2019 U.S. Post-consumer Plastic Recycling Data Report

June 2021

Prepared by Stina Inc. and funded by:
The Plastics Division of the American Chemistry Council and the Association of Plastics Recyclers' Foundation for Plastic Recycling

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Introduction

The studies contributing data to this report on United States (U.S.) sourced post-consumer[1] plastic recovered for recycling in 2019 include the continuation of the 30th annual study on plastic bottles, the 15th on film, the 13th on non-bottle rigid plastic, and the first including other plastics.[2] This report covers United States (U.S.) sourced plastic reclaimed in the U.S. or Canada and exported overseas.[3] This report is a technical summary of the study findings.

The Executive Summary provides an overview of the post-consumer plastic recycling in 2019 by major category. Bottles are detailed by resin due to the larger percentage of polyethylene terephthalate (PET) and high-density polyethylene (HDPE) bottles generated and recovered for recycling, as well as to provide continuity from previous reports. Detail by resin is provided for non-bottle rigid plastics in the Non-bottle Rigids section including PET, HDPE, PVC (polyvinyl chloride), LDPE (low-density polyethylene), PP (polypropylene), PS (polystyrene) and Other resin (e.g., acrylonitrile butadiene styrene). Film plastic recovered for recycling is primarily PE (polyethylene), but the total in this report includes non-PE film. Non-bottle rigid plastics, film, and other plastics (e.g., wovens and other flexibles) include packaging and non-packaging categories that have met their intended uses by households and businesses. Foam is not covered in this report although the survey does include questions about foam.[4] Recycling rates for bottles are detailed in this report. Recycling rates are not available for categories beyond bottles for the 2019 report, but with additional collaboration and resources, recycling rates for other plastic categories will be reported on in future reports.

The annual plastic recycling survey conducted by Stina Inc. (Stina) collects data for all plastic categories recovered for recycling by destination. Only the categories and countries, for which funding was available, received extensive follow up and vetting. For this reason, the 2019 report is limited to the U.S. and does not include other countries in North America.

The National Association for PET Container Resources (NAPCOR) conducts a separate survey of PET bottle reclaimers. In collaboration, Stina provided the PET bottle export data to NAPCOR and NAPCOR provided data for the PET Bottle section of this report, including PET bottles generated and recovered for recycling. NAPCOR data from PET reclaimers also contributes to the PET non-bottle rigid data detailed in this report. A detailed report on PET is available from NAPCOR. Non-PET bottle virgin resin production utilized in the calculation for the bottle recycling rate was provided by the American Chemistry Council's Plastic Industry Producers Statistics Group. Historical recycling data is available in previous reports: the National Postconsumer Plastic Bottle Report, the National Post-Consumer Non-Bottle Rigid Plastic Recycling Report and the National Post-consumer Film and Bag Recycling Report. To view previous reports, visit the APR Library.

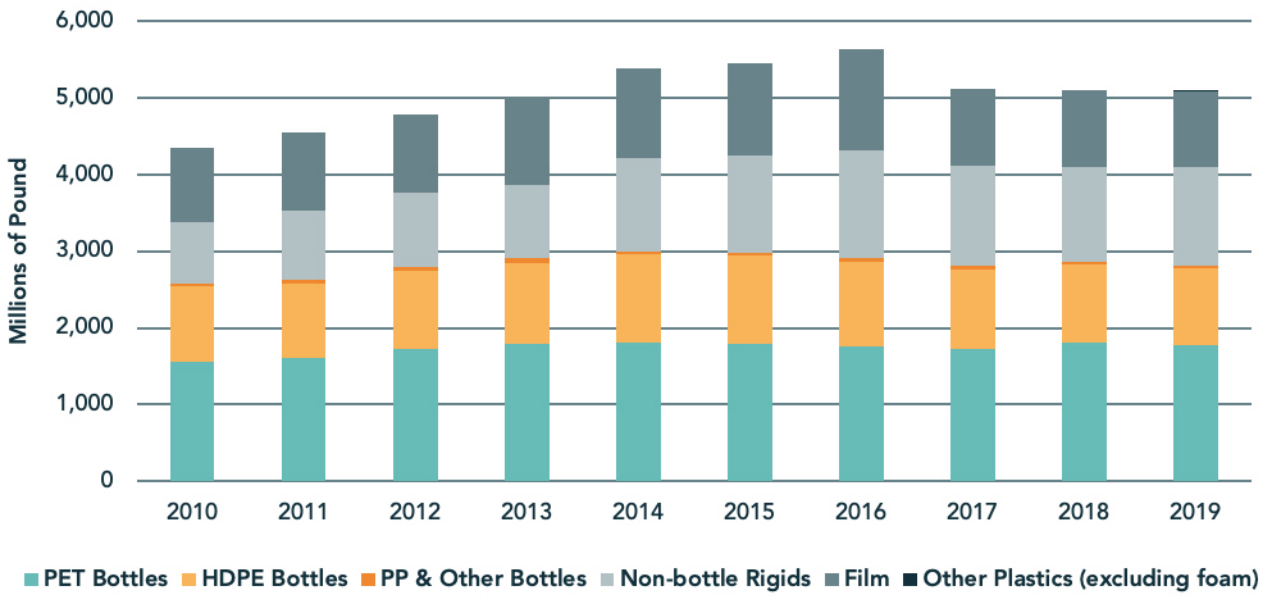
1. Throughout this report, the term "post-consumer" refers to plastics that have been used for their intended purpose by consumers and businesses. Commercial materials that have met their intended use are often recovered outside of curbside or drop-off collection programs and include items such as totes, pallets, crates, stretch wrap, poly bags and other commercial packaging. This report does not cover the recycling of post-industrial (pre-consumer) materials, which the U.S. EPA defines as materials that are generated in manufacturing and conversion processes, such as scrap and trimmings
2. In the context of this report, plastic recovered for recycling refers to the gross pounds of post-consumer plastic collected and acquired by markets for recycling.
3. The U.S. and Canada, as distinct from material exported overseas, are the destination for U.S. sourced recycled plastic. U.S. and Canadian reclaimers are the primary responders to the survey to date and therefore are highlighted in the charts below. Imports by reclaimers in Mexico of U.S. sourced material have not been reported to date. Future studies will include more outreach to reclaimers in Mexico in an effort to document material flow throughout North America.
4. EPS-IA conducts a PS Foam survey and provides a public report.

The 2019 report was made possible by those that respond to the survey, collaboration with the Association of Plastic Recyclers (APR) and NAPCOR, as stated above, and through funding from the Plastics Division of the American Chemistry Council (ACC) and APR's Foundation for Plastic Recycling.

Executive Summary

In 2019, 5,094.1 million pounds of post-consumer plastic material sourced in the U.S. was recovered for recycling in the categories of bottles, non-bottle rigid plastics, film, and other plastics (excluding foam). The category with the largest increase was Non-bottle Rigids by 45.9 million pounds and the largest decrease was in PET Bottles by 39.3 million pounds compared to 2018.[5] The categories of bottles, non-bottle rigid plastic and film, tracked in previous years, were down overall by 27 million pounds. Other plastics (excluding foam) was a new focus for 2019 data collection.[6] In 2019, 17.4 million pounds of recovered plastic was reported and is represented in this report as Other Plastic (excluding foam).

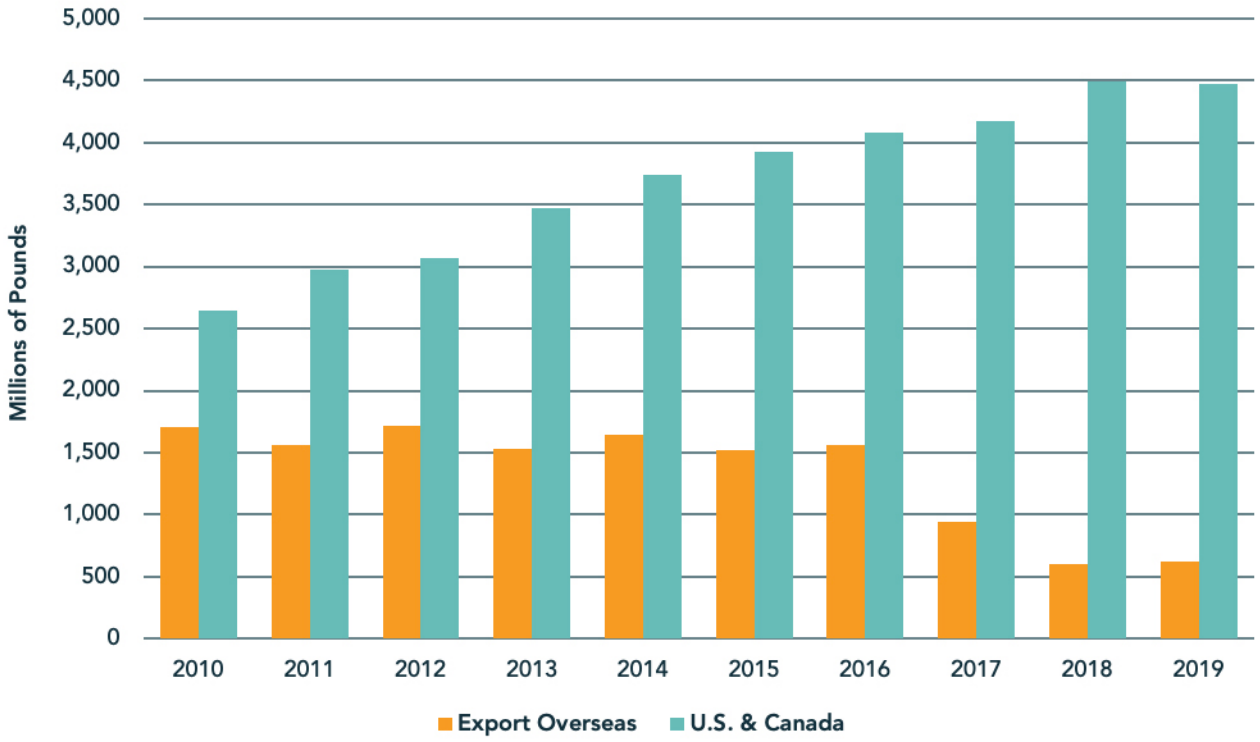
Figure 1. U.S. Sourced Post-consumer Plastic Recovered for Recycling by Category



5. Throughout this report all reported increases or decreases are compared to 2018 unless otherwise stated.
6. The Other Plastics (excluding foam) category — which includes wovens, non-wovens and other flexible products and packaging that are not included in any of the other major categories— will be further delineated and reported as participation in the survey increases in future studies.

As was the case in 2018, most of the material recovered for recycling in the U.S. was purchased by reclaimers[7] in the U.S. or Canada (87.9 percent) rather than moving to overseas markets. A total of 4,476.3 million pounds was reported as recovered for recycling in the U.S. and Canada. The remaining 617.8 million pounds, or 12.1 percent, of plastic recovered for recycling was exported overseas.

Figure 2. U.S. Sourced Post-consumer Plastic Recovered for Recycling by Destination



Plastic bottles continued to make up the majority of the recycled plastic recovered for recycling at 55.2 percent, with PET Bottles remaining the largest category in 2019, despite a 39.3 million pound (2.2 percent) decrease compared to 2018. Non-bottle Rigids remained the second largest category—and the only major category reporting growth in 2019—with an increase of 45.9 million pounds, or 3.7 percent over 2018. The third largest category, HDPE Bottles, saw a net decrease of 8.5 million pounds (0.8 percent), reflecting growth in Colored HDPE Bottles offset by a decline in Natural HDPE Bottles recovered for recycling. Film accounted for 19.2 percent of total post-consumer plastic recovered for recycling, a decrease of 24.4 million pounds or 2.4 percent.

7. The survey gathers data and includes material from reclaimers, which are defined as companies that wash post-consumer material or otherwise process unwashed material into a clean feedstock or end product.

Table 1: U.S. Sourced Post-consumer Plastic Recovered for Recycling by Category

Plastic Category	Total Recovered for Recycling in 2019 (Millions of Pounds)	Total Percent Change Since 2018	% Acquired by U.S. and Canadian Reclaimers
PET Bottles	1,776.8	-2.2%	96.1%
HDPE Bottles	997.9	-0.8%	92.2%
PP & Other Bottles	34.7	-2.0%	92.2%
Non-bottle Rigids	1,289.7	3.7%	86.6%
Film	977.7	-2.4%	71.5%
Other Plastics (excluding foam)	17.4	N/A	4.9%
Total	**5,094.1**	**-0.5%**	**87.9%**

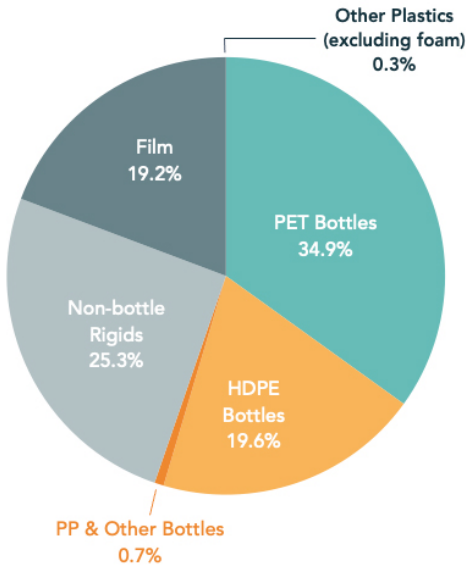
Total Recovered for Recycling in 2019 includes all destinations, including U.S. and Canada as well as Export Overseas.

Given 2019 is the first year Other Plastics (excluding foam) were included in the analysis and reporting a comparison to 2018 is not available, and therefore, the Total Percent Change Since 2018 does not include Other Plastics (excluding foam).

Bottles

In 2019, the amount of bottles reported as recovered for recycling in the U.S. totaled 2,809.4 million pounds, with a bottle recycling rate of 28.4 percent, down half a percentage point from 2018.[8] The amount of plastic resin generated for use in U.S. bottles increased by 11 million pounds to 9,878 million pounds in 2019. Bottles recovered for recycling in 2019 declined by 48.5 million pounds, reflecting a 39.3 million pound decrease in PET bottles recovered for recycling in 2019. HDPE bottles recovered for recycling also declined by 8.5 million pounds, reflecting a 25.6 million pound decrease in Natural HDPE Bottles offset by a 17.1 million pound increase in Color HDPE Bottles. Recovery of PP & Other bottles was down by 0.7 million pounds. U.S. and Canadian reclaimers continue to purchase the bulk of the plastic bottles recovered for recycling in the U.S. at 94.7 percent in 2019. U.S. reclaimer purchases were down for U.S.-sourced PET, HDPE and PP bottles while Canadian reclaimer purchases increased overall. Overseas export of U.S. sourced bottles reported for recycling represented 5.3 percent of the total at 149.7 million pounds in 2019, up from 123.8 million pounds in 2018.

Figure 3. U.S. Sourced Post-consumer Plastic Recovered for Recycling by Category



8. PP & Other Bottles includes PP, LDPE, PVC and other bottle resins (e.g., polycarbonate). The bottle recycling rate only includes PET, HDPE, PP, LDPE and PVC bottles because the data for virgin resin production is only available for those resins. The recycling rate is based on gross pounds recovered for recycling and acquired by markets for recycling.

Non-bottle Rigid Plastics

Non-bottle Rigids contributed 25.3% of the total post-consumer plastic recovered for recycling in 2019. HDPE and PP made up the majority of Non-bottle Rigids recycled, at 40.6 percent and 34.3 percent, respectively. The total amount of U.S. sourced post-consumer non-bottle rigid plastic recovered for recycling in 2019 increased by 45.9 million pounds over 2018 to 1,289.7 million pounds, primarily due to an increase in non-bottle rigid HDPE recovered for recycling. As in previous years, the majority (86.6 percent) of non-bottle rigid was recovered for recycling in the U.S. or Canada, and the remaining (13.4 percent) was sold to export markets overseas. U.S. and Canadian reclaimer purchases of U.S. sourced non-bottle rigid plastic increased by 46.9 million pounds, while purchases for export overseas stayed fairly steady, declining by one million pounds.

Film

In 2019, Film contributed 19.2% of the total post-consumer plastic recovered for recycling. A minimum of 977.7 million pounds of post-consumer film was recovered for recycling with 71.5 percent reclaimed in the U.S. or Canada and 28.5 percent exported overseas. Although U.S. and Canadian reclaimers purchased more film, the total amount of U.S. sourced film recovered for recycling decreased by 24.4 million pounds (2.4 percent) in 2019. Film purchasing by overseas export markets decreased by 28.5 million pounds. The overall Film decline was primarily due to a decrease in commercial film recovered for recycling, although there were increases in film from retail and agricultural sources.

Other Plastics

Other Plastics (excluding foam) accounted for 0.3% of the total, but continued research and increased survey breadth will provide better insight about the materials recycled beyond Bottles, Non-bottle Rigids and Film categories in future reports.

Methodology

Data on recovered post-consumer plastic are collected through a voluntary, annual plastic recycling survey that gathers data on post-consumer bottles, non-bottle rigid plastics, film and other plastics. Additional data from collaborators also contribute to the findings for this report.

STEPS TO GATHER THE DATA UTILIZED IN THIS REPORT

- A proprietary markets database is continually updated to include current exporters, reclaimers, and other handlers of scrap plastic.
- Data Collection is conducted through an electronic survey of market participants in plastic recycling.
- To ensure accuracy of the data provided, follow-up with responders and other industry contacts is conducted and other sources of recycling industry information is reviewed.
- Virgin resin production data for PET Bottles and aggregated data for total PET bottles and thermoforms recovered for recycling are received from NAPCOR and incorporated. NAPCOR conducts a separate PET reclaimer survey. PET export data is provided to NAPCOR from data collection performed in the annual plastic recycling survey conducted by Stina Inc.
- Available virgin resin production data for non-PET bottles is received from American Chemistry Council's Plastic Industry Producers Statistics Group (PIPS) and incorporated in the analysis.

Data Collection and Analysis

Stina regularly updates a proprietary database of plastic reclaimers, other processors, exporters, and brokers to help ensure that the survey reaches the key plastic scrap buyers of North American plastic.[9]

Stina uses a custom-designed, web-based survey system to gather data. Although the overall methodology has not changed since the first report, Stina seeks ways to improve the completeness and timeliness of survey responses with each iteration. These changes allow for better material flow tracking and assist with prevention of double counting. For example, Stina continues to expand questions related to non-mechanical recycling, as technology emerges in this space.

Stina is involved in the plastic recycling industry's work to harmonize commodity categories and the terminology used by the industry. Updates to categories are reflected in the annual survey tool and in the other tools and resources for the recycling industry that Stina maintains. This is critical in order to report on the key materials, to avoid misunderstanding, and to further support harmonization of terminology used in the industry.[10] The model plastic bale specifications, maintained by the Association of Plastic Recyclers (APR), are a key resource in this process.[11] A list of survey categories can be viewed on the online version of the report that can be found here.

9. Through other research projects and resources that Stina maintains to support the recycling value chain, Stina regularly engages with companies and new contacts in this sector.
10. The Plastic Recycling Terms and Tools resource is intended to help harmonize terminology across the plastic recycling value chain. This resource can be found at https://www.recyclemoreplastic.org/view/termstools#pmtt_getTermsToolsPage.
11. Bale specifications maintained by the Association of Plastic Recyclers (APR) are in alignment with the Plastic Recycling Terms and Tools, https://plasticsrecycling.org/model-bale-specifications.

The survey is distributed by sending an email with a unique link to each survey contact, including reclaimers in the U.S., Canada, and Mexico, export buyers for post-consumer plastic, as well as some key players within the value chain, such as MRFs, brokers, and end users. After an appropriate amount of response time has passed, Stina employees send follow-up emails and make telephone calls to retrieve data. The data are entered into the online survey tool, either directly by the company surveyed, or by Stina staff in conjunction with the relevant company. Incoming data are reviewed for accuracy, and follow-up calls are made as needed. After data collection is complete, the data are compiled and categorized based on the detail reported.[12]

Rigid commodity categories from commingled/other collection[13] may be a mixture of resins, or some combination of bottles, containers, bulky items, and other non-bottle rigid plastic. Some commodity categories are further segregated by resin and others are intentionally reported as a combination of resin and product type. Where the commodities are a mix of bottle and non-bottle or resin, the non-bottle rigid plastic portion of the mixed rigid bales reported by respondents is calculated for this report by applying the content percentages of resin and product type from the 2014/15 mixed rigid bale composition study with some adjustment given industry-provided audit data since that study.[14] Since 2016, the 2014/2015 study data has been used for the reports whereas previous reports dating back to 2011 used the 2011 composition study.[15]

Data received from NAPCOR and PIPS are incorporated into the analysis and Stina engages with both organizations for clarifications and vetting, as needed. The final data totals are reviewed, analyzed, and reported in as much detail as possible without compromising the confidentiality of the participating companies' individual responses.[16] In order to determine trends and identify anomalies that may require further vetting, the analysis includes year-to-year comparisons of the totals, material categories, and trends among buyers. This quality control, which often requires follow-up with survey responders, is essential to determining if there has been an actual shift or just an entry error by the responder. Clarification may also be needed to determine whether reported material can be counted as post-consumer/commercial or if it is, in fact, post-industrial scrap. Describing how the data are collected, as well as what is and is not included in the survey, provides readers of this report with the transparency needed to cross-reference the results with other available industry data.

12. Stina conducts the survey and takes steps to maintain the confidentiality of individual responses; including procedures designed so that no individual company data are released, nor are any specific data that do not include at least three companies reporting.
13. Typically collected curbside or at a municipal drop off. Previous reports used "residential" as synonymous with commingled/other collection, but this material can include curbside collection from businesses.
14. National Mixed Rigid Plastic Bale Composition Study, Association of Plastic Recyclers (APR), July 2015.
15. National Mixed Rigid Plastic Bale Composition Study & Analysis of Non-bottle Rigid Plastic Available for Recycling, Association of Plastic Recyclers (APR), 2011.
16. Due to rounding, some totals may not correspond with the sum of the separate figures.

Data Gaps and Assumptions

Participation in the survey is voluntary and the reported data are based on the responses received. Many companies have limited resources to put towards participation in the survey, and some companies may choose not to respond due to their confidentiality policies. Therefore, because there is not 100 percent participation, the presented totals represent the minimum amount of the plastic categories recovered for recycling and sold in the marketplace. Only data provided by North American reclaimers and exporters selling directly overseas, are included in the reported totals, unless Stina determines that data are missing in areas where substantive information from other reliable sources is available. If reclaimers omit their capacity data, Stina uses the pounds purchased for recycling as an estimate of their respective capacities. Data provided by brokers and MRFs are primarily used as a reference to better understand the flow of material, but Stina may include their data if enough information is provided that would enable attribution of material sold to a non-responding reclaimer or exporter.

There were no responses for the import of U.S. sourced plastic into Mexico in 2019. It is possible U.S. sourced recycled plastic was purchased by reclaimers in Mexico in 2019 and prior years, but industry contacts said this became more prevalent in 2020 and into 2021.

Again, since participation in the survey is voluntary, Stina sometimes receives responses from existing companies that did not previously respond. Changes in year-to-year recovery totals are often a combination of changes in actual collection, along with new information about material that was recovered for recycling in previous years, but not reported. When Stina can conclude the nature of an increase (or decrease), the reasoning is indicated. However, it can be difficult to make a reliable determination in any given year, depending on the depth of information Stina receives from plastic handling companies for previous years and while considering the need to protect the confidentiality of the data from individual responses.

Stina tracks exporters' purchasing of plastic through key industry resources. Except for the largest exporters, players in the export market come and go, and may change the type or mix of materials they purchase. Increased volatility in the export market began in 2017 with the National Sword policy in China restricting the import of scrap materials. China's Blue Sky plan, intended to curb pollution through continued restrictions on the import of scrap plastic, took effect in 2018 and remains in effect.

In addition to the potential impact of non-responders, changes in how responders report pounds in the survey categories can impact the totals reported year over year. Mixed resin rigid bale commodities often require follow-up and a data quality check due to the inconsistent terminology used in the marketplace to describe these commodities. In some cases, it is also possible that responders may interchange PE Retail Bag and Film and PE Mixed Colored Film in the data they report. Also, responders may lump a mixture of film categories in Other Film rather than break out their purchased volumes into the individual PE film categories.

Post-commercial material, which is material from the commercial sector that has met its intended use, can be difficult to track because it is often purchased by companies that are also handling industrial scrap. To handle responses from industrial/commercial scrap recyclers, the survey specifically includes a detailed section on post-industrial plastic recycling to help differentiate and track post-commercial from post-industrial categories. As responses are received, responders are further engaged to determine if post-commercial material was handled that they may not realize is considered post-consumer.

As previously mentioned, Stina applied the bale composition results from the 2014/15 study commissioned by the APR, adjusted based on additional industry data, to the mixed resin rigid plastic bale quantities reported by responders to arrive at the non-bottle portion of these bales, separated by resin.[17] Only the plastic portions of the mixed resin rigid bales are included in the quantity totals; the waste is removed. The composition of the mixed resin rigid bales has likely begun to shift given changes in the marketplace. An updated bale composition study is needed to provide a current assessment of the material mix in mixed rigid and other bale categories.

17. National Mixed Rigid Plastic Bale Composition Study, Association of Plastic Recyclers (APR), July 2015.

Findings

Bottles

In 2019, 2,809.4 million pounds of U.S. sourced bottles were reported as recovered for recycling. This is a decrease of 48.5 million pounds compared to the 2018 total. The amount of plastic resin used for bottles increased by 11 million pounds to 9,878 million pounds in 2019. The total bottle recycling rate for 2019 was 28.4 percent, down half a percentage point from 2018.[18] The per capita consumption of plastic bottles overall was similar to 2018. PET and HDPE bottles make up the majority of bottles produced (97.1 percent) and recycled (98.8 percent), as was the case in 2018.

Table 2: U.S. Sourced Post-consumer Bottles Recovered for Recycling

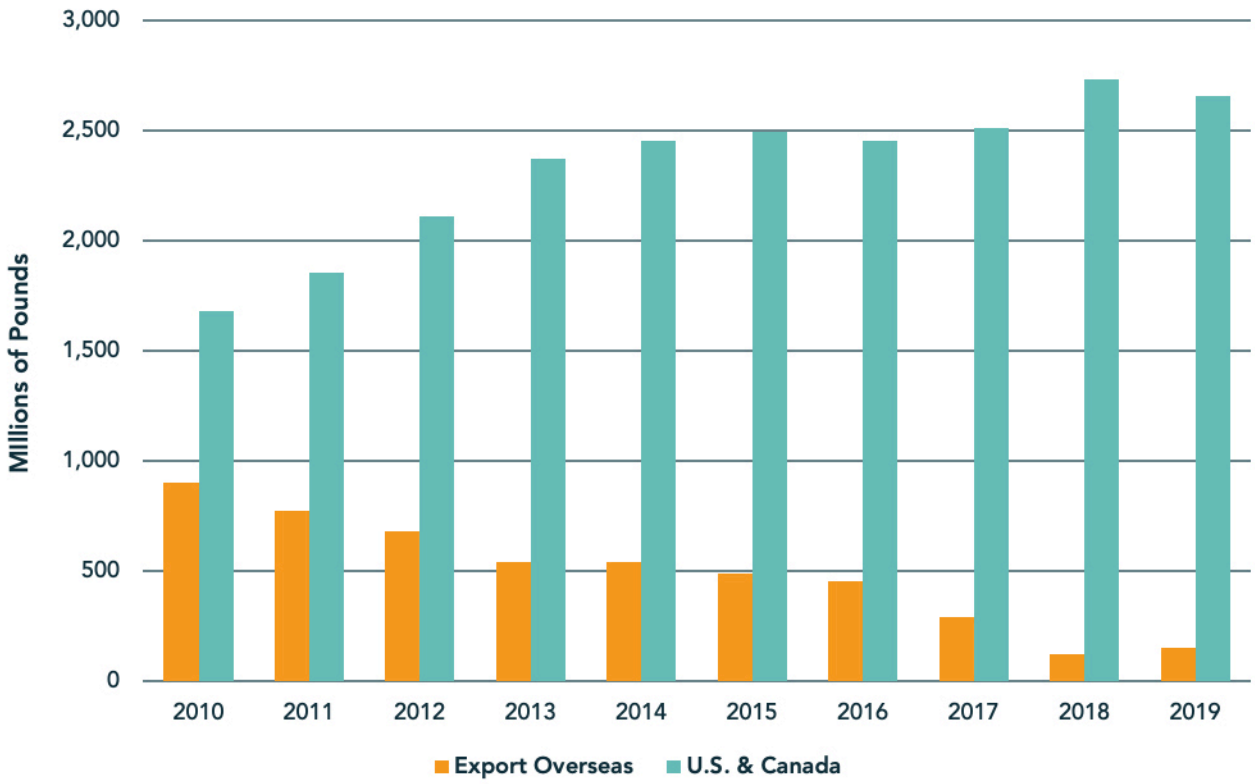
Year	Exported Overseas	Acquired by the U.S. & Canada		Total
		Quantity	Percent	
		Millions of Pounds		
2010	900.9	1,681.1	65.1%	2,582.0
2011	776.3	1,856.7	70.5%	2,633.0
2012	681.2	2,111.9	75.6%	2,793.1
2013	544.2	2,371.1	81.3%	2,915.3
2014	539.2	2,455.3	82.0%	2,994.4
2015	487.7	2,494.3	83.6%	2,981.9
2016	455.3	2,454.8	84.4%	2,910.1
2017	292.9	2,514.6	89.6%	2,807.5
2018	123.8	2,734.2	95.7%	2,857.9
2019	149.7	2,659.7	94.7%	2,809.4

Due to rounding, some totals may not correspond with the sum of the separate figures.

18. PP & Other Bottles includes PP, LDPE, PVC and other bottle resins (e.g., polycarbonate). The bottle recycling rate only includes PET, HDPE, PP, LDPE and PVC bottles because the data for virgin resin production is only available for those resins. The recycling rate is based on gross pounds recovered for recycling and acquired by markets for recycling.

U.S. and Canadian reclaimers acquired 94.7 percent of the bottles recycled in the U.S. in 2019, and reclaimers in the U.S. purchased 88.6 percent.[19] The export of bottles overseas has generally been in decline since before 2010 for bottles overall, but there was a slight increase in 2019. Purchases by Canadian reclaimers declined for PET and Natural HDPE bottles, but increased for Colored HDPE and PP bottles. Exports of all bottles overseas totaled 149.7 million pounds or 5.3 percent, up from 2018 when bottle exports were at an all-time low of 123.8 million pounds (4.3 percent).

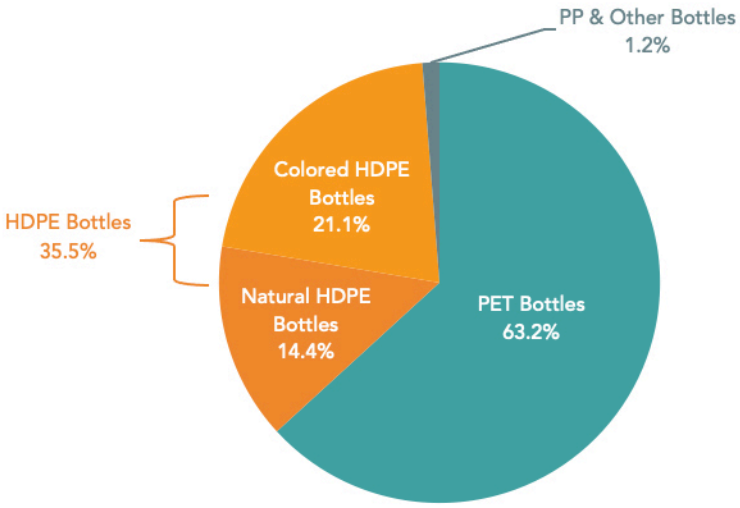
Figure 4: U.S. Sourced Post-consumer Bottles Recovered for Recycling by Destination



19. This report highlights the amount of recycled plastic sourced in the U.S. and processed in the U.S. and Canada compared to exports overseas. The historical U.S. National Postconsumer Plastic Bottle Recycling Report highlighted U.S. purchase compared to all exports, including material going to Canada.

PET represents 63.2 percent of bottles recovered for recycling, followed by Colored HPDE bottles at 21.1 percent and Natural HDPE bottles at 14.4 percent; the remaining 1.2 percent is PP and Other Bottles. Other bottles include LDPE, PVC and Other Bottles as part of the composition of mixed rigid bales, with some reported as specific bales, e.g. Polycarbonate (PC).

Figure 5: Percentage of Pounds of U.S. Sourced Post-consumer Bottles Recovered for Recycling by Category



Due to rounding, some totals may not correspond with the sum of the separate figures.

PET Bottles

PET Bottles, sourced in the U.S., are the largest category of bottles produced and recovered for recycling. The amount recovered for recycling decreased by 39.3 million pounds for a total of 1,776.8 million pounds in 2019. Resin going into PET Bottles in 2019 (the recycling rate denominator) increased by 94.8 million pounds (1.5 percent) over 2018 to 6,365 million pounds. The increase of bottles in the marketplace combined with a decrease in the amount of bottles recovered for recycling resulted in just over a one percentage point drop in the PET bottle recycling rate to 27.9 percent.

The vast majority (96.1 percent) of PET bottles recovered for recycling in the U.S. are processed by reclaimers in the U.S. or Canada with the remaining going to overseas export markets. U.S. reclaimers purchased 92.2 percent of the U.S. sourced PET bottles recovered for recycling and also imported 65.8 million pounds, a 1.7 percent decrease compared to 2018. PET bottle reclaimers processed a total of 1,852.5 million pounds of PET recovered for recycling sourced from the U.S. and outside the U.S., including bottles and non-bottle PET material (e.g., thermoforms) in 2019. This was a decline of 36.9 million pounds compared to 2018, primarily due to the decrease in U.S. sourced PET bottles purchased.

Table 3: U.S. Sourced Post-consumer PET Bottle Recycling Rate

PET Bottles		
Millions of Pounds	**2018**	**2019**
Resin Sales	6,270	6,365
Recovered for Recycling	1,816	1,777
Recycling Rate	29.0%	27.9%

Capacity and End Uses

U.S. reclaimer capacity remained consistent with 2018 at nearly 2.4 billion pounds. Fiber remains the dominant North American end use for recycled PET bottles, with Bottle end market share (both food/beverage and non-food/beverage) continuing to increase year over year, followed by Sheet and Film, Strapping and Other end markets.

Source of the above PET Bottle recycling detail is NAPCOR's Report on Post-Consumer PET Container Recycling Activity in 2019.

HDPE Bottles

HDPE bottles, the second largest bottle category, also declined overall by 8.5 million pounds, for a total of 997.9 million pounds recovered for recycling in 2019. There was a significant decline in Natural HDPE Bottles recovered for recycling by 25.6 million pounds to 405.2 million pounds for 2019. However, Colored HDPE Bottles partially offset the decline in Natural HDPE Bottles with an increase of 17.1 million pounds to 592.7 million pounds in 2019. HDPE bottle production declined by 89 million pounds, with Natural HDPE bottles declining by 8 million pounds and colored declining by 81 million pounds. Given the increase in Colored HDPE Bottle recovery compared to the decline in resin going into bottles produced in 2019, the overall recycling rate for HDPE bottles increased by half a percentage point to 30.9 percent.

Table 4: U.S. Sourced Post-consumer HDPE Bottle Recycling Rate[20]

Millions of Pounds	2018			2019		
	Natural HDPE Bottles	Colored HDPE Bottles	Total HDPE Bottles	Natural HDPE Bottles	Colored HDPE Bottles	Total HDPE Bottles
Resin Sales	1,500	1,815	3,315	1,492	1,734	3,226
Recovered for Recycling	431	576	1006	405	593	998
Recycling Rate	28.7%	31.7%	30.4%	27.2%	34.2%	30.9%

Due to rounding, some totals may not correspond with the sum of the separate figures.

The majority (82.8 percent) of HDPE bottles recovered for recycling in the U.S. are processed in the U.S. Canadian and U.S. reclaimers process 92.2 percent of the HDPE bottles recovered for recycling in the U.S. with 7.8 percent exported overseas. Reclaimers in Canada purchased 93.5 million pounds of HDPE bottles in 2019, up 14.5 million pounds from 2018. U.S. reclaimers processed 858.7 million pounds of HDPE bottles in 2019, sourced from the U.S. and outside the U.S., down 39.9 million pounds compared to 2018. Similar to 2018, U.S. reclaimers purchased 32.3 million pounds of non-U.S. sourced HDPE bottles in 2019, with 78.1 percent of that material sourced from Canada.

20. All non-PET Resin Sales is based on data provided by the American Chemistry Council's Plastics Industry Producers Statistics Group. HDPE resin sales include both the virgin resin sales and recycled plastic pounds used to produce new bottles. Imports from non-ACC members are not included. The recycling rate is based on gross pounds recovered for recycling and acquired by markets for recycling.

Capacity and End Uses

U.S. reclaimer capacity increased in 2019 to 1.3 billion pounds, up nearly 100 million pounds from 2018. The primary end uses for U.S. and Canadian Reclaimers of HDPE bottles are new bottles and pipe, followed by lawn/garden, plastic lumber/decking, and automotive applications. The largest end use for natural bottles is new bottles, followed by plastic lumber/decking, and then film/sheet. The largest end use for Colored HDPE bottles is pipe, followed by bottles, lawn/garden products, automotive applications, then plastic lumber/decking, and film/sheet.

PP & Other Bottles

PP Bottles recovered for recycling in 2019 totaled 29.8 million pounds, a small decline from 30.6 in 2018. PP Bottles produced in 2019 increased by 8 million pounds to 188 million pounds. The recycling rate dropped to 15.9 percent in 2019 compared to 17 percent in 2018. PP Bottles end up in Colored HDPE Bottle bales, mixed rigid bales and are traded to a lesser degree in segregated PP Bottle only bales.[21] PP Bottles from mixed rigid bales accounts for 66.2 percent of the PP bottles recovered for recycling in 2019. PP bottles as a percentage of Colored HDPE Bottles represented 28.8 percent of total PP bottles recovered for recycling with the remaining reported as segregated PP bottle bales at 5.0 percent. U.S. reclaimers purchased less PP bottle material overall with a decline of 4.7 million pounds compared to 2018. This decline was softened primarily due to Canadian reclaimers increased purchases of PP Bottles sourced from the U.S. across the above three commodity categories that include PP bottles. The largest increase coming from the purchase of mixed rigid bales. Due to limited data sources, information on PP reclamation capacity is not available. Recycled PP is used to manufacture crates, buckets, pallets, automotive applications, and other injection molded items.

LDPE, PVC, and Other bottles comprised 4.9 million pounds of the total bottles recovered for recycling in this report, which is slightly up from the 4.8 million pounds in 2018. These bottles are primarily found in mixed rigid bales as well as some direct report of segregated bales, for bottles like Polycarbonate (PC). Although these bottles are recyclable, and to varying degrees are recycled, e.g. LDPE, the deliberate recycling of those resin bottles is limited by the continuing challenge to reach a critical mass of readily recognizable bottles for economical collection and processing.

21. PP Bottles are estimated at 1.5% of Colored HDPE bottle bales. A HDPE bottle bale composition analysis would support an update to this estimate. The PP bottle portion of mixed rigid bales is based on the composition study noted in the methodology.

Non-bottle Rigid Plastics

Data reported indicate nearly 1,289.7 million pounds of U.S. sourced non-bottle rigid plastic were recovered for recycling in the U.S. in 2019. U.S. and Canadian reclaimers purchased 86.6 percent of the total pounds recovered in 2019. The remaining 13.4 percent was exported overseas.

Figure 6: U.S. Sourced Non-bottle Rigid Plastic Recovered for Recycling by Destination

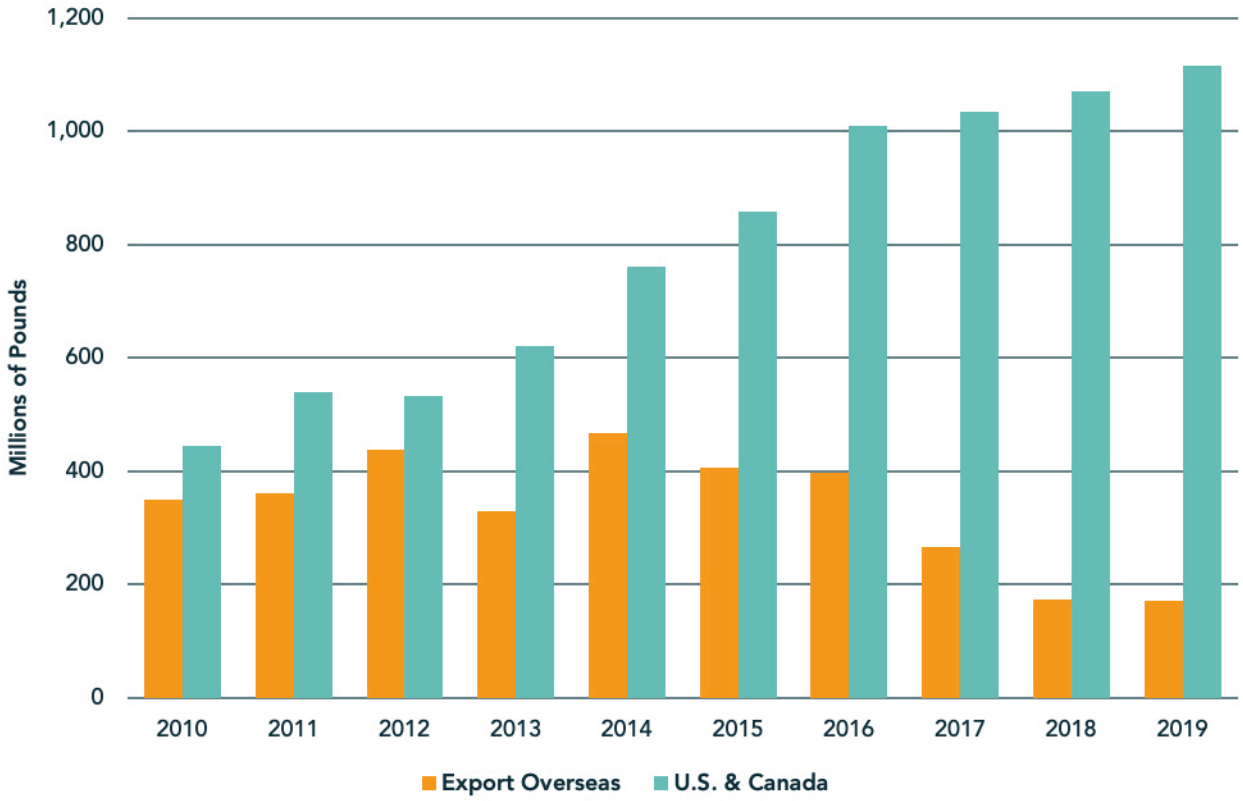


Table 5: U.S. Sourced Post-consumer Non-bottle Rigid Plastic Recovered for Recycling[22]

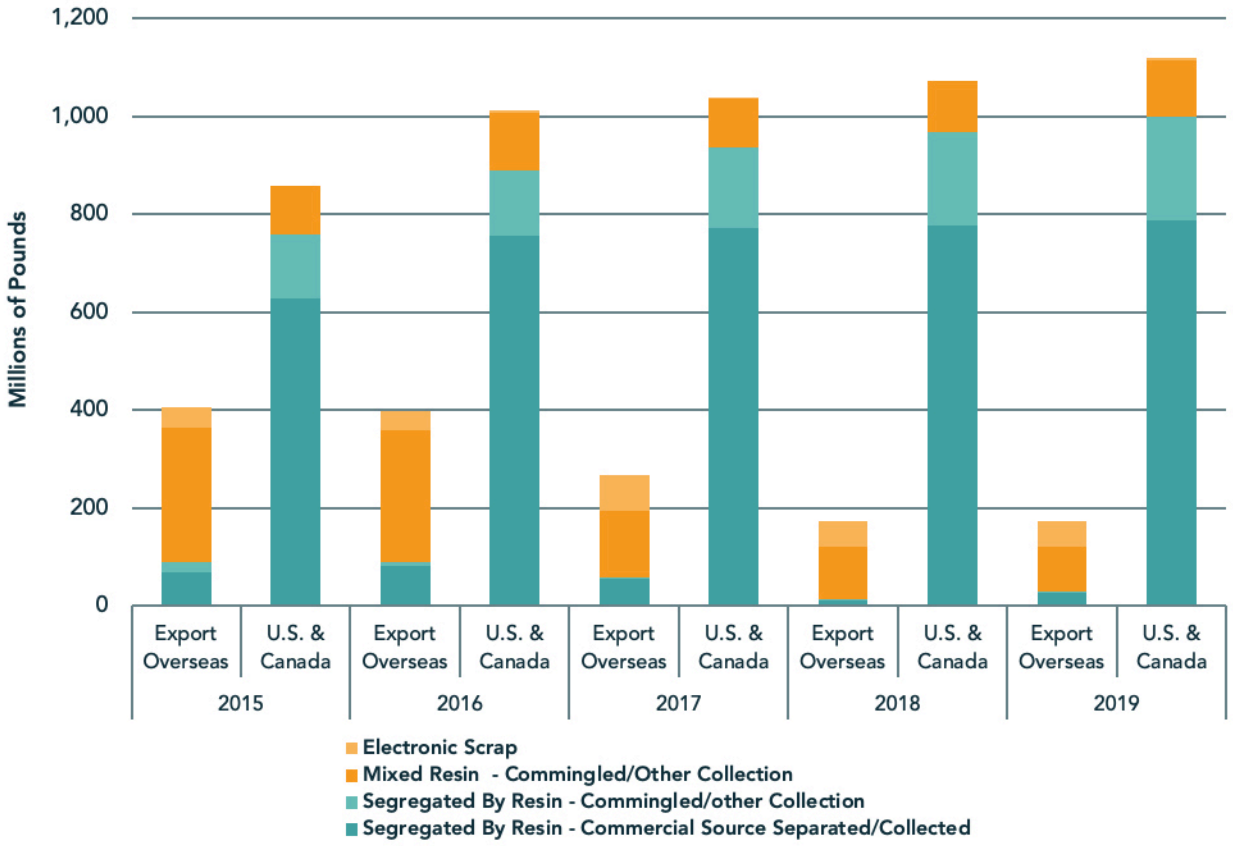
Year	Exported Overseas	Acquired by the U.S. & Canada		Total
		Quantity	Percent	
Millions of Pounds				
2010	350.9	445.3	55.9%	796.2
2011	361.5	541.0	59.9%	902.5
2012	437.2	534.3	55.0%	971.5
2013	329.0	621.4	65.4%	950.3
2014	467.8	761.6	62.0%	1,229.4
2015	407.1	857.8	67.8%	1,264.8
2016	398.1	1,009.3	71.7%	1,407.4
2017	266.6	1,034.1	79.5%	1,300.7
2018	173.7	1,070.1	86.0%	1,243.8
2019	172.7	1,117.0	86.6%	1,289.7

Due to rounding, some totals may not correspond with the sum of the separate figures.

From 2018 to 2019, non-bottle rigid plastic recovered for recycling increased by 45.9 million pounds. Export purchasing dropped one million pounds, but U.S. and Canadian reclaimer purchasing of U.S. sourced non-bottle rigid plastic increased by 46.9 million pounds (or 4.4 percent). U.S. and Canadian buyers reported a significant increase coming from material further segregated by resin from commingled/other collection, typically from curbside collection or municipal drop-off, as well as more source separated commercial commodities and mixed resin rigid bales. Exporters reported a decrease from 2018 to 2019 for non-bottle rigid plastic mixed resin rigid bales, but doubled the amount reported for segregated by resin in 2019 compared to 2018. Total non-bottle rigid plastic recovered for recycling increased over 62.0 percent since 2010, while exports decreased by 50.8 percent since 2010.

22. Previous non-bottle rigid plastic reports included cap and label from PET reclamation in the total recovered for recycling to document the PP and HDPE recycled from PET bottle processing. Due to tallying the major plastic categories in this report, cap and label is not included in the non-bottle rigid plastics data provided in this report, because it is already included in gross recycling totals for PET Bottles in this report.

Figure 7: U.S. Sourced Post-consumer Non-bottle Rigid Plastic Recovered for Recycling by Destination



U.S. and Canadian reclaimers purchased 3.5 percent more segregated non-bottle rigid material, 10.1 percent more mixed resin plastic from commingled or other collection and a small amount of electronic scrap. In 2019, 79.8 percent of the non-bottle rigid plastic was segregated by resin, up from 78.7 percent in 2018. The remaining 20.2 percent purchased was mixed resin material; 16.0 percent was mixed resin rigid bales and 4.2 percent was electronic scrap plastic. U.S. and Canadian markets continue to dominate the purchase of non-bottle rigid plastic further segregated by resin from commingled/other collection, reporting 97.0 percent of purchases in this category in 2019 with an increase of 34.2 million pounds compared to 2018.

U.S. and Canadian reclamation markets purchased 56.4 percent of the non-bottle rigid plastic from mixed resin rigid bales in 2019. Export purchases dropped for mixed resin material by 17.9 million pounds, but more than doubled for segregated material compared to 2018 with an increase of 17.0 million pounds. Non-bottle rigid plastic from mixed resin rigid bale purchasing fell overall by 2.7 percent, due to a decline in export across bale categories and despite increased U.S. and Canadian reclaimer purchases of 3-7 Bottles and Small Rigid Plastic.

Figure 8: U.S. Sourced Post-consumer Non-bottle Rigid Plastic Recovered for Recycling from Commingled/Other Collection by Destination

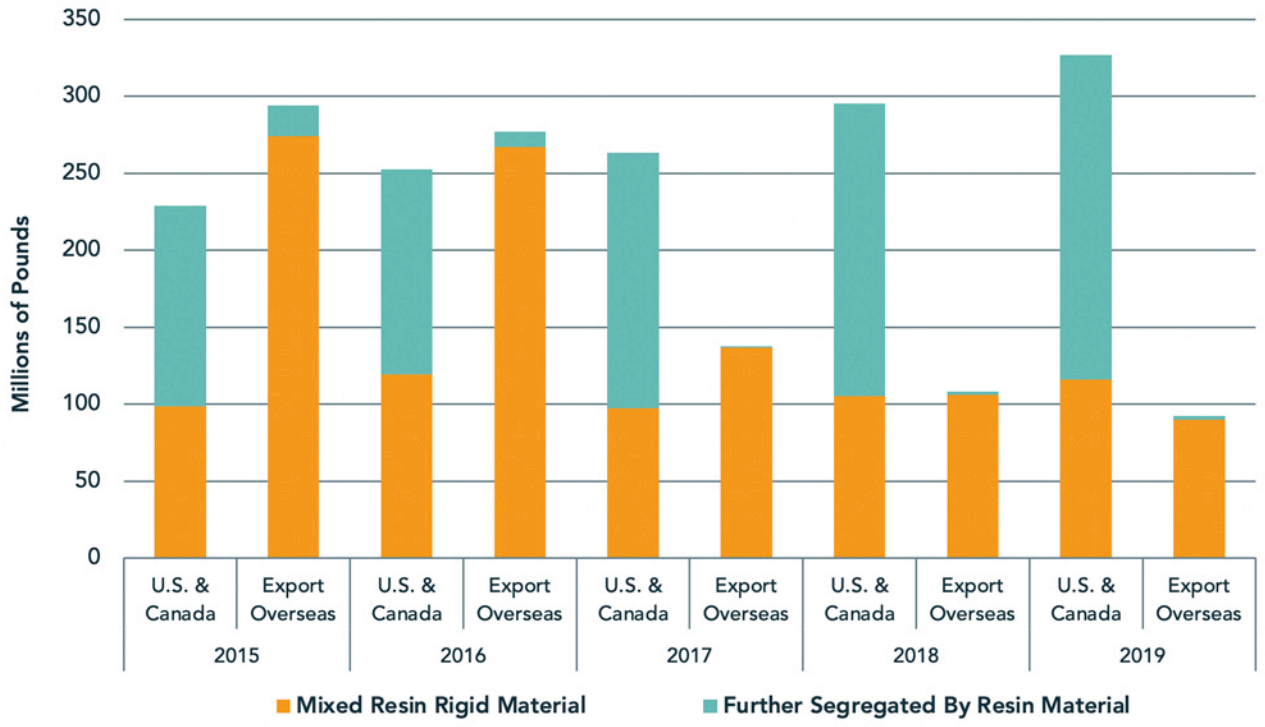
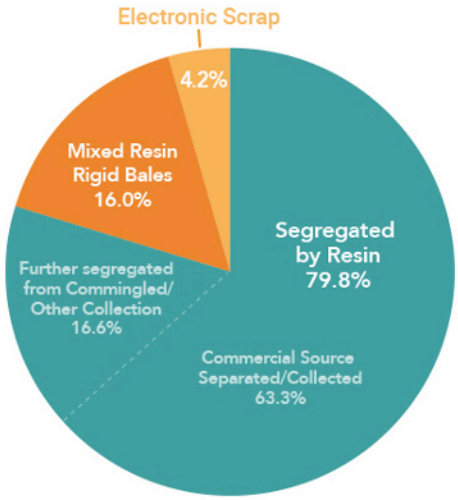


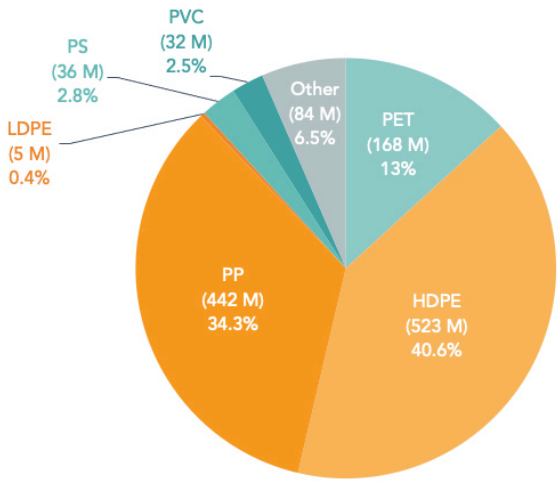
Figure 9: Sources of U.S. Sourced Post-consumer Non-bottle Rigid Plastic Recovered for Recycling



Due to rounding, some totals may not correspond with the sum of the separate figures.

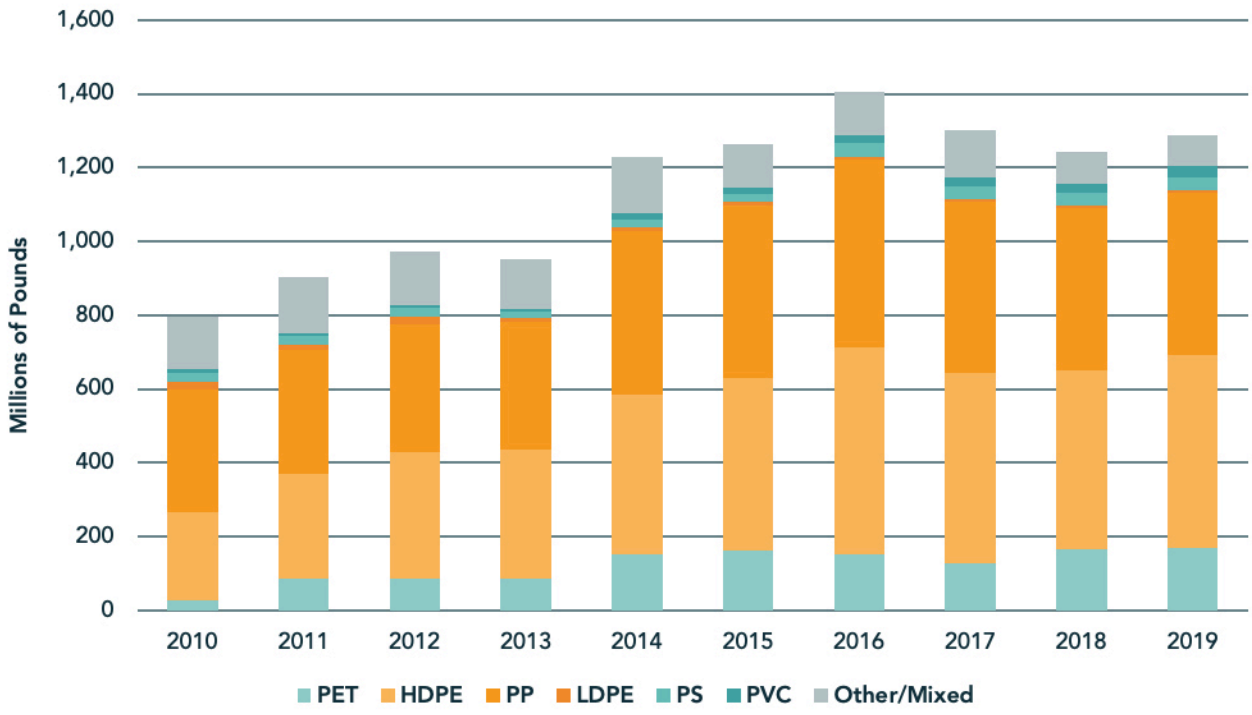
Non-bottle rigid plastic is primarily comprised of HDPE and PP; together HDPE and PP made up 74.9 percent of the non-bottle rigid plastic acquired for recycling in 2019. Despite the drop in total non-bottle rigid plastic recovered for recycling since the peak total recovered for recycling reported in 2016, HDPE and PP continue to maintain their percentage of the total composition with an increase in HDPE from 2018 to 2019 of 38.9 million pounds to 40.6 percent and PP at 34.3 percent increasing just under 1 million pounds. PVC, PET and PS also increased in total pounds, but the increase didn't change the percentage of the total significantly. Other/Mixed resin and LDPE decreased in total pounds and their percentages of the total decreased slightly compared to 2018.

Figure 10: U.S. Sourced Post-consumer Non-bottle Rigid Plastic Recovered for Recycling by Resin



Due to rounding, some totals may not correspond with the sum of the separate figures

Figure 11: U.S. Sourced Post-consumer Non-bottle Rigid Plastic Recovered for Recycling by Resin



PET - polyethylene terephthalate, HDPE - high-density polyethylene, PP - polypropylene, LDPE - low-density polyethylene, PS - polystyrene, PVC – polyvinyl chloride

PET stayed the same at 13 percent in 2019 with a slight increase of two million pounds. PVC increased by just under 6 million pounds. PS increased slightly by just over half a million pounds but maintained the same percentage of the total amount recovered for recycling compared to 2018.

The Other category (including mixed resins or otherwise unknown resin) represented the largest decrease in non-bottle rigid recovered for recycling in 2019 with a decrease of 1.9 million pounds, mainly due to a decrease in ABS and Other resin reported. LDPE modestly decreased by less than half a million pounds compared to 2018.

Capacity and End Uses

For 2019, a conservative estimate for non-bottle rigid plastic reclamation capacity in the U.S. is 1.2 billion pounds.[23] Most of the U.S. reclamation capacity for non-bottle rigid plastic is for relatively clean segregated PE and PP items.

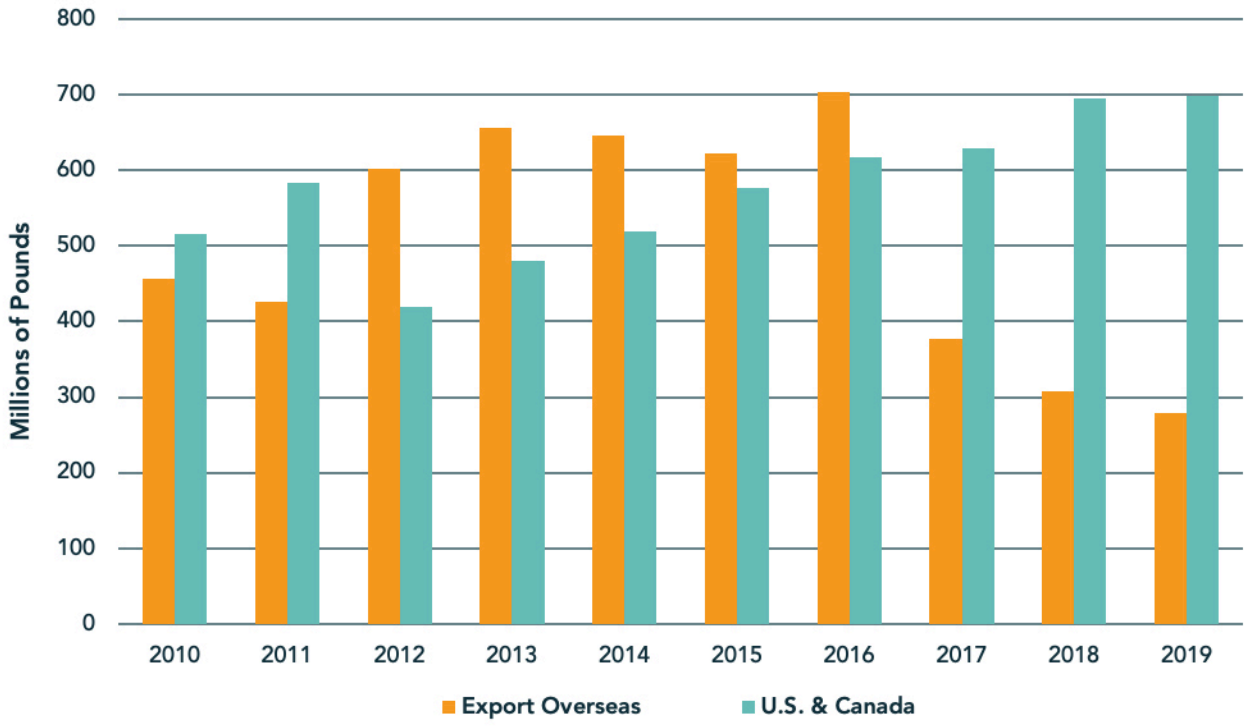
End uses for non-bottle rigid plastics are automotive products, crates, buckets, pallets, lawn and garden products, railroad ties and other relatively thick-walled injection molded products. A small portion of the non-bottle rigid plastic recovered is used in plastic lumber and other extruded products.

23. Given a large percentage of non-bottle rigid plastic recycled is HDPE, the capacity for processing non-bottle rigid plastic likely overlap some of the capacity reported in the HDPE Bottle and the Film section below.

Film

The majority of plastic films are made from polyethylene (PE) resins, such as high-density polyethylene (HDPE), low-density polyethylene (LDPE), and linear low-density polyethylene (LLDPE).[24] Those mentioned are the predominant forms included in this report. In 2019, 977.7 million pounds of film were reported as recovered for recycling in the U.S., which is a 49.8 percent increase since 2005, when film recycling was first documented, but a 24.4 million pound drop from the 2018 total. Total film reported as recovered for recycling is down; conversely, the amount of film reported as recovered for recycling by U.S. or Canadian reclaimers increased in 2019 for the highest amount reported in the history of this study, 698.8 million pounds or 71.5 percent of the film recovered for recycling. Export overseas totals peaked in 2016 and have continued to drop. In 2019, export totals decreased by 28.5 million pounds from 2018, making up 28.5 percent of the total amount of film recovered for recycling.

Figure 12: U.S. Sourced Post-consumer Film Recovered for Recycling by Destination



24. In this report plastic bags, wrap and film are generally referred to as "film," which is defined as thin, flexible sheets of plastic.

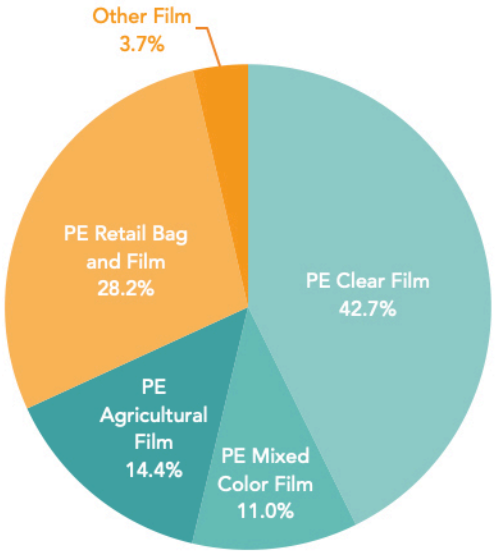
Table 6: U.S. Sourced Post-consumer Film Recovered for Recycling

Year	Exported Overseas	Acquired by the U.S. & Canada		Total
		Quantity	Percent	
Millions of Pounds				
2010	456.0	515.8	53.1%	971.8
2011	426.7	583.0	57.7%	1,009.8
2012	601.9	418.6	41.0%	1,020.5
2013	656.3	479.7	42.2%	1,136.1
2014	645.7	519.4	44.6%	1,165.1
2015	622.5	576.6	48.1%	1,199.1
2016	704.4	617.7	46.7%	1,322.1
2017	377.6	629.1	62.5%	1,006.7
2018	307.3	694.7	69.3%	1,002.0
2019	278.9	698.8	71.5%	977.7

Due to rounding, some totals may not correspond with the sum of the separate figures

Depending on how and where scrap film is collected, recovered film bales may contain combinations of HDPE, LDPE, and LLDPE resins or may contain a single resin. For example, stretch film (e.g., pallet wrap) is either collected separately and marketed as PE Clear Film, or it may be mixed with other polyethylene film—including post-consumer bags and wrap—and marketed as PE Retail Bags and Film. Stretch film represents a significant majority of the post-consumer film recovered for recycling.

Figure 13: Percentage of Pounds of U.S. Sourced Post-consumer Film Recovered for Recycling by Category



PE Clear Film continued to comprise the largest category of film recovered for recycling, with a total of 417.3 million pounds, or 42.7 percent. PE Retail Bags and Film was second at 275.8 million pounds or 28.2 percent, which resulted in a 13.8 percent increase in its category and this category now makes up nearly a third of the total film recovered for recycling. U.S. and Canadian reclaimers purchased less film in all categories except PE Retail Bags and Film and PE Agricultural Film. Both of these categories had increases in both U.S. and Canadian reclaimer purchasing and export overseas. Export overseas purchasing dropped overall, with the most significant drop in PE Clear Film with a 23.9 percent decrease compared to the 2018 category total. However, as stated previously, PE Clear Film continues to be the largest category of film recovered for recycling.

Table 7: U.S Sourced Post-consumer Film Recovered for Recycling by Category

Film Category	Total Recovered for Recycling in 2019 (Millions of Pounds)	Total Percent Change Since 2018	% Acquired by U.S. and Canadian Reclaimers
PE Clear Film	417.3	-11.7%	66.3%
PE Mixed Color Film	107.7	-7.4%	65.5%
PE Agricultural Film	141.2	5.6%	94.9%
PE Retail Bags & Film	275.8	13.8%	77.8%
Other Film	35.7	-4.1%	7.9%
Total	**977.7**	**-2.4%**	**71.5%**

For 2019, Other Film also includes MRF Curbside Film since total pounds was negligible.

Post-Consumer Bags and Wrap Recycling

Stina estimates that 177.6 million pounds of U.S. sourced post-consumer bags and wrap generated from the residential sector were recovered for recycling in 2019, which is 18.2 percent of the total film recovered for recycling.[25] A private national bale audit in the retail sector provided the percentage of bags in PE Retail Bags and Film bales from 2012-2019.[26] Based on the findings of the bale audit study, this report assumes that approximately 64 percent of PE Retail Bags and Film bales are post-consumer bags and wrap, approximately 27 percent is stretch wrap, and the remainder is contamination. Approximately 30 percent of the post-consumer bags and wrap are retail carryout bags, and the remaining material is post-consumer packaging wrap and other bags. Given the historical variability in percentages, this is a conservative estimate of consumer-returned bags and wrap recovered for recycling.

25. Consumer-returned plastic bags and wrap are commonly commingled with stretch film wrap and other retailer-generated scrap film for efficient collection at retail locations. Therefore, "bag only" bales, containing only consumer bags and wrap, are rare.
26. Prior to the 2012 Report, Stina used an average of the percentages of bags in PE Retail Bags and Film bales reported by reclaimers. In addition to the private bale audit study, the Flexible Film Recycling Group (FFRG) conducted bag audits on material recovered during Wrap Recycling Action Program's (WRAP) educational campaigns in WI, WA, and CT to provide additional insight and assess the impacts of specific signage and education at the retail level on the quality and volume of recovered film. More information about WRAP reports, including bag audits, is available on PlasticFilmRecycling.org.

Capacity and End Uses

In 2019, film reclamation capacity in the U.S. was approximately 1.0 billion pounds.[27] Most of the U.S. film processing capacity is for clean PE film.

The primary end uses for plastic film include plastic lumber/decking, film and sheet, and injection molding, which may include products such as pallets, crates, and buckets. Plastic lumber/decking remains the dominant end use for post-consumer film.

27. Given a the majority of film recycled is PE, the capacity for processing film likely overlap some of the capacity reported in the HDPE Bottle and the Non-bottle Rigid section.

Other Plastics (excluding foam)

In 2019, 17.4 million pounds of Other Plastics, excluding foam, were reported as recovered for recycling. This is the 1st year these additional materials were included in the survey findings and therefore could contribute additional pounds of plastic reported as recovered for recycling. This category more broadly represents wovens, non-wovens and other semi-rigid flexible products and packaging not covered under the existing categories.

Material categories include:

- FIBCs (flexible intermediate bulk containers - e.g. Super Sacks, totes, bulk bags)
- Drip Tape
- Twine and Netting
- Other Non-Film Flexibles

The carpet reported was not included in the total due to limited response. There is a separate CARE 2019 annual study and report by the Carpet America Recovery Effort.

Of the 17.4 million pounds, five percent was purchased by reclaimers in the U.S. or Canada, and 95 percent was exported overseas. The pounds reported for the Other Plastics (excluding foam) is likely under-reported for 2019 based on limited responses in these categories but known trading of the material for some companies that did not respond for 2019. Due to limited data sources, information on reclamation capacity and end uses are not available.

The 2019 data gathering process laid the groundwork to receive additional responses in the future and the study will continue to further delineate the material categories in the next survey and reports, as well as coordination with existing material reporting for carpet.

Additional information

The Plastics Division of the American Chemistry Council (ACC) represents leading manufacturers of plastic resins. ACC offers resources to communities that wish to increase post-consumer plastic collection, including some targeted specifically at bottles and rigid plastics, as well as others focusing on plastic films, bags and wraps. Visit www.AdvancingCircularPackaging.com, www.PlasticFilmRecycling.org, and https://plastics.americanchemistry.com/ for more information.

The Association of Plastic Recyclers (APR) is The Voice of Plastics Recycling®. As the international trade association representing the plastics recycling industry, membership includes independent recycling companies of all sizes, processing numerous resins, as well as consumer product companies, equipment manufacturers, testing laboratories, organizations, and others committed to the success of plastics recycling. APR advocates the recycling of all plastics. Visit www.PlasticsRecycling.org for more information.

The Foundation for Plastic Recycling's mission is to drive sustainability solutions for plastics packaging in order to support the Circular Economy. Through education, research and collaboration, the Foundation seeks to enhance the value of plastic recycling as well as expand plastic recycling efforts at the state and national level. Established by The Association of Plastic Recyclers, the Foundation for Plastic Recycling is unique for its commitment to enhancing and expanding plastics recycling efforts in order to garner economic and environmental benefits. Visit www.plasticsrecycling.org/the-foundation-for-plastic-recycling for more information.

Stina Inc., previously d.b.a. More Recycling is a mission-based research and technology firm with recognized expertise in plastic recycling. Stina has conducted the annual plastic recycling study for over 10 years for the United States and Canada. Confidentiality and neutrality are the cornerstones to this research, analysis, and reporting. Stina supports the recycling industry by creating tools that support greater connectivity and recognition of leaders in circularity. Such tools include www.PlasticsMarkets.org, the Buy Recycled Products Directory, which can be found on www.CircularityinAction.com, a platform designed to connect users with the relevant tools to support the transition to circularity, provide opportunities to recognize successes in recycling, and share the state of recycling in the public domain.

The 2019 survey and report were made possible through funding from the Plastics Division of the American Chemistry Council (ACC) and a grant from APR's Foundation for Plastic Recycling.

To view previous study reports, visit the APR Library.

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