BURNS McDONNELL

PENNSYLVANIA LITTER RESEARCH STUDY

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SUBMITTED TO:

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

pennsylvania
DEPARTMENT OF TRANSPORTATION

KEEP PENNSYLVANIA Beautiful
KEEP AMERICA BEAUTIFUL AFFILIATE

KEEP AMERICA BEAUTIFUL

CREATE AMAZING.

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
DEP	Pennsylvania Department of Environmental Protection
FHWA	Federal Highway Administration
HPMS	Highway Performance Monitoring System
KAB	Keep America Beautiful
KPB	Keep Pennsylvania Beautiful
PennDOT	Pennsylvania Department of Transportation

EXECUTIVE SUMMARY

Significantly reducing littering behavior is key to a clean, beautiful, healthier, and more prosperous Pennsylvania. Whether intentional or unintentional, litter negatively impacts the quality of life, the natural environment, and economic development in communities across Pennsylvania.

The Pennsylvania Departments of Environmental Protection (DEP) and Transportation (PennDOT) partnered with Keep Pennsylvania Beautiful (KPB), the state affiliate of Keep America Beautiful (KAB), in 2018-2019 to perform a research study documenting the quantity, composition, and sources of litter as well as attitudes toward litter and littering in Pennsylvania. The aim is to gain Pennsylvania-specific litter data on which to base development of a customized action plan of strategies to reduce littering in Pennsylvania.

DEP, PennDOT, and KPB retained Burns & McDonnell, Cascadia Consulting Group, and the Docking Institute of Public Affairs, collectively referred to as the Burns & McDonnell Project Team, to conduct the Pennsylvania Litter Research Study. The Burns & McDonnell Project Team in collaboration with DEP, PennDOT, and KPB conducted a visible litter survey, public attitude survey, and Litter Summit (the Summit) that provided the foundation for the Study.

Visible Litter Survey

The visible litter survey provides a comprehensive understanding of the quantity, composition, and sources of litter on roadways. The Burns & McDonnell Project Team conducted visible litter surveys at 180 sites statewide. At each site, the Burns & McDonnell Project Team categorized litter into six material groups that were subdivided into 85 material categories. In addition, the Burns & McDonnell Project Team assigned each litter item to one of six sources. Section 3 presents the aggregate (e.g., statewide) visible litter survey results and Section 4 presents the regional (e.g., urban versus rural) visible litter results.

The following are key findings related to the aggregate visible litter survey:

- **Over a half billion pieces of litter on Pennsylvania roadways.** Pennsylvania roadways are littered with approximately 502.5 million pieces of litter.
- **Cigarette butts and plastic collectively compose the majority of litter items.** Of the total estimated litter on Pennsylvania roadways, 186.2 million (37.1 percent) pieces were cigarette butts followed by 152.9 million (30.4 percent) pieces of plastic. Plastic film is the most prevalent type of plastic littered on Pennsylvania roadways followed by plastic beverage containers.

- **Majority of litter is smaller, but larger items contribute to the litter issue as well.** The majority of litter on Pennsylvania roadways (429.8 million pieces or 85.5 percent) is 4-inches or smaller in size; however, the Study estimates there is still a significant quantity (72.7 million pieces or 15.5 percent) of larger, and often more visible, litter on Pennsylvania roadways.
- **The composition of litter varies by the size of the litter item.** Beverage containers and plastic film were the most predominant types of larger litter. Cigarette butts are the most common of the smaller items. Some material categories, such as tire tread, food packaging film, other plastic, and other organics, are within the top ten materials for both large and small litter items.
- **Motorists and pedestrians are leading sources of litter, regardless of item size.** Motorists and pedestrians are leading sources of litter for both small and large items. For litter items greater than four inches, improperly secured loads also become a leading source.
- **Freeways and expressways had the most litter items per mile.** Freeways and expressways had the most litter per mile (7,523 litter items per mile on average). In contrast, local roads had the lowest littered items per mile (1,034 litter items per mile on average).
- **Local roads had the most total litter items.** Local roads had the lowest littered items per mile (1,034 litter items per mile on average). However, local roads account for the most road miles (84,832 miles) in the Commonwealth. In aggregate, local roads had the highest percentage (34.9 percent) of total litter items by roadway type statewide.
- **Litter source varies by roadway type.** The primary distinction identified by roadway types was the litter source. Motorists contributed the most litter to interstate roadways (69.7 percent) and decreasing amounts to arterial (65.6 percent), collector (58.0 percent), and local (50.0 percent) roadways. In contrast, pedestrians contributed the most to local roadways (32.9 percent) and decreasing amounts to collector (32.0 percent), arterial (23.3 percent), and interstate (0.1 percent) roadways. Improperly secured loads contributed more to interstates (11.3 percent) than to any other roadway type.
- **Over 40 million beverage containers and fast food products are littered on Pennsylvania roadways.** An estimated 29.3 million beverage containers and 12.3 million fast food items are currently littered on Pennsylvania roadways.

The following are key findings related to the regional visible litter survey:

- **Urban roads have more litter per mile than rural roads in Pennsylvania.** Urban roads had approximately 2,585 litter items per mile. In comparison, rural roads had approximately 1,635 litter items per mile.

- **Urban and rural roads represent comparable total litter items.** Although urban roads are more littered per mile, there are more rural than urban road miles in the Commonwealth. Consequently, urban and rural roads represent comparable total litter items.
- **Composition of litter by material group on urban and rural roadways are similar.** However, there was some minor variation in the composition of smaller and larger litter by region. For example, urban roadways had 10 percent more cigarette butts found than rural roadways (see Figures 4-5 and 4-6).

Public Attitude Survey

The public attitude survey provides an understanding of Pennsylvania residents' opinion of the effects of litter, prevalence of litter, instance of littering, tobacco littering, consequences of littering, and litter prevention and abatement in the Commonwealth. The Burns & McDonnell Project Team contacted 3,849 residents to participate in the public attitude survey. Of the total residents contacted, 502 residents completed the survey. Section 5 presents the results of the public attitude survey.

The following key findings are related to the public attitude survey:

- **Citizens believe that litter is a problem in Pennsylvania.** Over 90 percent of survey respondents reported that litter is a problem in the Commonwealth.
- **Litter negatively impacts communities.** Respondents reported that they believe the presence of litter has an impact on the environment, waterways, property taxes, home values, tourism and businesses, and safety of communities.
- **Respondents to the Public Attitude Survey, like the Visible Litter Survey, 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, plastic film, beverage containers and tobacco products are perceived to be the most commonly littered items.** Respondents reported that the primary types of litter are fast food packaging, plastic film, beverage containers and tobacco products. Their perceptions are generally in line with the survey findings, as these four categories were among the most commonly identified litter items along roadways.
- **Respondents believe that the two primary causes of litter are: when people don't care about the effects of litter and when a convenient receptacle is not available.** Almost all survey respondents indicated they believe that it is unacceptable to litter.

- **Minimal perceived consequences for littering.** Approximately 80 percent of respondents said, "Not likely at all." when asked how likely it is for someone to actually get caught or fined for littering.
- **Respondents report only rare or no public education and outreach addressing litter.** About one-half of the survey respondents expressed that they could recall seeing or hearing litter abatement advertisements in Pennsylvania. Of survey respondents that could recall litter public education and outreach, about one-half reported such litter public education and outreach was rare.

Litter Summit Event

A Litter Summit (the Summit), held on November 14 in Harrisburg, brought together key stakeholders from across the Commonwealth to discuss the results of the Pennsylvania Litter Research Study and The Cost of Litter & Illegal Dumping in Pennsylvania a Study of Nine Cities Across the Commonwealth and solicit input regarding strategies to reduce and eradicate litter in Pennsylvania. The Summit was attended by 124 representatives from state and local governments, non-profits and private industry. Section 6 presents the findings from the Summit.

The following key findings are related to the Summit:

- **Motorists and pedestrians are considered the primary sources of litter.** Summit attendees were polled as to what is the primary source of litter in terms of volume and impact. Attendees were provided the options of motorists, pedestrians, overflowing containers, unsecured loads, garbage trucks, and vehicle parts. Summit attendees, like the visible survey and public attitude survey, perceived motorists and pedestrians to be the primary sources of litter.
- **Individuals who litter and local governments should be responsible for the abatement of litter.** Summit attendees ranked litterers and local governments first and second when asked who should be responsible for abatement of litter.
- **Resources should be focused on regulations, enforcement, and infrastructure to reduce littering and illegal dumping.** The majority of Summit attendees responded that regulations and enforcement (51.7 percent) and infrastructure (37.2 percent) should be the focus for reducing littering and illegal dumping. A minority (11.1 percent) stated education should be the focus.
- **Increase awareness of litter impacts via education.** During the facilitated discussion, Litter Summit attendees identified the need to educate the public as to the negative impacts of litter. For example, attendees stated the need to increase awareness that litter on land will end up in Pennsylvania waterways.

- **Increase funding for litter initiatives.** Summit attendees stated that additional funding was needed for enforcement personnel and infrastructure. Attendees identified levying taxes on commonly littered items as a means to provide funding to local governments.
- **Increase solid waste and recycling management and litter prevention infrastructure.** Solid waste management infrastructure (e.g., transfer stations) and recycling facilities (e.g., electronics and household hazardous waste facilities) were identified by Summit attendees as a means to decrease littering and illegal dumping. In addition, Summit attendees stated more litter receptacles and cigarette butt stations would assist with reducing litter in Pennsylvania communities.

Study Recommendations and Conclusions

The visible litter survey, public attitude survey, and Litter Summit provided a thorough understanding of the littering issue in Pennsylvania. The following are recommendations and conclusions based on the key findings of the Study overall:

- **Develop Litter Education and Outreach Campaign.** Education and outreach are essential to reducing litter. The public attitude survey reported that only one-half of the survey respondents expressed that they could recall seeing or hearing litter education and outreach in Pennsylvania. Of survey respondents that could recall litter public education and outreach, about one-half reported such litter education and outreach was rare.

  The visible litter survey results enable the Commonwealth to develop a litter education and outreach campaign that targets litter overall as well as key materials (e.g., cigarette butts, plastic film, beverage containers, and fast food packaging) and sources (e.g., motorists and pedestrians). The education and outreach should be tailored by roadway type (e.g., freeways and expressways, arterial, collector, and local) and region (e.g., urban and rural) to have the most impact on littering behavior and root causes.
- **Develop Partnerships.** Approximately 502.5 million pieces of litter are on Pennsylvania roadways. As identified during the Litter Summit, partnerships are key to addressing the litter issue and root causes in Pennsylvania. Partners can provide financial assistance and/or increased awareness of the issue.

  Partners should include state and local governmental entities and community organizations that dedicate resources to combat litter in Pennsylvania (e.g., DEP, PennDOT, KPB and local public works, water, and enforcement departments). Potential partners should also include those generating the products littered (e.g., industry representatives, bottlers, brands, etc.), those that

benefit from reduced litter (e.g., parks, businesses, tourism, etc.) and those that have regular interactions with the community (e.g., schools, elected officials, local entertainers, athletes, etc.).

- **Provide Assistance to Local Communities.** Litter is a major issue for communities throughout the Commonwealth of Pennsylvania. Over a third of the litter in the Commonwealth is on local roads. Local governments, KPB affiliates, and other local organizations provide litter education and outreach as well as abatement assistance to communities. Expanding the technical and financial assistance to local communities to prevent litter is essential to reducing litter in the Commonwealth. Investments in local communities can include development of school litter education programs, provision of litter prevention infrastructure (e.g., public space litter cans and recycling bins), and facilitation of more robust solid waste and recycling infrastructure (e.g., drop-off sites and transfer stations) as well as litter enforcement.
- **Review Effectiveness of Litter Ordinances, Laws, and Statutes.** The majority of Litter Summit attendees responded that regulations and enforcement should be the focus for reducing littering and illegal dumping in the Commonwealth. Regulations are a tool to prevent (e.g., waste and recycling program requirements) and deter (e.g., litter fines) littering behavior.
  The Commonwealth with its partners should evaluate the effectiveness of current and new ordinances, laws, and statutes as it relates to reducing litter in Pennsylvania. The Commonwealth and its partners should consider regulations that target highly littered items (e.g., plastic, beverage containers, fast food packaging, and cigarette butts). The Commonwealth should also evaluate regulations as a means to fund anti-litter strategies (e.g., sales tax on highly littered items).
- **Review Enforcement of Litter Regulations.** Approximately 80 percent of public attitude survey respondents said, “Not likely at all.” when asked how likely it is for someone to actually get caught or fined because of littering. The Commonwealth in collaboration with enforcement partners should evaluate why current litter regulations are not enforced. The Commonwealth should consider investments in enforcement personnel, training, and infrastructure to deter littering behavior in Pennsylvania.
- **Conduct Future Litter Research Study.** The Study provided a comprehensive understanding of the current littering behavior and root causes in Pennsylvania. The Commonwealth of Pennsylvania should conduct a future litter research study in five years to evaluate the success of strategies implemented and measure progress towards eradicating litter in Pennsylvania. Prior to conducting the next litter research study, DEP, PennDOT, and KPB should evaluate opportunities to enhance the Study such as inclusion of behavioral observations.
- **Evaluate Anti-Litter Funding Mechanisms.** Significantly reducing litter in Pennsylvania is key to a clean, beautiful, healthier, and more prosperous Pennsylvania. Investments in education and

outreach, prevention, infrastructure, and enforcement are required to implement anti-littering strategies. The Commonwealth with its partners should evaluate funding mechanisms for anti-littering strategies.

1.0 INTRODUCTION

Significantly reducing littering behavior is key to a clean, beautiful, healthier, and more prosperous Pennsylvania.

Litter is improperly managed waste. It includes waste that is intentionally improperly disposed, 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 the quality of life, the natural environment, and economic development in communities across Pennsylvania.

The Pennsylvania Departments of Environmental Protection (DEP) and Transportation (PennDOT) partnered with Keep Pennsylvania Beautiful (KPB), the state affiliate of Keep America Beautiful (KAB), in 2018-2019 to perform a research study documenting the quantity, composition, and sources of litter as well as attitudes toward litter and littering in Pennsylvania.

The aim is to gain Pennsylvania-specific litter data on which to base development of a customized action plan of strategies to reduce littering in Pennsylvania.

KAB is currently conducting a national litter research study.[1] As part of this work, KAB funded the development of an enhanced methodology for conducting litter research that provides a more detailed view of the extent of the litter issue in the United States as well as the underlying causes of litter, in order to better inform the types of solutions critical to addressing the litter issue. This methodology is replicable across time and different geographies to allow for comparisons, to improve our response to litter, and to have a strong positive impact on litter reduction and prevention in the United States.

DEP, PennDOT, and KPB retained Burns & McDonnell, Cascadia Consulting Group, and the Docking Institute of Public Affairs, collectively referred to as the Burns & McDonnell Project Team, to conduct the Pennsylvania Litter Research Study using this enhanced methodology. Pennsylvania is the first state to deploy this methodology and use the findings to develop a litter behavior change initiative.

[1] 2009 National Visible Litter Survey and Litter Cost Study located at https://kab.org/wp-content/uploads/2019/08/News-Info_Research_2009_NationalVisibleLitterSurveyandCostStudy_Final.pdf

1.1 Project Objective

The objective of this Study is to gain a comprehensive understanding of the quantity, composition, and sources of litter, as well as gauging the public's attitude towards litter issues in Pennsylvania.[2] A comprehensive understanding of the litter issue in Pennsylvania is key to the development of tailored strategies and initiatives to combat litter within the Commonwealth. In addition, the Study will provide a basis for future measurement of progress towards reducing litter in the Commonwealth.

1.2 Project Approach

The Burns & McDonnell Project Team in collaboration with DEP, PennDOT, and KPB developed the following key tasks that provided the foundation for the Study. The methodology for the project is described in Section 2 and a summary of the recommendations and conclusions are presented in Section 7.

1.2.1 Visible Litter Survey

The visible litter survey provides a comprehensive understanding of the quantity, composition, and sources of litter on roadways. The Burns & McDonnell Project Team conducted visible litter surveys at 180 sites statewide. At each site, the Burns & McDonnell Project Team categorized litter into six material groups that were subdivided into 85 material categories. In addition, the Burns & McDonnell Project Team assigned each litter item to one of six sources. Section 3 presents the aggregate (e.g., statewide) visible litter survey results and Section 4 presents the regional (e.g., urban versus rural) visible litter results.

1.2.2 Public Attitude Survey

The public attitude survey provides an understanding of Pennsylvania residents' opinion of the effects of litter, prevalence of litter, instance of littering, tobacco littering, consequences of littering, and litter prevention and abatement in the Commonwealth. The Burns & McDonnell Project Team contacted 3,849 residents to participate in the public attitude survey. Of the total residents contacted, 502 residents completed the survey. Section 5 presents the results of the public attitude survey.

1.2.3 Litter Summit Event

A Litter Summit (the Summit), held on November 14 in Harrisburg, brought together key stakeholders from across the Commonwealth to discuss the results of the Pennsylvania Litter Research Study and The

[2] KPB conducted The Cost of Litter & Illegal Dumping in Pennsylvania a Study of Nine Cities Across the Commonwealth to understand the cost of litter and illegal dumping. The Litter and Illegal Dumping Cost Study provides an estimate of the costs incurred by participating Pennsylvania municipalities for the management of litter and illegal dumping.

Cost of Litter & Illegal Dumping in Pennsylvania a Study of Nine Cities Across the Commonwealth and solicit input regarding strategies to reduce and eradicate litter in Pennsylvania. The Summit was attended by 124 representatives from state and local governments, non-profits and private industry. Section 6 presents the findings from the Summit.

2.0 METHODOLOGY

Historically, the methodology for conducting litter research has varied between different studies. KAB funded the development of an enhanced methodology for conducting litter research, visible litter surveys and public attitude surveys as part of the national litter research study currently being conducted. Utilizing the enhanced methodology developed by KAB, DEP, PennDOT and KPB sought to quantify and document the magnitude of the litter issue in Pennsylvania. The results of the litter research, visible litter surveys and public attitude surveys, along with the input from a Litter Summit were utilized to assist with developing strategies to reduce litter in the Commonwealth.

This section of the report provides an overview of the methodology for conducting the visible litter survey and public attitude survey. The Litter Summit agenda is summarized in Section 6.

2.1 Visible Litter Survey Methodology Overview

The Burns & McDonnell Project Team conducted visible litter surveys at 180 roadway sites in Pennsylvania. 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;
- Survey protocol; and
- Data analysis.

2.1.1 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 85 material categories. The material categories were developed based on the 2009 KAB 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 & health drinks	Food packaging film
	Juice	Other film
	Tea & coffee	Plastic food service items
	Water	Expanded polystyrene food service items
	Other plastic beverage bottles or containers	Other expanded polystyrene
	Fast food plastic cups	Other plastic food packaging
	Plastic straws	Other plastic
Glass	Beer	Tea & coffee
	Soda	Water
	Single serve wine & liquor	Other glass beverage bottles or containers
	Other wine & liquor	Broken glass or ceramic
	Sports & health drinks	Other glass
	Juice	
Metal	Beer	Other metal beverage bottles or containers
	Soda	Other beverage packaging
	Sports & health drinks	Metal food packaging
	Juice	Other metal
	Tea & coffee	
Organics	Pet waste	Other food waste
	Human waste	Other organics
	Confection	
Other	Medical waste	Other tobacco-related products & packaging
	Hazardous waste	Toiletries/ personal hygiene products
	Vehicle debris	Entertainment items
	Tires	Flat-screen televisions and computer monitors
	Tire tread	CRT televisions and computer monitors
	Construction and demolition debris	Portable electronics
	Textiles/ small rugs	Electronic cords
	Bulky items	Other electronics
	Cigarette butts	Other items
	Electronic cigarettes	

2.1.2 Litter Sources

Understanding the source of litter is key to developing strategies to reduce litter in a community. Behavioral observations were not conducted as part of the Study. 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.

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

2.1.3 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 & expressway, other principal arterial, minor arterial, major collector, minor collector, and local road). For the 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 & Expressways:** Includes interstates and other freeways & 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 & 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 used a proportional sample allocation procedure to allocate samples to the four roadway types. The proportions for allocation are determined based on the following two factors:

- The proportional share of miles for each roadway type.
- The average litter per mile for each roadway type.

The first factor accounts for the portion of the total roadways represented by a given roadway type. The second factor accounts for the fact that the amount of litter accumulation may be independent of the length or share of the roadway type. The following databases were then used to develop the proportional sample allocation for the Study:

- The HPMS Geospatial database[3] was used to identify and quantify the miles of roadway types, their regions, and their ownership in Pennsylvania.
- Historic data from the 2009 KAB National Litter Research Study was used to estimate average litter per mile for each roadway type.

To allocate samples to each roadway type, the Burns & McDonnell Project Team multiplied the Pennsylvania road miles reported in the HPMS database with the proxy average items per mile to get an estimate of litter items that accumulate along each type of roadway. These proportions were then used to allocate the 180 samples across the four roadway types. In addition to the weighted proportions, a minimum of 30 samples was allocated to freeways to ensure that statistical validity of results for this roadway type. Next, the 180 samples were divided equally between urban and rural regions because Pennsylvania's proportions of urban (40 percent) and rural (60 percent) are relatively similar. Then, samples were allocated proportional to PennDOT ownership using the data on ownership included in the HPMS database. Table 2-2 shows the final sample allocation for the Study.

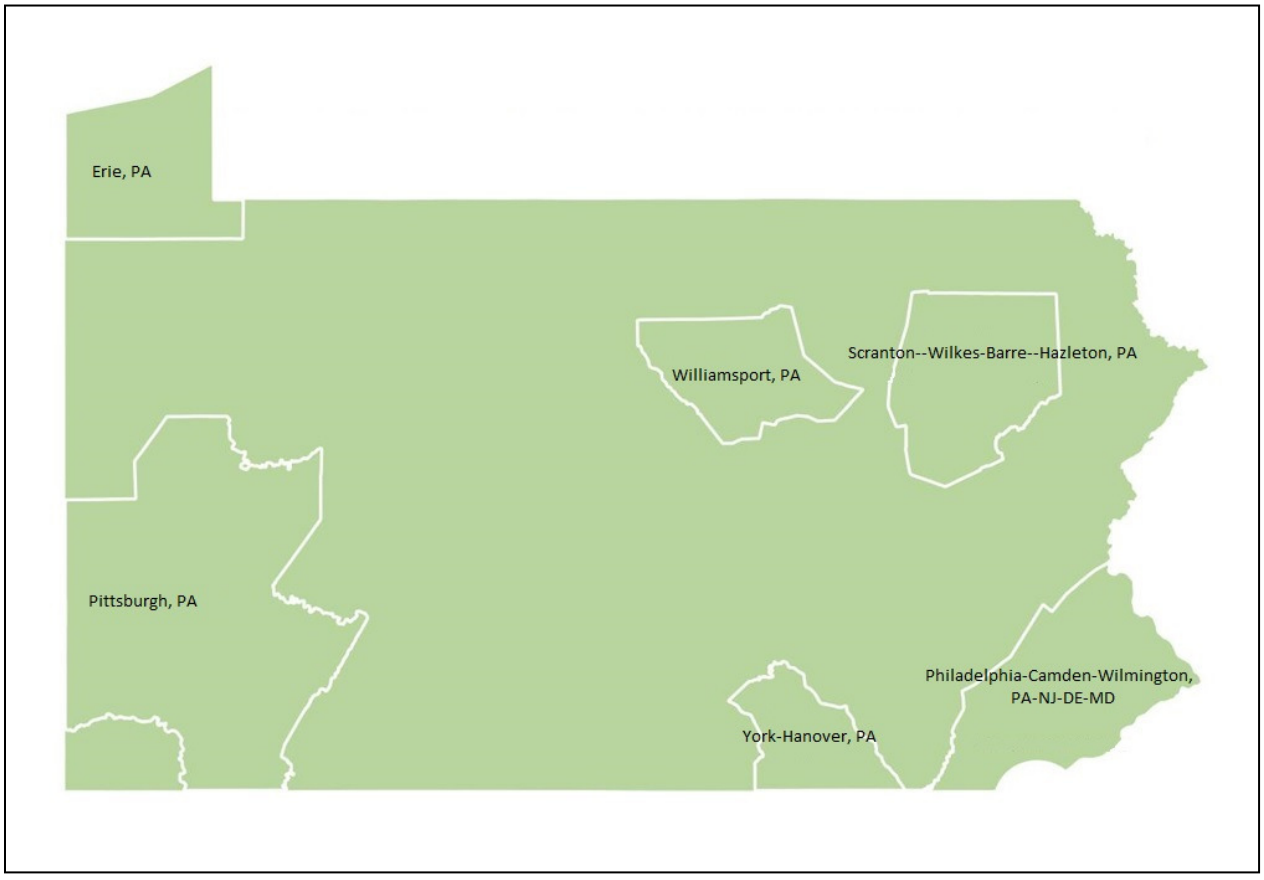
[3] HPMS Public Release Shapefiles, Source: https://www.fhwa.dot.gov/policyinformation/hpms/shapefiles.cfm

Table 2-2: Final Sample Allocation for Pennsylvania Litter Research Study

Roadway Type	Rural samples			Urban samples			Total		
	Penn DOT	Other Agency	Rural Total	Penn DOT	Other Agency	Urban Total	Penn DOT	Other Agency	Total
Freeways & Expressways	13	2	15	13	2	15	26	4	30
Arterials	21	0	21	19	2	21	40	2	42
Collectors	23	1	24	15	9	24	38	10	48
Local	4	26	30	1	29	30	5	55	60
Total	**61**	**29**	**90**	**48**	**42**	**90**	**109**	**71**	**180**

As a final step for the Study's sampling plan, the samples were distributed equally among six metropolitan statistical areas (MSAs), with 30 sample sites in each MSA. The MSAs were randomly selected and finalized with input from DEP, PennDOT, and KPB. Figure 2-1 presents a map of the six MSAs included in the Study: Erie, Pittsburgh, Williamsport, Scranton - Wilkes-Barre - Hazleton, York - Hanover, and Philadelphia - Camden - Wellington.

Figure 2-1: Metropolitan Statistical Areas Sampled for Study



2.1.4 Field Survey Protocol

The following steps outline the visible litter field survey methodology the field teams used when surveying litter along roadways:

- Proceed to the designated sample site.
- Pull over at a safe distance from the road with NO barriers or hazards blocking you or the sample area. If the designated 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. The field crew will never walk on or attempt to sample litter on the roadway itself due to safety concerns.
- Retrieve the survey from the electronic data collection application.
- Record site information in the *Survey Site Overview* as completely as possible, noting weather, influencing factors, etc.
- From the end of the pavement, measure and mark the ends of the 300 x 15-foot full sampling area and the 15 x 15-foot sub-sample area.
- Perform a "meander count" of the 300 x 15-foot area to tabulate the items that are four inches or larger. Record counts on the *Full Survey Tally Sheet*.
- Perform a "cross section sub-count" of the sub-sample area to tabulate items that are less than four inches. Record counts on the *Sub Survey Tally Sheet*.
- Photograph the sample site.
- Confirm all sampling equipment has been collected from the site, all forms are filled out, and proceed to the next sample site.

2.2 Public Attitude Survey Methodology Overview

The Burns & McDonnell Project Team contacted 3,849 people from a sample of residential land line and mobile telephone numbers registered in Pennsylvania developed by Scientific Telephone Samples. Respondents were also offered the option to complete a web-based questionnaire. Of the total people contacted, 3,316 individuals ended the call before the interview could begin. Another 33 respondents ended the call mid-interview. A total of 502 interviews were fully completed. The cooperation rate for this survey is 13 percent and the margin of error is +/- 4.3 percent. The public attitude survey questionnaire is included in Appendix B.

The Burns & McDonnell Project Team targeted completions within the six Pennsylvania DEP regions to gather input throughout the Commonwealth.[4] Responses from each region were monitored during data gathering. Each phone number was attempted up to 10 times, and phone numbers were called during varying times throughout the day (10AM to Noon, 2PM to 4PM, and 5PM to 9PM 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*.[5], [6] If a respondent did not provide gender, age, or race information, the results of that particular survey were not included in the overall results.

[4] Pennsylvania Department of Environmental Protection regional map located at https://www.dep.pa.gov/About/Regional/Pages/default.aspx
[5] American Fact Finder located at https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml
[6] American Community Survey located at https://www.census.gov/programs-surveys/acs

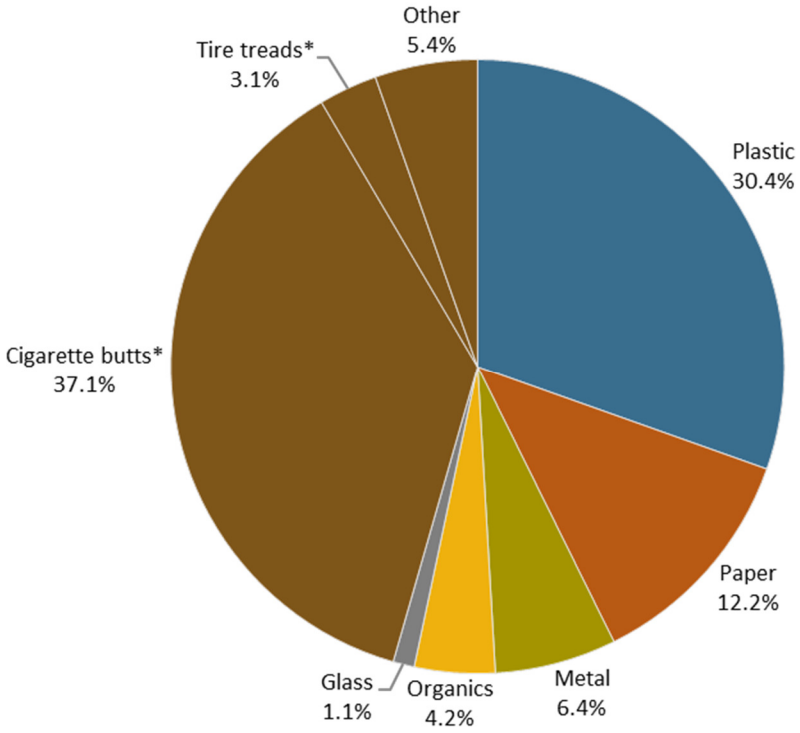
3.0 VISIBLE LITTER SURVEY AGGREGATE RESULTS

Approximately 502.5 million pieces of litter are estimated to be on Pennsylvania roadways. This section provides a comprehensive understanding of the quantity, composition, and sources of litter found across the Commonwealth. In addition, this section evaluates litter by roadway type and litter research interest (i.e., plastics, bottles, tobacco products, and fast food products). A summary of key findings is presented at the conclusion of this section.

3.1 Quantity and Composition of Litter

Of the total litter on Pennsylvania roadways, 186.2 million (37.1 percent) pieces of litter were cigarette butts, a material category within the "Other" material group, followed by 152.9 million (30.4 percent) pieces of plastic. Figure 3-1 presents the aggregate composition of litter items on roadways by material group.

Figure 3-1: Aggregate Composition of Litter by Count, All Roadways



* 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.

The majority of litter on Pennsylvania roadways (429.8 million pieces or 85.5 percent) were 4-inches or smaller in size; however, the Study estimates there is still a significant quantity (72.7 million pieces or 15.5 percent) of larger, and often more visible, litter on Pennsylvania roadways. The material composition

of litter varied by size of the litter item. As shown in Figures 3-2 and 3-3, plastic composed the majority (45.0 percent) of larger litter while cigarette butts composed the majority (43.3 percent) of smaller litter.

Figure 3-2: Aggregate Composition of 4-inch-plus Litter by Count, All Roadways

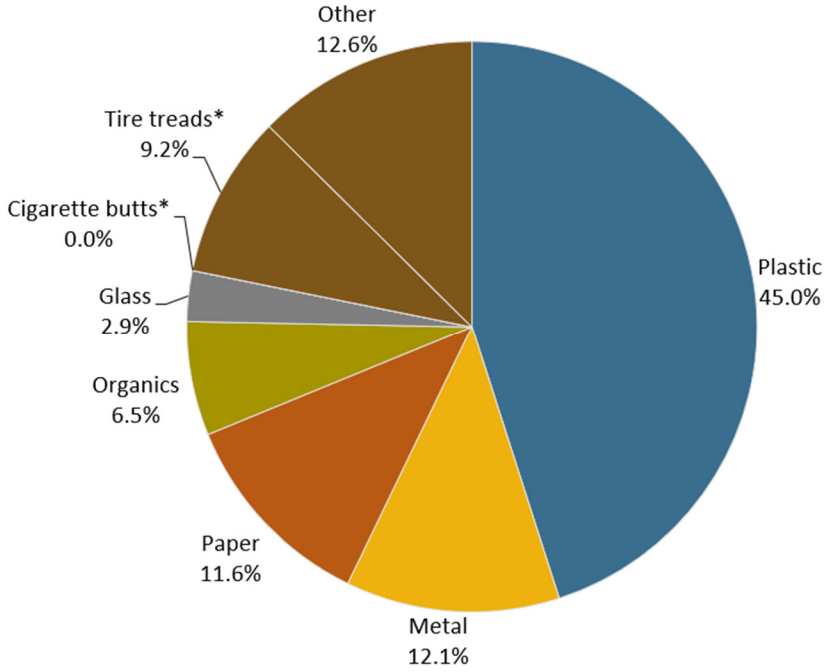
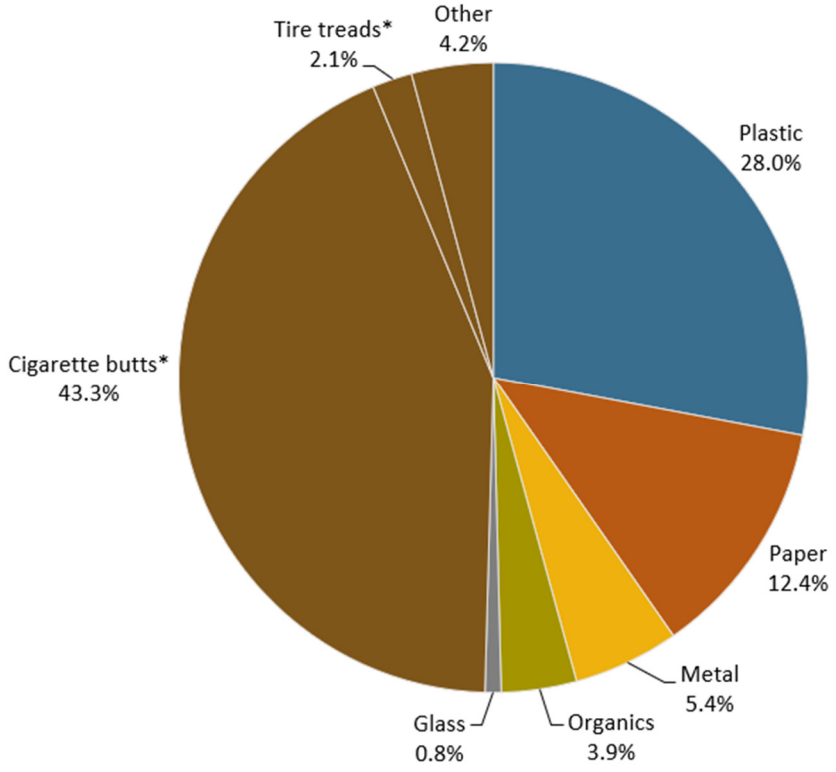


Figure 3-3: Aggregate Composition of 4-inch-less Litter by Count, All Roadways



* 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 3-1 presents the aggregate composition of litter on Pennsylvania roadways by material category.

Table 3-1: Aggregate Composition of Litter by Material Category, All Roadways

Groups	Categories	4-inch-plus	4-inch-less	Total Count	Percent of Total
Paper	Other food packaging paper	433,866	14,553,345	14,987,211	3.0%
	Other paper fast food service items	1,226,113	5,452,944	6,679,057	1.3%
	Paper home food packaging	350,720	1,509,480	1,860,200	0.4%
	Fast food paper cups	936,785	826,680	1,763,464	0.4%
	Office paper/ mail	587,328	918,814	1,506,142	0.3%
	Newspaper/ inserts	399,916	712,907	1,112,823	0.2%
	Cardboard	494,982	601,441	1,096,423	0.2%
	Receipts	312,788	669,102	981,890	0.2%
	Beverage carriers/ cartons	36,378	776,881	813,259	0.2%
	Fast food paper bags- empty	162,503	-	162,503	0.0%
	Aseptic/ gable top containers	135,999	-	135,999	0.0%
	Other advertising signs	115,271	-	115,271	0.0%
	Political signs	89,065	-	89,065	0.0%
	Magazines	38,844	-	38,844	0.0%
	Fast food paper bags - full	38,090	-	38,090	0.0%
	Kraft bags (brown paper bags)	21,012	-	21,012	0.0%
	Books	-	-	-	0.0%
	Other paper	3,078,695	27,066,705	30,145,400	6.0%
	Subtotal Paper	**8,458,356**	**53,088,299**	**61,546,655**	**12.2%**
Plastic	Food packaging film	5,849,242	33,201,193	39,050,435	7.8%
	Other film	3,585,321	7,056,673	10,641,993	2.1%
	Other expanded polystyrene	682,685	9,092,026	9,774,711	1.9%
	Expanded polystyrene food service items	1,236,963	6,820,568	8,057,531	1.6%
	Other plastic beverage bottles or containers	1,024,543	4,929,704	5,954,247	1.2%
	Plastic food service items	1,802,159	4,017,632	5,819,791	1.2%
	Water bottle	3,669,078	455,732	4,124,811	0.8%
	Plastic straws	1,275,175	2,563,218	3,838,392	0.8%
	Plastic trash bags - empty	178,935	3,455,778	3,634,713	0.7%
	Fast food plastic cups	2,306,685	1,322,345	3,629,031	0.7%
	Other plastic food packaging	1,062,208	2,551,807	3,614,014	0.7%
	Other plastic bags - empty	1,944,042	1,366,453	3,310,495	0.7%
	Other beverage packaging	230,245	2,622,543	2,852,789	0.6%
	Soda	2,105,786	111,467	2,217,253	0.4%
	Sports & health drinks	992,569	722,773	1,715,342	0.3%
	Other wine & liquor	6,067	1,613,482	1,619,549	0.3%
	Tea & coffee	287,473	279,819	567,293	0.1%
	Juice	238,986	-	238,986	0.0%
	Single serve wine & liquor	125,710	111,467	237,176	0.0%
	Other plastic bags - full	170,890	-	170,890	0.0%

Groups	Categories	4-inch-plus	4-inch-less	Total Count	Percent of Total
	Plastic trash bags - full	113,127	-	113,127	0.0%
	Other plastic	3,841,673	37,845,592	41,687,265	8.3%
	Subtotal Plastic	**32,729,562**	**120,140,272**	**152,869,834**	**30.4%**
Glass	Broken glass or ceramic	216,275	2,035,054	2,251,329	0.4%
	Beer bottle	1,319,888	-	1,319,888	0.3%
	Tea & coffee	115,044	-	115,044	0.0%
	Other glass beverage bottles or containers	111,639	-	111,639	0.0%
	Juice	71,454	-	71,454	0.0%
	Other wine & liquor	59,834	-	59,834	0.0%
	Soda bottle	56,419	-	56,419	0.0%
	Water	39,874	-	39,874	0.0%
	Single serve wine & liquor	-	-	-	0.0%
	Sports & health drinks	-	-	-	0.0%
	Other glass	89,092	1,513,605	1,602,696	0.3%
	Subtotal Glass	**2,079,520**	**3,548,658**	**5,628,179**	**1.1%**
Metal	Metal food packaging	1,013,228	9,144,993	10,158,220	2.0%
	Beer can	4,559,648	1,295,453	5,855,102	1.2%
	Soda can	1,550,377	2,365,667	3,916,044	0.8%
	Sports & health drinks	752,415	-	752,415	0.1%
	Other metal beverage bottles or containers	19,564	168,353	187,917	0.0%
	Tea & coffee	144,503	-	144,503	0.0%
	Juice	10,908	-	10,908	0.0%
	Other metal	757,392	10,399,746	11,157,138	2.2%
	Subtotal Metal	**8,808,034**	**23,374,212**	**32,182,246**	**6.4%**
Organics	Other food waste	619,020	4,140,540	4,759,560	0.9%
	Confection	24,499	1,196,032	1,220,531	0.2%
	Pet waste	298,906	-	298,906	0.1%
	Human waste	42,025	-	42,025	0.0%
	Other organics	3,739,528	11,259,878	14,999,406	3.0%
	Subtotal Organics	**4,723,977**	**16,596,450**	**21,320,428**	**4.2%**
Other	Cigarette butts	-	186,220,908	186,220,908	37.1%
	Tire tread	6,702,502	8,823,629	15,526,131	3.1%
	Vehicle waste	3,487,557	4,680,250	8,167,806	1.6%
	Other tobacco-related products and	1,598,509	5,147,390	6,745,899	1.3%
	Construction and demolition	1,650,369	3,018,712	4,669,081	0.9%
	Textiles / small rugs	1,163,793	2,695,647	3,859,439	0.8%
	Toiletries / personal hygiene products	241,678	984,073	1,225,751	0.2%
	Medical waste	16,835	505,058	521,894	0.1%
	Electronic cords	92,887	168,353	261,239	0.1%
	Bulky items	173,652	-	173,652	0.0%
	Entertainment items	125,689	-	125,689	0.0%
	Tires	81,889	-	81,889	0.0%
	Hazardous waste	45,050	-	45,050	0.0%

Groups	Categories	4-inch-plus	4-inch-less	Total Count	Percent of Total
	Portable electronics	26,586	-	26,586	0.0%
	Other electronics	5,573	-	5,573	0.0%
	Electronic cigarettes	-	-	-	0.0%
	Flat screen televisions	-	-	-	0.0%
	CRT televisions and computer monitors	-	-	-	0.0%
	Other items	442,449	821,397	1,263,846	0.3%
	Subtotal Other	**15,855,015**	**213,065,417**	**228,920,432**	**45.6%**
Total		72,654,465	429,813,309	502,467,774	100.0%

Beverage containers and plastic film were amongst the most predominant types of larger litter. Cigarette butts were the most common item littered of smaller items. Some material categories, such as tire tread, food packaging film, other plastic, and other organics, were within the top ten materials for larger and small litter items. Figures 3-4 and 3-5 present the top 10 litter material categories by size of litter.

Figure 3-4: Top 10 Aggregate Litter Items of 4-inch-plus Litter by Count, All Roadways

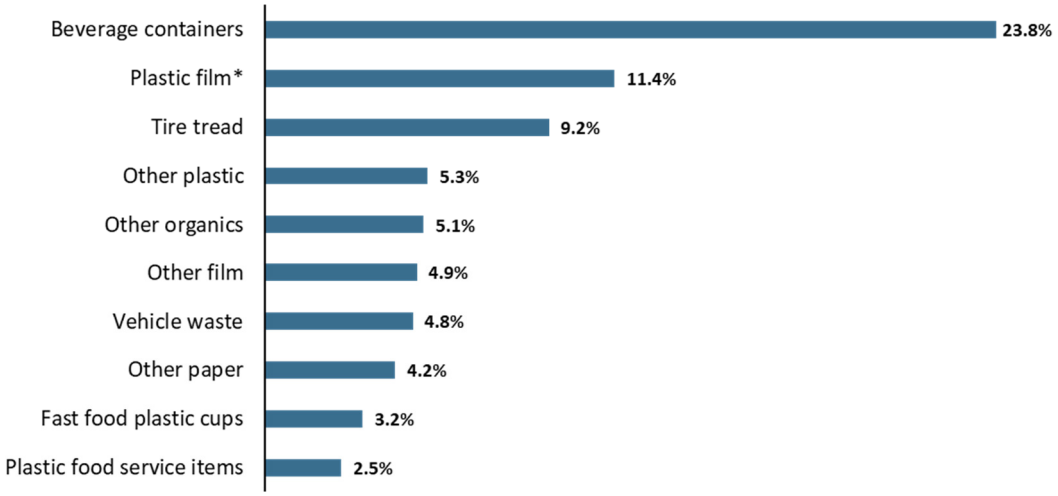
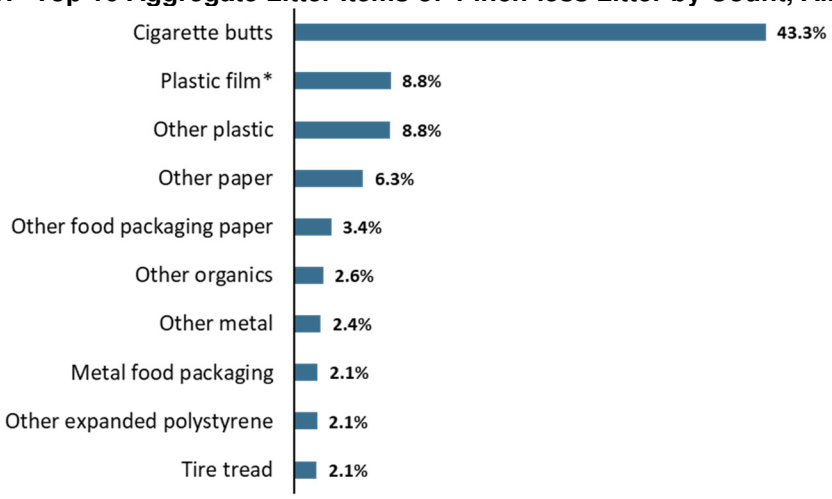


Figure 3-5: Top 10 Aggregate Litter Items of 4-inch-less Litter by Count, All Roadways

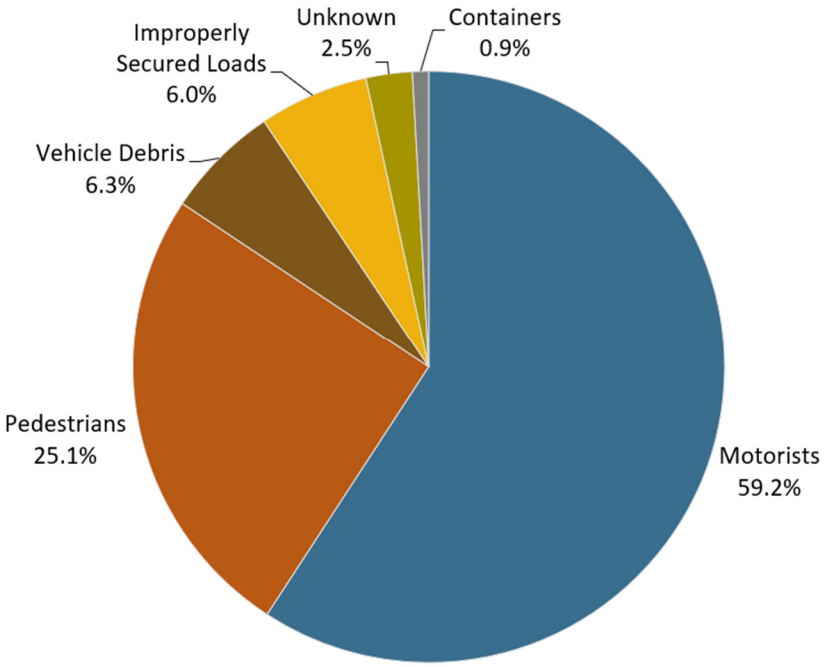


* For above figures, plastic film includes plastic trash bags, other plastic bags, and food packaging film material categories.

3.2 Source of Litter

Like the 2009 KAB National Litter Research Study, motorists and pedestrians were determined to be the leading sources of litter on Pennsylvania roadways (collectively 84.3 percent). Figure 3-6 presents the sources of litter items found on Pennsylvania roadways.

Figure 3-6: Source of Litter by Count, All Roadways



Figures 3-7 and 3-8 compare the litter source by size of litter. Motorists and pedestrians are leading sources of litter regardless of size. For litter items greater than 4 inches, improperly secured loads also become a leading source. The difference between litter sources is primarily due to the fact that the 4-inch-less category includes cigarette butts while the 4-inch-plus category does not.

Figure 3-7: Source of 4-inch-plus Litter by Count, All Roadways

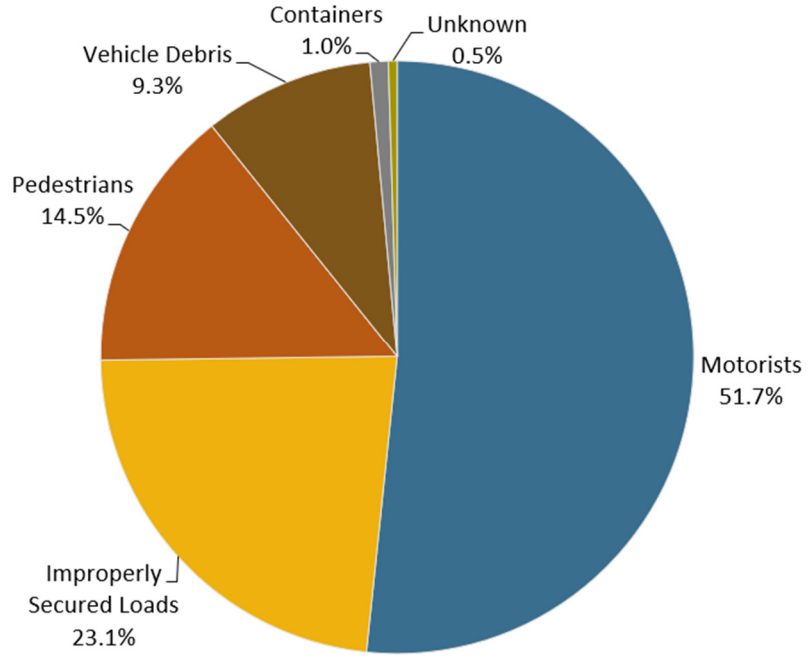
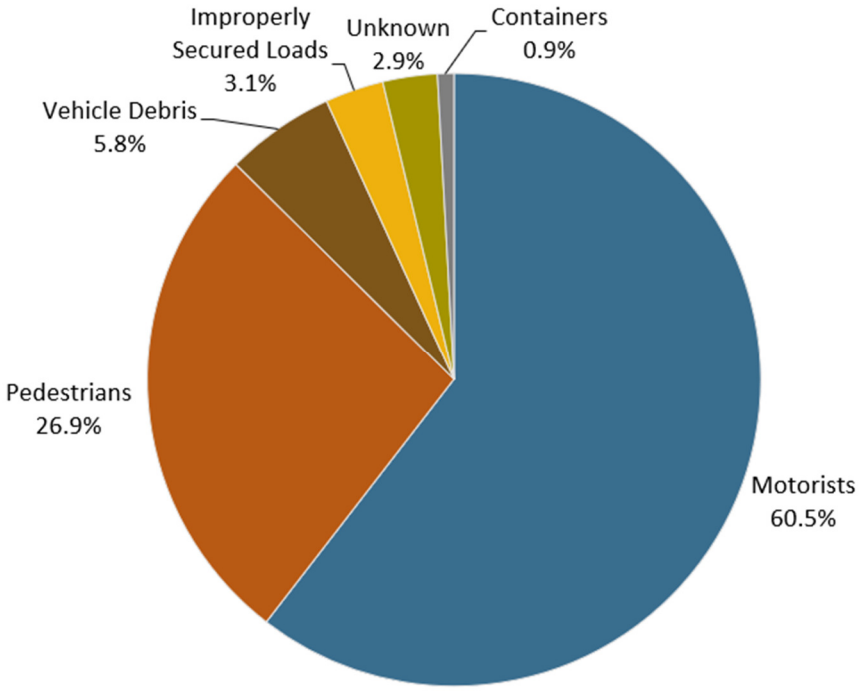


Figure 3-8: Source of 4-inch-less Litter by Count, All Roadways



3.3 Aggregate Visible Litter Survey Results by Roadway Type

Pennsylvania has 124,474 miles of roadways. Freeways and expressways had the most litter items per mile (7,523 litter items per mile on average) but the lowest road miles in the Commonwealth resulting in the lowest percentage (14.9 percent) of total litter items by roadway type. In contrast, local roads had the lowest number of litter items per mile (1,034 litter items per mile on average) and the most road miles in the Commonwealth resulting in the highest percentage (34.9 percent) of total litter items by roadway type. Table 3-2 presents the estimated incidence of litter by roadway type.

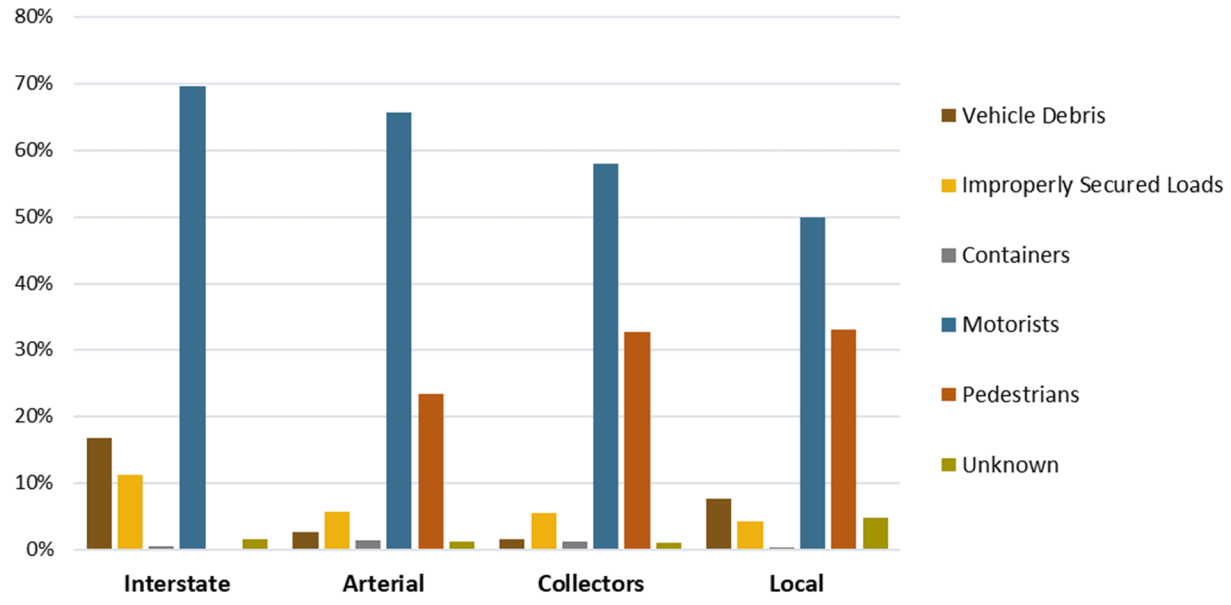
Table 3-2: Aggregate Incidence of Litter by Roadway Type

Roadway Type	Average Items per Mile	Road Shoulder Miles	Total Average Litter Items	Percent of Total Litter Items
Freeways & Expressways	7,523	4,960	74,630,772	14.9%
Arterial	5,107	14,616	149,283,766	29.7%
Collector	2,570	20,066	103,156,199	20.5%
Local	1,034	84,832	175,397,037	34.9%
Total	**2,018**[1]	**124,474**	**502,467,774**	**100.0%**

1. Total is weighted average of items per mile by roadway type.

The primary distinction identified by roadway types was the litter source. Motorists contributed the most to interstate roadways (69.7 percent) and decreasing amounts to arterial (65.6 percent), collector (58.0 percent), and local (50.0 percent) roadways. In contrast, pedestrians contributed the most to local roadways (32.9 percent) and decreasing amounts to collector (32.0 percent), arterial (23.3 percent), and interstate (0.1 percent) roadways. Improperly secured loads contributed proportionally more to interstates (11.3 percent) than other types of roadways. Figure 3-9 shows the source of litter by roadway.

Figure 3-9: Source of Litter by Count by Roadway



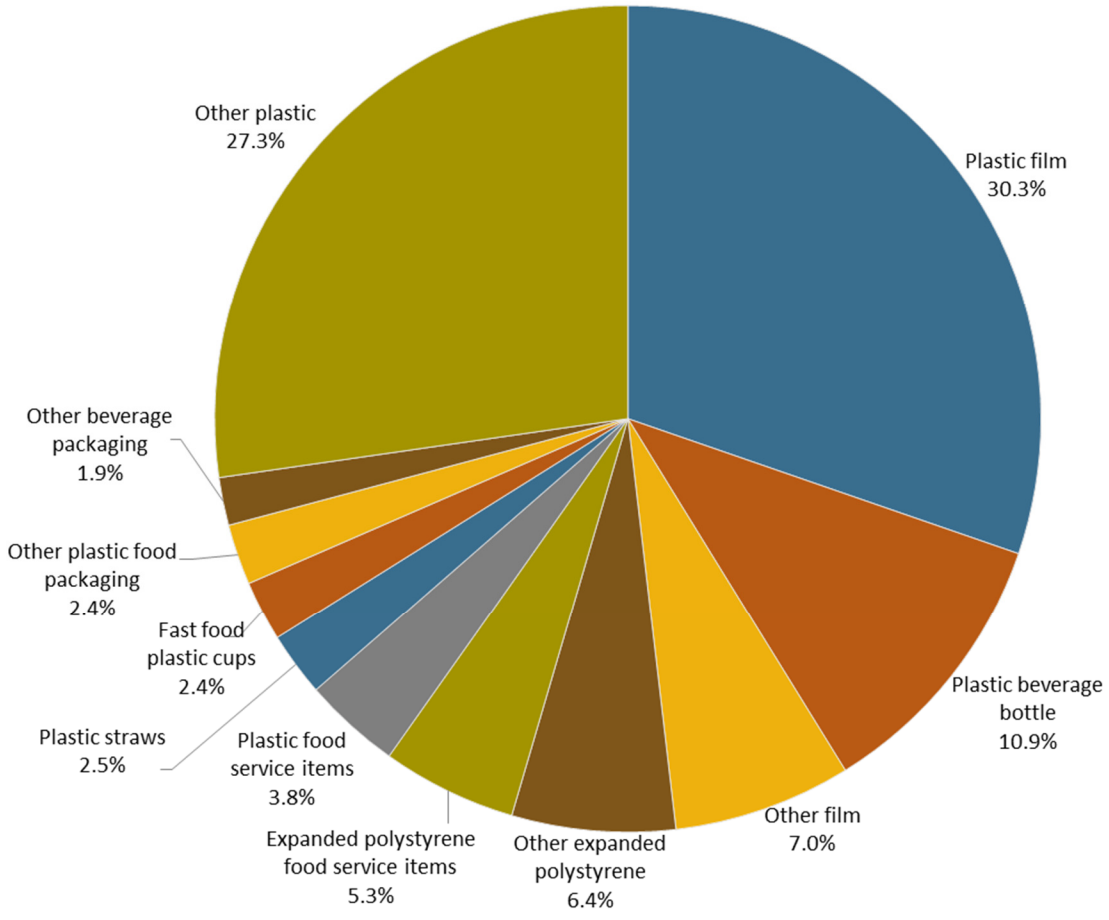
3.4 Other Visible Litter Survey Results by Litter Research Interest

In addition to gaining an understanding of the quantity, composition, and sources of litter on roadways statewide, the Study provides key insights on plastics, bottles, tobacco products, and fast food product prevalence as litter along Pennsylvania roadways.

3.4.1 Plastics

Plastics represent 152.9 million (30.4 percent) of all litter found on Pennsylvania roadways. Plastics represent 45.0 percent of litter over four inches and 28.0 percent of litter less than four inches in size. As shown in Figure 3-10, plastic film was the most prevalent plastic item found littered on Pennsylvania roadways followed by other plastic and plastic beverage containers.

Figure 3-10: Composition of Plastic Litter by Material Category, All Roadways



As shown in Figure 3-11, plastic beverage containers (i.e. soda, wine & liquor, sports & health drinks, juice, tea & coffee, water, and other plastic bottles and containers) represent over a quarter (25.8 percent) of 4-inch-plus plastic litter. Food packaging and other plastic represent the largest portion of small plastic

litter (see Figure 3-12). Table 3-3 provides detailed composition and estimated count of litter items by plastic material category.

Figure 3-11: Aggregate Composition of 4-inch-plus Plastic Litter by Count, All Roadways

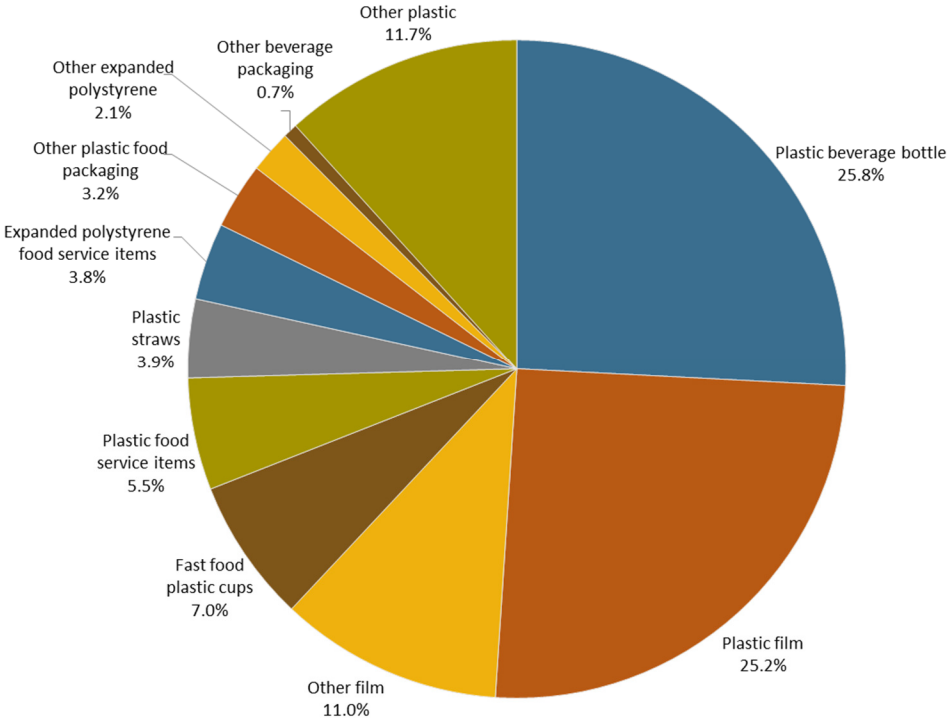


Figure 3-12: Aggregate Composition of 4-inch-less Plastic Litter by Count, All Roadways

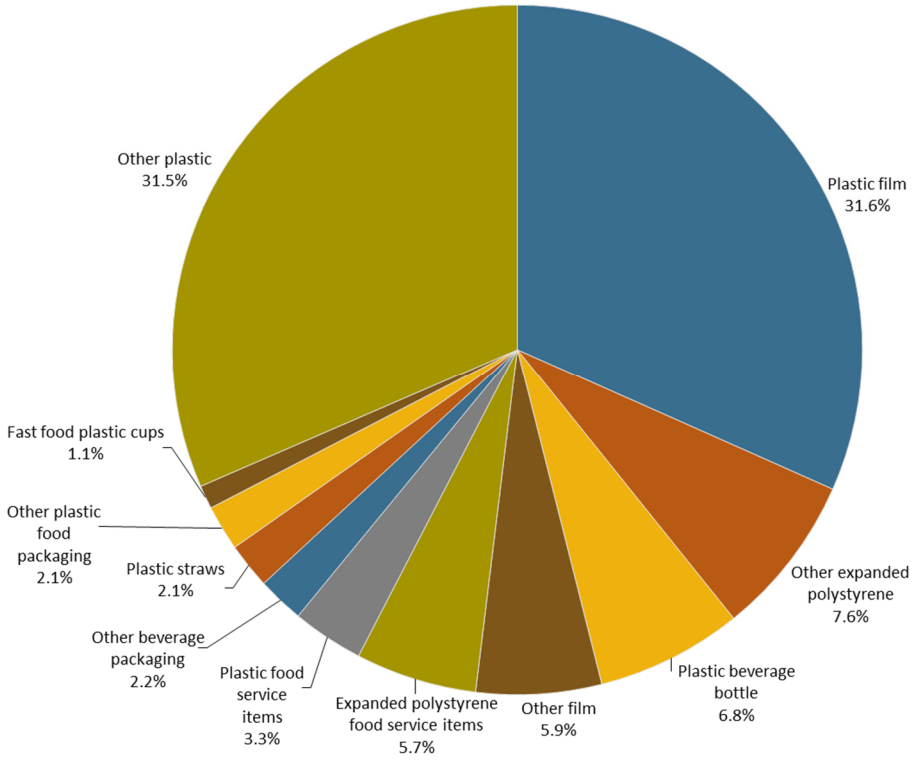


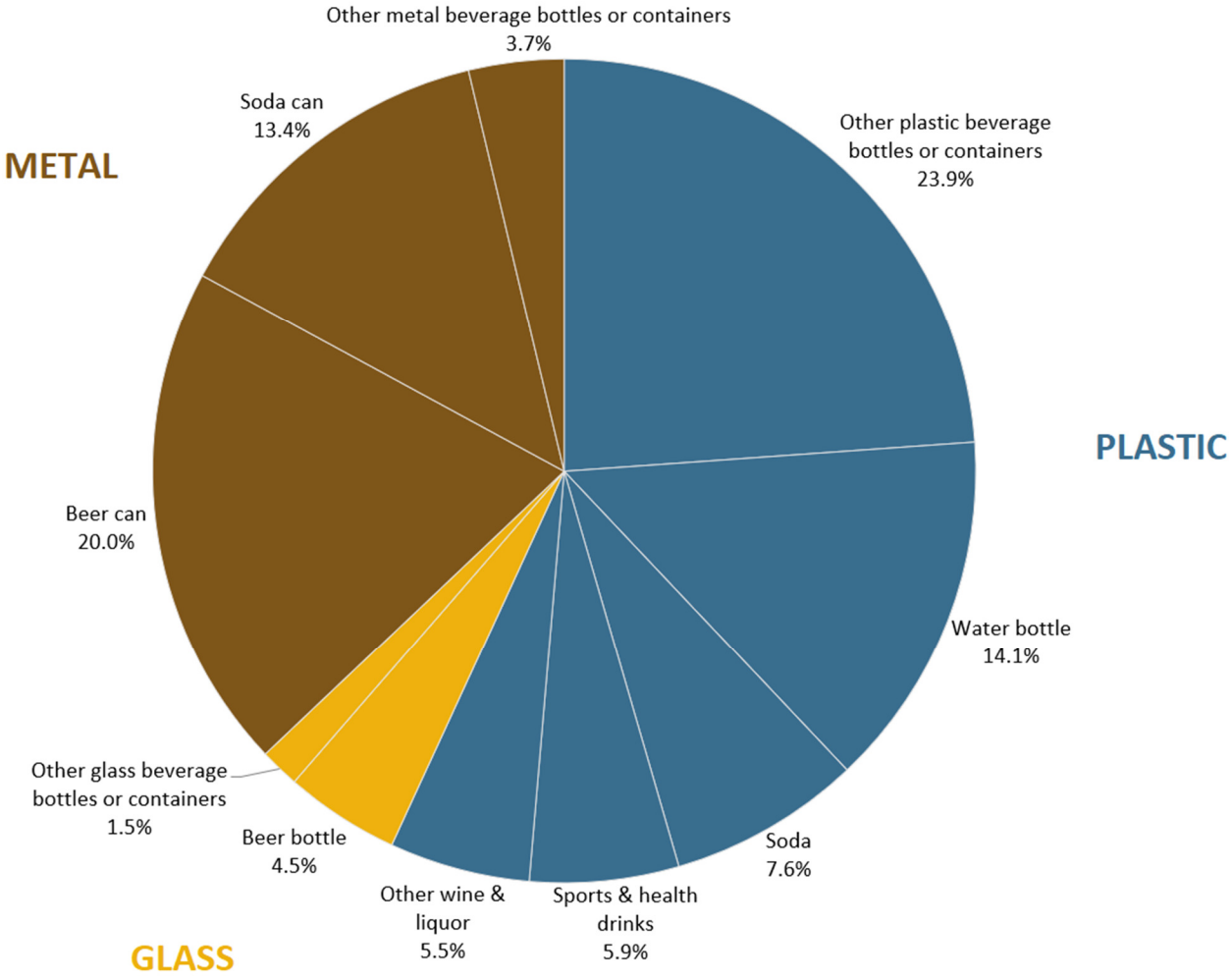
Table 3-3: Aggregate Composition of Plastic Litter by Material Category, All Roadways

Group	Categories	4-inch-plus	4-inch-less	Total Count	Percent of Total
Plastic	Food packaging film	5,849,242	33,201,193	39,050,435	7.8%
	Other film	3,585,321	7,056,673	10,641,993	2.1%
	Other expanded polystyrene	682,685	9,092,026	9,774,711	1.9%
	Expanded polystyrene food service items	1,236,963	6,820,568	8,057,531	1.6%
	Other plastic beverage bottles or containers	1,024,543	4,929,704	5,954,247	1.2%
	Plastic food service items	1,802,159	4,017,632	5,819,791	1.2%
	Water bottle	3,669,078	455,732	4,124,811	0.8%
	Plastic straws	1,275,175	2,563,218	3,838,392	0.8%
	Plastic trash bags - empty	178,935	3,455,778	3,634,713	0.7%
	Fast food plastic cups	2,306,685	1,322,345	3,629,031	0.7%
	Other plastic food packaging	1,062,208	2,551,807	3,614,014	0.7%
	Other plastic bags - empty	1,944,042	1,366,453	3,310,495	0.7%
	Other beverage packaging	230,245	2,622,543	2,852,789	0.6%
	Soda	2,105,786	111,467	2,217,253	0.4%
	Sports & health drinks	992,569	722,773	1,715,342	0.3%
	Other wine & liquor	6,067	1,613,482	1,619,549	0.3%
	Tea & coffee	287,473	279,819	567,293	0.1%
	Juice	238,986	-	238,986	0.0%
	Single serve wine & liquor	125,710	111,467	237,176	0.0%
	Other plastic bags - full	170,890	-	170,890	0.0%
	Plastic trash bags - full	113,127	-	113,127	0.0%
	Other plastic	3,841,673	37,845,592	41,687,265	8.3%
	Subtotal Plastic	**32,729,562**	**120,140,272**	**152,869,834**	**30.4%**

3.4.2 Beverage Containers

An estimated 29.3 million beverage containers are currently littered on Pennsylvania roadways. Beverage containers represent 23.8 percent of litter over four inches and 2.8 percent of litter less than four inches in size. As shown in Figure 3-13 and Table 3-4 below, approximately 93.9 percent of the bottles littered on Pennsylvania roadways are composed of plastic or metal.

Figure 3-13: Aggregate Composition of Beverage Container Litter by Count, All Roadways



* For each material group, item categories that composed under 3% of the total were consolidated into the "Other" category for that material.

Table 3-4: Aggregate Composition of Beverage Container Litter by Material Category, All Roadways

Groups	Categories	Total Count	Percent of Total
Plastic	Other plastic beverage bottles or containers	5,954,247	20.3%
	Water bottle	4,124,811	14.1%
	Soda	2,217,253	7.6%
	Sports & health drinks	1,715,342	5.9%
	Other wine & liquor	1,619,549	5.5%
	Tea & coffee	567,293	1.9%
	Juice	238,986	0.8%
	Single serve wine & liquor	237,176	0.8%
	Plastic Subtotal	**16,674,657**	**56.9%**
Glass	Beer bottle	1,319,888	4.5%
	Tea & coffee	115,044	0.4%
	Other glass beverage bottles or containers	111,639	0.4%
	Juice	71,454	0.2%
	Other wine & liquor	59,834	0.2%
	Soda bottle	56,419	0.2%
	Water	39,874	0.1%
	Single serve wine & liquor	-	0.0%
	Sports & health drinks	-	0.0%
	Glass Subtotal	**1,774,153**	**6.1%**
Metal	Beer can	5,855,102	20.0%
	Soda can	3,916,044	13.4%
	Sports & health drinks	752,415	2.6%
	Other metal beverage bottles or containers	187,917	0.6%
	Tea & coffee	144,503	0.5%
	Juice	10,908	0.0%
	Metal Subtotal	**10,866,888**	**37.1%**
Total		**29,315,699**	100.0%

3.4.3 Tobacco Products

Cigarette smoking is decreasing in Pennsylvania, and in 2018 a reported 17 percent of adults in Pennsylvania smoked cigarettes.[7] However, the Study, like the 2009 KAB National Litter Research Study, found that cigarette butts are the most littered material with an estimated 186.2 million cigarette butts currently littered on roadways in Pennsylvania. Some communities are installing public cigarette receptacles to help manage cigarette butts, but the problem is exacerbated by the fact that in-car ashtrays are becoming less common in today's vehicles.

[7] CDC, Behavioral Risk Factor Surveillance System, State Tobacco Activities Tracking and Evaluation System, 2018.

Overall, tobacco products (including cigarette butts as well as cigars, chewing tobacco, and tobacco packaging) account for an estimated 193.0 million pieces of litter items on Pennsylvania roadways. Table 3-5 shows the estimated composition and count by tobacco product material category.

Table 3-5: Aggregate Composition of Tobacco Products Litter by Material Category, All Roadways

Groups	Categories	Total Count	Percent of Total
Other	Cigarette butts	186,220,908	96.5%
	Other tobacco-related products and packaging	6,745,899	3.5%
	Electronic cigarettes	-	0.0%
Total		**192,966,807**	**100.0%**

3.4.4 Fast Food Products

An estimated 12.3 million fast food products are currently littered on Pennsylvania roadways. Fast food products represent 0.9 percent of litter over four inches and 1.5 percent of litter less than four inches in size. 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 Figure 3-14 and Table 3-6. "Other paper fast food service items" (a category that includes napkins and beverage holders) and fast food paper and plastic cups represent 98.4 percent of the fast food products littered on Pennsylvania roadways.

Figure 3-14: Aggregate Composition of Fast Food Product Litter by Count, All Roadways

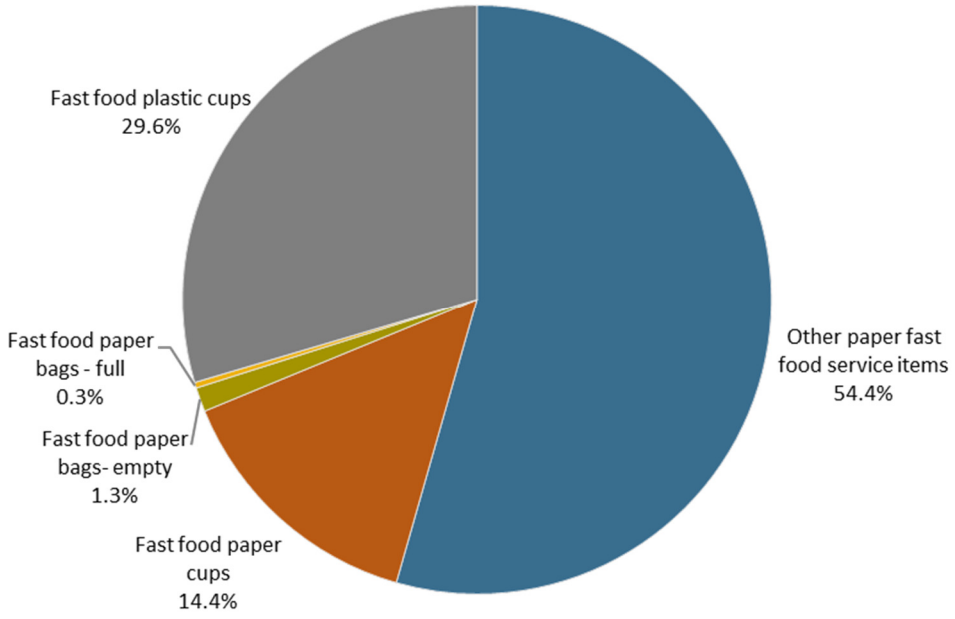


Table 3-6: Aggregate Composition of Fast Food Products Litter by Material Category, All Roadways

Groups	Categories	Total Count	Percent of Total
Paper	Other paper fast food service items	6,679,057	54.4%
	Fast food paper cups	1,763,464	14.4%
	Fast food paper bags- empty	162,503	1.3%
	Fast food paper bags - full	38,090	0.3%
	Subtotal Paper	**8,643,115**	**70.4%**
	Fast food plastic cups	3,629,031	29.6%
	Subtotal Plastic	**3,629,031**	**29.6%**
Total		**214,416,489**	**100.0%**

3.5 Key Highlights

- **Over a half billion pieces of litter on Pennsylvania roadways.** Pennsylvania roadways are littered with approximately 502.5 million pieces of litter.
- **Cigarette butts and plastic collectively compose the majority of litter items.** Of the total estimated litter on Pennsylvania roadways, 186.2 million (37.1 percent) pieces were cigarette butts followed by 152.9 million (30.4 percent) pieces of plastic. Plastic film is the most prevalent type of plastic littered on Pennsylvania roadways followed by plastic beverage containers.
- **Majority of litter is smaller, but larger items contribute to the litter issue as well.** The majority of litter on Pennsylvania roadways (429.8 million pieces or 85.5 percent) is 4-inches or smaller in size; however, the Study estimates there is still a significant quantity (72.7 million pieces or 15.5 percent) of larger, and often more visible, litter on Pennsylvania roadways.
- **The composition of litter varies by the size of the litter item.** Beverage containers and plastic film were the most predominant types of larger litter. Cigarette butts are the most common of the smaller items. Some material categories, such as tire tread, food packaging film, other plastic, and other organics, are within the top ten materials for both large and small litter items.
- **Motorists and pedestrians are leading sources of litter, regardless of item size.** Motorists and pedestrians are leading sources of litter for both small and large items. For litter items greater than four inches, improperly secured loads also become a leading source.
- **Freeways and expressways had the most litter items per mile.** Freeways and expressways had the most litter per mile (7,523 litter items per mile on average). In contrast, local roads had the lowest littered items per mile (1,034 litter items per mile on average).
- **Local roads had the most total litter items.** Local roads had the lowest littered items per mile (1,034 litter items per mile on average). However, local roads account for the most road miles

(84,832 miles) in the Commonwealth. In aggregate, local roads had the highest percentage (34.9 percent) of total litter items by roadway type statewide.

- **Litter source varies by roadway type.** The primary distinction identified by roadway types was the litter source. Motorists contributed the most litter to interstate roadways (69.7 percent) and decreasing amounts to arterial (65.6 percent), collector (58.0 percent), and local (50.0 percent) roadways. In contrast, pedestrians contributed the most to local roadways (32.9 percent) and decreasing amounts to collector (32.0 percent), arterial (23.3 percent), and interstate (0.1 percent) roadways. Improperly secured loads contributed more to interstates (11.3 percent) than to any other roadway type.
- **Over 40 million beverage containers and fast food products are littered on Pennsylvania roadways.** An estimated 29.3 million beverage containers and 12.3 million fast food items are currently littered on Pennsylvania roadways.

4.0 VISIBLE LITTER SURVEY REGIONAL RESULTS

Pennsylvania roadways have approximately 2,018 items per mile. Urban roads are more littered than rural roads in Pennsylvania on a per-mile basis. However, urban and rural roads represent comparable total litter items statewide since there are more rural roads across the Commonwealth. This section provides a comprehensive understanding of the quantity, composition, and sources of litter by region (e.g., urban or rural) in the Commonwealth.

4.1 Quantity and Composition of Litter

Urban roads have approximately 2,585 litter items per mile on average. In comparison, rural roads had approximately 1,635 litter items per mile on average. However, there are more rural than urban road miles in the Commonwealth. Consequently, urban and rural roads represent comparable total litter items. Table 4-1 presents the estimated incidence of litter by region.

Table 4-1: Aggregate Incidence of Litter by Region

Region Type	Items per Mile	Road Shoulder Miles	Total Litter Items	Percentage of Total Litter Items
Urban	2,585	50,206	259,543,023	51.7%
Rural	1,635	74,268	242,924,751	48.3%
Total	**2,018**	**124,474**	**502,467,774**	**100.0%**

The composition of litter by material group on urban and rural roadways are similar. Figure 4-1 and Figure 4-2 present the aggregate composition of litter items by region by material group. Table 4-2 presents the regional composition and estimated count of litter items on Pennsylvania roadways by material category.

Figure 4-1: Urban Regional Composition of Litter by Count, All Roadways

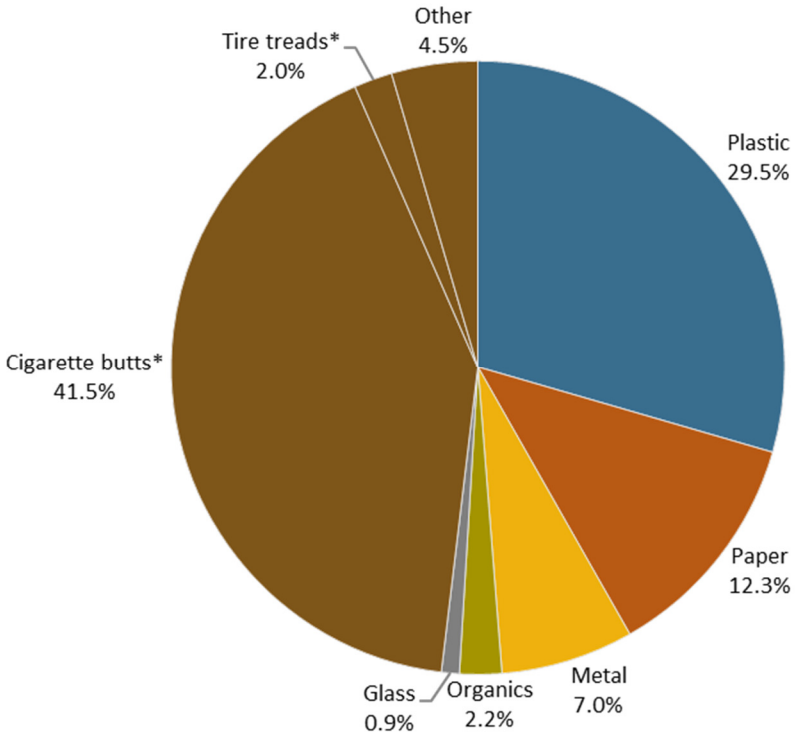
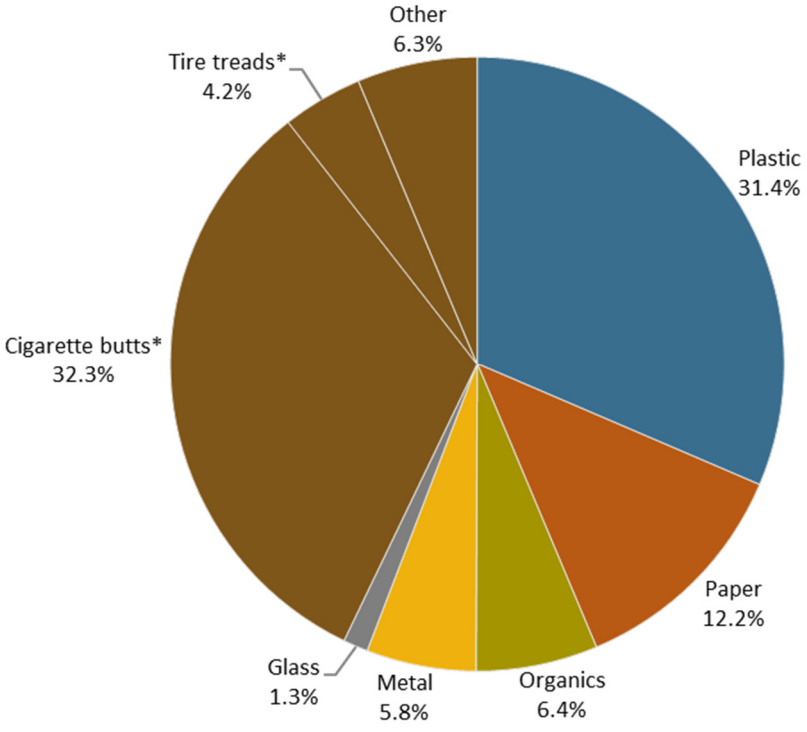


Figure 4-2: Rural Regional Composition of Litter by Count, All Roadways



* 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 4-2: Regional Composition of Litter by Material Category, All Roadways

Groups	Categories	Urban	Rural	Total Count	Percent of Total
Other	Other food packaging paper	7,016,665	7,970,546	14,987,211	3.0%
	Other paper fast food service items	3,919,868	2,759,189	6,679,057	1.3%
	Paper home food packaging	1,763,215	96,985	1,860,200	0.4%
	Fast food paper cups	1,107,796	655,668	1,763,464	0.4%
	Office paper/ mail	1,234,229	271,913	1,506,142	0.3%
	Newspaper/ inserts	781,938	330,885	1,112,823	0.2%
	Cardboard	767,125	329,299	1,096,423	0.2%
	Receipts	217,367	764,523	981,890	0.2%
	Beverage carriers/ cartons	807,192	6,067	813,259	0.2%
	Fast food paper bags- empty	91,794	70,709	162,503	0.0%
	Aseptic/ gable top containers	44,417	91,582	135,999	0.0%
	Other advertising signs	44,702	70,569	115,271	0.0%
	Political signs	89,065	-	89,065	0.0%
	Magazines	38,844	-	38,844	0.0%
	Fast food paper bags - full	27,182	10,908	38,090	0.0%
	Kraft bags (brown paper bags)	-	21,012	21,012	0.0%
	Books	-	-	-	0.0%
	Other paper	13,909,198	16,236,202	30,145,400	6.0%
	Paper Subtotal	**31,860,598**	**29,686,057**	**61,546,655**	**12.2%**
Plastic	Food packaging film	16,809,173	22,241,261	39,050,435	7.8%
	Other film	5,518,013	5,123,980	10,641,993	2.1%
	Other expanded polystyrene	7,317,458	2,457,253	9,774,711	1.9%
	Expanded polystyrene food service items	4,976,753	3,080,779	8,057,531	1.6%
	Other plastic beverage bottles or containers	3,753,523	2,200,724	5,954,247	1.2%
	Plastic food service items	2,267,316	3,552,475	5,819,791	1.2%
	Water bottle	2,361,862	1,762,949	4,124,811	0.8%
	Plastic straws	2,663,880	1,174,512	3,838,392	0.8%
	Plastic trash bags - empty	1,161,499	2,473,215	3,634,713	0.7%
	Fast food plastic cups	2,111,046	1,517,984	3,629,031	0.7%
	Other plastic food packaging	1,922,504	1,691,511	3,614,014	0.7%
	Other plastic bags - empty	1,719,412	1,591,083	3,310,495	0.7%
	Other beverage packaging	559,836	2,292,953	2,852,789	0.6%
	Soda	997,023	1,220,230	2,217,253	0.4%
	Sports & health drinks	814,556	900,786	1,715,342	0.3%
	Other wine & liquor	-	1,619,549	1,619,549	0.3%
	Tea & coffee	406,468	160,825	567,293	0.1%
	Juice	116,932	122,055	238,986	0.0%
	Single serve wine & liquor	170,505	66,671	237,176	0.0%
	Other plastic bags - full	164,824	6,067	170,890	0.0%
	Plastic trash bags - full	53,465	59,662	113,127	0.0%
	Other plastic	20,640,967	21,046,298	41,687,265	8.3%
	Plastic Subtotal	**76,507,014**	**76,362,820**	**152,869,834**	**30.4%**
Glass	Broken glass or ceramic	772,054	1,479,275	2,251,329	0.4%
	Beer bottle	444,550	875,338	1,319,888	0.3%
	Tea & coffee	39,874	75,170	115,044	0.0%
	Other glass beverage bottles or containers	13,991	97,648	111,639	0.0%

	Juice	8,418	63,037	71,454	0.0%
	Other wine & liquor	32,756	27,079	59,834	0.0%
	Soda bottle	13,591	42,827	56,419	0.0%
	Water	39,874	-	39,874	0.0%
	Single serve wine & liquor	-	-	-	0.0%
	Sports & health drinks	-	-	-	0.0%
	Other glass	1,085,719	516,977	1,602,696	0.3%
	Glass Subtotal	**2,450,827**	**3,177,352**	**5,628,179**	**1.1%**
Metal	Metal food packaging	5,414,680	4,743,540	10,158,220	2.0%
	Beer can	2,199,281	3,655,820	5,855,102	1.2%
	Soda can	2,683,290	1,232,754	3,916,044	0.8%
	Sports & health drinks	191,660	560,754	752,415	0.1%
	Other metal beverage bottles or containers	187,917	-	187,917	0.0%
	Tea & coffee	81,447	63,056	144,503	0.0%
	Juice	-	10,908	10,908	0.0%
	Other metal	7,397,274	3,759,863	11,157,138	2.2%
	Metal Subtotal	**18,155,551**	**14,026,696**	**32,182,246**	**6.4%**
Organics	Other food waste	2,839,480	1,920,080	4,759,560	0.9%
	Confection	13,591	1,206,940	1,220,531	0.2%
	Pet waste	239,245	59,662	298,906	0.1%
	Human waste	-	42,025	42,025	0.0%
	Other organics	2,650,016	12,349,390	14,999,406	3.0%
	Organics Subtotal	**5,742,332**	**15,578,096**	**21,320,428**	**4.2%**
Other	Cigarette butts	107,790,588	78,430,319	186,220,908	37.1%
	Tire tread	5,246,352	10,279,779	15,526,131	3.1%
	Vehicle waste	2,706,837	5,460,969	8,167,806	1.6%
	Other tobacco-related products and packaging	2,142,586	4,603,313	6,745,899	1.3%
	Construction and demolition	2,875,082	1,793,999	4,669,081	0.9%
	Textiles / small rugs	2,378,779	1,480,661	3,859,439	0.8%
	Toiletries / personal hygiene products	227,614	998,136	1,225,751	0.2%
	Medical waste	521,894	-	521,894	0.1%
	Electronic cords	207,082	54,158	261,239	0.1%
	Bulky items	22,409	151,244	173,652	0.0%
	Entertainment items	119,622	6,067	125,689	0.0%
	Tires	43,902	37,986	81,889	0.0%
	Hazardous waste	22,009	23,041	45,050	0.0%
	Portable electronics	5,573	21,012	26,586	0.0%
	Other electronics	5,573	-	5,573	0.0%
	Electronic cigarettes	-	-	-	0.0%
	Flat-screen televisions	-	-	-	0.0%
	CRT televisions and computer monitors	-	-	-	0.0%
	Other items	510,800	753,046	1,263,846	0.3%
	Other Subtotal	**124,826,702**	**104,093,730**	**228,920,432**	**45.6%**
Total		**259,543,023**	**242,924,751**	**502,467,774**	**100.0%**

There was some variation in the composition of smaller and larger litter by region. For example, urban areas contained more paper and plastic litter while rural areas had more metal 4-inch plus litter. In addition, urban areas had more cigarette butts than rural area roadways. Figure 4-3 and Figure 4-4 present

the composition of 4-inch-plus litter items by region by material group. Figure 4-5 and Figure 4-6 present the composition of 4-inch-less litter items by region by material group.

Figure 4-3: Urban Regional Composition of 4-inch-plus Litter by Count, All Roadways

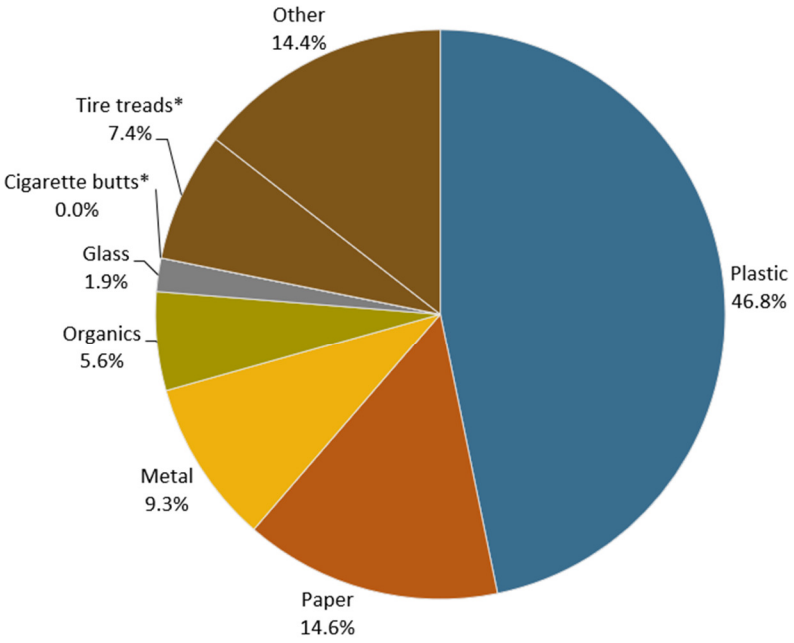
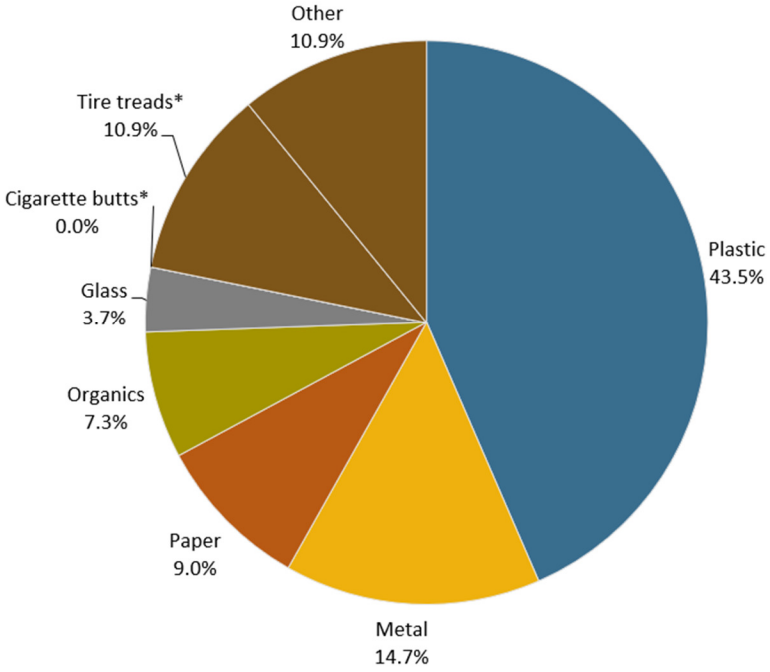


Figure 4-4: Rural Regional Composition of 4-inch-plus Litter by Count, All Roadways



* 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.

Figure 4-5: Urban Regional Composition of 4-inch-less Litter by Count, All Roadways

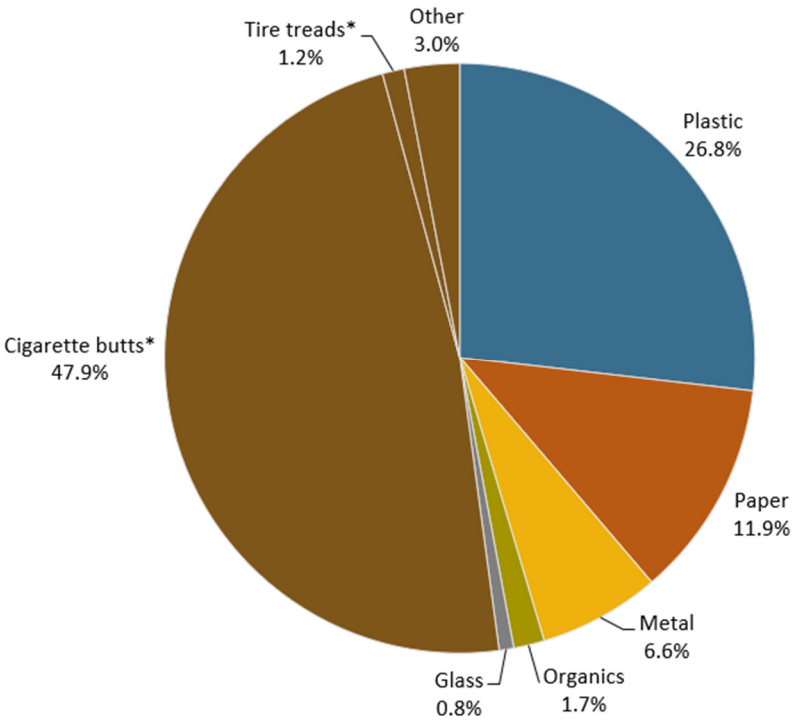
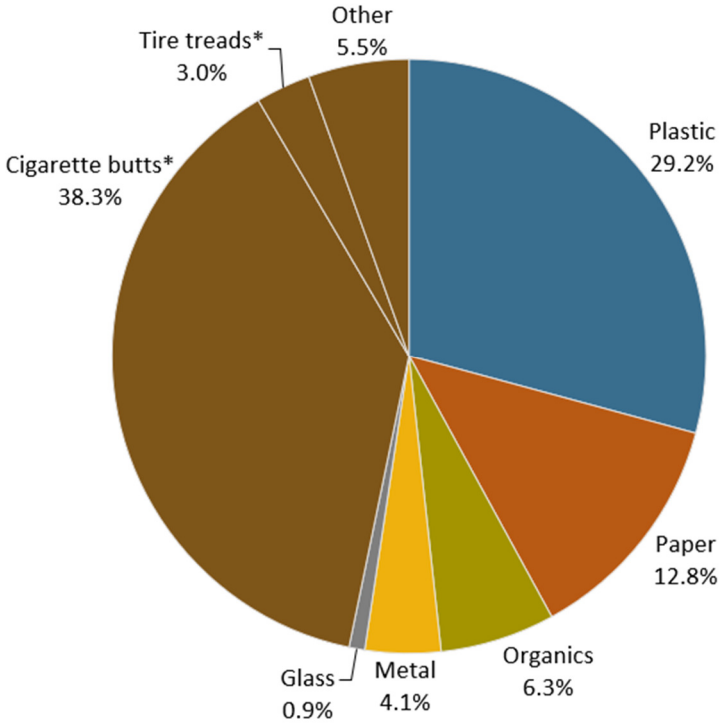


Figure 4-6: Rural Regional Composition of 4-inch-less Litter by Count, All Roadways

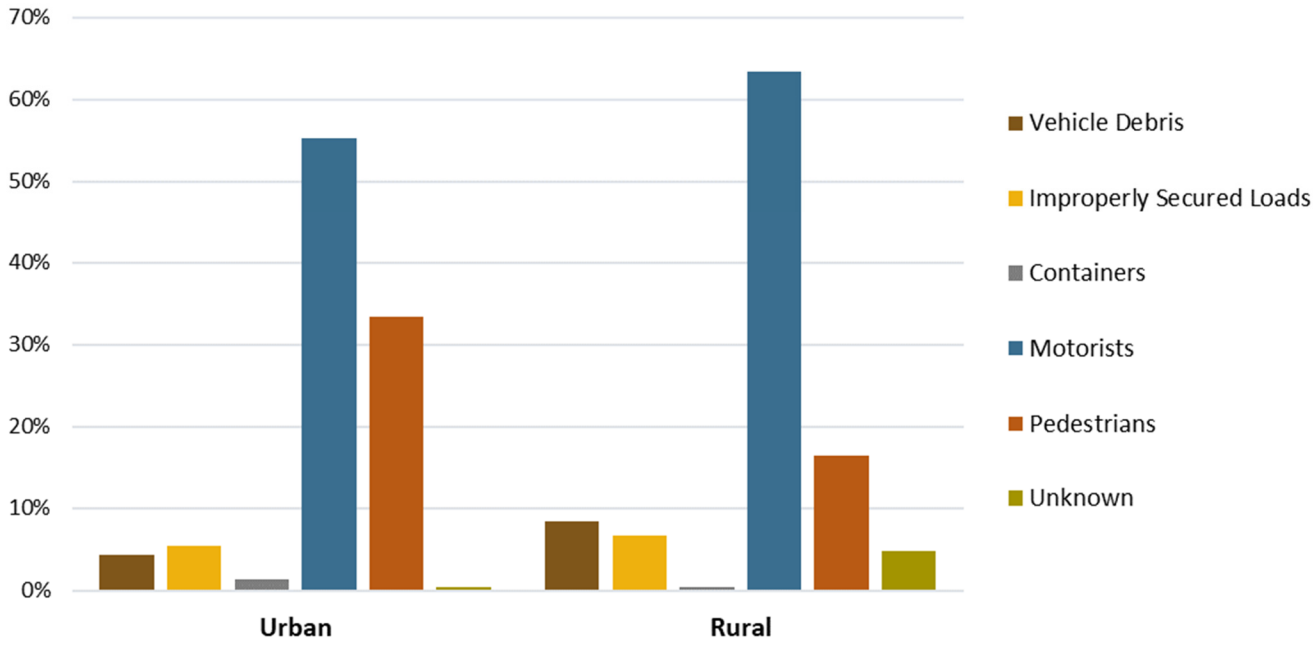


* Cigarette butts and tire treads were the majority of other litter material group. Therefore, other material group subdivided into cigarette butts, tire treads, and other for above figure.

4.2 Source of Litter

The primary distinction identified by region was the source of the litter. Motorists contributed to a higher percentage of litter on rural roads (63.4 percent) than on urban roads (55.3 percent). In contrast, pedestrians contributed to a higher percentage of litter on urban roads (33.3 percent) than on rural roads (16.4 percent). Figure 4-7 shows the source of litter by region.

Figure 4-7: Source of Litter by Count by Region



4.3 Key Findings

- **Urban roads have more litter per mile than rural roads in Pennsylvania.** Urban roads had approximately 2,585 litter items per mile. In comparison, rural roads had approximately 1,635 litter items per mile.
- **Urban and rural roads represent comparable total litter items.** Although urban roads are more littered per mile, there are more rural than urban road miles in the Commonwealth. Consequently, urban and rural roads represent comparable total litter items.
- **Composition of litter by material group on urban and rural roadways are similar.** However, there was some minor variation in the composition of smaller and larger litter by region. For example, urban roadways had 10 percent more cigarette butts found than rural roadways (see Figures 4-5 and 4-6).

5.0 PUBLIC ATTITUDE SURVEY RESULTS

The public attitude survey gathered insight into Pennsylvania residents' opinions of the prevalence and effects of litter, causes of littering behavior, tobacco littering, consequences of littering, and litter prevention and abatement in the Commonwealth. This section provides the results from the public attitude survey.

5.1 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. Over 90 percent of survey respondents reported that litter is a problem in Pennsylvania. As shown below in Figure 5-1, only about 3.4 percent reported litter is not a problem or are unsure.

Figure 5-1: Percentage of Surveyed Individuals Who Believe Litter is a Problem in Pennsylvania

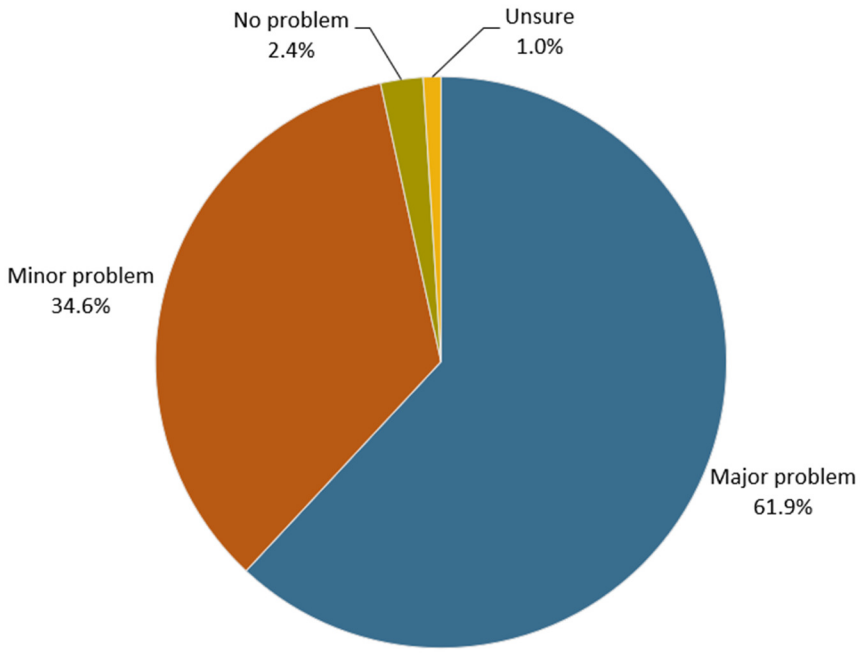


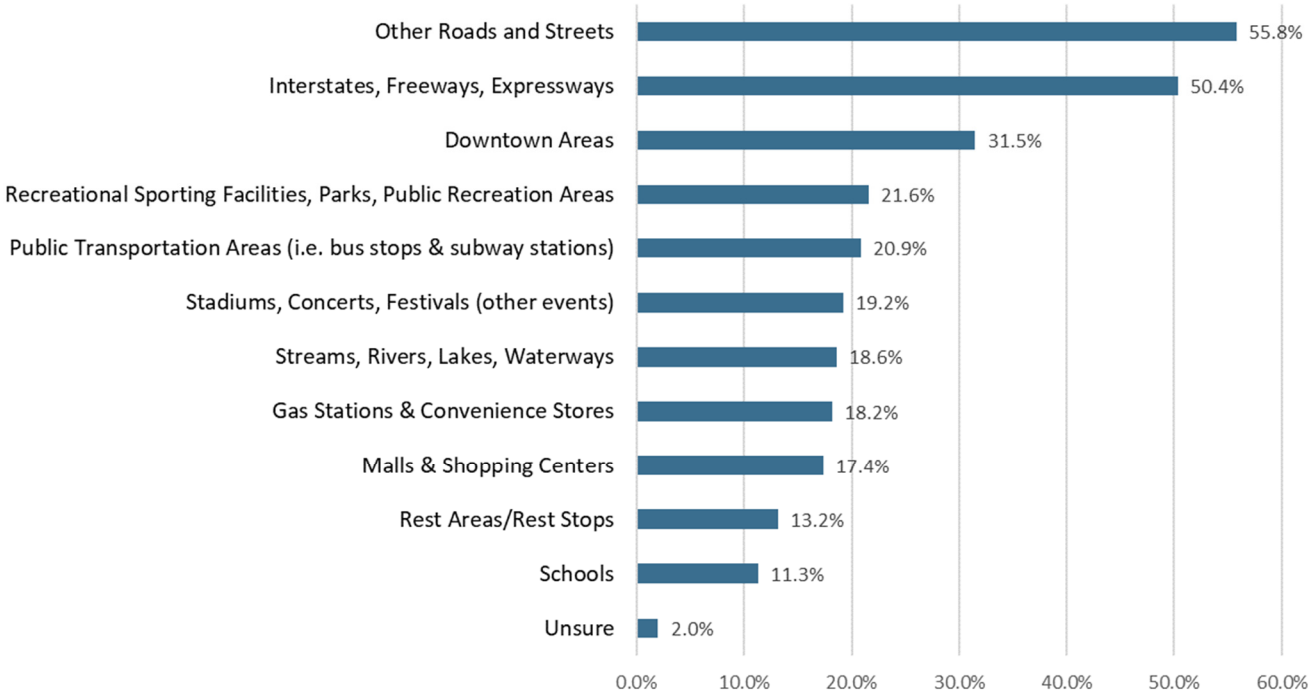
Figure 5-2 provides a summary of the public's perception of how the presence of litter may impact communities. Between 40 – 50 percent of those surveyed believe the presence of litter affects the environment, waterways, property taxes, home values, tourism and businesses, and safety. Survey respondents agreed the least with "Litter leads to increased crime."

Figure 5-2: How Litter Affects the Community

5.2 Prevalence of Littering

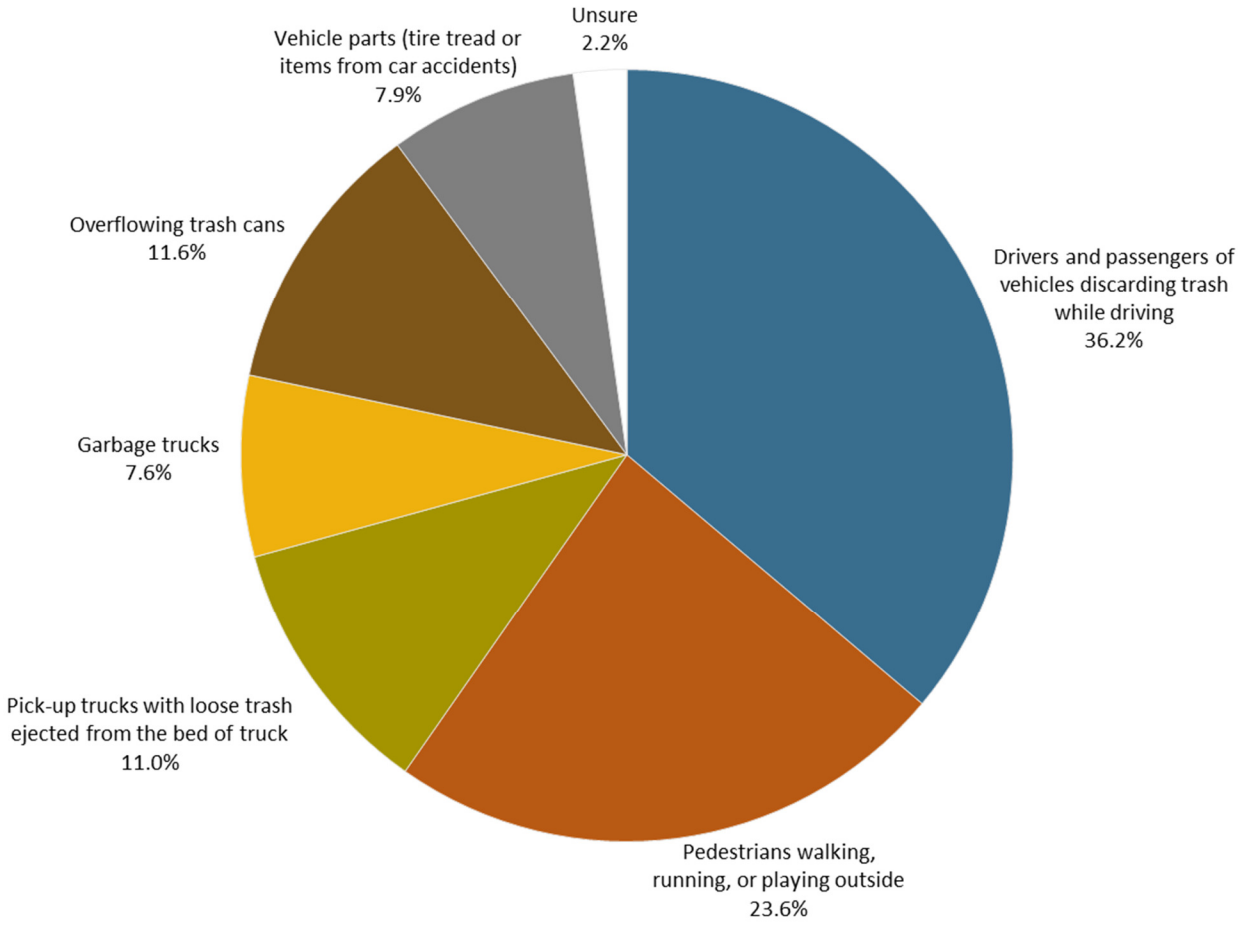
This section provides the results from survey questions that were geared towards documenting the respondents' litter observations, such as the kinds of litter they have actually seen and what they think the sources may be. The majority of survey respondents reported that litter is most prevalent along roadways, interstates, expressways, and freeways. provides a visual representation of the locations where most respondents specified observing litter.

Figure 5-3: Areas Where Litter is Most Commonly Observed (by Percentage)



The majority of survey respondents reported motorists and pedestrians were the primary source of litter. The public's opinion is consistent with the findings of the visible litter survey. Figure 5-4 lists the most commonly viewed sources for litter, based on the opinions of survey respondents.

Figure 5-4: Survey Respondents Perception of Litter Sources (by Percentage)



Respondents reported that the primary types of litter observed was fast food packaging, plastic bags, beverage containers and tobacco products (see Figure 5-5). Figure 5-5 shows that 13 percent of survey respondents reported observing cigarette butts; however, cigarette butts were the most littered item based on the visible litter survey. Figure 5-6 illustrates that over 75 percent of survey respondents have observed another person littering in the past year.

Figure 5-5: Main Types of Litter Observed by Survey Respondents in Pennsylvania

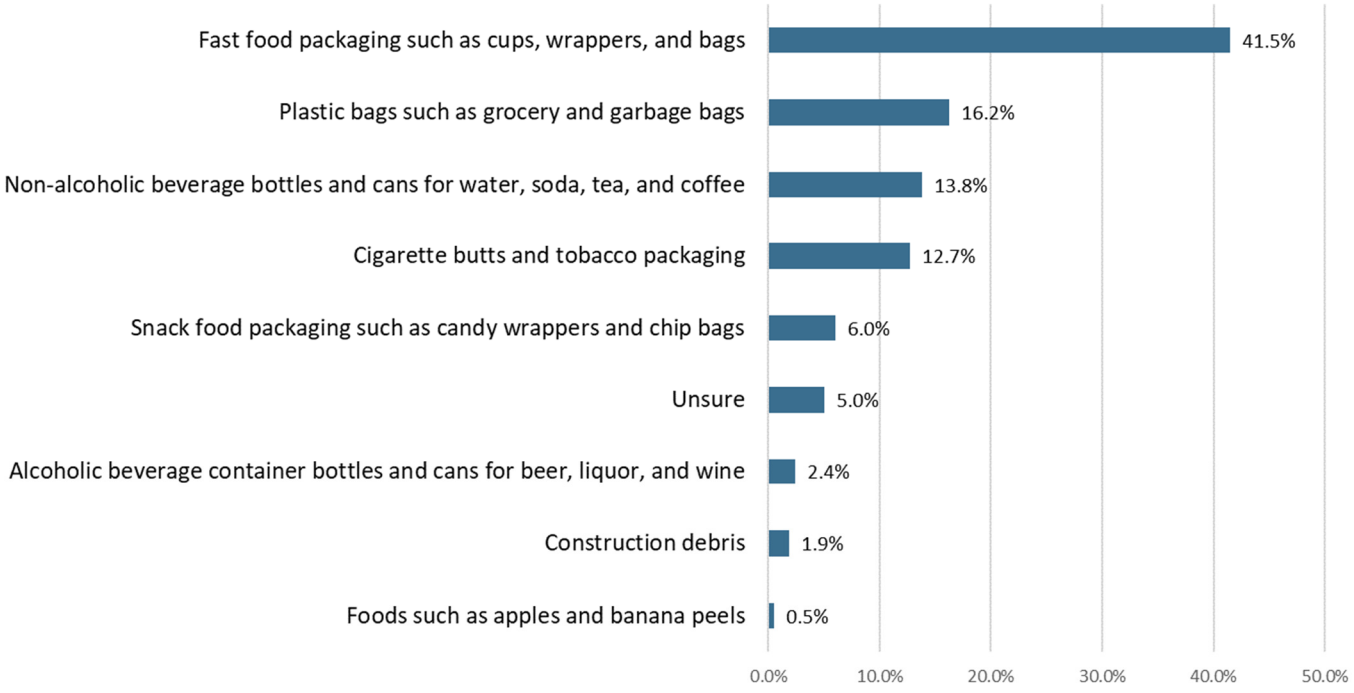
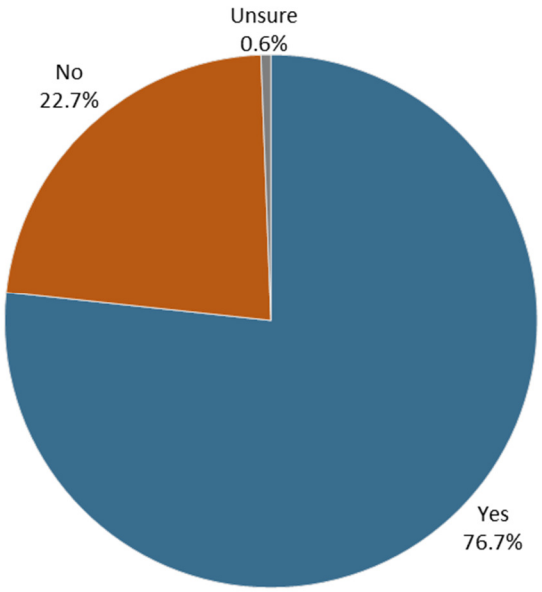


Figure 5-6: Percentage of Respondents Who Have Observed Someone Litter in the Past Year



5.3 Instances of Littering

The survey questions associated with this section were designed to help quantify respondents' thoughts and opinions regarding when, where, and why someone litters. More than half of the respondents believe that the leading cause is a lack of appreciation for the effects of litter (see Figure 5-7). Almost half believe that the act of littering is most likely to occur when a convenient trash can is not available (see Figure 5-8). Almost 100 percent of survey respondents indicated they believe that it is unacceptable to litter, regardless of location (see Figure 5-9).

Figure 5-7: Reasons Why People Litter

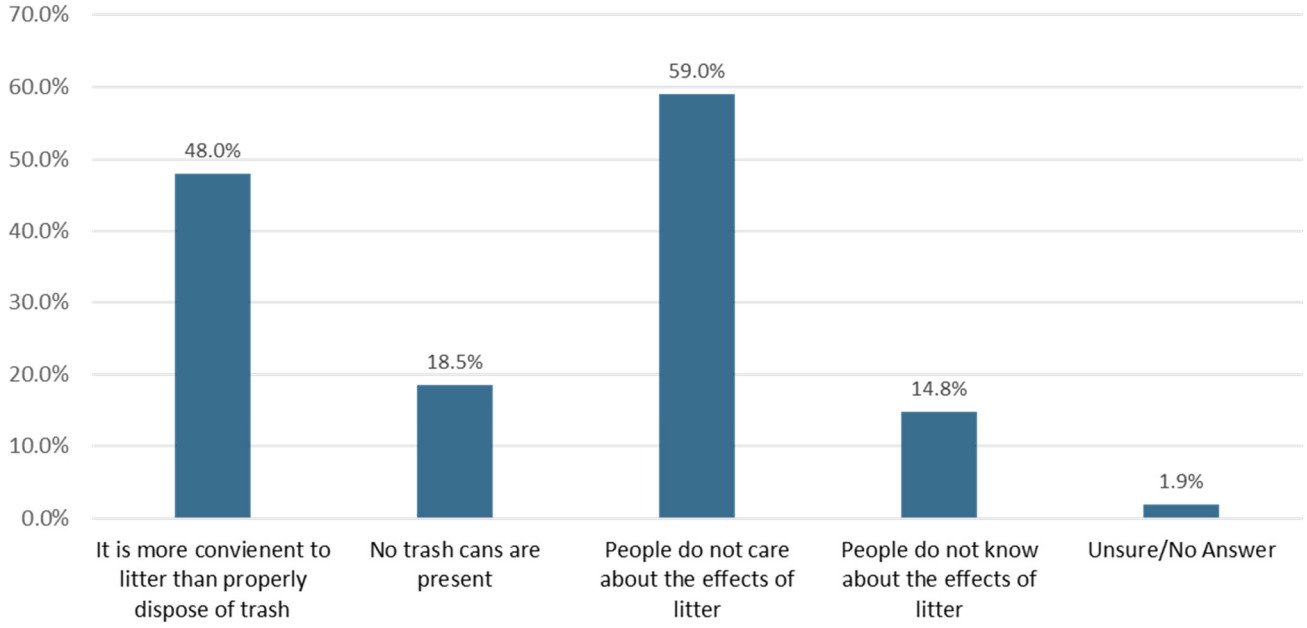


Figure 5-8: Circumstances When People Litter

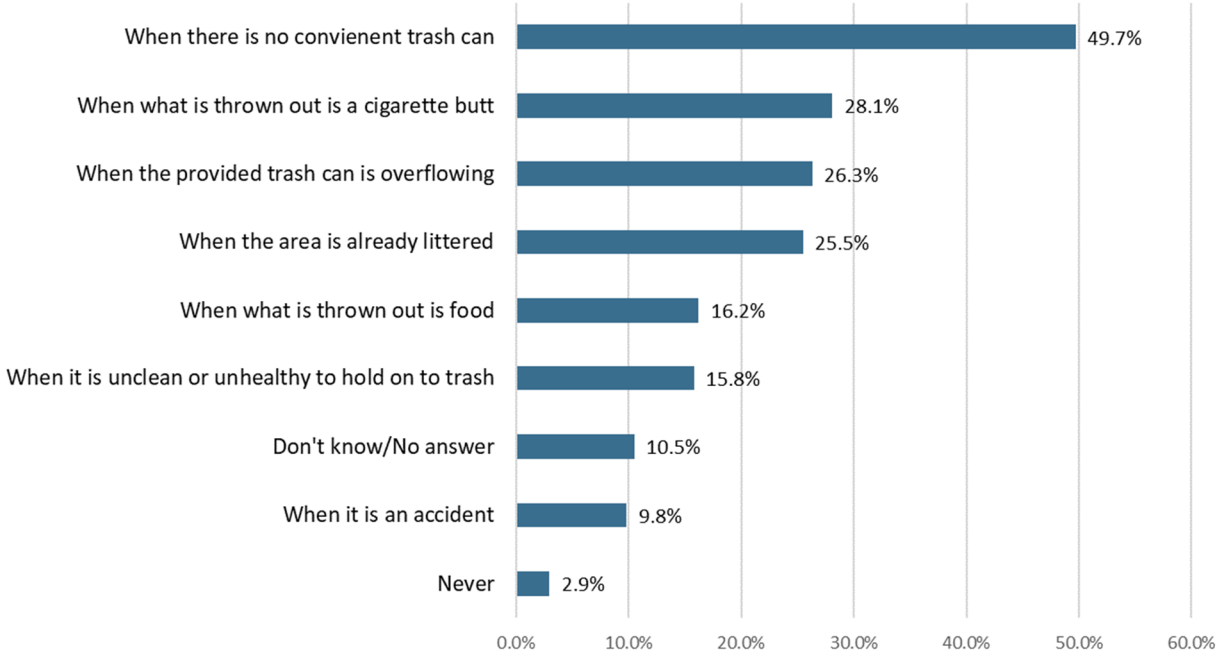
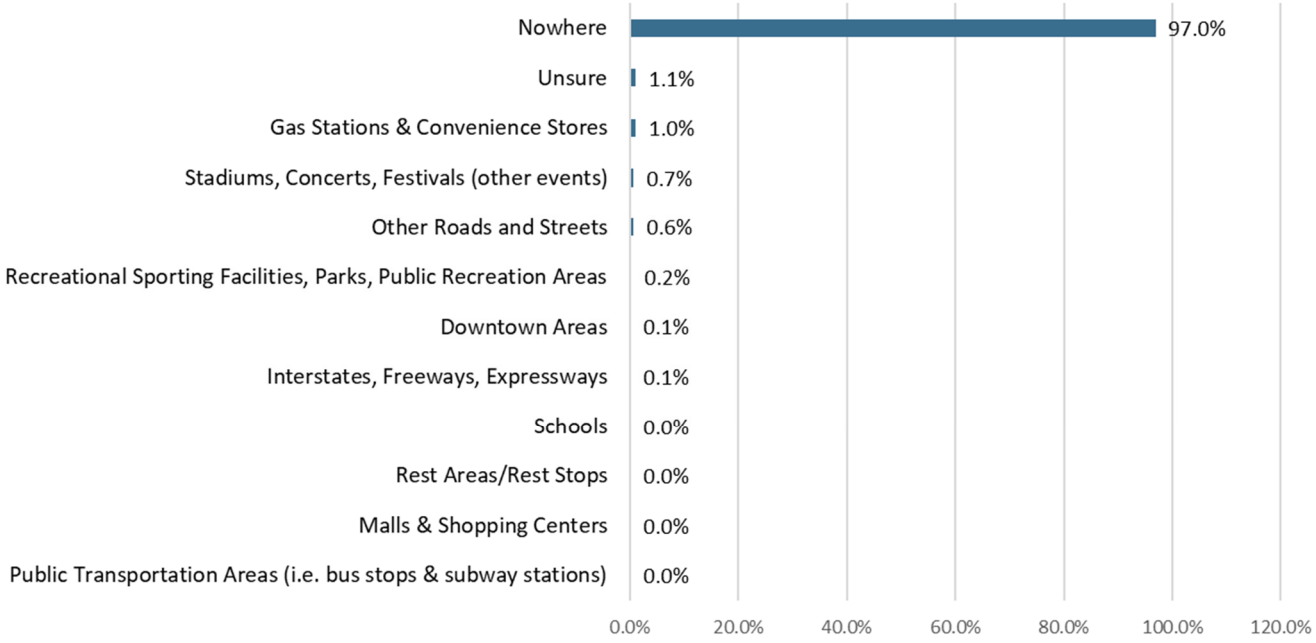


Figure 5-9: Locations Where Littering is Acceptable

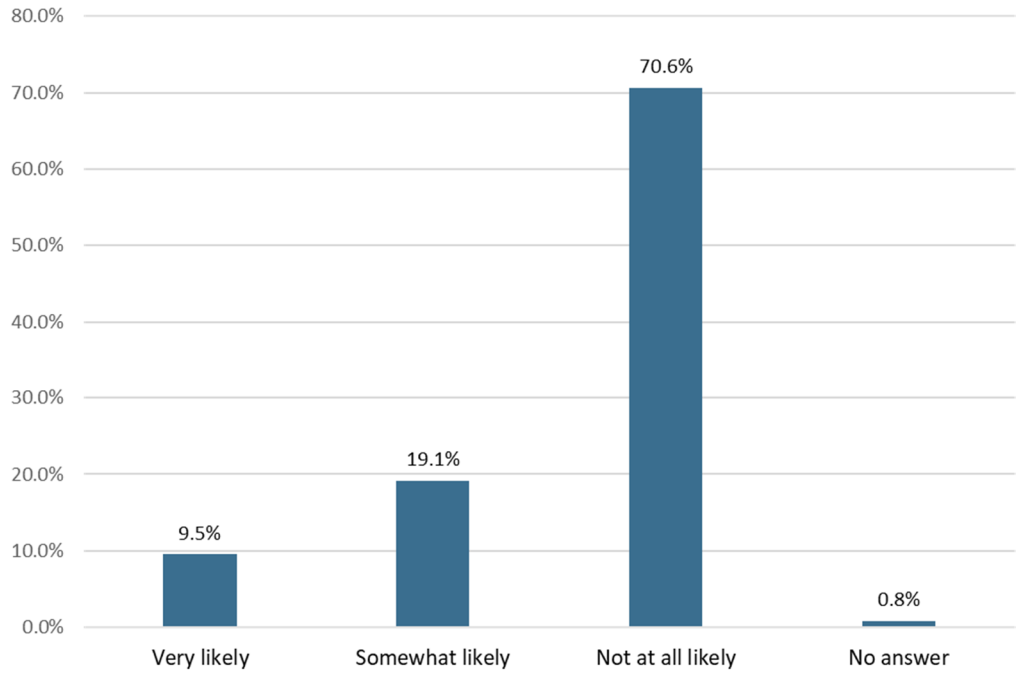


5.4 Tobacco Littering

About 96 percent of the survey respondents agreed that cigarette butts should be considered litter. When asked if the respondent was a smoker, only about 13 percent indicated they smoke regularly. About 70

percent of smokers surveyed reported that they were not at all likely to litter a cigarette butt (see Figure 5-10). However, cigarette butts were the most littered item based on the visible litter survey.

Figure 5-10: Likelihood of Intentionally Dropping a Cigarette on the Road or Ground (Past or Present), Among Respondents Who Smoke



5.5 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 said no (see Figure 5-11). Further, when asked how likely it is for someone to actually get caught or fined because of littering, 84 percent of respondents said, "Not likely at all" (see Figure 5-12). Figure 5-13 provides an overview of respondents' likelihood of reacting in three specific ways to observing another person in the act of littering.

Figure 5-11: Have You or Someone You Known Been Caught or Fined for Littering

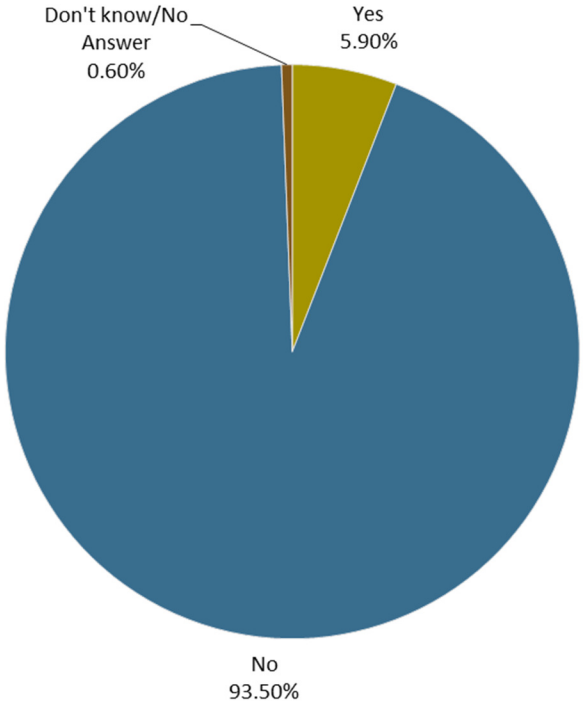


Figure 5-12: Likelihood that People Who Litter Will be Caught

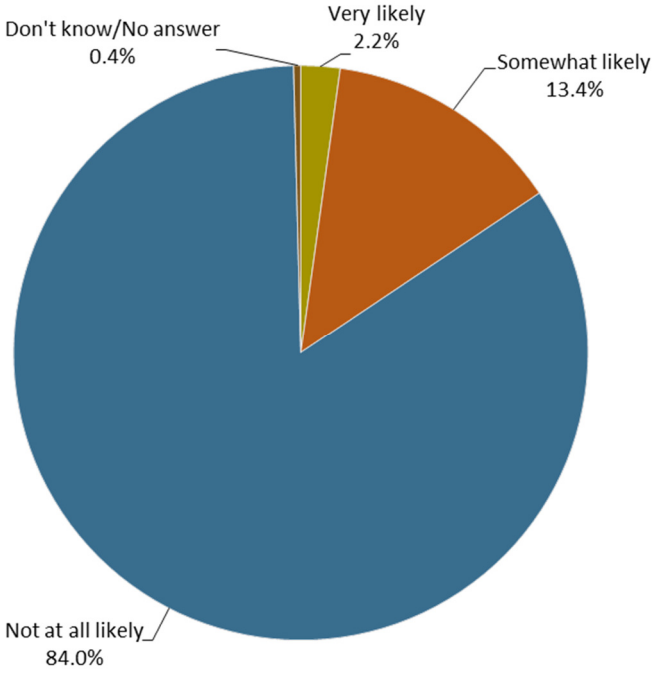
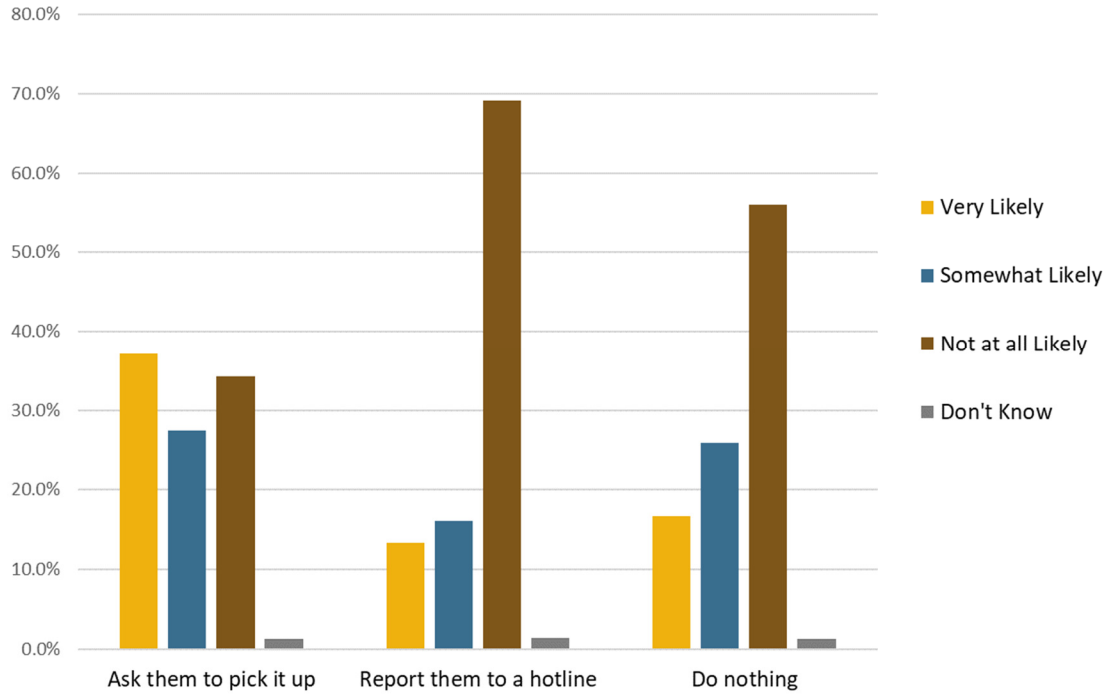
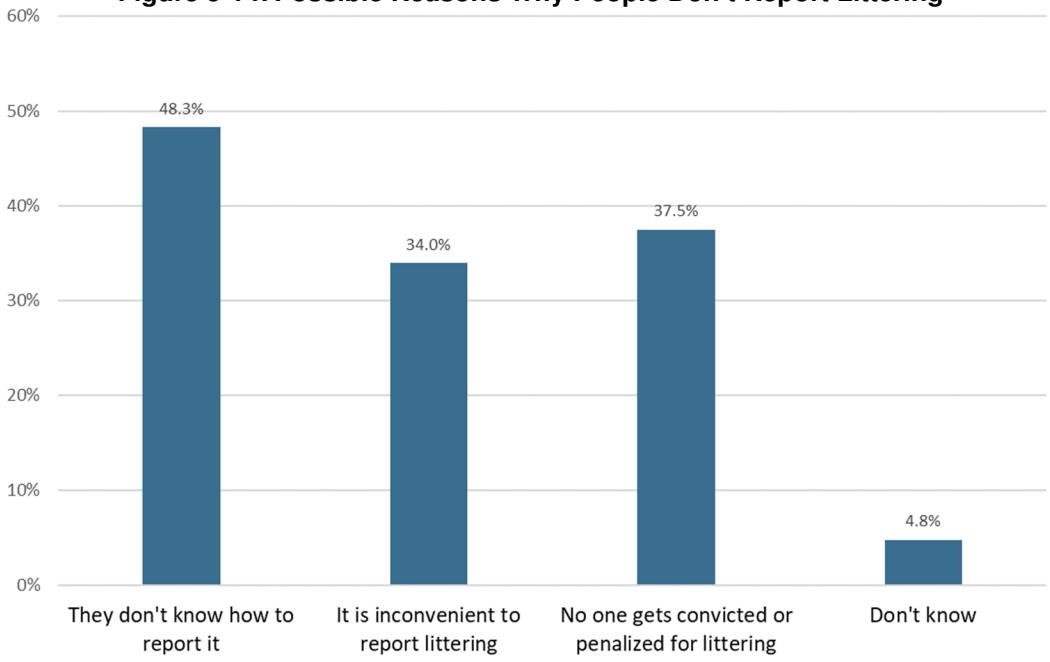


Figure 5-13: Likelihood of Reacting when Someone Litters and Possible Responses



Pennsylvania does not have a statewide hotline; however, some municipalities have local hotlines whereby citizens can report littering. The majority of survey respondents said they did not know how to report littering. Figure 5-14 shows the different reasons the survey respondents assumed other people have not or would not report littering.

Figure 5-14: Possible Reasons Why People Don't Report Littering



5.6 Litter Prevention and Abatement

About one-half of the survey respondents expressed that they could recall seeing or hearing litter prevention advertisements in Pennsylvania. Figure 5-15 provides some of the litter prevention messages seen or heard by survey respondents; and, Figure 5-16 captures the frequency respondents recalled hearing or seeing these messages.

Figure 5-15: Litter Prevention Messages Seen or Heard by Survey Respondents

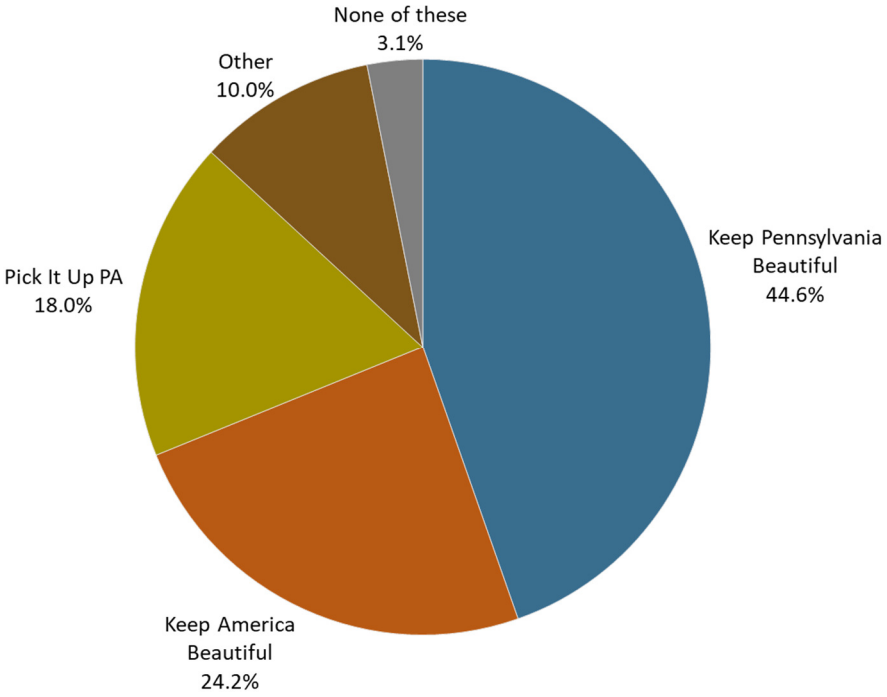
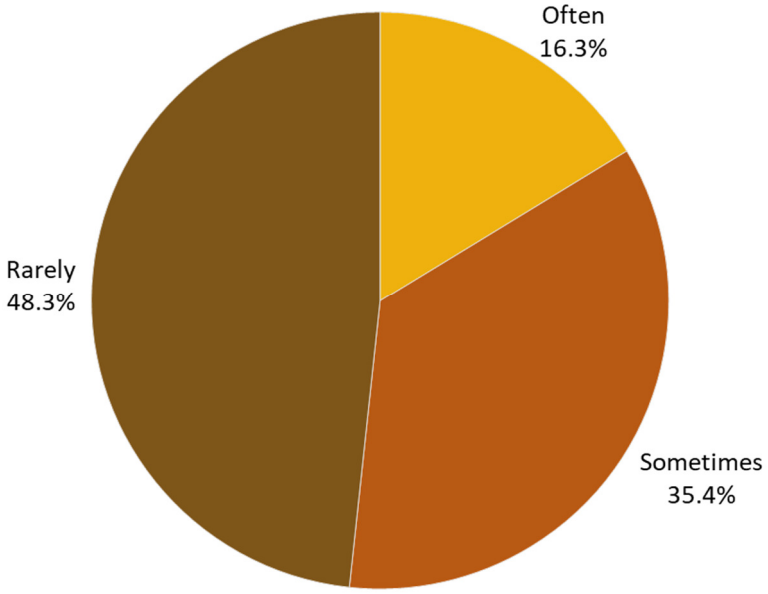
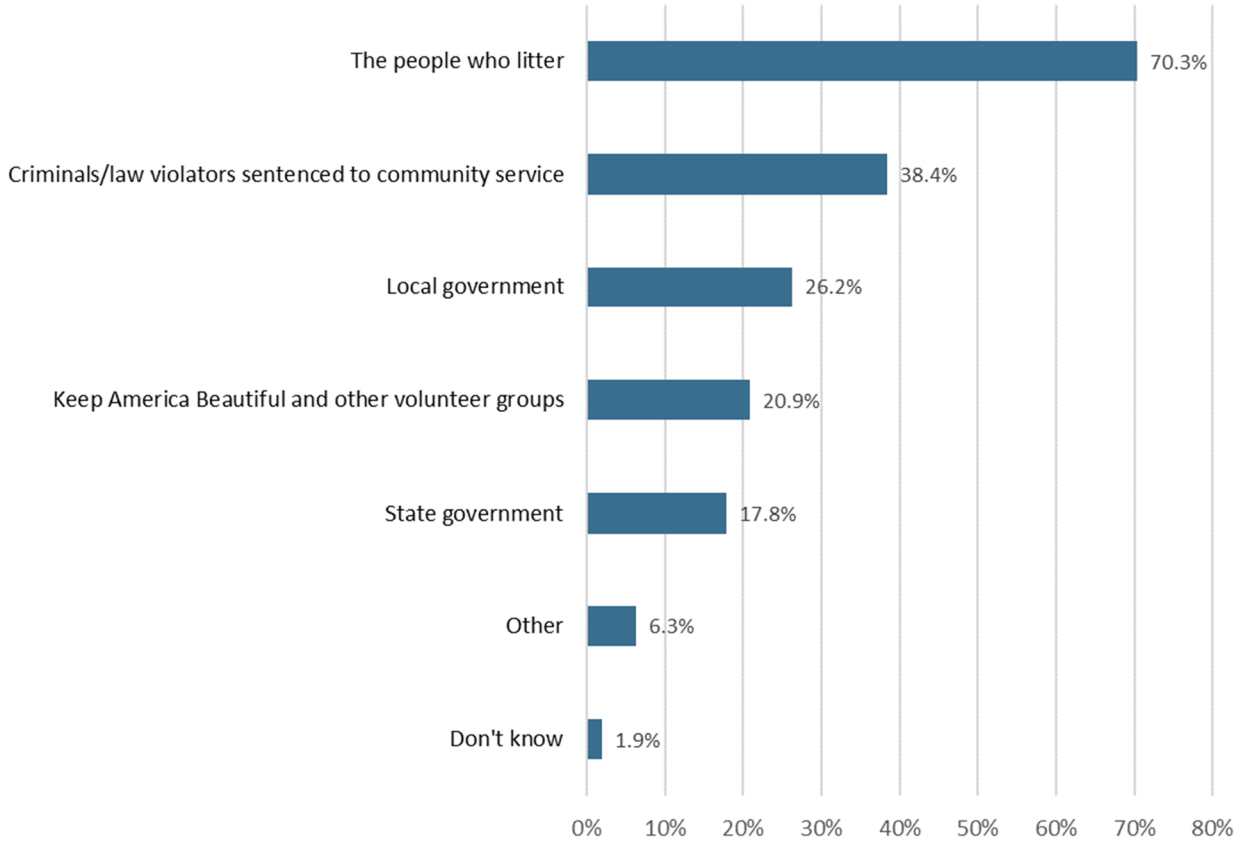


Figure 5-16: How Often Survey Respondents Hear or See Litter Prevention Messaging



About 70 percent of survey respondents feel that the people who are responsible for littering should be the ones responsible for cleaning it up (see Figure 5-17).

Figure 5-17: Who Should Clean Up Litter



5.7 Key Findings

- **Citizens believe that litter is a problem in Pennsylvania.** Over 90 percent of survey respondents reported that litter is a problem in the Commonwealth.
- **Litter negatively impacts communities.** Respondents reported that they believe the presence of litter has an impact on the environment, waterways, property taxes, home values, tourism and businesses, and safety of communities.
- **Respondents to the Public Attitude Survey, like the Visible Litter Survey, 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, plastic film, beverage containers and tobacco products are perceived to be the most commonly littered items.** Respondents reported that the primary types of litter are fast food packaging, plastic film, beverage containers and tobacco products. Their perceptions

are generally in line with the survey findings, as these four categories were among the most commonly identified litter items along roadways.

- **Respondents believe that the two primary causes of litter are: when people don't care about the effects of litter and when a convenient receptacle is not available.** Almost all survey respondents indicated they believe that it is unacceptable to litter.
- **Minimal perceived consequences for littering.** Approximately 80 percent of respondents said, "Not likely at all." when asked how likely it is for someone to actually get caught or fined for littering.
- **Respondents report only rare or no public education and outreach addressing litter.** About one-half of the survey respondents expressed that they could recall seeing or hearing litter abatement advertisements in Pennsylvania. Of survey respondents that could recall litter public education and outreach, about one-half reported such litter public education and outreach was rare.

6.0 LITTER SUMMIT

The Litter Summit held in Harrisburg, PA on November 14, 2019 brought together key stakeholders from state and local governments, non-profits and private industry to discuss the results of the Pennsylvania Litter Research Study and The Cost of Litter & Illegal Dumping in Pennsylvania a Study of Nine Cities Across the Commonwealth and solicit input regarding strategies to reduce and eradicate litter in Pennsylvania. This section provides the key findings from the Litter Summit.

6.1 Summit Attendees

The Litter Summit was attended by 124 representatives including those from state and local governments, non-profits, and private industry. The following is a list of organizations in attendance at the summit:

- Allegheny CleanWays
- Antis Township
- Baylor University
- Capital Region Water
- Central County Recycling & Refuse Authority
- City of Allentown
- City of Harrisburg
- City of Lancaster
- City of Philadelphia
- City of Pittsburgh
- City of Reading
- Clark's Creek Watershed Preservation Association
- Community Marketing Concepts
- Columbia Gas of Pennsylvania
- County of York
- Darby Creek Valley Association
- Friends of Pennypack Park
- Friends of the Riverfront
- Foundation for PA Watersheds
- Garver Foundation
- Giant Food Stores, LLC
- Joint Legislative Conservation Committee
- Juniata County Conservation District
- Keep America Beautiful
- Keep Delaware Beautiful
- Keep Georgia Beautiful Foundation
- Keep Philadelphia Beautiful
- Keep Tennessee Beautiful
- Keep Texas Beautiful
- Keep Virginia Beautiful
- Lackawanna County
- Lancaster County Solid Waste Management Authority
- Lawrence County
- Luzerne County Convention & Visitors Bureau
- McCutcheon Enterprises, Inc.
- Mercer County
- Monroe County Waste Authority
- Nestor Resources, Inc.
- Ocean Conservancy
- Overbrook Environmental Education Center
- PA Beverage Association
- PA Department of Conservation & Natural Resources
- PA Department of Environmental Protection
- PA Department of General Services
- PA Environmental Council
- PA Fish and Boat Commission

- PA Food Merchants Association
- PA Game Commission
- PA House of Representatives
- PA Liquor Control Board
- PA Recycling Markets Center
- PA Resources Council
- PA Waste Industry Association
- Partnership for the Delaware Estuary
- PennDOT
- PennEnvironment
- Penn State Extension
- Pennsylvania Downtown Center
- Perry County Conservation District
- Philadelphia Water Department
- Pocono Mountains Visitors Bureau
- PPO&S Marketing and Communications
- Republic Services Sierra Club PA Chapter
- Silver Lake Nature Center
- Tri-County Community Action
- Wawa, Inc.
- Wildheart Ministries

6.2 Overview of Summit Agenda

The results of the Pennsylvania Litter Research Study and Municipal Litter and Illegal Dumping Cost Study were presented at the Litter Summit (the Summit). Leaders from the Pennsylvania Departments of Environmental Protection, Transportation, and Conservation and Natural Resources also discussed the state impact of litter, and further presentations addressed reasons why people litter and associated behavior change, global trends in plastics and recycling, and recycling infrastructure and related industries in Pennsylvania. Attendees then participated in a facilitated discussion in small groups and live-polling to express their views and recommendations regarding statewide strategies to address litter.

6.3 Key Findings

- **Motorists and pedestrians are considered the primary sources of litter.** Summit attendees were polled as to what is the primary source of litter in terms of volume and impact. Attendees were provided the options of motorists, pedestrians, overflowing containers, unsecured loads, garbage trucks, and vehicle parts. Summit attendees, like the visible survey and public attitude survey, perceived motorists and pedestrians to be the primary sources of litter.
- **Individuals who litter and local governments should be responsible for the abatement of litter.** Summit attendees ranked litterers and local governments first and second when asked who should be responsible for abatement of litter.
- **Resources should be focused on regulations, enforcement, and infrastructure to reduce littering and illegal dumping.** The majority of Summit attendees responded that regulations and enforcement (51.7 percent) and infrastructure (37.2 percent) should be the focus for reducing littering and illegal dumping. A minority (11.1 percent) stated education should be the focus.

- **Increase awareness of litter impacts via education.** During the facilitated discussion, Summit attendees identified the need to educate the public as to the negative impacts of litter. For example, attendees stated the need to increase awareness that litter on land will end up in Pennsylvania waterways.
- **Increase funding for litter initiatives.** Summit attendees stated that additional funding was needed for enforcement personnel and infrastructure. Attendees identified levying taxes on commonly littered items as a means to provide funding to local governments.
- **Increase solid waste and recycling management and litter prevention infrastructure.** Solid waste management infrastructure (e.g., transfer stations) and recycling facilities (e.g., electronics and household hazardous waste facilities) were identified by Summit attendees as a means to decrease littering and illegal dumping. In addition, Summit attendees stated more litter receptacles and cigarette butt stations would assist with reducing litter in Pennsylvania communities.

7.0 RECOMMENDATIONS AND CONCLUSIONS

The visible litter survey, public attitude survey, and Litter Summit provided a thorough understanding of the littering issue in Pennsylvania. The following are recommendations and conclusions based on the key findings.

- **Develop Litter Education and Outreach Campaign.** Education and outreach are essential to reducing litter. The public attitude survey reported that only one-half of the survey respondents expressed that they could recall seeing or hearing litter education and outreach in Pennsylvania. Of survey respondents that could recall litter public education and outreach, about one-half reported such litter education and outreach was rare.

  The visible litter survey results enable the Commonwealth to develop a litter education and outreach campaign that targets litter overall as well as key materials (e.g., cigarette butts, plastic film, beverage containers, and fast food packaging) and sources (e.g., motorists and pedestrians). The education and outreach should be tailored by roadway type (e.g., freeways and expressways, arterial, collector, and local) and region (e.g., urban and rural) to have the most impact on littering behavior and root causes.
- **Develop Partnerships.** Approximately 502.5 million pieces of litter are on Pennsylvania roadways. As identified during the Litter Summit, partnerships are key to addressing the litter issue and root causes in Pennsylvania. Partners can provide financial assistance and/or increased awareness of the issue.

  Partners should include state and local governmental entities and community organizations that dedicate resources to combat litter in Pennsylvania (e.g., DEP, PennDOT, KPB and local public works, water, and enforcement departments). Potential partners should also include those generating the products littered (e.g., industry representatives, bottlers, brands, etc.), those that benefit from reduced litter (e.g., parks, businesses, tourism, etc.) and those that have regular interactions with the community (e.g., schools, elected officials, local entertainers, athletes, etc.).
- **Provide Assistance to Local Communities.** Litter is a major issue for communities throughout the Commonwealth of Pennsylvania. Over a third of the litter in the Commonwealth is on local roads. Local governments, KPB affiliates, and other local organizations provide litter education and outreach as well as abatement assistance to communities. Expanding the technical and financial assistance to local communities to prevent litter is essential to reducing litter in the Commonwealth. Investments in local communities can include development of school litter education programs, provision of litter prevention infrastructure (e.g., public space litter cans and

recycling bins), and facilitation of more robust solid waste and recycling infrastructure (e.g., drop-off sites and transfer stations) as well as litter enforcement.

- **Review Effectiveness of Litter Ordinances, Laws, and Statutes.** The majority of Litter Summit attendees responded that regulations and enforcement should be the focus for reducing littering and illegal dumping in the Commonwealth. Regulations are a tool to prevent (e.g., waste and recycling program requirements) and deter (e.g., litter fines) littering behavior.
  The Commonwealth with its partners should evaluate the effectiveness of current and new ordinances, laws, and statutes as it relates to reducing litter in Pennsylvania. The Commonwealth and its partners should consider regulations that target highly littered items (e.g., plastic, beverage containers, fast food packaging, and cigarette butts). The Commonwealth should also evaluate regulations as a means to fund anti-litter strategies (e.g., sales tax on highly littered items).
- **Review Enforcement of Litter Regulations.** Approximately 80 percent of public attitude survey respondents said, "Not likely at all." when asked how likely it is for someone to actually get caught or fined because of littering. The Commonwealth in collaboration with enforcement partners should evaluate why current litter regulations are not enforced. The Commonwealth should consider investments in enforcement personnel, training, and infrastructure to deter littering behavior in Pennsylvania.
- **Conduct Future Litter Research Study.** The Study provided a comprehensive understanding of the current littering behavior and root causes in Pennsylvania. The Commonwealth of Pennsylvania should conduct a future litter research study in five years to evaluate the success of strategies implemented and measure progress towards eradicating litter in Pennsylvania. Prior to conducting the next litter research study, DEP, PennDOT, and KPB should evaluate opportunities to enhance the Study such as inclusion of behavioral observations.
- **Evaluate Anti-Litter Funding Mechanisms.** Significantly reducing litter in Pennsylvania is key to a clean, beautiful, healthier, and more prosperous Pennsylvania. Investments in education and outreach, prevention, infrastructure, and enforcement are required to implement anti-littering strategies. The Commonwealth with its partners should evaluate funding mechanisms for anti-littering strategies.

APPENDIX A - MATERIAL GROUPS, CATEGORIES, AND DEFINITIONS

Material Group	Material Category	Definition	Rule for Determining 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

Material Group	Material Category	Definition	Rule for Determining Source
Paper (continued)	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

Material Group	Material Category	Definition	Rule for Determining Source
Paper (continued)	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

Material Group	Material Category	Definition	Rule for Determining Source
Paper (continued)	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**

Material Group	Material Category	Definition	Rule for Determining Source
Paper (continued)	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 or container of any size (excluding plastic cups) designed to contain soft drinks.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Single serve wine & liquor	Single serve (e.g., mini) plastic bottles or containers (excluding plastic cups) 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

Material Group	Material Category	Definition	Rule for Determining Source
Plastic (continued)	Other wine & liquor	Plastic bottles or containers (excluding plastic cups) 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 & health drinks	Plastic bottle or container of any size (excluding plastic cups) designed to contain sports and health drinks.	**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 or container of any size (excluding plastic cups) designed to contain juice.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted

Material Group	Material Category	Definition	Rule for Determining Source
Plastic (continued)	Tea & coffee	Plastic bottle or container of any size (excluding plastic cups) designed to contain 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
	Water	Plastic bottle or container of any size (excluding plastic cups) designed to contain water.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Other plastic beverage bottles or containers	Plastic bottle or container of any size (excluding plastic cups) 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

Material Group	Material Category	Definition	Rule for Determining Source
Plastic (continued)	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

Material Group	Material Category	Definition	Rule for Determining Source
Plastic (continued)	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

Material Group	Material Category	Definition	Rule for Determining Source
Plastic (continued)	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

Material Group	Material Category	Definition	Rule for Determining Source
Plastics (continued)	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 or containers 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 or container of any size designed to contain soft drinks.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted

Material Group	Material Category	Definition	Rule for Determining Source
Glass (continued)	Single serve wine & liquor	Single serve (e.g., mini) glass bottles or containers (excluding plastic cups) 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 or containers (excluding plastic cups) designed to contain wine, wine coolers, hard liquor, and other liqueurs other than single serve wine & liquor glass 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 & health drinks	Glass bottle or container of any size designed to contain sports and health drinks.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted

Material Group	Material Category	Definition	Rule for Determining Source
Glass (continued)	Juice	Glass bottle or container of any size designed to contain juice.	**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 or container of any size designed to contain tea.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Water	Glass bottle or container of any size designed to contain water.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted

Material Group	Material Category	Definition	Rule for Determining Source
Glass (continued)	Other glass beverage bottles or containers	Glass bottle or container 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	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
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

Material Group	Material Category	Definition	Rule for Determining Source
Metal (continued)	Soda	Aluminum cans of any size designed to contain soft drinks.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted
	Sports & health drinks	Aluminum cans of any size designed to contain sports and health 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 juice.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted

Material Group	Material Category	Definition	Rule for Determining Source
Metal (continued)	Tea & coffee	Aluminum cans of any size designed to contain 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 or containers	Metal bottle or container 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
	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

Material Group	Material Category	Definition	Rule for Determining Source
Metal (continued)	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 categories. May be combined with minor amounts of other materials.	**Motorists:** not compacted, roadway without pedestrian walkway **Pedestrian:** not compacted, roadway with pedestrian walkway **Overflowing Containers:** near container **Improperly secured loads:** compacted

Material Group	Material Category	Definition	Rule for Determining Source
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
	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**
	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**

Material Group	Material Category	Definition	Rule for Determining Source
Other (continued)	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 cigarettes, and reusable electronic cigarettes.	**Motorists:** roadway without pedestrian walkway **Pedestrian:** roadway with pedestrian walkway **Overflowing Containers:** near container
	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**

Material Group	Material Category	Definition	Rule for Determining Source
Other (continued)	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, headphones, adapters, power cords, and other cords.	**Motorists:** roadway without pedestrian walkway **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

Material Group	Material Category	Definition	Rule for Determining Source
Other (continued)	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

APPENDIX B - 2019 PUBLIC ATTITUDE SURVEY INSTRUMENT AND WEIGHTED RESULTS

Q1. Keep Pennsylvania Beautiful Survey Questionnaire		
Are you at least 18 years of age?		
Answer	**Frequency/Count**	**Percentage**
Yes	482	100
No	0	0

Q2. Keep Pennsylvania Beautiful Survey Questionnaire		
Which age group applies to you? (n=482)		
Answer	**Frequency/Count**	**Percentage**
18 to 24 years	72	14.9
25 to 34 years	80	16.6
35 to 44 years	70	14.5
45 to 54 years	85	17.6
55 to 64 years	82	17.1
> 65 years	93	19.3
Total	**482**	**100**

Q3. Keep Pennsylvania Beautiful Survey Questionnaire		
Are You male or female? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Male	246	51
Female	236	49
Total	**482**	**100**

Q4A. Keep Pennsylvania Beautiful Survey Questionnaire		
Do You live near a stream, river, lake, or other waterway? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Yes	328	68.1
No	150	31.2
Don't know/No answer	3	0.7
Total	**482**	**100**

Q4B. Keep Pennsylvania Beautiful Survey Questionnaire		
Do you recreate near a stream, river, lake, or other waterways? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Yes	268	55.7
No	210	43.6
Don't know/No answer	3	0.7
Total	**482**	**100**

Q5. Keep Pennsylvania Beautiful Survey Questionnaire		
In general, would you say litter is a major problem, minor problem, or not a problem at all in Pennsylvania? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Major problem	298	61.9
Minor problem	167	34.6
Not at all a problem	12	2.4
Don't know/No answer	5	1.0
Total	**482**	**100**

Q6. Keep Pennsylvania Beautiful Survey Questionnaire		
Would you say litter in streams, rivers, lakes, or other waterways in Pennsylvania is a major problem, a minor problem, or not at all a problem? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Major problem	264	54.8
Minor problem	180	37.4
Not at all a problem	15	3.1
Don't know/No answer	23	5.0
Total	**482**	**100**

Q7. Keep Pennsylvania Beautiful Survey Questionnaire						
In general, do you strongly agree, agree, neutral, disagree, or strongly disagree with the following:						
	Percentages shown (n=482)					
Answer	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Don't Know/No Answer**
Litter is an environmental problem	54.5	41.9	1.0	2.1	0.5	0.0
Litter eventually ends up in our waterways	47.9	48.1	0.8	2.5	0.1	0.7
Litter impacts my quality of life	33.2	42.2	13.7	9.6	0.8	0.5
Litter leads to increased crime	8.1	23.6	21.5	36.3	4.0	6.6
Litter poses a health & safety risk to people and animals	47.4	47.4	1.6	3.2	0.1	0.3
Litter negatively impacts tourism and businesses	41.1	45.9	6.5	4.9	0.5	1.1
Litter reduces property values	44.2	49.4	2.9	2.1	0.1	1.3
Litter causes taxes to increase because of clean-up costs	27.1	49.0	7.6	10.8	0.7	4.8

Q8. Keep Pennsylvania Beautiful Survey Questionnaire		
Where do see the most litter in Pennsylvania? (n=482)		
Answer	**Frequency/ Count**	**Percentage**
Interstates, freeways, and expressways	243	50.4
Other roads and streets	269	55.8
Streams, rivers, lakes, and other waterways	90	18.6
Recreational sports facilities, parks, and other similar public areas	104	21.6
Stadiums, concerts, festivals, and other events	92	19.2
Downtown areas	152	31.5
Public transportation areas such as bus stops and subway stations	101	20.9
Malls and shopping centers	84	17.4
Schools	55	11.3
Gas stations and convenience stores	88	18.2
Rest areas and rest stops	63	13.2
Don’t know/No answer	10	2.0

Q9. Keep Pennsylvania Beautiful Survey Questionnaire		
Based on your observation, what are the main sources of litter in Pennsylvania? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Drivers & passengers discarding trash while driving	325	67.5
People walking, running, or playing outside discarding trash	212	44.0
Pick-up trucks with loose trash in the bed of the truck	99	20.5
Garbage trucks	68	14.1
Overflowing trash cans	104	21.7
Vehicle parts such as tire tread or items from car accidents	71	14.8
Don't know/No answer	20	4.1

Q10. Keep Pennsylvania Beautiful Survey Questionnaire		
Based on your observation, what is the main type of litter in Pennsylvania? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Fast food packaging such as cups, wrappers, and bags	200	41.5
Snack food packaging such as candy wrappers and chip bags	29	6.0
Cigarette butts and tobacco packaging	61	12.7
Plastic bags such as grocery bags or garbage bags	78	16.2
Non-alcoholic beverage bottles and cans for water, soda, tea, and coffee	67	13.8
Alcoholic beverage container bottles and cans for beer, liquor, and wine	11	2.4
Foods such as apples and banana peels	3	0.5
Construction debris	9	1.9
Don't know/no answer	24	5.0
Total	**482**	**100**

Q11. Keep Pennsylvania Beautiful Survey Questionnaire		
How frequently do you see people litter? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Often	169	35.1
Sometimes	143	29.6
Rarely	133	27.6
Never	35	7.2
Don't Know/No answer	2	0.5
Total	**482**	**100**

Q12. Keep Pennsylvania Beautiful Survey Questionnaire		
Have you seen someone litter in the past year? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Yes	369	76.7
No	109	22.7
Don't Know/No answer	3	0.6
Total	**482**	**100**

Q13. Keep Pennsylvania Beautiful Survey Questionnaire		
Based on your observation, why do people litter? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Littering is more convenient than properly disposing of trash	231	48.0
No trash cans nearby	89	18.5
People don't care about the effects of litter	284	59.0
People don't know about the effects of litter	71	14.8
Don't know/No answer	9	1.9

Q14. Keep Pennsylvania Beautiful Survey Questionnaire		
Based on your observation, when have you seen people litter? (n=482)		
Answer	**Frequency/Count**	**Percentage**
When there is no trash can nearby	239	49.7
When the provided trash can is overflowing	127	26.3
When it's unclean or unhealthy to hold onto trash	76	15.8
When it's an accident	47	9.8
When the area is already littered	123	25.5
When what's thrown out is food	78	16.2
When what's thrown out is a cigarette butt	135	28.1
Never	14	2.9
Don't know/No answer	51	10.5

Q15. Keep Pennsylvania Beautiful Survey Questionnaire		
In your opinion, where is it acceptable to litter? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Interstates, freeways, and expressways	1	0.1
Other roads and streets	3	0.6
Recreational sports facilities, parks, and other similar public areas	1	0.2
Stadiums, concerts, festivals, and other events	3	0.7
Downtown areas	1	0.1
Public transportation areas such as bus stops and subway stations	0	0.0
Malls and shopping centers	0	0.0
Schools	0	0.0
Gas stations and convenience stores	5	1.1
Rest areas and rest stops	0	0.0
Nowhere	467	97.0
Don’t know/No answer	5	1.1

Q16. Keep Pennsylvania Beautiful Survey Questionnaire		
Do you consider cigarette butts to be litter? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Yes	463	96.1
No	17	3.5
Don't know/No answer	2	0.4
Total	**482**	**100**

Q17. Keep Pennsylvania Beautiful Survey Questionnaire		
What are some of the reasons you do NOT consider cigarette butts to be litter?		
Answer	**Frequency/Count**	**Percentage**
Cigarette butts are biodegradable	7	38.4
Cigarette butts are so small	4	26.2
Fire hazard to hold onto cigarettes	5	30.3
Health hazard to hold onto cigarette butts	0	0.0
Some other reason…	0	0.0
Don't know/No answer	1	8.4

Q18. Keep Pennsylvania Beautiful Survey Questionnaire		
Do you smoke cigarettes and if so, how often? Would you say every day, some days, not anymore, or I never have? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Every day	46	9.5
Some days	18	3.8
Not anymore	77	16.0
I never have	341	70.7
Don't know/No answer	0	0.0
Total	**482**	**100**

Q19. Keep Pennsylvania Beautiful Survey Questionnaire		
How likely are you/were you to drop a cigarette butt on the road or ground? Would you say you're very likely, somewhat likely, or not at all likely? (n=140)		
Answer	**Frequency/Count**	**Percentage**
Very likely	13	9.5
Somewhat likely	27	19.1
Not at all likely	99	70.6
Don't know/No answer	1	0.8
Total	**140**	**100**

Q20. Keep Pennsylvania Beautiful Survey Questionnaire		
Have you or someone you've known ever been caught or fined for littering? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Yes	29	5.9
No	450	93.5
Don't know/No answer	3	0.6
Total	**482**	**100**

Q21. Keep Pennsylvania Beautiful Survey Questionnaire		
Generally speaking, would you say males or females are more likely to litter? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Males	266	55.2
Females	30	6.3
Don't know/No answer	186	38.6
Total	**482**	**100**

Q22. Keep Pennsylvania Beautiful Survey Questionnaire		
What age group is most likely to litter? (n=482)		
Answer	**Frequency/Count**	**Percentage**
14 years and under	44	9.2
15 to 24 years	281	58.4
25 to 34 years	51	10.6
35 to 44 years	16	3.4
45 to 54 years	5	1.1
55 to 64 years	8	1.7
65 years and over	3	0.5
Don't know/No answer	73	15.1
Total	**482**	**100**

Q23. Keep Pennsylvania Beautiful Survey Questionnaire		
In your opinion, how likely are people who litter to get caught or fined for littering? Would you say very likely, somewhat likely, or not at all likely? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Very likely	10	2.2
Somewhat likely	64	13.4
Not at all likely	405	84.0
Don't know/No answer	2	0.4
Total	**482**	**100**

Q24. Keep Pennsylvania Beautiful Survey Questionnaire				
Generally speaking, if you saw someone litter, would you be very likely, somewhat likely, or not at all likely for the following:				
	Percentages Shown (n=482)			
	Very likely	**Somewhat likely**	**Not at all likely**	**Don't know/No answer**
Ask them to pick it up	37.1	27.4	34.3	1.2
Report them to a hotline	13.3	16.1	69.2	1.4
Do nothing	16.7	25.9	56.0	1.3

Q25. Keep Pennsylvania Beautiful Survey Questionnaire		
In your opinion, why do people not report littering? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Do not know how to report littering	233	48.3
It is inconvenient to report littering	164	34.0
No one gets convicted or penalized for littering	180	37.5
Don't know/No answer	23	4.8

Q26. Keep Pennsylvania Beautiful Survey Questionnaire		
Do you know how to report littering in Pennsylvania? (n=482)		
Answer	**Frequency/Count**	**Percentage**
Yes	53	11
No	426	88.5
Don't know/No answer	2	0.5
Total	**482**	**100**

Q27. Keep Pennsylvania Beautiful Survey Questionnaire		
In your opinion, who should be responsible for cleaning up litter? (n=482)		
Answer	**Frequency/Count**	**Percentage**
The people who litter	339	70.3
Criminals/law violators sentenced to community service	185	38.4
Keep America Beautiful and other volunteer groups	101	20.9
Local government	126	26.2
State government	86	17.8
Other	30	6.3
Don't know/No answer	9	1.9

Q27. Keep Pennsylvania Beautiful Survey Questionnaire		
In your opinion, who should be responsible for cleaning up litter? Additional comments (n=37)		
Answer	**Frequency/Count**	**Percentage**
Everyone	18	48.6
Property owner	4	10.8
Community/Neighborhoods	10	27.0
Homeless/people on welfare/prisoners	5	13.5
Total	**37**	**100**

Q28. Keep Pennsylvania Beautiful Survey Questionnaire		
Have you seen, read, or heard of any litter prevention messages in Pennsylvania?		
Answer	**Frequency/Count**	**Percentage**
Yes	252	52.8
No	225	47.2
Total	**477**	**100**

Q29. Keep Pennsylvania Beautiful Survey Questionnaire		
Please tell me which litter prevention messages you have seen, read, or head. (n=252)		
Answer	**Frequency/Count**	**Percentage**
Keep Pennsylvania Beautiful	129	51.2
Keep America Beautiful	70	27.8
Pick it Up PA	52	20.5
Other	29	11.3
None of the above	9	3.4

Q31. Keep Pennsylvania Beautiful Survey Questionnaire		
How frequently would you say you see, read, or hear litter prevention messages? Would you say often, sometimes, or rarely see or hear litter prevention messages media?		
Answer	**Frequency/Count**	**Percentage**
Often	40	16.3
Sometimes	88	35.4
Rarely	119	48.3
Total	**247**	**100**

Q32. Keep Pennsylvania Beautiful Survey Questionnaire		
The last set of questions is for classification purposes only. To begin, have you recycled in the past month?		
Answer	**Frequency/Count**	**Percentage**
Yes	430	89.4
No	51	10.6
Total	**481**	**100**

Q33. Keep Pennsylvania Beautiful Survey Questionnaire		
Which best describes you: I have littered recently, I used to litter, I have never littered?		
Answer	**Frequency/Count**	**Percentage**
I have littered recently	14	3
I used to litter	123	26.1
I have never littered	335	70.9
Total	**472**	**100**

Q34. Keep Pennsylvania Beautiful Survey Questionnaire		
What is your race or ethnicity?		
Answer	**Frequency/Count**	**Percentage**
American Indian or Alaska Native	1	0.2
Asian	33	6.9
Black or African American	52	10.9
Hispanic or Latino	36	7.4
White	350	72.7
Bi-racial	8	1.7
Other	1	0.2
Total	**481**	**100**

Q35. Keep Pennsylvania Beautiful Survey Questionnaire		
In what type of residence do you live?		
Answer	**Frequency/Count**	**Percentage**
House, single-detached	384	80.5
Apartment/Townhouse/Condominium	82	17.2
Mobile home	11	2.3
Total	**477**	**100**

Q36. Keep Pennsylvania Beautiful Survey Questionnaire		
Do you own or rent your place of residence?		
Answer	**Frequency/Count**	**Percentage**
Own	352	77.3
Rent	104	22.7
Total	**456**	**100**

Q37. Keep Pennsylvania Beautiful Survey Questionnaire		
What is the highest level of education that you have completed?		
Answer	**Frequency/Count**	**Percentage**
Less than High School Diploma	11	2.4
High School Diploma or GED	105	22.0
Completed Some College	66	13.9
A Two-Year Associate (Community College)	73	15.3
Bachelor's Degree	135	28.2
Masters or Law Degree	77	16.2
Doctoral Degree	9	2.0
Total	**476**	**100**

Q38. Keep Pennsylvania Beautiful Survey Questionnaire		
What was your annual household income before taxes last year?		
Answer	**Frequency/Count**	**Percentage**
Under $20,000	44	10.8
At least $20,000 but under $40,000	81	19.8
At least $40,000 but under $60,000	60	14.7
At least $60,000 but under $80,000	55	13.5
At least $80,000 but under $120,000	76	18.5
At least $100,000 but under $120,000	41	10.1
$120,000 or more	52	12.6
Total	**409**	**100**

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