

# **2018 New Jersey Litter Survey**

A Survey of Litter along  
94 Roadways

Conducted for

**New Jersey  
Clean Communities Council, Inc.**

by

**Environmental Resources Planning, LLC**

**Final Report**

**July 2018**



# ***2018 New Jersey Litter Survey***

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# ***2018 New Jersey Litter Survey***

## **Executive Summary**

In September 2017, Environmental Resources Planning, LLC (ERP) conducted a comprehensive litter survey throughout the State of New Jersey to evaluate any changes in the amount and composition of litter tallied on the same 94 sites surveyed in 2004.

The methodology used to conduct these litter surveys was the same one used in 2004 and consisted of tallying each littered item observed and making note of its material composition. This is the methodology typically used with statistically-based litter surveys conducted throughout the U.S. and Canada.

### **Methodology Overview**

The first task was to identify the locations of the original 94 sites surveyed in 2004, which had been selected using a stratified random selection process, taking roadway locales as well as population and traffic densities into account.

The site lengths and areas surveyed were the same as those used in the 2004 survey as was the size of litter tallied (all items one inch or larger). Each site was photographed and documented. Each item was characterized by item type (125 categories) and material composition. Items made of multiple materials (e.g., toys, vehicle parts and certain home articles, etc.) were classified as *Composite*. Items designated as recyclables were materials that were accepted in local recycling programs in both 2004 and 2017.

### **Litter Survey Results - Highlights**

Overall, a 53 percent reduction in litter was achieved between 2004 and 2017. In addition, 87 of the 94 sites showed reductions in litter. The most prominent components of litter from this most recent survey are shown below:

#### ***Litter by Category***

1. *Vehicle/Construction* (18.2 percent)
2. *Papers* (14.8 percent)
3. *Beverage Containers* (14.1 percent)
4. *Cups/Lids/Straws* (10.3 percent)
5. *Candy/Snack Packaging* (7.3 percent)

#### ***Litter by Item***

1. *Tire Scraps* (11.0 percent)
2. *Business/School Papers* (8.9 percent)
3. *Shrink Wrap* (4.9 percent)
4. *Plastic Water Bottles* (3.8 percent)
5. *Paper Towels/Unbranded Napkins* (3.0%)

Approximately 28.9 percent of littered items (primarily *Paper, Boxes* and *Beverage Containers*) could have been recycled in municipal curbside recycling programs throughout New Jersey.

# ***2018 New Jersey Litter Survey***

## **Introduction**

In September 2017, Environmental Resources Planning, LLC (ERP) conducted a comprehensive litter survey throughout the State of New Jersey. The purpose of this survey was to gauge the amount and composition of litter along roadways and how litter rates have changed since the previous survey was conducted in 2004.

The methodology used to conduct these litter surveys consisted of tallying each littered item observed and making note of its material composition. This is comparable to the methodology used with most litter surveys conducted throughout the U.S. and Canada.

### **Methodology Overview**

The first task was identifying the locations of the original 94 sites surveyed in 2004, which had been selected using a stratified random selection process, taking roadway locales as well as population and traffic densities into account.

The site lengths and areas surveyed were identical to the 2004 survey, as was the size of litter tallied (items one inch or larger). Surveyors have been trained to spot litter by size, a process that takes time to develop such expertise. Items smaller than one inch were not counted for several reasons that are particularly insightful when considered together.

1. Since one of the goals of this survey was to compare data with a similar survey conducted in 2004, it was important to use the same methodology, which entailed only counting items one inch or larger rather than using a larger size cutoff such as two inches.
2. Counting items smaller than one inch would have understated the impact of larger pieces of litter more prominently observed in this survey such as tires, boxes, shrink wrap, napkins as well as food and beverage packaging.
3. Tallying every piece of litter along the 1.1 million square feet surveyed, regardless of how small each piece was, would take an inordinate amount of time and would have required a significantly higher budget.
4. Items smaller than one inch are typically shredded pieces of larger litter or pieces broken off of larger litter. These items are usually represented by pieces that are about one inch in size.
5. The smaller the littered item, the more difficult it is to determine what the item was originally. It is not unusual to find litter that has been mowed into very small pieces. Very small, torn pieces of paper or plastic may have been a piece of various items. The time spent trying to identify these tiny pieces of litter would also have substantial impacts on the project budget.

# ***2018 New Jersey Litter Survey***

This being said, as microplastics continue to become of more interest, obtaining this level of data could be useful. One way to address this issue is to select a subset of the sites to conduct a detailed survey of very small pieces of litter in the future. Although the specific characteristics of each item may be difficult to discern, the material itself would be self-evident and would provide useful data about items that could eventually become microplastics.

Two field crews conducted this survey, starting on Monday, September 18<sup>th</sup> and completing it at the end of the day on Thursday, September 21<sup>st</sup>. Each day, surveys were to begin no earlier than sunrise and were to be completed before the twilight that precedes sunset. Each site was photographed and documented. Each item was characterized and recorded by item type and material composition. Items made of multiple materials (e.g., toys, vehicle parts and certain home articles, etc.) were classified as *Composite*. Items designated as recyclables were materials accepted in local recycling programs throughout New Jersey in both 2004 and 2017 for comparative purposes.

## **Roadways - Litter Survey**

### **Roadways - Sampling Methodology**

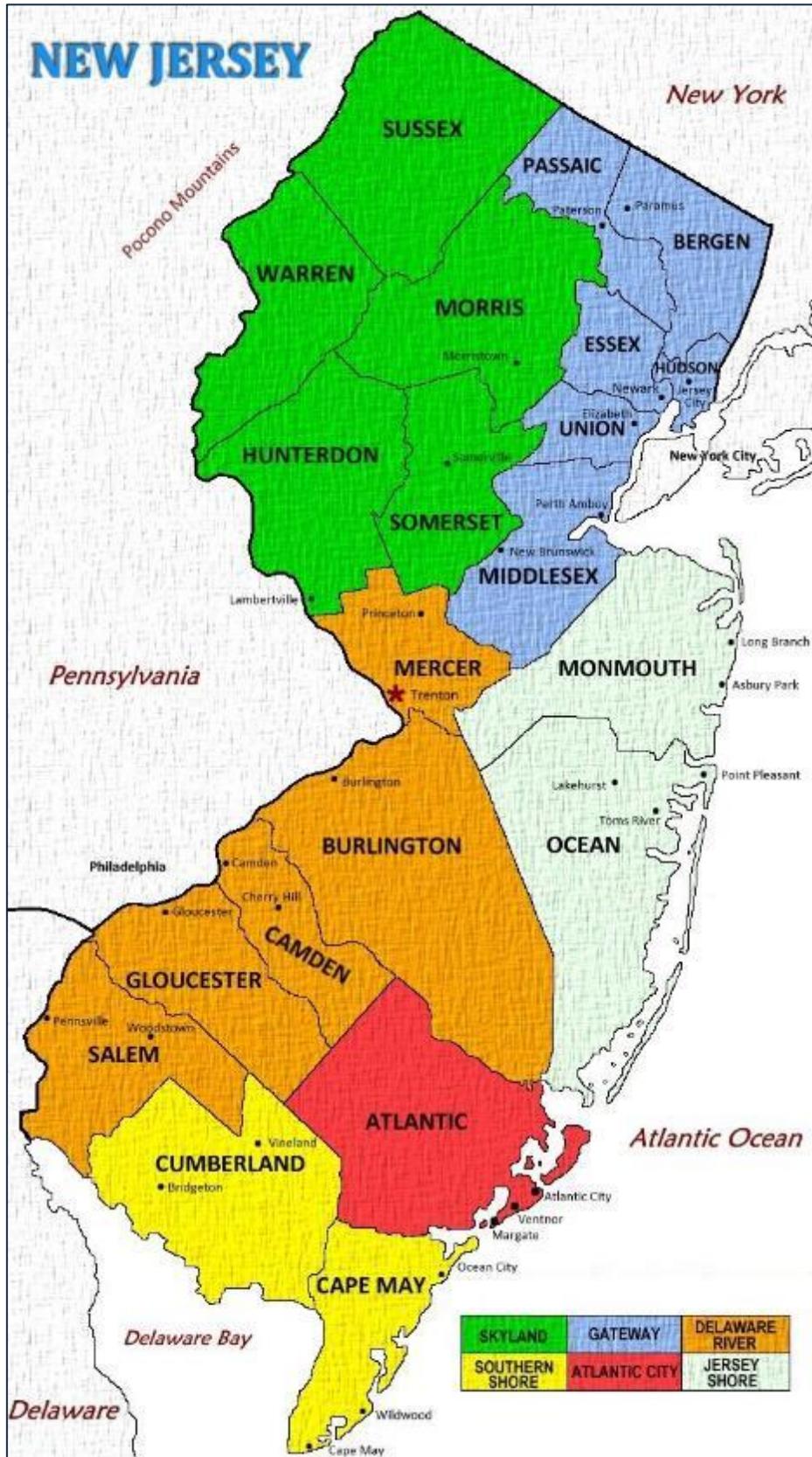
The first task was determining which sites would be surveyed. It was decided that a re-survey of the same sites surveyed in 2004 would provide unique insights into changes in litter rates and patterns over the past 13 years. Since the original 94 sites had been chosen based on a stratified random selection process, comparisons of the data from 2004 and 2017 would be statistically credible.

As in 2004, items one inch or larger were tallied and characterized by type of item and material composition. The categories from 2004 were used as roll-ups, while the number of detailed categories was expanded to 125 different items. Site lengths for each site were identical to the lengths surveyed in 2004. The optimal width was 18 feet.

Items made of multiple materials (e.g., toys, vehicle parts and certain home articles, etc.) were classified as *Composite*. Items designated as recyclables included only those materials accepted in local recycling programs in 2004 and 2017.

Litter was characterized and analyzed by type of item, material, locale, county and region. The regions breakdown is shown in Figure 1.

# 2018 New Jersey Litter Survey



**Figure 1 - Map of New Jersey by Region**

# ***2018 New Jersey Litter Survey***

Each site was photographed and documented. Each item was characterized by material composition. *Misc. Paper* and *Misc. Plastic* refer to unidentifiable items that have typically been mowed over and/or weathered so that the exact product type is uncertain.

Data records from the National Climatic Data Center were reviewed and indicated that no major weather events had occurred in New Jersey within the 30-day period preceding this litter survey, although there was light rain during the first two days of surveying.

All roadways were originally classified by locales: discrete roadway types that each exhibit specific litter profiles. The number of sites represented in each locale is based, in part, on factors such as population density, traffic levels and roadway mileage and the proportion of motorist or pedestrian exposure to each. Those locales are defined below.

1. Rural Freeways and Tollways (RFT): Interstate highways, non-interstate toll roads and limited access highways located outside of urban areas.
2. Other State Rural Highways (OSR): U.S. and state highways located outside of urban areas without limited access.
3. Rural Local Roads (RLR): Public roads outside of an urban area that are maintained by a city, county, borough, township, etc.
4. Urban Freeways and Tollways (UFT): Interstate highways, non-interstate toll roads and limited access highways located within an urban area.
5. Vacant, Industrial or Unmaintained Street Frontages (VIU): The edge of an urban street in front of a vacant lot, an unmaintained industrial site or a lot with a building in disrepair and receiving no upkeep.
6. Commercial Street Frontage (COM): The edge of an urban street in front of a store, mall, restaurant, or other place of public business.
7. Public Facility Street Frontage (PUB): The edge of an urban street in front of a park, stadium, school, courthouse, public library, police station, or other government or quasi-public use building or facility.
8. Residential Street Frontage (RES): The edge of an urban street in front of residences, typically along neighborhood streets.
9. Water-Related (WAT): The edge of a street directly adjacent to a beach or waterway. These are considered special research sites.

# 2018 New Jersey Litter Survey

## Analysis

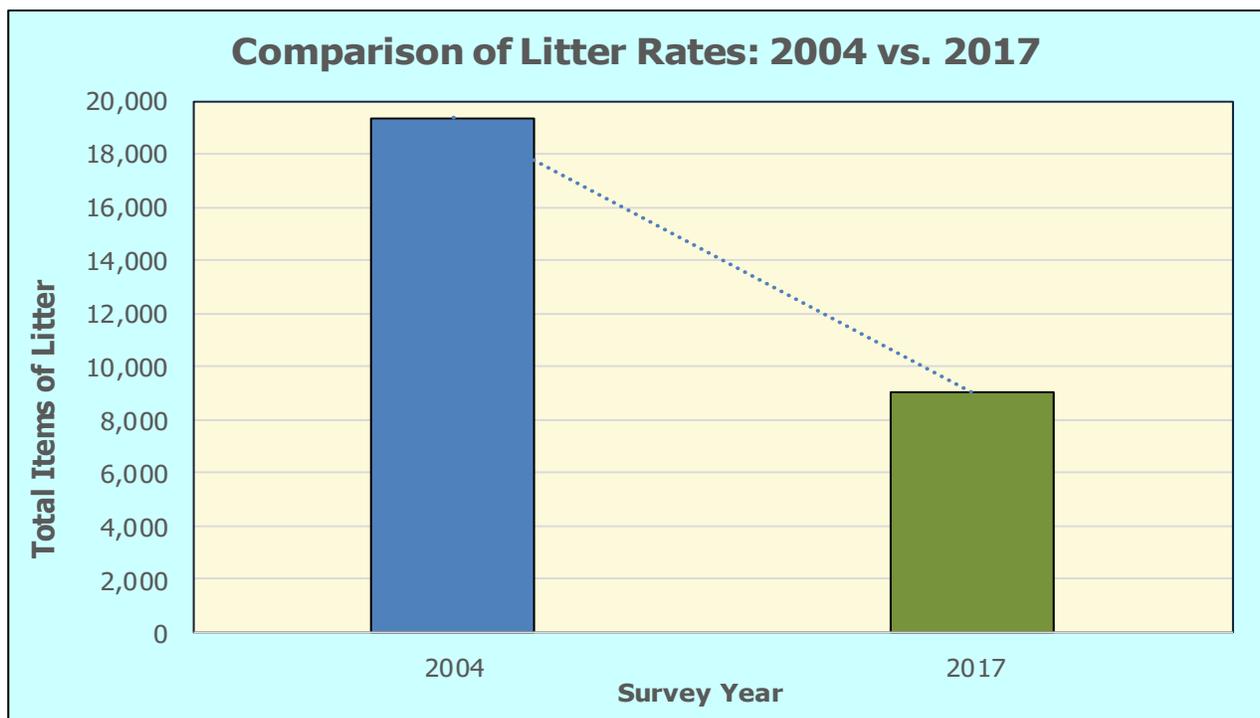
When the 2004 survey was conducted, in addition to the raw data, certain factors that are known to influence observed litter rates were applied. These include proximity to densely populated areas, traffic volume and recent weather conditions prior to the survey. For this follow-up study, it was deemed more useful to compare the raw data from this survey to the raw data from the 2004 survey. The results from these two surveys are comparable since both were conducted in transitional seasons (fall and spring) when children were in school, vacation months were not in play, leaves had not fallen significantly and the ground was free of snow.

## Litter Survey Results

Changes in litter rates were examined from a number of different perspectives and the 94 sites were assigned to categories (e.g., locale type, county, region) for the purpose of making these comparisons. In each case, the mean count of littered items was calculated for each category. Where appropriate, tests were performed to determine if observed differences in litter rates were statistically significant.

## Statewide

A total of 9,016 littered items were tallied on the 94 sites, or an average of about 96 items per site. This was a 53 percent reduction compared to 2004, which had yielded a total of 19,349 items or 206 items per site. This change was observed throughout New Jersey as 87 of the 94 sites (93 percent) showed a reduction in litter.



**Figure 2 - Comparison of Overall Litter: 2004 and 2017**

# 2018 New Jersey Litter Survey

## Litter by Locale Type

Litter was reduced in all locale types as shown in Table 1. Outside of the two special waterway sites, the highest reductions were observed in the two types of state roads (OSR and RLR).

**Table 1 - Litter by Locale Type**

Locale	Sites	2017	2004	Change	Percent
COM	11	917	2,010	(1,093)	(54) %
OSR	8	652	2,249	(1,597)	(71) %
PUB	13	500	1,462	(962)	(66) %
RES	22	820	2,436	(1,616)	(66) %
RFT	9	1,462	2,281	(819)	(36) %
RLR	11	799	2,727	(1,928)	(71) %
UFT	9	2,544	3,369	(825)	(24) %
VIU	9	1,306	2,505	(1,199)	(48) %
WAT	2	19	312	(293)	(94) %

## Litter by Region

The 94 surveyed sites were classified by one of six regions (shown in Figure 1). The regions and the counties they include are: Atlantic City (Atlantic), Delaware (Burlington, Camden, Gloucester, Mercer and Salem), Gateway (Bergen, Essex, Hudson, Middlesex, Passaic and Union), Jersey Shore (Monmouth and Ocean), Skyland (Hunterdon, Morris, Somerset, Sussex and Warren) and Southern Shore (Cape May and Cumberland).

After the litter counts were calculated for each site, the data was averaged by region. Although all regions showed reductions in litter, there are considerable differences in the percentage of litter reduced. Atlantic City shows the highest reduction (81 percent), while Delaware, Jersey Shore and Southern Shore also showed significant reductions in litter. Gateway and Skyland showed overall reductions as well although each of these two regions had at least one site that was considerably more littered than in 2004.

**Table 2 - Litter by Region**

Region	Sites	2017	2004	Change	Percent
Atlantic City	3	154	799	(645)	(81) %
Delaware	16	1,186	3,731	(2,545)	(68) %
Gateway	43	4,740	8,438	(3,698)	(44) %
Jersey Shore	14	1,136	3,236	(2,100)	(65) %
Skyland	13	1,384	1,916	(532)	(28) %
Southern Shore	4	365	1,075	(710)	(66) %

# 2018 New Jersey Litter Survey

## Litter by County

When the data is broken down further, 18 of the 21 counties showed significant reductions in litter. As shown in Table 3, only three counties showed increased litter at the sites surveyed in 2004: Hudson, which included two of the most littered sites in 2017; Hunterdon, which had only one site; and Morris, which included one of the most littered sites in 2017.

Changes in litter are more meaningful for those with a larger number of sites allocated to them. Still, reductions in litter were reflected in 85 percent of the counties. The increase in Morris County was attributable to one outlier, while the increase in Hudson County was attributable to two outliers. The increase in Hunterdon reflected the results of just one site.

**Table 3 - Changes in Litter by County**

County	Sites	2017	2004	Change	Percent
Atlantic	3	154	799	(645)	(81) %
Bergen	10	496	1283	(787)	(61) %
Burlington	3	125	332	(207)	(62) %
Camden	5	354	1409	(1,055)	(75) %
Cape May	2	156	617	(461)	(75) %
Cumberland	2	209	458	(249)	(54) %
Essex	7	425	878	(453)	(52) %
Gloucester	3	208	792	(584)	(74) %
Hudson	6	1,830	1,140	690	61 %
Hunterdon	1	132	102	30	29 %
Mercer	4	408	1,009	(601)	(60) %
Middlesex	10	1,299	2,921	(1,622)	(56) %
Monmouth	8	487	2,189	(1,702)	(78) %
Morris	6	991	935	56	6 %
Ocean	6	649	1,047	(398)	(38) %
Passaic	6	399	1,276	(877)	(69) %
Salem	1	91	191	(100)	(52) %
Somerset	3	96	297	(201)	(68) %
Sussex	2	139	397	(258)	(65) %
Union	7	481	810	(329)	(41) %
Warren	1	26	106	(80)	(75) %

# 2018 New Jersey Litter Survey

## Litter - Largest Components

The 10 components of litter most frequently found in New Jersey litter during this survey were *Tire Scraps*, *Paper*, *Shrink Wrap*, *Sweet Snack Packaging* and *Plastic Water Bottles* as shown in Table 4. These 10 components constituted 47.1 percent of all litter in New Jersey.

**Table 4 - Litter - 10 Largest Components**

#	Item	Percent
1	Tire Scraps	11.0%
2	Business/Home/School Papers	8.9%
3	Shrink Wrap	4.9%
4	Sweet Snack Packaging	4.7%
5	Plastic Water Bottles	3.8%
6	Unbranded Paper Napkins & Towels	3.0%
7	Tobacco Packaging & Accessories	3.0%
8	Corrugated Boxes	2.9%
9	Block Foam Packing	2.7%
10	Hard Plastic Cups	2.2%

Once litter components were rolled-up by product type, *Vehicle and Construction Debris* (18.2 percent) was the most prevalent type of litter, followed by *Paper* (14.8 percent) and *Beverage Containers* (14.1 percent) as shown in Table 5.

**Table 5 - Litter by Category**

Item	Percent
Vehicle/Construction	18.2%
Paper	14.4%
Beverage Containers	14.1%
Cups/Lids/Straws	10.3%
Candy/Snack Packaging	7.3%
Other Items	5.9%
Shrink Wrap/Dry Cleaner Wrap	4.9%
Bags	4.9%
Take-Out Food Packaging	4.6%
Napkins/Tissues	4.4%
Packing Materials	4.1%
Tobacco-Related	3.0%
Cloth/Fabric	1.6%
Beverage-Related	1.4%
Hm Food Pkg	0.8%
Other Metal	0.2%

# 2018 New Jersey Litter Survey

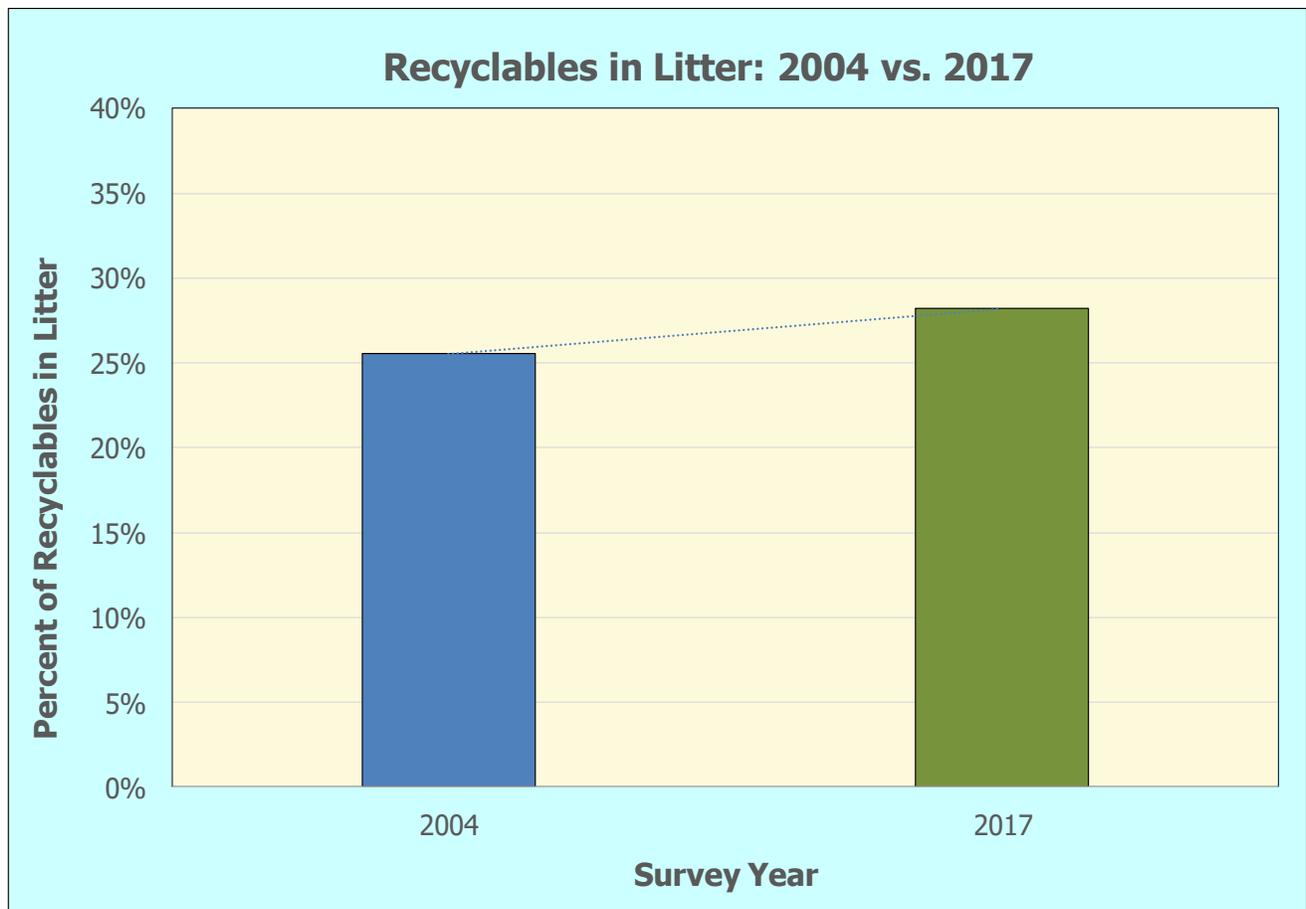
## Recyclables in Litter

Although the number of recyclables littered was reduced from 2004 to 2017, they now comprise a higher percent of overall litter in 2017 (28.9 percent) compared to 2004 (25.5 percent) as shown in Figure 3. For the purposes of this comparison, the items evaluated were those that were acceptable as curbside recyclables in both 2004 and 2017.

The largest components of these recyclables in 2017 were *Beverage Containers*, *Business Papers* and *Corrugated Boxes*.

*Beverage Containers* were slightly higher as a component of litter (from 13 percent to 14.1 percent). The remaining recyclable items, mostly papers, rose from 12.6 percent in 2004 to 14.8 percent in 2017.

Certain additional items, such as plastic containers with the recyclable designation of #3-#7, have been added to curbside recycling in some communities since 2004. Those items comprised less than 1 percent of litter in 2017. Since they are not universally accepted in curbside recycling programs, they were excluded from this particular analysis.



**Figure 3 - Recyclables in Litter: 2004 and 2017**

# 2018 New Jersey Litter Survey

## Litter by Material

In terms of composition, litter was predominantly *Plastic* (39 percent) or *Paper* (24 percent) items as shown in Figure 4. The largest components of *Plastic* were *Shrink Wrap* (4.9 percent), *Sweet Snack Packaging* (4.7 percent) and *Plastic Water Bottles* (3.8 percent).

The components of *Paper* were mostly *Business/School Papers* (8.9 percent) and *Paper Towels/Unbranded Napkins* (3.0 percent), which - consistent with other recent surveys - tended to be clean. *Rubber* items consisted solely of *Tires* and *Tire Scraps*. *Metal* items were predominantly *Beer Cans* (1.6 percent) and *Foil Food Wrappers* (1.4 percent).

Most of the *Foam* items tallied were pieces of discarded construction insulation that constituted 46 percent of all foam materials tallied in 2017. Composite materials were dominated by *Tobacco Packaging* (3.0 percent).

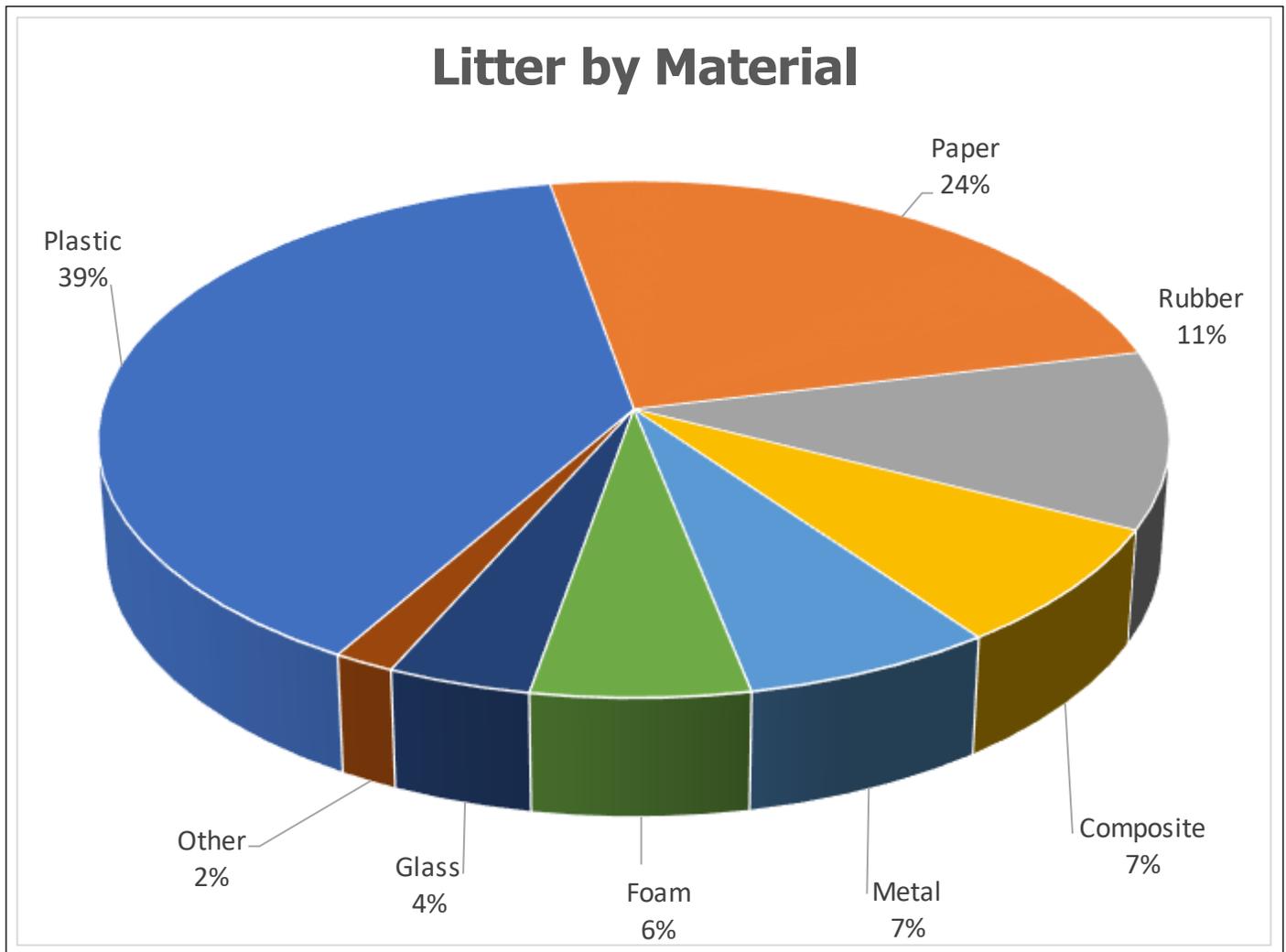


Figure 4 - Litter by Material

# ***2018 New Jersey Litter Survey***

Figure 5 shows litter at a vacant/industrial site in Union County.



**Figure 5 - VIU Site in Union County**

## ***2018 New Jersey Litter Survey***

Figure 6 shows litter on the side of an urban freeway in Essex County.



**Figure 6 - UFT Site in Essex County**

# ***2018 New Jersey Litter Survey***

Figure 7 shows litter found in front of Roosevelt Park in Cumberland County.



**Figure 7 - PUB Site in Cumberland County**

# 2018 New Jersey Litter Survey

## Litter Targeting Analysis

The likely sources of tallied litter were determined using an observation-correlation approach in which hundreds of littering incidents were studied by the type of item littered, whether it was deemed intentional or accidental and the likely age grouping of the litterer.

This sampling was then measured against studies in which the age of the litterers was known and closely corresponded to the incidents observed. Once this correlation was established, it was applied to the litter tallied in the 2017 litter survey and yielded the targets noted in Table 6 below.

To create more concise and accessible results, the estimate of litterers by age was broken down into age groupings and by deliberate vs. accidental littering incidents. Table 6 compares the groupings between 2004 and 2017. Although there are slight changes in the littering profiles, deliberate littering tends to be more of an issue for those aged 11-34, while accidental littering continues to be an issue for those up to age 54.

Littering education is more effective when the age groups with the higher percentages are contiguous, providing a clearer focus. While this tends to work well with deliberate litterers, it is not as useful with accidental litterers.

**Table 6 - Target Age Groups**

2017			2004		
Group	Deliberate	Accidental	Group	Deliberate	Accidental
<11	5.1%	3.4%	<11	8.5%	6.1%
11-17	23.9%	7.9%	11-17	25.8%	9.1%
18-24	24.3%	11.4%	18-24	29.0%	14.3%
25-29	11.3%	11.4%	25-29	10.2%	9.8%
30-34	10.4%	15.7%	30-34	8.2%	14.5%
35-39	4.8%	16.4%	35-39	2.6%	15.0%
40-44	5.5%	13.3%	40-44	3.0%	11.4%
45-54	10.0%	12.1%	45-54	9.5%	13.4%
55+	4.6%	8.3%	55+	3.0%	6.4%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>Total</b>	<b>100%</b>	<b>100%</b>

Target:            69.9%            80.3%

Target:            65.0%            78.4%

## Statistical Tests

A series of correlation analyses were run to evaluate whether the proximity of convenience stores, fast food restaurants, commercial establishments, public facilities, bus stops, construction sites, landscaped areas or solid waste facilities was associated with the amount of litter found at the sites surveyed.

# 2018 New Jersey Litter Survey

A correlation analysis is a type of statistical test that yields a correlation coefficient, a number (statistic) used to measure the strength of a relationship between two variables.

The most common type of correlation is the Pearson Product Moment Correlation, which examines the linear relationship between two sets of data and is the one used in this analysis.

A correlation coefficient can be positive or negative but is never less than -1 and is never greater than +1. A positive correlation means that high scores on one variable are associated with high scores on the other variable, while low scores on one are associated with low scores on the other. On the other hand, a negative correlation means that high scores on one variable are associated with low scores on the other.

A correlation of zero, or close to it (either positive or negative), suggests that there is little or no relationship between the variables. Any result between -0.1 and 0.1 would typically be considered very weak. Even results between 0.1 and 0.3 (positive or negative) would usually be considered weak. The closer you get to +1 or -1, the stronger the relationship.

However, the statistical significance of such a result would also depend on the size of the sample (that is, the number of measurements). A coefficient of +1 or -1 is almost never obtained in practice. For example, you could achieve a -1 by comparing individuals ages in years with the number of years left until each might reach the age of 120 (since one variable immediately and perfectly determines the other, but in the opposite direction).

**Table 7 - Statistical Test Results**

Factor Evaluated	Corr.	% Sites
Shopping Stores	-0.10	29%
Public Buildings	-0.11	23%
Receptacles	-0.09	14%
Bus Stop	-0.03	11%
Convenience Stores	-0.01	10%
Fast Food Est.	-0.08	10%
SWM Facilities	0.00	3%
Construction Sites	-0.06	1%

These data points suggest that intervening dynamics may be in place. For instance, in response to public pressure over time, some stores and fast food establishments clean up litter around their establishment, while the items or packaging purchased may be littered in other areas. However, they may not be able to clean up enough to create a completely litter-free environment. If they had, that particular score would have been closer to -1.00. Even a .4 or -.4 would have suggested some kind of relationship between a given factor and the amount of litter observed at the site. In addition, it's helpful to note that many of the sites were not in areas where these potential factors were found.

# ***2018 New Jersey Litter Survey***

## **Broader Study Aspects**

The scope of this project was broadened to include development of a curriculum focused on litter surveying and abatement. This curriculum was designed by a project team that included the New Jersey Clean Communities Council (NJCCC), Environmental Resources Planning, LLC (ERP) and Rutgers Office of Continuing Professional Education. It is being used to train county and municipal coordinators, students and other interested stakeholders and teach them how to conduct their own follow-up litter surveys, analyze data and, based on the resulting data, develop and implement plans that will effectively reduce litter. It will be based on Visible Litter Survey (VLS) procedures.

Coordinators have participated in regional training workshops to earn continuing education credit hours and attended regional events to learn the fundamentals on how to conduct a survey and train volunteers.

A plan of action is required that includes a mission statement, project goals and objectives, research (litter survey), analysis of data, implementation of a project or program developed to solve the litter problem, and project evaluation.

This will be the key for the NJCCC to formulate a long-term plan of action, as it plots a strategy to significantly reduce the amount of statewide litter over the next 10 years. The survey would also help establish program standards, in which Clean Communities Coordinators and other supporters will attend training workshops, survey field sites, document the results and submit final reports. Each coordinator must submit a final report that identifies litter observed at their site. It will be graded based on the applicability of the program proposed to reduce litter at that site.

Another aspect of this project consisted of ensuring that a litter app was available for community volunteers to input litter data while conducting field surveys. Bergen County GIS Specialist, Kathryn McSorley, led the effort to develop this GIS app with input from NJCCC and ERP. The app will also allow volunteers to record the ambient conditions that may affect littering rates at each site.

In addition, Just Right TV has been tasked with documenting this project through film and photos. A professional short has already been produced and distributed.

This New Jersey project is unique in its broad scope and will provide county and municipal Clean Communities coordinators, as well as local community volunteers, with unprecedented tools that will allow them to be integrated more deeply into New Jersey's litter abatement efforts along with the ability to have access to litter survey professionals for guidance.

Specific enforcement strategies are addressed in the Recommendations section as part of a broader and more comprehensive litter abatement program. While enforcement is just one tool in a successful litter abatement program, without some level of enforcement in the areas noted, the message received by residents and commercial enterprises will be that litter abatement is not a high priority for New Jersey and its communities.

## ***2018 New Jersey Litter Survey***

The NJ Department of Transportation (NJDOT) notes that the reduction in litter observed on state highways is likely attributable to a number of factors, but that three specific initiatives contributed most to this accomplishment:

1. Expanded use of New Jersey Inmate workers to regularly patrol and clean New Jersey's interstate and major state roads. Over the last several years NJDOT has nearly doubled the use of this resource to clean major portions of our roadway system. Currently NJDOT has funding in place to have up to 10 crews with 10 inmates each (100 inmates) working nearly full time to pick up litter.
2. Enhanced effort by NJDOT Operations crews. In the last six years the NJDOT Highway Operations Crews have made a much more concerted effort to keep their sections of roadway free of litter and debris.
3. Expansion of the volunteer Adopt-a-Highway (AAH) program. NJDOT has renewed its partnership and relationship with NJCCC to expand the AAH program. AAH promotes the cleanup of state roadways by volunteers, and in conjunction with Inmate Labor and Operation crews, contributes to the cleanliness of state roads and calls attention to the need to keep the state clean.

Over the last six years the collective efforts from NJDOT crews, Adopt-a-Highway teams and Inmate details have picked up between 3.5 tons to 5 tons of litter annually. There are still littered areas that need to be addressed, but the data from this survey shows that their efforts are paying off.

# ***2018 New Jersey Litter Survey***

## **Conclusions**

Jurisdictions within the State of New Jersey have significant litter abatement, recycling and waste diversion programs in place that have proven to be effective.

- Between 2004 and 2017, litter statewide was reduced by 53 percent. This reduction was broadly seen throughout New Jersey: in all regions, all locales, 18 of its 21 counties and 93 percent of the sites surveyed.
- Reductions in litter may be the result of statewide programming in place since 2004. Since 2004, NJCCC has re-established the state Clean Communities program. With a solid funding base provided by the Clean Communities Act, NJCCC has strengthened its network of Clean Communities coordinators, established a coordinator training program through Rutgers Office of Continuing Professional Education, and set up an online statistical report system designed to track the progress of local programs. NJCCC has partnered with the state departments of Environmental Protection and Transportation to administer the Adopt-a-Beach and Adopt-a-Highway programs, encouraging the volunteer cleanup of public lands. Based on information provided by the 2004 Litter Survey, NJCCC implemented a Slam Dunk the Junk campaign to reduce litter in urban communities.
- *Vehicle and Construction Debris* (18.2 percent) represented the category of most littered items in this survey, followed by (14.8 percent).
- *Tire Scraps* (11.0 percent) and *Business/School Papers* (8.9 percent) were the most littered individual items.
- *Plastic Shrink Wrap* (4.9 percent) was the third most littered item. It is reasoned that much of this light weight material originates from insufficiently tarped or secured construction dump trucks, tractor trailers and open-bed vehicles.
- *Plastic Water Bottles* (3.8 percent) was the most littered type of *Beverage Container*.
- A significant portion of littered items (28.9 percent) would have been recyclable before they were littered. These were predominantly *Beverage Containers*, *Business Papers* and *Boxes*.
- Pedestrians and motorists between the ages of 11 and 34 were found to be the most likely to intentionally litter in New Jersey, accounting for nearly 70 percent of all deliberate litter.

# ***2018 New Jersey Litter Survey***

## **Recommendations**

The following recommendations can contribute to more effective litter abatement in New Jersey.

- Develop programs to address the most littered items and outreach to the identified age groups of litterers.
- Focus litter abatement efforts on sites that still show high amounts of litter and other hotspots that have also been identified.
- Dedicate resources to remove *Tire Scraps*, the most littered item in 2017.
- Continue to forge litter abatement partnerships that include all stakeholders such as governmental entities, NGOs and industry. Anti-littering efforts that exclude stakeholders limit their opportunity for successful litter abatement considerably.
- Continue promoting programs such as Adopt-a-Highway and Adopt-a-Beach. Ensure that relevant metrics (such as the bags of litter collected and the most frequently found items) are tracked. This will help to direct the focus of litter abatement programs more effectively.
- Monitor and enforce littering violations caused by trash and recycling collection vehicles when these vehicles are improperly secured during the collection and transportation process.
- Track number of citations issued vs. number of fines paid. This will give an idea of the importance both law enforcement and the judiciary system place on the seriousness of litter. Income from fines and enforcement actions should go directly into municipal and county Clean Communities accounts.
- Monitor and enforce proper trash setouts. Improper setouts were observed spreading litter while this survey was being conducted.
- Expand the use of hidden cameras in areas where wide-spread littering and illegal dumping occur. This will allow officials to record the license plates of offending vehicles for enforcement activities.
- Ensure that all funds generated by material restriction taxes or fees continue to be dedicated solely to litter abatement programs.
- Ensure that recycling carts continue to replace open-top recycling bins, which will help reduce residential litter.
- Consider amendments to the 2008 Clean Communities Program Act that will support recommendations and ensure a stable future for New Jersey Clean Communities.

# ***2018 New Jersey Litter Survey***

## **Appendix**

Appendix A - Litter by Item, Material and Percent

Appendix B - Litter Categories and Descriptions

Appendix C - List of Roadway Sites

Appendix D – GIS Map of All Sites

Appendix E - Firm Qualifications

# 2018 New Jersey Litter Survey

## Appendix A - Litter by Item, Material and Percent

Litter Category	Percent
Vehicle - Rubber	11.0%
Other Paper - Paper	8.9%
Shrink Wrap - Plastic	4.9%
Sweet Snack Packaging - Plastic	4.7%
Water Bottles - Plastic	3.8%
Unbranded Towels/Napkins - Paper	3.0%
Packs, Matches, Lighters - Composite	3.0%
Corrugated Boxes - Paper	2.9%
Block Construction Foam - Foam	2.7%
Cups - Plastic	2.2%
Other Plastics - Hard - Plastic	2.1%
Cup Lids - Plastic	2.1%
Straws/Wrappers - Plastic	2.1%
Glass - Other	1.9%
Vehicle - Composite	1.8%
Unbranded Retail Bags - Plastic	1.7%
Soda Bottles - Plastic	1.7%
Beer Cans - Metal	1.6%
Cups - Paper	1.6%
Cups - Foam	1.6%
Vehicle Debris - Plastic	1.6%
Salty Snack Packaging - Plastic	1.5%
Foil Food Wrappers - Metal	1.4%
Sports Drink Bottles - Plastic	1.4%
Wine/Liquor Bottles - Plastic	1.4%
Clothing - Cloth	1.4%
Construction Materials - Metal	1.3%
Newspaper - Paper	1.2%
Tissues - Paper	1.2%
Soda Cans - Metal	0.9%
Ads/Signs/Cards - Paper	0.9%
Peanut Foam - Foam	0.9%
Beer Bottles - Glass	0.8%
Bottle Caps/Seals - Plastic	0.8%
Branded Retail Bags - Plastic	0.8%
Construction - Plastic	0.8%
Home Articles	0.8%
Broken Bottles - Glass	0.7%
Utensils - Plastic	0.7%
Condiment Packaging - Plastic	0.6%
Sweet Snack Packaging - Paper	0.6%
Zipper Bags - Plastic	0.5%
Construction - Composite	0.5%
Non-Retail Leaf/Trash Bags - Plastic	0.5%
Clamshells - Foam	0.5%

## ***2018 New Jersey Litter Survey***

<b>Litter Category</b>	<b>Percent</b>
Vehicle - Metal	0.5%
Sports Drink Bottles - Metal	0.4%
Toiletries/Drugs - Composite	0.4%
Sweet Snack Packaging - Composite	0.4%
Paper Packing - Paper	0.4%
Plates - Paper	0.4%
Fast Food Carrying Bags - Plastic	0.4%
Cups/Pieces - Plastic	0.4%
Juice Containers - Plastic	0.4%
Large Milk/Juice Containers - Plastic	0.4%
Lottery Tickets - Paper	0.4%
Construction - Wood	0.4%
Beverage Cartons - Paper	0.3%
Fast Food Carrying Bags - Paper	0.3%
Food Jars/Bottles/Cups - Plastic	0.3%
Tea Bottles - Plastic	0.3%
Retail - No Brand - Paper	0.3%
Straws/Wrappers - Paper	0.3%
Food - Composite	0.3%
Food Wrappers - Paper	0.2%
Napkins - Brand - Paper	0.2%
Non-Clothing Fabric - Cloth	0.2%
Clamshells - Plastic	0.2%
Branded Retail Bags - Paper	0.2%
Juice Containers - Aseptic	0.2%
Games/CDs/Recreational Equipment	0.2%
Vehicle Debris - Glass	0.2%
Clamshells - Paper	0.1%
Retail Food/Non-Food/Ice Bags - Plastic	0.1%
Tea Cans - Metal	0.1%
Wine/Liquor Bottles - Glass	0.1%
Boxes - Paper	0.1%
Magazines - Paper	0.1%
Other - Describe	0.1%
Container Lids - Metal	0.1%
Bottle Caps - Metal	0.1%
Aerosol Cans - Metal	0.1%
Six-Pack Rings - Plastic	0.1%
Plates - Foam	0.1%
Food Jars/Bottles/Cups - Metal	0.1%
Construction - Foam	0.1%
Juice Containers - Composite	0.1%
Salty Snack Packaging - Paper	0.1%
Construction Debris - Glass	0.1%
Carpet - Cloth	0.1%
Non-Foam Peanuts	0.1%
Non-Food Containers - Plastic	0.1%

## ***2018 New Jersey Litter Survey***

<b>Litter Category</b>	<b>Percent</b>
Condiment Packaging - Paper	0.0%
Syringes/Drug Paraphernalia - Composite	0.0%
Tea Bottles - Glass	0.0%
Wine/Liquor Cans - Metal	0.0%
Bottle Caps/Seals - Paper	0.0%
Cups - Metal	0.0%
Trays - Paper	0.0%
Books - Paper	0.0%
Soda Bottles - Glass	0.0%
Plates - Plastic	0.0%
Juice Cans - Metal	0.0%
Tea Containers - Aseptic	0.0%
Water Cans - Metal	0.0%
Water Bottles - Glass	0.0%
Beverage Cartons - Composite/Other	0.0%
Cups - Composite/Other	0.0%
Trays - Foam	0.0%
Utensils - Metal	0.0%
Sweet Snack Packaging - Wood (e.g. Popsicle Sticks)	0.0%
Salty Snack Packaging - Composite	0.0%
Food Jars/Bottles/Cups - Glass	0.0%
Food Wrappers/Cartons - Plastic	0.0%
Food Wrappers/Cartons - Paper	0.0%
Air-Filled Plastic Cushions - Plastic	0.0%
Furniture - Wood	0.0%
Food - Plastic	0.0%
Trays - Plastic	0.0%
Reusable - Plastic	0.0%
Non-Retail Leaf/Trash Bags- Paper	0.0%
Large Milk/Juice Containers - Aseptic	0.0%
Appliances - Metal	0.0%
Yard Waste - Wood	0.0%
Ceramic - Other	0.0%

# 2018 New Jersey Litter Survey

## Appendix B - Litter Categories and Descriptions

#	Litter Category	Type	Composition
1	Beverage Containers	Beer	Metal
2	Beverage Containers	Beer	Glass
3	Beverage Containers	Juice	Metal
4	Beverage Containers	Juice	Plastic
5	Beverage Containers	Juice	Composite
6	Beverage Containers	Juice	Aseptic
7	Beverage Containers	Soda	Glass
8	Beverage Containers	Soda	Metal
9	Beverage Containers	Soda	Plastic
10	Beverage Containers	Sports	Metal
11	Beverage Containers	Sports	Plastic
12	Beverage Containers	Tea	Glass
13	Beverage Containers	Tea	Metal
14	Beverage Containers	Tea	Aseptic
15	Beverage Containers	Tea	Plastic
16	Beverage Containers	Water	Metal
17	Beverage Containers	Water	Plastic
18	Beverage Containers	Water	Glass
19	Beverage Containers	Wine/Liquor	Glass
20	Beverage Containers	Wine/Liquor	Plastic
21	Beverage Containers	Wine/Liquor	Metal
22	Beverage Containers	Broken Bottles	Glass
23	Beverage-Related	Bottle Caps/Seals	Plastic
24	Beverage-Related	Bottle Caps/Seals	Paper
25	Beverage-Related	Bottle Caps	Metal
26	Beverage-Related	Six-Pack Rings	Plastic
27	Beverage-Related	Beverage Cartons	Comp/Other
28	Beverage-Related	Beverage Cartons	Paper
29	Cups/Lids/Straws	Cups	Comp/Other
30	Cups/Lids/Straws	Cups	Plastic
31	Cups/Lids/Straws	Cups - Pieces	Plastic
32	Cups/Lids/Straws	Cups	Paper
33	Cups/Lids/Straws	Cups	Foam
34	Cups/Lids/Straws	Cups	Metal
35	Cups/Lids/Straws	Cup Lids	Plastic
36	Cups/Lids/Straws	Straws/Wrappers	Paper
37	Cups/Lids/Straws	Straws/Wrappers	Plastic
38	Take-Out Food Packaging	Food Wrappers	Paper
39	Take-Out Food Packaging	Food Wrappers - Foil	Metal
40	Take-Out Food Packaging	Clamshells	Paper
41	Take-Out Food Packaging	Clamshells	Plastic
42	Take-Out Food Packaging	Clamshells	Foam
43	Take-Out Food Packaging	Boxes	Paper
44	Take-Out Food Packaging	Plates	Paper
45	Take-Out Food Packaging	Plates	Plastic

# ***2018 New Jersey Litter Survey***

<b>#</b>	<b>Litter Category</b>	<b>Type</b>	<b>Composition</b>
46	Take-Out Food Packaging	Plates	Foam
47	Take-Out Food Packaging	Trays	Plastic
48	Take-Out Food Packaging	Trays	Foam
49	Take-Out Food Packaging	Trays	Paper
50	Take-Out Food Packaging	Condiment Packaging	Paper
51	Take-Out Food Packaging	Condiment Packaging	Plastic
52	Take-Out Food Packaging	Utensils	Metal
53	Take-Out Food Packaging	Utensils	Plastic
54	Candy/Snack Packaging	Sweet Snack Packaging	Wood
55	Candy/Snack Packaging	Sweet Snack Packaging	Composite
56	Candy/Snack Packaging	Sweet Snack Packaging	Plastic
57	Candy/Snack Packaging	Sweet Snack Packaging	Paper
58	Candy/Snack Packaging	Salty Snack Packaging	Paper
59	Candy/Snack Packaging	Salty Snack Packaging	Plastic
60	Candy/Snack Packaging	Salty Snack Packaging	Composite
61	Bags	Retail - Brand	Plastic
62	Bags	Retail - Brand	Paper
63	Bags	Retail - No Brand	Plastic
64	Bags	Retail - No Brand	Paper
65	Bags	Reusable	Plastic
66	Bags	Non-Retail: Leaf/Trash	Paper
67	Bags	Non-Retail: Leaf/Trash	Plastic
68	Bags	Retail Food/Non-Food/Ice	Plastic
69	Bags	Fast Food Carrying Bags	Plastic
70	Bags	Fast Food Carrying Bags	Paper
71	Bags	Zipper Bags	Plastic
72	Shrink Wrap/Dry Cleaner Wraps	Shrink Wrap/Dry Cleaner Wraps	Plastic
73	Napkins/Tissues	Napkins - Brand	Paper
74	Napkins/Tissues	Towels/Napkins - No Brand	Paper
75	Napkins/Tissues	Tissues	Paper
76	Home Food Containers	Food Jars/Bottles/Cups	Glass
77	Home Food Containers	Food Jars/Bottles/Cups	Plastic
78	Home Food Containers	Food Jars/Bottles/Cups	Metal
79	Home Food Containers	Food Wrappers/Cartons	Plastic
80	Home Food Containers	Food Wrappers/Cartons	Paper
81	Home Food Containers	Large Milk/Juice Containers	Plastic
82	Home Food Containers	Large Milk/Juice Containers	Aseptic
83	Paper	Newspaper	Paper
84	Paper	Magazines	Paper
85	Paper	Books	Paper
86	Paper	Ads/Signs/Cards	Paper
87	Paper	Corrugated Boxes	Paper
88	Paper	Lottery Tickets	Paper
89	Paper	Other Paper	Paper
90	Vehicle/Construction	Construction	Foam
91	Vehicle/Construction	Construction	Plastic
92	Vehicle/Construction	Construction	Metal

## ***2018 New Jersey Litter Survey***

<b>#</b>	<b>Litter Category</b>	<b>Type</b>	<b>Composition</b>
93	Vehicle/Construction	Construction	Glass
94	Vehicle/Construction	Construction	Composite
95	Vehicle/Construction	Construction	Wood
96	Vehicle/Construction	Vehicle	Plastic
97	Vehicle/Construction	Vehicle	Metal
98	Vehicle/Construction	Vehicle	Glass
99	Vehicle/Construction	Vehicle	Rubber
100	Vehicle/Construction	Vehicle	Composite
101	Cloth/Fabric	Clothing	Cloth
102	Cloth/Fabric	Carpet	Cloth
103	Cloth/Fabric	Non-Clothing Fabric	Cloth
104	Packing Materials	Air-Filled Plastic Cushions	Plastic
105	Packing Materials	Block Foam	Foam
106	Packing Materials	Peanut Foam	Foam
107	Packing Materials	Peanut: Non-Foam	Foam
108	Packing Materials	Paper Packing	Paper
109	Other Metal	Aerosol Cans	Metal
110	Other Metal	Appliances	Metal
111	Other Metal	Container Lids	Metal
112	Other Wood	Furniture	Wood
113	Other Wood	Yard Waste	Wood
114	Tobacco-Related	Packs, Matches, Lighters	Composite
115	Other Items	Non-Food Containers	Plastic
116	Other Items	Other Plastics - Hard	Plastic
117	Other Items	Ceramic	Other
118	Other Items	Food	Plastic
119	Other Items	Food	Composite
120	Other Items	Games, CDs, Recreational Equip.	Composite
121	Other Items	Glass	Glass
122	Other Items	Home Articles	Composite
123	Other Items	Toiletries/Drugs	Composite
124	Other Items	Syringes/Drug Paraphernalia	Composite
125	Other Items	Other (Describe)	Other

# **2018 New Jersey Litter Survey**

## **Appendix C - List of Roadway Sites**

<b>#</b>	<b>Street to Survey</b>	<b>County</b>	<b>Locale</b>
N-1	Washington Street	Warren	RES
N-2	SR-15	Sussex	RFT
N-3	SR-94/CR-515	Sussex	RLR
N-4	I-287 South	Morris	RFT
N-5	Parsippany Avenue	Morris	COM
N-6	Troy Meadow Road	Morris	PUB
N-7	Troy Road	Morris	RES
N-8	US-206	Morris	OSR
N-9	CR-619 (Hillside Ave.)	Morris	RLR
N-10	Paterson/Hamburg Turnpike	Passaic	VIU
N-11	Hillview Court	Passaic	RES
N-12	Hudson Avenue	Passaic	RES
N-13	I-80 East	Passaic	UFT
N-14	Morris Avenue/Ryerson Ave.	Passaic	PUB
N-15	Ringwood Avenue/SR-511	Passaic	COM
N-16	East/West Palisade Ave.	Bergen	COM
N-17	Englewood Municipal Building	Bergen	PUB
N-18	Mackay Drive	Bergen	RES
N-19	Main Street	Bergen	COM
N-20	Pond under 219 Patriot Way	Bergen	WAT
N-21	Ramapo College of NJ	Bergen	PUB
N-22	Ridgewood Avenue	Bergen	RES
N-23	SR-4	Bergen	UFT
N-24	Rockland Electric Utility Road	Bergen	VIU
N-25	Vreeland Terrace	Bergen	VIU
N-26	15th Street	Hudson	RES
N-27	Audrey Zapp Drive	Hudson	PUB
N-28	719 Communipaw Avenue	Hudson	COM
N-29	Davis Avenue	Hudson	RES
N-30	I-78 East	Hudson	UFT
N-31	Monitor Street	Hudson	VIU
N-32	Beech Spring Road	Essex	RES
N-33	Gregory Terrace	Essex	RES
N-34	I-280 East	Essex	UFT
N-35	Laurel Avenue	Essex	RES
N-36	Eagle Rock Ave.	Essex	PUB
N-37	Prospect Road	Essex	COM
N-38	Walnut Street	Essex	VIU
N-39	Buttonwood Lane	Union	RES
N-40	I-78 West	Union	UFT
N-41	West Linden Avenue	Union	VIU
N-42	Potter Avenue	Union	RES

## ***2018 New Jersey Litter Survey***

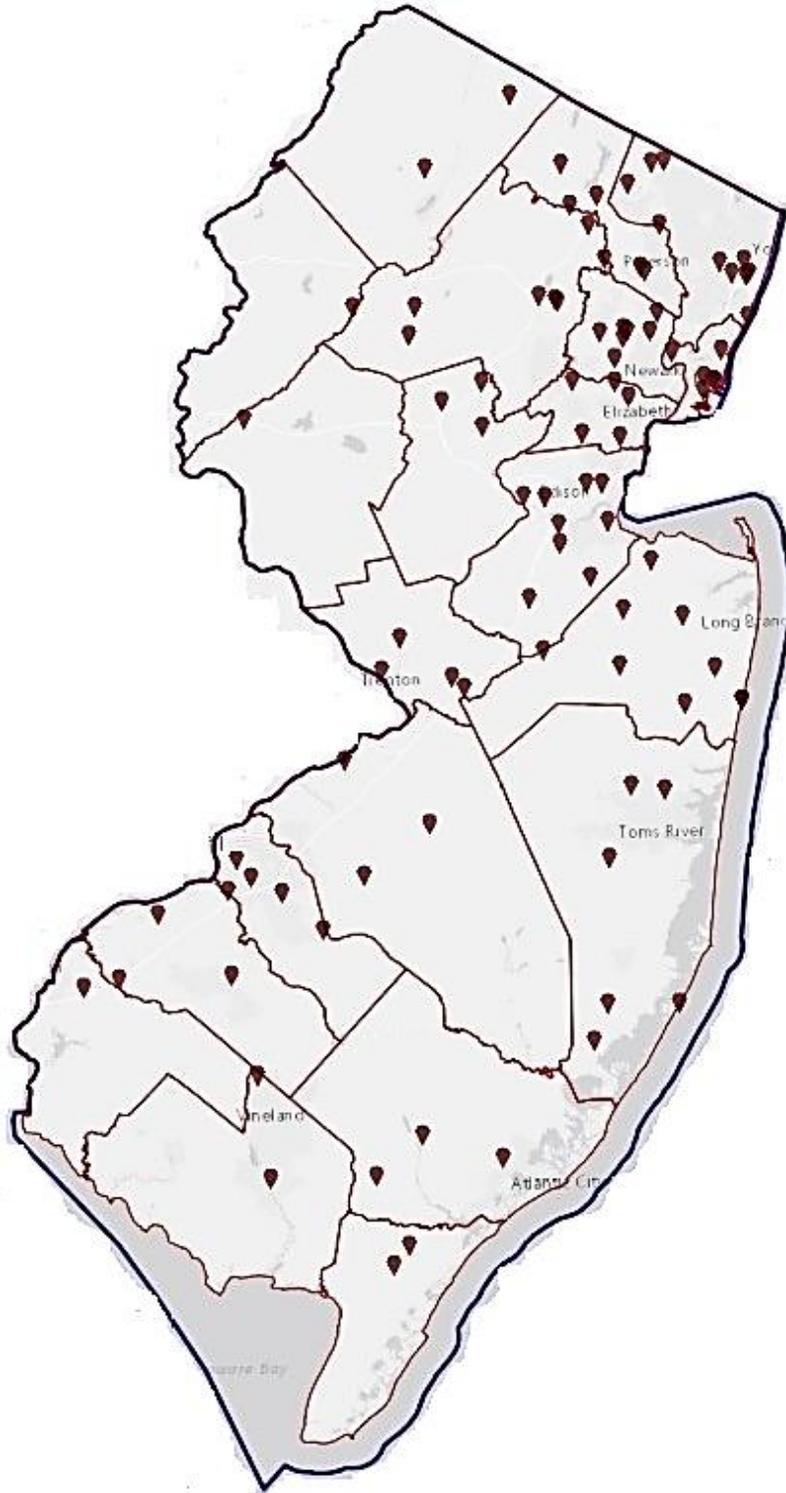
<b>#</b>	<b>Street to Survey</b>	<b>County</b>	<b>Locale</b>
N-43	Summit Free Public Library	Union	PUB
N-44	Bertram Avenue	Middlesex	RES
N-45	Entrance to Middlesex Co. LF	Middlesex	RLR
N-46	Frelinghuysen Road	Middlesex	PUB
N-47	I-95 South	Middlesex	UFT
N-48	Narrows Way	Middlesex	RES
N-49	Raceway Gas Station	Middlesex	CON
N-50	Route 1 South - Menlo Shopping Center	Middlesex	COM
N-51	SR-18 South	Middlesex	RFT
N-52	SR-33 East	Middlesex	CON
N-53	Truman Drive	Middlesex	VIU
S-1	I-78	Hunterdon	RFT
S-2	I-287	Somerset	UFT
S-3	Mountain View Lane	Somerset	RES
S-4	Peapack Road by Park	Somerset	PUB
S-5	CR-526 East	Mercer	RLR
S-6	I-95 South	Mercer	RFT
S-7	SR-33 West	Mercer	OSR
S-8	Stuyvesant Avenue	Mercer	RES
S-9	18th Avenue	Monmouth	RES
S-10	CR-54 West/Phalanx Road	Monmouth	RLR
S-11	Garden State Parkway South	Monmouth	UFT
S-12	I-195 West	Monmouth	RFT
S-13	Ocean Avenue	Monmouth	BEA
S-14	Route 9 North /Three Brooks Road	Monmouth	VIU
S-15	SR-66 East	Monmouth	OSR
S-16	Wyncrest Road	Monmouth	PUB
S-17	12th Street	Ocean	RES
S-18	CR-606 North	Ocean	RLR
S-19	CR-618 North	Ocean	RLR
S-20	Garden State Parkway North	Ocean	RFT
S-21	SR-70	Ocean	OSR
S-22	US-9 South	Ocean	OSR
S-23	CR-541 North	Burlington	PUB
S-24	Delaware River Boardwalk	Burlington	PUB
S-25	Elizabeth Street	Burlington	RES
S-26	CR-675	Camden	RLR
S-27	I-295 North	Camden	UFT
S-28	Kings Highway W/CR 551 Spur	Camden	PUB
S-29	SR-130 North - Pedestrian Walkway	Camden	VIU
S-30	Sussex Avenue	Camden	RES
S-31	Glasswycke Drive	Gloucester	RES

## ***2018 New Jersey Litter Survey***

<b>#</b>	<b>Street to Survey</b>	<b>County</b>	<b>Locale</b>
S-32	New Jersey Turnpike	Gloucester	RFT
S-33	SR-44 (Broad Street)	Gloucester	COM
S-34	Atlantic City Expressway	Atlantic	RFT
S-35	CR-637 East (Cumberland Ave.)	Atlantic	RLR
S-36	US-40 West (Harding Hwy)	Atlantic	OSR
S-37	CR-641	Salem	RLR
S-38	SR-47 North	Cumberland	OSR
S-39	US-47 North	Cumberland	COM
S-40	CR-610 South	Cape May	RLR
S-41	SR-50 South	Cape May	OSR

# 2018 New Jersey Litter Survey

## Appendix D – Sites Map



**Figure 8 - Sites Surveyed**

# 2018 New Jersey Litter Survey

## Appendix E – Firm Qualifications

Environmental Resources Planning, LLC (ER Planning) is an analytics firm focusing exclusively on litter surveys and litter-related research. Field crews under our supervision have surveyed more than 21 million square feet of roadways and recreational areas in a number of states and cities throughout North America including the following litter surveys:

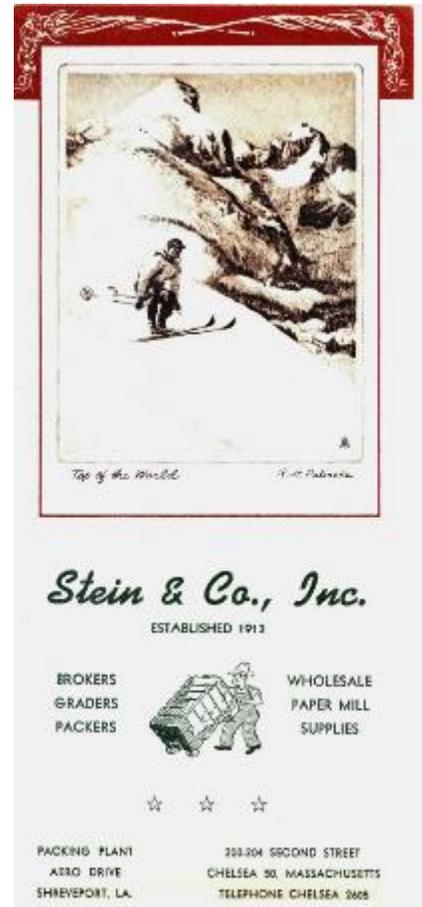
- New Jersey Litter Survey (2017-18)
- Los Angeles Area Litter Survey (2017)
- Honolulu Litter Index Survey (2016)
- Honolulu Litter Study (2016)
- Anacostia Statewide Litter Survey (2015)
- Rhode Island Litter Survey (2014)
- Texas Statewide Litter Survey (2013)
- Toronto, ON Citywide Litter Survey (2012)
- Oakland, CA Citywide Bag Litter Survey (2011-12)
- San Francisco, CA Citywide Bag Litter Survey (2011-12)
- Washington, DC Citywide Bag Litter Survey (2011-12)
- Maine Statewide Litter Survey (2010)
- New Hampshire Statewide Litter Survey (2010)
- Vermont Statewide Litter Survey (2010)
- KAB National Litter Survey and Cost Study (2008-09)
- KAB Community Appearance Index (2007-08)
- KAB Litter - Literature Review (2007)
- Georgia Statewide Litter Survey (2006)
- Tennessee Statewide Litter Survey (2006)
- Santa Monica, CA Citywide Beach Litter Surveys (2005)
- Malibu, CA Citywide Beach Litter Surveys (2005)
- New Jersey Statewide Litter Survey (2004)

The firm's roots date back more than 100 years when Mr. Stein's family opened their first recycling facility. His litter-related work began with a KAB affiliate project in 1986.

Mr. Stein's litter studies and research have been featured in *National Geographic* magazine, the *New York Times* and *Time* magazine as well as on *ABC's Good Morning America* and *NPR*.

He was invited, as a subject-matter expert, to participate in a study on community resilience and resource optimization conducted for the President in 2010.

Mr. Stein earned his B.Sc. Cum Laude in *Environmental Studies* from *Syracuse University* and *SUNY College of Environmental Science and Forestry* studying *Waste Management* and *Environmental Law* while interning with the NYS Department of Environmental Conservation. He also earned his M.Sc. in *Natural Resource Policy and Management* there.



# ***2018 New Jersey Litter Survey***

He was awarded a scholarship by New York SWANA for his Master's thesis research, examining the impacts of public policy intervention on sustainable recycling markets.

He also began a doctorate program that focused on identifying underlying cultural influences on littering rates.

In addition, Mr. Stein has been active in numerous activities and writing related to litter and marine debris including, most recently:

- California State Water Board - Technical Assessment of Statewide Water Quality Plans to Control Storm Water Trash (2014)
- Florida Litter Prevention Program - Advisor (2014)
- San Francisco Water Board - Presentation on Measuring Trash TMDL Compliance and Load Reductions (2013)
- Ocean Conservancy - Beach Litter Survey Methodology Enhancements (2011)
- National Litter Forum - Restoring Our Communities, Organizer (2011)
- Keep America Beautiful - International Litter Research Forum (2007)
- Keep America Beautiful - Litter: Literature Review, Lead author (2007)
- Potomac Watershed Initiative Trash Monitoring Protocol Subcommittee - Survey design advisor, pro bono (2006-2007)
- Ocean Conservancy's National Marine Debris Monitoring Program - Survey director for Chincoteague Island Site, pro bono (2006-2007)

Other senior staff on this project includes:

Kristian Ferguson, Senior Consultant, has managed field surveys and assisted with analysis and cost studies for litter projects throughout the U.S. and Canada. He received his B.Sc. in Geography and, while receiving his Master's Degree, he presented a capstone seminar focusing on the relationship between litter and solid waste management.

Emilie Knapp, Assistant Project Manager, has helped plan all aspects of field survey work, supervised field crews, conducted data management and coordinated the site selection process for 10 litter surveys nationwide. In this role, she has surveyed more than 10 million square feet of roadways. She earned an A.A. in Business Management and subsequently a B.A.

Ron Visco, Project Statistician, holds a Ph.D. in Research Design and Statistics from Princeton University. Dr. Visco conducted the statistical analysis for the firm's litter-related projects in Anacostia, Maine, New Hampshire, Oakland, Rhode Island, San Francisco, Texas, Toronto, Vermont and Washington, DC.

# ***2018 New Jersey Litter Survey***

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