

Contamination Reduction Best Management Practices

Overview

This Best Management Practices (BMP) section provides strategies and references to studies, toolkits, and websites to support local governments with their ongoing contamination reduction goals. This section will be available in the [Contamination Reduction Resource Library](#) and is a work in progress. Ecology will continue to add additional resources and strategies. Currently, the Education and Outreach section is the most defined.

There are many different types of recycling collection programs, and each present their own unique challenges. Collection programs addressed in the BMPs include:

- Single-Family Residential
- Multi-Family Residential
- Commercial
- Dropbox
- Glass

Reducing the amount of contamination in any program is a multi-step process involving many different strategies. Five focus areas organize the contamination reduction strategies, which local governments can piece together for their programs.

The strategic focus areas are:



Communications & Outreach



Policies & Mandates



Operations & Collection



Measurement & Reporting



Incentives & Pricing

Regional Strategies

Now is the time to explore a regional recycling strategy to overcome common barriers to successful, clean recycling programs. Working with nearby jurisdictions, or those within your MRF-shed, can yield many shared benefits such as:

- Shared costs between jurisdictions for equipment, transportation, education and outreach, operating costs, and capital for facilities;
- Increased volumes of recyclables that open new marketing possibilities;
- Cooperative marketing possibilities that could increase revenues; and
- Regional economic stimulus from new collection and processing jobs.



Communications & Outreach

The following strategies relate to community engagement, education and outreach, public relations, marketing, promotion, and behavior change campaigns. These methods are crucial to reducing contamination and increasing participation in recycling programs.

The Community-Based Social Marketing Approach

It's fairly easy and inexpensive to print and distribute materials, maintain a website, or place ads with the goal of increasing knowledge and building support for recycling programs. While these are important elements to include in your contamination reduction efforts, studies show that information by itself has little effect on behavior.

The Community-Based Social Marketing (CBSM) approach is effective at fostering sustainable behavior change. Its practical approach includes five major steps outlined in this [Quick Guide to Community-Based Social Marketing](#) from the University of Pennsylvania.

Utilize existing resources, learn from other communities, and apply CBSM principals to your contamination reduction efforts if possible. Start with a small project targeting a simple behavior or one problematic material contaminating your recycling stream. You can split the CBSM steps over time, or scale up to a comprehensive campaign with a higher budget.

Community-Based Social Marketing resources:

- [Doug McKenzie-Mohr's website](#)
- [Tools for Change website](#)
- [Pacific Northwest Social Marketing Association](#)

Key strategies for all recycling programs:

- Utilize consistent, clear, and harmonized messaging throughout the community and region.
- Update community, hauler, and Solid Waste Program websites to reflect all changes to recycling lists or collection methods.
 - Include educational elements to clarify what should and should not be recycled. For clarity and overcoming language barriers, use pictures and graphics (green check for acceptable, red x for unacceptable, etc.) rather than words.
 - Provide links to the most applicable education and outreach materials from the hauler or service provider.
- Have separate webpages for single-family, multi-family, commercial, and dropbox recycling programs. This helps direct people to the correct information and prevent confusion. Include customized information and tools for multi-family and commercial property managers.
- Work with service providers and/or realtors to create and send informational packets to new homeowners or individuals who switch service providers. Consider combining these with service calendars.
- Invite property managers, maintenance staff, and residents to lead education and outreach efforts in a way that is meaningful to the targeted community.
- Organize and staff an interactive educational booth at diverse community events.
- Identify and collaborate with community leaders to engage the community on recycling issues. This is particularly effective for minority and non-English speaking communities
- Utilize existing community-wide messaging channels such as newsletters, media articles, mailers (combined with or in addition to service calendars), and neighborhood-based social sites (like Nextdoor).
- Work with local partners (utility and cable companies, etc.) to put flyers in monthly bills.

Use transcreation principles to reach diverse populations effectively. See the following resources:

Resource Recycling's [Do you Speak Recycling article about King County's "Recicla más" campaign.](#)

Waste Management's [transcreated materials](#) and [multicultural outreach tools.](#)

- Conduct direct mailings to all customers in your solid waste area.
- Promote single or multiple social media pages so interested residents can follow for regular updates. Partner with likeminded organizations and community influencers to utilize their social media base and extend the reach of posts.
- Inform residents how, where, and why to recycle using mailers, posters, signage, door-to-door campaigns, bin tags, bill inserts.
- Develop marketing and outreach materials using pictures and short videos to show recyclable and non-recyclable materials. Implement a multi-media (TV, radio, online and print ads, outdoor signage, social media, Reddit pages, etc.) campaign to reach target audiences and create a “brand” that normalizes proper recycling behaviors.



Figure 19: Samples of Spokane's contamination reduction campaign, including postcards, FAQs, and more are in the local programs section of the [Resource Library](#).

Single-Family Residential Recycling

- Utilize Washington State's [Recycle Right Campaign](#) materials and messaging to encourage the collection of empty, clean, dry, and unbagged recyclable materials.
- Cart tagging gives residents/customers direct feedback on their recycling practices by identifying their bin contents. [Spokane's Feet on the Street cart tagging program](#) and [Waste Management's oops tags](#) are helpful resources.
- Targeted route mailers are a great option if haulers identify specific routes with higher levels of contamination.
- Consistently use blue recycling bins.

These resources from [The Recycling Partnership](#) provide steps and tools to improve the quality of your recycling program.

[Curbside Anti-Contamination Kit](#)

[Start at the Cart](#)

Multi-Family Residential Recycling

- Take inventory of all multi-family properties in your jurisdiction. Find contact information for property owners and reach out to them to build a relationship.

- Meet with property managers to assess larger scale and shared problems or concerns.
- Have separate pages for multi-family residents and property managers on your website. Include frequently asked questions, educational materials, and resources specific to multi-family recycling.
- Provide resources for other solid waste programs like household hazardous waste collection, large bulky item pick-up or drop-off, food waste, and drop-off centers for recyclables not included in the multi-family collection program.
- Encourage property managers to include links on their website to the appropriate solid waste information.
- The turnover rate of residents in multi-family housing is high, so consistent and ongoing outreach to these communities is crucial.
- Create a moving checklist with common items and simple instructions for how to dispose or recycle them. (e.g. mattresses, moving boxes, microwaves, laptops, cleaning supplies, paint cans, furniture, clothing, and other bulky items)
- Work with the service provider and MRF to develop, or modify their, tenant welcome packet bags. Tenant welcome packet bags have many benefits:
 - Hold all educational materials and prompts. Ensure residents have a simple, picture-based flier outlining what can and cannot go into recycling collection bins.
 - Distributed to all new tenants and the property owner manages the inventory.
 - Display relevant local information, websites, and messaging on the sides of the bag and build a “culture of recycling”.

See Resource Recycling’s series on Multi-Family Recycling.

[Multi-Family Mythbusting](#)
[The Path Toward Progress](#)

Cascadia’s 2012 [International Multi-family Recycling Case Study](#) provides a range of opportunities to improve multi-family recycling programs.

The City of SeaTac developed a Contamination Plan with Recology, their local hauler, to do on-site customer audits at multifamily complexes. Find more information in the local program section of the [Resource Library](#)

- Can collect recyclables within individual units and transport to the recycling container. Adding a strap to the bottom of the bag is helpful.
- If the property has community gatherings, try to attend at least one per year to engage tenants.
- Create surveys for both property managers and residents. Identify what barriers exist from each perspective.
- Take well-planned steps to tailor your multi-family program and outreach materials to the diverse backgrounds, perspectives, and needs of residents.
- Provide resources for starting a Green Team / Property Recycling Champion. Help property owners empower one or more vocal, motivated tenants by designating them a recycling champion or point person. They can help disseminate information to other residents and communicate observed and shared concerns with property managers.
- Develop a special multi-family advertising or behavior change campaign. Research the barriers residents face and ensure you target those.
- Create a multi-family recycling team of engaged property and facility managers to meet, research issues, and develop solutions.

[Toronto's 3Rs Ambassadors program](#) enlists apartment residents to champion recycling and waste reduction with neighbors, sparking enthusiasm for recycling across linguistic and cultural boundaries.

Commercial Recycling

For unincorporated areas in Washington, residential recycling is a monopoly granted to the hauler with the [g-certificate](#) for that area. However, commercial recycling is an open market.

Incorporated areas have more choice over their residential systems. They can default to the nearby g-certificate, contract for services, or provide services themselves. However, the general idea of a residential monopoly and commercial free market remains. Some cities choose to exert their powers over a portion of the commercial sector by having a contract with a hauler that addresses both residential and commercial recycling, etc.

In both unincorporated and incorporated areas, the end result is that while only one hauler serves residents, there may be multiple recyclers serving the commercial sector.

At first glance, the multitude of haulers serving the commercial sector may seem counter-intuitive to the message of uniformity, especially if their accepted materials lists differ from your residential list. However, smaller commercial recyclers often exist because their profit is made off the price they get for the recyclables they collect; not the fee charged (or embedded)

to collect it. It is important to allow these entities to compete with the larger haulers, many of whom own their own landfills. These smaller haulers offer specialized services that often prioritize commodity quality and end-use ahead of the quantity of material they collect.

- Include ALL haulers of key commercial recyclables on outreach materials. Example: on the [City of Issaquah commercial recycling webpage](#), they provide contact information for more than just the City's contracted hauler.
- The planning jurisdiction or service provider should perform walkthroughs for businesses to address their specific needs and identify available services. This is especially helpful for restaurants wanting help locating garbage, recycling, and compost services.
- Work with service providers on outreach materials and provide appropriate indoor and outdoor signage to businesses. Encourage signage in common areas like break or lunch rooms.
- Lunchroom programs should be consistent with household programs in regards to plastic and metal containers.
- Advise businesses to add links to recycling information on their websites.
- Reach out to commercial property managers to reach many commercial accounts at once.
- Work with service providers if they also provide outreach and assistance to commercial recycling customers.
- Work with business organizations like a Chamber of Commerce to engage the business community. Provide presentations or informational booths at their business-related gatherings.
- Provide resources and assistance to businesses about starting a Green Team or appointing a Recycling Champion. Often, there are staff who are vocal, active, and motivated around recycling issues. They can become Recycling Champions, or a point person, to help disseminate information to other employees and communicate tips and concerns.
- Share Best Management Practices tailored for specific types of businesses.
- If commercial and residential recycling are similar enough, combine the education and promotion efforts.
- Commercial recycling should be as similar as possible to residential service. Aim for similar color patterns for garbage (black or grey), recycling (blue), and compost (green).

- For best results, develop specific commercial recycling communications and promotion. Add business specific tips that outline the differences between residential and commercial information. Acknowledge areas that may be particularly confusing for employees who work and live in different jurisdictions with different rules or programs.

Dropbox Recycling

- Provide staff or volunteers to assist residents and provide education at dropbox locations.
- Consider co-locating dropboxes through partnerships with your community such as fire stations, recreation centers, businesses, and schools. This may also help rural multi-family households have access to recycling.
- Create signage with actual objects stuck to them. For paper items, a shadowbox can prevent damage from the rain.

Use [The Recycling Partnership's Drop-Off Anti-Contamination Kit](#) to kick-start a better quality material stream.



Figure 20: Lopez Solid Waste District uses actual recyclables to create 3D signage at their dropbox locations.



Operations and Collection

These strategies address contamination at the infrastructure level rather than consumer behavior. These include logistical solutions like re-locating shared collection containers, designing mini recycling centers, improving container design, and distributing collection bins for individual resident use.

Key strategies for all recycling programs:

Dropbox, commercial, and multi-family collection programs would benefit from the implementation of the 4 C's container strategies:

Capacity

- Recycling needs sufficient capacity, the same volume as the garbage service, or 20-30 gallons per unit per week. Or 1-1.5 cubic yards per every 10 units per week.
- Ensure proper garbage capacity as well. Recycling should never be an overflow for garbage.



Figure 21: : Dropbox, commercial, and multi-family collection programs should consider the 4 C's (Capacity, Convenience, Color, and Clarity). from [Cascadia Consulting – 2019 Role of Recycling Policy and Code presentation](#)

Convenience

- Recycling and garbage need to be equally convenient.
- All material will flow first into whatever container is most convenient. This either equals garbage in recycling or recycling in garbage.

Clarity / Color

- It needs to be extremely easy for the average resident to tell what each container is for. There should be consistency with single-family residential collection bins.
- Blue is typically associated with recycling.
- If children take out the garbage and recycling in a family, they need to be able to understand the system.

- Consistent color schemes are a very useful tool. The more consistency there is, the better and easier it is for residents to transition.
- Signage is the other method to share information. Pictures are worth a 1,000 words. Commonly confused items can go on a poster board.

Container Lids

- There are collection container lids with special gaps that only allow targeted recyclables in, and reduce large item contamination. There are specific lids for cardboard, glass, metal cans, and plastic bottles and jugs.
- [Impact](#) is one company among others that offer these lid designs.
- Use a locking mechanism for the best effect.
- Mix and match lids for different programs and to address specific barriers.

Single-Family Residential Recycling

In this report, single-family recycling focuses solely on single-family curbside collection services. So the terms single-family and curbside are interchangeable.

Considerations by Collection Service Type

There are unique challenges that come with each single-family recycling collection type. Collection service types vary between Commingled, Dual Stream, and Source Separated. It is important to identify which collection service types and their associated challenges you are

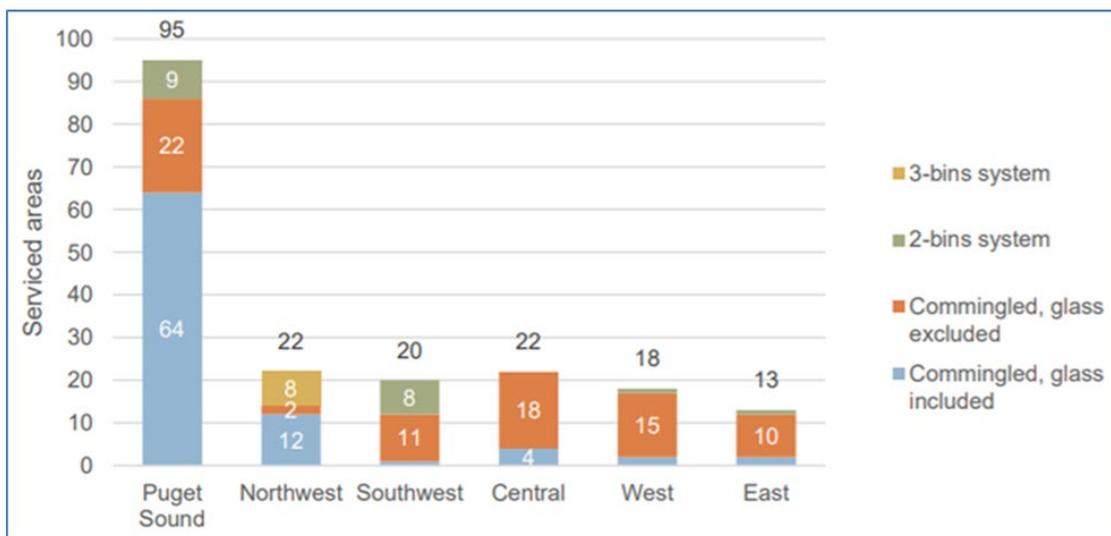


Figure 22: ZeroWaste Washington survey of residential recycling collection programs by waste composition area or WGA. See glossary for a definition of a WGA.

facing. See considerations for each service type below.

Commingled Collection

Also known as single stream or mixed recycling. In this system, residents place all recyclables into one bin at the curb. Commingled recycling increased in popularity because it is easy for residential customers to put recyclables in one container, can cost cities less money, and increases recycling collection rates. However, collecting more materials can also cause a rise in contamination levels. Material cross contamination and residential confusion regarding accepted materials contribute to the problem.

Considerations for commingled collection:

- Clarity of accepted materials list, and harmonization of accepted materials within the region or MRF-Shed.
- Material cross-contamination happens frequently. Whether from liquids and food-soiled materials spilling onto other marketable materials, or from clean materials making their way into the wrong bale. The latter commonly occurs with flat lightweight objects that act like paper in the MRF sorting process, or when glass shatters and embeds itself into other materials like paper fibers.

A more comprehensive list of the benefits and limitations of commingled residential collection on Ecology's [commingled collection webpage](#).

Dual Stream Collection

In this system, residents use two bins for collecting materials for curbside recycling. In one version, residents place all paper and fiber products in one bin and plastics, metals, and glass in the other. This collection system lowers contamination of the paper stream from liquids and other materials. In another version, residents put mixed recyclables in one and keep glass separate in the second container. This prevents broken glass shards from contaminating other materials, especially paper fibers.

Considerations for Dual Stream collection:

- Material cross contamination is still possible
- Increased hauling and infrastructure costs
- If collection is done manually, workers are at greater risk of being injured
- Only effective if the MRF has the technology to handle this system

Source Separated Collection

In this system, residents place materials into multiple bins by material type. The specifics of material separation varies by jurisdiction and depends on preferences and local requirements. Additionally, the ways paper, metal, glass, and plastics are separated varies by jurisdiction. These materials may be broken into types that are more specific. For instance, mixed paper versus newspaper and scrap paper. Plastics can be mixed, 1s and 2s, bottles and jugs only, and 3-7 mixed plastics. Typically, transfer stations and drop off/dropbox locations use this method more than curbside. It requires residents to separate and place recyclable materials into multiple dumpsters holding very specific materials.

Considerations for Source Separated collection:

- Contamination via dumping
- If collection is done manually, workers are at greater risk of being injured
- Source separated curbside programs cost more for hauling/infrastructure
- Only effective if the MRF has the technology to handle this system

Other Curbside Strategies

- Refine the accepted materials lists to reflect what is economically and environmentally viable for your region/MRF-shed. This may require removing items from your accepted lists such as: glass, aseptic containers, or difficult to market plastics (e.g. 3-7s). Collecting these materials separately in a drop box system is an option if there is a viable end market or a beneficial reuse options.
- Standardize cart colors within your MRF-shed to reduce residential confusion about which bins are for recycling and which are for garbage.
- Utilize hauler cameras and technology. Some haulers already have technology such as truck cameras and routing software allowing for easy reporting of contaminated loads. Use these systems to identify customers who would benefit from additional information or possible corrective actions.
- Consider switching to a dual-stream collection service. If contamination is most prevalent in paper fibers (from food/liquid, plastics, or glass) and your MRF has the technology to process this material separately, the quality of paper fibers could

Read about Whatcom County's three-bin collection system and its impressively low 1% contamination rate.

[Here's why most Whatcom recycling isn't ending up in landfills, despite China's ban.](#)

dramatically improve. That said, this is a discussion that will be heavily influenced by the current infrastructure your haulers and MRFs have in place as well as the feasibility of replacing that infrastructure with dual-stream compatible technology.

Multi-Family Residential Recycling

Multi-family recycling often requires more effort than recycling in a single-family setting. The barriers to resident participation are much more complex than a simple matter of convenience. Many apartments and other multi-family settings lack basic recycling infrastructure and may not be able to develop an effective program. Addressing these issues requires a systematic approach.

- Identify how permitting of multi-family properties works in your area, if there are specific requirements related to recycling, and how they are defined for solid waste. Do they share a garbage bill?
- Clarify how multi-family properties receive service. Determine if they are on commercial or residential trucks/routes and if garbage and recycling are in the same category (especially if there is a dumpster and roll carts for recycling).
- Take an inventory of all multi-family units/complexes and identify which ones have and don't have adequate recycling infrastructure. Reach out to determine which ones are willing to accept infrastructure improvements and technical assistance.
- Ensure all recycling containers are properly marked and are located near a garbage container.
- Provide residents with a dedicated container or bag to collect recyclables within individual units and to use to transport materials to central collection areas.
- Consider whether there is a need for a source-separated stream like cardboard. These can be easier to label and can be adapted to ensure only certain sized materials can enter.
- Depending on the circumstances, it may be less costly and labor intensive to educate residents on other places they can recycle such as drop box sites.

[Waste Management's 2017 Multi-Family Study](#)
details best management practices for infrastructure improvements, property management engagement, and resident education.

- Depending on the hauling service, multi-family recycling collection may be done on the same route as curbside residential service, on a separate service contract overseen by the jurisdiction, on a private contract managed by the multi-family housing complex, or not available at all except at drop box locations. Because of these and other variables and complexities, background research and evaluation is essential.

Commercial Recycling

- Though an open market, local governments may still influence operations and collection:
 - Incorporated areas: Contracting for commercial collection can provide a city more control and give them the ability to direct collection methods (such as dual stream vs. single-stream), set the accepted materials list, and reject loads
 - Unincorporated areas: Providing the residential accepted items list to commercial recycling providers and/or discussing with them shared goals and priority items for recycling in the local area
- If the business is interested, determine if there are opportunities to collect a unique large waste stream for recycling to save on disposal costs. As an example, packaging and printing companies with adequate space can collect special grade paper separately. Check with your service provider and MRF before starting any new programs with new material streams.
- Encourage business or commercial property owners to request a service and pricing review with their hauler. Occasionally changing service frequency can reduce collection costs.



Incentives and Pricing

Implementation of economic incentives like variable fees or financial rewards can be effective strategies for residents or property managers to reduce contamination.

Single-Family Residential Recycling

- If contamination is a reoccurring issue with a customer, work with your service provider and consider the following enforcement options:
 - not collecting the cart and charging landfill costs
 - fine resident/customer if contamination persists
 - discontinue recycling service

Multi-Family Residential Recycling

- Property owners or managers should request a service and pricing review with their hauler and ask how changing service frequency or container size impacts price.

Commercial Recycling

- Incorporated areas:
 - Avoid the use of embedded recycling fees. This creates an uneven playing field for competitors and perpetuates the idea that recycling is free.
 - Perform audits on commercial bins and charge for overly contaminated bins, especially if they must be dumped as garbage.
 - Use caution if coupling volumes of garbage and recycling.
- Work with business organizations or Chamber of Commerce to develop a business recognition program for businesses that are doing a good job of recycling. Use monetary or promotional rewards.
- Be very careful with any program that incentivizes higher quantities of recyclables. This can increase contamination and reduce overall material quality.

Dropbox Recycling

- Ecology is identifying additional strategies to include in this section. Please share your ideas and resources.



Policies and Mandates

There are several ways that specific jurisdictional policies or ordinances can improve recycling systems and contamination levels. This section provides some common examples.

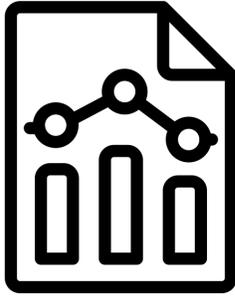
Key strategies for all recycling programs:

- Minimum service level ordinances can greatly influence the amount of material that is recycled, as well as the contamination.
- Solid waste is generally the last thing considered when designing property layouts. Building codes and the permitting process can address recycling issues such as proper container enclosure specifications and adequate space for services.
- Service providers should supply the specifications.
- Similar to ensuring fire truck spacing, properties should ensure their service location has easy access and capacity for all needed (or wanted) solid waste and recycling services.
- Plan for the future. If you are planning on expanding your program to include additional recycling, or organics, think about the space needs for all of these new services.
- If contamination can't be controlled in specific geographical areas, work with your hauler to remove recycling service from problem areas to preserve the system as a whole.
- Specify the use of contamination-reducing containers.

Single-Family Residential Recycling Multi-Family Residential Recycling Commercial Recycling Dropbox Recycling

- Ecology is identifying additional strategies to include in these sections. Please share your ideas and resources.

In 2006, Thurston County adopted a [minimum service ordinance](#) that specifies what materials are required for recycling collection in the county.



Measurement and Reporting

Evaluation of your current program and contamination materials is vital to moving forward with targeted strategies. You will first need to establish a baseline level of recycling contamination. Without this baseline information, you will not be able to know if you're making progress toward achieving your contamination reduction goals.

Strategies in this section cover the collecting and sharing data on the levels, types, and sources of contamination.

Key strategies for all recycling programs

The backbone of your data collection program are assessments. Conducting assessments will provide you with your baseline levels and types of contamination in your recycling stream so you can measure the effectiveness of your contamination reduction strategies.

Assessments to Consider:

- **Waste Characterization Studies:** These describe how much and what kinds of materials are in your waste stream
- **Visual Assessments and Lid-Lift Audits:** Easy way for staff to see what material is in recycling containers and hauled loads.
- **Technology:** Truck cameras, in-container cameras, and routing software allow for easy reporting of contaminated loads and identifying specific customers or routes for education or possible corrective action.
- **Surveys:** Conduct surveys with the public, staff, your hauler, and the MRF that processes your material.
- **Truck and Trunk Audits:** Survey vehicles before they drop off their recyclables.

Know Your Weight

Talk with your hauler(s) and MRF(s) about how and when they weigh your materials. Do they weigh your bins as they come in? Do they sort the material and then weigh? The answers to these questions will help you design a better data collection system to establish both your baseline level of contamination and the impact of your anti-contamination reduction efforts on reducing those levels.

The Recycling Partnership's [Municipal Measurement Program](#) offers free software to government agencies they can use to create a database to track key recycling program metrics.

Accepted Materials in Your MRF-Shed

Assessments go hand-in-hand with your accepted recyclables list. Contamination partly comes from public confusion regarding what is actually accepted for recycling. It also comes from a lack of consistency between what people think can be recycled and what they want to recycle, and what is actually recyclable based on their region's hauling infrastructure, MRF technology and infrastructure, and market availability.

The [Recycling Partnership](#) has a [MRF Survey](#) to help you ask the right questions when talking to your MRF.

- Confirm that the materials on your accepted recycling materials list are actually being recycled by your MRF. Learn more about the end markets for your materials through conversations with your hauler, MRF, and Ecology representative.
- If you plan to collect materials beyond the priority items discussed in the [The Harmonization Choir section](#), consult Ecology's [Best Management Practices Guide](#) and the [Resource Library](#).

Understand Your Markets

Developing a relationship with your hauler and MRF allows you to find out what markets are available in your area and in your region.

- Contact the MRF that your material goes to and ask questions about what is acceptable, not acceptable, etc.
- For material that your MRF does not accept, ask if they know of any other MRFs in the region that do accept those materials. This will help you develop your overall marketing strategy. Contact information for the primary MRFs in the state can be found in the [MRF-shed sortable spreadsheet](#).
- Don't forget about the small recycling operations in your area, such as the scrap metal haulers, paper collectors, etc. They also have information on what markets are available in your region.

Single-Family Residential Recycling Multi-Family Residential Recycling Dropbox Recycling

- Ecology is identifying additional strategies to include in these sections. Please share your ideas and resources.

Commercial Recycling

- For incorporated areas, consider removing commercial recycling from municipal waste hauling contracts.



Glass Collection

This section includes high-level recommendations for glass collection. This includes the type of data to gather when considering glass collection, and criteria to help decide if and how to include glass in your recycling programs.

Before collecting glass, it's important to weigh the economic and environmental benefits and impacts against the costs. Have discussions with your hauler, MRF, and end markets to decide if glass is a viable option for your community.

Use the following questions to guide decision-making:

- Is there a viable end market for this material?
 - Do end markets have the capacity to accept the amount of material generated by your community?
 - What are the restrictions and specifications for glass (e.g. must be source separated)?
 - Is this end market using the material to transform and/or remanufacture it into usable or marketable materials rather than disposal? Keep in mind, that Ecology does not define the use of glass alternative daily cover as recycling.



Figure 24: Glass collected in commingled recycling programs can end up at paper mills and seriously damage paper-making equipment. This 2009 photo shows glass that was in a paper bale and rejected in the pulping process at NORPAC.

- Does the total cost of collection, processing, transportation to the end market, and end market acceptance allow for a net profit? If there is a cost, is it less than disposing of glass?
- Is proper infrastructure in place to collect the glass in a way that aligns with the end market's specifications? What will it cost to install this infrastructure and to promote the program?
- What are your biggest barriers to glass recycling? These may include: market conditions, haulers not accepting glass, tipping fee and transport to glass processor is greater than landfill tipping fees, contamination, MRF not equipped to clean glass, etc.

If the answers to these questions demonstrate that there is a viable end market to recycle glass at a net profit, or at a cost you've decided is reasonable compared to other glass management options, then your community should continue to explore the feasibility of collecting glass for recycling.

If the answers to these questions demonstrate there are not viable markets and/or the cost is too high to collect glass for recycling, consult NERC's [Glass Recovery Hierarchy](#) for options other than disposal.



Figure 25: City of Olympia removed glass from their commingled residential recycling program in 2020 to reduce cross-contamination of the others materials they collect. They now provide glass recycling at drop off sites around the city.

Additionally, consider the following questions:

- Could resources spent on glass collection be better used to recycle easier and more valuable materials like cardboard?
- What alternatives to traditional glass recycling are available? (e.g. glass manufacturer, fiberglass plant, roadbed aggregate, ADC, crushed landscaping substrate, sandblast medium).
- Have you explored opportunities for regional engagement (coordination, partnerships, hub & spoke model) to improve glass recycling?

Possible reasons to keep glass in recycling programs:

- Resident satisfaction
- Divert tonnage from landfill
- Environmental/sustainability goals
- Prevention of illegal dumping

Questions to ask your MRF:

- What type of processing system do you operate for glass? (Single-stream, color-separated, dual stream, etc.)
- What is the final destination of your collected glass?
- Has there been a constant outlet for glass products to alternative processors and end-users?
- What determines where you sell glass?
- Does your system have glass-cleaning equipment?

Glass Recycling and Reuse Resources

The [Northeast Recycling Council](#) has compiled a robust set resources on glass recycling. Go their [resource page](#) and search for glass.

[The Glass Recycling Institute](#) offers resources and technical assistance to communities interested in recycling more glass. In [this presentation](#), Scott Defife, the president of the Glass Packaging Institute, provides an overview of the glass recycling industry in the U.S. He also provides a comprehensive list of reasons why drop off programs in communities where MRFs don't or won't accept glass.

[Strategic Materials](#) is the largest recycler of glass in the U.S. and operates a large facility in Seattle. In [this presentation](#), Laura Hennemann, the VP for Marketing and Communications for Strategic Materials, provides an overview of their operations



Figure 26: Refresh Glass is on a mission to rescue 10 million bottles from disposal by transforming wine bottles into exquisite glassware. As of August 6, 2020, they've rescued 1,613,747 bottles and counting.

across the country. She lists what she says are the myths about glass, including that broken or mixed colored glass can't be recycled and that glass contaminates other recyclables. According to her, "Single-stream contaminates every material in the bin. Proper layout, sequence and processing at the MRF maximizes value for all streams."

[Refresh Glass](#) – Refresh Glass upcycles wine bottles into beautiful glassware and other products that are now used in restaurants around the world. In [this presentation](#), Ray DeLMuro, the founder of Refresh Glass profiles his company, the new products he's launching soon.