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Recycling Contamination Reduction Best Management Practices & Resources Companion Guide

A supplement to Washington State's Recycling Contamination Reduction and Outreach Plan (CROP)

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2020 Washington State Contamination Reduction Outreach Plan

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Recycling Contamination Reduction Best Management Practices & Resources Companion Guide

By

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Contamination Reduction Best Management Practices

Overview

These Best Management Practices (BMPs) and resources provide strategies and references to studies, toolkits, and websites to support local governments with their ongoing contamination reduction goals. These BMPs and resources support Washington State's Recycling Contamination Reduction and Outreach Plan (CROP) and are a work in progress. The CROP, BMPs and resources, and supporting documents are available in the Contamination Reduction Resource Library. Ecology will continue to add additional resources and strategies. Currently, the Communications and Outreach section is the most defined.

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

- Single-Family Residential
- Multi-Family Residential
- Commercial
- Drop box
- 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

Measurement & Reporting

Operations & Collection

Incentives & Pricing

Policies & Mandates

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 the 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 to increase 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.

Community-Based Social Marketing resources:

- *Doug McKenzie-Mohr's website*
- *Tools for Change website*
- *Pacific Northwest Social Marketing Association*

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.

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.
    - Provide residents and businesses with a clear and comprehensive list of rates and can size for recycling as well as garbage on the hauler and municipal websites.
- Have separate webpages for single-family, multi-family, commercial, and drop box 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.
- Recycle stream: The messaging should be as simple as possible and acknowledge that the stream is only as clean as the worst performing contributor.
- Garbage stream: Overcoming the "landfill aversion" customers have requires work and ongoing communication. Many residents feel guilty disposing of things in the garbage and we need to "give people permission" to put dirty and non-recyclable items in the garbage. For instance:
    - Consumers can make decisions before items enter their home. The decision to purchase is the moment to prevent materials from going to the landfill.
    - Create a list of materials that should go to the landfill once they enter the home if they want to dispose of them through home delivered services.
    - Use "when it doubt, throw it out" in educational materials.

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*

- 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.
    - If utilizing a g-certificated hauler, per WAC 480-70-361, the hauler must provide at least basic informational services, including distribution of brochures.
- 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).
- Promote the Washington Recycles hotline (1-800-RECYCLE) and online tool (http://1800recycle.wa.gov/)
- Work with local partners (utility and cable companies, etc.) to put flyers in monthly bills.

Figure 1: Samples of Spokane's contamination reduction campaign, including postcards, FAQs, and more are in the local programs section of the Resource Library.

- Consider the effectiveness of direct mail pieces to reduce contamination. Specifically target individuals and communities that need it, e.g. no access to the internet, etc.
- Promote single or multiple social media pages so interested residents can follow for regular updates. Collaborate with like-minded 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, or on the bins.
- 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.
- Utilize Washington State's Recycle Right Campaign materials and messaging to encourage the collection of empty, clean, dry, and unbagged recyclable materials.

- Have waste prevention and recycling education programs targeting schools and youth. Kids can then teach their parents how to recycle properly.

Single-Family Residential Recycling

- 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 the larger scale and shared problems or concerns.
- If possible, provide onsite customized assistance to the buildings that need it or would benefit the most (larger properties and properties that have the largest barriers to participation). The onsite assistance can help identify ways to improve convenience for residents.
- Use metrics (such as service levels per week per dwelling) to help guide proactive outreach.
- 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.

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

- *Multi-Family Mythbusting*
- *The Path Toward Progress*

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

- 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 of or recycle them. (e.g. mattresses, moving boxes, microwaves, laptops, cleaning supplies, paint cans, furniture, clothing, and other bulky items)

Cascadia's 2012 International Multi-family Recycling Case Study provides a range of opportunities to improve multi-family recycling programs.

- 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."
    - 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 with 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 as a recycling champion or point person. They can help disseminate information to other residents and communicate observed and shared concerns with property managers.

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.

- 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.

Commercial Recycling

For unincorporated areas in Washington, recycling collection from residences is either a monopoly granted to the hauler with the g-certificate for that area, or it may be contracted out by the county. In contrast, recycling collection from commercial sources is an open market.

Incorporated areas have more options, but the general idea of a residential monopoly and free market for commercial recycling services remains. Incorporated cities can default to the nearby g-certificate, contract for services, or provide services themselves. Some cities choose to provide recycling services to commercial customers or contract with a hauler for both residential and commercial recycling. None of these options precludes the operation of additional commercial recyclers within their city limits.

In both unincorporated and incorporated areas, the 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 the 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 landfills. These smaller haulers offer specialized services that often prioritize commodity quality and end-use ahead of the quantity of material they collect. Below is a list of strategies to reduce recycling contamination of the commercial recycling stream and to improve recycling services for commercial customers

- 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 may 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.
- Let businesses selling beverages in single-use cans or bottles in areas with curbside recycling know they must provide recycling at official gatherings and sports events. Details are in RCW 70.93.093.

- Work with service providers on outreach materials and provide appropriate indoor and outdoor signage to businesses. Encourage signage in common areas like a break or lunchroom.
- Lunchroom programs should be consistent with household programs where possible.
- Check with janitorial staff to ensure their collection methods and understanding of accepted items are in line with communications to staff using the program. Ensure janitorial staff is not bagging recyclables (unless the commercial recycler wants it that way, for example, to produce a dual-stream of bagged containers and loose papers).
- Advise businesses to add links to recycling information on their intranet sites.
- 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.
- Commercial recycling should be as similar as possible to residential service. If people learn to recycle right at work, they tend to do so at home. Aim for similar materials and color patterns for garbage (black or grey), recycling (blue), and compost (green).
- Develop specific commercial recycling communications and promotions. 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. In areas where commercial and residential recycling are truly provided by only one hauler, combine the education and promotion efforts.

Drop Box Recycling

- Provide staff or volunteers to assist residents and provide education at drop box locations.
- Consider co-locating drop boxes through partnerships with your community such as

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

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 shadow box can prevent damage from the rain. Although there are no studies to indicate that using actual items works better than photos, Jefferson County and Lopez Solid Waste Disposal District have found them to be effective. (see Figures 2 and 5).

Figure 2: Lopez Solid Waste Disposal District uses actual recyclables to create 3D signage at their drop box 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:

Drop box, commercial, and multi-family collection programs would benefit from the implementation of the 5 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 3: Drop box, 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 the 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 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.
- The 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.

Enforcement

Even when infrastructure is perfectly set up, some customers still will not properly recycle and just want their materials to simply "disappear." If efforts to change behavior fail, you may need to say "No" to collection or to possibly increase costs.

- Educate, empower, and consider incentivizing front-line staff (route drivers and their managers) to monitor for, and take action on, contamination. They could tag, educate, and eventually penalize as necessary. Some haulers have dedicated staff for monitoring and enforcement work.
- Leave contaminated bins with a tag and other outreach methods (phone call, direct mail) to explain what the customer needs to do to correct the problem. Give leniency to first-time offenders and customize your escalation steps for your local audience. If manually collecting, some haulers leave just the contaminants in the recycle bins. The customers quickly get the message and are more likely to change their behavior.
- Charge customers for bins that must be dumped like garbage. Again, it will be important to exercise discretion based on a customer's history. However, ultimately, to change their behavior, there will need to be consequences for putting garbage in their recycling containers.
- Consider removing bins from customers that continue to contaminate their recycling, but set up pricing so it does not reduce their fees.

Other

- Leverage the collective power of multiple jurisdictions working within the same MRF-shed to create more uniformity in materials collected to reduce confusion at the customer level. Also, consider the materials that are processed and advocate for operational adjustments to better capture new materials or capture materials better.
- Consider adding technical solutions to multi-stream collection/source separation. For instance:
    - Color-coded bags are conveniently sized to fit within household kitchen or utility room cupboards to collect materials separately (such as the Optibag).
    - Multi-compartment containers such as the Quattro Select System in Sweden, etc.

Single-Family Residential Recycling

In this report, single-family recycling focuses solely on single-family curbside collection services. Therefore, 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 facing. See considerations for each service type below.

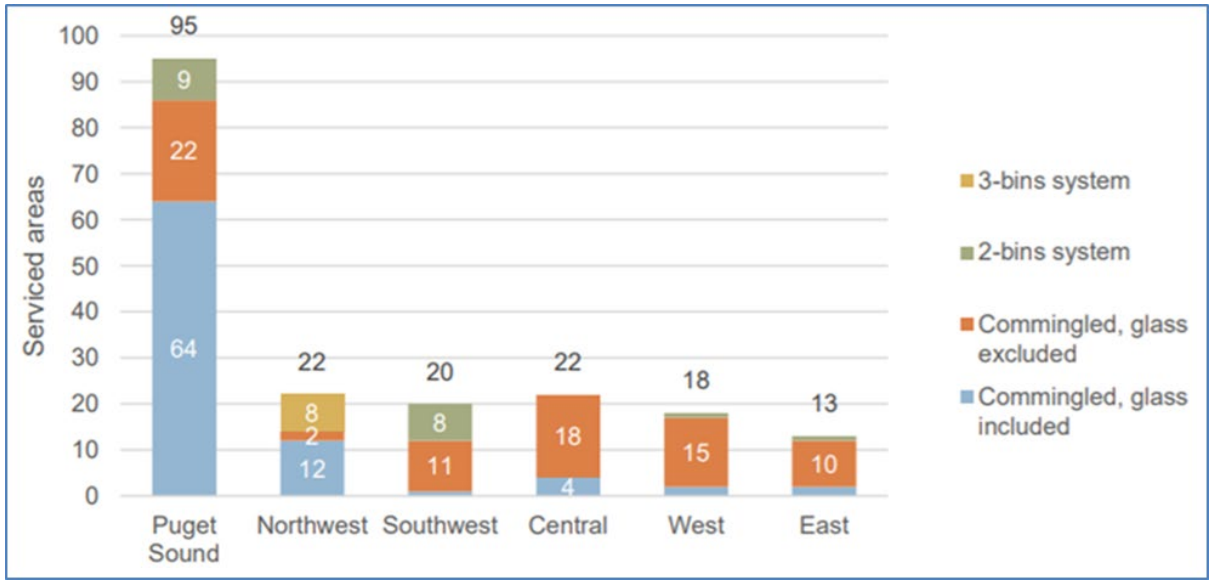


Figure 4: ZeroWaste Washington survey of residential recycling collection programs by waste generation area or WGA. See glossary for a definition of a WGA.

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 – promoted by haulers across to state to reduce costs – makes it easier for residential customers to recycle because they put all materials in one container. This can result in increased 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.

- Carefully compare the pros and cons of all your collection options when deciding whether to include glass in the mix. Glass poses unique safety and cross-contamination issues when collected commingled. See the Glass Recycling section for more information.
- Ecology's commingled collection webpage has a more comprehensive list of benefits and limitations of commingled residential collection.

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.

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.

Mill Valley, California implemented another type of dual-stream option in 2018. Under this system, residents are given two recycling bins – one for mixed paper and cardboard and one for rigid plastic containers, metal cans, and glass bottles and jars. These carts are collected every other week – fiber one week and containers the next. This system does require purchasing more carts. However, it can be implemented using the same number of collection trucks and staff and may result in much cleaner material.

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. However, it also allows for closer examination of materials and rejection of contamination.
- 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 more specific types. 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/drop box locations use this method more than curbside. It requires residents to separate and place recyclable materials into multiple bins holding very specific materials.

Considerations for Source Separated collection:

- Contamination via dumping in unattended drop boxes
- 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 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 with contaminated loads and follow-up with those customers with additional information or possible corrective actions.
- Consider switching to a dual-stream collection service. If contamination is most prevalent in paper stream (from food/liquid, plastics, or glass) and your MRF has the technology to process this material separately, the quality of the paper collected for recycling could dramatically improve. That said, this is a discussion heavily influenced by the current infrastructure your haulers and MRFs have in place and 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

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

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.
- Clarify how multi-family properties receive service. Determine if they are on commercial or residential trucks/routes if garbage and recycling are in the same category, and what kind of containers are used for collection.
- Identify how tenants are charged for garbage and recycling services. Is it included in their rent or are they responsible for some or all of the costs?
- Take an inventory of all multi-family units/complexes and identify which ones have and do not have adequate recycling and garbage infrastructure. Reach out to determine which ones are willing to accept infrastructure improvements and technical assistance.
- Providing multi-family residents with convenient access to solid waste containers is perhaps the most significant improvement in multi-family recycling. This was demonstrated by DiGiacomo et al (Convenience improves composting and recycling rates in high-density residential buildings, 2017).
- Ensure all recycling containers are properly marked and are located near a garbage container.
- Using the same size, and if possible the same types, of containers to collect both garbage and recycling helps improve participation and decrease contamination as they are either equally convenient (or inconvenient if they are large and hard to dump into).
- Using smaller, rather than larger, containers improves recycling convenience for multi-family residents. Even a 2-cubic yard container can be hard to use. It requires some level of strength and coordination to open a heavy lid far enough to be able to dump material inside with the other hand.
- As residents approach an enclosure or solid waste area, the most accessible container should be the garbage one. This helps protect the recycling container from contamination. People that want to quickly get rid of random items will place them in the garbage. People that take the time to sort out their recyclables inside their apartment are motivated enough to walk a couple more steps to the recycling 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. Some multi-family managers require residents to use bags.
- 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 be placed in them.

- 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.
- 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:** Greater control over the commercial sector is possible in incorporated areas compared to unincorporated areas because the city/town may either contract for service or participate in the open market with their trucks and employees. This can provide the municipality 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. However, this additional control has drawbacks as well. One drawback is the additional work on the part of the municipality to oversee their portion of the commercial recycling system. Another is the potential to push other recyclers out of business, especially if recycling fees are embedded within garbage rates (which remain fully under municipal control). Thus, municipalities might consider removing themselves from such direct participation in commercial recycling.
    - **Unincorporated areas:** Provide the residential accepted items list to commercial recycling providers and/or discuss with them shared goals and priority items for recycling in your jurisdiction.

To learn more about these and related topics, visit the Municipal Research and Services Center's solid waste, recycling, and disposal resources page. It contains information about solid waste collection and disposal, legal requirements, solid waste management plans, collection options, and examples of local policies, procedures, and contracts.

- 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 haulers. Occasionally changing service frequency can reduce collection costs.

Drop Box Recycling

Figure 5: Jefferson County drobox signage includes actual examples of acceptable and unacceptable materials. Find more information in the local programs section of the Resource Library.

- Use volunteers for monitoring of unattended drop boxes. Volunteers can spend an hour or two a week pulling out obvious contaminants, while also providing basic recycling education to residents as they drop off material.
- Do not leave your site open 24/7. Limit the hours and lock the site.
- Use a container with modified openings or lids with special gaps that only allow targeted recyclables in, and reduce large item contamination. There are specific lids for cardboard, comingle, and containers. Lock collection boxes further reduce the potential for contamination. There are specific lids for cardboard, comingle, and containers. There are also containers for plastic, metal, or glass containers with narrow openings to help reduce contamination and illegal dumping. An example is in Figure 7 below.
- Dual-stream and multi-stream collection can result in lower levels of contamination and better quality, higher value material that is more marketable for resale by MRFs.
- Consider locating reuse areas near drop boxes.
- Harmonize your material list with curbside programs. This means working with your hauler and recycling partners to use the same information on the containers, at the sites, etc.
- Invest in attractive, easily understandable photos or images of acceptable items. You can also use actual items on your signs.
- Select signage that is durable, weather and UV resistant, and preferably made with post-consumer recycled content materials.
- Ensure all recycling containers are properly marked and are located near a garbage container. Ideally, any self-haul garbage locations like a transfer station will have recycling drop boxes located nearby.
- Ecology, counties, and cities could work with major retail chains to encourage them to host drop boxes for common and valuable recyclable materials. The city or county could provide this service free or it could potentially be a revenue source for retailers. Consider other convenient locations such as schools, libraries, parks, etc.

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 recurring 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.
- It's important to have a better understanding of the methods used by property managers to calculate how much apartment residents pay for solid waste. That understanding could help figure out how apartment residents could directly benefit from the pricing incentives for waste prevention and recycling. In single-family the benefit is very direct. However, that is not the case in multi-family, where the solid waste costs of an individual household are the same regardless of how much garbage they produce.

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 are dumped as garbage.
    - Use caution if coupling volumes of garbage and recycling, as lower-priced recycling incentivizes "wishful recycling" and can increase contamination Commercial entities are also less likely to invest in protecting "free" or lower-cost bins from outside contamination from passers-by or illegal dumping. This protection can often be as simple as placement in an enclosure, but can also include having locking bins or keeping bins inside until collection day.

- Work with business organizations or the 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.

Drop Box Recycling

Drop box recycling could include a fee. Charging for recycling at drop boxes could offer an opportunity to discuss the value of recycling with councils, etc. A fee would help pay for contamination reduction strategies like local sorting, monitoring, etc.

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 influence the amount of material that is recycled, and the types and levels of 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 be involved in setting these specifications.

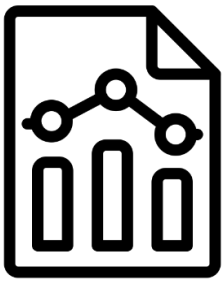
In 2006, Thurston County adopted a minimum service ordinance that specifics what materials are required for recycling collection in the county.

- 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 to expand your program to include additional recycling or organics, think about the space needs for all of these new services.
- If you find it difficult to meaningfully reduce recycling contamination in specific geographical areas, work with your hauler to discontinue to limit recycling services in those areas to preserve the system as a whole.
- Specify the use of contamination-reducing containers. These could include containers with openings or lids with special gaps that only allow targeted recyclables in, and reduce large item contamination. There are specific lids for cardboard, comingle, and containers. There

are also containers for plastic, metal, or glass containers with narrow opening to help reduce contamination and illegal dumping. An example is in Figure 7 below.

Single-Family Residential Recycling
Multi-Family Residential Recycling
Commercial Recycling
Drop box Recycling

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



Measurement and Reporting

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

Key strategies for all recycling programs:

Purpose and goals

There are many different methods and metrics for measuring recycling contamination. Before gathering any data, it is important to be clear about the purpose and goals of your measurement program. Define who will use the data, for what purposes, and how to share it. A recycling contamination measurement and reporting program can have many goals including:

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.

- Educating residents and businesses about how to recycle right and what materials don't belong in their bins.
- Identifying the most common contaminants to help develop targeted outreach campaigns.
- Measuring the overall effectiveness of a contamination reduction program over time.
- Negotiating a recycling collection and/or processing contract to set service rates.
- Identifying the most hazardous contaminants to reduce the risk to collection and processing staff.

If you are clear about your purpose and how you intend to use and share the data, you can then choose the right metrics, assessment, monitoring, and reporting tools to achieve your goals.

Metrics

It's important to choose the right metrics to achieve your goals. Below are some of the more common metrics to measure the cost and benefits of recycling and the impacts of recycling contamination:

- **Weight** – Typically used for waste and recycling characterization studies, to determine the rates charged by MRFs for processing services, and by counties for disposal.
- **Volume** – There are many different ways to use this metric. Most customers pay for their garbage and recycling service by volume. So collecting this kind of data helps determine the impact of recycling right on the rates a customer pays for collection. Also, in some cases, it is too expensive or not feasible to do a weight-based audit. In these cases, measuring contamination by volume may make sense.
- **Number and/or types of items observed –** Metrics typically used for visual audits of carts, bins, and drop boxes.
- **Sustainability metrics** – these metrics are calculated in many ways based on the data gathered on the quantities and types of materials collected for recycling, and where and how they are processed, recycled, or disposed of. These metrics could include greenhouse gas emission impacts, jobs created, and public health and social equity measures. Tools to calculate these metrics include Life Cycle Analysis (LCA) and the EPA's WARM model. More information on LCA, including recent LCA studies on specific products and materials, is on the Oregon Department of Environmental Quality's website. Other resources on ways to use sustainability metrics to measure the environmental and other costs and benefits of recycling can be found in Susan Robinson's 2017 presentation to Ecology on *Using Lifecycle Thinking for Strategic Goal* Setting, and David Allaway's 2020 *Rethinking Recycling presentation*.

Assessments and Monitoring Options

The backbone of your data collection program is assessments. Conducting assessments provides you with baseline levels and types of contamination in your recycling stream so you can measure the effectiveness of your contamination reduction strategies. Ongoing monitoring of your collection programs and providing regular feedback to customers helps ensure the impact of all your contamination reduction efforts are sustained over the long-term.

Whatever tools you use, it is important to be consistent in the way you use them. For example, if you are gathering baseline recycling contamination data, make sure you document the process and the metrics you used to gather the data. That allows you to replicate the process to measure changes over time.

Some assessment and monitoring options to consider include:

- **Recycling Characterization Studies:** These describe how much and what kinds of materials are in your recycling stream, including the levels and types of recycling contamination. Local examples of recycling characterization studies for the City of Seattle, and Clark and Kitsap Counties are located in the Local Resources section of the Resource Library.

A Sorting Manual for Recycling Characterization studies prepared by Green Solutions can be found in the Resource Library.

- **Visual Assessments and Lid-Lift Audits:** These are an easy way for staff to see what material is in recycling containers and hauled loads. Please note that visual methods can be imprecise and hard to replicate later. The use of a visual method requires some practice and training beforehand, and careful documentation of the procedures used so it can be repeated later (assuming it's used for a before-and-after analysis). Reports on these types of assessments done in Clark and King Counties and the City of Olympia are in the Local Resources section of the Resource Library.

  Note – privacy and constitutional issues have been raised about using this method in Washington State. It is important to check with your jurisdiction's legal counsel before using these types of assessments. According to the Washington Refuse and Recycling Association: "In Washington, these programs operate under the high standard of privacy set by Art. I §7 of the Washington Constitution. State v. Boland (1990)*, found that privacy right extends to garbage placed out at the curb and other cases have elaborated on that right over time" They also note that a "superior court found that enforcement of a Seattle cart-inspection ordinance violated the constitution in* Bonesteel v. City of Seattle (2016)*."*

- **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.

- **RFID tags**: If possible, purchase carts and containers with RFID tags or add them to existing collection bins. They can attach addresses to carts for efficient monitoring and follow-up with customers to reduce contamination. The tags can also be used to track and manage assets, measure set-out and participation rates, and increase the efficiency of collection routes. Waukesha County in Wisconsin implemented another similar approach. They developed their own ArcGIS-based program to identify and automatically send out OOPs tags and educational materials to customers who placed "non-conforming" materials in their carts.

- **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.

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, what they want to recycle, and what is actually recyclable based on their region's hauling infrastructure, MRF technology and infrastructure, and market availability.

- 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 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 your region.

The Recycling Partnership has a MRF Survey to help you ask the right questions when talking to your MRF.

- 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 any other MRFs in the region that do accept those materials. This helps develop an overall marketing strategy. Contact information for the primary MRFs in the state is 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
Drop box Recycling
Commercial Recycling

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

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. Alternative daily cover (ADC) means to cover material other than earthen material placed on the surface of the active face of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing litter, and scavenging.
- 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 the 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 the pros and cons of collecting glass in different ways (commingled, dual-stream, or drop box)?
- What are your biggest barriers to glass recycling? These may include market conditions, haulers not accepting glass,

Figure 6: Glass collected in commingled recycling programs can end up at paper mills and seriously damage papermaking equipment. This 2009 photo shows glass that was in a paper bale and rejected in the pulping process at NORPAC.

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 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 no viable markets and/or the cost is too high to collect the glass for recycling, consult NERC's Glass Recovery Hierarchy for options other than disposal.

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, alternative daily cover, crushed landscaping substrate, sandblast medium).
- Have you explored opportunities for regional engagement (coordination, partnerships, hub & spoke model) to improve glass recycling?

Figure 7: 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.

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 (NERC) compiled a robust set of resources on glass recycling. Go to their resource page and search for glass. NERC also held a two-day Glass Forum in September 2018. The presentations and recordings from the forum are also available on their website.

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 work 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 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 maximize value for all streams."

Refresh Glass – Refresh Glass upcycles wine bottles into beautiful glassware and other products 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.

Figure 8: 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.

Resources

Ecology Resources

Ecology's Recycle Right campaign and Toolkit – a statewide campaign to reduce contamination and increase the value of the material collected for recycling in Washington State. https://ecology.wa.gov/recycleright#:~:text=Recycling%20Right%20Matters,recyclables%20in%20the%20recycling%20bin.&text=They%20can%20also%20contaminate%20other,support%20local%20jobs%20and%20businesses.

The Recycle Right toolkit includes free customizable outreach materials for local governments and community partners in both English and Spanish - https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Recycle-Right/Toolkit-request-form

- **2018 – Best Management Practices: Commingled Residential Recycling** – *updated BMPs to address the impacts of export bans and the high levels of recycling contamination*
  https://apps.ecology.wa.gov/publications/SummaryPages/1807014.html
- **2016 - Northwest Region Report** – *Optimizing the Commingled Residential Curbside Recycling Systems in Northwest Washington*
  https://apps.ecology.wa.gov/publications/SummaryPages/1607028.html
- **2011 – Best Management Practices Guides for Local Governments**
  What to include in Your Residential Commingled Recycling Collection Program
  https://apps.ecology.wa.gov/publications/SummaryPages/1107026.html
- **2012 – Public Outreach for Your Residential Commingled Recycling Collection Program**
  https://apps.ecology.wa.gov/publications/SummaryPages/1207061.html
- **2010 - Beyond the Curb –** *Tracking the Commingled Residential Recyclables from Southwest WA*
  https://apps.ecology.wa.gov/publications/SummaryPages/1007009.html

The Recycling Partnership Resources

- **Anti-Contamination Toolkit & Campaign Builder**
  Free, step-by-step planning guide with lots of links to other resources - https://recyclingpartnership.org/contamination-kit/
  The toolkit includes:
  - Contamination fighting readiness assessment tool
  - Artwork – *downloadable design files for anti-contamination tools*
  - MRF & Hauler contract considerations focused on contamination

- Worksheets to work with your MRF, haulers, and other stakeholders to develop a contamination reduction plan
- Pro Tips – *advice form communities that have used the toolkit*
- MRF survey tool – *to identify issues and goal*
- MRF tracking form to track contamination metrics
- Standard Operation Procedures – *lays out the roles, responsibilities, timeline, and tracking for your anti-contamination plan*
- Training video for drivers and enforcement staff to provide curbside feedback
- Set out video – *overview of the difference between set-out rate and participation rate and how to calculate*
- Tally sheet to track tagging progress

- **Campaign Builder -** *free, easy-to-customize anti-contamination materials including OOPs tags, top-issue mailers, and annual recycling program info cards* https://recyclingpartnership.org/pdf-builder-login/

- **Webinar on how to use the toolkit** – NERC – TRP -Massachusetts DEP – April 2018 https://nerc.org/documents/Implementing%20the%20Recycling%20IQ%20Toolkit%20to%20Reduce%20Contamination%20of%20Residential%20Recycling_%20Lessons%20Learned%20.mp4

- **Municipal Measurement Program (MMP)** - https://www.municipalmeasurement.com/
  The MMP provides municipalities with free access to a centralized database to measure program performance, benchmark results, and access tools and resources to improve curbside recycling programs.

- **Best Management Practices for MRF contracting** file:///C:/Users/pgut461/Downloads/RecyclingPartnership-Community-MRF-Contracts-6.24.20%20(1).pdf

The Context for Contamination

- **From Green Fence to Red Alert** – A China Timeline – Resource Recycling - regularly updated https://resource-recycling.com/recycling/2018/02/13/green-fence-red-alert-china-timeline/

- **Why China Stopped Buying U.S. Recycling** – CNBC – March 1, 2020 https://www.youtube.com/watch?v=YYjkdYAUa0c&feature=youtu.be

- **Recycling's dirty truths exposed** - Seattle Times - April, 26, 2020 https://www.seattletimes.com/pacific-nw-magazine/with-recyclings-dirty-truths-exposed-washington-works-toward-a-cleaner-more-sustainable-system/#:~:text=Local%20News-,With%20recycling's%20dirty%20truths%20exposed%2C%20Washington%20works,a%20cleaner%2C%20more%20sustainable%20system&text=IN%202017%2C%20ABOUT%20three%2Dquarters,tubs%20%E2%80%94%20was%20shipped%20to%20China.

    - **Backstory for Times article** – I've cleaned up my act, but the system needs to be cleaned up too - https://www.seattletimes.com/pacific-nw-magazine/the-backstory-ive-cleaned-up-my-act-but-the-system-needs-to-be-cleaned-up-too/

- **In My Opinion – Fix the Broken System** – Plastics Recycling News – Feb. 2, 2017, https://resource-recycling.com/plastics/2018/02/20/opinion-fix-broken-system/

- **NWRA – issue brief on China Sword** - https://cdn.ymaws.com/sites/wasterecycling.site-ym.com/resource/resmgr/files/issue_brief/China's_Changing_Policies_on.pdf

- **MRSC – Recycling in Crisis – WA's response** - http://mrsc.org/Home/Stay-Informed/MRSC-Insight/November-2018/A-Recycling-Crisis-in-Washington.aspx

- **Is this the End of Recycling?** – The Atlantic- March 6, 2019 https://www.theatlantic.com/technology/archive/2019/03/china-has-stopped-accepting-our-trash/584131/

- **Recycling in the U.S. is Broken. How do we fix it?** - Earth Institute – March 13, 2020 https://blogs.ei.columbia.edu/2020/03/13/fix-recycling-america/#:~:text=Photo%3A%20USEPA-,Recycling%20in%20the%20U.S.%20is%20broken.,actually%20end%20up%20being%20recycled.

- **Monopoly and the U.S. Waste Knot** – ILSR - December 4, 2018 - https://ilsr.org/monopoly-and-the-us-waste-knot/

- **The era of easy recycling may be coming to an end** – FiveThirtyEight - January 10, 2019, https://fivethirtyeight.com/features/the-era-of-easy-recycling-may-be-coming-to-an-end/

- **The Conflict of Interest that is Killing Recycling** – NY Times – August 15, 2018 - https://www.nytimes.com/2018/08/15/opinion/fixes-recycling-labeling-landfills.html

- **All the ways recycling is broken** – and how to fix them – Fast Company – April 4, 2019 - https://www.fastcompany.com/90321566/all-the-ways-recycling-is-broken-and-how-to-fix-them

- **Single Stream Recycling: Explaining the Waste Knot**– ILSR – August 29, 2018, https://medium.com/@ILSR/single-stream-recycling-explaining-the-waste-knot-16bdf8c47e22

- **Single-Use Plastics – A roadmap for Sustainability** – UNEP- June, 5, 2018 https://www.unenvironment.org/resources/report/single-use-plastics-roadmap-sustainability

- **Americans believe strongly in recycling** – TRP – June 17, 2020 https://recyclingpartnership.org/americans-strongly-believe-in-recycling/

- **Derek Ruckman – Presentation on Recology's Zero Waste Mission** – April 29, 2020 https://1drv.ms/v/s!AuL3p2W6v4a1ilYpjoSuQTEiicpvNA?e=kdFpnX

Certificated Hauler Service Area Maps

Includes statewide and county maps from the WA Utilities and Transportation Commission

- **PDFS of maps** https://www.utc.wa.gov/regulatedIndustries/transportation/solidWaste/Pages/SWServiceMaps-ByCounty.aspx

- **Statewide searchable map** https://wutc.maps.arcgis.com/home/webmap/viewer.html?webmap=d379029aa77d4f2086c0570706c02efa

Gable Top - Aseptic Containers

- **Expanding Carton Recycling Within Evolving Fiber Markets** – Upcyclers Network – 07/08/2020 https://www.upcyclersnetwork.org/wp-content/uploads/2020/07/Evolving-Fiber-Markets-and-Expanding-Carton-Recycling-Access-for-Municipalities-1.pdf

Contracting for Processing of Recyclables

- **The Recycling Partnership BMPs for MRF contracting**
  file:///C:/Users/pgut461/Downloads/RecyclingPartnership-Community-MRF-Contracts-6.24.20%20(1).pdf

- **MRF & Hauler contract considerations focused on contamination**
  https://therecyclingpartnership.box.com/s/2cbpcxvgrjkj6tfbhspzjhnb0p3cre49

- **SWANA/NWRA contracting guide**
  https://cdn.ymaws.com/wasterecycling.org/resource/resmgr/docs/resource_library/SWANA-NWRA_Best_Contracting_.pdf

- **Using Contract Language to Improve Recycling** – King County Responsible Recycling Task Force
  Includes sample contract language
  https://kingcounty.gov/~/media/depts/dnrp/solid-waste/about/planning/documents/task-force-contract-language.ashx?la=en

- **City of Palo Alto Contract for Collection & Processing** – *includes detailed reporting requirements, certificates of end-use, etc.*
  https://www.cityofpaloalto.org/civicax/filebank/documents/68449

Multi-Family

- **WSRA – 2019 Annual Conference**
  Building for Success: Using Code to Improve Multi-family Recycling - Speakers: Angela Wallis; Seattle Public Utilities, Sarah Kirby; Metro Oregon, Jenna McInnis; City of Kirkland, Andrea Lei; Cascadia Consulting

  - SPU – MF Code to Drive diversion https://wsra.net/wp-content/uploads/2019/12/WSRA_AOR-Presentation-2019_MF-Code.pdf

  - Oregon Metro – MF Community Engagement - https://wsra.net/wp-content/uploads/2019/12/WSRA_MF_METRO_final.pdf

  - City of Kirkland – Using Simple Code to increase recycling - https://wsra.net/wp-content/uploads/2019/12/MF-Code-Conference-Presentation.pdf

- Cascadia – the role of recycling code and policy - https://wsra.net/wp-content/uploads/2019/12/Cascadia-WSRA-AOR-2019_MF-Policy-and-Code_DRAFT.pdf

- **Salt Lake City Business and MF Recycling Ordinance** – Creating a recycling plan – case studies- http://www.slcdocs.com/slcgreen/Waste&Recycling/SLC%20Business%20Recycling%20Toolkit%20FINAL_December%202018_Small.pdf

- **MF Recycling guide** – from rental association https://www.rentecdirect.com/blog/create-recycling-program/

- **Reducing Contamination at Apartment Complex** – Michigan https://wmich.edu/sites/default/files/attachments/u691/2016/Swanson_1.pdf

- **Oregon DEQ MF** – Improving access to tenants https://www.oregon.gov/deq/recycling/Pages/Recycling-for-Tenants.aspx https://www.oregon.gov/deq/FilterDocs/recMultiTenOppFS.pdf

Cart Tagging

WSRA – 2019 Annual Conference
Cart Tags for a Less Contaminated Tomorrow - Speaker/s: Lindsay Chapman; Spokane County, James Tieken; City of Spokane, Steven Gimpel; Waste Management
Speakers: Joel Kohlstedt; Waste Management, Stacy Ludington; Clackamas County Sustainability and Solid Waste, Cody Marshall, The Recycling Partnership

- TRP – overview - https://wsra.net/wp-content/uploads/2019/12/3b_Partnership-Tagging-Presentation-4.22.19.pdf

- City of Spokane, Clackamas County, Waste Management - https://wsra.net/wp-content/uploads/2019/12/WSRA_Slides_3b.pdf

Single & Dual-Stream Collection

- **Experts duel over dual-stream's merits** – Resource Recycling – 5/14/2019 https://resource-recycling.com/recycling/2019/05/14/experts-duel-over-dual-streams-merits/
- **Dual-stream collection regains appeal in some areas** - Resource Recycling – 7/17/2018 https://resource-recycling.com/recycling/2018/07/17/dual-stream-collection-regains-appeal-in-some-areas/
- **Mill Valley Refuse Service dual-stream recycling pilot program –** 9/28/2018

https://www.cityofmillvalley.org/news/displaynews.htm?NewsID=1599&TargetID=53,52

General Contamination Reduction

- **WSRA** - https://wsra.net/events/2018-wred-events/ Contamination Fest March – many presentations

- **SCS Engineers** – high-level guides for reducing contamination and includes other linked resources
  https://www.scsengineers.com/minimize-contamination-in-recycling-programs/
  https://www.scsengineers.com/proven-methods-reduce-contamination-recycling/

- **NWRA** – Anti-contamination Poster
  https://cdn.ymaws.com/wasterecycling.org/resource/resmgr/images/Reduce_Contamination_Infogra.pdf

- **Oregon DEQ** – Recycle Right campaign
  https://www.oregon.gov/deq/recycling/Pages/Recycle-Right.a

- **Recycle or Not** – Oregon Metro https://www.recycleornot.org/

Hauler Websites

- **Republic Services** – Recycling Simplified - https://recyclingsimplified.com/
- **Waste Management** – Recycle Right - https://www.wm.com/us/en/recycle-right
- **Waste Connections** – Recycle Right – Clark County - https://wcnorthwest.com/recycleright
- **Recology** – Better at the Bin - https://www.recology.com/better-at-the-bin/

Glass

- **Recycling glass with alternative collections –** *Laura Hennemann, Strategic Materials- 07/22/2020*
  https://www.upcyclersnetwork.org/wp-content/uploads/2020/07/Upcyclers-Strategic-Materials-July-20_Laura.pptx

- **Glass Recycling in Today's Market –** *Scott DeFife, Glass Packaging Institute – 07/22/2020*
  https://www.upcyclersnetwork.org/wp-content/uploads/2020/07/Upcyclers_Glass-Webinar_Scott.pptx

- **Refresh Glass** – *Ray DeMuro, Refresh Glass – wine bottles into glassware – 07/22/2020* https://www.upcyclersnetwork.org/wp-content/uploads/2020/07/Ray-DelMuro_Refresh-Glass-short.pptx

Measurement and Cost Analysis

- **Measuring Composition and Contamination at the MRF** – NERC Conference – 10/31/2018 https://nerc.org/documents/conferences/Fall%202018%20Conference/Measuring%20Composition%20and%20Contamination%20at%20the%20MRF_John%20Culbertson.pdf

- **Municipal Measurement Program (MMP) -** https://www.municipalmeasurement.com/ The MMP provides municipalities free access to a centralized database to measure program performance, benchmark results, and access tools and resources to improve curbside recycling programs.

- **2013 Material Composition Study** – Ontario Blue Box Program https://stewardshipontario.ca/wp-content/uploads/2016/03/2013-MRF-Material-Composition-Study-March-22-16-1.pdf

- **Costs of adding non-core materials to processing costs and recovery rates** https://thecif.ca/understanding-how-program-costs-and-recovery-have-changed-over-time/

Life Cycle Analysis

- **EPA Waste Reduction Model (WARM) Calculator** – estimate GHG emissions reductions, energy savings, and economic impacts of alternative waste management strategies. https://www.epa.gov/warm

- **Oregon Department of DEQ Environmental Footprinting for Packaging** - https://www.oregon.gov/deq/mm/production/Pages/Packaging.aspx

- **Waste Management 2018 Sustainability report** – includes data on impacts of recycling on GHG emission - page *31* - https://sustainability.wm.com/downloads/report.php

- **Using Lifecycle Thinking for Strategic Goal Setting** – Susan Robinson - presentation to Washington State Department of Ecology – 10/04/2017 https://www.ezview.wa.gov/Portals/_1962/Documents/rcrr/Robinson%20WDOE%20-%2010-4-2017%20v2%20.pdf

- **Rethinking Recycling** – David Allaway – presentation to NE Recycling Coalition – *03-19-2020*
  https://www.ezview.wa.gov/Portals/_1962/Documents/rcrr/Rethinking%20Recycling%20Presentation_David%20Allaway_OR%20DEQ.pdf

Product Design for Recyclability

- **How2Recycle Recyclability Insights Report**
  https://how2recycle.info/insights?utm_source=newsletter&utm_medium=email&utm_content=Explore&utm_campaign=H2R%20Guidance%20Doc%207.2017

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