



2015 National Post-consumer Plastic Bag & Film Recycling Report

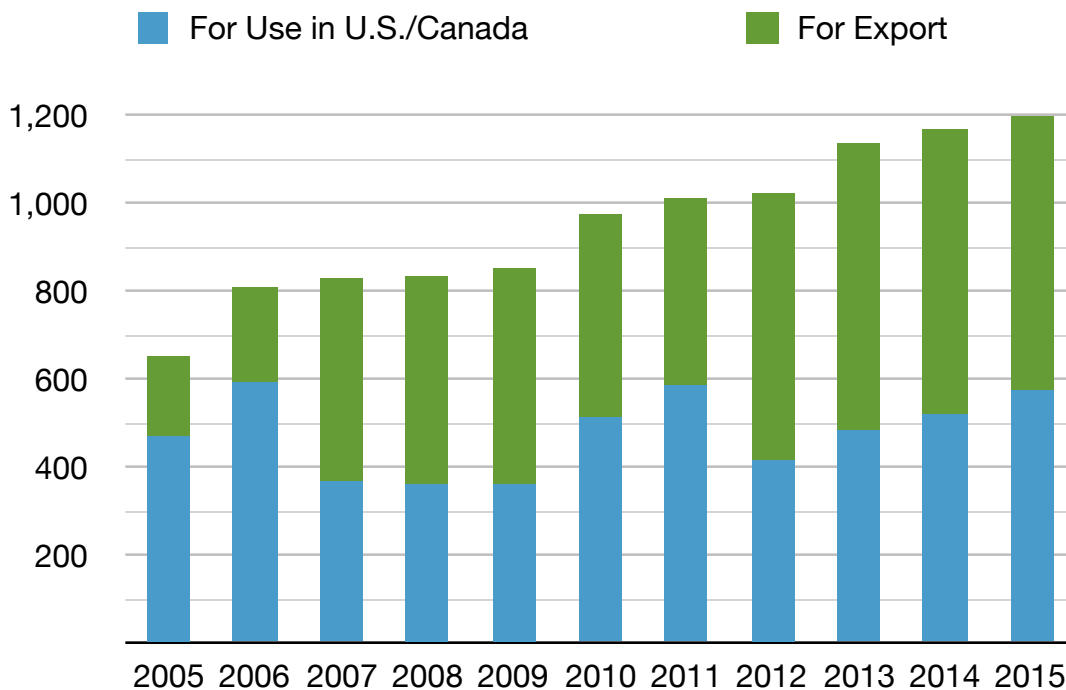
March 2016

Prepared by Moore Recycling Associates Inc. for the
American Chemistry Council

Introduction

This 2015 National Post-consumer¹ Plastic Bag and Film Recycling Report is the 11th annual report on the amount of plastic bags and film² recovered in the United States (U.S.) for recycling. This research was conducted and the report finalized by Moore Recycling Associates Inc. for the Plastics Division of the American Chemistry Council (ACC).

U.S. Post-consumer Film Recovered (Millions of pounds)



¹ The Environmental Protection Agency (EPA) defines “post-consumer” as a material or a finished product that has served its intended use that is then diverted or recovered before it is disposed. It is the material consumers and businesses recycle; it does not include manufacturing waste, which is commonly reused in the original manufacturing process. The EPA defines “pre-consumer” on the EPA website as material that is recycled before it is used by a consumer (EPA Home; Pacific Southwest. Waste. Solid Waste. Reduce, Reuse, Recycle, Buy Recycled, Oct. 15, 2015. <<http://www3.epa.gov/region9/waste/solid/reduce.html#br4>>). This study uses EPA’s definition throughout this report, wherein “post-consumer” refers to plastics that have been previously 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, and other commercial packaging. This report does not cover the recycling of post-industrial (pre-consumer) materials. An example of post-industrial material is scrap or trimmings that are generated in manufacturing and converting processes.

² In this report, plastic bags and film are generally referred to as “film.” Film is thin, flexible sheets of plastic. The majority of plastic films are made from polyethylene resins, such as high-density polyethylene (HDPE), low density polyethylene (LDPE), and linear low density polyethylene (LLDPE).

Executive Summary

A minimum of 1.2 billion pounds of post-consumer film (which includes plastic bags and wrap) was recovered for recycling in 2015, which is a 34 million pound increase from 2014. In 2015, U.S. and Canadian processors recycled approximately 48 percent of the post-consumer film recovered for recycling; the remainder was exported. Domestic purchases of post-consumer film increased 11 percent, whereas export purchases decreased nearly four percent compared to 2014. The result was a three percent overall increase in post-consumer film recovered for recycling in 2015.

PE Clear Film (see page 4 for film category definitions) continued to comprise the largest category of film recovered for recycling, with an estimated 610 million pounds. PE Mixed Color Film is the second largest category of film recovered for recycling, at 235 million pounds, indicating a two percent increase from 2014. PE Retail Bags and Film, the category that includes post-consumer bags and wrap recovered for recycling, decreased for the second year in a row to 194 million, from 221 million pounds in 2014. Other Film and MRF³ Curbside Film categories comprise a very small portion of the materials that are collected for recycling.

To estimate the pounds of post-consumer plastic recovered for recycling in 2015, Moore Recycling surveyed both domestic and export markets for all post-consumer plastic (as well as some key players within the value chain, such as MRFs, brokers, and end users). This report's findings are based on reported data from the recovery of U.S.-sourced, post-consumer material. Moore Recycling received responses from 24 U.S. and Canadian plastic reclaimers⁴ and 36 exporters. Even though exporters reported less film overall, the number of participating companies increased by eight for 2015 compared to 2014. The number of participating U.S. and Canadian plastic reclaimers also increased, by seven companies.

³ Material Recovery Facility (MRF)

⁴ Moore Recycling surveys and counts material from reclaimers, defined as companies that wash post-consumer material or otherwise process unwashed material into a clean feedstock or end product.

Methodology

Data on recovered post-consumer plastic is collected through a voluntary, annual plastic recycling survey that also gathers data on plastic bottles, non-bottle rigid plastics and other plastics.

The following steps are taken to prepare the report:

- Moore Recycling continually updates its markets database to include current exporters, reclaimers, and other handlers of plastic scrap;
- Moore conducts an electronic survey of market participants in plastic recycling to collect data; and
- Moore undertakes a follow-up step for survey-collected data, to help check the accuracy of the data through follow-up calls, conversations with industry contacts, and reviews of other sources of recycling industry information.

Data Collection and Analysis

Moore Recycling continually updates a proprietary database of plastic exporters, processors, reclaimers, and key brokers to help ensure that the survey reaches the key plastic scrap buyers from North America.⁵

Moore Recycling uses a custom-designed, web-based survey system to gather data. Although the overall methodology has not changed since the first report, Moore Recycling continually seeks ways to improve the completeness and timeliness of survey responses. These changes allow for better material flow tracking and assist with avoidance of double counting. The year 2015 marked the second-annual inclusion of an expanded section for post-industrial plastic. Annually, an email with a unique link and message is sent to each contact in Moore Recycling's database. After an adequate amount of response time has passed, Moore Recycling employees send follow-up emails and make telephone calls to retrieve data. This follow-up process can take weeks or months, depending on the responses. The data are entered in an online survey tool, either directly by the company being surveyed, or by Moore Recycling 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.⁶

⁵ Through Moore Recycling's project work in the industry and websites it manages—PlasticsMarkets.org, RecycleMorePlastic.org and PlasticFilmRecycling.org—Moore Recycling regularly engages with companies and new contacts in this sector. Moore also identifies potential buyers through published market databases and conversations with suppliers, such as materials recovery facilities (MRFs) and key reclaimers.

⁶ Moore Recycling conducts the survey and maintains the confidentiality of individual responses; no individual company data are released, nor any specific data that do not have at least three companies reporting.

The final data totals are reviewed and analyzed; then, they are reported with as much detail as possible without compromising confidentiality. In order to determine trends and identify anomalies that may require further vetting, the analysis includes year-to-year comparisons of totals, material categories, and trends among export and domestic buyers. Describing how the data are collected, and 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 recycling data.

Film Categories

The 2015 survey used the following material categories:

- **PE Clear Film** (formerly Commercial Clear Film) - Clear, clean polyethylene (PE) film from commercial sources, including stretch wrap and poly bags
- **PE Mixed Color Film** (formerly Commercial Mixed Color Film) - Mixed color PE film from commercial sources, including stretch wrap; no post-consumer bags
- **PE Retail Bag and Film** (formerly Mixed Film) - Mixed color, clean PE film, including stretch wrap and retail collected post-consumer bags, sacks, and wraps
- **MRF Curbside Film** (formerly Curbside Film) - Post-consumer Mixed-PE film collected curbside
- **PE Agricultural Film** (formerly Agricultural Film) - Dirty Ag Film, or film that has been in contact with the ground, exhibiting up to 50 percent contamination, including mulch film; this also includes Clean Ag Film, or dry film, which has been used in applications that do not involve contact with the ground, at up to 10 percent contamination, including greenhouse film
- **Other Film** - A “catch-all” for film that does not fit in any of the categories above; mostly non-PE films, such as polyvinyl chloride (PVC) and polypropylene (PP)

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 plastic recovered for recycling and sold on the marketplace. For example, we know of at least two reclaimers that may have recycled post-consumer film that did not respond to the 2015 survey. Only data provided by North American reclaimers, predominantly U.S. and Canadian, but also exporters selling directly overseas, are included in the reported totals, unless we determine that data is missing in areas where substantive information from other reliable sources is available. Data provided by brokers and material recovery facilities (MRFs) are primarily used as a reference to better understand the flow of material, but Moore Recycling may include their data if enough information is provided that would enable us to attribute material sold to a non-responder.

Except for the largest exporters, players in the export market come and go and may frequently change the materials purchased. This can make the export market difficult to track. Moore Recycling tracks exporters handling plastic through a number of industry resources, and most of the large exporters respond to the survey.

Again, since participation in the survey is voluntary, Moore Recycling sometimes receives responses from existing companies that did not previously respond. Increases in year-to-year recovery rates are often a combination of increased collection along with material that was recycled in previous years but not reported. When Moore Recycling can conclude the nature of an increase (or decrease), the reasoning is indicated; however, it can be difficult to make a solid determination in any given year, depending on the depth of information Moore Recycling receives from plastic handling companies from previous years and while taking into account the need to protect confidentiality.

Often, Moore Recycling must follow up with responders due to inconsistent placement of data in survey categories. Quality control is essential to determining if there has been an actual shift or just an entry error. Clarification is often needed to determine whether reported material can be counted as post-consumer commercial or if it is, in fact, industrial scrap.

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. The survey now specifically includes a detailed section on post-industrial plastic recycling to encourage responses from industrial/commercial scrap recyclers. Having an additional focus on post-industrial recycling enables us to engage these recyclers about handled post-commercial material that they may not realize is considered post-consumer.

Determining the amount of post-consumer bags and wrap recovered for recycling is not straightforward. Most retailers combine consumer-returned bags and wrap with film for transport to markets that can reclaim a mixture of polyethylene film. These bales, containing bags and wrap, are reported by reclaimers and exporters in the PE Retail Bags and Film category. Moore Recycling estimates the recovery of post-consumer bags and wrap from consumers by adding a percentage of the PE Retail Bags and Film total to the total MRF Curbside Film. The percentage used is based on on-going bale audits (see more explanation of the post-consumer bags and wrap total on page 7).

Findings

Film Recycled

In 2015, the amount of plastic bags and film reported as recovered in the U.S. for domestic and overseas recycling was 1.2 billion pounds, which is an increase of 34 million pounds over 2014 values. Approximately 48 percent was reclaimed in the U.S. or Canada, and the remainder was exported overseas. The amount of material reported as recycled by domestic processors

increased by 11 percent from 2014. Because participation in the survey is voluntary, and not all market players report activities, the data in the report do not reflect 100 percent of the film recovered for recycling.

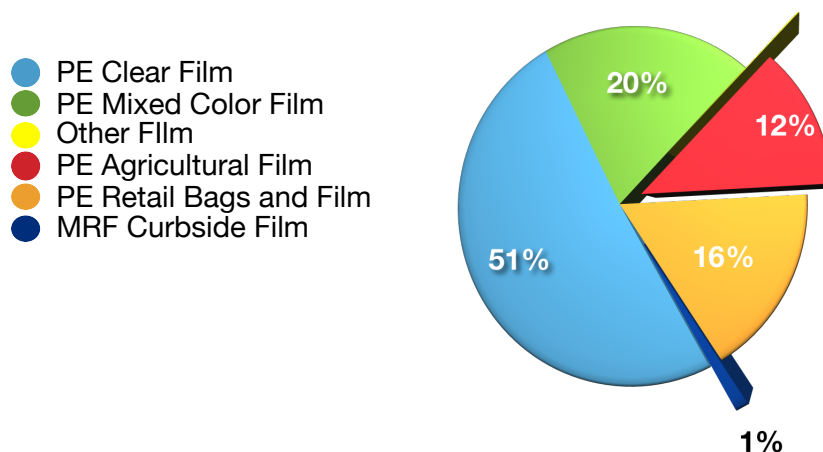
U.S. Post-consumer Film Recovered for Recycling (pounds)

Year	Exported	Acquired for use in US or Canada	TOTAL
2005	183,701,000	468,776,000	652,477,000
2006	221,082,000	590,928,000	812,010,000
2007	462,611,000	367,569,000	830,180,000
2008	469,968,000	362,426,000	832,394,000
2009	490,718,000	363,659,000	854,377,000
2010	455,984,000	515,823,000	971,807,000
2011	426,738,000	583,023,000	1,009,761,000
2012	601,890,000	418,641,000	1,020,531,000
2013	656,347,000	479,710,000	1,136,057,000
2014	645,658,000	519,426,000	1,165,084,000
2015	622,516,000	576,611,000	1,199,127,000

Depending on how and where it 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.

The following categories increased in 2015 compared to 2014: PE Clear Film, PE Mixed Color Film and MRF Curbside Film. Domestic processing totals increased in all of the previously stated categories, but decreased in the remaining three film categories. The export totals increased

2015 Percentage of Pounds of Recovered Film by Category



for PE Retail Bags and Film and MRF Curbside Film, but decreased in all other categories, which tempered the overall increase led by domestic reclaimers.

2015 Pounds of Recovered Film by Category

Recovered Film Category	Pounds Recovered in 2015	Change Over 2014
PE Clear Film	610,267,000	13%
PE Mixed Color Film	234,627,000	2%
PE Retail Bags and Film	194,369,000	-12%
PE Agricultural Film	144,871,000	-10%
MRF Curbside Film	13,899,000	43%
Other Film	1,094,000	-76%

Post-consumer Bags and Wrap Recycling

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 bags and wrap, are rare. Thus, as indicated in the [Data Gaps and Assumptions](#) section, the total amount of recovered post-consumer bags and packaging is defined in this study as the combined total of MRF Curbside Film with a specific percentage of the PE Retail Bags and Film bale.

Using the available data, Moore estimates that 125 million pounds of post-consumer bags and wrap were recovered for recycling in 2015, which is an eight percent decrease from 2014. The MRF Curbside Film total reported in 2015 increased by four million pounds, but domestic buyers reported a decrease of 46 million pounds of PE Retail Bags and Film (see the [Discussion and Recommendations](#) section for more information about the decrease in consumer-returned bags and wrap).

Since the 2012 Report, an on-going private national bale audit in the retail sector has provided the percentage of bags in PE Retail Bags and Film bales.⁷ The bale audit study⁸ is conducted by members of the [Flexible Film Recycling Group](#) (FFRG), which represents more than half of the domestic processing capacity for post-consumer film. Based on the findings of the bale

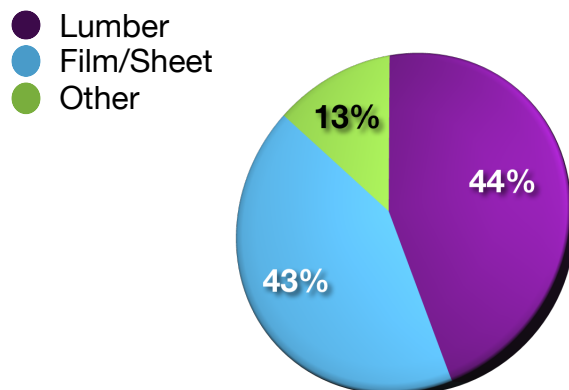
⁷ Prior to the 2012 Report, Moore Recycling used an average of the percentages of bags in PE Retail Bags and Film bales reported by reclaimers.

⁸ In addition to the private bale audit study, the FFRG conducted bag audits on material recovered during Wrap Recycling Action Program’s (WRAP) educational campaigns in Milwaukee, WI and Vancouver, WA to 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.com (see the [Recommendations](#) section for information about WRAP).

audit study, this report assumes that 57 percent of PE Retail Bags and Film bales are bags and wrap. Given the historical variability in percentages, this is a rough estimate of consumer-returned bags and wrap recovered for recycling, and it is also a conservative estimate. Retail bags (grocery or carryout) comprise approximately 20-25 percent of these bales, consumer-returned packaging wrap and other bags comprise approximately 35-40 percent, and stretch wrap accounts for most of the remainder.

Domestic Capacity and End Markets

Reclaimed U.S. Post-consumer Film: 2015 End Uses



Moore Recycling estimates that in 2015 there was approximately 870 million pounds per year of plastic film reclamation capacity⁹ in the U.S., which includes washing or processing unwashed material directly into regrind, agglomerate, pellets, or end products. Based on survey data, there were at least 36 million more pounds of capacity in 2015 compared to 2014.

The utilization rate¹⁰ was approximately 66 percent in 2015, which is an increase of nearly four percent from 2014. The increase in capacity is mostly due to the increase reported by several domestic reclaimers.

Most of the U.S. film processing capacity was represented by clean LDPE and HDPE film, which can be used to make a new product without washing, or by single-resin film (e.g., LDPE only). Very few companies have wash capacity, because it is a very costly phase in reprocessing.

The primary domestic end uses for plastic film include composite lumber, film and sheet, and “other” uses, which includes marine products, agricultural products, crates, buckets, and pallets. Of the U.S. recycled material, composite lumber manufacturers used 263 million pounds; the film and sheet market used 205 million pounds; and approximately 109 million pounds were used in “other” end uses beyond film/sheet and lumber, or the end use was undetermined.

The survey asked responders to make a historical characterization of the 2015 market compared to previous years. Almost half of the domestic reclaimers provided comments. Most

⁹Capacity for processing post-consumer film often overlaps with capacity to process post-industrial film and in some cases bottles and non-bottle rigid plastics. The annual United States National Post-consumer Plastic Bottle Recycling Report and the annual National Post-consumer Non-bottle Rigid Plastic Recycling Report likely report some capacity that is also reported here. Thus, adding the non-bottle rigid, bottle, and film capacities from this report and the others could result in some double counting.

¹⁰ Utilization, or the rate at which potential production levels are being met, can be determined by dividing the total pounds reported as acquired for recycling by the estimated capacity.

involved comments about a more challenging environment in 2015 for their products, diminishing value gap between post-consumer and virgin resin, and general volatility in the market due to struggles with crude oil, virgin resin, and the global economy.

Note: *The remaining sections of this Report present Discussion and Recommendations that reflect Moore Recycling's expertise and industry knowledge.*

Discussion

Overall, plastic film recycling increased for the 11th year in a row. Domestic purchases of post-consumer film increased 11 percent, whereas export purchases decreased nearly four percent compared to 2014.

In 2015, there was an increase in the number of domestic companies that participated in the survey. Most of the increase in purchasing was for higher grade material (i.e., PE Clear Film). Four domestic companies reported a drop in PE Retail Bags and Film purchases in 2015 compared to 2014. There was an increase in the number of exporters participating in the survey, yet, the amounts reported were generally lower. Based on potential issues associated with the composition of imported material, many large export buyers purchased less scrap plastic film in 2015, but some material continued to move to a variety of offshore markets. Despite these changes, slightly more film (52 percent) flowed to offshore markets than domestic markets in 2015.

Many responders noted a decrease in end-use demand in 2015 due to competition from virgin resin. The modest expansion in reclamation capacity was likely due to plans made in 2014 when market conditions for recycled materials were more favorable. End-use demand for post-consumer resin is fundamentally an economic issue. Low oil prices provided lower virgin resin prices created stronger competition for post-consumer resin in 2015. Most manufacturers use post-consumer resin when it provides a cost advantage over virgin resin. The value of post-consumer resin is what drives innovation in collection, processing, and conversion of scrap material for use in new products. Growth in end-use demand is essential if film recycling is to continue to expand.

MRFs are likely handling an increased amount of film. E-commerce is bringing more film into the home, and the shift by brand companies towards lighter-weight packaging to achieve greenhouse gas savings is also generating more flexible packaging. Unfortunately, although many MRFs have the capability to sort, bale and transport film, a number have reported challenges in finding buyers for curbside-collected film, given market conditions and processing expenses.

Only three U.S. and Canadian companies reported domestic MRF Curbside Film purchases, but this was an increase of 200,000 pounds over 2014. Overall MRF Curbside Film comprised approximately one percent of the total film reported as purchased for recycling. The industry is heavily dependent on offshore markets for the movement of MRF Curbside Film. There were five additional export companies that reported film in this category in 2015 compared to

2014, which resulted in a four-million pound increase overall. Better survey participation from export companies may have contributed to this increase in pounds recovered over 2014, although it is also likely that MRFs had to find markets for more film collected from curbside programs.

Directly related to the increase amounts of film seen at MRFs is the continued lack of awareness and motivation among consumers to recycle household film through at-store drop-off programs. While there is a growing number of consumers in specific locations that understand that they can recycle film beyond bags at retail drop-off locations, the vast majority of U.S. residents are either unaware of how (and what) to recycle when it comes to plastic film, or they are not willing or motivated to recycle, especially when it requires the extra step of returning to a retail location. Communities and retailers with strong education and outreach about how to recycle film exhibit a measurable increase in return-to-retail activity, and consumers seem to value the fact that their household film, beyond bags, is recyclable¹¹. Increases in post-consumer bags and wrap recycling will likely require widespread outreach and education along with incentives for consumers with a lower motivation to recycle. Additionally it will require increased demand for PCR.

Recommendations

Outreach and Education

A certain amount of film, including mixed-resin film material, will end up in MRFs, even with a significant improvement in consumer education.¹² Solutions are needed on several levels, but strong unified messaging about how and what to recycle should be institutionalized throughout the value chain to prevent ongoing confusion and lack of information from serving as barriers to recycling.

The Wrap Recycling Action Program (WRAP) is a national public outreach and education initiative, created by the FFRG to increase film recycling by engaging key stakeholders to improve education and to activate collection networks. WRAP has now impacted communities in the Northeast, Midwest, Northwest, and Southeast and is working to reach more areas in the coming years. The new partnership with the EPA will likely support this goal.

While communities such as Vancouver, WA saw a 125 percent increase in film recycling at participating retailers after an education campaign was launched, WRAP needs far more engagement from key stakeholders, such as brand companies, packaging manufacturers, retailers, and the public sector, to be able to affect a broader market.

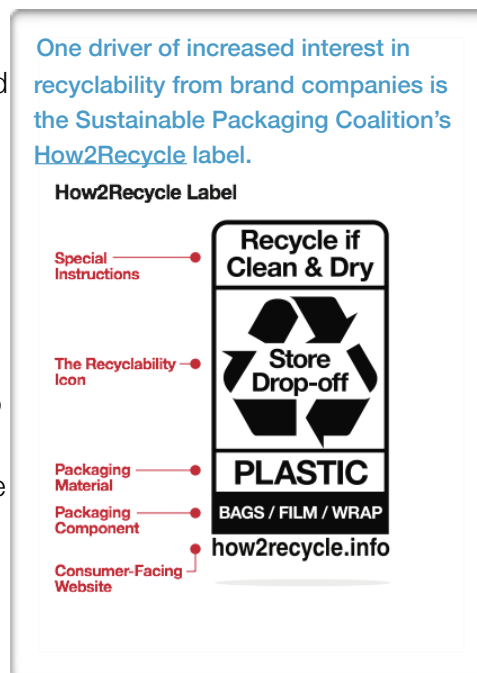
¹¹ Vancouver, WA, a WRAP Partner, measured an increase in bags returned to retail locations after extensive education. http://www.plasticfilmrecycling.org/pdf/2015_Vancouver_WRAP_Campaign_Report

¹² Vancouver, WA, a WRAP Partner, measured a decline in bags in the curbside stream after extensive education. http://www.plasticfilmrecycling.org/pdf/2015_Vancouver_WRAP_Campaign_Report

WRAP case studies demonstrate that broader adoption of WRAP signage¹³ among retailers and wide use of the How2Recycle label among brand owners would help to significantly increase recycling of plastic bags and wraps.

Demand and End Uses for Post-consumer Resin (PCR)

Increasing the amount of post-consumer bag and film material collected from homes and businesses is an important part of a healthy recovery system, but it will also require increased demand for PCR from end users. Film reclaimers have been vocal about the challenges they face in finding buyers for their PCR. Low virgin resin prices, which are expected to continue given the expansion in production capacity for virgin resin, will likely dampen the film reclamation industry. Without greater support for end use demand or value placed on PCR usage, film reclaimers face challenges to find products that can be made with PCR. Stronger demand in end use demand from brand companies, retailers, and resin companies will likely be necessary for continued growth in film recycling.



Additional Information

The Plastics Division of the American Chemistry Council, which provided funding to Moore Recycling Associates to prepare this report, provides resources to assist communities, businesses and others to increase awareness and education about the recycling of plastic bottles, containers, bags, and film. Moore Recycling is a recognized expert in the field of plastics recycling and has been conducting recycling studies for over 27 years. This work has been conducted and evaluated in an objective manner by persons qualified to do so, using procedures generally accepted in the profession. Visit www.PlasticFilmRecycling.com for updates on WRAP programs including results from campaigns. Moore Recycling provides technical support for WRAP, which is primarily funded by ACC's Flexible Film Recycling Group. Also visit www.PlasticsMarkets.org which is maintained by Moore Recycling Associates, for information about additional markets and handling guidelines. This report and others on plastic recycling can be found at www.MooreRecycling.com/m_02_00.html.

Disclaimer

The 2015 National Report on Post-consumer Plastic Bag and Film Recycling was prepared to provide information to parties interested in the recycling of plastics, in particular, plastic bags and

¹³ Free signage and other educational materials are available at PlasticFilmRecycling.org

film. Facilities developing a recycling process and all entities involved in the chain of collection, processing, distribution, and sale of recycled products have an independent obligation to ascertain that their plans, actions, and practices meet all relevant laws and represent sound business practices for their particular operations. Facilities may vary their approach with respect to particular operations, products, or locations based on specific factual circumstances, the practicality and effectiveness of particular actions and economic and technological feasibilities. This report is not designed or intended to define or create legal rights or obligations. The ACC does not make any warranty or representation, either express or implied, with respect to the accuracy or completeness of the information contained in this report; nor does the ACC assume any liability of any kind whatsoever resulting from the use of or reliance upon any information, conclusion, or options contained herein. The American Chemistry Council sponsored this report.

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