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REPORT ON
THE COSTS AND BENEFITS OF STATE AND LOCAL OPTIONS TO STIMULATE AN INCREASE IN THE RECYCLING OF PLASTICS

Prepared by the
Maine State Planning Office

for the

Joint Standing Committee on Natural Resources
of the 124th Legislature

January 2009

Acknowledgements

This report is prepared by the State Planning Office in accordance with the letter received from the Joint Standing Committee on Natural Resources of the 123rd Legislative Session.

Information contained within was gathered from conversations with municipal recycling program staff, commercial recyclers and other industry participants. In addition, the services of Moore Recycling Inc. were invaluable in being able to access and provide program information and market data of the plastics industry. We would like to thank all for their help with this report.

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January 2009

Printed under Appropriation #014 07B 1655 008208

Contents

EXECUTIVE SUMMARY

This report is intended to provide both an overview of plastic container recycling efforts currently underway in Maine's municipalities and offer possible options that could be adopted to increase the capture and recycling of plastic containers. Data used in this report is from 2006 and 2007, the most current 'complete year' data available.

The earliest broad-based plastic recycling program in the state resulted from the operation of the state's 'Bottle Bill', where empty beverage containers, including plastic containers, are redeemed for monetary value and the beverage industry processes and markets those containers to the plastic reclaimers.

Today, nearly all of Maine's municipally offered recycling programs include plastic container recycling, typically, the high density polyethylene (HDPE) resin, either of the un-pigmented (natural) resin or pigmented resin. Many programs also collect polyethylene terephthalate (PET) containers. The 'single stream' or 'single sort' recycling collection programs, adopted by approximately 50 communities, accept 'all plastic containers' and the processing facilities sort the containers by resin type. In addition, a few municipal programs include 'bulky' or other plastics not classified as 'containers'.

In examining possible options to increase the recovery and ultimate recycling of plastic containers, it is critical to understand that the used plastic containers are actually a commodity. While the scrap plastic is desired by the markets, and though the adoption of varying state and local actions can affect the supply of scrap plastic, the markets do dictate the demand for that scrap. Historically, the state has encouraged recycling of materials and products for which there are known markets, and plastic is such an example. Municipalities were encouraged to begin adding plastic to their recycling programs in the late 1980's and plastic containers became a common material in the emerging programs in the early 1990's. Collection of plastics has been problematic, due to the light weight of the containers and the volume of space they occupied. In addition, the resident needs to properly rinse the container prior to placing in the recycling bin.

Current plastic recycling incentives include: adoption of a 'pay as you throw' program, where residents pay the cost of collection and disposal of trash, but not recyclables; adoption of mandatory recycling, which has been done by many communities, but enforcement is quite variable; and the adoption of 'single sort' or 'single stream' recycling, where all plastic containers are accepted for recycling.

In reviewing the potential costs and benefits of recycling an increased volume of plastics, the actual expenses of adding additional types of plastics could not be readily extracted from the recycling program data available, since recycling collection and processing is largely performed as a single activity, and not separated by recyclable item or product. However, in examining the gross numbers of recycling programs, of collection and processing expenses, the costs of recycling were similar to the costs of managing the solid waste of the community, on a ton to ton comparison. However, when factoring in the revenue received from the sale of recyclables, recycling can be provided at a lower cost than disposal of that material as a solid waste.

BACKGROUND ON THE REQUEST FOR THIS REPORT

During the 123rd Legislative session, a draft version of LD 810, "An Act to Improve Solid Waste Management", contained a directive to have the State Planning Office and the Department of Environmental Protection "conduct a review of the costs and benefits of state and local government options to stimulate an increase in the recycling of plastics, and report the findings and recommendations to the Committee in the next session. The types of plastics proposed to be studied include plastic bottles and rigid containers, numbered 1 through 7."

During Committee discussion of LD 810, even though there was a sense from the members that this review could be valuable, there was a reluctance to include the review in the final version of the bill. SPO agreed to undertake the review. The letter sent by the Committee to State Planning is found in Appendix A.

For further explanation of the types of plastics included in this report, Appendix B provides a description of the plastic resins '1' through '7' used in today's packaging as well as information on their properties, applications and what products they may be recycled into.

OVERVIEW OF CURRENT PLASTIC CONTAINER EFFORTS RESULTING FROM THE MAINE 'BOTTLE BILL' REDEMPTION PROGRAM

One of the more visible plastic container recovery efforts is that of the Maine beverage container redemption program, more commonly referred as 'the bottle bill'. Enacted on November 2, 1976, and implemented in January 1978, many of the beverage containers sold in Maine have carried a redemption value, typically five cents. The Maine Department of Agriculture, through its Division of Quality Assurance and Regulations, administers the bottle bill.

In the beginning of the program, soda and beer products were covered by the program but during the 1980's, the program was expanded to include wine coolers and then juice, water, sports drinks, certain ciders, wine and spirits. Maine is one of the eleven states in the United States with a bottle bill program, and has one of the broadest 'bottle bill's in effect.

To manage the hundreds of thousands of beverage containers redeemed daily, both retailers and independent redemption centers accept the empty containers and provide the redemption value of the container to the bearer of the containers. Approximately 810 such locations are in operation across the state. These facilities accept glass, aluminum, tin and plastic containers for redemption, with the containers then being processed and recycled by material category. This system of beverage container management provides for the recovery of thousands of tons of glass, metal, plastic and associated materials each year.

In 2007, the Department of Agriculture was directed, through Resolve Chapter 40, to "Estimate the Annual Value of Uncollected Bottle Deposits, Fraud and Total Costs under Maine's Bottle Bill." Part of the effort in completing that report included gathering beverage container sales information. Nearly 650,000,000 beverage containers were reported as being sold through retail outlets in 2006. The numbers obtained by the Department do not include the material category for these containers but viewing the product shelves in markets, if conservatively one-third of the beverage containers are plastic, then the bottle bill encouraged the redemption (and recycling) of over 215,000,000 containers (if all containers were redeemed) in 2006.

A LOOK AT COMMUNITY PLASTICS RECYCLING SYSTEMS

Across the country, most community recycling programs include at least one type of plastic. Which plastics are actually accepted for recycling can vary widely from program to program. HDPE and PET are the most widely accepted plastics in community recycling programs because they make up nearly 95% of all plastic bottles found in the residential waste stream and there are well-established recycling markets for these bottles.

In recent years, community efforts to improve recycling economics have resulted in a variety of innovative collection methods. These collection methods include, Pay-Per-Bag (or Pay As You Throw – PAYT), dual stream collection, and single stream collection programs. The focus of each of these methods is to increase recovery rates and improve on recycling economics. As these methods have strived to make recycling easier for the consumer, the consumer has responded with a desire to recycle more materials—including more plastics.

The Plastics Division of the American Chemistry Council (formerly the American Plastics Council) developed the "all plastic bottles" collection program strategy as a way to increase the recovery of HDPE and PET bottles in response to the Association of Post-Consumer Plastic Recyclers' request for increased recovery of these two commodities. Many communities that have switched to dual stream, single stream and PAYT collection programs have also transitioned to "all plastic bottles" collections. The result has been increased recovery of HDPE and PET bottles with minimal or no cost increases.

Visit this website to learn more about "All Plastic Bottle Programs"
http://www.allplasticbottles.org/

Although most communities found that they received no increase in plastics that were not targeted for recycling, the new collection programs brought consumer attention to the amount of other plastic containers in the residential waste stream. Consumers, wanting to do the 'environmentally correct thing', responded to municipal programs by requesting to recycle 'more plastics'. As a result some communities have expanded their plastics collections to include all plastic containers (often with some size limitations). Many MRFs (material processing facilities) or other processing facilities have begun sorting and baling these additional containers for marketing to emerging domestic markets or overseas markets. (See *Resource Recycling,* "Plastics Recycling Update" November 2008, 'Recycling more than plastic bottles.')

Communities in other Northeast states have successfully added and marketed all rigid plastic containers (expanding collection beyond just 'bottles', which are containers with 'necks') or some mix of rigid plastic containers. In most cases, recycling managers reported that their residents wanted to recycle more plastic and they were able to identify a market that would take the material baled. One community even stated "Even if we receive no revenue for [it] (mixed plastic containers), it is still more economical than disposal and we would continue to collect and recycle all plastic containers".

The recent high cost of oil and corresponding high cost of virgin plastic resins prompted increased activity to develop recycling programs for these additional containers that are easily obtainable through the established recycling collection infrastructure. This continuing market development shows promise for the future of plastic recycling outside the arena of HDPE and PET bottle recycling.

OVERVIEW OF MUNICIPAL RECYCLING PROGRAMS THAT INCLUDE PLASTIC CONTAINERS

Background

Maine municipalities are responsible for providing solid waste disposal and recycling services to their residents and commercial entities. Recycling became a strongly encouraged municipal activity in the late 1980's and early 1990's, resulting in the establishment of over 300 municipal programs using nearly 145 processing facilities to prepare the recyclables for market.

The first products to be included in recycling programs were newsprint, corrugated cardboard, mixed paper, glass and tin cans. Over time, that increased and included plastic bottles. Primarily, the High Density Polyethylene (HDPE) bottles (containers with 'necks') were collected with some differentiation. HDPE plastic containers constitute the highest component of plastic containers in the municipal solid waste stream.

Milk containers are made from a 'natural' HDPE resin and contain no added pigment (except those marketed as 'light block' or other term where titanium dioxide has been added to the resin to reduce the impact of ultra-violet light on the milk inside the container). Other HDPE containers such as laundry detergent bottles, coffee 'cans', some juice containers and others have pigments added, These containers may be collected and marketed with the 'natural' HDPE or marketed as a separate material. Plastic containers are typically 'baled' for marketing.

Value of these plastics varies, as recyclables are a commodity, but bales of 'natural' HDPE usually command a higher price than the bales of pigmented HDPE containers. 'Natural' HDPE containers are readily available in the waste stream. 'Natural HDPE easily accepts the addition off color additives when desired. The recycled resin is in higher demand by a variety of product manufacturers. All of these reasons contribute to the higher price usually offered for 'natural' HDPE bales. HDPE plastic container recycling has been supported by residents and has not been a major issue for the municipal recycling program to manage, as the containers bale easily with proper equipment.

In addition to the HDPE containers, many municipal recycling programs also collect and process Polyethylene terephthalate (PET) plastic containers. These are typically clear (not necessarily free of pigment) and include soda bottles, cooking oil, snacks and other products. However, PET resin possesses a strong 'memory ability', make baling of these containers more of a challenge for many municipal programs. In the early days of recycling, most PET containers consisted of beverage bottles, and were recovered through the deposit system in Maine. This fact, coupled with the relatively small amount of 'other' PET containers in the waste stream when plastic recycling began, did not result in widespread adoption of PET container recycling by Maine municipal recycling programs.

Maine Community Plastic Recycling Efforts

In Maine, almost all residents have access to HDPE bottle recycling. Many communities collect PET bottles and a few collect 'other rigid plastic containers' for recycling. (Refer to Appendix C for a listing of reported plastic recycling efforts by Maine's communities).

Since Maine has expanded beverage container deposit legislation in place, it is likely that most plastic beverage bottles are being recovered through the redemption system. In recent years, PET has also become a popular resin choice for bottles and containers used to package food and non-food products such as peanut butter, mayonnaise, ketchup, salad oils, shampoo, liquid soaps, dish washing soaps, cleaning products and other food and non-food products.

Because these additional PET bottles and containers are not covered by the Maine bottle deposit program, if a community does not collect PET for recycling, they are more than likely being thrown away with household trash and either landfilled or incinerated. A few communities collect and bale PET containers. Since non-bottle bill PET is only 20-25% of the residential PET stream, these communities do not generate that much material annually. They ship the PET bales along with their HDPE bales through an arrangement with the HDPE processor. The HDPE processor will eventually ship them to a PET reclaimer when they have generated enough for a truckload of only PET bales. Under this type of arrangement, the price paid for the PET bales is much lower than if a full truckload were shipped directly to a PET reclaimer. Although there is a ready market for PET, the labor, storage needs and low price paid for less than a truckload of bales are often factors that discourage communities from targeting PET for recycling.

Other Rigid Container Recycling

Ecomaine, (a non-profit waste management company owned and operated by 21 municipalities in Southern Maine) opened a single-sort recycling processing facility in Portland in 2007. Single sort recycling is a collection system where all fiber products and container recyclables are placed in a single container and delivered to a MRF for sorting and processing for sale to market. Portland and other member communities of ecomaine are collecting not only HDPE and PET bottles but also all other rigid plastic containers as part of their recycling program. To date the rigid plastic container material has been successfully marketed to processors outside the United States. As new markets develop, there could be more opportunities to deliver the material domestically.

FCR Goodman (the recycling division of Casella Waste Systems Inc.) also offers a 'single stream' recycling program to many of the municipalities it services, with processing done at their Auburn, Massachusetts, MRF. The single stream and single sort collection programs are similar, just with different names. Additional communities that are recycling rigid containers include Andover, Brunswick, Falmouth, Freeport, Limerick, Scarborough and South Berwick. Both operations are actively inviting additional communities to join in these collection programs, so there may be additional communities coming on line that include all rigid plastic containers in their recycling mix.

In the current economy, a number of communities are considering the single stream approach as it eliminates labor costs to sort and bale individual plastic streams such as HDPE and PET. Although there is still revenue to be gleaned from bales of HDPE and PET, without looking closely at each individual recycling program it is difficult to see if single stream collection and marketing could improve the economics of any particular recycling program. However, programs that collect 'all bottles' do report higher recovery rates of HDPE and PET containers, due to the simple fact that when all plastic bottles are included in a recycling program, more HDPE and PET containers are provided to the program, bringing in additional revenue without adding significantly to processing costs. Often, whether to expand recycling programs becomes more of a question of whether a community wishes to recycle more material or glean higher revenue from a more labor-intensive process of sorting and baling individual streams of plastic.

Municipal recycling programs that include other types of plastics

Other Plastic Recycling

Some communities in Maine are collecting bulky plastic waste, such as plastic toys, wading pools, 5 gallon pails, and other plastic products, to increase their recovery of waste plastics. St. George and Readfield are two of these communities collecting this material. Although this market is variable at best in a good economy (mostly only export markets exist for this type of plastic) collection criteria are very specific and consolidation requirements to meet export container specifications are equally stringent. Just as domestic markets do not want garbage, export markets do not want it either.

Recent exporting regulations put the pressure on exporters to meet the qualifications for material entering foreign markets and stiff fines can be the result of sending material that does not qualify as clean secondary material. In the slumping world economy the export market demand is depressed as well, due to the fact that no one is buying goods.

OVERVIEW OF THE MARKETS FOR PLASTICS

Plastics Markets Overview

Plastic bottles were one of the later post-consumer recycling markets to be developed, prompted by the rapid switch from glass to plastic for many beverages in the seventies and subsequently food and cosmetic products in later years. In the mid-late 1980s, a few communities were just beginning to collect HDPE and PET bottles for recycling. Milk and soda were being bottled in plastic and discarded bottles were being generated at a rate that proved critical mass for developing a recycling industry.

At the start of plastic bottle recycling, the prices paid for collected bottles were quite low compared to the prices that have been paid in the past few years. It took time for the industry to fully develop as well as end product manufacturers to become familiar with recycled resin and comfortable using it in manufacturing product. After many growing pains, the industry matured. It took time for plastics recycling to reach the point of being able to reliably provide recycled resin of consistent quality and quantity to meet the needs of product manufacturers.

Over the years the HDPE and PET recycling industry have become well established in the United States and abroad. The recycling industry is probably a purer form of capitalism than any other industry. There are no subsidies for plastic recycling and commodity pricing is very closely tied to supply and demand. When demand is high, and/or available supply short, prices paid for baled bottles is higher and when the opposite is the case prices are lower - - much like what is happening now with a slow economy, products that utilize recycled HDPE and PET are not in high demand. The result is an over supply of recycled resin, full warehouses of baled bottles and low purchasing prices for feedstock. Even the export market is sluggish, which historically has been an outlet for material when domestic demand is low.

It is important to remember that even though the prices paid for plastics have taken a sharp decline in the past month or two, as the economy recovers, recycling commodity prices will also recover. Even though prices paid for recycled plastic are much lower than in previous years, it still makes economic sense to continue to recycle plastic for at least two reasons. One, it currently costs more to landfill or incinerate plastic in Maine, and two, the viability of the plastic recycling industry is dependent on supply to remain stable. It is much harder to regenerate a supply chain once it has been stopped

Recycling ‘More Than Bottles’

In addition to milk and beverages, an increasing number of food products and cosmetic products are now packaged in plastic bottles and containers. Plastic weighs less than glass, steel or aluminum, and in most instances this material substitution results in more product being delivered for less cost due to lighter weight packaging. These additional plastic containers subsequently end up in the waste stream. Due to increase environmental awareness, consumers are interested in recycling these containers as well.

In an effort to recover more HDPE and PET bottles to feed the domestic plastics recycling industry, the American Plastics Council promoted “All Plastic Bottles” collection programs. Since HDPE and PET make up 95 percent of the plastic bottle stream, by collecting all bottles, more HDPE and PET bottles would be recovered. This proved to be true in all communities that incorporated the “all bottles” program. (Visit the website www.allplasticbottles.org for more details). Appendix D is the plastics section of the United States Environmental Protection Agency’s ‘2007 Characterization of Municipal Solid Waste, by Weight, which provides a detailed analysis of how and which plastic resins are found in the waste stream. This will provide the reader with a perspective on the role of plastics in product manufacture and distribution, and on managing these plastics at the end of their intended use.

With the proliferation of ‘Pay As You Throw’ and single stream collection programs, consumers and processors are more aware of what is in the waste stream and looking for more ways to remove as much from the disposal stream as possible. Often times, consumers put these plastic containers in their recycling bins regardless of what is actually accepted in their particular recycling program. They may be confused by the chasing arrows triangle on the container/lid, or just assume all plastics are the same and should be in the recycling bin.

Many MRFs (materials recycling facilities) have experimented with marketing these additional plastic containers in order to avoid disposing of them at disposal rates. The high cost of oil resulting in a corresponding higher cost for virgin resin feedstock has prompted domestic reclaimers to look at this material for processing as an alternative feedstock to higher priced resins. The export market has been accepting and reclaiming this material for a number of years and uses it in the manufacture of many products. In short this is a relatively new, developing plastic recycling market. As was the case with HDPE and PET in earlier years, generating critical mass and establishing the infrastructure for recycling these additional plastic containers will be critical in seeing the industry to fruition. Many single stream MRFs and community recycling programs are contributing to the development of this new recycling market. Eco Maine in Portland and St. Georges Island are two Maine communities experimenting with collecting and marketing these materials.

The Association of Post-Consumer Plastics Recyclers is forming a committee to address the issues and opportunities of expanding recycling to non-bottle rigid plastics. The recycling of these commodities is expected to grow and develop as demand and supply increase. Please refer to Appendix E for plastic container specification sheets, as provided by a broker/reclaimer.

Plastic Films

Over the past year or so there have been many news articles about bans on plastic bags, plastic bag recycling promotions, plastic bag usage fees and alternatives to plastic bags. Whereas plastic bags have been actively recycled at chain grocery stores for a number of years, there is a new push to encourage recycling them due to the increased consumer environmental awareness. Plastic bags have been one focus because of their prolific use and visibility as litter.

For years, the composite lumber industry has used plastic bags as feedstock for their decking products. Trex, AERT, and International Paper are a few companies that purchase plastic film as feedstock for composite decking. In addition to retail and grocery bags, they may use stretch film and other clean film streams commercially generated. For the most part, consumers, or community residents are mostly dealing with plastic retail/grocery bags. There are some successful curbside and/or residential plastic bag collections. Rhode Island successfully recycles plastic bags from their MRF collections.

Maine has a statute on their books regarding plastic bag recycling developed by the Maine Retail Grocers Association:

> 38 MRSA §1605. Plastic bags; recycling
>
> A retailer may use plastic bags to bag products at the point of retail sale only if the retailer:
>
> 1. Location. Locates inside the store or within 20 feet of the main entrance to the store a receptacle for collecting any used plastic bags; and
> 2. Recycles. Ensures that the plastic bags collected are recycled or delivered to a person engaged in recycling plastics.
>
> SECTION HISTORY 1989, c. 585, §E35 (NEW). 1991, c. 475, §1 (RPR).
>
> http://janus.state.me.us/legis/statutes/38/title38sec1605.html

If all retailers were in compliance with this statute, recycling plastic bags would be available to everyone who chooses to use them. The key is to make sure recycling bins are available at retailers that choose to use plastic bags, maintained properly and consumers are educated on the importance of using available recycling bins for managing the plastic bags they use.

The American Chemistry Council Plastics division has sponsored a website that provides general information on plastic bag recycling, resources and information about plastic bag recycling programs and where to recycle plastic bags. That website is www.PlasticBagRecycling.org

Boat Wrap Recycling

There have been some successful boat wrap recycling programs in New England and New Jersey. These programs require cooperation between the stretch wrap supplier, boat yard owner and collection vendor to coordinate all aspects of these programs. The 'pressure point support plastic' has to be compatible with the stretch film in order to be marketable. There needs to be a simple single collection strategy over a wide collection area to capitalize on marketability. Because this is a seasonal collection opportunity, early planning and prior market research and gathering full support of the possible 'suppliers' is necessary to avoid an unsuccessful project.

http://www.wastecap.org/wastecap/Programs/shrinkwrap/shrinkwrap.htm

A REVIEW OF STATE AND LOCAL OPTIONS TO STIMULATE AN INCREASE IN THE RECYCLING OF PLASTICS

The state has placed the responsibility of providing solid waste disposal services upon municipalities (38 MRSA, §1305). The state established the Waste Management Hierarchy (38 MRSA §2101), which places a higher value on recycling as opposed to disposal of municipal solid waste, and set the statewide recycling goal of 50%. In addition, the state has provided over $12 million in cost-sharing grants to municipalities to aid in establishing or expanding recycling programs since 1991.

Where the state's solid waste management policy, expressed through the hierarchy, places greater value on recycling than on disposal, and that recycling effectively diverts materials and products from disposal facilities, implementation of recycling programs to increase the capture and providing those items to manufacturers is appropriate.

As part of its annual review of municipal solid waste and recycling programs, the State Planning Office collects financial data from the programs, and uses that information to aid in calculating average program expenses and revenues. The average cost for a municipality to provide solid waste disposal services (including collection, consolidation, transport and disposal) and offer recycling services (including collection, processing and marketing), is quite similar, ranging from $90 to $110 per ton. When the revenue received from the sale of recyclables is considered, which varies from material to material, the cost of providing recycling services drops below that of managing those materials as 'waste'. For example, in 2008, HDPE pigmented plastic, when baled, commanded a value of over $500 per ton, corrugated cardboard had a value of over $120 per ton, newsprint value was $115 per ton - - these revenues definitely improved the economics of recycling when compared with disposal. Even those these values moved off their high during the last quarter of the year, with values of over $25 per ton, recycling still was justifiable.

The benefits of increased recycling include: a reduction in the amount of solid waste requiring management and disposal; reduction in greenhouse gas emissions (recycling typically releases 15 to 25% less emissions as compared to using raw materials for manufacturing); recycling creates more jobs and supports more industrial operations than disposal does; and conservation of water, energy and natural resources, when compared with using raw materials.

In reviewing the potential costs and benefits of recycling an increased volume of plastics, the actual expenses of adding additional types of plastics could not be readily extracted from the recycling program data available, since recycling collection and processing is largely performed as a single activity, and not separated by recyclable item or product.

Options that the state could undertake to stimulate an increase in the recycling of plastics include:

- Expand education and outreach efforts on the value of recycling plastics
- Provide financial incentives to assist with local recycling program development and expansion
- Consider further expansion of Maine's bottle bill program
- 'mandate' recycling (but that raises a number of issues and concerns)
- ban the disposal of selected bottles or containers

During the summer of 2007, a project undertaken by the State Planning Office focused on identifying factors that influence residential recycling rates in Maine at the municipal level. One of the primary questions this study sought to explore was whether municipal recycling success is influenced more by nature or nurture—in other words, is recycling influenced more heavily by demographic factors or by municipal policies that seek to promote recycling?

First, the results of this study suggest that the simplest and most effective way to establish a successful recycling program is to accept as many different recyclable materials as possible. This is the 'sine qua non' of recycling programs. Quite simply, a town cannot have a truly successful recycling program without accepting a wide variety of materials. It is also helpful for municipalities to create venues for re-use, which is in fact preferable to recycling on the waste management hierarchy and can make a big difference in recycling rates.

Beyond this simple step, the results of this study indicate that there are many different paths a town can take in order to achieve a successful recycling program:

- An established ordinance on solid waste and recycling appears to be common in towns with high recycling rates, but the case studies suggest that in many towns having an ordinance does little to actively promote recycling, either because the ordinance only mentions recycling in passing or because the ordinance is rarely enforced. An exception, of course, would be a town that actually enforces its ordinance in a systematic fashion.

- While the statistical relationship between recycling committees and recycling rates is not overwhelming, the anecdotal evidence certainly supports the idea that such committees can have very positive effects on local recycling efforts. In addition to the education and promotion that these committees usually provide for the recycling program, committees can also be instrumental in establishing new recycling policies and features; for example, in one community, the committee helped to install silver bullets and recycling bins around the town.

- Adoption of municipal policies like curbside recycling, mandatory recycling, and 'pay as you throw' programs may help individual towns, but none are by any means required in order to have a successful program. On its own, curbside recycling should not be expected to produce a successful recycling program, although it will likely increase municipal recycling rates (as has been seen in some communities) and may serve as a good complement in a town with a variety of accepted materials and venues for bulky recycling.

The fact is that many of the better recycling programs in the state do not have curbside recycling and that many towns with curbside recycling have unimpressive rates. Many towns simply have enthusiastic and committed residents that do not require much encouragement; the statistical data supports the hypothesis that this is partially a function of demographic factors like education, income, and population size. A simple drop-off program with a wide variety of accepted materials is often sufficient for high recycling rates, especially in wealthy, educated towns of moderate size.

Conversely, many towns with curbside recycling do not have impressive rates. One possible reason for this may be that curbside recycling generally does not address bulky waste and recycling, which makes up a very large portion of the waste stream. Thus, if a town provides curbside pickup for household recyclables but does not recycle bulky materials at all, it may still have a very low rate. Furthermore, curbside may make recycling more convenient, but overall success is still heavily influenced by the variety of materials accepted. If a town has curbside pickup but does not accept a variety of materials, it should not expect to achieve a high rate.

As some communities have found, even with curbside recycling services, such as single sort or single stream, a high number of accepted materials does not guarantee a high recycling rate - - the program may be affected by demographic factors that discourage recycling (large number of apartments, relatively low income and education levels). Thus, while curbside recycling is probably useful in increasing household recycling rates, it is by no means a guarantee of a successful program, nor is it necessary to achieve a successful program in many towns.

As for mandatory recycling, it may be worthwhile as a symbolic measure, but should not be expected to produce substantial results unless seriously enforced. Although there was not enough statistical evidence to reach any definite conclusions on PAYT, such programs do appear to be useful in efforts to reduce the amount of waste produced and increase recycling of small household items, and when combined with other policies are likely to be very effective.

In sum, while it is clear that recycling is influenced by relatively fixed demographic factors like education and income, the main factor appears to be the variety of materials accepted by the municipality. Regardless of demographic factors, increasing the variety of materials accepted tends to have a very positive effect, and establishing an ordinance, curbside recycling, a recycling committee, or adopting PAYT may have a positive impact as well given on the individual town's circumstances.

FINDINGS & RECOMMENDATIONS

There are a variety of options available to the state and municipalities in encouraging an increase in the recovery and recycling of plastic containers:

1) increase education and awareness efforts of recycling with an emphasis on plastics

2) establish a committee to assist with promotion of its recycling program

3) make it 'easier' for residents to recycle: simplify the drop-off area; increase drop-off opportunities for plastics; adopt 'single stream/ single sort' recycling collection

4) expand the number or type of plastic containers being accepted

5) encourage regionalization of recycling programs, building upon 'economies of scale' for managing plastics and other recyclables

6) enact an ordinance requiring recycling

7) adopt a financial incentive, such as 'pay as you throw' programs, that places a fee on the disposal of waste but not on recyclables

8) explore possibility of adopting minimum recycled content legislation or state purchasing guideline for plastic products, such as has been done with paper products

9) provide financial incentives, such as grants and cost-sharing, for expanding recycling programs; or disincentives, such as the banning of certain products from the waste stream, directing them to be recycled instead

The cost of managing additional plastics is going to be largely dependent upon the current recycling collection and processing system. Adding PET plastics to a drop-off recycling program can be done, but the baling of the PET containers is more time consuming than baling of HDPE containers, because of the resin's 'memory' – it doesn't stay crushed as easily as HDPE does. Going with offsite processing of recyclables removes that from the local program, and places that the receiving facility. Most MRF's have balers able to handle PET, or even the mixed (numbers 3 through 7) containers, so processing doesn't necessarily have to be a deterrent.

Curbside collection of recyclables is done typically in one of two ways: recyclables are placed out at the curb and the truck operator separates the recyclables into specific bins on the truck, keeping the materials sorted; or the recyclables are collected 'co-mingled', as with the 'single sort' or 'single stream' collection method. With the 'sorted' collection system, the recyclables are delivered to a processing facility and managed separately, whereas with the co-mingled collection, the processing facility receives the mixed recyclables and must separate the materials. Costs vary greatly between the two collection systems, as well as within each system. Variables such as number of stops, frequency of collection, number of participants, types of recyclables accepted, and other factors influence the actual collection cost.

Just as the design of the recycling program needs to take into account the overall solid waste management system in place within the community, so should the method of increasing plastics recycling meld with the recycling program. The addition of other plastic products needs to be planned so that the collection, processing and marketing of these new plastics does not burden or reduce the effectiveness of the current program.

As municipalities consider possible methods of increasing the capture and recycling of plastic containers from their waste stream, they should not overlook the value of increasing paper recovery and improved management of organics. By fully addressing the components of the waste stream in their recycling program, reaching the state's 50% recycling goal becomes attainable.

APPENDICES

Appendix A

Letter from Natural Resources Committee

April 15, 2008

Martha Freeman, Director
State Planning Office
38 State House Station
Augusta, Maine 04333-0038

RE: LD 810, An Act To Improve Solid Waste Management

Dear Director Freeman:

As you may be aware, the Joint Standing Committee on Natural Resources recently voted LD 810 out of committee with an OUGHT TO PASS AS AMENDED report. One of the initiatives considered in an earlier draft version of the bill was having the Department of Environmental Protection and the State Planning Office conduct a review of the costs and benefits of state and local government options to stimulate an increase in the recycling of plastics, and report the findings and recommendations to this Committee in the next session. The types of plastics proposed to be studied include plastic bottles and rigid containers, numbered 1 through 7.

During work sessions on this bill, there was a sense from the Committee that although the results of this review could be valuable, there was a reluctance to include the review in LD 810. Upon discussion with your staff, they agreed to conduct this review if a letter requesting the review was sent by the Committee.

Please consider this letter as the Committee's request for your Office to conduct a review of the costs and benefits of state and local government options to stimulate an increase in the recycling of plastics. We appreciate the willingness of your staff to undertake this task and look forward to receiving a report on the review by January 5, 2009.

Sincerely,

Senator John Martin
Senate Chair

Representative Ted Koffman
House Chair

cc: Members, Joint Standing Committee on Natural Resources

Appendix B

Description and uses of plastic resins 1 through 7

American® Chemistry Council

Plastic Packaging Resins

Resin Codes	Descriptions	Properties	Product Applications	Products Made with Recycled Content*
1 PET	**Polyethylene Terephthalate (PET, PETE).** PET is clear, tough, and has good gas and moisture barrier properties. This resin is commonly used in beverage bottles and many injection-molded consumer product containers. Cleaned, recycled PET flakes and pellets are in great demand for spinning fiber for carpet yarns, producing fiberfill and geo-textiles. Nickname: Polyester.	• Clear and optically smooth surfaces for oriented films and bottles • Excellent barrier to oxygen, water, and carbon dioxide • High impact capability and shatter resistance • Excellent resistance to most solvents • Capability for hot-filling	Plastic bottles for soft drinks, water, juice, sports drinks, beer, mouthwash, catsup and salad dressing. Food jars for peanut butter, jelly, jam and pickles. Ovenable film and microwavable food trays. In addition to packaging, PET's major uses are textiles, monofilament, carpet, strapping, films, and engineering moldings.	Fiber for carpet, fleece jackets, comforter fill, and tote bags. Containers for food, beverages (bottles), and non-food items. Film and sheet. Strapping.
2 HDPE	**High Density Polyethylene (HDPE).** HDPE is used to make many types of bottles. Unpigmented bottles are translucent, have good barrier properties and stiffness, and are well suited to packaging products with a short shelf life such as milk. Because HDPE has good chemical resistance, it is used for packaging many household and industrial chemicals such as detergents and bleach. Pigmented HDPE bottles have better stress crack resistance than unpigmented HDPE.	• Excellent resistance to most solvents • Higher tensile strength compared to other forms of polyethylene • Relatively stiff material with useful temperature capabilities	Bottles for milk, water, juice, cosmetics, shampoo, dish and laundry detergents, and household cleaners. Bags for groceries and retail purchases. Cereal box liners. Reusable shipping containers. In addition to packaging, HDPE's major uses are in injection molding applications, extruded pipe and conduit, plastic wood composites, and wire and cable covering.	Bottles for non-food items, such as shampoo, conditioner, liquid laundry detergent, household cleaners, motor oil and antifreeze. Plastic lumber for outdoor decking, fencing and picnic tables. Pipe, floor tiles, buckets, crates, flower pots, garden edging, film and sheet, and recycling bins.

Resin Codes	Descriptions	Properties	Product Applications	Products Made with Recycled Content*
	**Polyvinyl Chloride (PVC, Vinyl).** In addition to its stable physical properties, PVC has good chemical resistance, weatherability, flow characteristics and stable electrical properties. The diverse slate of vinyl products can be broadly divided into rigid and flexible materials.	• High impact strength, brilliant clarity, excellent processing performance • Resistance to grease, oil and chemicals	Rigid packaging applications include blister packs and clamshells. Flexible packaging uses include bags for bedding and medical, shrink wrap, deli and meet wrap and tamper resistance. In addition to packaging, PVC's major uses are rigid applications such as pipe, siding, window frames, fencing, decking and railing. Flexible applications include medical products such as blood bags and medical tubing, wire and cable insulation, carpet backing, and flooring.	Pipe, decking, fencing, paneling, gutters, carpet backing, floor tiles and mats, resilient flooring, mud flaps, cassette trays, electrical boxes, cables, traffic cones, garden hose, and mobile home skirting. Packaging, film and sheet, and loose-leaf binders.
	**Low Density Polyethylene (LDPE).** LDPE is used predominately in film applications due to its toughness, flexibility and relative transparency, making it popular for use in applications where heat sealing is necessary. LDPE also is used to manufacture some flexible lids and bottles as well as in wire and cable applications. Includes Linear Low Density Polyethylene (LLDPE).	• Excellent resistance to acids, bases and vegetable oils • Toughness, flexibility and relative transparency (good combination of properties for packaging applications requiring heat-sealing)	Bags for dry cleaning, newspapers, bread, frozen foods, fresh produce, and household garbage. Shrink wrap and stretch film. Coatings for paper milk cartons and hot and cold beverage cups. Container lids. Toys. Squeezable bottles (e.g., honey and mustard). In addition to packaging, LDPE's major uses are in injection molding applications, adhesives and sealants, and wire and cable coverings.	Shipping envelopes, garbage can liners, floor tile, paneling, furniture, film and sheet, compost bins, trash cans, landscape timber, and outdoor lumber.
	**Polypropylene (PP).** PP has good chemical resistance, is strong, and has a high melting point making it good for hot-fill liquids. This resin is found in flexible and rigid packaging, fibers, and large molded parts for automotive and consumer products.	• Excellent optical clarity in biaxially oriented films and stretch blow molded containers • Low moisture vapor transmission • Inertness toward	Containers for yogurt, margarine, takeout meals, and deli foods. Medicine bottles. Bottle caps and closures. Bottles for catsup and syrup. In addition to packaging, PP's major uses are in fibers, appliances and	Automobile applications, such as battery cases, signal lights, battery cables, brooms and brushes, ice scrapers, oil funnels, and bicycle racks. Garden rakes, storage bins, shipping pallets, sheeting, trays.

Resin Codes	Descriptions	Properties	Product Applications	Products Made with Recycled Content*
		acids, alkalis and most solvents	consumer products, including durable applications such as automotive and carpeting.	
 PS	**Polystyrene (PS).** PS is a versatile plastic that can be rigid or foamed. General purpose polystyrene is clear, hard and brittle. It has a relatively low melting point. Typical applications include protective packaging, foodservice packaging, bottles, and food containers. PS is often combined with rubber to make high impact polystyrene (HIPS) which is used for packaging and durable applications requiring toughness, but not clarity.	• Excellent moisture barrier for short shelf life products • Excellent optical clarity in general purpose form • Significant stiffness in both foamed and rigid forms. • Low density and high stiffness in foamed applications • Low thermal conductivity and excellent insulation properties in foamed form	Food service items, such as cups, plates, bowls, cutlery, hinged takeout containers (clamshells), meat and poultry trays, and rigid food containers (e.g., yogurt). These items may be made with foamed or non-foamed PS. Protective foam packaging for furniture, electronics and other delicate items. Packing peanuts, known as "loose fill." Compact disc cases and aspirin bottles. In addition to packaging, PS's major uses are in agricultural trays, electronic housings, cable spools, building insulation, video cassette cartridges, coat hangers, and medical products and toys.	Thermal insulation, thermometers, light switch plates, vents, desk trays, rulers, and license plate frames. Cameras or video cassette casings. Foamed foodservice applications, such as egg shell cartons. Plastic mouldings (i.e., wood replacement products). Expandable polystyrene (EPS) foam protective packaging.
 OTHER	**Other.** Use of this code indicates that a package is made with a resin other than the six listed above, or is made of more than one resin and used in a multi-layer combination.	Dependent on resin or combination of resins	Three- and five-gallon reusable water bottles, some citrus juice and catsup bottles. Oven-baking bags, barrier layers, and custom packaging.	Bottles and plastic lumber applications.

***Recycling may not be available in all areas. Check to see if plastics recycling is available in your community.**

American Chemistry Council, Plastics Division
Last Updated: March 2007

Appendix C

Listing of 2007 reports from municipal recycling programs

2007 Plastic Recycling Efforts as Reported to the State Planning Office

12/31/2008 Rpt: Plasticreport08
View: TFacWk1

	HDPE Plastic	PET Plastic	Other Plastics	Total Tons	Population
Abbot	0	0	0	**0**	630
Albion	2.41	0	0	**2.41**	1946
Alfred	5.8	0	0	**5.8**	2497
Alton	0	0	0	**0**	816
Andover	0	0	0.25	**0.25**	864
Anson	0	0	6.2	**6.2**	2583
AROOSTOOK VALLEY	3.75	0	0	**3.75**	1871
Arrowsic	0	0	0	**0**	477
Arundel	0	0	31.87	**31.87**	3571
Athens	0	0	0	**0**	847
Auburn	14	0	0	**14**	23203
BAILEYVILLE REGION	1.5	0	0	**1.5**	3697
Bancroft	0	0	0	**0**	61
Bangor	0	0	23.94	**23.94**	31473
Bar Harbor	5.63	0	0	**5.63**	4820
Bath	0	0	15	**15**	9266
Belfast	5	0	0	**5**	6381
Belgrade	5.92	1.41	0	**7.33**	2978
Belmont	0.4	0	0	**0.4**	821
Berwick	0	0	0	**0**	6353
Bethel	0	0	3.92	**3.92**	3027
Biddeford	5	4	8	**17**	20942
Bingham	0	0	0	**0**	989
BLUE HILL REGION	8.54	0	0	**8.54**	6605
BOOTHBAY REGION	14.83	0	0	**14.83**	7068
Bowdoin	2.54	0	0	**2.54**	2727
Bowdoinham	10.59	0	0	**10.59**	2612
Bradley	0.64	0	0	**0.64**	1242
Brewer	5.95	0	0	**5.95**	8987
Bridgton	11.48	3.44	1.82	**16.74**	4883
BRISTOL REGION	5	3	0	**8**	3541
Brooks	0.28	0.12	0.59	**0.99**	1022
Brownfield	0	0	1.37	**1.37**	1251
Brunswick	0	0	20	**20**	21172
BUCKFIELD REGION	0	0	0	**0**	2577
BUCKSPORT REGION	0	0	30	**30**	7042
BURLINGTON-LOWELL	0	1	1	**2**	642
Burnham	0	0	0	**0**	1142
Buxton	9.68	0	0	**9.68**	7452
Calais	2	0	0	**2**	3447
Canaan	5.03	0	0	**5.03**	2017
Canton	2.14	0	0	**2.14**	1121
Cape Elizabeth					

2007 Plastic Recycling Efforts as Reported to the State Planning Office

12/31/2008 Rpt: Plasticreport08
View: TFacWk1

	HDPE Plastic	PET Plastic	Other Plastics	Total	Population
	22.72	0	0	**22.72**	9068
CARATUNK REGION	0	0	2	**2**	190
Casco	4.62	0	0	**4.62**	3469
Castine	2.79	0	0	**2.79**	1343
CENTRAL PENOBSCOT	2.35	0	0	**2.35**	5094
CHERRYFIELD REGION	0.85	0	0	**0.85**	1235
Chester	0	0	0	**0**	525
Chesterville	1.61	0	0	**1.61**	1170
China	4.09	0	0	**4.09**	4106
Clifton	0	0	0	**0**	743
CLINTON REGION	4.6	0	0	**4.6**	5897
Cornish	0.4	0	0	**0.4**	1269
Cranberry Isles	0.47	0	0	**0.47**	128
Cumberland	22.82	0	0	**22.82**	7159
Danforth	0	0	0.75	**0.75**	629
Dayton	0	0	0	**0**	1805
Dedham	0	0	1.51	**1.51**	1422
Deer Isle	0	13.28	0	**13.28**	1876
Denmark	2.16	0	0	**2.16**	1004
Detroit	0	0	5.31	**5.31**	816
Dixmont	0.61	0.12	0	**0.73**	1065
DOVER-FOXCROFT REGI(	11.46	1.09	0	**12.55**	6539
Dresden	7.51	0	0	**7.51**	1625
Durham	7.2	0	0	**7.2**	3381
E. Millinocket	2.6	0	1.38	**3.98**	1828
Eastport	0	0	2	**2**	1640
Eliot	12	2	0	**14**	5954
ELLSWORTH AREA	9	0	0	**9**	6594
Enfield	2.8	0	0	**2.8**	1616
EUSTIS REGION	2.62	0	0	**2.62**	890
Falmouth	45.8	0	0	**45.8**	10310
Farmington	12.7	0	0	**12.7**	7410
Fayette	0.88	0	0	**0.88**	1040
Franklin	1.8	0.28	0	**2.08**	1370
Freedom	0.37	0.07	0	**0.44**	645
Freeport	0	0	15.41	**15.41**	7800
Frye Island	0	0	0	**0**	70
Fryeburg	2.53	2.78	3.18	**8.49**	3083
Garland	1.21	0	0	**1.21**	990
Georgetown	3.4	0	0	**3.4**	1020
Gilead	0.37	0	0	**0.37**	156
Glenburn	1.6	0	0	**1.6**	3964
Gorham					

2007 Plastic Recycling Efforts as Reported to the State Planning Office

12/31/2008 Rpt: Plasticreport08
View: TFacWk1

	HDPE Plastic	PET Plastic	Other Plastics	Total	Population
	0	0	36.33	**36.33**	14141
Gouldsboro	2.6	0.26	0	**2.86**	1941
Gray	19	0	15	**34**	6820
Greene	0	0	0	**0**	4076
GREENWOOD WOODSTO	3.66	2	0	**5.66**	2109
Hampden	7.4	0	0	**7.4**	6327
Hancock	2.9	0.29	0	**3.19**	2147
HARMONY REGION	0	0	0	**0**	1212
Harpswell	6.74	1.49	7.13	**15.36**	5239
Harrington	0	0	0.3	**0.3**	882
Harrison	0	0	2.81	**2.81**	2315
Hartford	2.12	2.2	0	**4.32**	963
Hartland	4.44	0	0	**4.44**	1816
HATCH HILL REGION	15	0	0	**15**	41785
Haynesville	0	0	0	**0**	122
Hebron	2.27	0	0	**2.27**	1053
Hermon	0.72	0	0	**0.72**	4437
Holden	4.66	0	0	**4.66**	2827
Hollis	6.84	0	0	**6.84**	4114
Howland	2.5	0.2	1.75	**4.45**	1362
Hudson	1.6	0	0	**1.6**	1393
Indian Township	0	0	0	**0**	676
Industry	1.5	0	0	**1.5**	790
Isle Au Haut	0	0	0	**0**	79
Islesboro	1.18	0	0	**1.18**	603
JACKMAN REGION	0.69	0	0	**0.69**	1321
Jackson	0.16	0.06	0.14	**0.36**	506
Jay	13.57	0	0	**13.57**	4985
Kenduskeag	0.55	0	0	**0.55**	1171
Kennebunkport	0	0	0	**0**	3720
KINGFIELD REGION	6.27	0	0	**6.27**	2507
Kittery	0	30	0	**30**	9543
Knox	0.43	0.09	0	**0.52**	747
Lagrange	0	0	0	**0**	747
Lakeville	0	0	0	**0**	63
Lamoine	4.45	0	0	**4.45**	1495
Lebanon	0	0	0	**0**	5083
Lee	0	0	0	**0**	845
Leeds	2.07	0	0	**2.07**	2001
Levant	1.02	0	0	**1.02**	2171
Lewiston	54.9	0	0	**54.9**	35690
Limerick	0	0	27.84	**27.84**	2240
Limington					

2007 Plastic Recycling Efforts as Reported to the State Planning Office

12/31/2008 Rpt: Plasticreport08
View: TFacWk1

	HDPE Plastic	PET Plastic	Other Plastics	Total	Population
	0	0	2.45	**2.45**	3403
Lincoln	0	0	2	**2**	5221
Lincoln Plt.	0.22	0	0	**0.22**	46
Lisbon	16.3	0	6.63	**22.93**	9077
Litchfield	0	0	0	**0**	3110
Littleton	0	0	0	**0**	955
Livermore	4.64	0	0	**4.64**	2106
Livermore Falls	9.19	0	0	**9.19**	3227
Long Island	0.94	0	0	**0.94**	202
LOVELL REGION	5.2	0	0	**5.2**	1262
Lubec	2.24	0	0	**2.24**	1652
Lyman	0	0	0	**0**	3795
MACHIAS REGION	10.62	0	0	**10.62**	3360
Macwahoc Plt.	0	0	0	**0**	98
Madison	10	0	0	**10**	4523
Magalloway Plt.	0	0	0	**0**	37
Mariaville	0.25	0	0	**0.25**	414
MARION TS	0	0	0	**0**	7713
MARS HILL AREA	3.88	0	0	**3.88**	1484
Mattawamkeag	0.95	0.95	0	**1.9**	825
Maxfield	0	0	0	**0**	87
Mechanic Falls	5.28	0	0	**5.28**	3138
Medford	0	0	0	**0**	231
MEDWAY REGION	1	0	2.6	**3.6**	1775
Mercer	0.71	0	0	**0.71**	647
MID-COAST	29	0	0	**29**	11890
MID-MAINE	15.75	0	0	**15.75**	9812
Milbridge	7.5	0	0	**7.5**	1279
Milford	1.37	0	0	**1.37**	2950
Millinocket	8	0	0	**8**	5203
Minot	0	0	0	**0**	2248
MONMOUTH REGION	6	2	0	**8**	4850
MONSON REGION	0	0	0	**0**	749
Montville	0.58	0.12	0	**0.7**	1002
Morrill	0	0	0	**0**	774
Moscow	0	0	0.9	**0.9**	577
Mount Desert	2.52	0	0	**2.52**	2109
Mount Vernon	2.95	0	0	**2.95**	1524
Naples	5.65	0	0	**5.65**	3274
New Gloucester	8.7	0	0	**8.7**	4803
New Sharon	1.53	0	0	**1.53**	1297
New Vineyard	0	0	0.95	**0.95**	725
Newburgh					

2007 Plastic Recycling Efforts as Reported to the State Planning Office

12/31/2008 Rpt: Plasticreport08
View: TFacWk1

	HDPE Plastic	PET Plastic	Other Plastics	Total	Population
	0.5	0	0	**0.5**	1394
Newfield	0	0	0	**0**	1328
Newport	10	0	0	**10**	3017
No. Yarmouth	0	0	5.62	**5.62**	3210
NOBLEBORO REGION	13.9	0	0	**13.9**	8585
Norridgewock	0	0	0	**0**	3294
North Berwick	0	0	15.42	**15.42**	4293
North Haven	0.15	0	0	**0.15**	381
NORTH OXFORD REGION	30.5	0	0	**30.5**	13965
NORTHERN AROOSTOOK	15.9	0	12.8	**28.7**	10794
NORTHERN KATAHDIN VA	4.5	0	0	**4.5**	4340
NORWAY PARIS	21.97	0	0	**21.97**	9404
Oakland	6.89	0.42	0	**7.31**	5959
Ogunquit	3.84	1.74	3.43	**9.01**	1226
Old Orchard Beach	0	0	0	**0**	8856
Old Town	9.54	0	0	**9.54**	8130
Orient	0	0	0	**0**	145
Orrington	2.15	0	0	**2.15**	3526
Otisfield	2.71	0	0	**2.71**	1560
Oxford	6	0	0	**6**	3960
Palmyra	5.9	1.39	0	**7.29**	1953
Parkman	0	0	1.22	**1.22**	811
Parsonsfield	2.4	0	0	**2.4**	1584
Passadumkeag	2	0	0	**2**	441
Penobscot	0	0	0.92	**0.92**	1344
PENOBSCOT COUNTY	0	0	1	**1**	1447
PENQUIS SOLID WASTE C	0	0	0	**0**	1259
Phippsburg	0	0	25.3	**25.3**	2106
PISCATAQUIS COUNTY	0.33	0.17	0	**0.5**	601
Pittsfield	43.2	36.35	4.33	**83.88**	4214
Plymouth	5.03	1.67	0	**6.7**	1257
Poland	0	0	0	**0**	4866
Portland	0	0	143	**143**	64249
Pownal	0	0	2.96	**2.96**	1491
PRESQUE ISLE REGION	10.68	2.45	0	**13.13**	14630
Princeton	0	0	0	**0**	892
Prospect	0.32	0	0	**0.32**	642
RANGELEY REGION	2.74	0	0	**2.74**	1302
Raymond	0	0	0	**0**	4299
Reed Plt.	0	0	0	**0**	207
Richmond	1	0.5	0	**1.5**	3298
Rockland	16.45	0	0	**16.45**	7609
Rome					

2007 Plastic Recycling Efforts as Reported to the State Planning Office

12/31/2008 Rpt: Plasticreport08
View: TFacWk1

	HDPE Plastic	PET Plastic	Other Plastics	Total	Population
	0	0	0	**0**	980
Sabattus	13	3	0	**16**	4486
Saco	0	0	0	**0**	16822
Sanford	13.41	0	0	**13.41**	20806
Scarborough	0	0	74.87	**74.87**	16970
Searsmont	1.51	0	0	**1.51**	1174
Searsport	0	0	0	**0**	2641
Sebago	0	0	0	**0**	1433
Shapleigh	0	0	0	**0**	2326
SHERMAN REGION	12	0	0	**12**	1828
Sidney	5.81	0	0	**5.81**	3514
Skowhegan	11.78	0	0	**11.78**	8824
Smithfield	0	0	0	**0**	930
Solon	7.22	0	0	**7.22**	940
Sorrento	0	0	0.44	**0.44**	290
SOUTH AROOSTOOK REG	17.38	0	0	**17.38**	11144
South Berwick	0	0	36.62	**36.62**	6671
South Portland	0	0	54.26	**54.26**	23324
Southwest Harbor	4.37	0	0	**4.37**	1966
Springfield	0	0	0	**0**	379
St. George	6.25	0.74	19.09	**26.08**	2580
Standish	0	0	15.57	**15.57**	9285
Starks	1.1	0.9	0	**2**	578
Stetson	0.7	0	0	**0.7**	981
Stockton Springs	0.99	0	0	**0.99**	1481
Stonington	2.25	0	0	**2.25**	1152
Strong	0	0	0.48	**0.48**	1259
Sullivan	0	0	1.76	**1.76**	1185
Swanville	1.32	0	0	**1.32**	1357
Sweden	0	0	0	**0**	324
Temple	0.58	0	0	**0.58**	572
THOMASTON REGION	0	0	0	**0**	6765
Thorndike	0.5	0.1	0	**0.6**	712
Topsham	17.14	0	0	**17.14**	9100
Tremont	2.46	0	0	**2.46**	1529
Trenton	1.28	0	0	**1.28**	1370
TRI-COMMUNITY	16	175	8	**199**	24306
TRI-COUNTY	14.4	0	0	**14.4**	7481
TRI-TOWN	0	0	3.52	**3.52**	4151
Troy	0.3	0.11	0.26	**0.67**	963
Turner	8.69	0	0	**8.69**	4972
Unity	1.89	1.5	6.5	**9.89**	1889
Van Buren					

2007 Plastic Recycling Efforts as Reported to the State Planning Office

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View: TFacWk1

	HDPE Plastic	PET Plastic	Other Plastics	Total	Population
	15	6	0	**21**	2631
Vassalboro	3.88	0	0	**3.88**	4047
Verona	0	0	0	**0**	533
Vienna	0.66	0	0	**0.66**	527
Vinalhaven	5.93	0	0	**5.93**	1235
WALDOBORO REGION	11.8	0	0	**11.8**	7442
Warren	4.03	2.39	0	**6.42**	3794
Waterboro	0	0	0	**0**	6214
Waterville	0	0	45	**45**	15605
Weld	0	0	1.24	**1.24**	402
Wells	0	0	0	**0**	9400
West Bath	0	0	0	**0**	1798
West Gardiner	0	0	3.96	**3.96**	2902
West Paris	2.99	0	0	**2.99**	1722
Westbrook	0	0	0	**0**	16142
Weston	0	0	0	**0**	203
Willimantic	0.35	0	0	**0.35**	135
WILTON AREA	20.64	0	0	**20.64**	4193
Windham	39.66	0	0	**39.66**	14904
Windsor	3.5	0	2.8	**6.3**	2204
Winn	0	0	1.5	**1.5**	420
Winslow	0	0	0	**0**	7743
Winter Harbor	0	0	0.7	**0.7**	500
Winterport	5.29	0	0	**5.29**	3602
Winthrop	27.61	0	0	**27.61**	6232
WISCASSET REGION	5.9	5.6	4.6	**16.1**	5023
Woolwich	0	0	0	**0**	2810
Yarmouth	0	0	18.36	**18.36**	8360
York	0	0	0	**0**	12854
	1,182.43	**312.28**	**797.86**	**2,292.57**	

Population of this Group: 1,205,005
Percent of 2000 US Census: 94.52 %

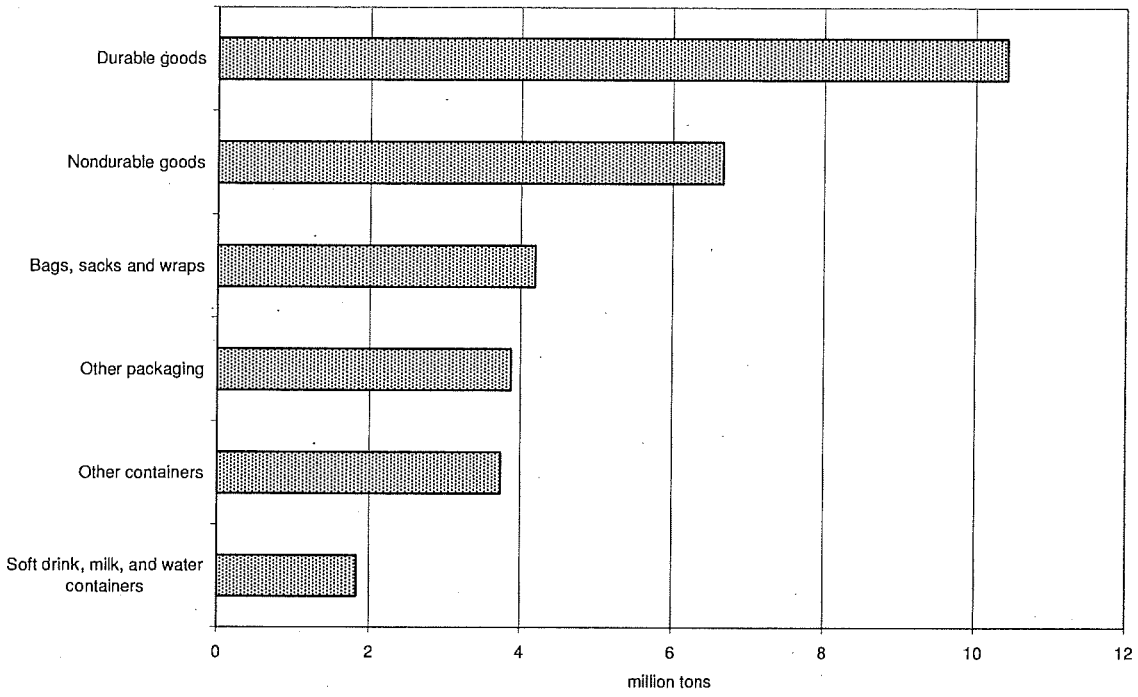
Appendix D

2007 Characterization of Municipal Solid Waste
(United States Environmental Protection Agency)

Plastics

Plastics are a rapidly growing segment of MSW. While plastics are found in all major MSW categories, the containers and packaging category (bags, sacks, and wraps, other packaging, other containers, and soft drink, milk, and water containers) has the most plastic tonnage (Figure 8 and Table 7).

Figure 8. Plastics products generated in MSW, 2007



In durable goods, plastics are found in appliances, furniture, casings of lead-acid batteries, and other products. (Note that plastics in transportation products other than lead-acid batteries are not included in this report.) As shown in Table 7, a wide range of resin types is found in durable goods. While some detail is provided in Table 7 for resins in durable goods, there are hundreds of different resin formulations used in appliances, carpets, and other durable goods; a complete listing is beyond the scope of this report.

Table 7

PLASTICS IN PRODUCTS IN MSW, 2007
(In thousands of tons, and percent of generation by resin)

Product Category	Generation (Thousand tons)	Recovery (Thousand tons)	Recovery (Percent of Gen.)	Discards (Thousand tons)
Durable Goods				
PET	570			
HDPE	780			
PVC	620			
LDPE/LLDPE	920			
PP	1,630			
PS	890			
Other resins	5,010			
Total Plastics in Durable Goods	**10,420**	**500**	**4.8%**	**9,920**
Nondurable Goods				
Plastic Plates and Cups				
LDPE/LLDPE	20			20
PS	840	Neg.		840
Subtotal Plastic Plates and Cups	860			860
Trash Bags				
HDPE	290			290
LDPE/LLDPE	780			780
Subtotal Trash Bags	1,070			1,070
All other nondurables*				
PET	230			230
HDPE	430			430
PVC	630			630
LDPE/LLDPE	1,680			1,680
PP	900			900
PS	590			590
Other resins	290			290
Subtotal All Other Nondurables	4,750			4,750
Total Plastics in Nondurable Goods, by resin				
PET	230			230
HDPE	720			720
PVC	630			630
LDPE/LLDPE	2,480			2,480
PP	900			900
PS	1,430			1,430
Other resins	290			290
Total Plastics in Nondurable Goods	**6,680**	**Neg.**	**Neg.**	**6,680**
Plastic Containers & Packaging				
Soft drink bottles				
PET	1,010	370	36.6%	640
Milk and water bottles				
HDPE	820	230	28.0%	590

HDPE = High density polyethylene
PET = Polyethylene terephthalate
PS = Polystyrene
LDPE = Low density polyethylene
PP = Polypropylene
PVC = Polyvinyl chloride
LLDPE = Linear low density polyethylene

* All other nondurables include plastics in disposable diapers, clothing, footwear, etc.

** Other plastic packaging includes coatings, closures, caps, trays, shapes, etc.

Details may not add to totals due to rounding.
Neg. = less than 5.000 tons or 0.05 percent

Source: Franklin Associates, A Division of ERG

Table 7 (continued)
PLASTICS IN PRODUCTS IN MSW, 2007
(In thousands of tons, and percent of generation by resin)

Product Category	Generation (Thousand tons)	Recovery (Thousand tons)	Recovery (Percent of Gen.)	Discards (Thousand tons)
Plastic Containers & Packaging, cont.				
Other plastic containers				
PET	1,730	270	15.6%	1,460
HDPE	1,410	240	17.0%	1,170
PVC	60	Neg.		60
LDPE/LLDPE	40	Neg.		40
PP	420	10	2.4%	410
PS	0			0
Other resins	80			80
Subtotal Other Containers	**3,740**	**520**	**13.9%**	**3,220**
Bags, sacks, & wraps				
HDPE	590	70	11.9%	520
PVC	80			80
LDPE/LLDPE	2,490	310	12.4%	2,180
PP	800			800
PS	0			0
Other resins	230			230
Subtotal Bags, Sacks, & Wraps	**4,190**	**380**	**9.1%**	**3,810**
Other Plastics Packaging**				
PET	220	40	18.2%	180
HDPE	1,330	30	2.3%	1,300
PVC	270	Neg.		270
LDPE/LLDPE	470	Neg.		470
PP	820	Neg.		820
PS	300	20	6.7%	280
Other resins	460			460
Subtotal Other Packaging	**3,870**	**90**	**2.3%**	**3,780**
Total Plastics in Containers & Packaging, by resin				
PET	2,960	680	23.0%	2,280
HDPE	4,150	570	13.7%	3,580
PVC	410			410
LDPE/LLDPE	3,000	310	10.3%	2,690
PP	2,040	10	0.5%	2,030
PS	300	20	6.7%	280
Other resins	770			770
Total Plastics in Cont. & Packaging	**13,630**	**1,590**	**11.7%**	**12,040**
Total Plastics in MSW, by resin				
PET	3,760	680	18.1%	3,080
HDPE	5,650	570	10.1%	5,080
PVC	1,660			1,660
LDPE/LLDPE	6,400	310	4.8%	6,090
PP	4,570	10	0.2%	4,560
PS	2,620	20	0.8%	2,600
Other resins	6,070	500	8.2%	5,570
Total Plastics in MSW	**30,730**	**2,090**	**6.8%**	**28,640**

HDPE = High density polyethylene
LDPE = Low density polyethylene
LLDPE = Linear low density polyethylene
PET = Polyethylene terephthalate
PP = Polypropylene
PS = Polystyrene
PVC = Polyvinyl chloride

* All other nondurables include plastics in disposable diapers, clothing, footwear, etc.
** Other plastic packaging includes coatings, closures, caps, trays, shapes, etc.
Some detail of recovery by resin omitted due to lack of data. Neg. = less than 5,000 tons or 0.05 percent

Source: Franklin Associates, A Division of ERG

Plastics are found in such nondurable products as disposable diapers, trash bags, cups, eating utensils, medical devices, and household items such as shower curtains. The plastic food service items are generally made of clear or foamed polystyrene, while trash bags are made of high-density polyethylene (HDPE) or low-density polyethylene (LDPE). A wide variety of other resins are used in other nondurable goods.

Plastic resins are also used in a variety of container and packaging products such as polyethylene terephthalate (PET) soft drink bottles, high-density polyethylene (HDPE) bottles for milk and water, and a wide variety of other resin types used in other plastic containers, bags, sacks, wraps, and lids.

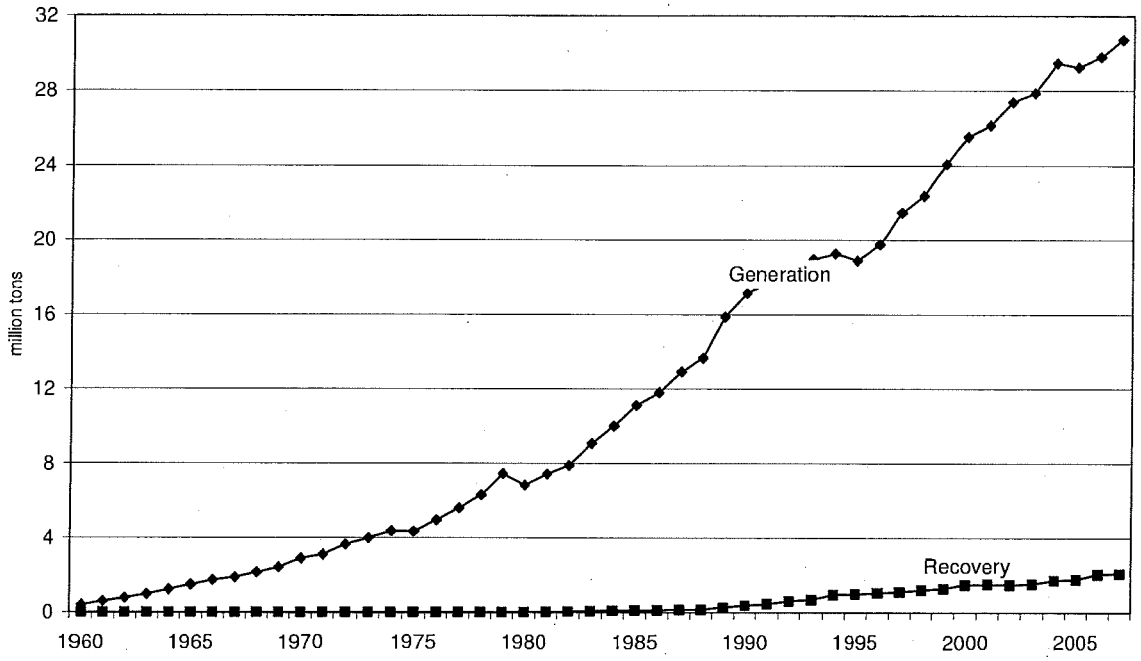
Generation. Production data on plastics resin use in products are taken from the American Chemistry Council's annual resin reports. The basic data are adjusted for product service life, fabrication losses, and net imports of plastic products to derive generation of plastics in the various products in MSW.

Plastics made up an estimated 390,000 tons of MSW generation in 1960. The quantity has increased relatively steadily to 30.7 million tons in 2007 (Figure 9). As a percentage of MSW generation, plastics were less than one percent in 1960, increasing to 12.1 percent in 2007.

Recovery for Recycling. While overall recovery of plastics for recycling is relatively small – 2.1 million tons, or 6.8 percent of plastics generation in 2007 (Table 7) – recovery of some plastic containers is more significant. PET soft drink bottles (including water bottles) were recovered at a rate of 36.6 percent in 2007. Recovery of high-density polyethylene milk and water bottles was estimated at about 28.0 percent in 2007. Significant recovery of plastics from lead-acid battery casings and from some other containers was also reported. The primary sources of data on plastics recovery are annual product recovery surveys conducted for the American Chemistry Council and the National Association for PET Container Resources (NAPCOR).

Discards After Recovery. Discards of plastics in MSW after recovery were 28.6 million tons, or 16.9 percent of total MSW discards in 2007 (Table 3).

Figure 9. Plastics generation and recovery, 1960 to 2007



Other Materials

Rubber and Leather. The predominant source of rubber in MSW is rubber tires from automobiles and trucks (Table 8). Other sources of rubber and leather include clothing and footwear and other miscellaneous durable and nondurable products. These other sources are quite diverse, including such items as gaskets on appliances, furniture, and hot water bottles, for example.

Appendix E

Plastic resin market specifications and information

HAYCORE
CANADA INC

Post Consumer Un-pigmented (Natural) HDPE Specifications

ACCEPTABLE MATERIALS – HDPE natural

- Curb-side plastics HDPE bottles number 2 (small neck only. i.e. Milk, water, and juice (quart, ½ gallon, and 1 gallon bottles))

ALLOWABLE LEVELS OF CONTAMINANTS

- Maximum waste is not to exceed 2% of total content (no PET, PVC, PP, Aluminium, tin food cans or beverage container, paper, cardboard or film)
- No moisture – dry bales only
- Maximum waste is to not exceed 2% of total content (no PET, PVC, film or pails)
- No trash, food, or paper inside bales (labels are acceptable)
- No hazardous material, medical waste
- No steel or aluminium
- No pails
- No industrial HDPE

BALE SIZE / MARKINGS

- Bale size 24 x 36 x 42 minimum to 36 x 48 x 72 maximum
- Bale weight 250 kg minimum to 500 kg maximum
- Truckload shipments only
- Bill of lading to list supplier's name and Haycore's reference number

PROHIBITED MATERIALS

- Bales containing hazardous product containers
- Bales containing medical waste such as IV bags and needles / syringes
- Bales containing other materials that would be dangerous or damaging to process

COMMENTS

A positive sort and a good faith effort to eliminate all forms of waste and contamination will ensure stable markets for this grade of material.

Head Office
3144 Gregoire Road
Russell, Ontario K4R 1E5
(613) 445-3610 fax (613) 445-0247

Processing Facility
9 Newport Drive
Prescott, Ontario K0E 1T0
(613) 925-0005

HAYCORE
CANADA INC

Post Consumer HDPE Specifications

ACCEPTABLE MATERIALS – HDPE color

- Curb-side plastics HDPE bottles number 2 (small neck only)

ALLOWABLE LEVELS OF CONTAMINANTS

- Maximum waste is not to exceed 2% of total content (no PET, PVC, PP, Aluminium, tin food cans or beverage container, paper, cardboard or film)
- No moisture – dry bales only
- No trash, food, or paper inside bales (labels are acceptable)
- No steel or aluminium
- No pails
- No industrial HDPE

BALE SIZE / MARKINGS

- Bale size 24 x 36 x 42 minimum to 36 x 48 x 72 maximum
- Bale weight 250 kg minimum to 500 kg maximum
- Truckload shipments only
- Bill of lading to list supplier's name and Haycore's reference number

PROHIBITED MATERIALS

- Bales containing hazardous product containers
- Bales containing medical waste such as IV bags and needles / syringes
- Bales containing other materials that would be dangerous or damaging to process

COMMENTS

A good faith effort to eliminate all forms of waste and contamination will ensure stable markets for this grade of material.

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HAYCORE
CANADA INC.

Post Consumer Mixed Plastics #1 Through #7

ACCEPTABLE MATERIALS – Mixed Plastic 1 - 7

- Curb-side plastics #1 through #7
- Must contain # 1 and # 2

ALLOWABLE LEVELS OF CONTAMINANTS

- No moisture – dry bales only
- Maximum waste is to not exceed 5% of total content
- Waste defined as #3-7 plastics, paper, metal or glass
- No trash, food, or paper inside bales (labels are acceptable)
- No hazardous material, medical waste

BALE SIZE / MARKINGS

- Bale size 24 x 36 x 42 minimum to 36 x 48 x 72 maximum
- Bale weight 250 kg minimum to 500 kg maximum
- Truckload shipments only
- Bill of lading to list supplier's name and Haycore's reference number

PROHIBITED MATERIALS

- Bales containing hazardous product containers
- Bales containing medical waste such as IV bags and needles / syringes
- Bales containing other materials that would be dangerous or damaging to process

COMMENTS

A good faith effort to eliminate all forms of waste and contamination will ensure stable markets for this grade of material.

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Prescott, Ontario K0E 1T0
(613) 925-0005

HAYCORE
CANADA INC

Grocery Bags Specifications

ACCEPTABLE MATERIALS

- Grocery bags

ALLOWABLE LEVELS OF CONTAMINANTS

- Maximum waste is not to exceed 2% of contamination.

BALE SIZE / MARKINGS

- Bale size 24 x 36 x 42 minimum to 36 x 48 x 72 maximum
- Bale weight 250 kg minimum to 500 kg maximum
- Truckload shipments only
- Bill of lading to list supplier's name and Haycore's reference number

PROHIBITED MATERIALS

- Bales containing hazardous product containers
- Bales containing medical waste such as IV bags and needles / syringes
- Bales containing other materials that would be dangerous or damaging to process
- Bales must be dry

COMMENTS

A positive sort and a good faith effort to eliminate all forms of waste and contamination will ensure stable markets for this grade of material.

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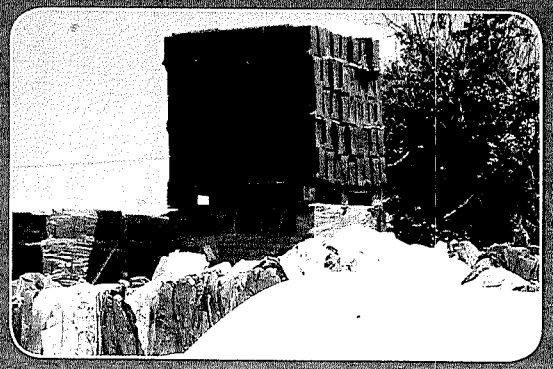
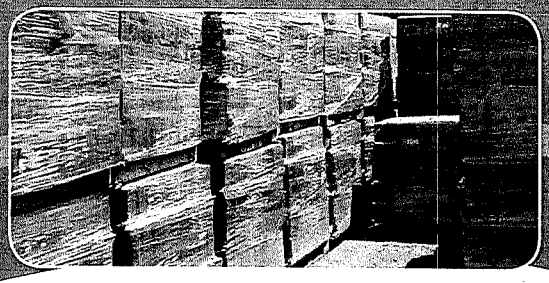




Once delivered to Mondo Polymers facility, the material is then processed and converted to highway department-approved guard rail spacer blocks. Approximately 21,000 blocks were constructed thanks to this 2006 recycling effort from plastic that has been land-filled in the past.

Is boat shrink-wrap filling your trash dumpsters?

Boat shrink-wrap is made of low-density polyethylene (LDPE), which can be recycled and used in the manufacture of new products such as plastic bags, guard rail blocks, wheel chalks, lawn edging, plastic banners, plastic lumber (decking, benches, etc.), and more!

Would your marina like to participate in a program to recycle that material?

In 2007, the boat shrink-wrap program will be expanded to include the entire Lake Erie coastline. Marinas, yacht clubs, dry marinas and boat storage yards can coordinate pick-up schedules to accommodate large and small quantity clients.

To find out how to participate, visit: ***ohiocleanmarina.osu.edu*** or contact Gary Comer, Jr. at *comer.29@osu*.edu or 419.609.4120.

The Boat Shrink-Wrap Recycling Program

Contact:

Gary L. Comer Jr., Ohio Clean Marinas Coordinator
Ohio Sea Grant Extension
105 West Shoreline Drive
Sandusky, Ohio 44870
comer.29@osu.edu
419.609.4120

David Kelch, Ohio Clean Marinas Program Administrator
Ohio Sea Grant Extension
42110 Russia Road
Elyria, Ohio 44035
kelch.3@osu.edu
440.326.5851

Ronnie Wesel
Mondo Polymers
Technologies, Inc.
State Route 7, P.O. Box 250
Reno, Ohio 45773
ron@mondopolymer.com
740.376.9396

The Ohio Clean Marinas Program is a proactive partnership among the Ohio Sea Grant College Program, Ohio Department of Natural Resources, Lake Erie Marine Trades Association, and other public and private sector partners that are connected to Ohio's recreational boating industry. The program is designed to encourage marinas and boaters to use simple, innovative solutions to keep Ohio's coastal and inland waterway resources clean. The Ohio Clean Marinas Program assists these operators in protecting the resources that provide their livelihood - clean water and fresh air.

ohiocleanmarina.osu.edu

Ohio Clean Marina

MONDO™ Polymer Technologies

The Boat Shrink-Wrap Recycling Program

In the spring of 2006, the Ohio Clean Marinas Program, in partnership with Mondo Polymer Technologies, Inc. completed the first year of a two-year pilot program, offering marina operators and boaters a welcomed cost effective alternative to recycle boat shrink-wrap.

The program provided a no-cost shrink-wrap collection service once every two weeks for more than 50 marinas located in Erie, Ottawa, and Lorain counties. In addition, scheduled pick-ups occurred at 20 marinas located in Lucas, Cuyahoga, and Lake counties by appointment.

Thanks to this program, more than 50 tons of boat shrink-wrap and more than 23 tons of greenhouse plastics were recycled into approximately 21,000 polymer guardrail blocks.

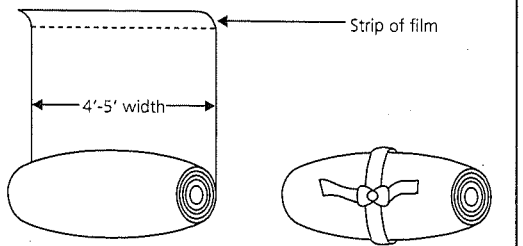
Packer truck used by Mondo Polymers to collect boat shrink-wrap and seasonal nursery plastic. Workers collected between 10,000 -15,000 pounds in a single truck load.

What You Can Do:

1. Remove all lumber, metal zippers, reusable vents, rope, and other non shrink-wrap materials (batteries, soda cans, screws, nails) from the shrink-wrap. The doors and vents may be reusable next year.

2. Keep the shrink-wrap as clean as possible – gravel, sand, and excess dirt make the recycling process more difficult.

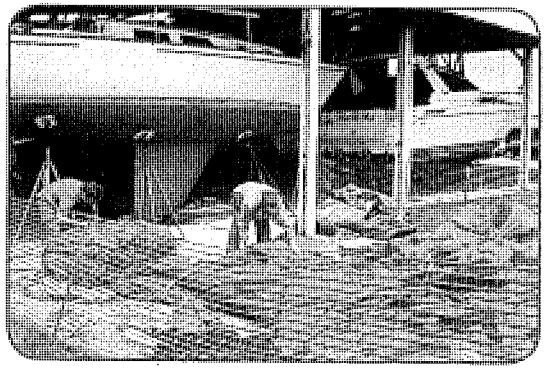
3. Maximize the amount of shrink-wrap that will fit in your storage area and reduce water weight by rolling the shrink-wrap into a bundle up to five feet long, similar to a rolled up sleeping bag. Tie the bundle with a strip of shrink-wrap or ribbon strapping (see diagram below). While rolling, try to keep the shrink-wrap clean.



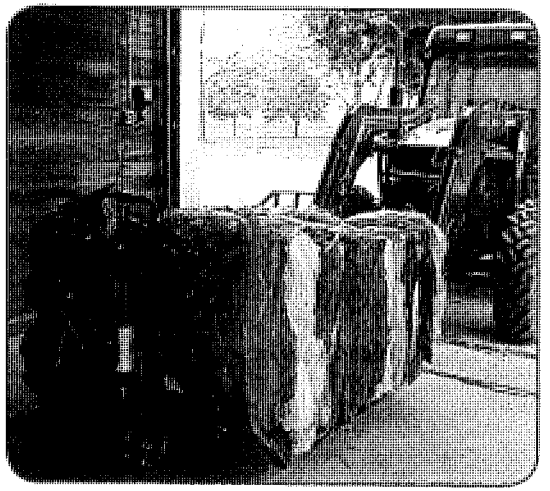
(1) Fold the film into a width of 4-5 feet, roll the film up and then cut off a strip of film from the end of the roll.

(2) Use the strip of film to tie the bundle.

4. Place rolled shrink-wrap in the designated containers marked "**SHRINK-WRAP ONLY**." Make sure to put only shrink-wrap into the container or storage area. Contaminated and dirty shrink-wrap may disrupt the recycling process decreasing the value of the material.



Marinas temporarily stored shrink wrap material in a variety of cost effective and creative ways.



Bales were loaded on tractor trailers for transport to Mondo Polymers, Inc. located in Reno, Ohio. Each trailer holds approximately 30,000 pounds or 15 tons of material.