2015 DATA CORNER COMPILATION

As seen in Resource Recycling Inc. magazine.

Each month, RRS industry professionals, technical analysts, and communication specialists highlight hot industry topics through the use of hard data, industry experience, and visual engagement.

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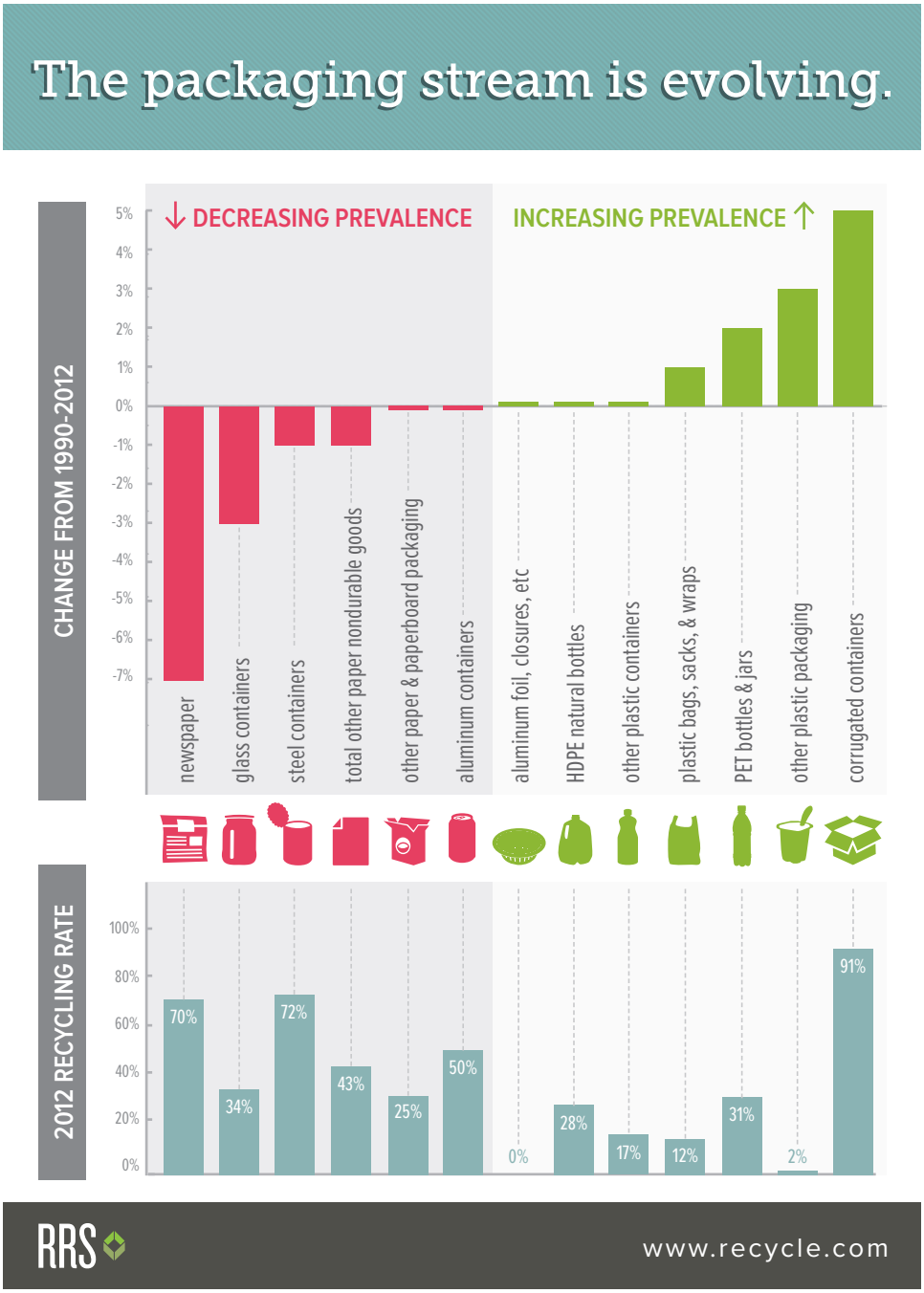
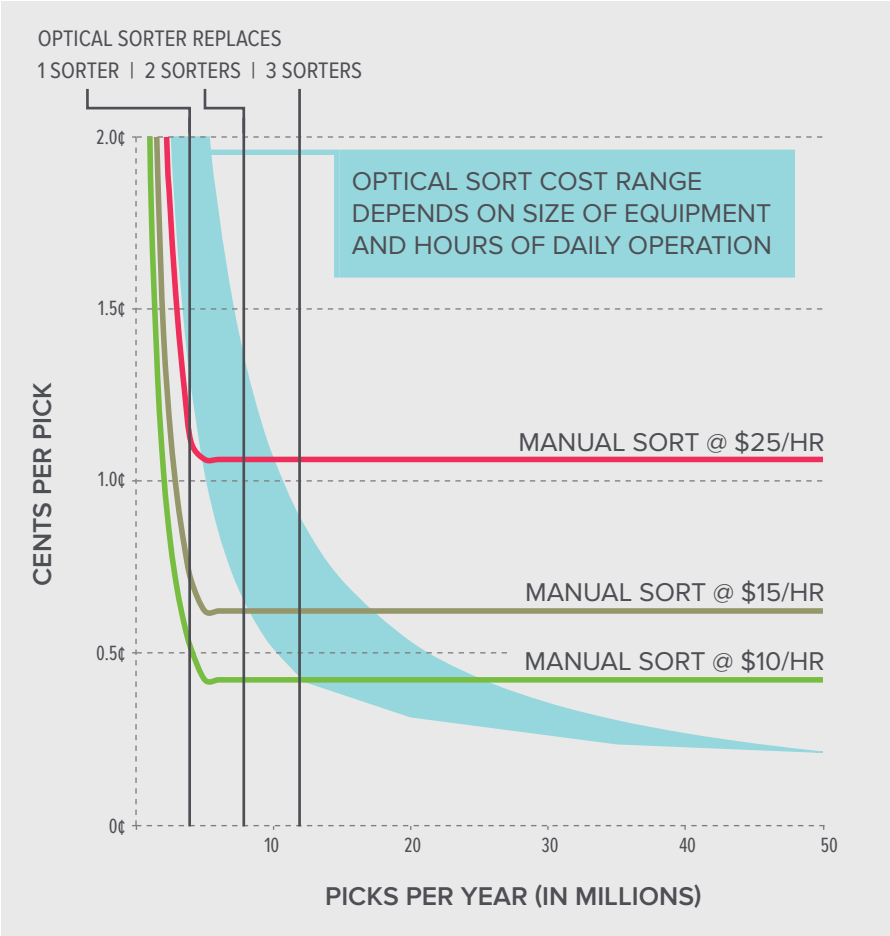
Welcome to our first edition of Data Corner, a monthly data snapshot put together by the number crunchers at consultancy RRS. This month we take a look at the changing face of domestic discards, comparing the packaging waste stream makeup from 1990 to 2012.

RRS compiled this information from EPA's 2012 Municipal Solid Waste Facts and Figures Report. As plastics displace traditional packaging materials such as newspaper, glass and steel, we see a decline in the dense materials that material recovery facilities were originally designed to handle in volume. At the same time, we see an increase in lighter, complex plastics valued for their resource efficiency. But these materials require more throughput to create a ton.



Human vs. Optical Sorting



10M PICKS IN 2008 = 150 TONS OF PET BOTTLES
10M PICKS IN 2000 = 200 TONS OF PET BOTTLES

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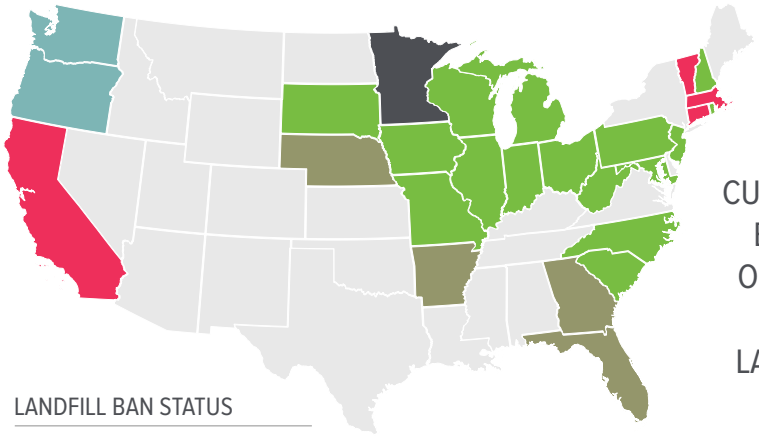
Optical sorters and manual sorters each have their advantages. But which method is lower-cost? This chart, derived from primary RRS research as well as information from the International Bottled Water Association, shows the variation in both optical and human costs on a per-pick basis. At lower wages and lower volumes of materials, manual sorting is more cost effective. As more of a particular commodity is present in a MRF, however, optical sorters begin to offer deeper value (optical sorters are dedicated to certain materials). Depending on the wage rate, an optical sorter will usually become more cost effective if it replaces three manual sorters. It is also important to note that lightweighting continues in the packaging sphere, the number of picks required for a ton of material will increase, further pushing facilities to optical sorters.

Organics Disposal Policies in the US

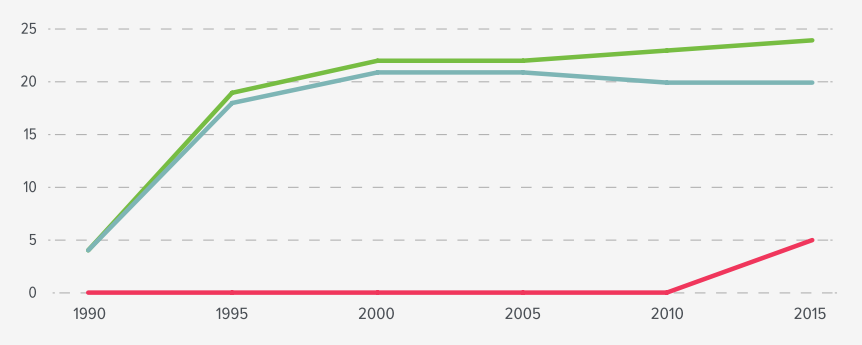


STATES CURRENTLY BANNING ORGANICS FROM LANDFILLS

LANDFILL BAN STATUS

- No Ban
- Commercial Food Scraps Ban
- Yard Debris Ban
- Weak Yard Debris Ban
- Strong Diversion Policies
- Strong Diversion Policies and Yard Debris Ban

CHANGE IN STATE ORGANICS DISPOSAL BANS OVER TIME



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Landfill bans for yard debris have proven to be effective at increasing diversion tonnages: Statistics from the U.S. EPA show the national recovery rate of yard debris went from negligible in 1980 to 12 percent in 1990 to above 50 percent in 2000. How has organics diversion evolved since then? Over the past five years, two competing trends have emerged. Four states have allowed exceptions to their yard debris bans to allow disposal in landfills that have methane capture systems – we've termed these "weak" yard debris bans. These efforts contributed to a peak recovery rate in 2008 of 65 percent (the rate has dropped to 58 percent since then). At the same time, several states have moved to ban food scraps from disposal and direct that material to composting facilities. Oregon, Washington and Wisconsin, meanwhile, have instituted "strong" organics diversion initiatives in which they support organics recovery through grant programs, sponsored conferences, incentives to local government and other means. As these laws come into effect, they will likely begin to drive a similar increase in food scrap diversion similar to what was originally seen in yard debris.

As communities and companies in the recovery supply chain grapple with diminishing recyclable commodity revenues, some may feel pinched by the fact their local processing infrastructures are not equipped to handle the growing and evolving stream of potentially recyclable materials. In short, recyclables are going to the landfill even in areas with excellent collection programs. The map below represents the top 10 metropolitan statistical areas (MSAs) that hold opportunities for building local capacity to recover more of the local recyclable tonnage. RRS arrived at the list by utilizing tonnage and capacity figures from databases that detail facility capabilities and waste composition studies. These locations could become hot spots for capital investments – and future growth in diversion.

Top 10 Potential Hot Spots for Local Capacity Increase

LANDFILLED RECYCLABLE TONNAGE GREATER THAN MRF CAPACITY

1. Greensboro-High Point, NC
2. Albuquerque Area, NM
3. McAllen-Edinburg-Mission, TX
4. Oklahoma City Area, OK
5. Lansing-East Lansing, MI
6. Las Vegas-Paradise, NV
7. Little Rock-North Little Rock-Conway, AR
8. Riverside-San Bernardino-Ontairo, CA
9. Sacramento-Arden-Arcade-Roseville, CA
10. Corpus Christi Area, TX

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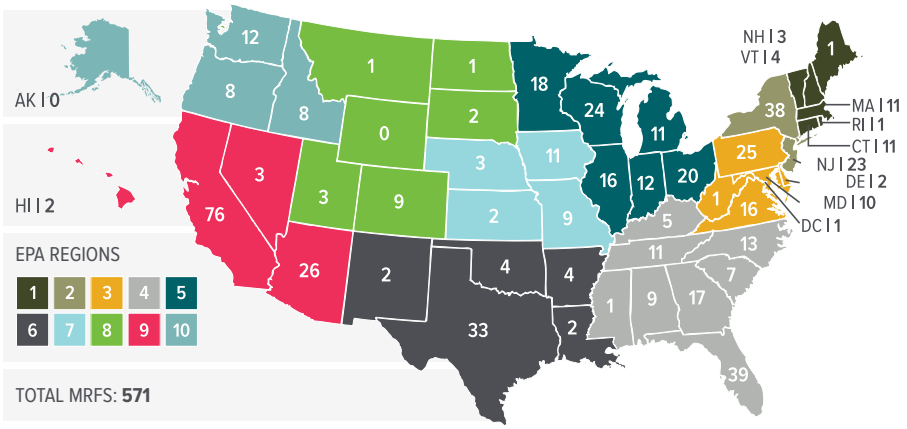
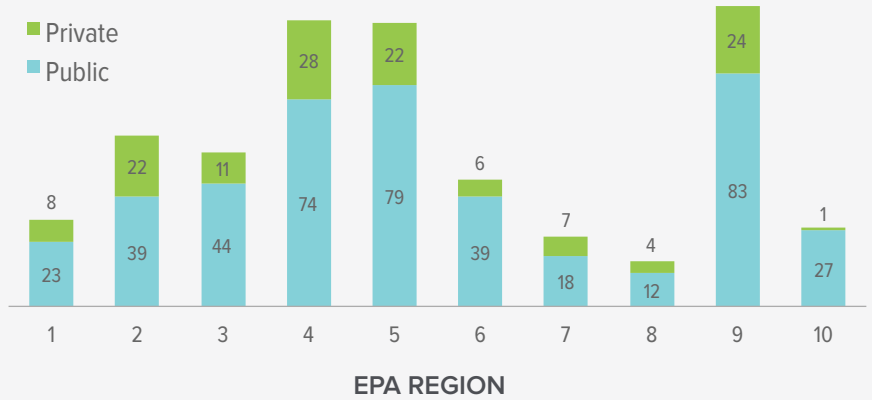
How many materials recovery facilities exist in the U.S.? Depending upon classification, the estimate is somewhere around 650. However, the RRS-generated MRF count represented below accounts for a specific group of facilities – those that have some level of automated sortation, bale most of their commodity materials, accept a core set of recyclable materials (OCC, other paper, aluminum, steel, plastic bottles) and primarily service residential tonnages. Nearly all these facilities utilize magnets and eddy currents due to the higher value of steel and aluminum. At larger facilities, more automation (fiber screens, optical sorters and more) is typically in place to handle the next level of valuable materials. Notice that higher population states don't always have the most MRFs. Instead, MRF density tends to increase in places with higher participation rates. This may suggest a self-fulfilling prophecy: Higher tonnage capacity and diverse material acceptance promotes diversion activity among residents.

Number of MRFs in the US

TOTAL NUMBER OF MRFs PER STATE



PUBLIC VS PRIVATE MRFS, BY EPA REGION



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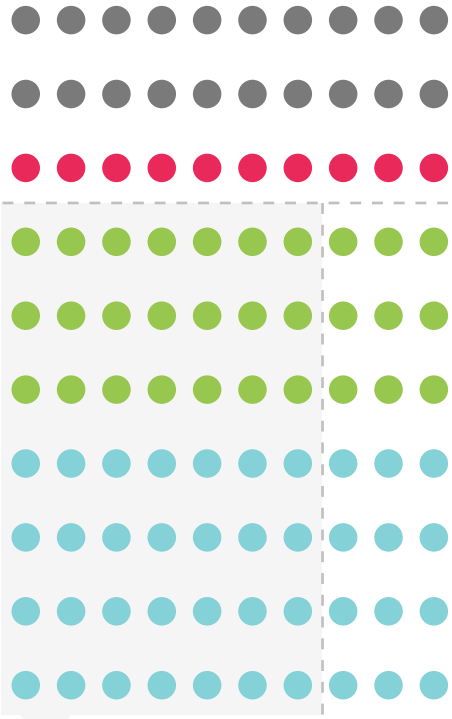
The Limits of Recovery, Part 1

ONLY ABOUT 70% OF THE US WASTE STREAM CAN ACTUALLY BE RECYCLED OR COMPOSTED.



CURRENTLY, ONLY 60-70% OF COMPOSTABLE/RECYCLABLE MATERIALS CAN BE CAPTURED

20% IMPOSSIBLE TO RECOVER

Diapers, painted Christmas trees, cat feces, broomsticks, skateboard wheels

10% CURRENTLY NOT ABLE TO RECOVER

Toothpaste tubes, sandwich bags, lip balm tubes, drink pouches, contact lens packaging

70% RECYCLABLE/ COMPOSTABLE

Water bottles, soda cans, newspapers, cardboard boxes, yard debris, food scraps

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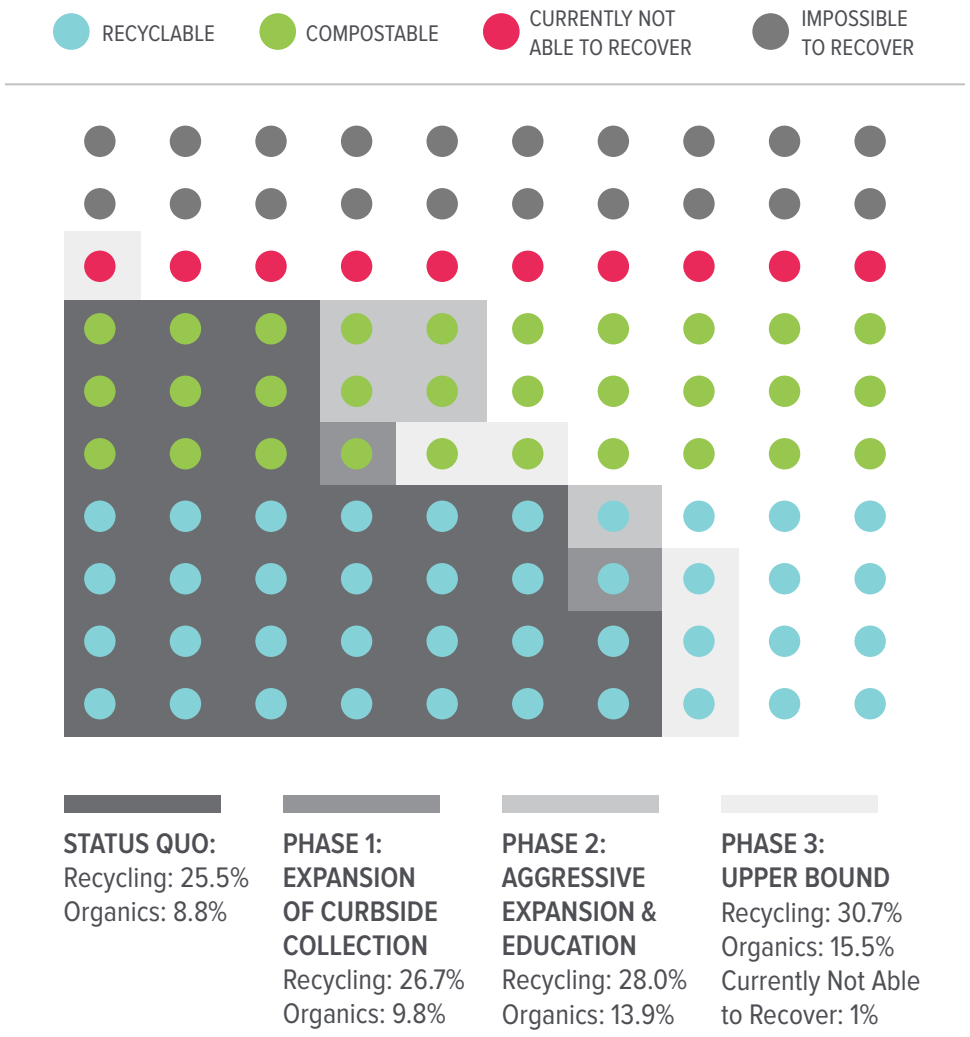
Based on composition studies as well as studies on material flow through facilities, RRS found that the typical waste stream has a recovery ceiling: Only about 70 percent of materials in the U.S. are presently recoverable via recycling or composting. The remaining 30 percent is broken into two parts. Twenty percent of the stream has no hope for re-entry to the industrial or natural ecosystems, and 10 percent is not currently recoverable (though with clever financing and good old human ingenuity, that segment could potentially be captured). However, there are limitations even to the 70 percent currently ready for recovery. RRS research indicates just 60 percent of that 70 percent could feasibly be captured in 90 percent of current recovery facilities due to material contamination, size and shape incompatibilities, and other factors. Even the best programs, harnessing multiple MRFs and technologies, top out below the ceiling. Come back next month, when Data Corner will delve into what is currently being captured and what increases could be seen with the implementation of best practices.

The Limits of Recovery, Part 2



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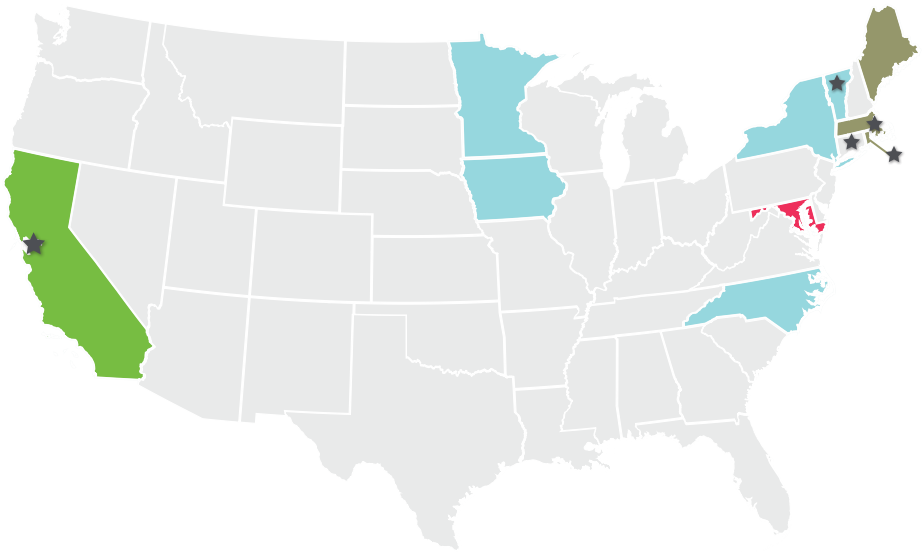
The current U.S. municipal solid waste recovery rate is 34.3 percent. How much growth is reasonable within the next 20 years? RRS, using nationwide modeling based on real-world cases, identified additional measures that could advance the needle, and the possible effects are detailed above. Phase 1 would involve rolling out curbside carts or drop-off centers to all communities while assuming reasonable regional participation rates. Such steps could expand access to recycling by 20 million households and organics collection by 25 million households nationwide. Phase 2 would improve multi-family/commercial programs and implement a three-cart system (trash, recycling, organics) for all curbside programs. Phase 2 findings also assumes a slightly higher participation rate due to quality outreach/education. Phase 3 assumes excellent residential, multi-family and commercial participation rates, and it would make progress on public/private partnerships to begin recovering "Currently Not Able to Recover" material, such as various films and small rigid plastics. It's also important to note innovations in equipment could push advances further.

RRS researchers monitor policy and legislation developments related to extended producer responsibility (EPR) for packaging, material landfill bans and food waste diversion. The map below illustrates how the discussion in these areas has evolved of late. Policy motivators include spurring recovery of hard-to-recycle materials and reducing marine debris. Further, recent emphasis on food waste diversion has increased recognition that food packaging needs to be designed for its intended recovery pathway, including composting and anaerobic digestion systems. Aside from state-wide laws or mandates, an expanding web of local policies has developed, presenting fiscal and compliance concerns for those in the packaging value chain. According to the National League of Cities, there are more than 19,000 municipal governments, 16,500 township governments and 3,000 counties in the U.S. Disharmonized local policy, while frequently catalytic, can be both disruptive and expensive.

Paper & Packaging EPR and Regulatory Influences



- MD P&P EPR is part of State Zero Waste Target
- CA State and local bag bans, 75% diversion
- P&P EPR legislation introduced in 2015
- P&P EPR legislation introduced prior to 2015
- Mandatory State Commercial Food Waste Composting

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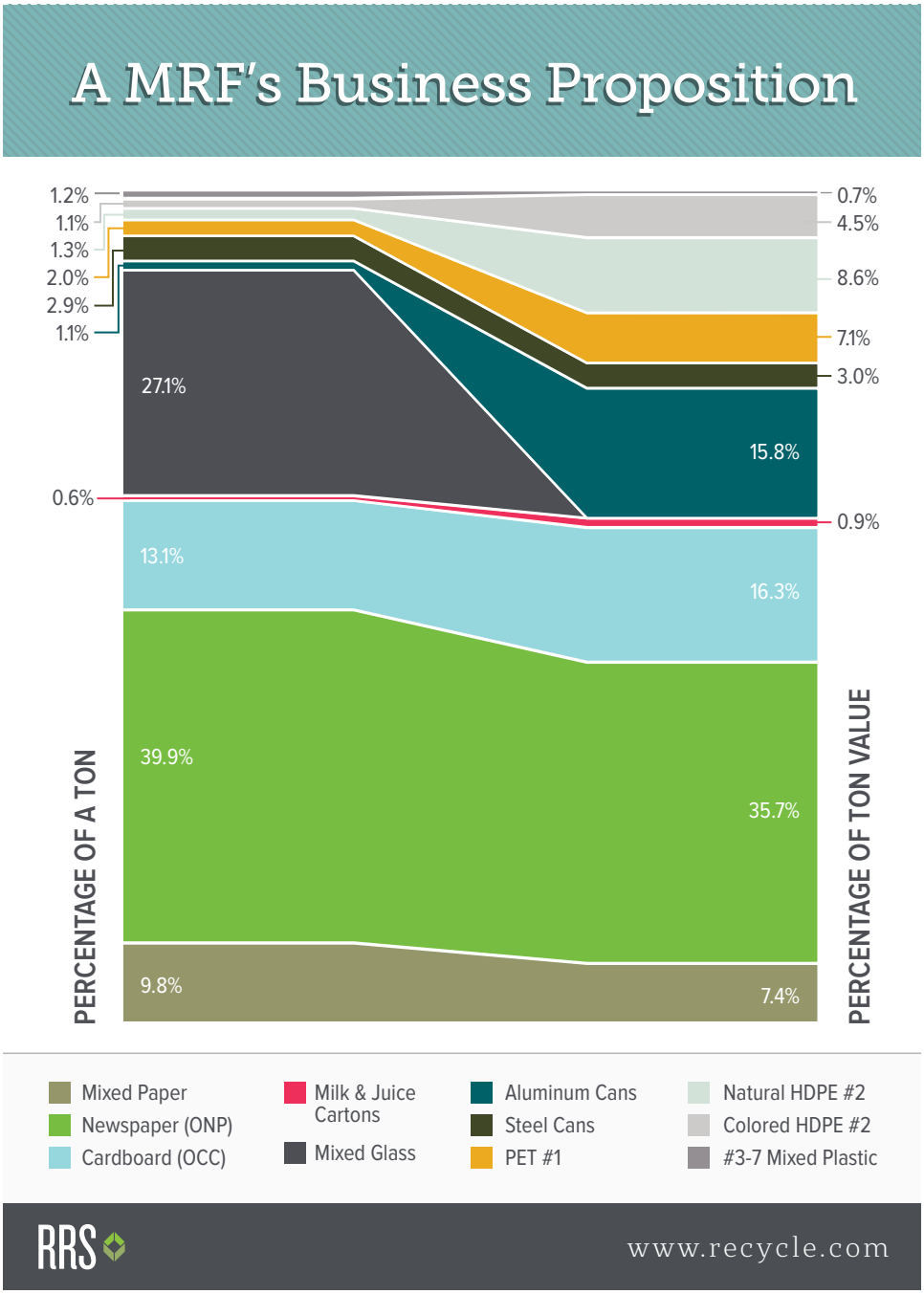
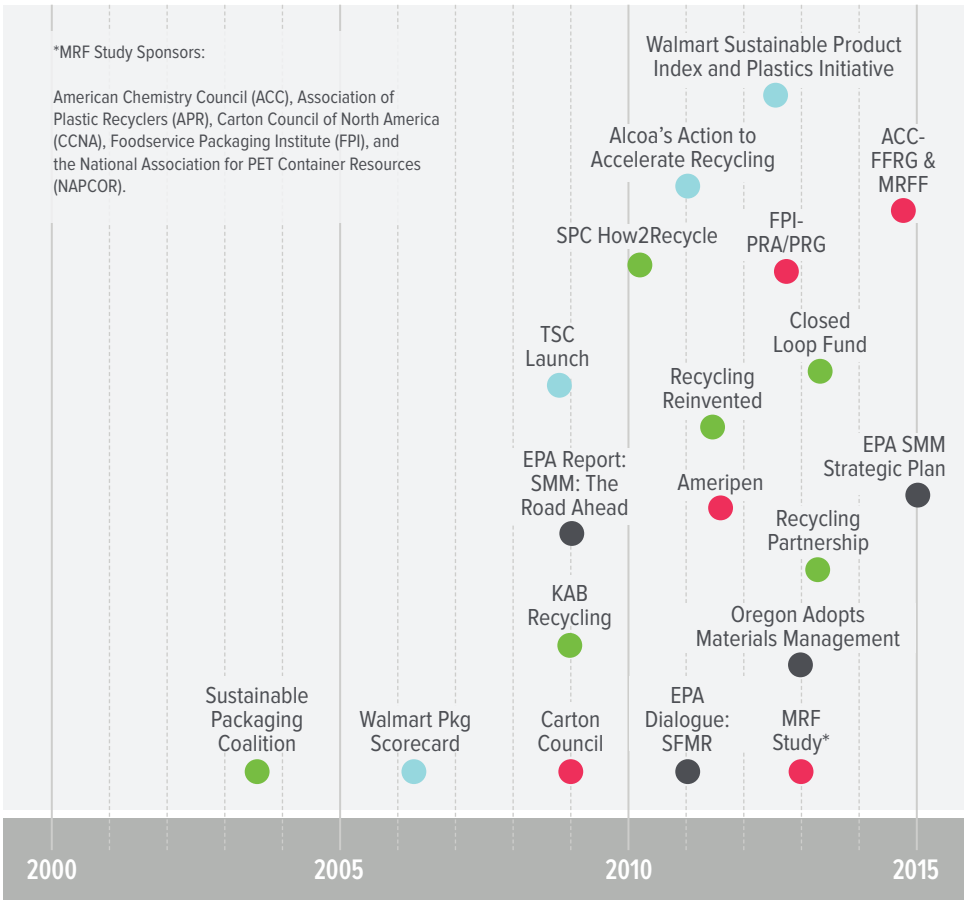
The graph below was updated Sept. 1, 2015 and continually fluctuates with markets and recycling participation. Pulling from numerous recycling composition studies from across the U.S., RRS determined the average weight composition of incoming materials to MRFs, which is represented on the left side of this graph. The right side represents the average commodity revenue per ton of processed material and excludes residue. MRF operators adapt their operations to respond to these numbers or risk missing out on revenue, regardless of equipment, techniques or contamination levels.



Evolution of Sustainable Materials Management



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With the U.S. EPA last month unveiling a strategic plan for sustainable materials management (SMM) initiatives through 2022, RRS decided to create the chart, which marks events and organization launches that have been important in the recycling industry's SMM evolution (SMM is a concept in which stakeholders aim to use and reuse materials more productively over the entire life cycle of products). During the time charted, the sector has seen the introduction of more rigorous research-based approaches to evaluating materials in material recovery systems. The concept has also been emphasized by government leaders – the EPA's latest plan comes four years after the agency's Sustainable Financing for Municipal Recycling (SFMR) dialogue.