aggregate Count of Waterway Litter per Mile, Urban and Rural

	Urban	Rural	Total
Total Litter Items	1,152,542,300	24,742,476,600	25,895,018,900
Miles[1]	278,991	10,461,325	10,740,317
Litter Items Per Mile	**4,131**	**2,365**	**2,411**

1. Source: Waterway distance based on U.S. Geological Survey (USGS) National Hydrography Dataset Plus High Resolution (NHDPlus HR).

Like the aggregate composition, plastic was determined to be the most prevalent littered items in urban and rural regions. Plastics accounted for 47.1 percent and 42.0 percent of total littered items near waterways in urban and rural areas, respectively. Figures 5-8 and 5-9 present the composition of litter items by material group for urban and rural areas.

Figure 5-8: Aggregate Composition of Waterway Litter by Count, Urban

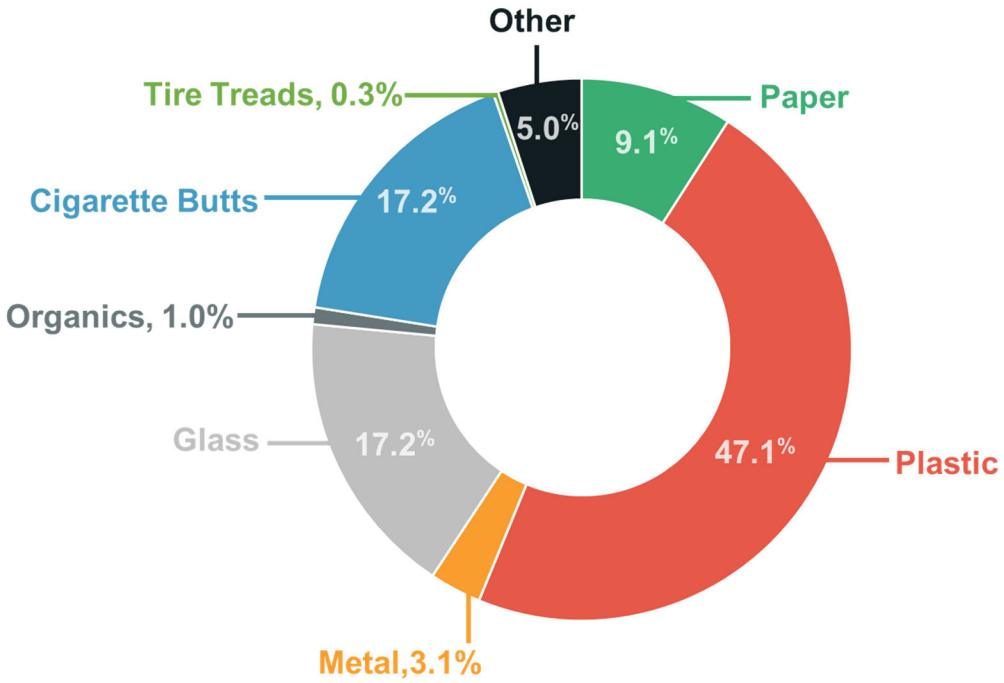
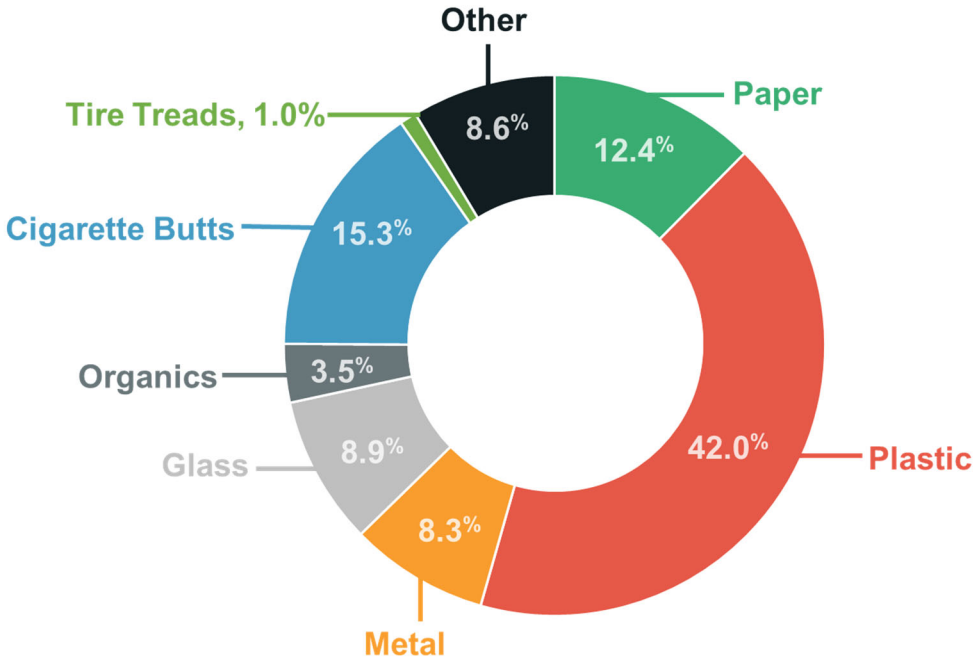


Figure 5-9: Aggregate Composition of Waterway Litter by Count, Rural



* Cigarette butts and tire treads were the majority of other litter material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other for above figure.

Bottle Bill and Non-Bottle Bill

An estimated 1.1 billion beverage containers were discarded near United States waterways. Waterways in bottle bill and non-bottle bill states had comparable deposit material litter items per mile (105 and 103 litter items per mile in bottle bill and non-bottle bill states respectively). On a per capita basis, residents littered substantially less deposit material in bottle bill states than in non-bottle bill states (1.6 and 4.1 litter items per capita in bottle bill and non-bottle bill states respectively) and less non-deposit material litter. Tables 5-7, 5-8, and 5-9 present the estimated count of waterway litter in aggregate and per mile by bottle bill and non-bottle bill region.

Table 5-7: Aggregate Count of Waterway Deposit Material Litter by Product Type, Bottle Bill and Non-Bottle Bill

Product Type	Bottle Bill	Non-Bottle Bill	Total Bottles
Soda	8,590,000	128,120,400	136,710,400
Beer	97,437,300	502,710,400	600,147,700
Single-serve wine & liquor	5,394,900	82,528,000	87,922,900
Other wine & liquor	754,600	21,724,700	22,479,300
Sports & energy drinks	5,995,900	60,052,400	66,048,300
Still water	23,334,400	153,563,300	176,897,700
Other water	719,500	2,430,800	3,150,300
Other plastic beverage bottles	2,871,500	15,761,400	18,632,900
Total	**145,098,100**	**966,891,400**	**1,111,989,500**

Table 5-8: Aggregate Count of Waterway Litter per Mile, Bottle Bill and Non-Bottle Bill

	Bottle Bill	Non-Bottle Bill	Total
Deposit Material Litter Items	145,098,100	966,891,400	1,111,989,500
Non-deposit Material Litter Items	4,614,228,600	20,168,800,800	24,783,029,400
Total Litter Items	4,759,326,700	21,135,692,200	25,895,018,900
Miles[1]	1,376,162	9,364,154	10,740,317
Deposit Material Litter Items Per Mile	**105**	**103**	**104**
Non-deposit Material Litter Items Per Mile	**3,353**	**2,154**	**2,307**
Litter Items Per Mile	**3,458**	**2,257**	**2,411**

1. Source: Roadway distance based on Federal Highway Administration (FHWA) Highway Performance Monitoring System (HPMS).

Table 5-9: Aggregate Count of Waterway Litter per Capita, Bottle Bill and Non-Bottle Bill

	Bottle Bill	Non-Bottle Bill	Total
Deposit Material Litter Items	145,098,100	966,891,400	1,111,989,500
Non-deposit Material Litter Items	4,614,228,600	20,168,800,800	24,783,029,400
Total Litter Items	4,759,326,700	21,135,692,200	25,895,018,900
Population[1]	88,751,439	236,634,918	325,386,357
Deposit Material Litter Items Per Capita	**2**	**4**	**3**
Non-deposit Material Litter Items Per Capita	**52**	**85**	**76**
Litter Items Per Capita	**54**	**89**	**80**

1. Source: U.S. Census 2020

Beer accounted for 15.2 percentage points more littered containers in bottle bill states than in states without bottle bills. In contrast, Soda accounted for 7.3 percentage points more containers in non-bottle bill states and single-serve wine and liquor accounted for 4.8 percentage points more containers in non-bottle bill states. Figures 5-10 and 5-11 present the composition of litter items by material group for bottle bill and non-bottle bill states.

Figure 5-10: Aggregate Composition of Deposit Material Littered on Waterways by Count, Bottle Bill

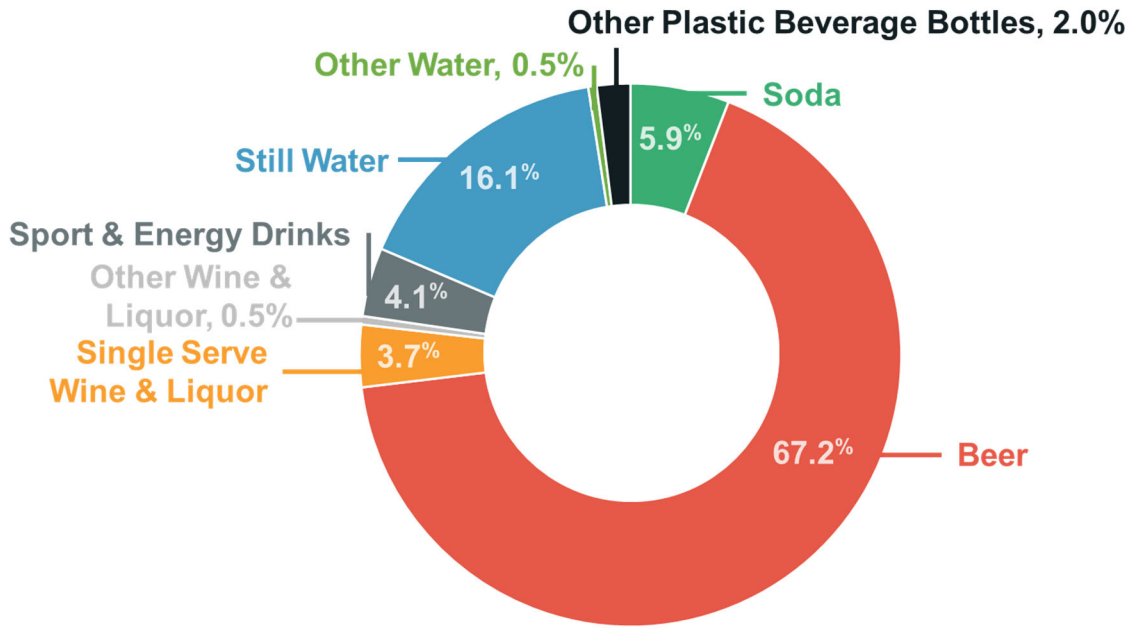


Figure 5-11: Aggregate Composition of Deposit Material Littered on Waterways by Count, Non-Bottle Bill

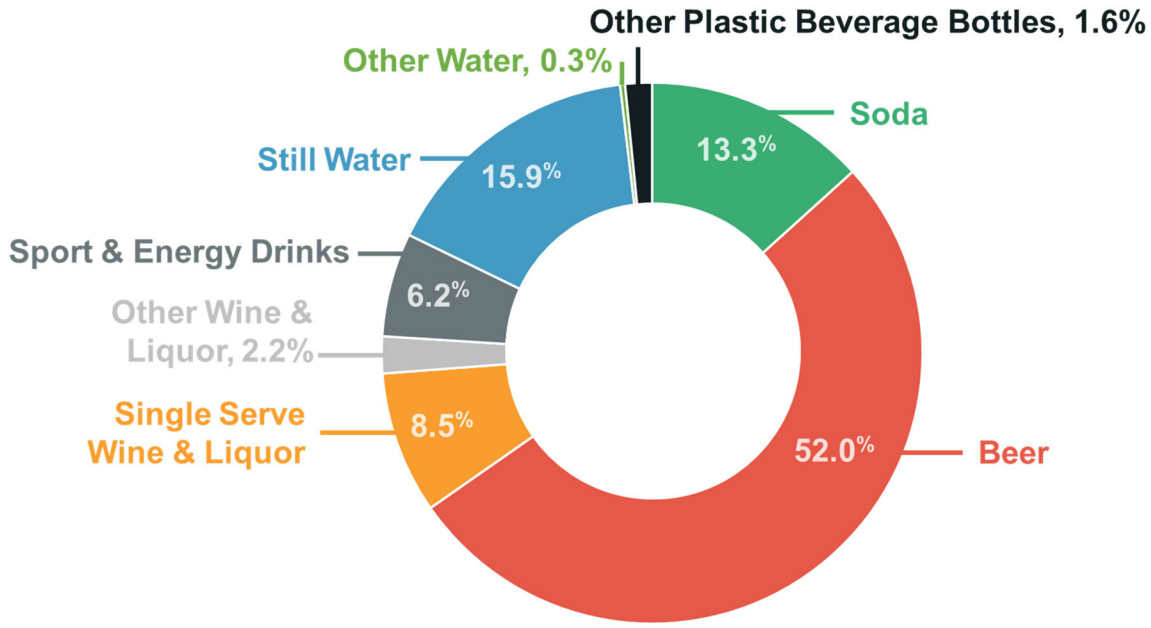


Table 5-10 presents the composition of litter by bottle bill state, non-bottle bill state, and aggregate by deposit material littered. Comparable quantities of plastic, metal, and glass bottles were littered along United States waterways collectively.

Table 5-10: Waterway Litter Composition of Deposit and Non-Deposit Material Category by Count, Bottle Bill and Non-Bottle Bill

	Groups	Deposit Material Categories	Bottle Bill	Non-Bottle Bill	Total Count	Percent of Total
Deposit Material	**Plastic**	Soda	1,615,200	31,166,200	32,781,400	0.1%
		Single-serve wine & liquor	4,826,900	76,136,900	80,963,800	0.3%
		Other wine & liquor	99,000	289,500	388,500	0.0%
		Sports & energy drinks	2,433,500	38,716,600	41,150,000	0.2%
		Still water	23,334,400	153,563,300	176,897,600	0.7%
		Other water	690,400	2,409,000	3,099,400	0.0%
		Other plastic beverage bottles	2,871,500	15,761,400	18,632,900	0.1%
		Subtotal Plastic	**35,870,900**	**318,042,900**	**353,913,600**	**1.4%**
	Metal	Beer	23,742,000	222,872,200	246,614,200	1.0%
		Soda	6,745,400	87,069,000	93,814,400	0.4%
		Sports & energy drinks	3,215,300	20,638,600	23,853,900	0.1%
		Still water	-	-	-	0.0%
		Other water	29,100	21,800	51,000	0.0%
		Subtotal Metal	**33,731,800**	**330,601,600**	**364,333,500**	**1.4%**
	Glass	Beer	73,695,300	279,838,200	353,533,400	1.4%
		Soda	229,400	9,885,200	10,114,500	0.0%
		Single-serve wine & liquor	568,000	6,391,100	6,959,100	0.0%
		Other wine & liquor	655,600	21,435,200	22,090,900	0.1%
		Sports & energy drinks	347,100	697,200	1,044,300	0.0%
		Still water	-	-	-	0.0%
		Other water	-	-	-	0.0%
		Subtotal Glass	**75,495,400**	**318,246,900**	**393,742,200**	**1.5%**
Non-Deposit Material	**Paper**	Fast-food paper bags	1,694,700	24,053,600	25,748,400	0.1%
		Fast-food paper cups	13,358,700	44,570,000	57,928,600	0.2%
		Other paper fast-food service	41,871,800	146,769,000	188,640,800	0.7%
		Cardboard	9,808,500	37,481,900	47,290,400	0.2%
		Kraft bags	253,600	3,221,300	3,475,000	0.0%
		Receipts	23,843,900	51,077,200	74,921,200	0.3%
		Political signs	12,000	9,500	21,500	0.0%
		Other advertising signs	54,700	64,300	119,000	0.0%
		Office paper/ mail	51,968,400	158,176,400	210,144,800	0.8%
		Newspaper/ inserts	1,090,100	15,494,200	16,584,300	0.1%
		Magazines	208,900	189,400	398,300	0.0%
		Books	0	0	0	0.0%
		Aseptic/ gable top containers	17,200	12,300	29,400	0.0%
		Beverage carriers/ cartons	1,717,500	2,472,100	4,189,500	0.0%
		Paper home food packaging	1,904,700	70,520,400	72,425,100	0.3%
		Other paper	420,514,900	2,056,598,900	2,477,113,800	9.6%
		Subtotal Paper	**568,319,600**	**2,610,710,500**	**3,179,030,100**	**12.3%**

Table 5-10: Waterway Litter Composition of Deposit and Non-Deposit Material Category by Count, Bottle Bill and Non-Bottle Bill

	Groups	Deposit Material Categories	Bottle Bill	Non-Bottle Bill	Total Count	Percent of Total
	Plastic	Juice	849,100	1,456,900	2,306,000	0.0%
		Tea & coffee	1,163,900	2,350,800	3,514,800	0.0%
		Fast-food plastic cups	18,252,100	92,158,900	110,411,000	0.4%
		Plastic straws	17,437,400	68,454,400	85,891,800	0.3%
		Other beverage packaging	103,914,300	276,922,000	380,836,300	1.5%
		Plastic trash bags	4,456,300	8,886,400	13,342,700	0.1%
		Other plastic bags	40,915,100	141,249,500	182,164,600	0.7%
		Food packaging film	148,526,700	1,001,720,900	1,150,247,600	4.4%
		Other film	260,759,500	1,404,911,400	1,665,670,900	6.4%
		Plastic food service items	17,884,300	110,049,800	127,934,000	0.5%
		Expanded polystyrene food	21,640,800	376,848,400	398,489,200	1.5%
		Other expanded polystyrene	85,059,800	952,150,700	1,037,210,400	4.0%
		Other plastic food packaging	61,535,600	335,820,100	397,355,600	1.5%
		Other plastic	1,041,974,300	3,980,644,500	5,022,618,800	19.4%
		Subtotal Plastic	**1,824,369,200**	**8,753,624,700**	**10,577,993,900**	**40.8%**
	Metal	Juice	12,000	9,500	21,500	0.0%
		Tea & coffee	407,700	5,593,400	6,001,100	0.0%
		Other metal beverage bottles	20,691,200	60,214,100	80,905,300	0.3%
		Other beverage packaging	54,672,200	149,111,500	203,783,800	0.8%
		Other metal	190,101,400	1,252,976,400	1,443,077,800	5.6%
		Subtotal Metal	**265,884,500**	**1,467,904,900**	**1,733,789,400**	**6.7%**
	Glass	Juice	12,000	9,500	21,500	0.0%
		Tea & coffee	91,500	152,200	243,700	0.0%
		Other glass beverage bottles	26,719,500	103,396,500	130,116,100	0.5%
		Broken glass or ceramic	361,887,400	1,153,579,500	1,515,466,900	5.9%
		Other glass food packaging	0	26,444,700	26,444,700	0.1%
		Other glass	100,255,700	223,948,300	324,204,000	1.3%
		Subtotal Glass	**488,966,100**	**1,507,530,700**	**1,996,496,800**	**7.7%**
	Organics	Pet waste	25,203,400	65,263,800	90,467,200	0.3%
		Human waste	1,729,800	4,122,400	5,852,200	0.0%
		Confection	0	67,563,400	67,563,400	0.3%
		Other food waste	180,848,600	466,671,700	647,520,300	2.5%
		Other organics	15,601,300	44,666,400	60,267,700	0.2%
		Subtotal Organics	**223,383,100**	**648,287,700**	**871,670,800**	**3.4%**
	Other	Medical waste	408,600	3,438,000	3,846,500	0.0%
		PPE gloves	3,754,400	97,425,600	101,180,000	0.4%
		PPE masks	6,116,200	20,132,100	26,248,300	0.1%
		Hazardous waste	0	0	0	0.0%
		Vehicle debris	56,127,700	300,498,800	356,626,500	1.4%
		Tires	355,000	5,021,300	5,376,300	0.0%
		Tire tread	81,952,800	172,026,100	253,978,800	1.0%
		Construction and demolition	26,119,600	137,475,900	163,595,500	0.6%
		Textiles/small rugs	131,093,700	365,358,100	496,451,800	1.9%
		Bulky items	203,500	184,800	388,300	0.0%
		Cigarette butts	723,294,600	3,270,815,300	3,994,110,000	15.4%

Table 5-10: Waterway Litter Composition of Deposit and Non-Deposit Material Category by Count, Bottle Bill and Non-Bottle Bill

	Groups	Deposit Material Categories	Bottle Bill	Non-Bottle Bill	Total Count	Percent of Total
		Electronic cigarettes	17,200	12,300	29,400	0.0%
		Other tobacco-related products	28,083,500	122,498,700	150,582,300	0.6%
		Toiletries/personal hygiene	24,047,800	59,346,700	83,394,500	0.3%
		Entertainment items	777,800	1,551,200	2,329,000	0.0%
		Flat screen TV and computer	0	0	0	0.0%
		CRT televisions and computer	0	0	0	0.0%
		Portable electronics	0	0	0	0.0%
		Electronic cords	22,710,900	46,244,300	68,955,200	0.3%
		Other electronics	6,783,900	22,125,700	28,909,600	0.1%
		Other items	131,459,100	556,587,500	688,046,500	2.7%
		Subtotal Other	**1,243,306,300**	**5,180,742,400**	**6,424,048,400**	**0.1%**
	Total		**4,759,326,900**	**21,135,692,300**	**25,895,018,900**	**100.0%**

5.4 KEY HIGHLIGHTS

- **Nearly 26 billion pieces of litter along United States waterways.** An estimated 25.9 billion pieces of litter were along the shores of 10.7 million center miles of United States waterways.
- **Large perennial waterways had the most litter items per mile.** Large perennial waterways had the most litter per mile (3,654 litter items per mile on average). Small perennial and intermittent waterways had fewer littered items per mile (3,141 litter items and 1,960 litter items per center mile on average respectively).
- **Intermittent waterways had the most total litter items.** Intermittent waterways account for more than half the total waterway miles. Although intermittent waterways had the lowest littered items per mile (1,960 litter items per mile on average), intermittent waterways had the most total littered items in aggregate (13.6 billion litter items).
- **Plastics and cigarette butts compose most litter items along waterways.** Of the total litter discovered near United States waterways, 10.9 billion (42.2 percent) were pieces of plastic followed by 4.0 billion (15.4 percent) cigarette butts. The composition of litter was comparable across waterway types for plastics, organics, and tire treads but varied for paper, metal, and cigarette butts.
- **Majority of waterway litter was smaller, but larger items contribute to the waterway litter issue as well.** Like roadway litter, most of the litter on United States waterways (22.8 billion pieces or 88.2 percent) were four inches or smaller in size. Approximately 3.1 billion pieces greater than 4-inches were littered near United States waterways.

- **Pedestrians were the leading source of litter along waterways.** Pedestrians were identified as the leading source of litter on waterways (collectively 42.9 percent). For waterways, pedestrians include persons not in vehicles on roadways, such as persons on the shore, in a boat, etc. Motorists were still a significant source of litter near waterways because many roads intersect or roughly parallel the paths of waterways, or have storm drains on the roads that lead to nearby waterways.
- **More waterway litter in aggregate in rural region, but urban region had more waterway litter per mile.** More than 95 percent of waterway litter in the United States was discarded in rural areas. However, urban waterways had more litter items per center mile than rural waterways.
- **On a per capita basis, residents littered less deposit materials along waterways in bottle bill states.** The Study estimated residents littered substantially less deposit materials in bottle bill states than non-bottle bill states (1.6 and 4.1 litter items per capita in bottle bill and non-bottle bill states respectively) and less non-deposit material (52 and 85 litter items per capita in bottle bill and non-bottle bill states respectively).

6.0 PRODUCT-SPECIFIC LITTER RESULTS

This section evaluates litter by product-specific research interest (i.e., fast food products, food packaging film, plastic bags, and personal protective equipment (PPE)) not discussed in detail in other sections. This section does not discuss beverage bottles or cigarette butts as these topics are evaluated in detail in Sections 3, 4, 5, and 7.

6.1 FAST FOOD PRODUCTS

An estimated 817.6 million fast-food products were littered along United States roadways and waterways. Fast food products represent 1.8 percent of litter along roadways and 1.4 percent of litter along waterways. Conservatively, the Study assumed fast-food products included littered materials that could be identified as originating from fast-food service restaurants, such as fast-food paper bags, paper cups, and plastic cups. Materials that could be from other sources such as non-fast-food restaurants or homes, such as straws, were excluded from Table 6-1. "Other paper fast food service items" (a category that includes napkins and beverage holders) represented 53.0 percent of the fast-food products littered. Fast food cups, paper, and plastic, represented 34.2 percent of the fast-food products littered. Table 6-1 presents the composition of fast-food product litter by roadways, waterways, and aggregate by material category.

Table 6-1: Aggregate Composition of Fast-Food Product Litter by Count, Roadway and Waterway

Groups	Categories	Roadway	Waterway	Total Count	Percent of Total
Paper	Fast-food paper bags	57,104,900	25,748,400	82,853,200	10.1%
	Fast-food paper cups	46,086,000	57,928,600	104,014,600	12.7%
	Other paper fast-food service items	244,792,500	188,640,800	433,433,300	53.0%
	Subtotal Paper	**347,983,400**	**272,317,800**	**620,301,100**	**75.9%**
Plastic	Fast-food plastic cups	86,919,000	110,411,000	197,330,100	24.1%
	Subtotal Plastic	**86,919,000**	**110,411,000**	**197,330,100**	**24.1%**
Total		**434,902,400**	**382,728,800**	**817,631,200**	**100.0%**

6.2 FOOD PACKAGING FILM

An estimated 2.6 billion food packaging film items (which include products like snack bags and candy wrappers)were littered along United States roadways and waterways. That equates to more than three times as many littered items as fast-food items, more than seven times the amount of littered soda containers, and more the twice the amount of beer containers. Not including materials that do not fit into other categories, food packaging film was the second most littered material category after cigarette butts. Approximately half (55.3

percent) of all food packaging film was along roadways and the other half (44.7 percent) was along waterways. Table 6-2 presents the composition of food packaging film litter by roadways, waterways, and aggregate.

Table 6-2: Aggregate Composition of Food Packaging Litter by Count, Roadway and Waterway

	Categories	Roadway	Waterway	Total Count	Percent of Total
Plastic	Food packaging film	1,424,362,100	1,150,247,600	2,574,609,700	100.0%
Total		**1,424,362,100**	**1,150,247,600**	**2,574,609,700**	**100.0%**

6.3 PLASTIC BAGS

An estimated 324.8 million plastic bags were littered along United States roadways and waterways. The vast majority, 94.6 percent, of plastic bags littered were not trash bags but were other plastic bags that include items, such as retail store plastic bags, newspaper bags, and other consumer packaging (thin film) plastic bags. Table 6-3 presents the composition of plastic bags by roadways, waterways, and aggregate by material category.

Table 6-3: Aggregate Composition of Plastic Bag Litter by Count, Roadway and Waterway

Groups	Categories	Roadway	Waterway	Total Count	Percent of Total
Plastic	Plastic trash bags	4,069,600	13,342,700	17,412,400	5.4%
	Other plastic bags	125,201,000	182,164,600	307,365,600	94.6%
Total		**129,270,600**	**195,507,300**	**324,778,000**	**100.0%**

6.4 PERSONAL PROTECTIVE EQUIPMENT

The past year saw a dramatic increase in the use of PPE masks and gloves to reduce the transmittal of COVID-19. However, as evidenced by pictures around the world, many people were not properly disposing of PPE masks and gloves. The Keep America Beautiful 2020 National Litter Study provides the first national estimate of the scale and scope of the PPE litter problem. The Study estimated 207.1 million PPE items were littered along United States roadways and waterways, which equates to a piece of PPE litter on the ground for nearly two out of three U.S. residents. The Study estimates that much of that PPE litter (127.4 million pieces) lies along US waterways. PPE gloves represented 72.1 percent of the PPE littered. PPE masks accounted for less littered PPE items, perhaps due to the increased usage of reusable masks over time. In both cases, future research will be critical to understanding if and to what extent PPE litter decreases over time as concerns about surface transmission erode (in particular, for PPE gloves), as consumers continue to adopt reusable masks, and as COVID-19 and its variants subside. Table 6-4 presents the composition of PPE litter by roadways, waterways, and aggregate by material category.

Table 6-4: Aggregate Composition of Litter by Count, Roadway and Waterway

Groups	Categories	Roadway	Waterway	Total Count	Percent of Total
	PPE gloves	48,098,900	101,180,000	149,279,000	**72.1%**
	PPE masks	31,615,000	26,248,300	57,863,200	**27.9%**
Total		**79,713,900**	**127,428,300**	**207,142,200**	**100.0%**

6.5 KEY HIGHLIGHTS

- **Over 800 million pieces of fast-food packaging were littered on United States roadways and waterways.** An estimated 394.7 million fast food cups and 423.0 million other fast-food items were currently littered along United States roadways and waterways.
- **An estimated 2.6 billion food packaging film items (which include products like snack bags and candy wrappers) were littered along United States roadways and waterways, making food packaging film as the second most littered item after cigarette butts.** Approximately half (55.3 percent) of all food packaging film was along roadways and the other half (44.7 percent was along waterways.
- **Nearly 350 million plastic bags were littered on United States roadways and waterways.** The vast majority, 94.6 percent) of plastic bags littered were not trash bags (i.e., retail store plastic bags).
- **An estimated 207 million PPE items were littered on United States roadways and waterways.** The Study estimated 149.2 million PPE gloves and 57.9 million PPE masks were littered on United States roadways and waterways.

7.0 COMPARISON OF 2009 AND 2020 ROADWAY LITTER SURVEY RESULTS

In 2009, Keep America Beautiful conducted a national litter research study to document the quantity, composition, and sources of litter on United States roadways. Approximately 51.2 billion pieces of litter were estimated to be littered along United States roadways in 2009. The Keep America Beautiful 2020 National Litter Study estimated approximately 23.7 billion pieces of litter along United States roadways in 2020, a decrease of 54 percent. The finding of a decrease in roadway litter is consistent with other recent statewide litter studies including Tennessee, which reported a 43 percent decrease from 2006 to 2016, Texas, which reported a 28 percent decrease from 2013 to 2019, and New Jersey which reported a 53 percent reduction in litter between 2004 and 2017.

On a per capita basis, United States residents' littering behavior has decreased from 167 to 73 items for each U.S. resident on roadways from 2009 to 2020. While this represents significant progress towards the goal of ending litter, there is still more work to efforts needed to achieve the ultimate goal of eradicating litter in the United States when we still find over 23 billion pieces of litter along US roads (see Section 4) and over 25 billion pieces of litter along US waterways (see Section 5). Tables 7-1, 7-2, and 7-3 present the estimated count of roadway litter in aggregate, per mile, and per capita based on the 2009 study and Keep America Beautiful 2020 National Litter Study.[24]

Table 7-1: Aggregate Count of Litter by Material Group, Roadway

Material Group	2009 Study Total Litter Items	2020 Study Total Litter Items	Difference	Change
Paper	11,196,607,196	4,335,691,200	(6,860,915,996)	-61.3%
Plastic	9,866,570,146	8,227,849,400	(1,638,720,646)	-16.6 %
Metal	2,963,135,873	1,813,443,600	(1,149,692,273)	-38.8 %
Glass	2,326,395,114	1,171,458,900	(1,154,936,214)	-49.6 %
Organics	2,165,083,993	397,136,200	(1,767,947,893)	-81.7 %
Cigarette Butts	18,583,533,952	5,703,542,200	(12,879,991,852)	-69.3 %
Vehicle Debris[1]	782,430,919	743,491,000[1]	(38,939,919)	-5.0 %
Other	3,292,132,629[2]	1,285,414,100[4]	(2,006,718,529)	-61.0 %
Total	**51,175,889,822**	**23,678,026,500**	**(27,497,863,322)**	**-53.7 %**

1. The 2009 Litter in America study included a Vehicle Debris material category that captured all types of vehicle debris, including tires and tire treads. To compare the 2020 Study results to the 2009 study results, the 2020 Tire Tread material category was combined with 2020 Vehicle Debris material category.
2. The 2009 Litter in America study litter count shown in the Other material group has been modified from the litter count presented in 2009 Litter in America report. Construction Debris, Cigar Butts, and Other Tobacco-Related 2009 litter counts were added to this category.

[24] Litter quantities in tables are rounded to nearest hundred for report. Rounding may impact reported categories quantities summation to reported total quantities.

3. The 2020 litter count shown in the Other category has been modified from the Other litter count presented elsewhere in this report. Tires and Vehicle Debris category counts were removed from total Other litter count and added to total Vehicle Debris litter count.

Table 7-2: Aggregate Count of Litter per Capita, Roadway

	2009 Study Total Litter Items	2020 Study Total Litter Items	Difference	Change
Total Litter Items	51,175,889,822	23,678,026,500	(27,497,863,322)	-53.7%
Population[1]	306,675,006	325,386,357	18,711,351	6.1%
Litter Items Per Capita	**167**	**73**	**(94)**	**-56.3%**

1. Source: U.S. Census 2020

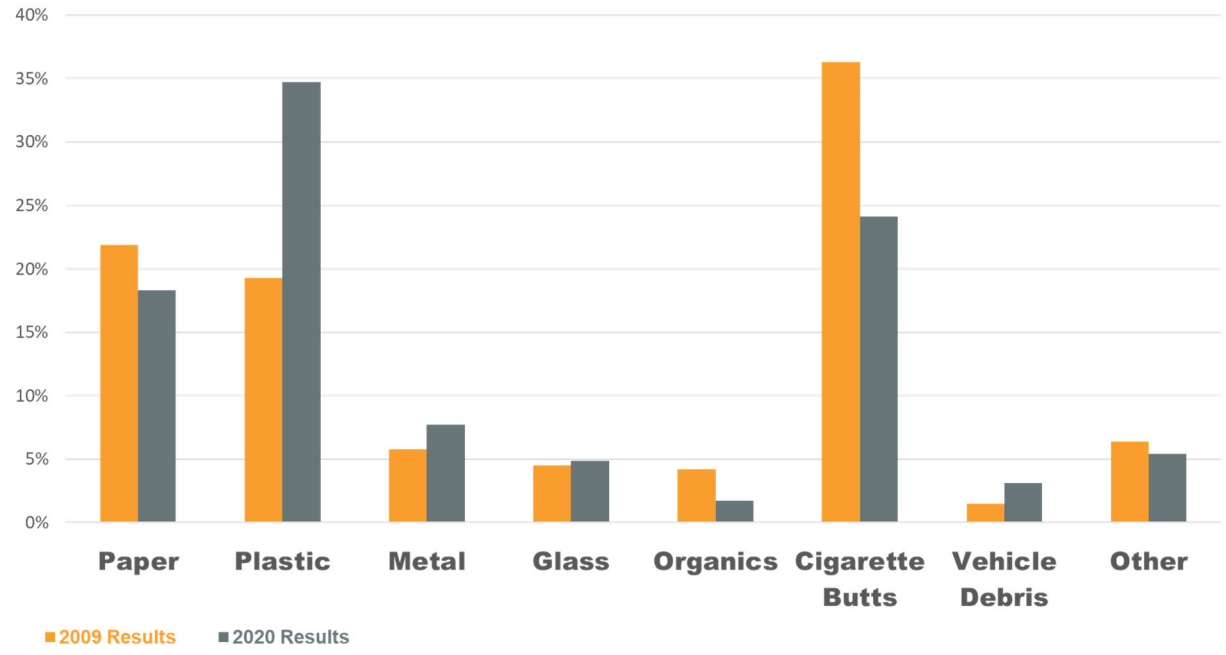
This section compares the results from the 2009 study to the current study.

7.1 AGGREGATE QUANTITY AND COMPOSITION

As Table 7-1 above shows, litter of all material groups decreased from 2009 to 2020, ranging from a decrease as small as 5 percentage points for litter from vehicle debris to a high of 81.7 percentage points decrease for organic material litter. While not the greatest proportional decrease among material types, the sheer decrease—12.9 billion pieces—in the amount of cigarette butt litter from 2009 to 2020 is notable.

With decreases of varying magnitude across the material groups, the proportional composition of litter shifted from 2009 to 2020. Of the total litter discarded near United States roadways, the percentages attributed to the paper, metal, glass, organics, vehicle debris and other material groups remained relatively similar between 2009 and 2020. In contrast, the plastic material group now represents a significantly higher percentage of all litter while cigarette butts represent a much smaller percentage of litter on roadways (Figure 7-1).

Figure 7-1: Comparison of Composition of Total Litter by Count from 2009 Study to 2020 Study, Roadway



Regarding material composition of larger litter (four inches or larger), the Keep America Beautiful 2020 National Litter Study shows the greatest proportional increase in the metal material group from the 2009 Study and the largest decrease in the paper material group. In regard to smaller litter, the Keep America Beautiful 2020 National Litter Study shows the greatest increase in the plastics material group and the largest decrease in cigarette butt litter. Figures 7-2 and 7-3 compare the composition of four-inch-plus and four-inch-less litter items by material group from the 2009 study and the Keep America Beautiful 2020 National Litter Study.

Figure 7-2: Comparison of Composition of 4-inch-plus Litter by Count from 2009 Study to 2020 Study, Roadway

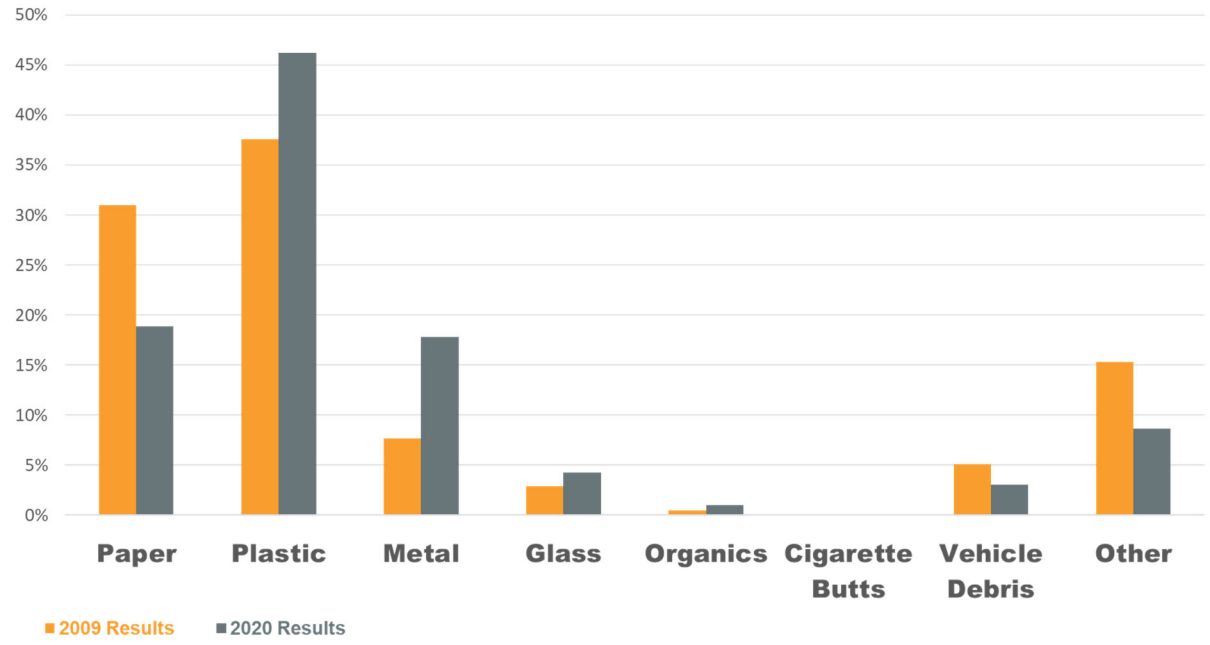


Figure 7-3: Comparison of Composition of 4-inch-less Litter by Count from 2009 Study to 2020 Study, Roadway

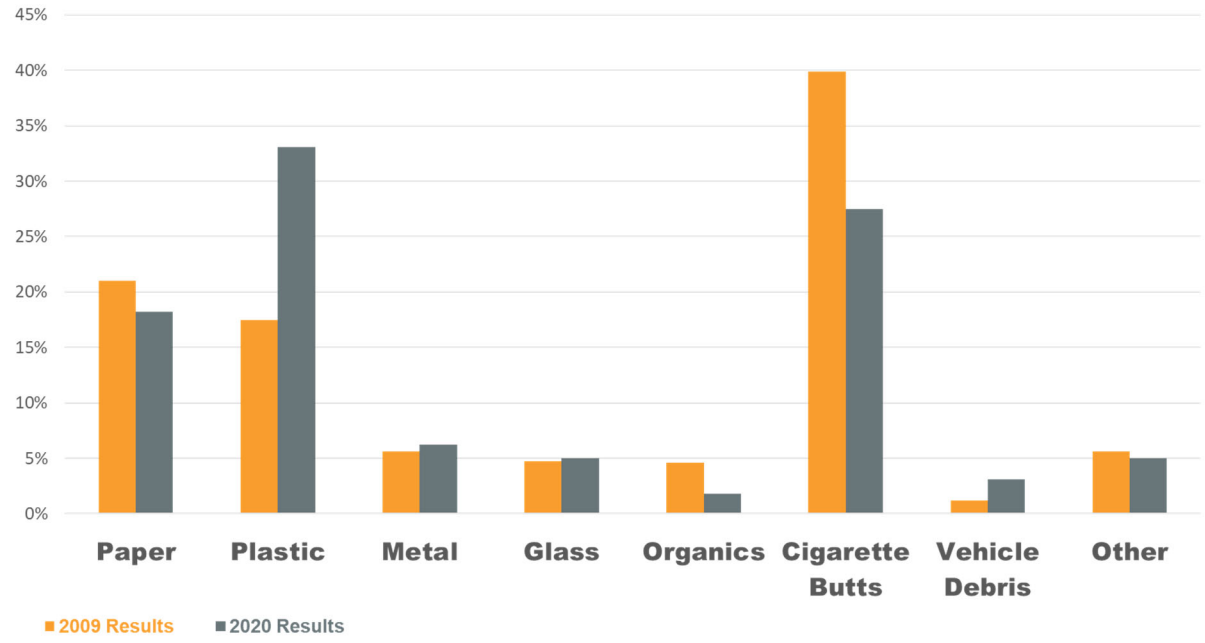


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Table 7-4: Comparison of Aggregate Composition of Litter by Count from 2009 to 2020 Study, Roadway

Groups	Categories	2009 Study	2020 Study	Difference	Change
Paper	Cardboard	122,748,649	185,754,400	63,005,751	51.3%
	Paper Fast-Food Service Items	1,418,382,582	347,983,300	(1,070,399,282)	-75.5%
	Kraft bags	81,119,139	6,920,200	(74,198,939)	-91.5%
	Office Paper & Discarded Mail	307,199,436	98,398,500	(208,800,936)	-68.0%
	Newspaper & Inserts	1,070,057,748	249,109,100	(820,948,648)	-76.7%
	Magazines & Books	16,054,870	3,134,000	(12,920,870)	-80.5%
	Receipts	295,900,297	89,817,600	(206,082,697)	-69.6%
	Advertising Signs & Cards	45,081,108	9,529,100	(35,552,008)	-78.9%
	Aseptic & Gable-Top Containers	18,406,868	3,747,500	(14,659,368)	-79.6%
	Beverage Carriers & Cartons	10,575,416	22,059,200	11,483,784	108.6%
	Paper Home Food Packaging	524,368,324	35,608,300	(488,760,024)	-93.2%
	Other Paper	7,286,712,760	3,283,630,000	(4,003,082,760)	-54.9%
	Subtotal Paper	11,196,607,196	4,335,691,200	(6,860,915,996)	-61.3%
Plastic	Plastic Soft Drink Bottles	154,949,833	56,981,800	(97,968,033)	-63.2%
	Plastic Wine & Liquor Bottles	16,516,500	249,489,100	232,972,600	1,410.5%
	Plastic Sports & Health Drink Bottles	34,670,688	42,393,900	7,723,212	22.3%
	Plastic Juice Bottles	12,590,150	16,786,800	4,196,650	33.3%
	Plastic Tea Bottles	4,669,276	4,695,900	26,624	0.6%
	Plastic Water Bottles	80,284,274	116,543,700	36,259,426	45.2%
	Plastic Beverage Bottles or Packaging	328,846,938	237,604,300	(91,242,638)	-27.7%
	Plastic Fast-Food Service Items	960,797,419	290,597,000	(670,200,419)	-69.8%
	Plastic Bags	309,272,707	129,270,600	(180,002,107)	-58.2%
	Food Packaging Film	936,445,509	1,424,362,100	487,916,591	52.1%
	Other Plastic Film	1,140,801,568	1,173,815,800	33,014,232	2.9%
	EPS Fast-Food Service Items	308,741,691	184,746,400	(123,995,291)	-40.2%
	Other Expanded Polystyrene	1,827,283,778	319,254,000	(1,508,029,778)	-82.5%
	Plastic Home Food Packaging	658,644,850	252,332,300	(406,312,550)	-61.7%
	Other plastic	3,092,054,964	3,728,975,800	636,920,836	20.6%
	Subtotal Plastic	**9,866,570,146**	**8,227,849,500**	**(1,638,720,646)**	**-16.6%**
Metal	Aluminum Beer Cans	213,392,185	401,334,300	187,942,115	88.1%
	Aluminum Soft Drink Cans	161,133,171	143,062,500	(18,070,671)	-11.2%
	Metal Sports & Health Drink Cans	5,434,139	38,382,300	32,948,161	606.3%
	Metal Juice Cans	4,915,001	6,658,300	1,743,299	35.5%
	Metal Tea Cans	3,246,355	2,998,200	(248,155)	-7.6%
	Other Metal Beverage Packaging	185,093,018	178,007,900	(7,085,118)	-3.8%
	Other Metal & Foil Packets	2,389,922,003	1,043,000,100	(1,346,921,903)	-56.4%
	Subtotal Metal	**2,963,135,873**	**1,813,443,600**	**(1,149,692,273)**	**-38.8%**
Glass	Glass Beer Bottles	201,368,896	126,131,100	(75,237,796)	-37.4%
	Glass Soft Drink Bottles	18,621,883	6,061,600	(12,560,283)	-67.4%
	Glass Wine & Liquor Bottles	14,360,099	39,662,500	25,302,401	176.2%
	Glass Sports & Health Drink Bottles	1,655,143	42,400	(1,612,743)	-97.4%
	Glass Juice Bottles	971,841	662,500	(309,341)	-31.8%
	Glass Tea Bottles	338,468	1,073,300	734,832	217.1%
	Glass Water Bottles	338,468	236,600	(101,868)	-30.1%
	Other Glass Bottles	105,225,926	39,345,300	(65,880,626)	-62.6%
Glass	Broken Glass or Ceramic	1,704,648,831	855,631,400	(849,017,431)	-49.8%
	Other Glass	278,865,558	102,612,200	(176,253,358)	-63.2%
	Subtotal Glass	2,326,395,114	1,171,458,900	(1,154,936,214)	-49.6%
Organics	Human waste	4,528,799	175,000	(4,353,799)	-96.1%

Groups	Categories	2009 Study	2020 Study	Difference	Change
	Food waste	2,160,555,194	291,539,400	(1,869,015,794)	-86.5%
	Other organics	-	105,421,700	105,421,700	NA
	Subtotal Organics	**2,165,083,993**	**397,136,100**	**(1,767,947,893)**	**-81.7%**
Cigarette Butts	Cigarette Butts	18,583,533,952	5,703,542,100	(12,879,991,852)	-69.3%
	Subtotal Cigarette Butts	**18,583,533,952**	**5,703,542,100**	**(12,879,991,852)**	**-69.3%**
Vehicle Debris	Vehicle Debris	782,430,919	743,491,000	(38,939,919)	-5.0%
	Subtotal Vehicle Debris	**782,430,919**	**743,491,000**	**(38,939,919)**	**-5.0%**
Other	Construction Debris	1,330,457,440	368,440,300	(962,017,140)	-72.3%
	Hazardous	9,623,943	546,300	(9,077,643)	-94.3%
	Other Tobacco-Related	699,707,631	242,278,100	(457,429,531)	-65.4%
	Textiles & Small Rugs	174,606,629	362,780,600	188,173,971	107.8%
	Toiletries & Sundries	119,275,202	25,186,700	(94,088,502)	-78.9%
	Entertainment Items	18,835,305	216,600	(18,618,705)	-98.9%
	Bulky Items	880,871	425,300	(455,571)	-51.7%
	Other items	938,745,608	285,540,200	(653,205,408)	-69.6%
	Subtotal Other	**3,292,132,629**	**1,285,414,100**	**(2,006,718,529)**	**-61.0%**
Total		**51,175,889,822**	**23,678,026,500**	**(27,497,863,322)**	**-53.7%**

Inside material groups, the 2009 and 2020 studies allow us to compare changes in littered items in material categories over time (Table 7-4).[25] At this level of detail, there is significant variation in both the degree of change and the direction (increase or decrease) of change in the amount littered material. The majority of the paper, plastic, glass, and other material categories saw declines from 2009 to 2020. Among high-profile material categories, fast-food packaging litter was down, as was soft drink litter (including plastic and glass bottles and aluminum cans), construction debris, and other tobacco-related litter. The large decline in cigarette butt litter—a decrease of 69.3 percentage points from 18.6 billion cigarette butts to 5.7 billion—far outpaces the decline in the percentage of U.S. residents who smoke from 2009 to 2020 and, therefore, cannot be completely explained by declining smoking rates. With prohibitions on outdoor gathering in many locations, COVID-19 may have had a larger than average impact on cigarette butt littering behavior as compared to other littering behaviors in this current study. A significant decline in newspaper, magazine, and receipt litter occurred during this period in which we saw an accelerating shift to electronic media and digital transactions.

While most litter types went down between 2009 and 2020, several key material categories saw increases in the amount of litter from 2009 including plastic wine and liquor, beer, food packaging film, sports drinks, and water.

The largest share of the decrease in roadway litter from 2009 to the current Study can be found in smaller litter (4-inches or smaller in size), which is to be expected because the vast majority of litter was of a smaller size.

[25] The material categories were expanded in 2020 to better capture newly emerging litter trends (e.g., PPE litter). For the sake of comparison, 2020 material categories that does not have an appropriate match in the other study were consolidated for comparison purposes.

Among smaller litter, the Study shows a decrease of 27.5 billion pieces or 53.7 percentage points. However, larger litter also decreased significantly in quantity from 2009 to the current Study (a decrease of 1.7 billion pieces of litter or 36.1 percentage points). Tables 7-5 and 7-6 compare the composition of roadway litter from the 2009 study to the Keep America Beautiful 2020 National Litter Study.

Table 7-5: Aggregate Composition of 4-Inch-Plus Litter by Count from 2009 to 2020 Study, Roadway

Groups	Categories	2009 4-inch-plus	2020 4-inch-plus	Difference	Change
Paper	Cardboard	77,948,189	44,920,700	(33,027,489)	-42.4%
	Paper Fast-Food Service Items	547,942,228	109,361,700	(438,580,528)	-80.0%
	Kraft bags	33,717,547	2,188,300	(31,529,247)	-93.5%
	Office Paper & Discarded Mail	151,390,816	5,248,900	(146,141,916)	-96.5%
	Newspaper & Inserts	79,150,246	17,418,500	(61,731,746)	-78.0%
	Magazines & Books	4,535,261	2,097,400	(2,437,861)	-53.8%
	Receipts	56,052,649	8,192,500	(47,860,149)	-85.4%
	Advertising Signs & Cards	25,871,553	5,267,900	(20,603,653)	-79.6%
	Aseptic & Gable-Top Containers	10,759,276	3,747,500	(7,011,776)	-65.2%
	Beverage Carriers & Cartons	5,616,926	3,641,400	(1,975,526)	-35.2%
	Paper Home Food Packaging	10,624,287	8,759,700	(1,864,587)	-17.6%
	Other Paper	429,666,661	347,883,800	(81,782,861)	-19.0%
	Subtotal Paper	**1,433,275,639**	**558,728,300**	**(874,547,339)**	**-61.0%**
Plastic	Plastic Soft Drink Bottles	109,175,146	56,981,800	(52,193,346)	-47.8%
	Plastic Wine & Liquor Bottles	16,516,500	38,321,100	21,804,600	132.0%
	Plastic Sports & Health Drink Bottles	30,180,513	40,488,500	10,307,987	34.2%
	Plastic Juice Bottles	12,590,150	16,786,800	4,196,650	33.3%
	Plastic Tea Bottles	4,669,276	4,695,900	26,624	0.6%
	Plastic Water Bottles	76,531,093	103,856,000	27,324,907	35.7%
	Plastic Beverage Bottles or Packaging	72,308,128	67,796,600	(4,511,528)	-6.2%
	Plastic Fast-Food Service Items	271,884,138	139,939,300	(131,944,838)	-48.5%
	Plastic Bags	110,349,583	83,193,000	(27,156,583)	-24.6%
	Food Packaging Film	351,169,088	207,546,400	(143,622,688)	-40.9%
	Other Plastic Film	196,685,498	156,144,600	(40,540,898)	-20.6%
	EPS Fast-Food Service Items	76,728,427	64,815,400	(11,913,027)	-15.5%
	Other Expanded Polystyrene	124,605,439	40,557,800	(84,047,639)	-67.5%
	Plastic Home Food Packaging	56,473,328	34,524,500	(21,948,828)	-38.9%
	Other plastic	228,228,507	309,472,100	81,243,593	35.6%
	Subtotal Plastic	**1,738,094,815**	**1,365,119,800**	**(372,975,015)**	**-21.5%**
Metal	Aluminum Beer Cans	123,751,623	303,972,100	180,220,477	145.6%
	Aluminum Soft Drink Cans	72,720,028	81,023,100	8,303,072	11.4%
	Metal Sports & Health Drink Cans	5,434,139	11,449,800	6,015,661	110.7%
	Metal Juice Cans	4,915,001	6,658,300	1,743,299	35.5%
	Metal Tea Cans	3,246,355	2,998,200	(248,155)	-7.6%
	Other Metal Beverage Packaging	1,904,955	19,260,200	17,355,245	911.1%
	Other Metal & Foil Packets	144,957,576	100,148,500	(44,809,076)	-30.9%
	Subtotal Metal	**356,929,678**	**525,510,200**	**168,580,522**	**47.2%**
Glass	Glass Beer Bottles	84,943,166	57,027,100	(27,916,066)	-32.9%
	Glass Soft Drink Bottles	18,621,883	6,061,600	(12,560,283)	-67.4%
	Glass Wine & Liquor Bottles	14,360,099	12,207,000	(2,153,099)	-15.0%

Groups	Categories	2009 4-inch-plus	2020 4-inch-plus	Difference	Change
	Glass Sports & Health Drink Bottles	1,655,143	42,400	(1,612,743)	-97.4%
	Glass Juice Bottles	971,841	662,500	(309,341)	-31.8%
	Glass Tea Bottles	338,468	1,073,300	734,832	217.1%
	Glass Water Bottles	338,468	236,600	(101,868)	-30.1%
	Other Glass Bottles	4,999,728	10,342,700	5,342,972	106.9%
Glass	Broken Glass or Ceramic	6,570,382	14,867,000	8,296,618	126.3%
	Other Glass	1,586,789	25,090,000	23,503,211	1,481.2%
	Subtotal Glass	**134,385,967**	**127,610,200**	**(6,775,767)**	**-5.0%**
Organics	Human waste	3,563,246	175,000	(3,388,246)	-95.1%
	Food waste	18,396,273	18,861,300	465,027	2.5%
	Other organics	0	10,899,700	10,899,700	NA
	Subtotal Organics	**21,959,520**	**29,936,000**	**7,976,480**	**36.3%**
Cigarette Butts	Cigarette Butts	0	1,098,200	1,098,200	NA
	Subtotal Cigarette Butts	**0**	**1,098,200**	**1,098,200**	**NA**
Vehicle Debris	Vehicle Debris	235,671,649	91,541,900	(144,129,749)	-61.2%
	Subtotal Vehicle Debris	**235,671,649**	**91,541,900**	**(144,129,749)**	**-61.2%**
Other	Construction Debris	240,152,929	33,595,000	(206,557,929)	-86.0%
	Hazardous	2,471,583	546,300	(1,925,283)	-77.9%
	Other Tobacco-Related	236,919,139	75,414,700	(161,504,439)	-68.2%
	Textiles & Small Rugs	91,786,061	45,269,900	(46,516,161)	-50.7%
	Toiletries & Sundries	15,717,503	23,733,700	8,016,197	51.0%
	Entertainment Items	849,391	216,600	(632,791)	-74.5%
	Bulky Items	880,871	425,300	(455,571)	-51.7%
	Other items	118,624,472	77,793,000	(40,831,472)	-34.4%
	Subtotal Other	**707,401,950**	**256,994,500**	**(450,407,450)**	**-63.7%**
Total		**4,627,719,218**	**2,956,539,100**	**(1,671,180,118)**	**-36.1pp**

Table 7-6: Aggregate Composition of 4-Inch-Less Litter by Count from 2009 to 2020 Study, Roadway

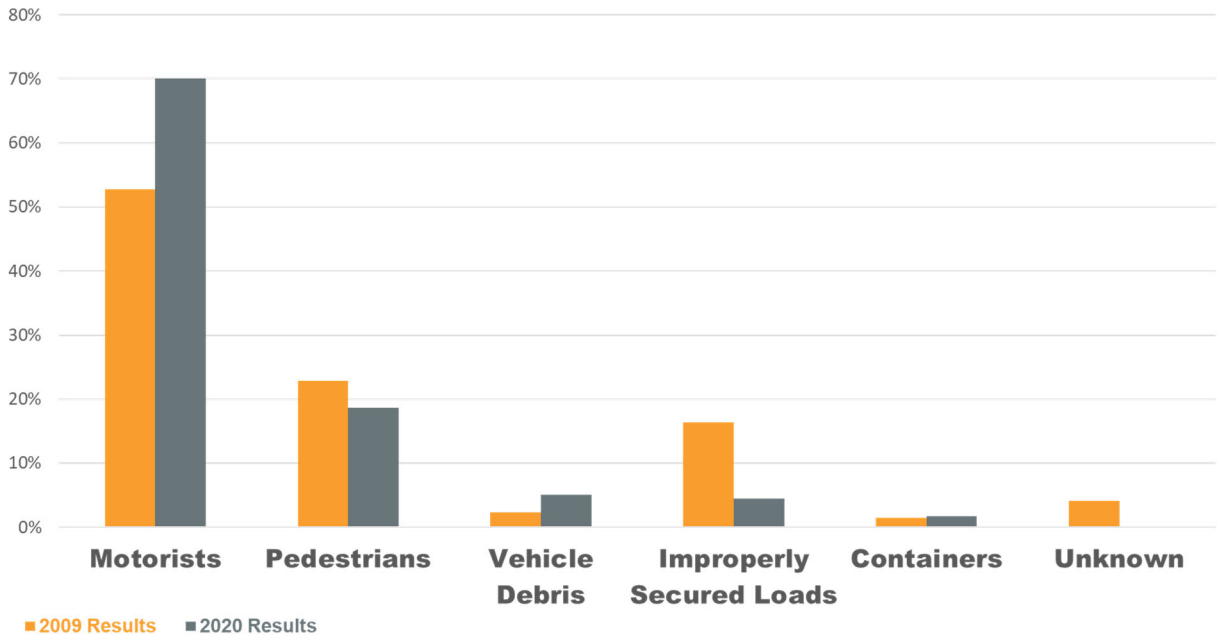
Groups	Categories	2009 4-inch-less	2020 4-inch-less	Difference	Change
Paper	Cardboard	44,800,460	140,833,700	96,033,240	214.4%
	Paper Fast-Food Service Items	870,440,355	238,621,600	(631,818,755)	-72.6%
	Kraft bags	47,401,592	4,731,900	(42,669,692)	-90.0%
	Office Paper & Discarded Mail	155,808,620	93,149,600	(62,659,020)	-40.2%
	Newspaper & Inserts	990,907,502	231,690,600	(759,216,902)	-76.6%
	Magazines & Books	11,519,609	1,036,600	(10,483,009)	-91.0%
	Receipts	239,847,647	81,625,100	(158,222,547)	-66.0%
	Advertising Signs & Cards	19,209,555	4,261,200	(14,948,355)	-77.8%
	Aseptic & Gable-Top Containers	7,647,592	-	(7,647,592)	-100.0%
	Beverage Carriers & Cartons	4,958,490	18,417,800	13,459,310	271.4%
	Paper Home Food Packaging	513,744,036	26,848,600	(486,895,436)	-94.8%
	Other Paper	6,857,046,100	2,935,746,200	(3,921,299,900)	-57.2%
	Subtotal Paper	**9,763,331,557**	**3,776,962,900**	**(5,986,368,657)**	**-61.3%**
Plastic	Plastic Soft Drink Bottles	45,774,687	-	(45,774,687)	-100.0%
	Plastic Wine & Liquor Bottles	-	211,168,000	211,168,000	NA
	Plastic Sports & Health Drink Bottles	4,490,175	1,905,400	(2,584,775)	-57.6%
	Plastic Juice Bottles	-	-	-	-
	Plastic Tea Bottles	-	-	-	
	Plastic Water Bottles	3,753,181	12,687,700	8,934,519	238.1%
	Plastic Beverage Bottles or Packaging	256,538,810	169,807,700	(86,731,110)	-33.8%
	Plastic Fast-Food Service Items	688,913,281	150,657,700	(538,255,581)	-78.1%
	Plastic Bags	198,923,124	46,077,600	(152,845,524)	-76.8%
	Food Packaging Film	585,276,421	1,216,815,700	631,539,279	107.9%
	Other Plastic Film	944,116,070	1,017,671,200	73,555,130	7.8%
	EPS Fast-Food Service Items	232,013,264	119,931,000	(112,082,264)	-48.3%
	Other Expanded Polystyrene	1,702,678,339	278,696,200	(1,423,982,139)	-83.6%
	Plastic Home Food Packaging	602,171,523	217,807,800	(384,363,723)	-63.8%
	Other plastic	2,863,826,457	3,419,503,700	555,677,243	19.4%
	Subtotal Plastic	**8,128,475,331**	**6,862,729,700**	**(1,265,745,631)**	**-15.6%**
Metal	Aluminum Beer Cans	89,640,561	97,362,200	7,721,639	8.6%
	Aluminum Soft Drink Cans	88,413,143	62,039,400	(26,373,743)	-29.8%
	Metal Sports & Health Drink Cans	-	26,932,500	26,932,500	NA
	Metal Juice Cans	-	-	-	-
	Metal Tea Cans	-	-	-	-
	Other Metal Beverage Packaging	183,188,063	158,747,700	(24,440,363)	-13.3%
	Other Metal & Foil Packets	2,244,964,427	942,851,600	(1,302,112,827)	-58.0%
	Subtotal Metal	**2,606,206,194**	**1,287,933,400**	**(1,318,272,794)**	**-50.6%**
Glass	Glass Beer Bottles	116,425,730	69,104,000	(47,321,730)	-40.6%
	Glass Soft Drink Bottles	-	-	-	-
	Glass Wine & Liquor Bottles	-	27,455,500	27,455,500	NA
	Glass Sports & Health Drink Bottles	-	-	-	-
	Glass Juice Bottles	-	-	-	-
	Glass Tea Bottles	-	-	-	-
	Glass Water Bottles	-	-	-	-
	Other Glass Bottles	100,226,198	29,002,600	(71,223,598)	-71.1%
Glass	Broken Glass or Ceramic	1,698,078,450	840,764,400	(857,314,050)	-50.5%
	Other Glass	277,278,769	77,522,200	(199,756,569)	-72.0%
	Subtotal Glass	**2,192,009,147**	**1,043,848,700**	**(1,148,160,447)**	**-52.4%**

Groups	Categories	2009 4-inch-less	2020 4-inch-less	Difference	Change
Organics	Human waste	965,553	-	(965,553)	-100.0%
	Food waste	2,142,158,921	272,678,100	(1,869,480,821)	-87.3%
	Other organics	0	94,522,000	94,522,000	NA
	Subtotal Organics	**2,143,124,473**	**367,200,100**	**(1,775,924,373)**	**-82.9%**
Cigarette Butts	Cigarette Butts	18,583,533,952	5,702,443,900	(12,881,090,052)	-69.3%
	Subtotal Cigarette Butts	**18,583,533,952**	**5,702,443,900**	**(12,881,090,052)**	**-69.3%**
Vehicle Debris	Vehicle debris	546,759,270	651,949,100	105,189,830	19.2%
	Subtotal Vehicle Debris	**546,759,270**	**651,949,100**	**105,189,830**	**19.2%**
Other	Construction Debris	1,090,304,510	334,845,300	(755,459,210)	-69.3%
	Hazardous	7,152,361	-	(7,152,361)	-100.0%
	Other Tobacco-Related	462,788,492	166,863,400	(295,925,092)	-63.9%
	Textiles & Small Rugs	82,820,567	317,510,700	234,690,133	283.4%
	Toiletries & Sundries	103,557,699	1,453,000	(102,104,699)	-98.6%
	Entertainment Items	17,985,913	-	(17,985,913)	-100.0%
	Bulky Items	-	-	-	-
	Other items	820,121,136	207,747,200	(612,373,936)	-74.7%
	Subtotal Other	**2,584,730,679**	**1,028,419,600**	**(1,556,311,079)**	**-60.2%**
Total		**46,548,170,604**	**20,721,487,400**	**(25,826,683,204)**	**-55.5%**

7.2 SOURCES OF ROADWAY LITTER

Motorists continued to be the leading source of litter on roadways (70.1 percent) in 2020 as they were in 2009. The change in the percentage of litter from motorists and improperly secured loads is, in part, due to development of field protocols in the Keep America Beautiful 2020 National Litter Study to define sources more reliably. As an enhancement for the Keep America Beautiful 2020 National Litter Study, protocol was developed to train field teams to identify the likely source of litter by evaluation of the site (i.e., type of roadway, pedestrian walkway, presence of container, etc.) and characteristics of the litter (i.e., compacted or not compacted). These definitions help to pinpoint more accurately the source of data without observing the act of littering firsthand. Holding aside the new protocol, the combined percentage of litter caused by motorists, improperly secured loads, and containers was comparable in 2009 and 2020. Figure 7-4 compares the source of litter by material group from the 2009 study and the Keep America Beautiful 2020 National Litter Study.

Figure 7-4: Comparison of Source of Litter by Count from 2009 Study to 2020 Study, Roadway



7.3 KEY HIGHLIGHTS

- **Decrease of 54 percent in litter along United States roadways.** In 2009, Keep America Beautiful conducted a national litter research study to document the quantity, composition, and sources of litter on United States roadways. Approximately 51.2 billion pieces of litter were estimated to be littered along United States roadways in 2009. The Keep America Beautiful 2020 National Litter Study estimated approximately 23.7 billion pieces of litter along United States roadways in 2020.
- **Significant decrease in smaller roadway litter.** Most of the decrease in roadway litter from the 2009 to current Study was a decrease in the quantity of litter items four-inches or smaller in size (a decrease of 25.8 billion pieces or 93.9 percent).
- **Litter in most material categories went down from the 2009 to current Study.** However, those decreases were not uniform across all categories and there is still much work to be done in eliminating litter in the United States. Notably, several high-profile litter categories, including cigarette butts, fast-food packaging, and soft-drink containers, saw large decreases in the number of littered items from 2009 to 2020. However, several key material categories saw increases in the amount of litter from 2009 to 2020 including beer containers, food packaging film, sports drink containers, and water containers.

8.0 NON-ROADWAY LITTER SURVEY RESULTS

In addition to evaluating litter along roadways and waterways, the study researched litter at non-roadways sites. While the roadway and waterway components of the study are intended to provide valid, national estimates of litter in America, the non-roadway study is intended to provide more insight about how litter and littering varies in some key areas of interest to solving the litter problem. The non-roadway sites were selected randomly across the regions of Study and included the following types of areas:

- **Retail shopping sites**
- **Local recreation sites**
- **Mass transit sites**
- **Construction sites**
- **Storm drains**
- **Coastline sites**

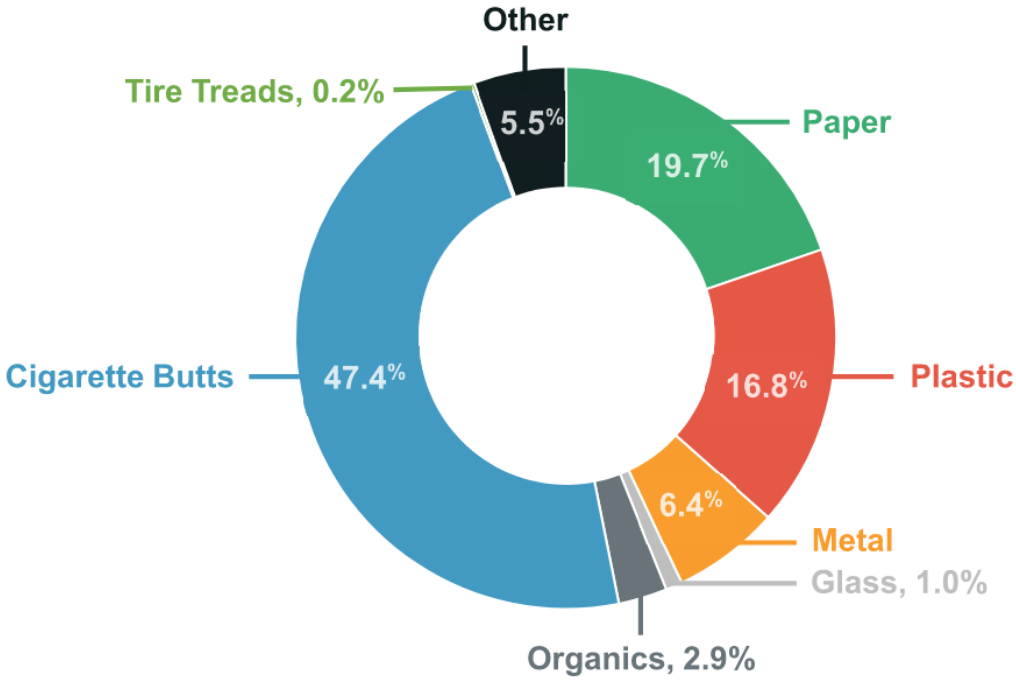
These types of sites were selected for several reasons: to continue tracking litter at public sites that were previously studied or have been identified as heavily littered areas, to study litter in settings that one commonly finds people congregating, and to understand litter in particularly areas that can have a substantial impact on the natural environment (e.g., storm drains and coastline sites). This section provides an understanding of the litter quantity by area, composition, and source of litter at each of these sites. By focusing on these three factors, the Keep America Beautiful 2020 National Litter Study provides metrics that facilitate comparison of the problem of litter across different areas and to enable the development of solutions that are appropriate for the types of spaces in which people and litter tend to congregate.

8.1 RETAIL SHOPPING SITES

Retail shopping sites include any establishments or group of establishments whose primary business is the selling of goods. A total of 29 retail shopping sites were randomly selected and surveyed. On average, there were 63 litter pieces per 1,000 square feet at surveyed retail sites. Of the total litter discarded near retail shopping sites, 47.4 percent were cigarette butts followed by paper items (19.7 percent). Retail shopping sites were the only type of non-roadway site that exhibited a greater overall paper litter composition than plastic composition. All other non-roadway sites discussed in this section were observed to have more plastic litter than paper. Retail shopping sites also had the greatest amount of littered cigarette butts by percent composition

compared to other non-roadway sites (roughly on par with mass transit sites). Figure 8-1 presents the aggregate composition of retail shopping site litter items by material group.

Figure 8-1: Composition of Total Litter by Count, Retail Shopping



As with roadway and waterway litter, most of the litter around United States retail shopping sites were four-inches or smaller in size (60.4 pieces per 1,000 square feet or 96 percent). Approximately 2.7 pieces per 1,000 square feet of litter items greater than four-inches in size were littered around United States retail shopping sites. As shown in Figure 8-2, paper and plastic composed most of the larger litter (34.8 and 34.5 percent respectively). Retail shopping site litter less than four-inches in size was mostly comprised of cigarette butts and paper (48.7 and 19.0 percent respectively). The overall composition of smaller litter items observed at retail shopping sites is provided as Figure 8-3.

Figure 8-2: Composition of 4-inch-plus Litter by Count, Retail Shopping

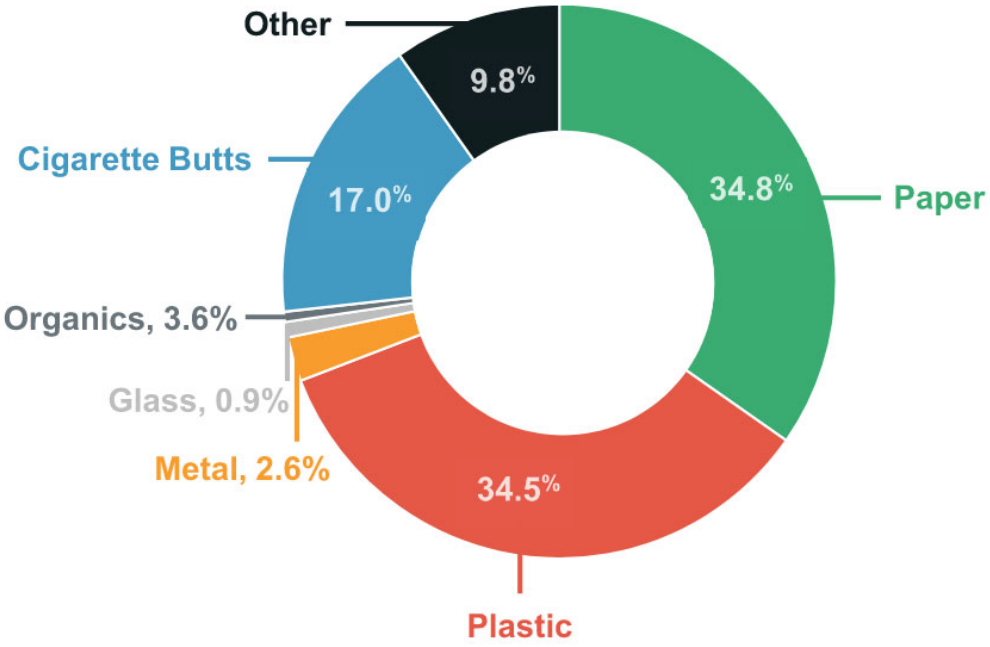
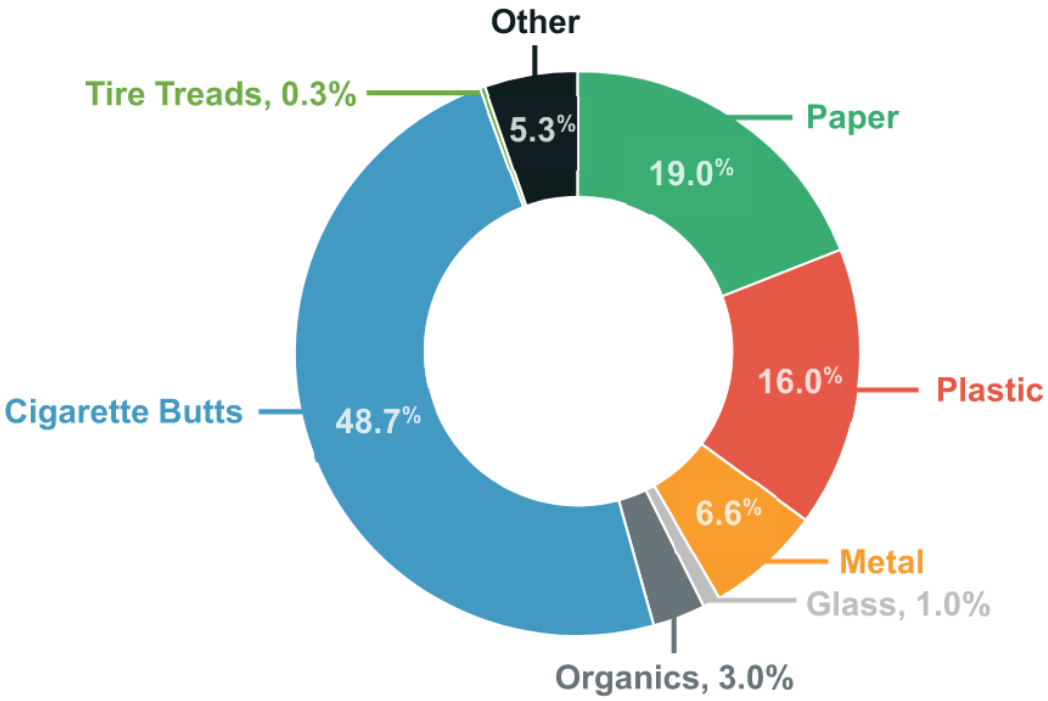
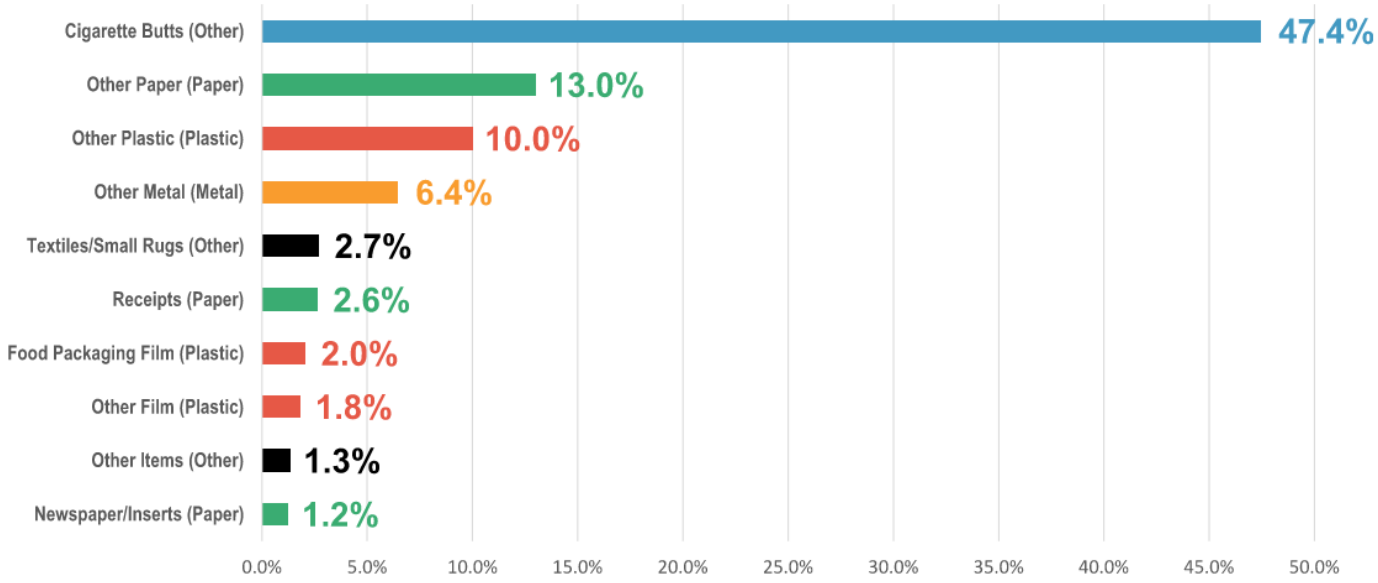


Figure 8-3: Composition of 4-inch-less Litter by Count, Retail Shopping



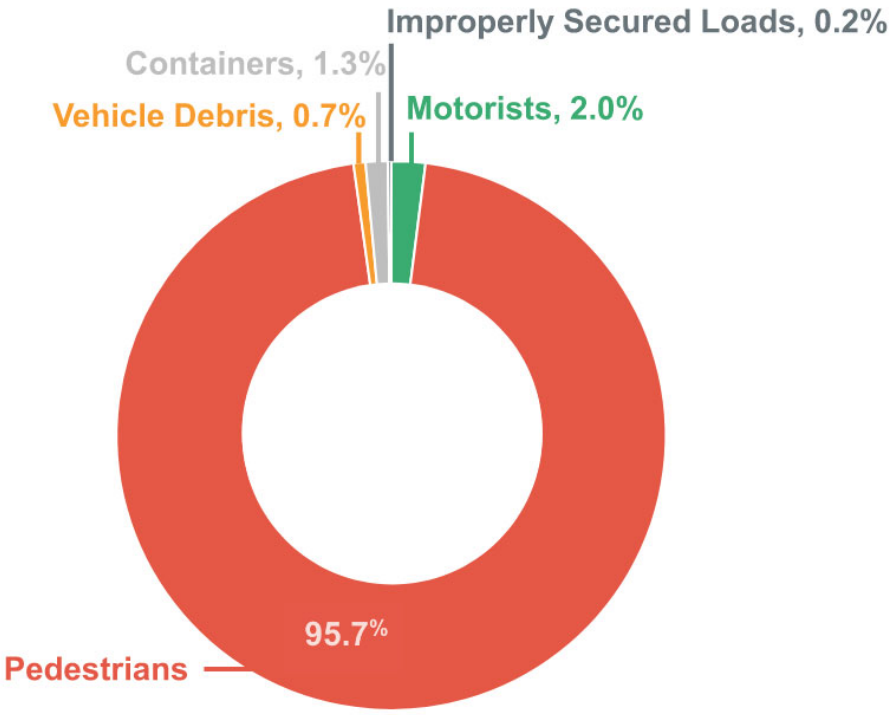
Looking at the more detailed material categories (as opposed to the material groups presented above), cigarette butts were the predominant item of the overall composition of all litter found at retail shopping sites, making up 47.4 percent of retail shopping litter. General other categories of paper, plastic, and metal comprised three out of the top 10 items littered in the vicinity of retail shopping sites. Retail shopping sites were the only non-roadway site type that exhibited other paper as the second-most littered item and where paper receipts and newspaper/inserts (including flyers) made the top 10 most littered items. Figure 8-4 presents the top 10 litter material categories by total litter count.

Figure 8-4: Top 10 Litter Items by Count, Retail Shopping



Pedestrians were identified as the overwhelming source of litter at retail shopping sites (collectively 95.7 percent). Figure 8-5 presents the sources of litter items found around United States retail shopping sites.

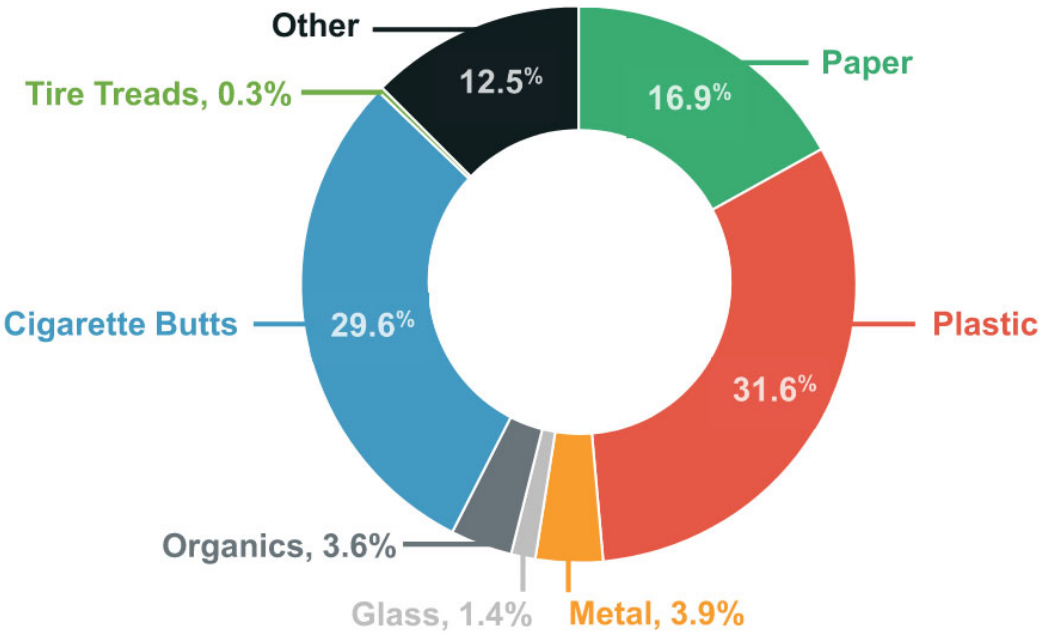
Figure 8-5: Source of Litter by Count, Retail Shopping



8.2 LOCAL RECREATION SITES

Local recreation sites included areas where people gather to spend time outdoors. Local recreation sites include beaches, parks, ski/skating areas, outdoor event locations (e.g., fairgrounds), and community sports locations (e.g., basketball courts). A total of 29 local recreation sites were randomly selected and surveyed. On average, there were 44.5 litter pieces per 1,000 square feet at surveyed local recreation site. Of the total litter discarded at recreation sites, the most littered items were either plastic or cigarette butts, which made up 31.6 and 29.6 percent of the total litter composition, respectively. Figure 8-6 provides the aggregate composition of total local recreation litter items by material group.

Figure 8-6: Composition of Total Litter by Count, Local Recreation



Most of the litter at United States local recreation sites was four-inches or smaller in size (42.5 pieces per 1,000 square feet or about 95 percent). Approximately two litter pieces greater than four-inches in size per 1,000 square feet were littered at local recreation sites. As shown in Figure 8-7, plastic made up most of the larger litter (50.6 percent), followed by paper items (23.8 percent). Local recreation litter less than four-inches in size was mostly comprised of cigarette butts and plastic (31 and 30.7 percent respectively). Figure 8-8 provides the overall composition of local recreation litter smaller than four-inches.

Figure 8-7: Composition of 4-inch-plus Litter by Count, Local Recreation

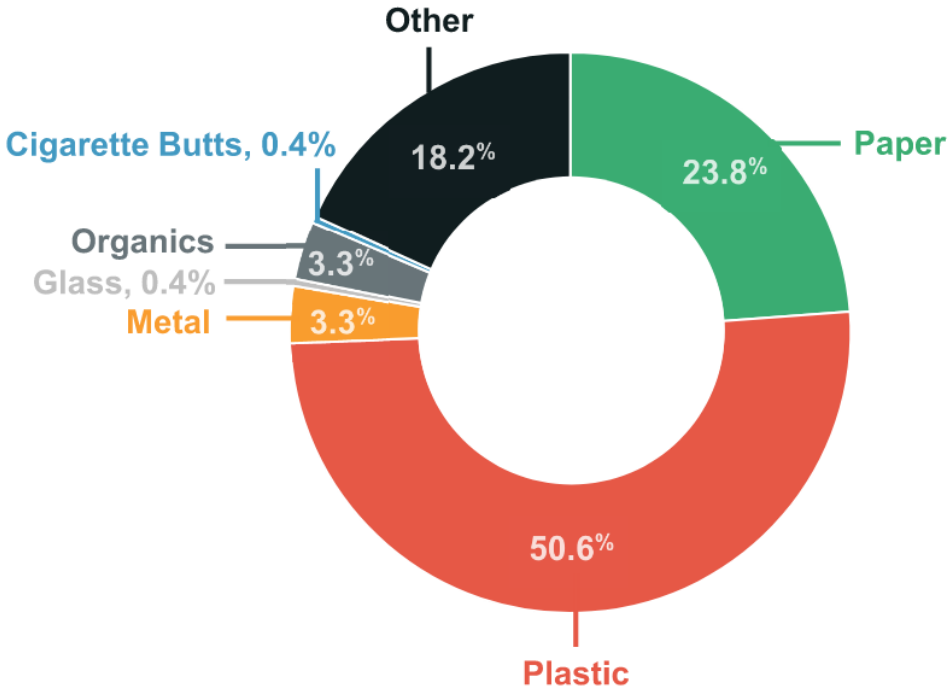
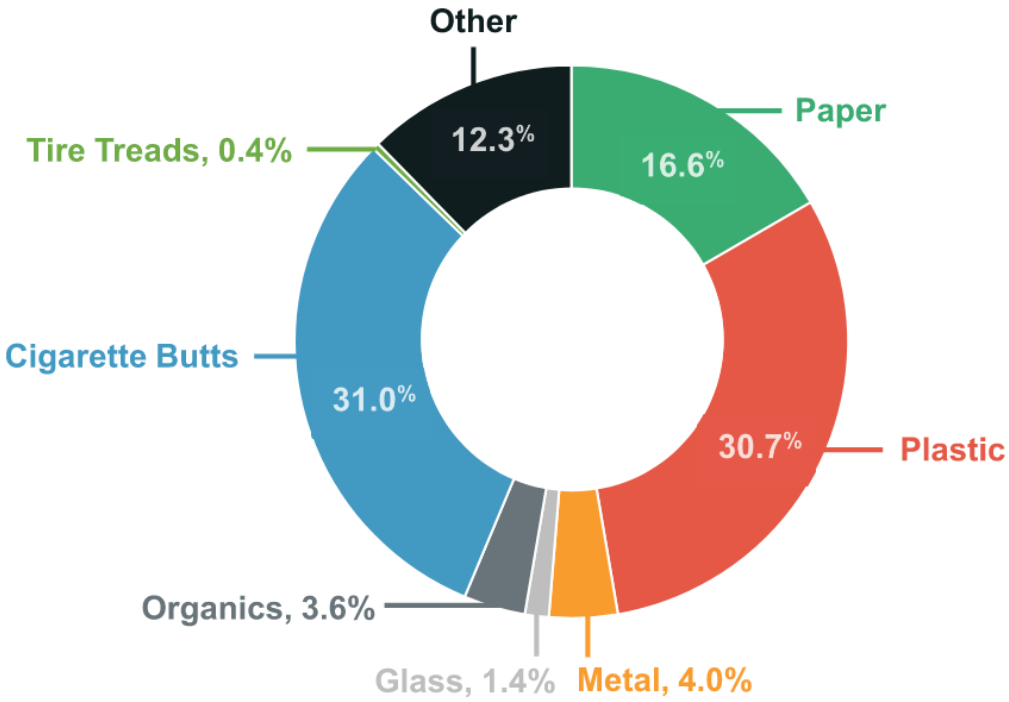
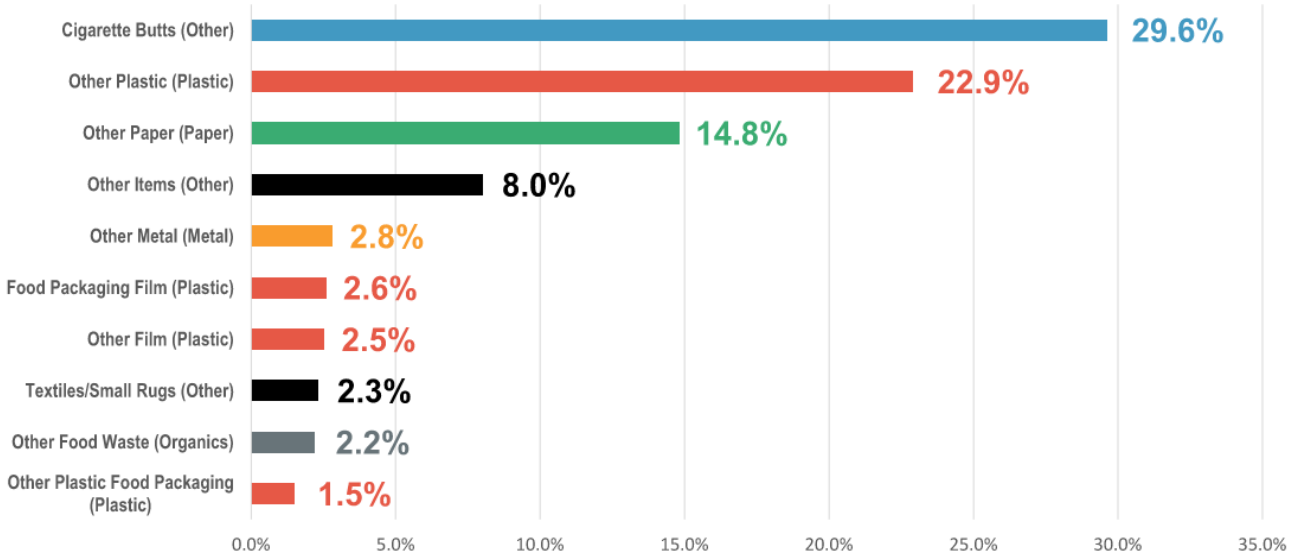


Figure 8-8: Composition of 4-inch-less Litter by Count, Local Recreation



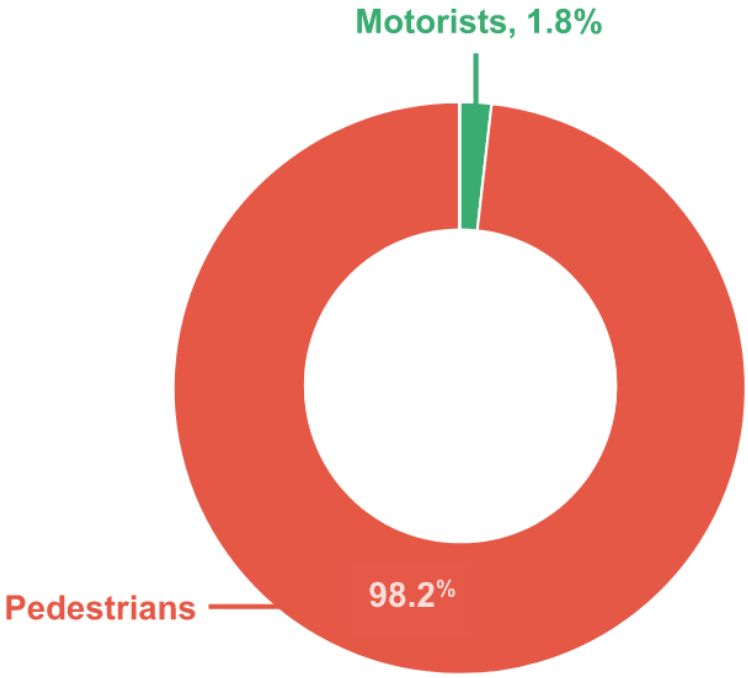
As observed at other non-roadway sites, cigarette butts were the most littered item in local recreation sites and general other material categories across all material types were in the top 10 most litter items. Plastic litter items comprised four out of the top 10 items littered at local recreation sites. The most common item was cigarette butts, making up 29.6 percent of total litter, followed by other plastic and other paper. Food packaging film, textiles, and food waste emerge as top littered items for local recreation sites. Figure 8-9 provides the top 10 litter material categories by total litter count at local recreation sites.

Figure 8-9: Top 10 Litter Items by Count, Local Recreation



Pedestrians were identified as the majority source of litter at local recreation sites (collectively 98.2 percent). Figure 8-10 presents the sources of litter items found at United States local recreation sites.

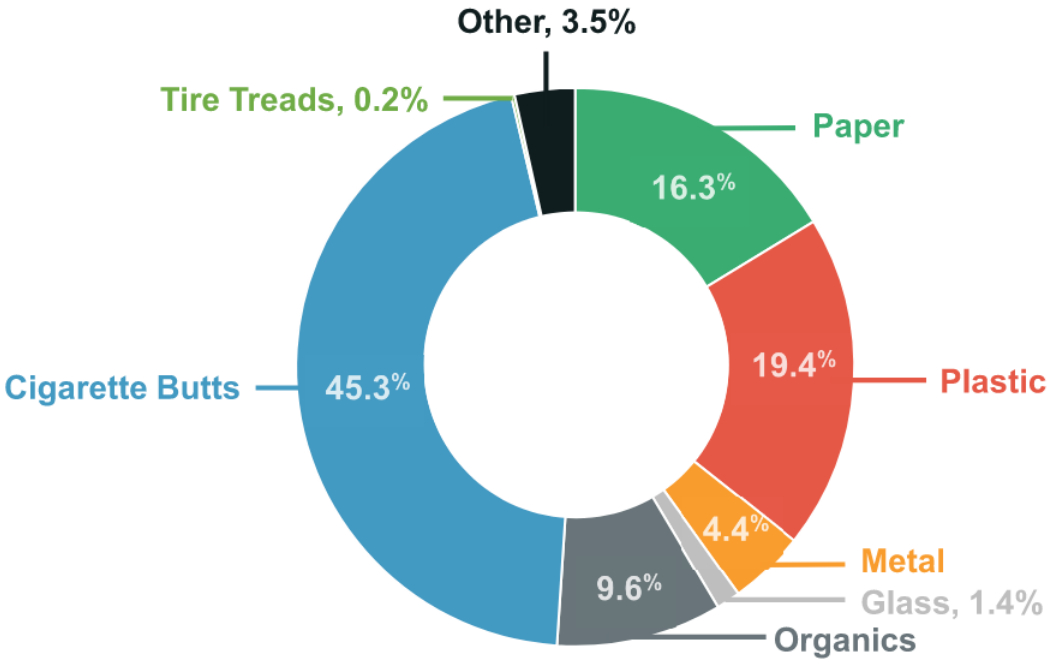
Figure 8-10: Source of Litter by Count, Local Recreation



8.3 MASS TRANSIT SITES

Mass transit sites included bus stops, subway stations, or other locations for mass transit. A total of 29 mass transit sites were randomly selected and surveyed. On average, there were 123.6 litter pieces per 1,000 square feet at surveyed mass transit sites, the most of any type of non-roadway site. Of the total litter discarded at mass transit sites, most items were either cigarette butts or plastic which made up 45.3 and 19.4 percent of the total litter composition, respectively. Figure 8-11 provides the aggregate composition of total mass transit litter items by material group.

Figure 8-11: Composition of Total Litter by Count, Mass Transit



Most of the litter at United States mass transit sites was four-inches or smaller in size (113 pieces per 1,000 square feet or about 91.4 percent). Approximately 11 litter pieces greater than four inches in size per 1,000 square feet were littered at mass transit sites. As shown in Figure 8-12, plastic made up most of the larger litter (48.1 percent), followed by paper items (32.4 percent). Mass transit litter less than four inches in size, presented on Figure 8-13, was mostly comprised of cigarette butts and plastic (49.5 and 16.7 percent respectively).

Figure 8-12: Composition of 4-inch-plus Litter by Count, Mass Transit

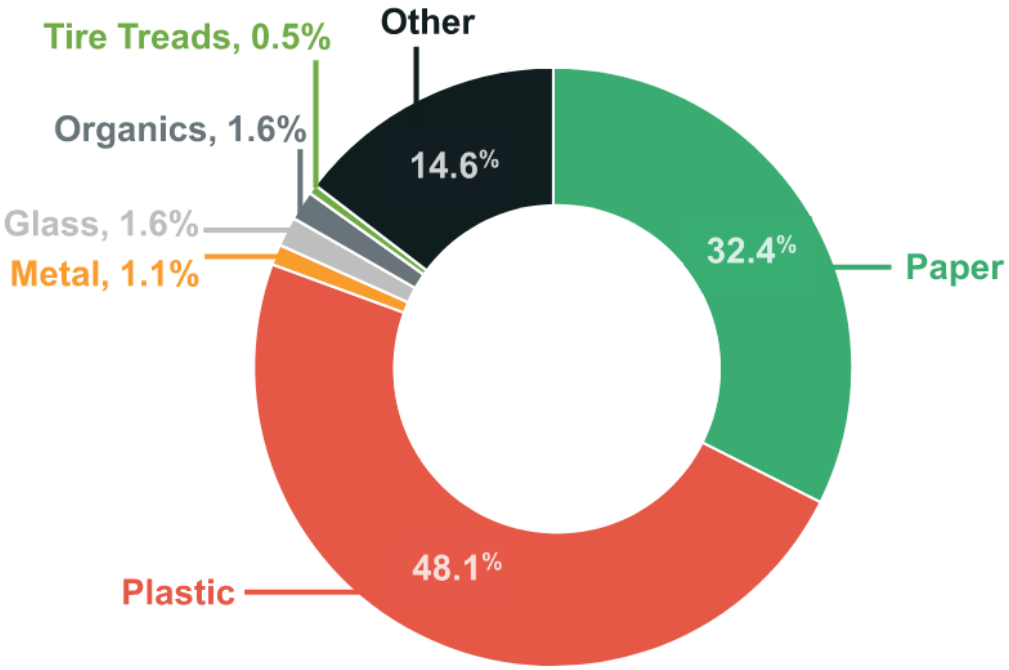
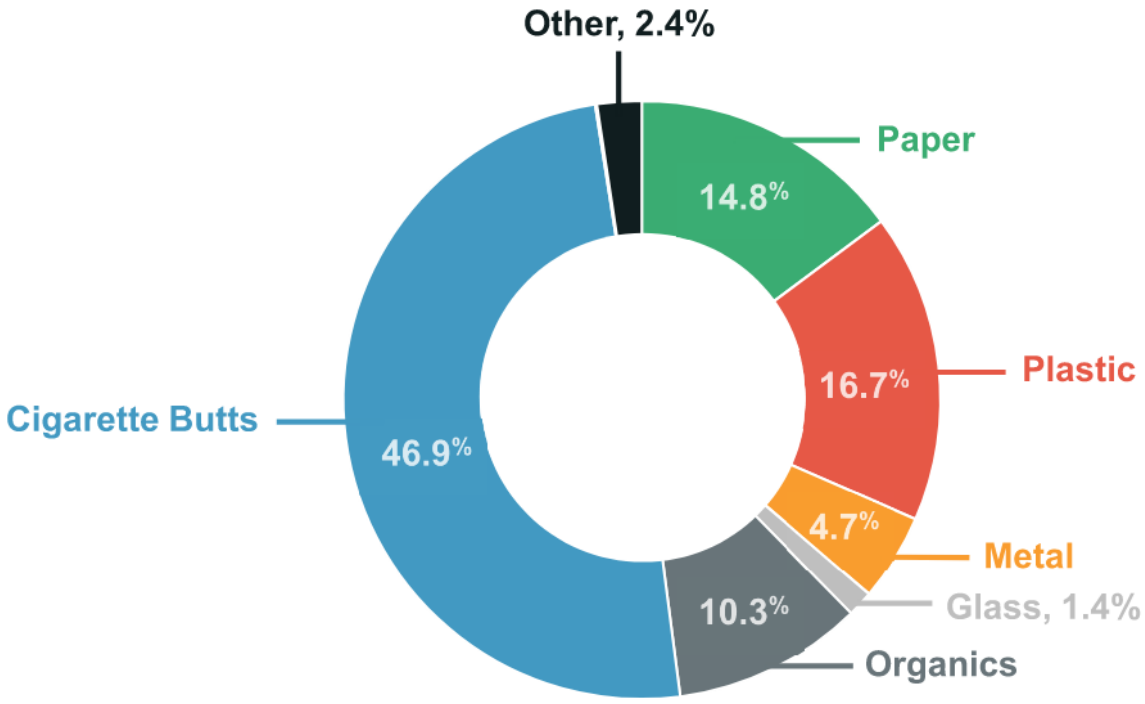


Figure 8-13: Composition of 4-inch-less Litter by Count, Mass Transit



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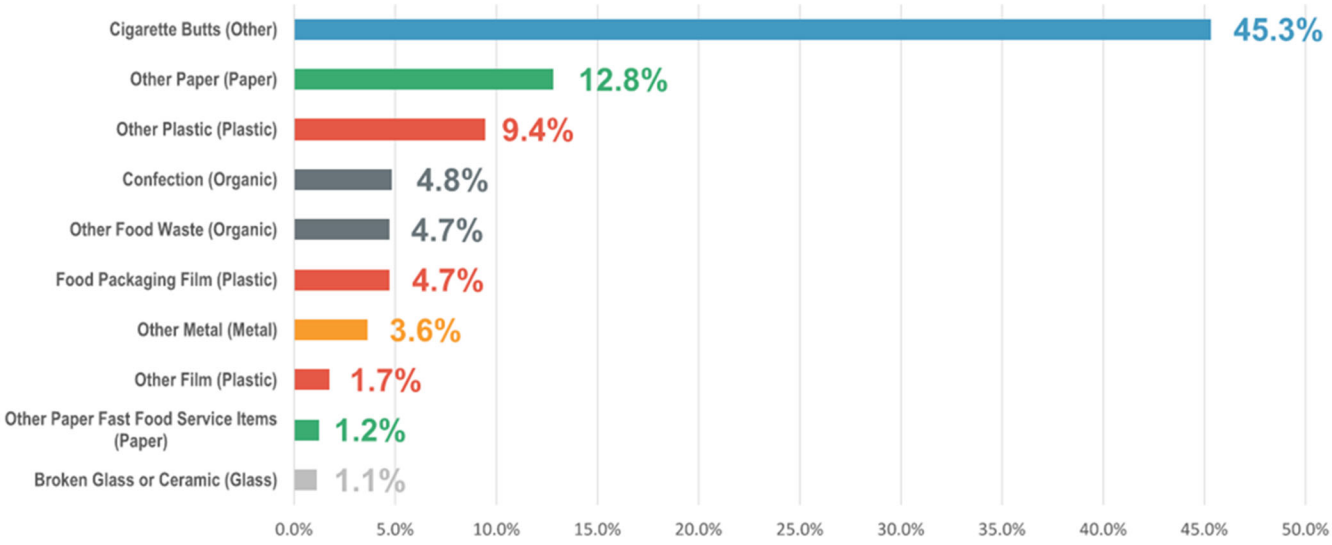
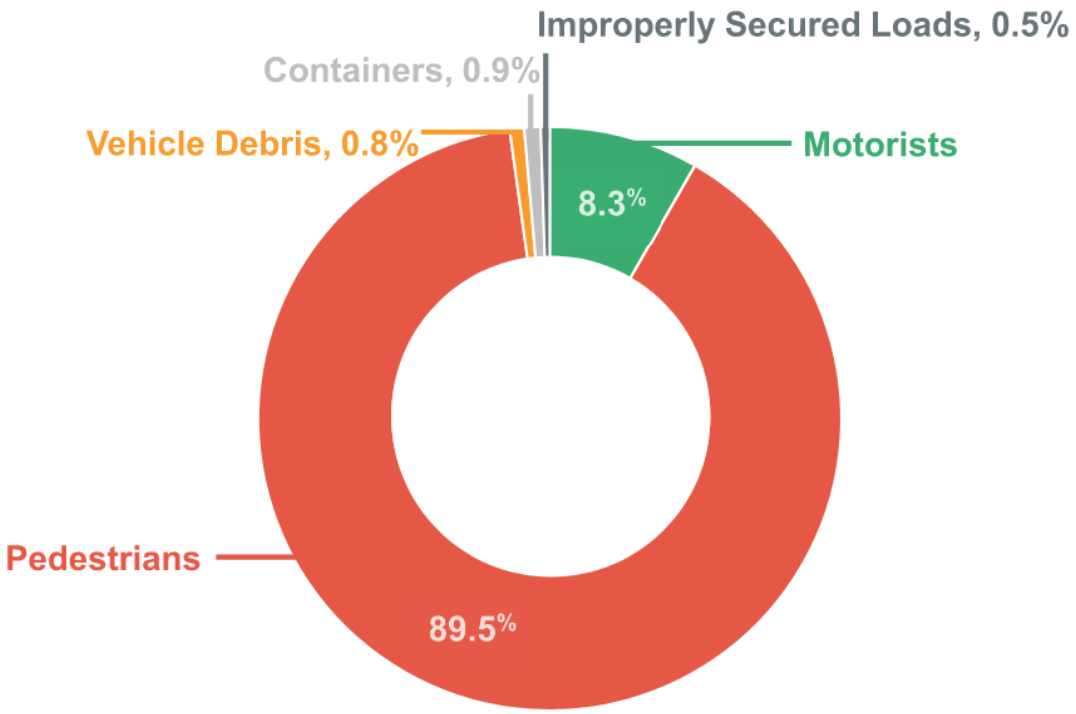
The most common item was cigarette butts, making up 45.3 percent of total litter, followed by other paper and other plastic. Plastic litter items comprised three out of the top 10 items littered at mass transit sites. Figure 8-14 provides the top 10 litter material categories by total litter count at mass transit sites.

Figure 8-14: Top 10 Litter Items by Count, Mass Transit



Pedestrians were identified as the majority source of litter at mass transit sites (collectively 89.5 percent). Figure 8-15 presents the sources of litter items found at United States mass transit sites.

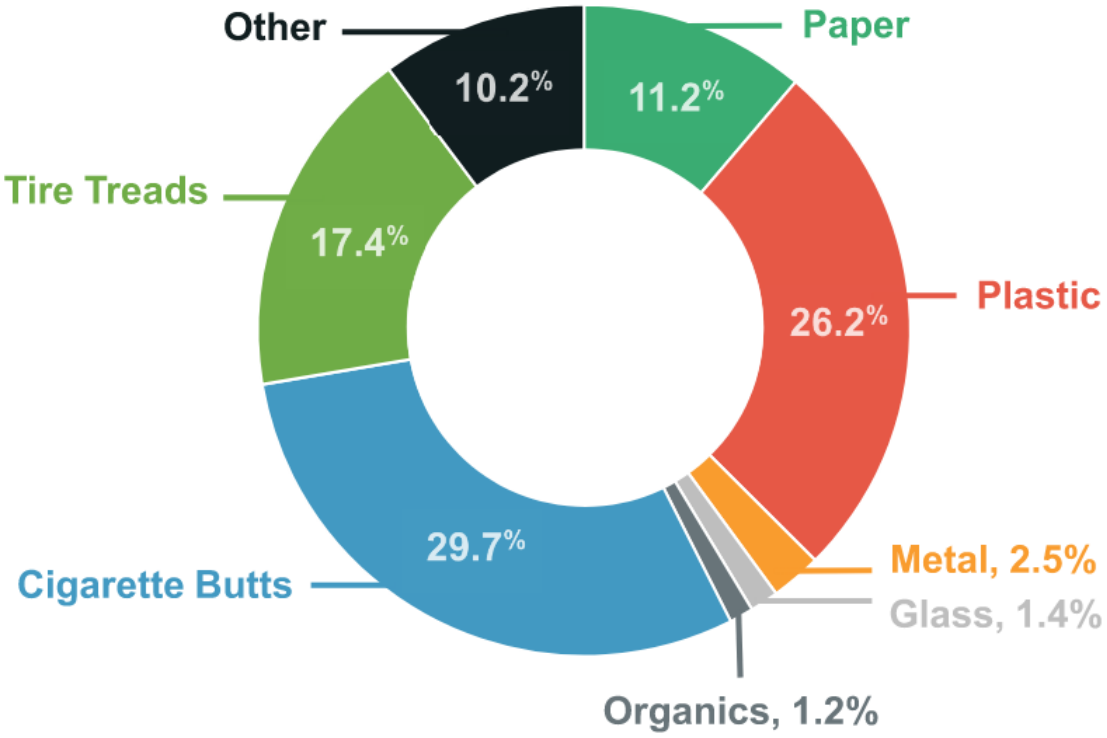
Figure 8-15: Source of Litter by Count, Mass Transit



8.4 CONSTRUCTION SITES

Construction sites included residential and commercial construction sites. A total of 33 construction sites were randomly selected and surveyed. On average, there were 94 litter pieces per 1,000 square feet at surveyed construction sites. Of the total litter discarded at construction sites, most items were either cigarette butts, plastic, or tire treads, making up 29.7, 26.2, and 17.4 percent of the total litter composition, respectively. Construction sites had far more tire tread litter by composition when compared to other non-roadway sites. Figure 8-16 provides the aggregate composition of total construction site litter items by material group.

Figure 8-16: Composition of Total Litter by Count, Construction Sites



Following the trend of litter size distribution observed at other non-roadway sites, most of the litter at United States construction sites was four inches or smaller in size (86 pieces per 1,000 square feet or about 91 percent). Approximately eight litter pieces greater than four inches in size per 1,000 square feet were littered at construction sites. As shown in Figure 8-17, plastic made up most of the larger litter (52.1 percent), followed by paper items (29.2 percent). Construction site litter less than four inches in size, presented on Figure 8-18, was mostly comprised of cigarette butts, plastic, and tire treads.

Figure 8-17: Composition of 4-inch-plus Litter by Count, Construction Sites

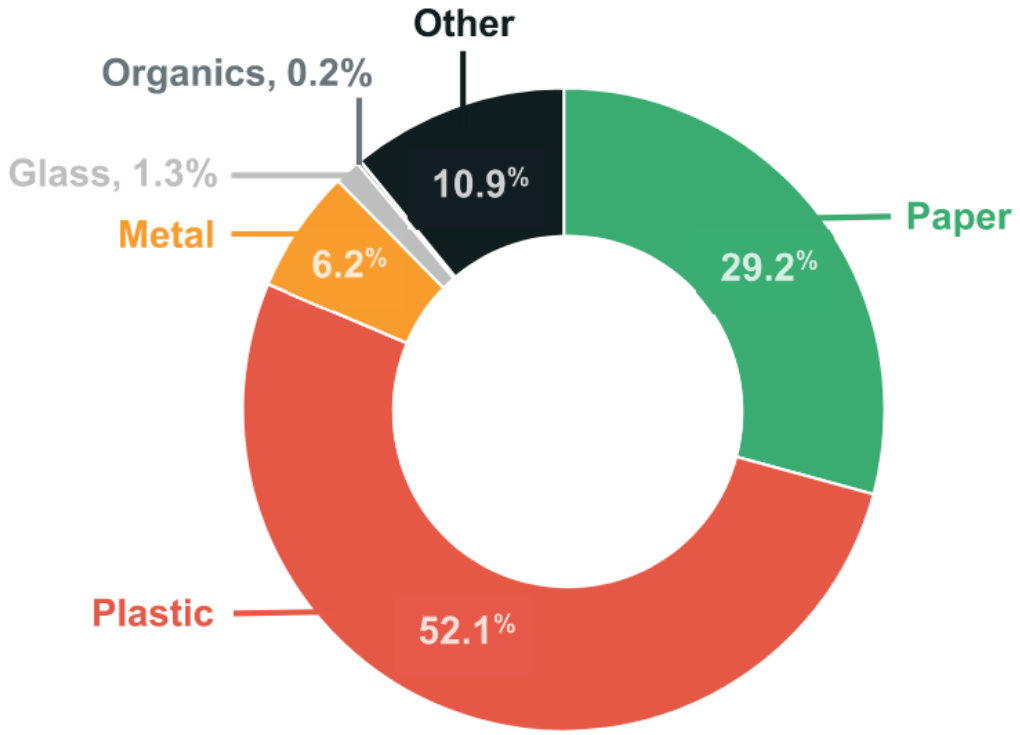
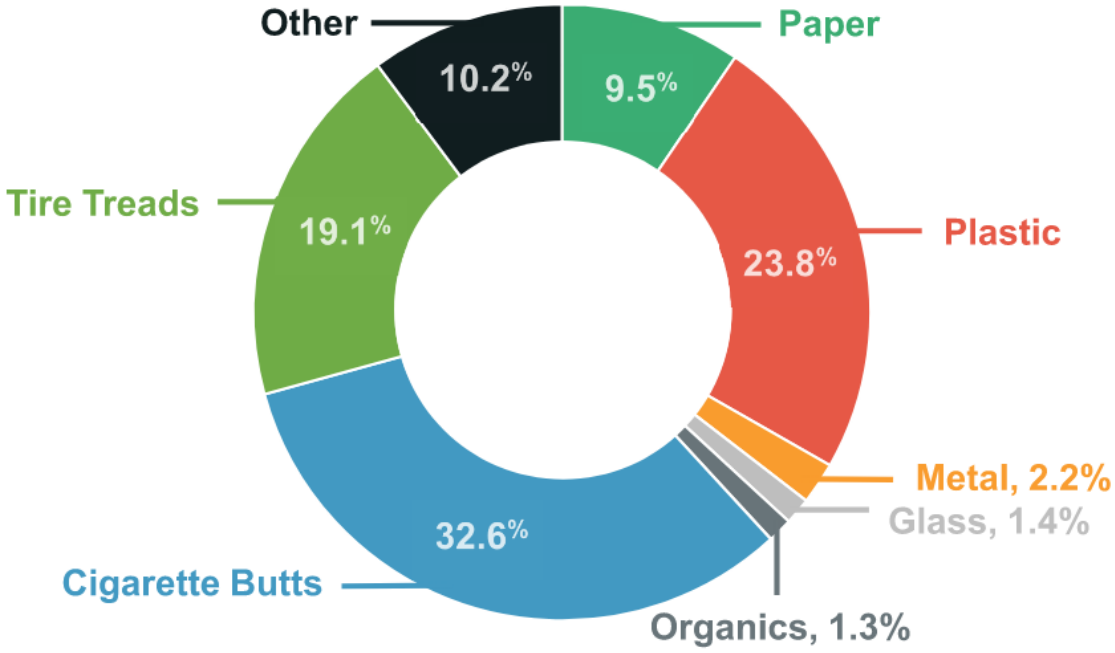


Figure 8-18: Composition of 4-inch-less Litter by Count, Construction Sites



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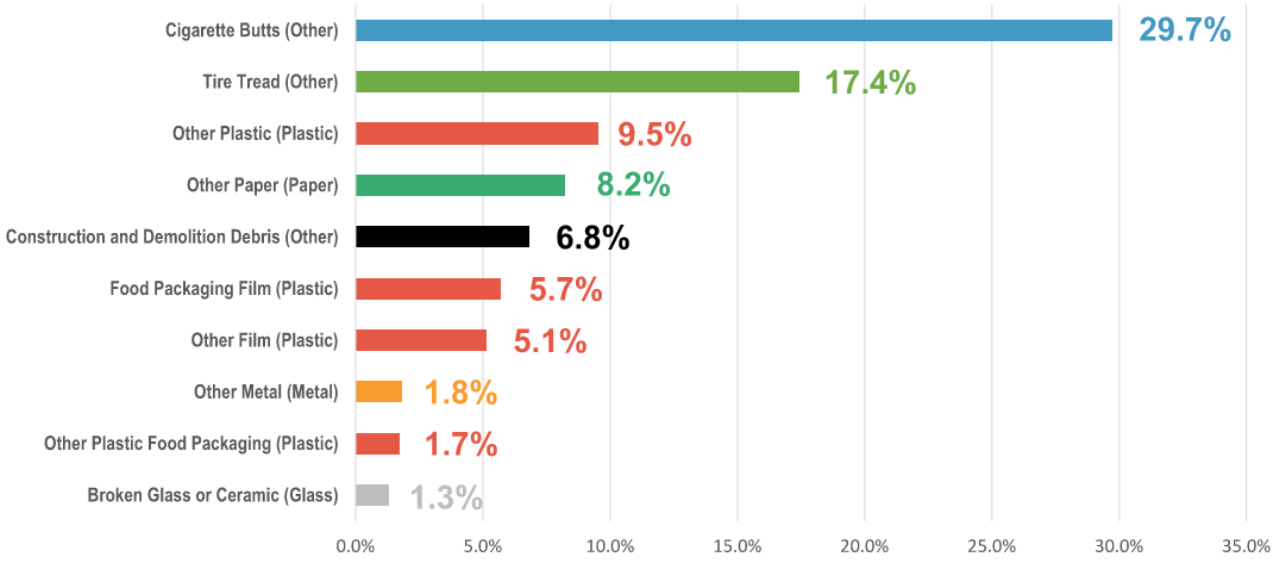
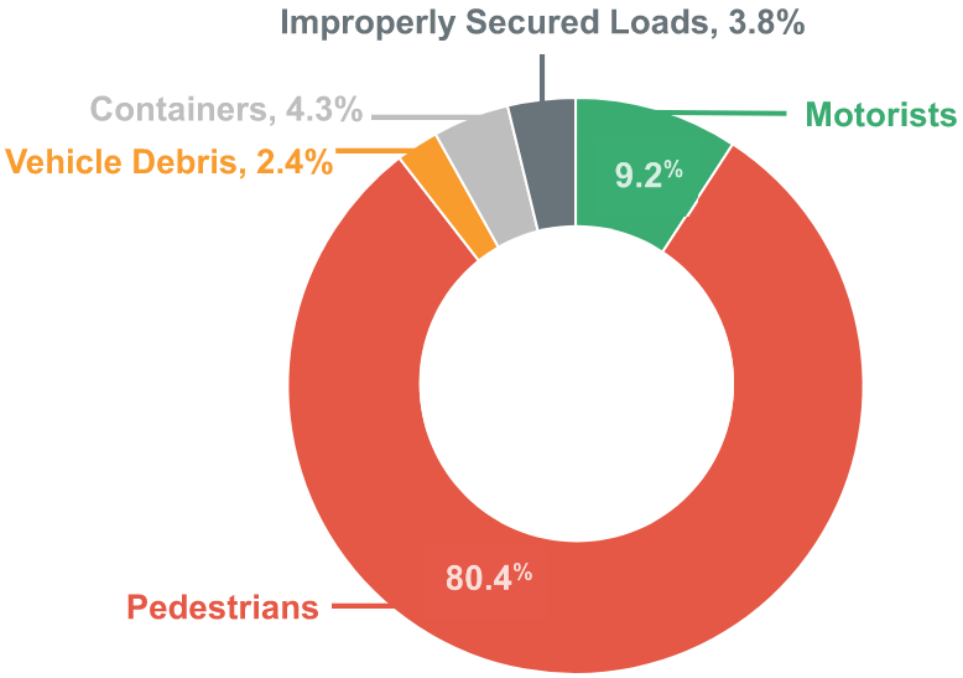
As observed at other non-roadway sites, cigarette butts were the most littered item in construction sites. The second most prevalent litter item was tire treads, comprising 17.4 percent of total litter. Plastic litter items comprised four out of the top 10 items littered at construction sites. Figure 8-19 provides the top 10 litter material categories by total litter count at construction sites.

Figure 8-19: Top 10 Litter Items by Count, Construction Sites



Pedestrians were identified as the majority source of litter at construction sites (80.4 percent). Motorists emerged as a significant (9.4 percent) source of litter at construction sites. These sites also had the most litter from containers and improperly secured loads of all non-roadway sites. Figure 8-20 presents the sources of litter items found around United States construction sites.

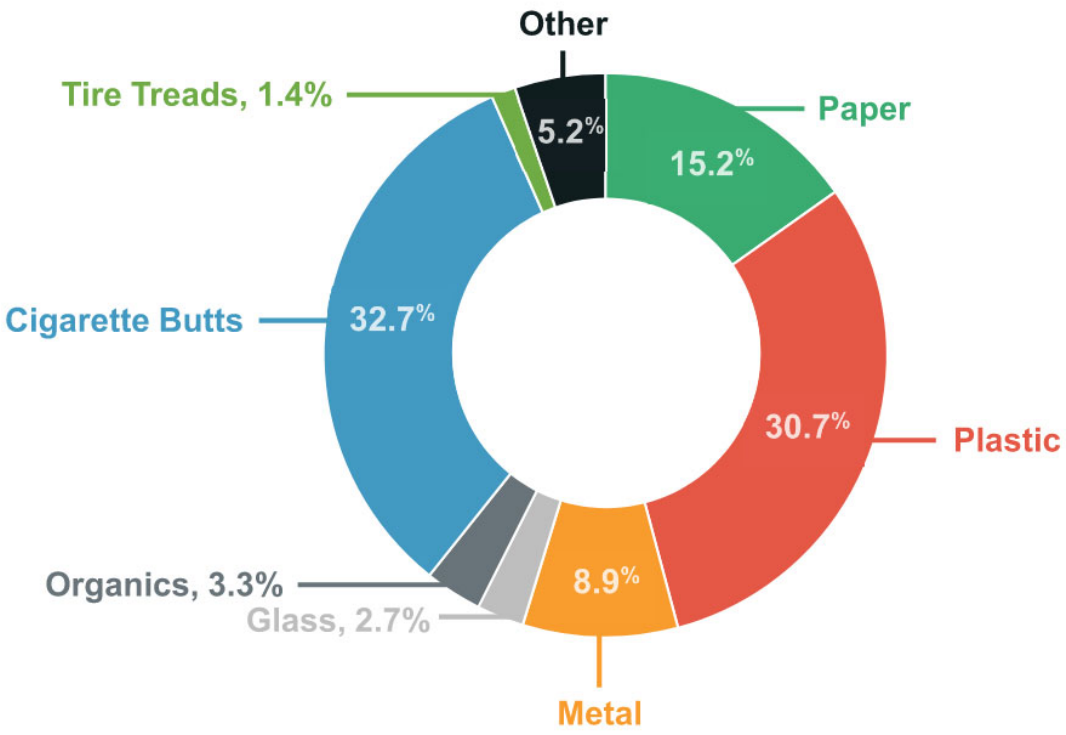
Figure 8-20: Source of Litter by Count, Construction Sites



8.5 STORM DRAINS

A total of 31 storm drains were randomly selected and surveyed to gain a better understanding of what types of litter are on or near the storm drain, even if only temporarily before being washed down the drain. On average, there were 45 litter pieces per 1,000 square feet at surveyed storm drains. Of the total litter discarded near and in storm drains, 32.7 percent were cigarette butts followed by plastic items (30.7 percent pieces of plastic). Figure 8-21 presents the aggregate composition of storm drain litter items by material group.

Figure 8-21: Composition of Total Litter by Count, Storm Drains



As with roadway and waterway litter, most of the litter in and around United States storm drains were four inches or smaller in size (36.4 pieces per 1,000 square feet or 80.25 percent). However, that proportion was far less than what was observed at other non-roadway sites, where over 90 percent of all litter was under 4 inches. While small litter is being trapped (if only temporarily) at storm drains, the Study provides some evidence of how much litter will pass through the drains if not pre-empted. Approximately nine pieces per 1,000 square feet greater than four inches in size were littered in and around United States storm drains. As shown in Figures 8-22 and 8-23, plastic composed most of the larger litter (50.5 percent). Storm drain litter less than four inches in size was mostly comprised of cigarette butts and plastic (38.9 and 25.8 percent respectively).

Figure 8-22: Composition of 4-inch-plus Litter by Count, Storm Drains

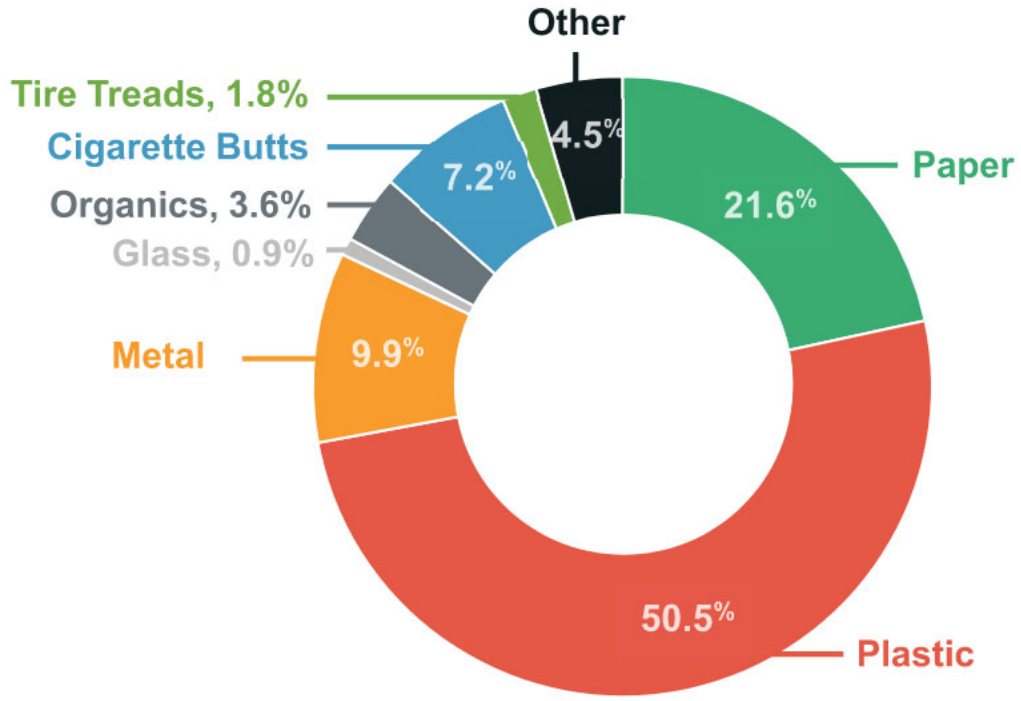
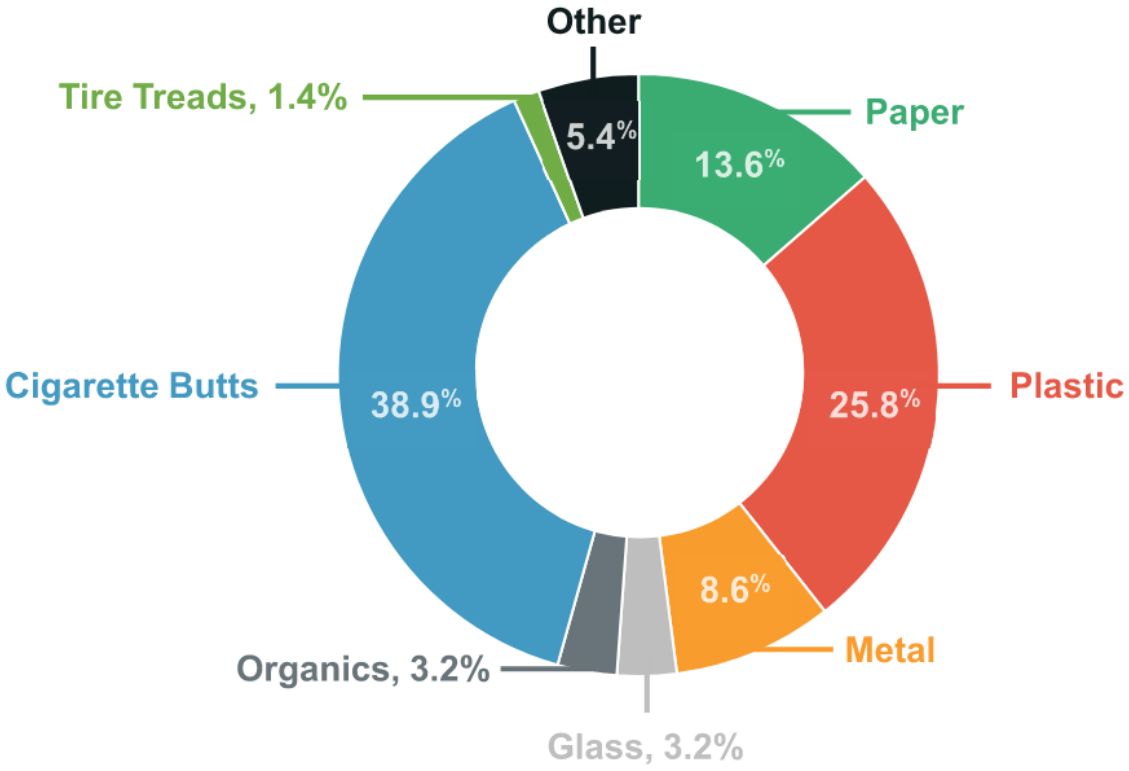
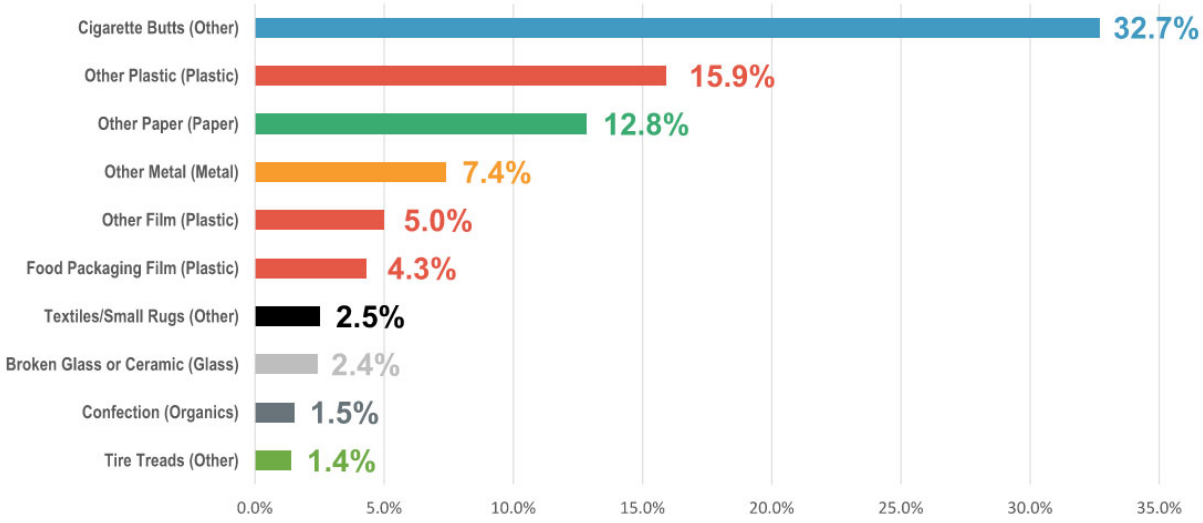


Figure 8-23: Composition of 4-inch-less Litter by Count, Storm Drains



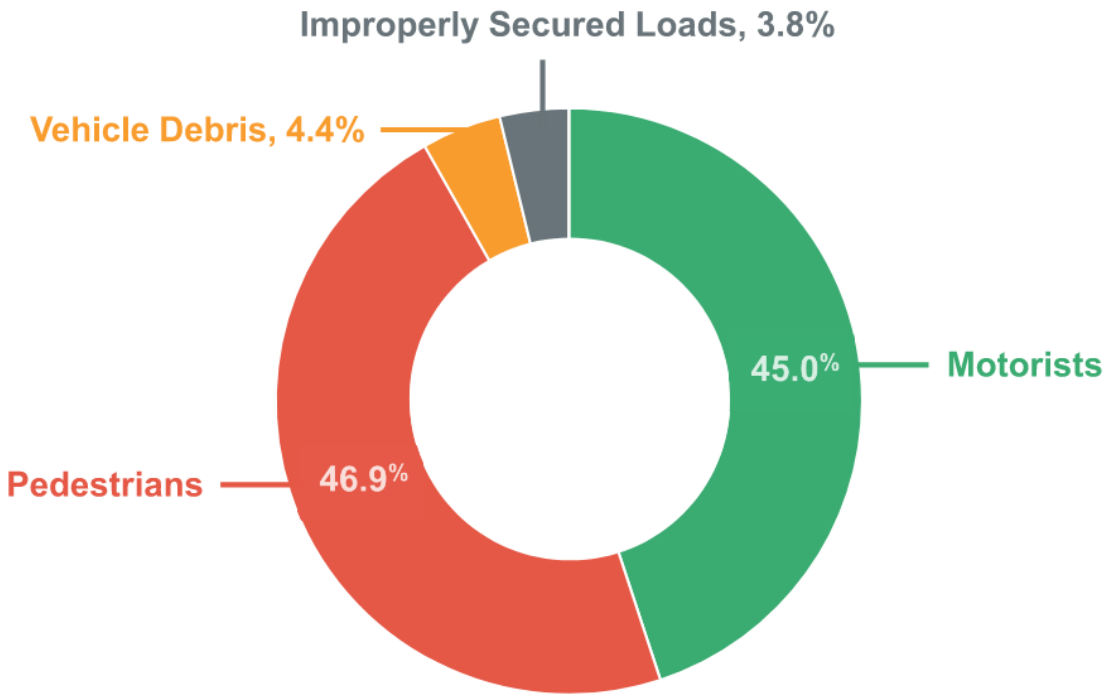
Plastics comprised four out of the top 10 items littered within and in the vicinity of storm drains. The most common storm drain litter item was cigarette butts. Some material categories, such as other plastic, other paper, other metal, and other film were within the top ten littered materials for all litter observed at storm drains. Figure 8-24 presents the top 10 litter material categories by total litter count.

Figure 8-24: Top 10 Total Litter Items by Count, Storm Drain



Pedestrians were identified as the leading source of litter at storm drains (collectively 46.9 percent), followed closely by motorists (45 percent), which is to be expected given the location of storm drains compared to other non-roadway sites. Figure 8-25 presents the sources of litter items found in and around United States storm drains.

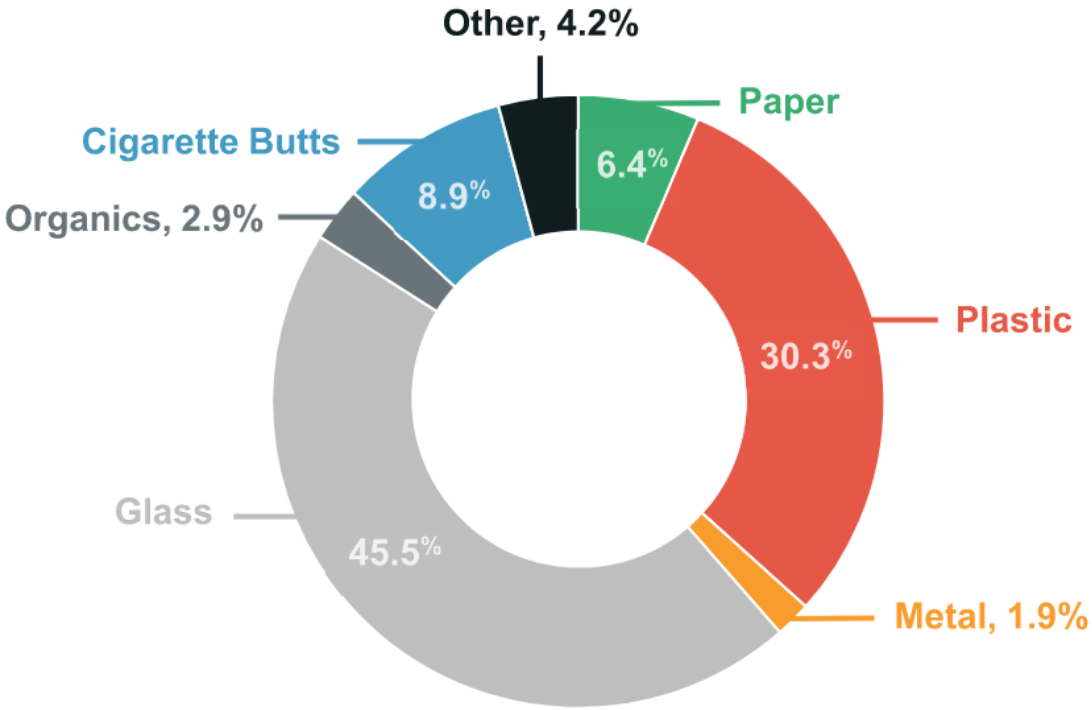
Figure 8-25: Source of Litter by Count, Storm Drains



8.6 COASTLINE SITES

Coastline sites included any areas directly adjacent to the open ocean, major estuaries, and the Great Lakes, which due to their proximity to these waters, bear a great proportion of the full range of effects from coastal hazards and host a large degree of economic production associated with coastal and ocean resources. A total of 30 coastline sites were randomly selected and surveyed. On average, there were 65 litter pieces per 1,000 square feet at surveyed coastline sites. Of the total litter observed at coastlines, the majority of items were either glass or plastic, making up 45.5, and 30.3 percent of the total litter composition, respectively. Coastline sites had far more glass litter by composition when compared to other non-roadway sites. Figure 8-26 provides the aggregate composition of total coastline site litter items by material group.

Figure 8-26: Composition of Total Litter by Count, Coastline



Most of the coastline litter in the United States was fourinches or smaller in size (63 pieces per 1,000 square feet or about 97 percent). Approximately two litter pieces greater than 4-inches in size per 1,000 square feet were littered at coastline sites. As shown in Figure 8-27, plastic made up most of the larger litter (51.6 percent), followed by paper items (20.8 percent). Coastline litter less than 4-inches in size, presented on Figure 8-28, was mostly comprised of glass and plastic. Notably, as a proportion, there was significantly less cigarette butt litter at coastal sites than what was observed at other roadway sites.

Figure 8-27: Composition of 4-inch-plus Litter by Count, Coastline

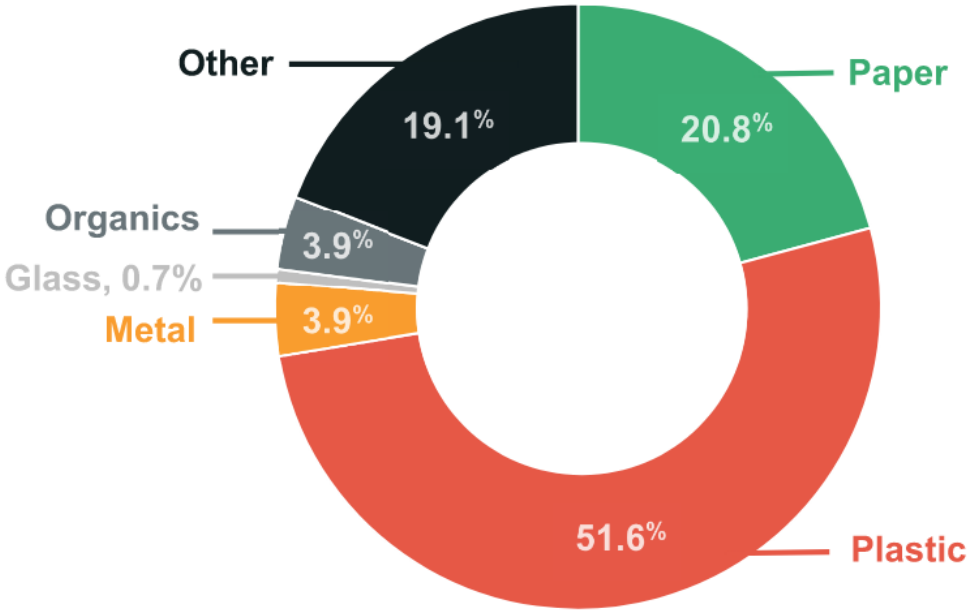
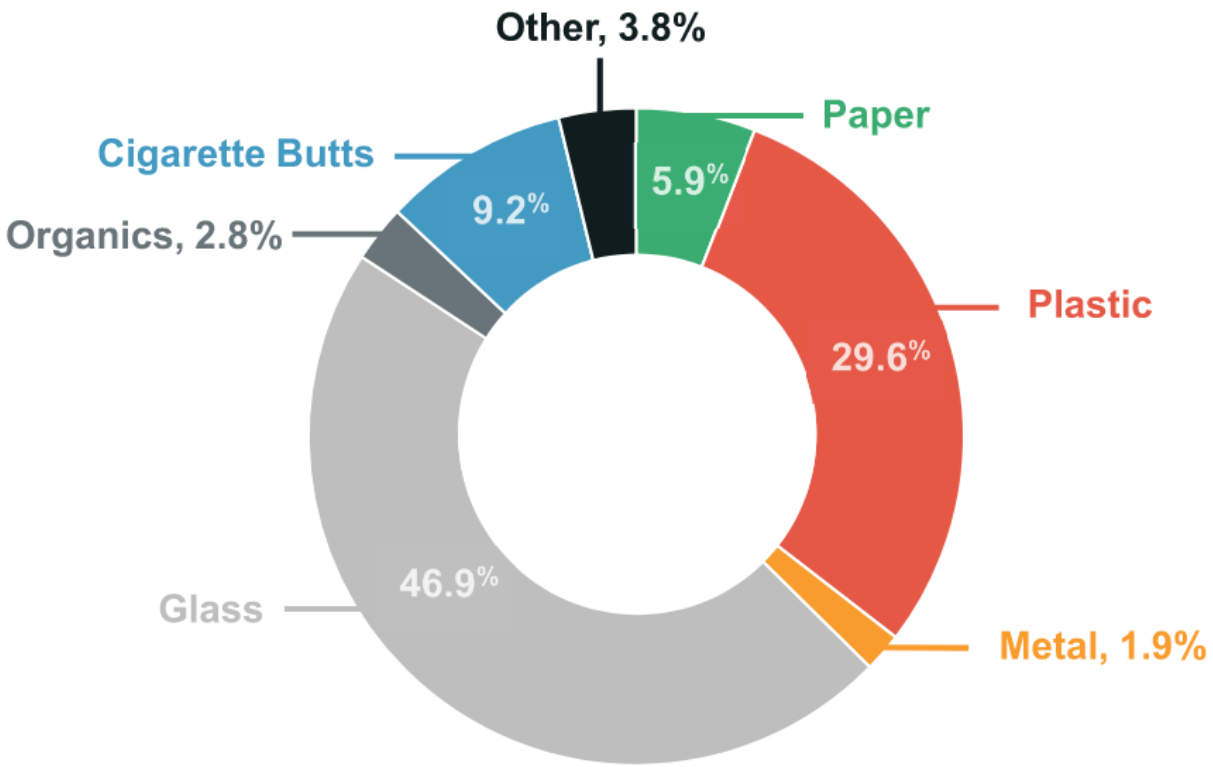


Figure 8-28: Composition of 4-inch-less Litter by Count, Coastline



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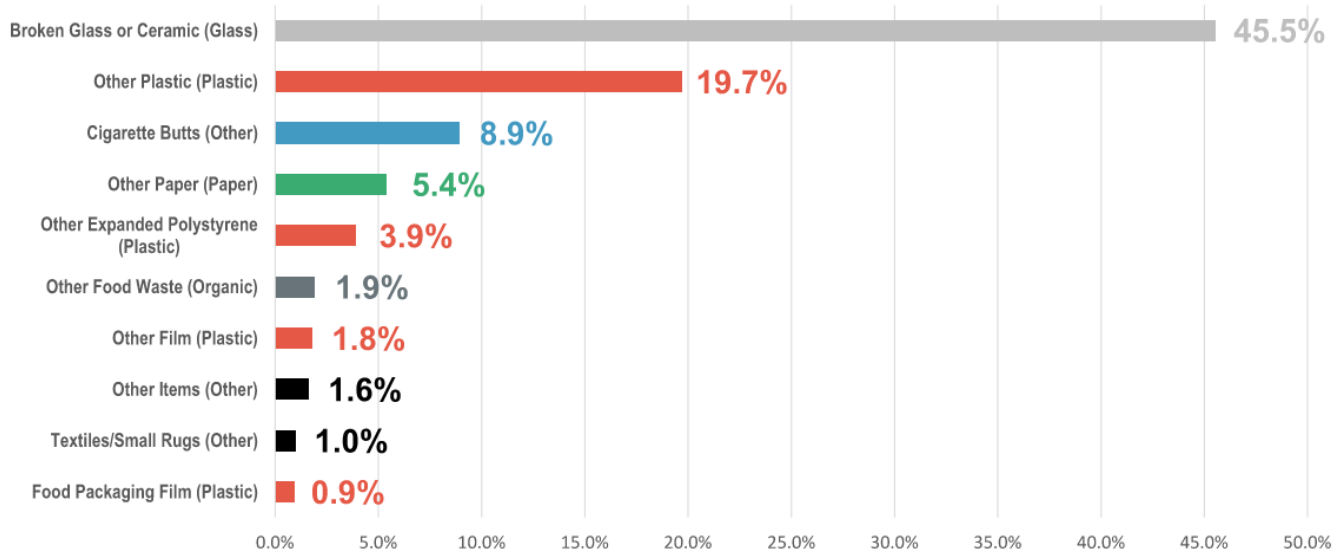
Diverging from observations at the other non-roadway sites, broken glass or ceramic was the most littered item observed at coastline sites. Across all sites, when research teams came across broken or damaged litter items, they were trained to look for comparable broken pieces in the near vicinity so as to not double count littered items, whenever possible.[26] The second most prevalent litter item was other plastic, comprising 18.3 percent of total litter. Plastic litter items comprised four out of the top 10 items littered at coastline sites. Figure 8-29 provides the top 10 litter material categories by total litter count on coastlines.

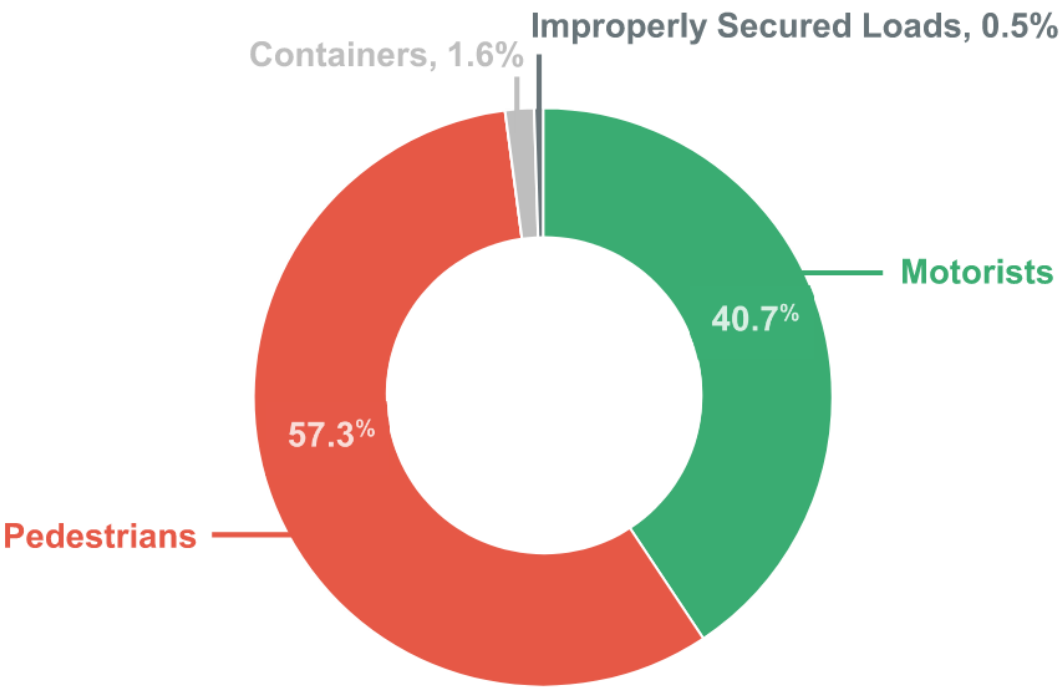
Figure 8-29: Top 10 Litter Items by Count, Coastline



Pedestrians were identified as the majority source of litter at coastline sites (57.3 percent) but motorists and their close proximity to coastal sites through roads and parking lots also emerged as a significant source at coastal sites. Figure 8-30 presents the sources of litter items found at United States coastline sites.

[2626] Glass at coastline sites may have been so widely distributed at the time of the litter survey that this matching process was less successful than at other sites and, therefore, led to more a significantly larger count of broken glass pieces.

Figure 8-30: Source of Litter by Count, Coastline Sites



8.7 KEY HIGHLIGHTS

- **The density of litter varied significantly across non-roadway sites.** At mass transit sites, there were 123.6 pieces of litter per 1,000 square feet. That number decreased to 94 litter pieces at construction sites, and down to 44.5 litter pieces per 1,000 square feet at local recreation sites.
- **Cigarette butts were a major litter item at all non-roadway sites.** Cigarette butt litter was a major contributor to overall litter composition observed at non-roadway sites. It ranged from 8.9 percent at coastline sites to 47.4 percent of total litter at retail sites.
- **Retail shopping sites exhibited a large amount of cigarette butts and paper litter items.** These two material groups together represented about two thirds of all retail shopping site litter (67.1 percent).
- **Local recreation sites had the highest prevalence of pedestrian litter.** Pedestrians were identified as the majority source of litter at local recreation sites (collectively 98.2 percent).
- **Construction sites had the highest percent litter composition by tire treads.** Tire treads represented 17.4 percent of all litter.

- **Storm drains had the smallest percentage of smaller litter (under 4 inches).** While storm drains can capture smaller, as well as larger, littered items at least temporarily, significant amounts of smaller litter are passing through storms drains.
- **Coastline sites exhibited the most glass litter by total percent composition.** Glass litter, mostly broken glass or ceramic, made up nearly half of all coastline litter (45.5 percent).

9.0 BEHAVIORAL OBSERVATIONS RESULTS

Visible litter surveys provide an understanding of the quantity, composition, and sources of litter. Behavioral observations expand the research to provide further understanding of the behavior of littering to address questions of who litters, where they litter, how they litter, and how the context of the behavior affects littering.

The 2009 study broke new ground for conducting behavioral observations of littering. In the process, the study determined key benchmarks and insights for understanding littering behavior.

- Seventeen percent (17 percent) of all product disposals were determined to be improper (i.e., littering).
- Most littering behavior (81 percent) occurred with notable intent.
- The availability and proximity of appropriate trash receptacles was strongly predictive of littering (i.e., the greater the availability and proximity of a receptacle, the less likely littering was to occur).

Replicating the methodology from 2009, the Keep America Beautiful 2020 National Litter Study conducted observations at 122 sites with traditionally high traffic and density of consumer and recreational behavior including retail shopping, local recreation, gas stations, mixed use developments, coastal, and bar/restaurants.[27] The 2009 study noted different littering behaviors for cigarette butt disposal and the disposal of other items. Consequently, both general littering and cigarette littering behavioral observations were conducted at each site in the Keep America Beautiful 2020 National Litter Study. General observations documented behavior of any person on site while cigarette observations focused on smokers only.

More than any other component of the Keep America Beautiful 2020 National Litter Study, COVID-19 had a significant impact on the research team's ability to conduct the behavioral observation study and to develop generalizable conclusions about littering behavior. However, the long-term consequences COVID-19 will have on public behavior, the "new normal" COVID-19 has created, and the low likelihood of returning to "COVID zero" mean that the results from the 2020 behavioral observations can provide initial insights into littering in public gathering places.

9.1 SUMMARY OF OBSERVATIONS

At the time of the behavioral observation study, numerous study sites were under varying COVID-19 alert levels and restrictions. COVID-19 drove traffic in public gathering places down and, when people came, they often

[27] Behavioral observations were conducted at four fast food sites. Remaining fast-food sites were reallocated to other site types due to no or low observations of fast-food sites as a result of COVID-19 restrictions. Based on the results of previous research, fast-food sites should be included in future studies.

passed through rather than congregating or lingering. COVID-19 resulted in a decrease in the number of persons at each site. For example, the current Study conducted 542 general observations at 21 retail shopping sites. In comparison, the 2009 study conducted at 1,206 general observations at 19 retail shopping sites. That equates to a 55 percent drop in traffic. Similarly, the current Study conducted 552 general observations at 20 gas stations. In comparison, the 2009 study conducted 1,444 general observations at 11 gas stations. Table 9-1 present the number of observations by site. By comparison, the 2009 study observed 9,757 individuals at 130 locations.

Table 9-1: Aggregate Count of Behavioral Observations by Site

Material Group	Sites	General Observations	Cigarette Observations	Total Observations
Retail Shopping	21	542	65	607
Local Recreation	18	364	14	378
Gas Stations	20	552	73	625
Mixed Use Developments	21	766	49	815
Coastal	21	569	31	600
Bars/Restaurants	21	460	65	525
Fast Food	4	106	10	116
Total	**126**	**3,359**	**307**	**3,666**

9.2 SUMMARY OF DISPOSAL ACTIVITY

In addition to decreasing the number of persons at behavioral observation sites, COVID-19 decreased on-site consumption and therefore disposal activity at sites. For the current Study, only 300 observations of the total 3,666 total observations disposed, either properly or improperly (littered), materials on site (8.2 percent). In comparison, the 2009 study reported 1,962 observations of the total 8,990 total general observations disposed of materials on site (21.8 percent).

For the current Study, 62 of the total 300 observed disposals were littering (20.7 percent). This is consistent with 2009 study which found that 342 of the total 1,962 observed disposals were littering (17.4 percent). Although the current set of observations is limited in size, it is notable that the littering rate for cigarette butts decreased from 57.6 percent in 2009 to 37.4 percent in the current Study. As shown in Tables 9-2 and 9-3, the primary disposal method was trash cans and ashtrays.

The smaller sample sizes preclude more in-depth exploration of littering behavior in 2020. The limited number of observations point to similar littering dynamics as observed in the 2009 study. As such, we recommend interested observers examine the 2009 report for more details about littering behavior. In the future, Keep America Beautiful will continue to replicate the research to track any potential changes in littering.

Table 9-2: Frequency for Disposal Method for General Observations

Disposal Method	Disposal Location	Total	Percent of Total
Litter	Ground	6	3.4%
	Parking Lot	6	3.4%
	Sidewalk	3	1.7%
	Table Bench Ledge	1	0.6%
	Subtotal Littered	**16**	**9.0%**
Properly Disposed	Ashtray	6	3.4%
	Recycle Can	4	2.3%
	Trash Can	141	79.7%
	Pocketed	2	1.1%
	Other	8	4.5%
	Subtotal Properly Disposed	**8**	4.5%
Total		**177**	**100.0%**

Table 9-3: Frequency for Disposal Method for Cigarette Observations

Disposal Method	Disposal Location	Total	Percent of Total
Litter	Ground	19	15.4%
	Grass	1	0.8%
	Parking Lot	20	16.3%
	Planter	1	0.8%
	Sidewalk	2	1.6%
	Table Bench Ledge	3	2.4%
	Subtotal Littered	**46**	**37.4%**
Properly Disposed	Ashtray	62	50.4%
	Recycle Can	0	0.0%
	Trash Can	3	2.4%
	Pocketed	6	4.9%
	Left Site with Cigarette	1	0.8%
	Other	4	3.3%
	Unknown	1	0.8%
	Subtotal Properly Disposed	**77**	**62.6%**
Total		**123**	**100.0%**

9.3 KEY HIGHLIGHTS

- **COVID-19 resulted in a decrease in the number of persons at each site and disposal activity at each site.** In comparison to the 2009 study, fewer observations and less disposal activity was observed at sites.
- **Littering rate consistent with prior study.** For the current study, 62 of the total 300 observed disposals were littering (20.7 percent). This is consistent with the 2009 study which reported 342 of the total 1,962 observed disposals were littering (17.4 percent).

10.0 PUBLIC ATTITUDE SURVEY RESULTS

The public attitude survey gathered insight into the public's opinions of the prevalence and effects of litter, causes of littering behavior, consequences of littering, and litter prevention and abatement nationally. This section provides the results from the public attitude survey of over 1,100 U.S. residents. See Section 2 for an overview of the methodology.

10.1 OPINION OF LITTERING AND EFFECTS OF LITTER

The first set of survey questions was intended to gain an understanding of the public's opinion on the presence of litter and its effects on the community and environment. As shown below in Figure 10-1, over 90 percent of U.S. residents reported litter is a problem in their state. As shown in Figure 10-2, over 80 percent reported litter was a problem in streams, rivers, lakes, or other waterways.

Figure 10-1: Percentage of US Residents Who Believe Litter is a Problem in Their State

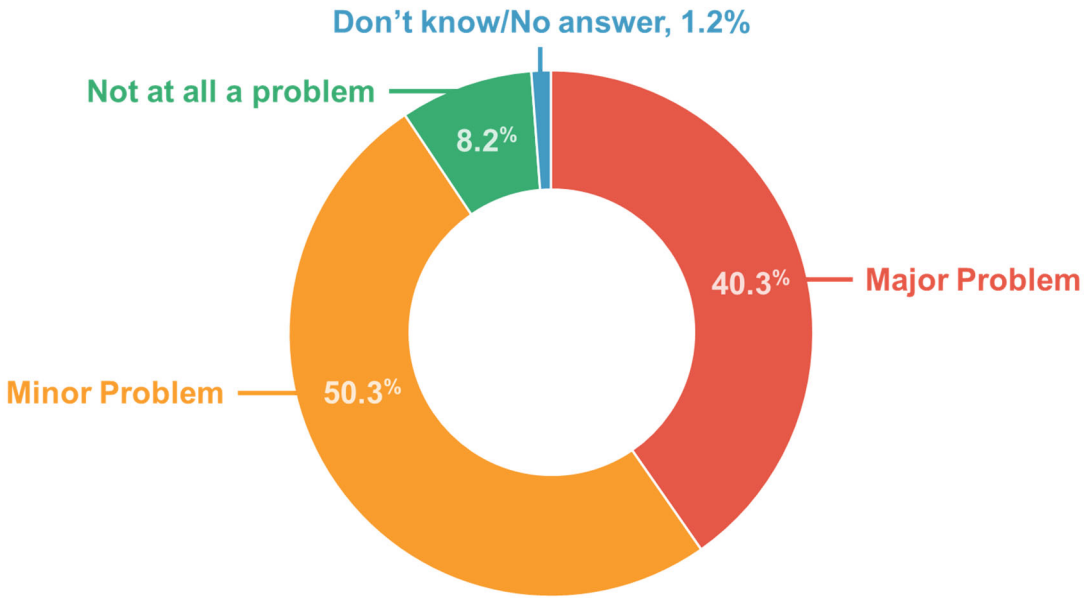


Figure 10-2: Percentage of Surveyed Individuals Who Believe Litter is a Problem in Waterways

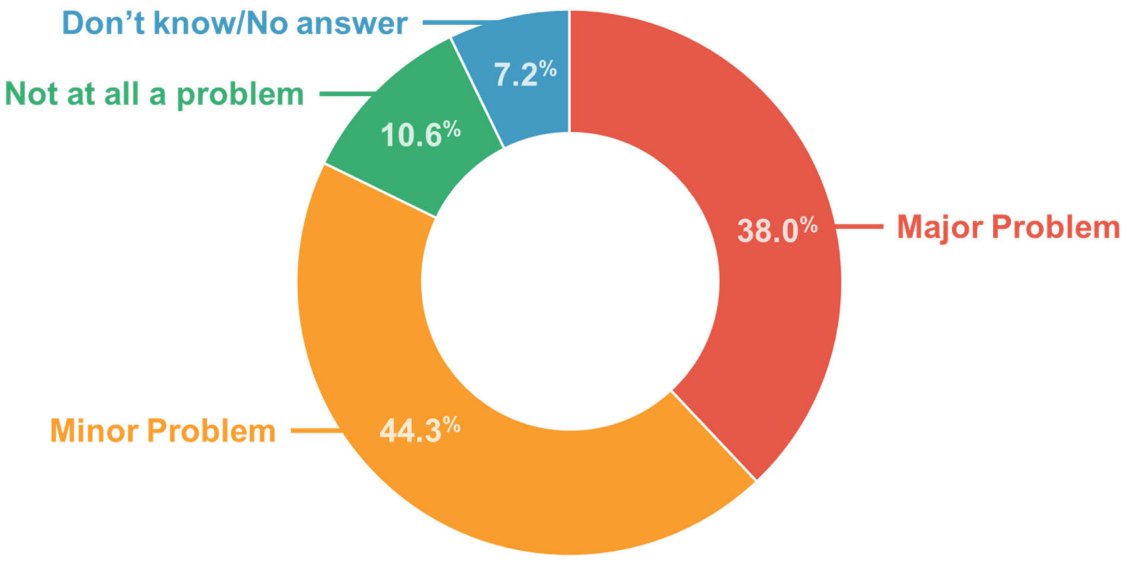
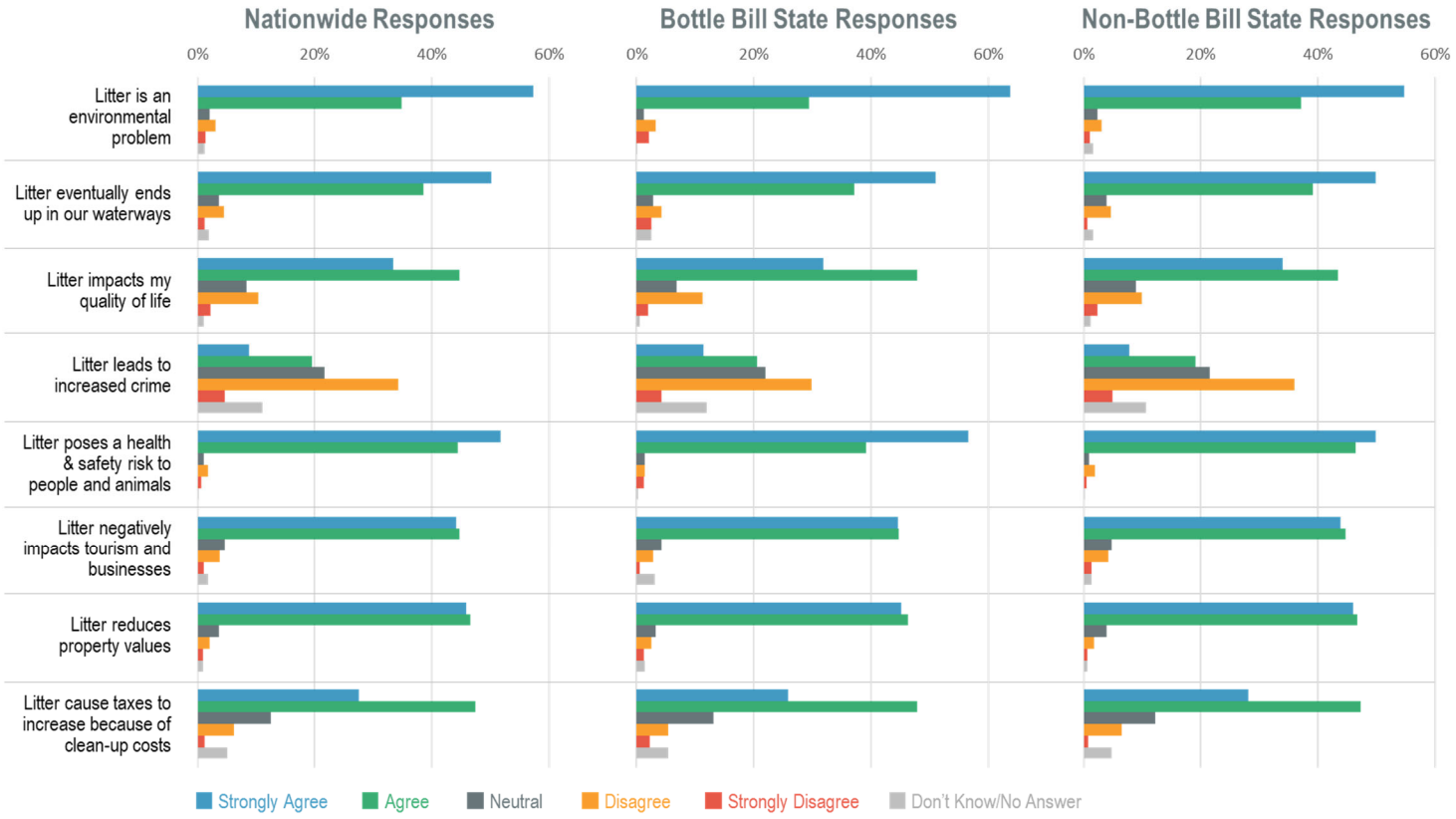


Figure 10-3 provides a summary of the public's perception of how the presence of litter may impact communities. Between 75-97 percent of U.S. residents agree the presence of litter affects the environment, waterways, property taxes, home values, tourism and businesses, quality of life, and health and safety. National survey respondents agreed the least with the statement that "Litter leads to increased crime."

Figure 10-3: How Litter Affects the Community

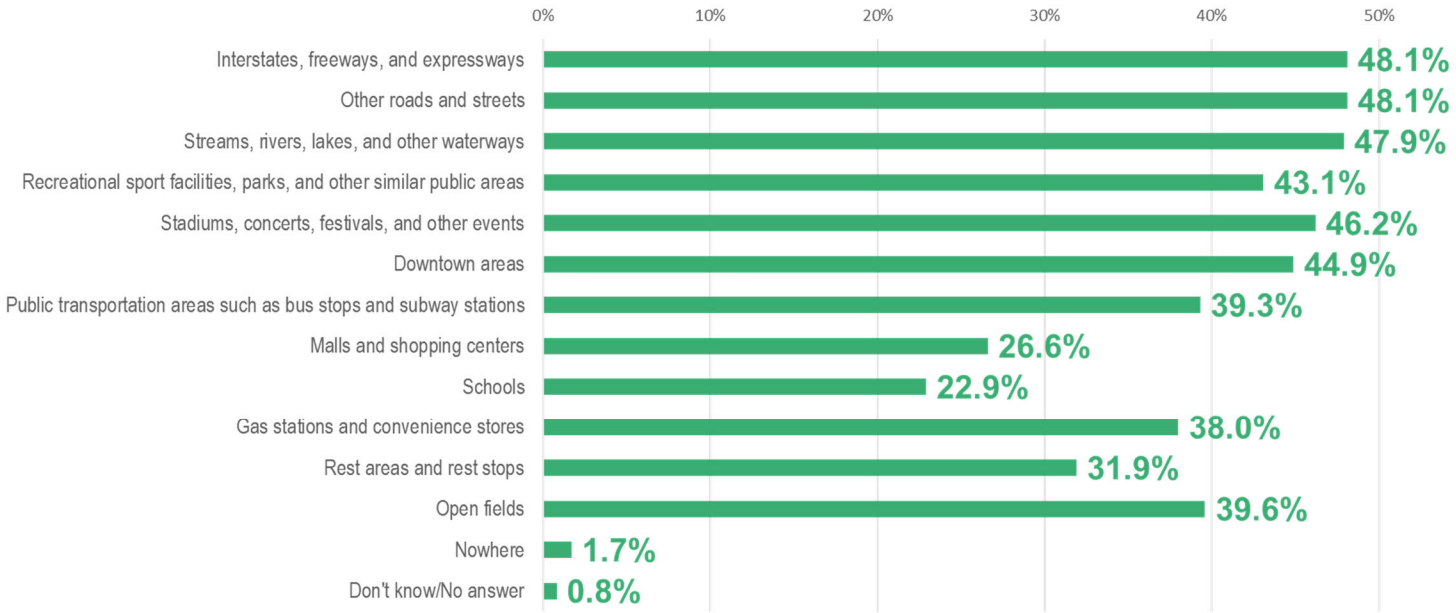


10.2 PREVALENCE OF LITTERING

This section provides the results from survey questions that were geared towards documenting the U.S. residents' litter observations, such as the kinds of litter they have seen and what they believe the sources may be. This helps identify where the public's knowledge and attitudes are aligned (or misaligned) with the Study's observations of litter on the ground.

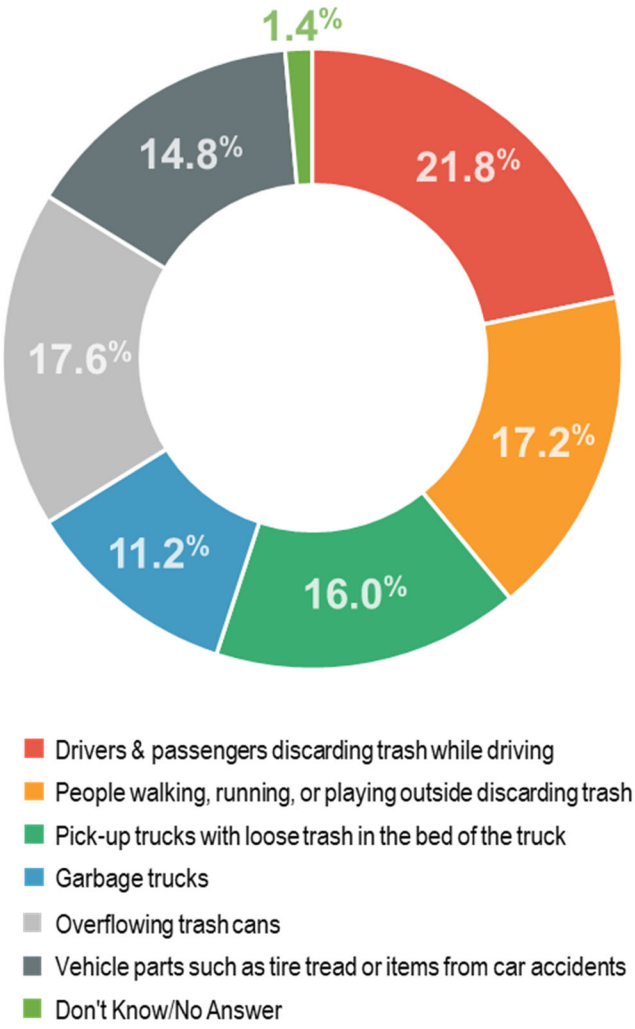
The majority of U.S. residents reported litter is most prevalent along roadways, interstates, expressways, and freeways, as well as in waterways and downtown areas. Figure 10-4**Error! Reference source not found.** provides a visual representation of the locations where most respondents specified observing litter.

Figure 10-4: Areas Where Litter is Most Commonly Observed (by Percentage)



The plurality of U.S. residents reported motorists were the primary source of litter. Public opinion about the sources of litter is generally consistent with the findings of the visible litter survey, though the public tends to overestimate the role of several sources of litter. For example, 17.6 percent of the public believes that overflowing trash cans were the primary source of litter, while the visible litter study estimates that 1.7 percent of all litter results from overflowing containers. Figure 10-5 lists the most common perceived sources for litter.

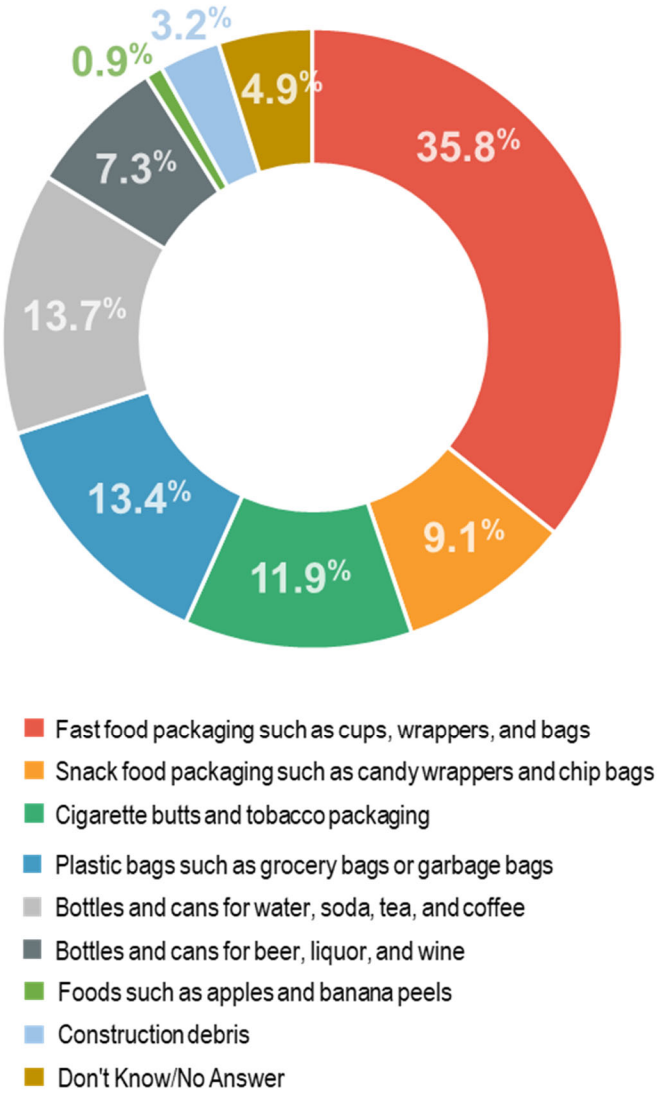
Figure 10-5: US Residents Perception of Litter Sources (by Percentage)



When asked to identify the main type of litter in their state, U.S. residents reported the primary types of litter observed were fast-food packaging, beverage containers, plastic bags, and tobacco products. While the data from the visible litter survey and the attitude survey are not strictly comparable, there is evidence that the public's perception of litter composition is inconsistent with the actual litter on the ground, as determined by the visible litter surveys. For example, Figure 10-6 shows that 11.9 percent of national survey respondents reported observing tobacco products as the main type of litter in their state compared with 35.8 percent reporting that fast-food packaging is the main type of litter. However, the visible litter survey finds that cigarette butts were the single most littered item (19.6 percent of all litter).

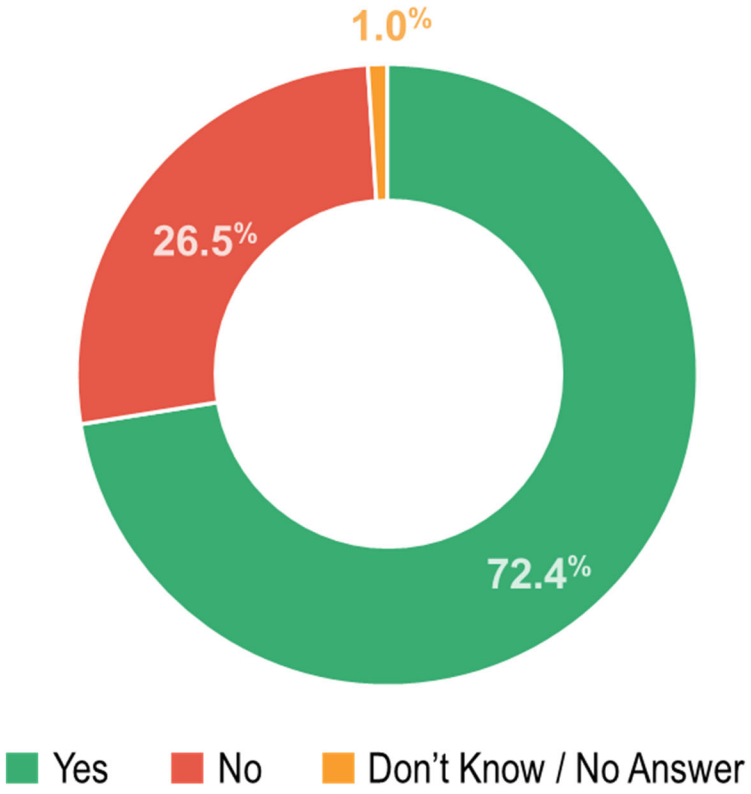
While the public may underestimate the scale of cigarette butt litter, and smaller litter more generally, they do recognize that cigarette butts are, in fact, litter. Nearly all U.S. residents (96 percent) agreed cigarette butts should be considered litter.

Figure 10-6: Main Types of Litter Observed by US Residents



While the survey finds that only three percent of US residents disclose having recently littered themselves, Figure 10-7 illustrates that over 70 percent of residents have observed another person littering in the past year. The size of the difference between personal reports of littering and observations of others littering can have many sources, including social desirability bias against self-reporting of an anti-social behavior such as littering.

Figure 10-7: Percentage of US Residents Who Have Observed Someone Litter in the Past Year



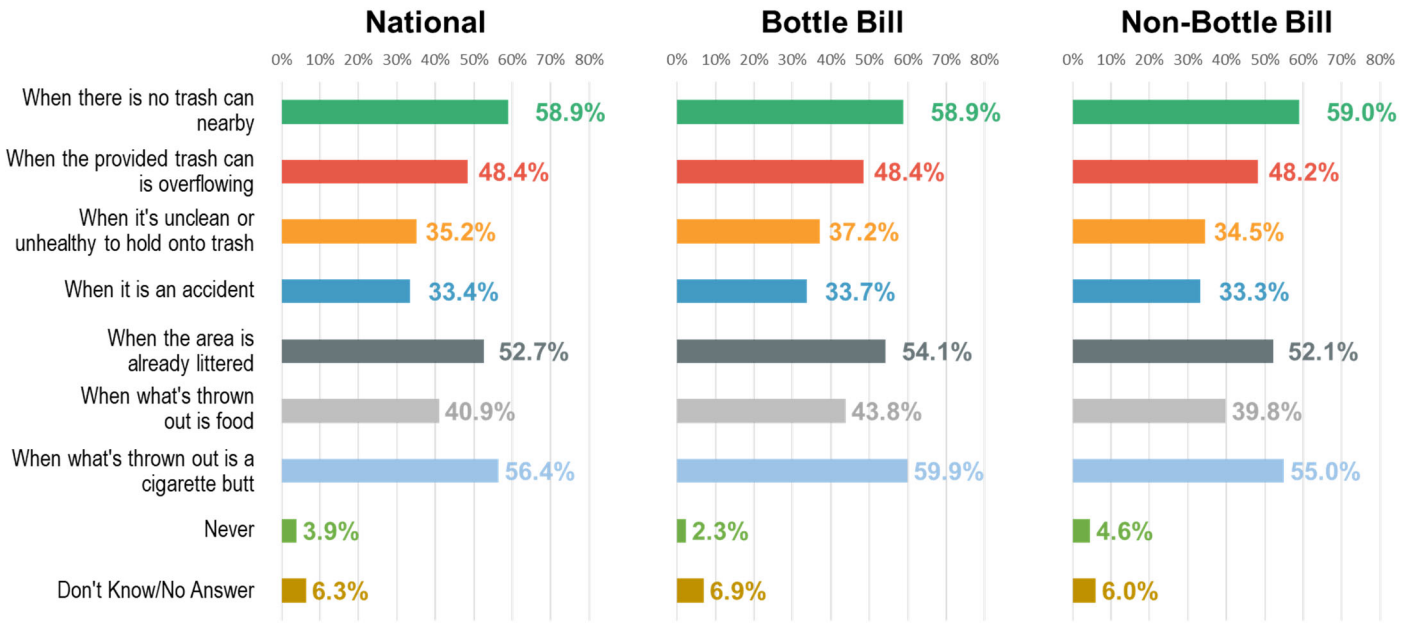
10.3 INSTANCES OF LITTERING

The survey questions associated with this section were designed to help quantify respondents' attitudes regarding when, where, and why someone litters. More than two-thirds of U.S. residents believe the reason why people litter is that people do not care about the effects of litter (see Figure 10-8). Half of U.S. residents believe people litter because littering is more convenient than properly disposing trash, which is consistent with previous research showing the impact of having appropriate infrastructure (e.g., litter bins, cigarette butt receptacles) in place to reduce littering.

More than half of U.S. residents believe the act of littering is most likely to occur when a convenient trash can is not available (58.9 percent), when what is thrown out is a cigarette butt (56.4 percent), or when the area is already littered (52.7 percent, see Figure 10-9). Just as we find that most U.S. residents understand the importance of infrastructure as a means of reducing littering, it is also a positive finding that the majority of US residents understand that litter begets litter and that people are more likely to litter in an area that is already littered.

Figure 10-8: Reasons Why People Litter

Figure 10-9: Circumstances When People Litter



10.4 CONSEQUENCES OF LITTERING

Survey questions that fell under this category were intended to gain an understanding of respondents' opinions on the appropriate consequence for the person responsible for littering. When asked if they or someone they know has ever been caught or fined for littering, over 90 percent of U.S. residents nationally said "no" (see Figure 10-10). Appropriate litter laws and enforcement are an important component of preventing litter, but the U.S. public does not believe that enforcement is occurring.

Figure 10-11 provides an overview of respondents' likelihood of reacting in three specific ways to observing another person in the act of littering.

Figure 10-10: Have You or Someone You Known Been Caught or Fined for Littering

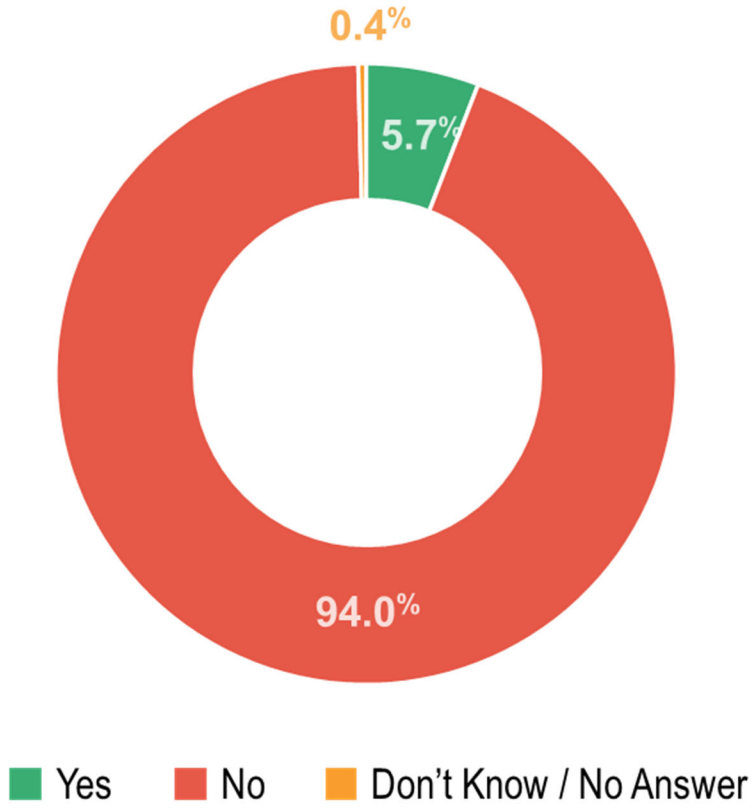
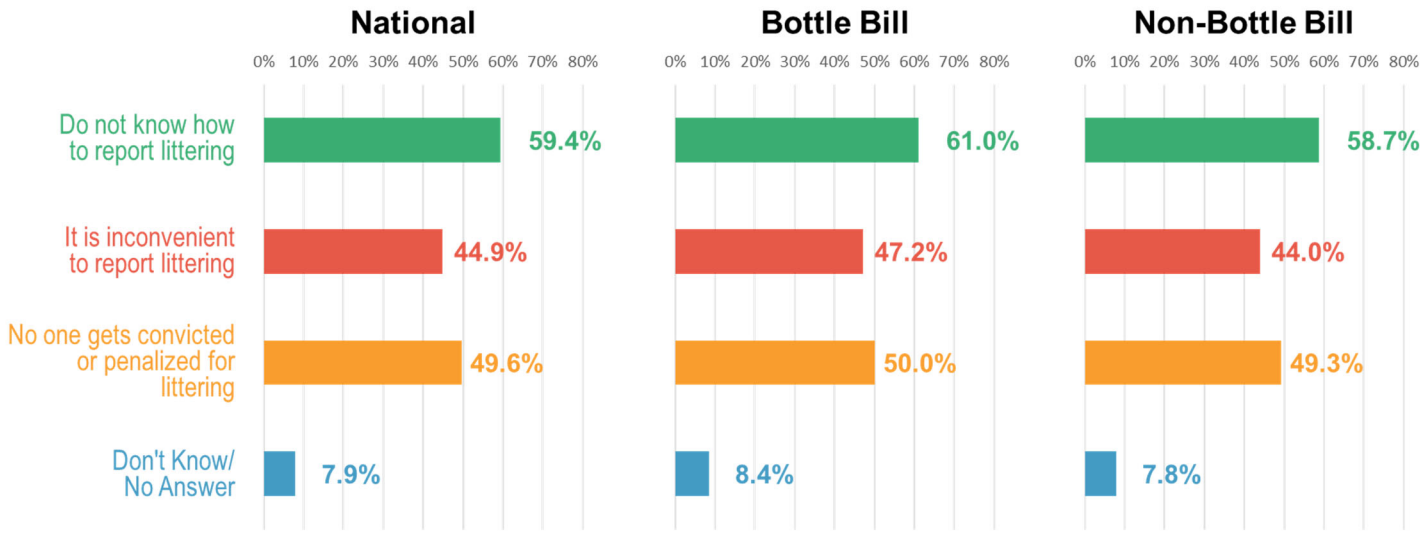


Figure 10-11: Likelihood of Reacting when Someone Litters and Possible Responses

While some states and municipalities have local hotlines whereby citizens can report littering, Figure 10-12 shows the different reasons the survey respondents assumed other people have not or would not report littering. Most survey respondents assumed that people do not report littering because they do not know how to report littering.

Figure 10-12: Possible Reasons Why People Don't Report Littering



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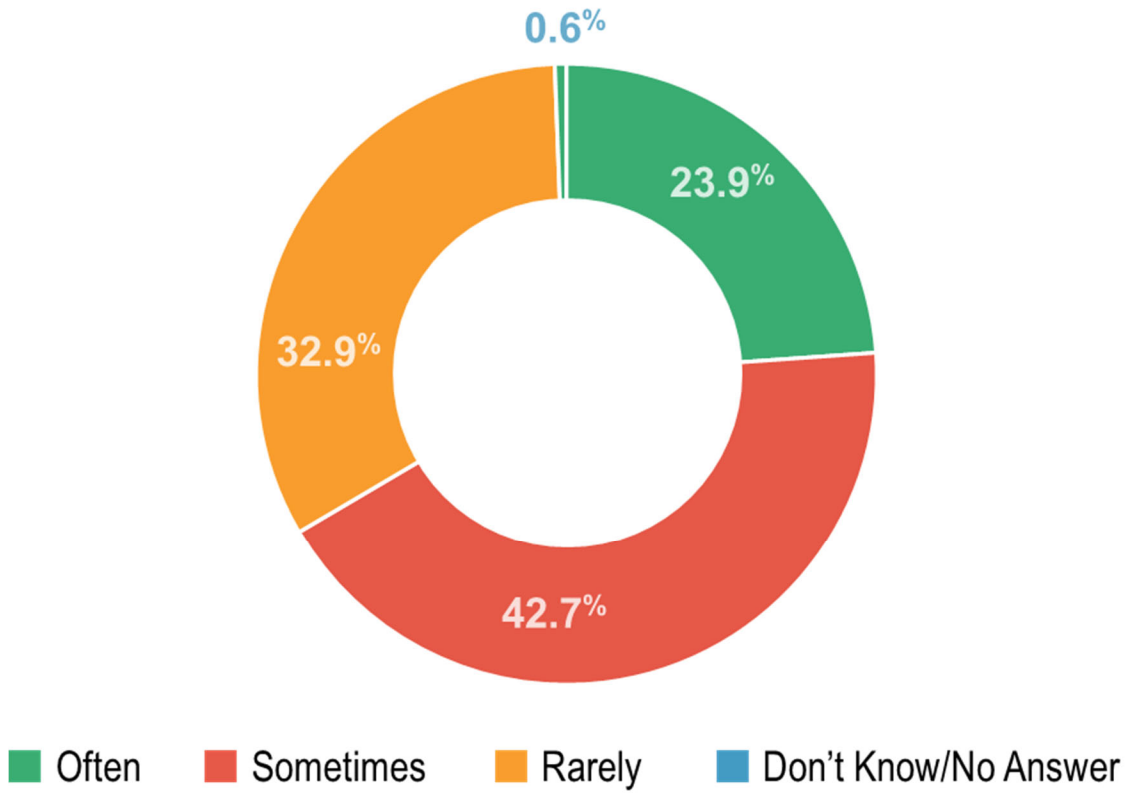
10.5 LITTER PREVENTION AND ABATEMENT

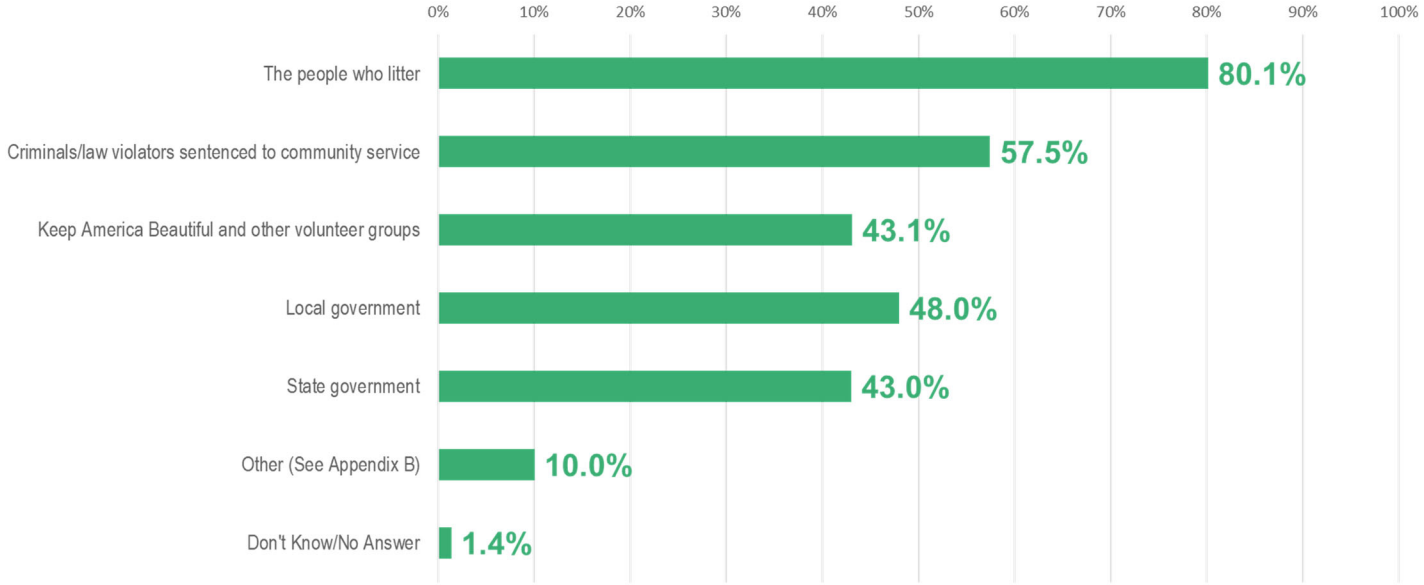
About half of the survey respondents expressed they could recall seeing or hearing litter prevention advertisements in their state. For that half of residents, Figure 10-13 captures the frequency with which respondents recalled hearing or seeing litter prevention messages. These results indicate U.S. residents are not receiving enough educational messaging to prevent litter. Combining their exposure to and frequency of messaging, only one third of U.S. residents are receiving litter prevention messaging even "sometimes." These levels of reach are not enough to address the scale of the littering problem in the United States.

Figure 10-13: How Often Survey Respondents Hear or See Litter Prevention Messaging



About 80 percent of survey respondents nationally, in both bottle bill and non-bottle bill states, feel the people who are responsible for littering should be the ones responsible for cleaning it up (see Figure 10-14).

Figure 10-14: Who Should Clean Up Litter



10.6 SUPPORT FOR BOTTLE DEPOSIT-STYLE LEGISLATION

As noted in previous sections, there is an association between the presence of bottle deposit legislation and the amount of litter on the ground. To understand U.S. residents' opinions about this type of legislation, survey respondents were asked about two types of policies targeted at increasing recycling. Half of respondents were asked whether or not they support a "refundable deposit" policy in their state, and the other half were asked whether or not they support a "rebate incentive." Across both questions, and across all respondents (nationally, in bottle-bill states, and in non-bottle bill states), over 75 percent of respondents supported the implementation of these policies within their state (see Figures 10-15 and 10-16).

Figure 10-15: Percentage of US Residents Who Support Recycling Refundable Deposit

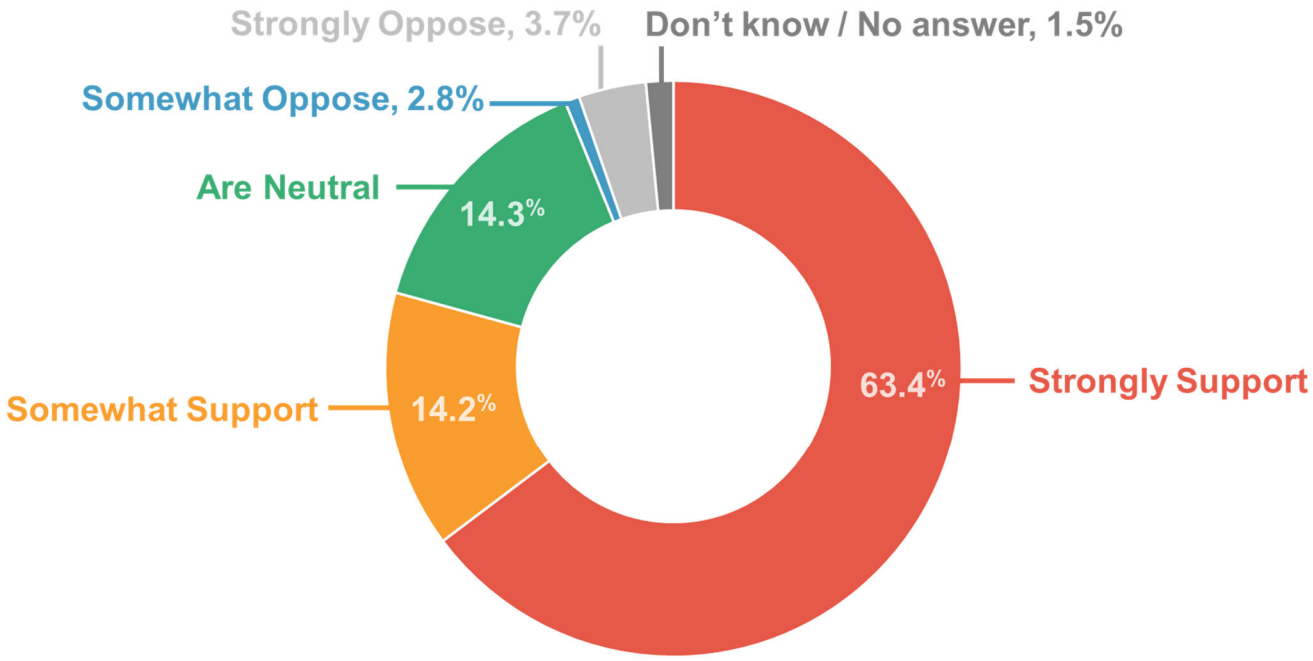
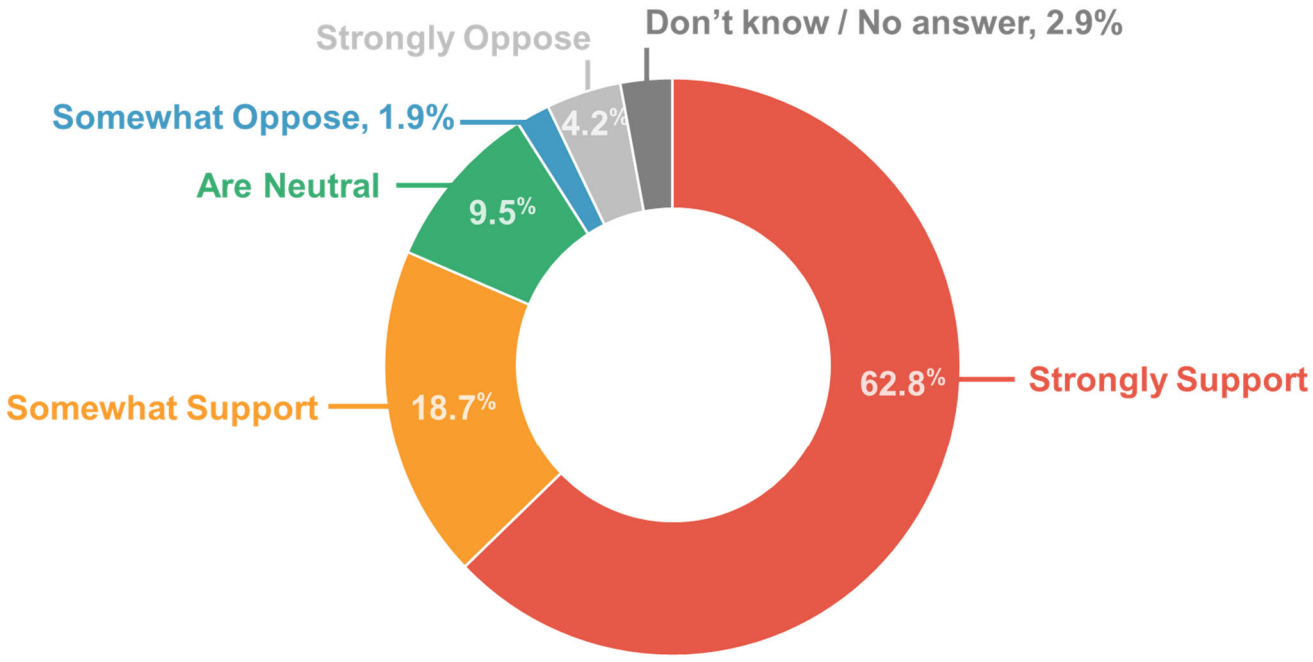


Figure 10-16: Percentage of US Residents Who Support Recycling Rebate Incentive



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10.7 KEY FINDINGS

- **Citizens believe that litter is a problem, nationally.** Over 90 percent of U.S. residents reported litter is a problem.
- **Litter negatively impacts communities.** Large majorities of U.S. residents reported they believe the presence of litter has an impact on the environment, waterways, property taxes, home values, tourism and businesses, quality of life, and health and safety.
- **U.S. residents identified motorists and pedestrians as the primary source of litter.** The public's opinion is consistent with the findings of the visible litter survey.
- **Fast-food packaging, beverage containers, plastic bags, and tobacco products were perceived to be the most commonly littered items.** Their perceptions were generally in line with the survey findings, as these four categories were among the most commonly identified litter items along roadways.
- **U.S. residents indicated that they have seen others litter most when there is no trash can nearby, when they are disposing of a cigarette butt, or when the area is already littered.** Over two-thirds of residents believe that people litter because they do not care about the effects of litter.
- **Minimal perceived consequences for littering.** Almost 95 percent of residents answered "No" when asked if they are aware of anyone being caught or fined for littering.
- **Respondents supported "refundable deposit" or "rebate incentive" to increase recycling**. Across all respondents (nationally, in bottle-bill states, and in non-bottle bill states), over 75 percent of respondents supported the implementation of these policies within their state.

APPENDIX A

MATERIAL GROUPS, MATERIAL CATEGORIES AND SOURCES

Table A-1: Visible Litter Survey Material Groups, Material Categories and Sources

Litter Survey Material Group	Material Category	Definition	Likely Source
Paper	Fast food paper bags	Paper bags from restaurants, taverns, drive-ins, concessions, the fast food section of a grocery store, and other such establishments. Bags will not be opened for the study. Surveyor to record whether full or empty.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Fast food paper cups	Paper cups used to serve one-time or fast food drinks originating from restaurants, taverns, drive-ins, concessions, convenience stores, the fast food section of a grocery store, and other such establishments.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other paper fast food service items	Paper items used to serve one-time or fast-food service items originating from restaurants, taverns, drive-ins, concessions, convenience stores, the fast-food section of a grocery store, and other such establishments. Examples include paper plates, bowls, wrappings, individual serving condiment packages, cup and beverage holders, napkins or towels, and pizza boxes known to be from such establishments.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Cardboard	Cardboard usually has three layers consisting of a center wavy layer sandwiched between two outer layers. Cardboard may have a wax coating on the inside or outside. Examples include entire cardboard containers, such as shipping and moving boxes, computer packaging cartons, and sheets and pieces of boxes and cartons.	**Motorists:** not compacted **Improperly secured loads:** compacted

Litter Survey Material Group	Material Category	Definition	Likely Source
	Kraft bags	Paper bags and sheets made from Kraft paper. Examples include paper grocery bags, department store bags, and heavyweight sheets of Kraft packing paper. Excludes fast food paper bags. Bags will not be opened for the study. Surveyor to record whether full or empty.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Receipts	Paper items showing purchases or receipt of items or goods.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Political signs	Examples include political yard signs.	**Pedestrian:** not compacted **Improperly secured loads:** compacted
	Other advertising signs	Examples include business advertising signs.	**Pedestrian:** not compacted **Improperly secured loads:** compacted
	Office paper/ mail	Paper used in offices and mailings. Examples include manila folders, manila envelopes, index cards, white envelopes, white window envelopes, white or colored notebook paper, carbonless forms, junk mail, and other mail.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Newspaper/ inserts	Printed groundwood newsprint, including glossy ads, inserts, and Sunday edition magazines that were delivered with the newspaper.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Magazines	Magazines, catalogs, and similar products with glossy paper.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted

Litter Survey Material Group	Material Category	Definition	Likely Source
	Books	Paperback and hardback books.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Improperly secured loads:** compacted
	Aseptic/ gable top containers	Gable-top containers. Examples include milk cartons, orange juice cartons, and soy milk aseptic containers.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Beverage carriers/ cartons	Paperboard boxes used to hold four or more individual soft drinks or beer bottles or cans.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Paper home food packaging	Low-grade recyclable papers used in food packaging, including chipboard and other solid boxboard (not polycoated). Examples include cereal, egg cartons (molded pulp), and other boxes and ice cream cartons and other frozen food boxes.	**Improperly secured loads**
	Other paper	Items made mostly of paper that do not fit into other paper categories. May be combined with minor amounts of other materials. Excludes items included in other material group.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
Plastic	Soda	Plastic bottle of any size designed to contain carbonated beverages other than those marketed or labeled as a type of water. Surveyor to record whether bottle is with or without cap.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted

Litter Survey Material Group	Material Category	Definition	Likely Source
	Single serve wine & liquor	Single serve (e.g., mini) plastic bottles of 50 ml or less designed to contain wine, wine coolers, hard liquor, and other liqueurs. Surveyor to record whether bottle is with or without cap.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other wine & liquor	Plastic bottles designed to contain wine, wine coolers, hard liquor, and other liqueurs other than single serve wine & liquor plastic bottles or containers. Surveyor to record whether bottle is with or without cap.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Sports & energy drinks	Plastic bottle of any size designed to contain sports and energy drinks. Surveyor to record whether bottle is with or without cap.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Juice	Plastic bottle of any size designed to contain juices and fruit drinks. Surveyor to record whether bottle is with or without cap.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Tea & coffee	Plastic bottle of any size designed to contain ready to drink tea or coffee. Surveyor to record whether bottle is with or without cap.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Still water	Plastic bottle of any size designed to contain still (nonsparkling) plan (unflavored) water 24 ounces or less. Surveyor to record whether bottle is with or without cap.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted

Litter Survey Material Group	Material Category	Definition	Likely Source
	Other water	Plastic bottle of any size designed to contain sparkling water, enhanced and flavored waters, and larger still (nonsparkling) plain (unflavored) water larger than 24 ounces. Surveyor to record whether bottle is with or without cap.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Loose bottle & container caps	Plastic caps not attached to a bottle or container.	**Motorists:** roadway without pedestrian walkway **Pedestrian:** roadway with pedestrian walkway **Overflowing Containers:** near container
	Fast food plastic cups	Plastic cups, including polystyrene fast food plastic cups, used to serve one-time or fast-food drinks originating from restaurants, taverns, drive-ins, concessions, convenience stores, the fast-food section of a grocery store, and other such establishments.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Plastic straws	A plastic (polypropylene, polystyrene, etc.) drinking straw used to consume one-time drinks.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other beverage packaging	Examples include plastic rings to hold soft drinks or beer cans, pull tabs, bottle caps, lids, and seals, made of plastic, used in the packaging/sealing of beverage containers.	**Pedestrian:** roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Plastic trash bags	Plastic bags used to contain trash. Examples include small, medium, and tall trash bags and black contractor trash bags. Bags will not be opened for the study. Surveyor to record whether full or empty.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted

Litter Survey Material Group	Material Category	Definition	Likely Source
	Other plastic bags	Plastic grocery and other merchandise shopping bags used to contain merchandise to transport from the place of purchase, given out by the store with the purchase (including dry cleaning bags). Bags will not be opened for the study. Surveyor to record whether full or empty.	**Pedestrian:** not full and roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** full or roadway without pedestrian walkway
	Food packaging film	Wrappings or bags used to package candy, gum, chips, or other food items.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other film	All other film packaging that does not fit into other categories excluding other plastic category. Examples include agricultural film (films used in various farming and growing applications, such as silage greenhouse films, mulch films, and wrap for hay bales), plastic sheeting used as drop cloths, and building wrap.	**Improperly secured loads**
	Plastic food service items	Plastic items (excluding Styrofoam) used to serve one-time or fast food service items originating from restaurants, taverns, drive-ins, concessions, the fast food section of a grocery store, and other such establishments. Examples include plastic lids, utensils, plates, bowls, wrappings, and individual serving condiment packages known to be from such establishments.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted

Litter Survey Material Group	Material Category	Definition	Likely Source
	Expanded polystyrene food service items	Polystyrene items used to serve one-time or fast food service items originating from restaurants, taverns, drive-ins, concessions, the fast food section of a grocery store, and other such establishments. Examples include Styrofoam platters, plates, bowls, cups, beverage holders, and clamshells. This does not include plastic cups, straws, or bags.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other expanded polystyrene	All other Polystyrene that does not fit into expanded polystyrene food service items. Examples include Polystyrene coolers.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other plastic food packaging	All other non-film food packaging that does not fit into other categories excluding other plastic category. Examples include cookie tray inserts and plastic frozen food trays.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other plastic	Items made mostly of plastic that do not fit into other plastic categories. May be combined with minor amounts of other materials. Excludes items included in other material group.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
Glass	Beer	Glass bottles of any size designed to contain beer or other malt beverages.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Soda	Glass bottle of any size designed to contain carbonated beverages other than those marketed or labeled as a type of water.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway

Litter Survey Material Group	Material Category	Definition	Likely Source
			Overflowing Containers: near container **Improperly secured loads:** compacted
	Single serve wine & liquor	Single serve (e.g., mini) glass bottles of 50 ml or less designed to contain wine, wine coolers, hard liquor, and other liqueurs.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other wine & liquor	Glass bottles designed to contain wine, wine coolers, hard liquor, and other liqueurs other than single serve wine & liquor plastic bottles or containers.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Sports & energy drinks	Glass bottle of any size designed to contain sports and energy drinks.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Juice	Glass bottle of any size designed to contain juices and fruit drinks.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Tea & coffee	Glass bottle of any size designed to contain ready to drink tea or coffee..	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Still water	Glass bottle of any size designed to contain still (nonsparkling) plan (unflavored) water 24 ounces or less.	**Motorists:** not compacted, roadway without pedestrian walkway

Litter Survey Material Group	Material Category	Definition	Likely Source
			Pedestrian: not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other water	Glass bottle of any size designed to contain sparkling water, enhanced and flavored waters, and larger still (nonsparkling) plain (unflavored) water larger than 24 ounces.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other glass beverage bottles	Glass bottle of any size that is not distinguishable by type of beverage.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Broken glass or ceramic	Broken glass pieces and ceramic products that do not fit into another category. Examples include broken glass beverage bottles, ceramic dishware, porcelain, china, garden pottery, and used toilets and sinks. Does not include automotive window glass.	**Improperly secured loads**
	Other glass food packaging	All other food packaging that does not fit into other categories excluding other glass category.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other glass	Items made mostly of glass that do not fit into other glass categories. May be combined with minor amounts of other materials. Excludes entertainment items and automotive window glass.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted

Litter Survey Material Group	Material Category	Definition	Likely Source
Metal	Beer	Aluminum cans of any size designed to contain beer or other malt beverages.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Soda	Aluminum cans of any size designed to contain carbonated beverages other than those marketed or labeled as a type of water.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Sports & energy drinks	Aluminum cans of any size designed to contain sports and energy drinks.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Juice	Aluminum cans of any size designed to contain juices and fruit drinks.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Tea & coffee	Aluminum cans of any size designed to contain ready to drink tea or coffee.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other metal beverage bottles	Metal bottle of any size that is not distinguishable by type of beverage.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway

Litter Survey Material Group	Material Category	Definition	Likely Source
			Overflowing Containers: near container **Improperly secured loads:** compacted
	Other beverage packaging	Pull tabs, bottle caps, lids, and seals, made of metal, used in the packaging/sealing of beverage containers.	**Pedestrian:** roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Metal food packaging	Steel/tin cans made mainly of steel, such as canned food containers, bimetal containers with steel sides and aluminum ends and aluminum foil.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other metal	Items made mostly of metal that do not fit into other metal categories. May be combined with minor amounts of other materials. Excludes items included in other material group.	**Improperly secured loads**
Organics	Pet waste	Animal waste bags of any size or shape that contain animal feces.	**Pedestrian**
	Human waste	Containers of any size or shape that contain human feces or urine. Examples include disposable baby diapers, protective undergarments for adults, and plastic beverage bottles filled with urine.	**Pedestrian**
	Confection	Any type of candy, chocolate, gum, or other sweet preparation containing sugar or artificial sweetener as its principal ingredient.	**Motorists:** roadway without pedestrian walkway **Pedestrian:** roadway with pedestrian walkway **Overflowing Containers:** near container
	Other food waste	Any item of food, excluding confection.	**Motorists:** roadway without pedestrian walkway **Pedestrian:** roadway with pedestrian walkway **Overflowing Containers:** near container
	Other organics	Items made mostly of organics that do not fit into other organics	**Motorists:** not compacted, roadway without pedestrian walkway

Litter Survey Material Group	Material Category	Definition	Likely Source
		categories. May be combined with minor amounts of other materials.	**Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
Other	Medical waste	Examples include needles, syringes, I.V. tubing, medications, ointments, creams, etc. used to heal persons or animals, but does not include their packaging unless negligible by weight.	**Motorists:** roadway without pedestrian walkway **Pedestrian:** roadway with pedestrian walkway **Overflowing Containers:** near container
	PPE Gloves	Examples include latex gloves, nitrile gloves, and other gloves.	**Motorists:** roadway without pedestrian walkway **Pedestrian:** roadway with pedestrian walkway **Overflowing Containers:** near container
	PPE Masks	Examples include fabric and medical masks.	**Motorists:** roadway without pedestrian walkway **Pedestrian:** roadway with pedestrian walkway **Overflowing Containers:** near container
	Hazardous waste	Examples include latex water-based paints, oil-based paints (including varnishes and stains), motor oil and other vehicle fluids.	**Improperly secured loads**
	Vehicle debris	Vehicle parts, debris from vehicle accidents, and other vehicle debris. Examples include hubcaps, tailpipes, tires, tire rims, vehicle molding, exterior light covers, rearview mirrors, or window glass known to be from an automobile, bicycle, or other motorized vehicle. This does not include tire tread.	**Motorists**
	Tires	Whole tires of all types (including bicycle tires).	**Motorist**

Litter Survey Material Group	Material Category	Definition	Likely Source
	Tire tread	Partial scraps of tire tread of all types (including bicycle tires).	**Vehicle Debris**
	Construction and demolition debris	Construction, renovation, and demolition debris Examples include rocks and brick, concrete, soil, fines, dirt, non-distinct fines, gypsum board, fiberglass insulation, other fiberglass, roofing waste, asphalt paving, asphalt roofing, lumber (non-treated), treated wood waste, pallets, and other C&D materials that did not fit into other categories.	**Improperly secured loads**
	Textiles/ small rugs	Items made of thread, yarn, fabric, or cloth. Examples include clothes, fabric trimmings, draperies, and bathroom rugs (flooring applications consisting of various natural or synthetic fibers bonded to some type of backing material). This type does not include cloth-covered furniture, mattresses, or leather.	**Improperly secured loads**
	Bulky items	Mixed material furniture, mattresses, box springs, appliances, refrigerators, and area rugs (flooring applications consisting of various natural or synthetic fibers bonded to some type of backing material).	**Improperly secured loads**
	Cigarette butts	The discarded ends, pieces or filters of fully or partially smoked cigarettes.	**Motorists:** roadway without pedestrian walkway **Pedestrian:** roadway with pedestrian walkway **Overflowing Containers:** near container
	Electronic cigarettes	Devices associated with the use of electronic cigarettes. Examples include electronic cigarette cartridges, disposable electronic	**Motorists:** roadway without pedestrian walkway **Pedestrian:** roadway with pedestrian walkway **Overflowing Containers:** near container

Litter Survey Material Group	Material Category	Definition	Likely Source
		cigarettes, and reusable electronic cigarettes.	
	Other tobacco-related products & packaging	All other tobacco-related products that do not fit into other categories. Examples include unsmoked cigarettes, cigars, chewing tobacco, pipe tobacco, matches, matchbooks and packaging for tobacco products such as paper boxes, plastic or foil wrappings, or other materials used to package cigarettes, cigars, chewing or pipe tobacco, including individual cigarette packages and unused cigarette papers.	**Motorists:** roadway without pedestrian walkway **Pedestrian:** roadway with pedestrian walkway **Overflowing Containers:** near container
	Toiletries/ personal hygiene products	Health care products. Examples include make-up sponges, gloves, and condoms.	**Motorists:** roadway without pedestrian walkway **Pedestrian:** roadway with pedestrian walkway **Overflowing Containers:** near container
	Entertainment items	Examples include games, music cassettes, CDs, golf balls, frisbees, small cars, and other toys.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway
	Flat-screen televisions and computer monitors	Television and computer monitors with a thin and flat screen. Examples include Plasma and LCD televisions.	**Motorists**
	CRT televisions and computer monitors	Cathode ray tube (CRT) monitor including television and computer monitors with large, deep casing.	**Motorists**
	Portable electronics	Cell phones and other portable electronics.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Electronic cords	Cords associated with electronics including charging cords,	**Motorists:** roadway without pedestrian walkway

Litter Survey Material Group	Material Category	Definition	Likely Source
		headphones, adapters, power cords, and other cords.	**Pedestrian:** roadway with pedestrian walkway **Overflowing Containers:** near container
	Other electronics	Electronics that do not fit into other categories.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other items	Any other material not otherwise described.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted

Table A-2: Behavioral Observation Material Groups and Material Categories

Litter Survey Material Group	Material Category	Definition	Behavioral Observation Material Category
Paper	Fast food paper bags	Paper bags from restaurants, taverns, drive-ins, concessions, the fast food section of a grocery store, and other such establishments. Bags will not be opened for the study. Surveyor to record whether full or empty.	Fast Food paper bag *Surveyor not to record whether full or empty.*
	Fast food paper cups	Paper cups used to serve one-time or fast food drinks originating from restaurants, taverns, drive-ins, concessions, convenience stores, the fast food section of a grocery store, and other such establishments.	Fast food paper cups
	Other paper fast food service items	Paper items used to serve one-time or fast-food service items originating from restaurants, taverns, drive-ins, concessions, convenience stores, the fast-food section of a grocery store, and other such establishments. Examples include paper plates, bowls, wrappings, individual serving condiment packages, cup and beverage holders, napkins or towels, and pizza boxes known to be from such establishments.	Other paper fast food service items
	Cardboard	Cardboard usually has three layers consisting of a center wavy layer sandwiched between two outer layers. Cardboard may have a wax coating on the inside or outside. Examples include entire cardboard containers, such as shipping and moving boxes, computer packaging cartons, and sheets and pieces of boxes and cartons.	Recyclable paper
	Kraft bags	Paper bags and sheets made from Kraft paper. Examples include paper grocery bags, department store bags, and heavyweight sheets of Kraft packing paper. Excludes fast food paper bags. Bags will not be opened for the study. Surveyor to record whether full or empty.	Recyclable paper
	Receipts	Paper items showing purchases or receipt of items or goods.	Receipts
	Political signs	Examples include political yard signs.	Other paper
	Other advertising signs	Examples include business advertising signs.	Other paper

Litter Survey Material Group	Material Category	Definition	Behavioral Observation Material Category
	Office paper/ mail	Paper used in offices and mailings. Examples include manila folders, manila envelopes, index cards, white envelopes, white window envelopes, white or colored notebook paper, carbonless forms, junk mail, and other mail.	Recyclable paper
	Newspaper/ inserts	Printed groundwood newsprint, including glossy ads, inserts, and Sunday edition magazines that were delivered with the newspaper.	Recyclable paper
	Magazines	Magazines, catalogs, and similar products with glossy paper.	Recyclable paper
	Books	Paperback and hardback books.	Recyclable paper
	Aseptic/ gable top containers	Gable-top containers. Examples include milk cartons, orange juice cartons, and soy milk aseptic containers.	Aseptic/ gable top containers
	Beverage carriers/ cartons	Paperboard boxes used to hold four or more individual soft drinks or beer bottles or cans.	Beverage carriers/ cartons
	Paper home food packaging	Low-grade recyclable papers used in food packaging, including chipboard and other solid boxboard (not polycoated). Examples include cereal, egg cartons (molded pulp), and other boxes and ice cream cartons and other frozen food boxes.	Recyclable paper
	Other paper	Items made mostly of paper that do not fit into other paper categories. May be combined with minor amounts of other materials. Excludes items included in other material group.	Other paper
Plastic	Soda	Plastic bottle of any size designed to contain carbonated beverages other than those marketed or labeled as a type of water. Surveyor to record whether bottle is with or without cap.	Plastic bottles *Surveyor not to record whether with or without cap.*
	Single serve wine & liquor	Single serve (e.g., mini) plastic bottles of 50 ml or less designed to contain wine, wine coolers, hard liquor, and other liqueurs. Surveyor to record whether bottle is with or without cap.	Plastic bottles *Surveyor not to record whether with or without cap.*
	Other wine & liquor	Plastic bottles designed to contain wine, wine coolers, hard liquor, and other liqueurs other than single serve wine & liquor plastic bottles or containers. Surveyor to record whether bottle is with or without cap.	Plastic bottles *Surveyor not to record whether with or without cap.*

Litter Survey Material Group	Material Category	Definition	Behavioral Observation Material Category
	Sports & energy drinks	Plastic bottle of any size designed to contain sports and energy drinks. Surveyor to record whether bottle is with or without cap.	Plastic bottles *Surveyor not to record whether with or without cap.*
	Juice	Plastic bottle of any size designed to contain juices and fruit drinks. Surveyor to record whether bottle is with or without cap.	Plastic bottles *Surveyor not to record whether with or without cap.*
	Tea & coffee	Plastic bottle of any size designed to contain ready to drink tea or coffee. Surveyor to record whether bottle is with or without cap.	Plastic bottles *Surveyor not to record whether with or without cap.*
	Still water	Plastic bottle of any size designed to contain still (nonsparkling) plan (unflavored) water 24 ounces or less. Surveyor to record whether bottle is with or without cap.	Plastic bottles *Surveyor not to record whether with or without cap.*
	Other water	Plastic bottle of any size designed to contain sparkling water, enhanced and flavored waters, and larger still (nonsparkling) plain (unflavored) water larger than 24 ounces. Surveyor to record whether bottle is with or without cap.	Plastic bottles *Surveyor not to record whether with or without cap.*
	Loose bottle & container caps	Plastic caps not attached to a bottle or container.	Other plastic
	Fast food plastic cups	Plastic cups, including polystyrene fast food plastic cups, used to serve one-time or fast-food drinks originating from restaurants, taverns, drive-ins, concessions, convenience stores, the fast-food section of a grocery store, and other such establishments.	Fast food plastic cups
	Plastic straws	A plastic (polypropylene, polystyrene, etc.) drinking straw used to consume one-time drinks.	Plastic straws
	Other beverage packaging	Examples include plastic rings to hold soft drinks or beer cans, pull tabs, bottle caps, lids, and seals, made of plastic, used in the packaging/sealing of beverage containers.	Other plastic
	Plastic trash bags	Plastic bags used to contain trash. Examples include small, medium, and tall trash bags and black contractor trash bags. Bags will not be opened for the study. Surveyor to record whether full or empty.	Plastic trash bags *Surveyor not to record whether full or empty.*

Litter Survey Material Group	Material Category	Definition	Behavioral Observation Material Category
	Other plastic bags	Plastic grocery and other merchandise shopping bags used to contain merchandise to transport from the place of purchase, given out by the store with the purchase (including dry cleaning bags). Bags will not be opened for the study. Surveyor to record whether full or empty.	Other plastic bags *Surveyor not to record whether full or empty.*
	Food packaging film	Wrappings or bags used to package candy, gum, chips, or other food items.	Food packaging film
	Other film	All other film packaging that does not fit into other categories excluding other plastic category. Examples include agricultural film (films used in various farming and growing applications, such as silage greenhouse films, mulch films, and wrap for hay bales), plastic sheeting used as drop cloths, and building wrap.	Other film
	Plastic food service items	Plastic items (excluding Styrofoam) used to serve one-time or fast food service items originating from restaurants, taverns, drive-ins, concessions, the fast food section of a grocery store, and other such establishments. Examples include plastic lids, utensils, plates, bowls, wrappings, and individual serving condiment packages known to be from such establishments.	Plastic food service items
	Expanded polystyrene food service items	Polystyrene items used to serve one-time or fast food service items originating from restaurants, taverns, drive-ins, concessions, the fast food section of a grocery store, and other such establishments. Examples include Styrofoam platters, plates, bowls, cups, beverage holders, and clamshells. This does not include plastic cups, straws, or bags.	Expanded polystyrene food service items
	Other expanded polystyrene	All other Polystyrene that does not fit into expanded polystyrene food service items. Examples include Polystyrene coolers.	Other expanded polystyrene
	Other plastic food packaging	All other non-film food packaging that does not fit into other categories excluding other plastic category.	Other plastic food packaging

Litter Survey Material Group	Material Category	Definition	Behavioral Observation Material Category
		Examples include cookie tray inserts and plastic frozen food trays.	
	Other plastic	Items made mostly of plastic that do not fit into other plastic categories. May be combined with minor amounts of other materials. Excludes items included in other material group.	Other plastic
Glass	Beer	Glass bottles of any size designed to contain beer or other malt beverages.	Glass bottles
	Soda	Glass bottle of any size designed to contain carbonated beverages other than those marketed or labeled as a type of water.	Glass bottles
	Single serve wine & liquor	Single serve (e.g., mini) glass bottles of 50 ml or less designed to contain wine, wine coolers, hard liquor, and other liqueurs.	Glass bottles
	Other wine & liquor	Glass bottles designed to contain wine, wine coolers, hard liquor, and other liqueurs other than single serve wine & liquor plastic bottles or containers.	Glass bottles
	Sports & energy drinks	Glass bottle of any size designed to contain sports and energy drinks.	Glass bottles
	Juice	Glass bottle of any size designed to contain juices and fruit drinks.	Glass bottles
	Tea & coffee	Glass bottle of any size designed to contain ready to drink tea or coffee.	Glass bottles
	Still water	Glass bottle of any size designed to contain still (nonsparkling) plan (unflavored) water 24 ounces or less.	Glass bottles
	Other water	Glass bottle of any size designed to contain sparkling water, enhanced and flavored waters, and larger still (nonsparkling) plain (unflavored) water larger than 24 ounces.	Glass bottles
	Other glass beverage bottles	Glass bottle of any size that is not distinguishable by type of beverage.	Glass bottles
	Broken glass or ceramic	Broken glass pieces and ceramic products that do not fit into another category. Examples include broken glass beverage bottles, ceramic dishware, porcelain, china, garden pottery, and used toilets and sinks. Does not include automotive window glass.	Other glass

Litter Survey Material Group	Material Category	Definition	Behavioral Observation Material Category
	Other glass food packaging	All other food packaging that does not fit into other categories excluding other glass category.	Other glass food packaging
	Other glass	Items made mostly of glass that do not fit into other glass categories. May be combined with minor amounts of other materials. Excludes entertainment items and automotive window glass.	Other glass
Metal	Beer	Aluminum cans of any size designed to contain beer or other malt beverages.	Metal cans
	Soda	Aluminum cans of any size designed to contain carbonated beverages other than those marketed or labeled as a type of water.	Metal cans
	Sports & energy drinks	Aluminum cans of any size designed to contain sports and energy drinks.	Metal cans
	Juice	Aluminum cans of any size designed to contain juices and fruit drinks.	Metal cans
	Tea & coffee	Aluminum cans of any size designed to contain ready to drink tea or coffee.	Metal cans
	Still water	Glass bottle of any size designed to contain still (nonsparkling) plan (unflavored) water 24 ounces or less.	Metal cans
	Other water	Glass bottle of any size designed to contain sparkling water, enhanced and flavored waters, and larger still (nonsparkling) plain (unflavored) water larger than 24 ounces.	Metal cans
	Other metal beverage bottles	Metal bottle of any size that is not distinguishable by type of beverage.	Metal cans
	Other beverage packaging	Pull tabs, bottle caps, lids, and seals, made of metal, used in the packaging/sealing of beverage containers.	Other beverage packaging
	Metal food packaging	Steel/tin cans made mainly of steel, such as canned food containers, bimetal containers with steel sides and aluminum ends and aluminum foil.	Metal food packaging
	Other metal	Items made mostly of metal that do not fit into other metal categories. May be combined with minor amounts of other materials. Excludes items included in other material group.	Other metal

Litter Survey Material Group	Material Category	Definition	Behavioral Observation Material Category
Organics	Pet waste	Animal waste bags of any size or shape that contain animal feces.	Pet waste
	Human waste	Containers of any size or shape that contain human feces or urine. Examples include disposable baby diapers, protective undergarments for adults, and plastic beverage bottles filled with urine.	Other Organics
	Confection	Any type of candy, chocolate, gum, or other sweet preparation containing sugar or artificial sweetener as its principal ingredient.	Confection
	Other food waste	Any item of food, excluding confection.	Other food waste
	Other organics	Items made mostly of organics that do not fit into other organics categories. May be combined with minor amounts of other materials.	Other Organics
Other	Medical waste	Examples include needles, syringes, I.V. tubing, medications, ointments, creams, etc. used to heal persons or animals, but does not include their packaging unless negligible by weight.	Other
	PPE Gloves	Examples include latex gloves, nitrile gloves, and other gloves.	PPE Gloves
	PPE Masks	Examples include fabric and medical masks.	PPE Masks
	Hazardous waste	Examples include latex water-based paints, oil-based paints (including varnishes and stains), motor oil and other vehicle fluids.	Other
	Vehicle debris	Vehicle parts, debris from vehicle accidents, and other vehicle debris. Examples include hubcaps, tailpipes, tires, tire rims, vehicle molding, exterior light covers, rearview mirrors, or window glass known to be from an automobile, bicycle, or other motorized vehicle. This does not include tire tread.	Vehicle debris
	Tires	Whole tires of all types (including bicycle tires).	Tires
	Tire tread	Partial scraps of tire tread of all types (including bicycle tires).	Other

Litter Survey Material Group	Material Category	Definition	Behavioral Observation Material Category
	Construction and demolition debris	Construction, renovation, and demolition debris Examples include rocks and brick, concrete, soil, fines, dirt, non-distinct fines, gypsum board, fiberglass insulation, other fiberglass, roofing waste, asphalt paving, asphalt roofing, lumber (non-treated), treated wood waste, pallets, and other C&D materials that did not fit into other categories.	Other
	Textiles/ small rugs	Items made of thread, yarn, fabric, or cloth. Examples include clothes, fabric trimmings, draperies, and bathroom rugs (flooring applications consisting of various natural or synthetic fibers bonded to some type of backing material). This type does not include cloth-covered furniture, mattresses, or leather.	Other
	Bulky items	Mixed material furniture, mattresses, box springs, appliances, refrigerators, and area rugs (flooring applications consisting of various natural or synthetic fibers bonded to some type of backing material).	Other
	Cigarette butts	The discarded ends, pieces or filters of fully or partially smoked cigarettes.	Cigarette butts
	Electronic cigarettes	Devices associated with the use of electronic cigarettes. Examples include electronic cigarette cartridges, disposable electronic cigarettes, and reusable electronic cigarettes.	Electronic cigarettes
	Other tobacco-related products & packaging	All other tobacco-related products that do not fit into other categories. Examples include unsmoked cigarettes, cigars, chewing tobacco, pipe tobacco, matches, matchbooks and packaging for tobacco products such as paper boxes, plastic or foil wrappings, or other materials used to package cigarettes, cigars, chewing or pipe tobacco, including individual cigarette packages and unused cigarette papers.	Other tobacco-related products & packaging
	Toiletries/ personal hygiene products	Health care products. Examples include make-up sponges, gloves, and condoms.	Other
	Entertainment items	Examples include games, music cassettes, CDs, golf balls, frisbees, small cars, and other toys.	Other

Litter Survey Material Group	Material Category	Definition	Behavioral Observation Material Category
	Flat-screen televisions and computer monitors	Television and computer monitors with a thin and flat screen. Examples include Plasma and LCD televisions.	Other
	CRT televisions and computer monitors	Cathode ray tube (CRT) monitor including television and computer monitors with large, deep casing.	Other
	Portable electronics	Cell phones and other portable electronics.	Other
	Electronic cords	Cords associated with electronics including charging cords, headphones, adapters, power cords, and other cords.	Other
	Other electronics	Electronics that do not fit into other categories.	Other
	Other items	Any other material not otherwise described.	Other

APPENDIX B

ADDITIONAL LITTER SURVEY RESULTS

Table B-1: Aggregate Composition with Confidence Intervals of Litter by Count by Material Group, Roadway

Material Group	Roadway Litter Items	+/- 90% Confidence Interval
Paper	4,335,691,200	1,227,736,170
Plastic	8,227,849,400	2,294,544,927
Metal	1,813,443,600	432,847,037
Glass	1,171,458,900	469,175,786
Organics	397,136,200	247,959,239
Cigarette butts[1]	5,703,542,200	2,246,935,893
Tire treads[1]	338,714,300	684,428,630
Other	1,690,190,700	520,661,678
Total	23,678,026,500	5,853,044

1. Cigarette butts and tire treads material categories were the majority of other material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other. Cigarette butts and tire treads are excluded from the other count above.

Table B-2: Aggregate Composition with Confidence Intervals of Litter by Count by Material Group, Waterway

Material Group	Waterway Litter Items	+/- 90% Confidence Interval
Paper	3,179,030,200	672,256,919
Plastic	10,931,907,400	2,777,370,344
Metal	2,098,123,100	408,378,380
Glass	2,390,239,000	4,416,735,625
Organics	871,670,800	227,173,607
Cigarette butts[1]	3,994,110,000	1,211,367,485
Tire treads[1]	253,978,800	235,766,705
Other	2,175,959,600	624,608,931
Total	25,895,018,900	6,891,682,443

1. Cigarette butts and tire treads material categories were the majority of other material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other. Cigarette butts and tire treads are excluded from the other count above.

Table B-3: Litter per 1,000 Square Feet with Confidence Intervals, Non-Roadway

Site Type	Litter per 1,000 Square Feet	+/- 90% Confidence Interval
Retail Shopping Sites	63	10
Local Recreation Sites	45	9
Mass Transit Sites	124	20
Construction Sites	94	21
Storm Drains	45	7
Coastline Sites	65	24