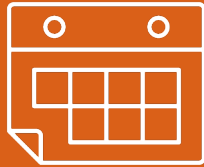


THE GROWING MARKET FOR RECYCLED POLYPROPYLENE

December 2, 2020

Prepared for: California Commission on Recycling Markets and Curbside Recycling
by: The Recycling Partnership and The Association of Plastic Recyclers

AGENDA



POLYPROPYLENE RECYCLING TODAY

- Challenges
- Opportunities



POLYPROPYLENE RECYCLABILITY CONSIDERATIONS

- Collection & Separation
- Sorting & Aggregation
- Quality & Quantity to Sustain Market Value
- Processing & Reclamation
- Feedstock in New Production



CLOSING THOUGHTS

POLYPROPYLENE (PP) RECYCLING IN CA: OVERVIEW



- Polypropylene (PP) has been collected for recycling for less than a decade, but collection and sortation is growing, with major investments being made by MRFs, some fueled by support from The Recycling Partnership and others
- PP markets are recovering from the disruption that occurred post Chinese National Sword policy; the market is responding, but it will take time for investments to come to fruition
- California MRFs are sorting PP into commodity bales with a positive market value
- PP reclaimers are actively buying material from California MRFs, and investments are being made in in-state reclamation
- Demand for recycled PP feedstock is growing, supported by major corporate commitments

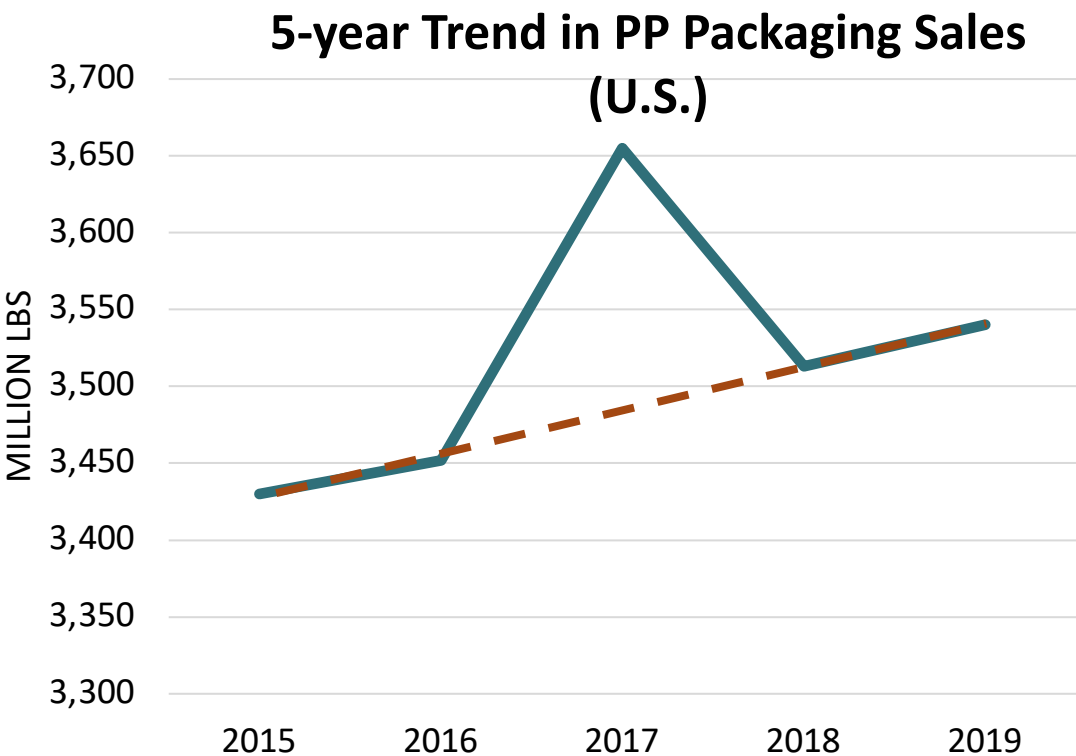
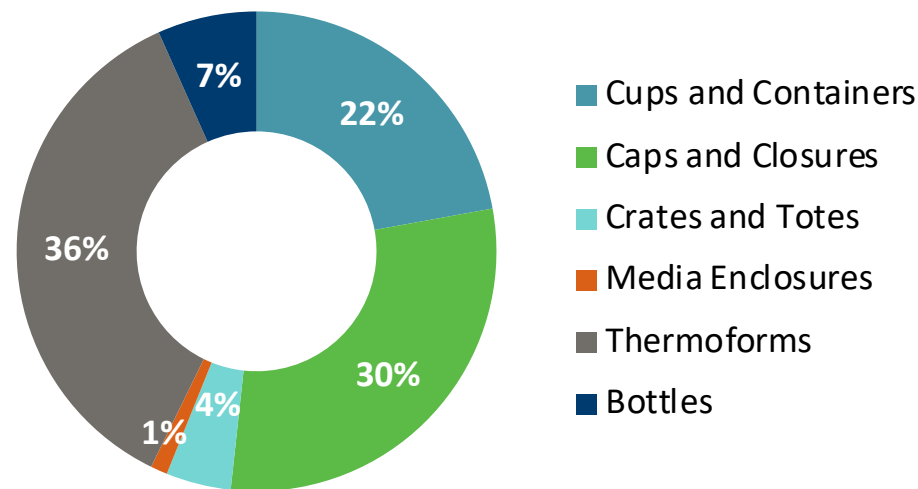
POLYPROPYLENE (PP) RECYCLING TODAY

Framing the Challenges
and Opportunities

PP IS A LARGE AND GROWING SEGMENT OF RIGID PLASTIC PACKAGING



PP CONTAINERS AND PACKAGING APPLICATIONS (U.S. 2018)



~3.5 billion lbs generated in the U.S. (2018)

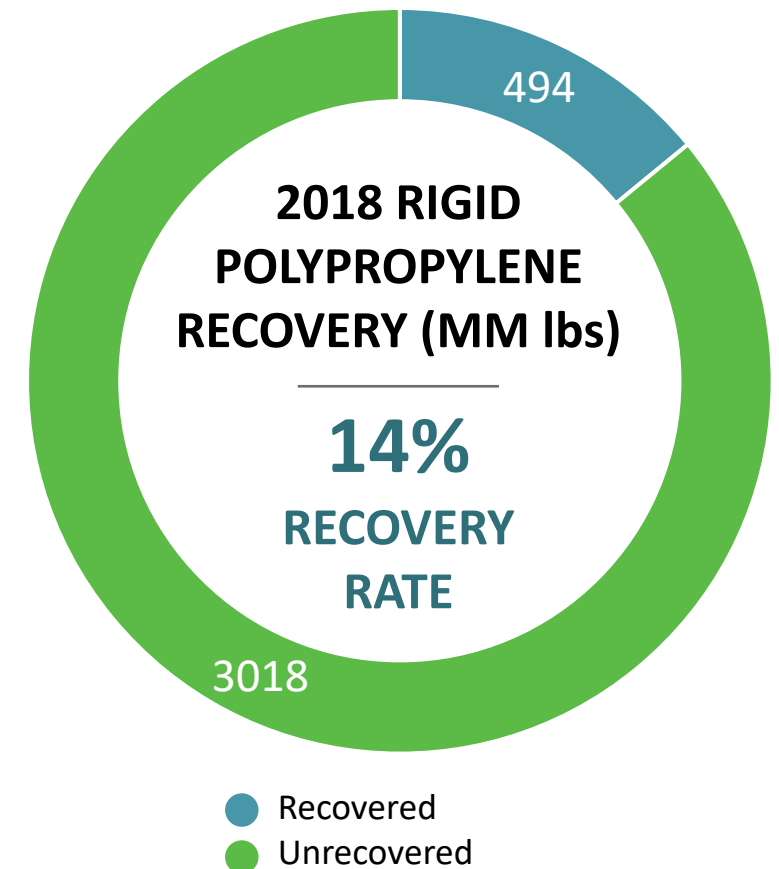
3.2% growth from 2015-2019

~420 mm lbs estimated generated in CA

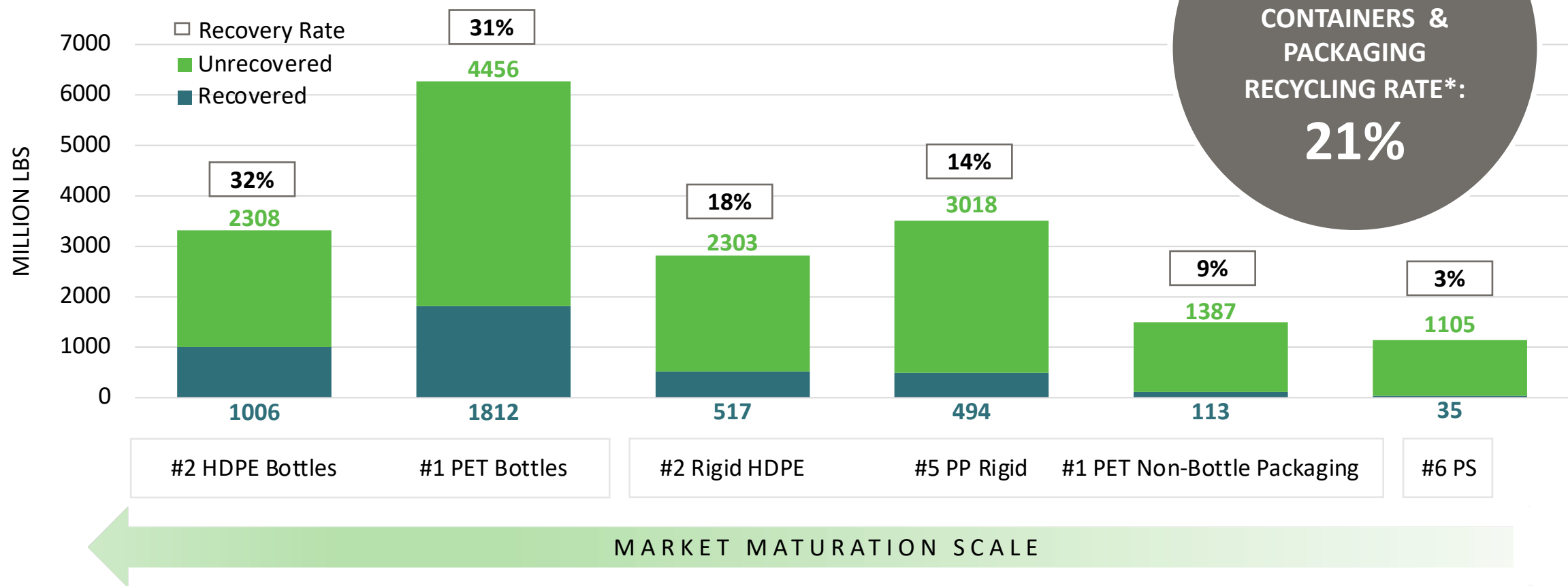
PP RECYCLING TODAY - CHALLENGES



- Approximately 3.5 billion pounds of rigid PP packaging is sold every year; the diversity of size, form, and applications of PP in packaging make it more challenging to sort and process than PET or HDPE
- Reliance on export markets fostered the mixed plastic bale and hamstrung development of domestic value chain for PP until recently
- Post-National Sword market shifts negatively impacted PP collection across the U.S.
- Areas without regional reclamation, notably the West Coast, were more severely impacted by dislocation post-National Sword
- PP has been commonly recycled for less than a decade, so reclamation is still maturing as compared to PET and HDPE, but investment in PP sorting and demand by end markets is growing



RIGID PLASTIC PACKAGING: US 2018



Recovered = collected for recycling and sold to end markets
Unrecovered = total generation minus total recovered

PP RECYCLING TODAY - OPPORTUNITIES



- Recycled PP (rPP) is commonly used in caps, cups, automotive parts, paint cans, transport packaging, housewares and other products
- The demand for rPP is growing in high value markets, such as food grade rPP
- Consumer brands with recycled content commitments use food grade rPP for personal care and nutraceutical applications (vitamins, supplements, etc.)

PP RECYCLING TODAY - OPPORTUNITIES



- Currently, there is very little food grade rPP produced, but the demand exists, and PP reclaimers are responding by investing in capacity and filing for FDA Letters of Non-Objection
 - Current rPP LNOS – Envision Plastics, KW Plastic
 - Pending rPP LNOs - EFS Plastics, Merlin, Erema
- Major retailers, dairy brands and quick service restaurants (QSR) are shifting from polystyrene to PP, particularly in food and food service applications, because they seek a material that has preferred material health characteristics, improved recyclability and potential for recycled content
- The rPP food contact market (i.e., foodservice and food packaging) can unlock when more food grade rPP supply is available

PP RECYCLING TODAY – EFFORTS TO GROW RECOVERY



- Substantial investment is being made to grow PP collection, improve the quantity and quality of recovered PP. Demand is driving higher value markets and recycled content.
 - **Collection & Sortation:** The Recycling Partnership - PP Coalition \$35M
 - **Sortation:** Technologies like artificial intelligence (AI) & robots addressing PP sortation challenges; MRFs transitioning from mixed plastic to PP sorting
 - **Reclamation Capacity:** PP reclamation capacity growing, especially in CA
 - **Quality:** Growth in LNOs to produce food grade rPP
 - **End Markets:** Brands are demanding recycled content and requiring progress reporting to meet US Plastic Pact and other commitments
 - **New Markets:** Virgin PP producers are investing in recycling and recycled content
 - **Innovation:** Investment and commercialization of new reclamation technologies like [PureCycle](#) open the door to reclaiming hard-to-recycle forms producing food grade rPP with virgin like properties
 - **Innovation:** Digital watermarks and fluorescent markers on packaging are improving near infrared (NIR) detection and sortation



**75 activators /
34 brands and
recyclers
working to
meet global
commitments
to recyclability
and recycled
content**

PP AND PLASTIC RECOVERY INVESTMENTS



Resin producer plans huge increase in PCR sales

“Polyolefins giant Braskem has set its sights on expanding post-consumer resin production as part of the company’s new sustainability commitments. The Brazil-headquartered company this month announced a goal to sell 300,000 tons of recycled content products by 2025, increasing that to 1 million tons by 2030...” *Plastics Recycling Update– November 18, 2020*

Brand owner invests \$30 million to bolster plastics recycling

The company (Nestle), a major global producer of food and drink products, on Sept. 7 announced a \$30 million investment in the Closed Loop Leadership Fund, a private equity arm of investment firm Closed Loop Partners. Nestlé said the investment will help in the “shift from virgin plastics to the use of food-grade recycled plastics in the U.S.,” according to a release. *Resource Recycling–Sept 15, 2020*

PureCycle Technologies Raises \$250 Million

Bond will be used to complete company’s first commercial plant in Ironton, OH, which is expected to produce more than 100 million pounds of ultra-pure recycled polypropylene annually. *Plastics Today – Oct 15, 2020*

New Investments in U.S. Plastics Recycling

Announced since July 2017

64
projects in the U.S.

Combined projects valued at

\$5.3
billion

Potential to divert

4.0
million metric tons of waste*
from landfills

ACC– New Investments in Advanced
Plastics Recycling, Aug 2020

INNOVATION AND INVESTMENT FOR MRF SORTING OF PP



Upgrade your MRF to Recover PP #5 with a Grant from The Recycling Partnership

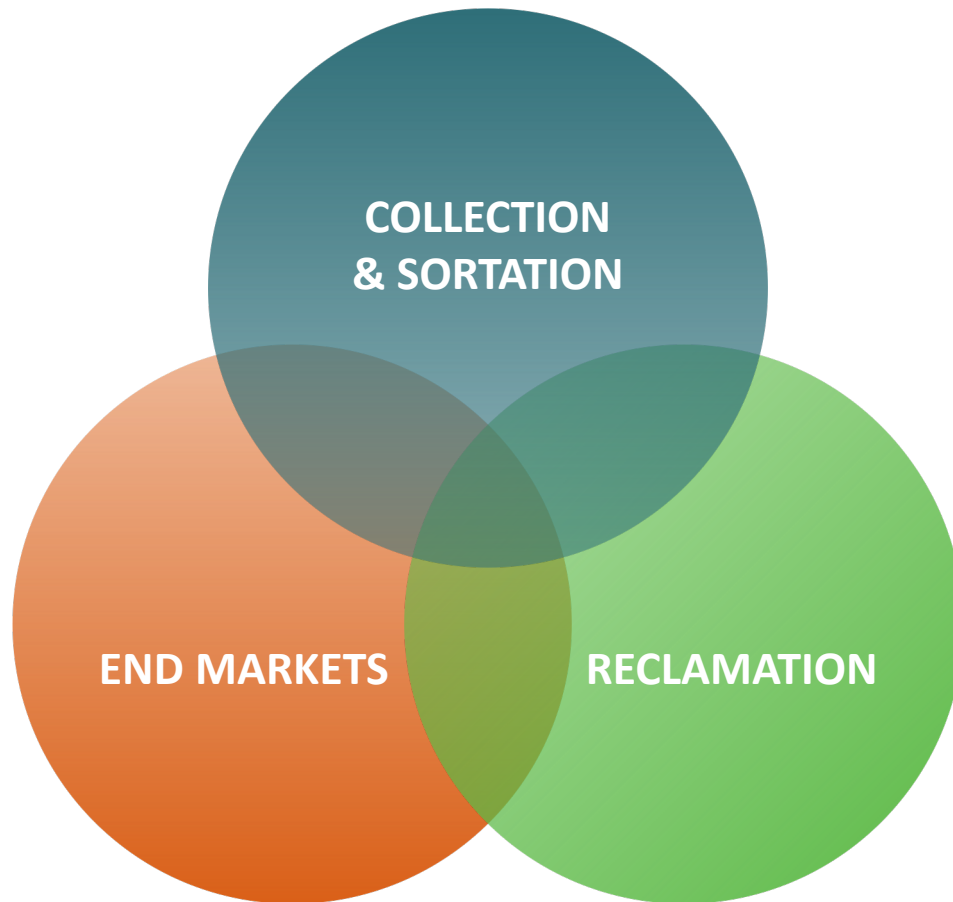
The Coalition also opened up a Request for Proposals (RFP) for Material Recovery Facilities (MRFs) to apply for financial grants that enable improved sorting of Polypropylene and widen acceptance through consumer education programs in communities.

How AI and robotics are shaping the MRF of the future
AI can transform the economics of the entire system, increasing the efficiency and consistency of sorting and processing of valuable recyclables.

Greenbiz, Sep 1, 2020

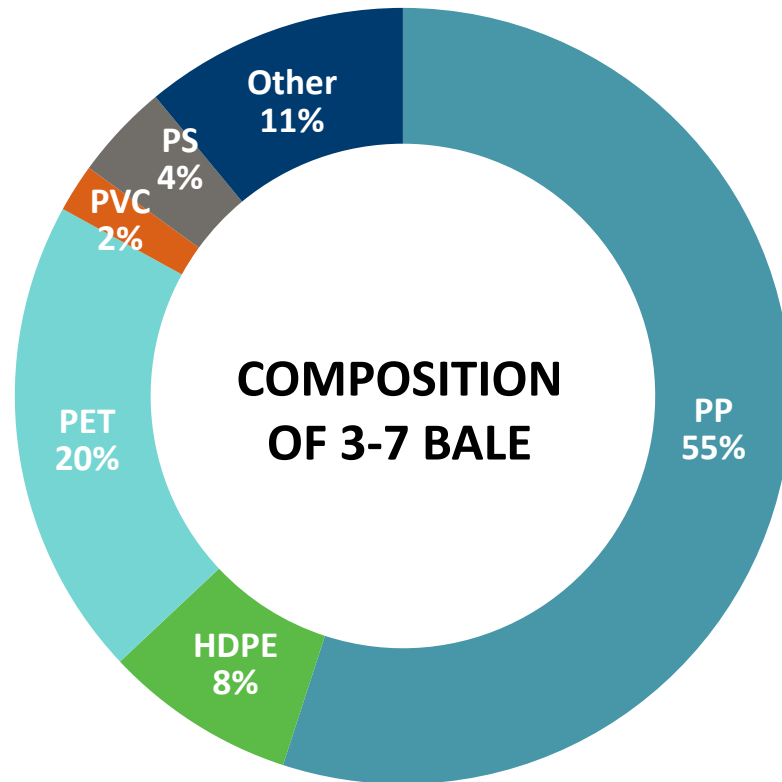
PP RECYCLABILITY CONSIDERATIONS

COLLECTION AND SORTATION OF PP FOR RECYCLING IS GROWING



- The Recycling Partnership's PP Coalition is focused on increasing collection and sortation, making grants available to MRFs to improve PP sorting and to communities for outreach and education
- The need to improve MRF economics by improving bale quality is driving technology improvement through additional optical sorting, AI and robotics (e.g., AMP robotics, WM MRF of the Future).
- Capability of Advanced Recycling Technologies to accept mixed polymers and hard to recycle forms is creating additional demand for the collection and sorting of plastics (e.g., Recent \$100M investment in PRF by IRG).

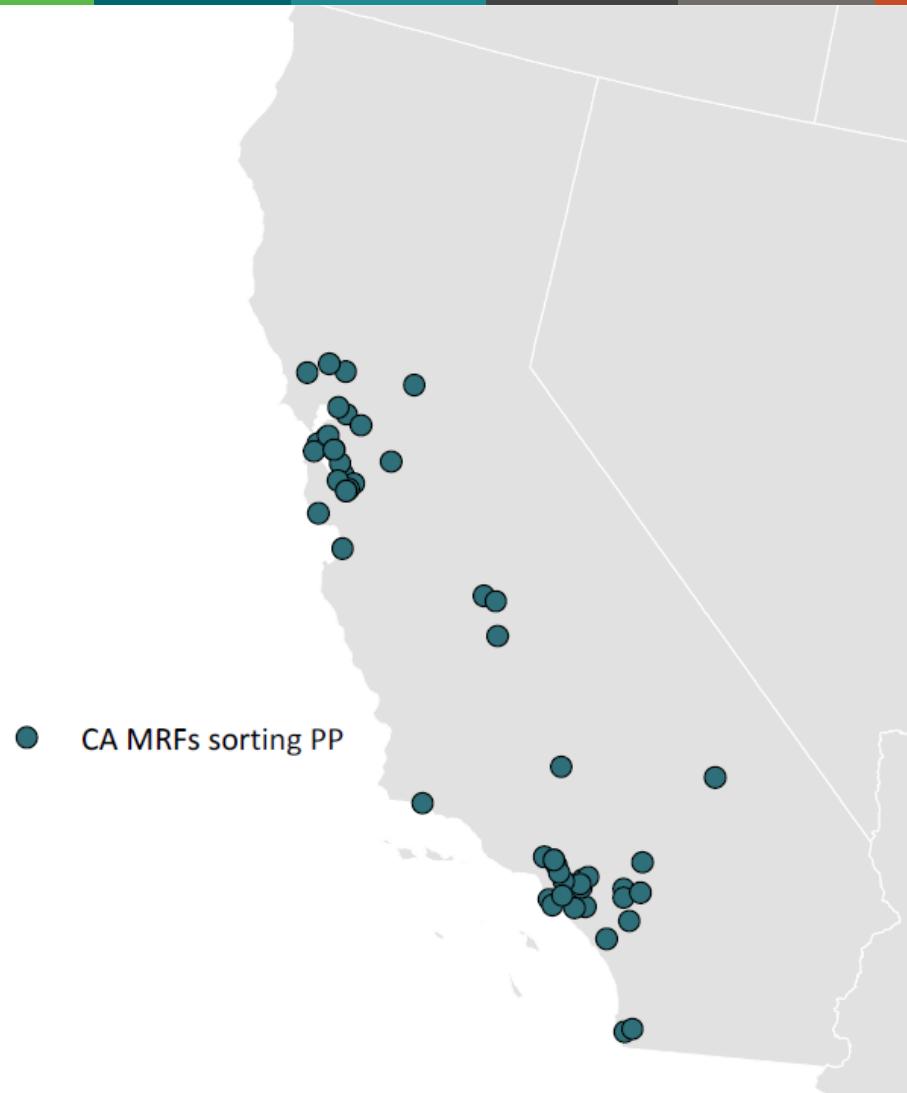
PP IS SORTED INTO DEFINED STREAMS FOR RECYCLING PROCESSES



- PP is sorted into either #3-7 bales, or #5 bales for sale to reclaimers
- PP content brings value and drives the market for the #3-#7 bale
- PP is emerging as a desired recyclable commodity, though still impacted by the recalibrating effects of National Sword
- Growing end market demand for food grade material and investments in processing capacity will grow demand for #3-#7 and PP bales

Source: APR 2015

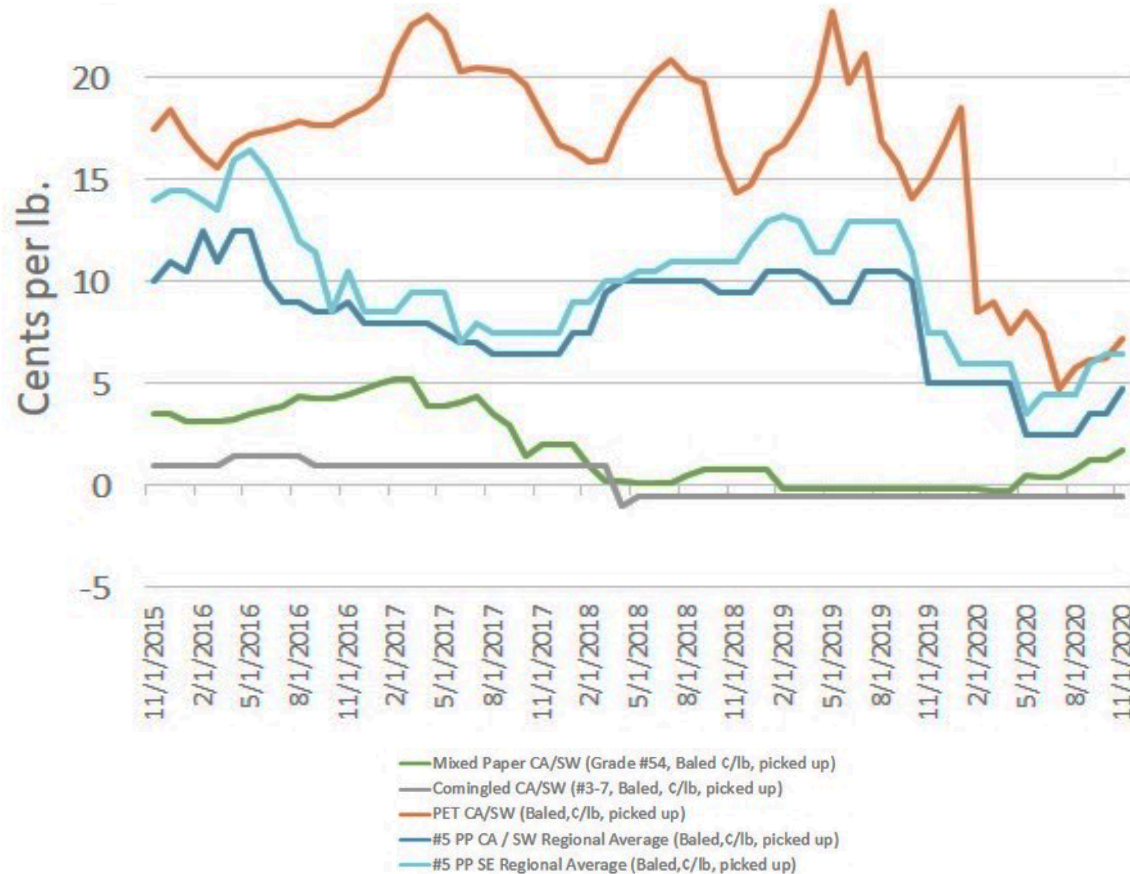
CALIFORNIA MRFS REPORTING SORTING PP



- 53 MRFs in California, with a combined throughput of greater than 4.5 million tons per year, report sorting and marketing PP

Source: RRS database; data gathered 2017 to 2020

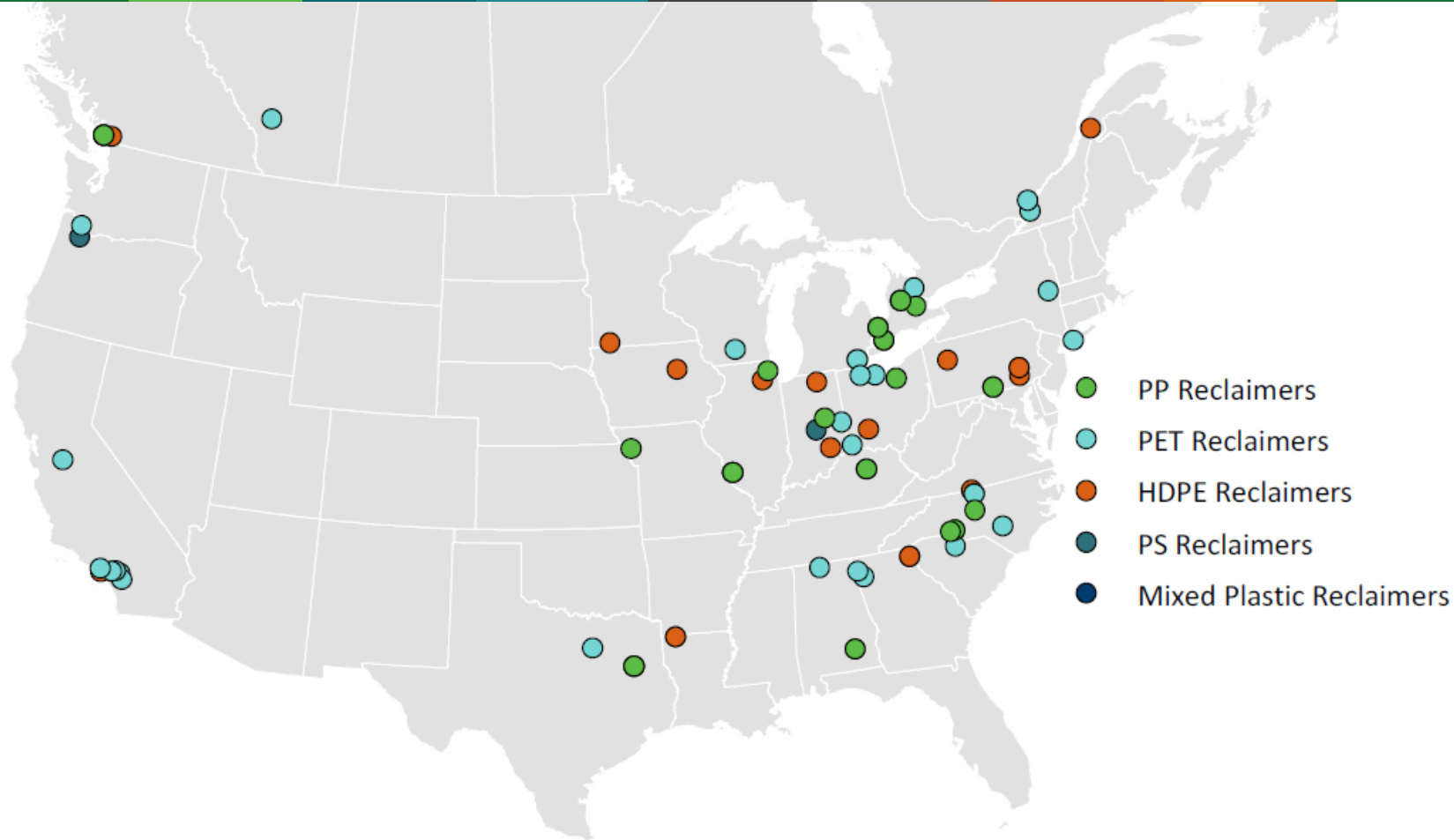
PP HAS A POSITIVE MARKET VALUE: PP BALE PRICES COMPARED TO OTHER COMMODITIES



- PP is marketed either in #5 bale or in a #3-7 bale
- To offset transportation costs, CA / SW PP market is valued consistently lower (~\$.01 - \$.03 per lb) than the SE where reclamation capacity is high
- Improved sorting infrastructure is needed to expand availability of #5 bales
- MRF sorting of PP bales is a growing trend

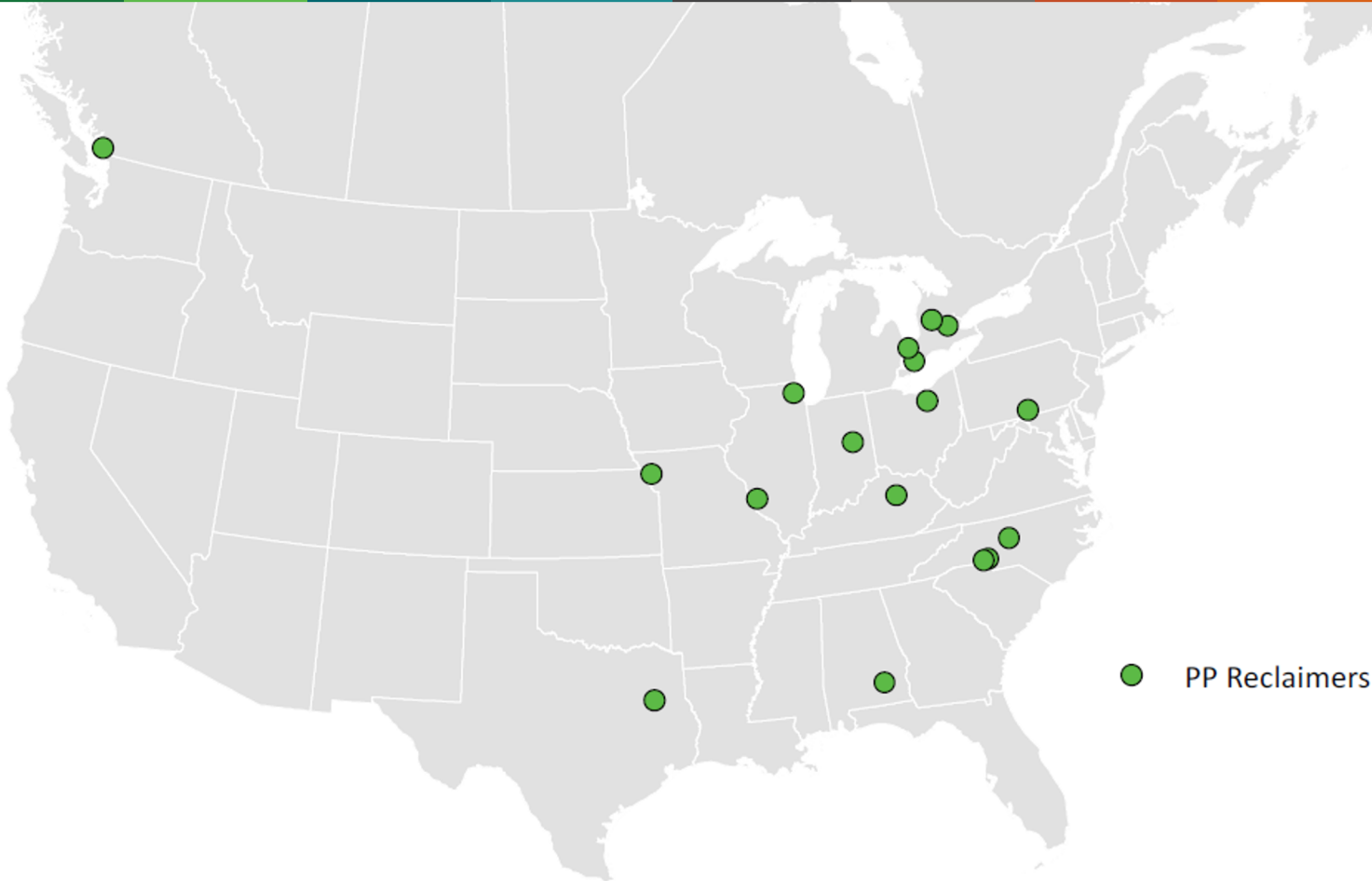
Source: RecyclingMarkets.net

ALL RIGID PLASTIC RECLAIMERS: US AND CANADA



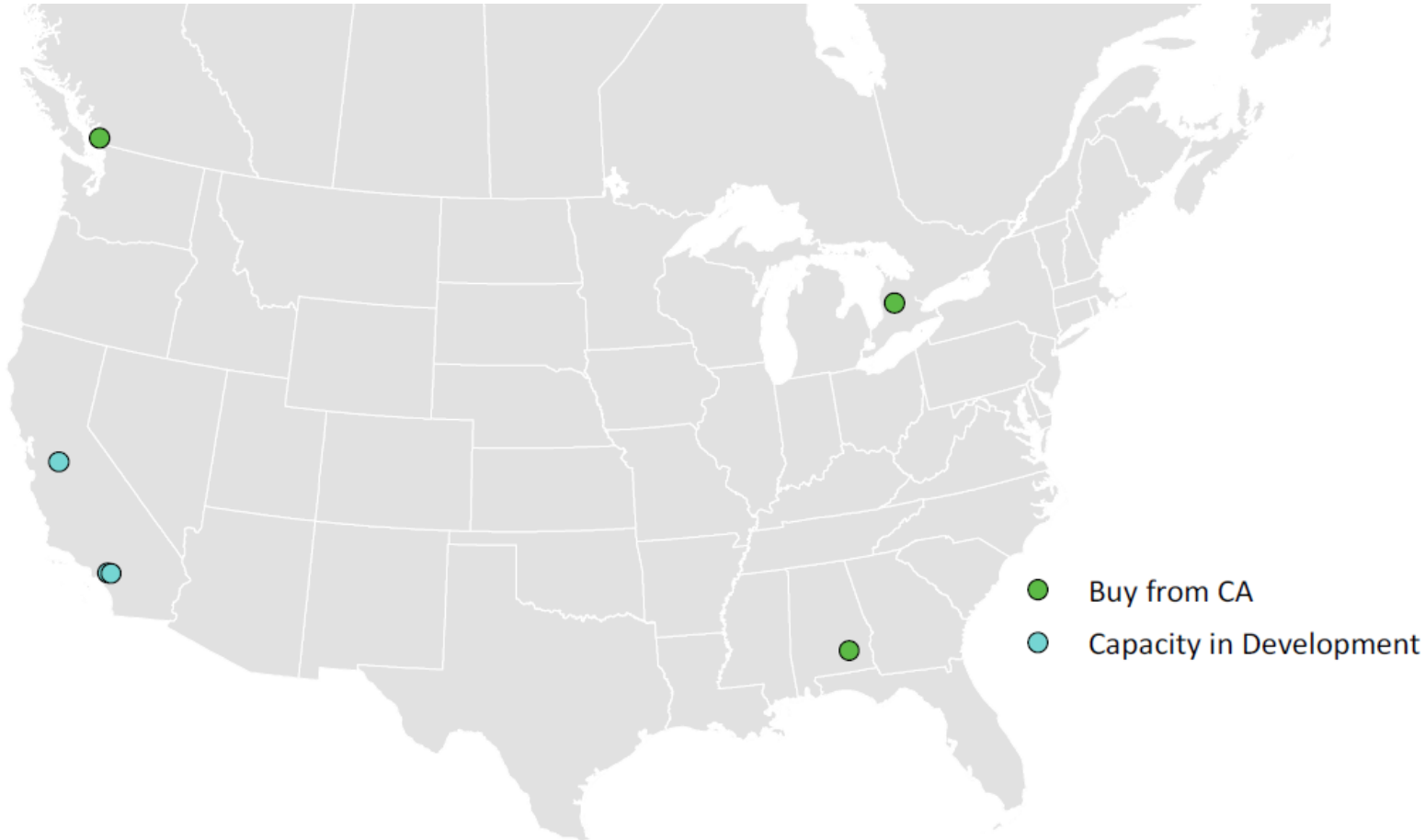
- Nationally there is broad reach and capacity for PET and HDPE reclamation which has evolved over 35 years
- This allows ready access to markets for PET and HDPE
- PP reclamation is still maturing as it has been collected for recycling for less than a decade, and much was exported prior to National Sword

PP RECLAIMERS: US AND CANADA



- The majority of PP reclamation takes place east of the Rockies
- Significant deficit of PP reclamation capacity on west coast, but capacity in development
- Some PP reclaimers buy recovered supply nationally

RECLAIMERS BUYING FROM PP FROM CA

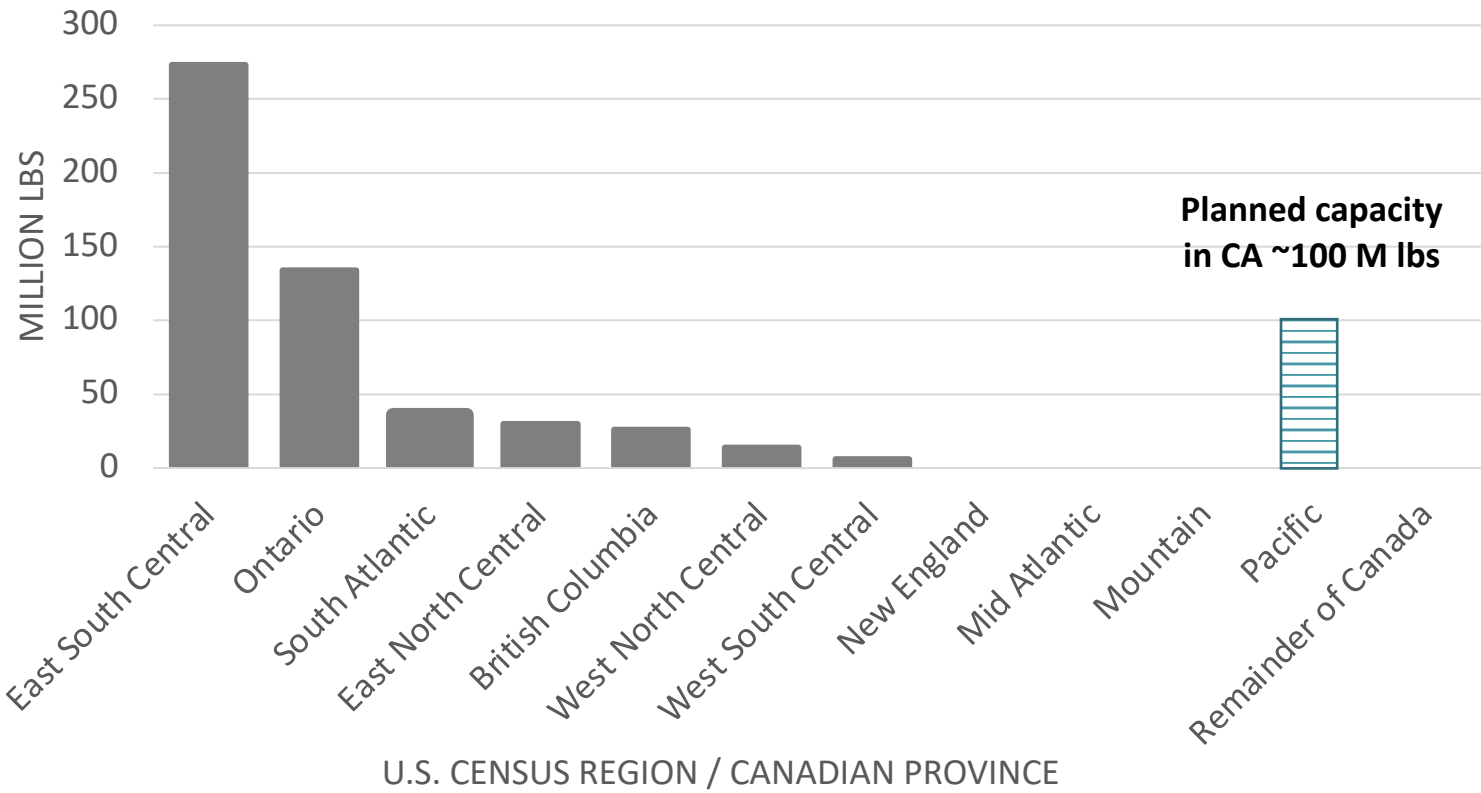


- Existing PP reclaimers in Canada and the SE are actively buying PP from CA
- New PP reclamation capacity is planned for California
- New capacity will unlock PP recycling throughout the West Coast

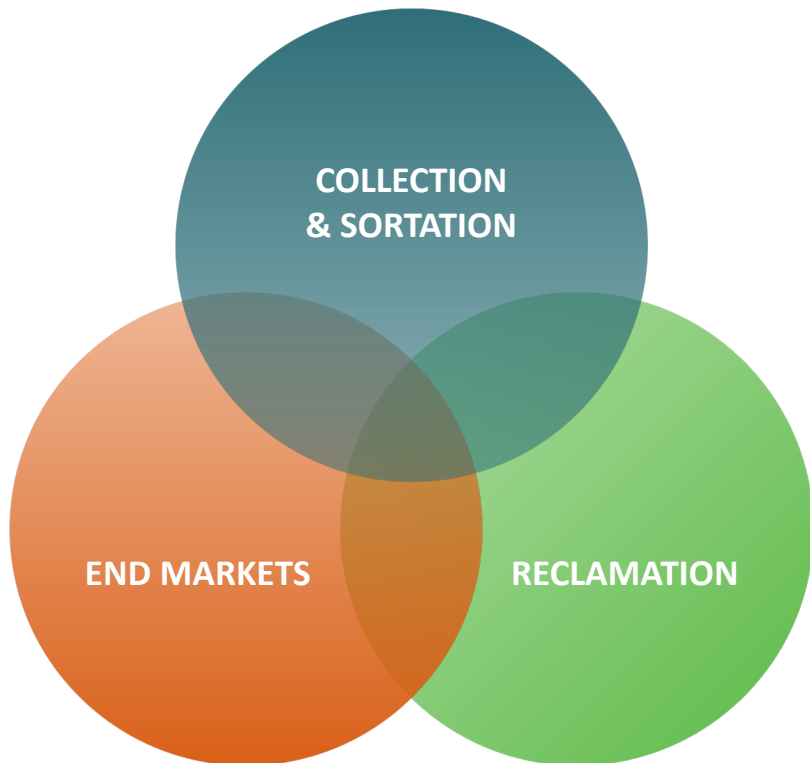
PP RECLAMATION CAPACITY



ESTIMATED REGIONAL PP RECLAMATION



RPP BECOMES FEEDSTOCK IN THE PRODUCTION OF NEW PRODUCTS: DEMAND AND RELATED INVESTMENTS



- rPP is commonly used in a host of end products, such as automotive, housewares, paint cans, caps and closures, and transport packaging

- Corporate commitments to use recycled content are a critical end market driver. The U.S. Plastics Pact is driving accountability to fulfill these commitments.



- Personal care and nutritional brands are looking for food grade material including:



- California is home to several brands and companies that are actively using recycled content today



CLOSING THOUGHTS



RESTRICTING COLLECTION OF PP COUNTER TO LARGER MARKET TRENDS



- There is strong national growth in the sale and use of polypropylene because it is a polymer of choice for food service and packaging due to its positive health profile and potential for recycling collection and recycled content
- China's National Sword policy caused significant dislocation in rPP markets; the private sector is responding with significant investment to build a sustainable system to collect, sort and use recycled PP
- California is a critical market and national player to address the infrastructure gaps that currently exist for PP and grow the market for recycled PP
- To restrict access to post-consumer PP in California would add challenges to the maturation of a relatively young national PP recovery system
- What California can do to grow PP recovery system
 - Continue to drive demand for rPP – especially in higher grade applications
 - Enhance MRF capabilities and technology to sort and produce quality PP bales
 - Support the development of PP reclamation capacity – especially for food grade
 - Re-establish and grow PP collection, including foodservice ware, and drive participation through strong and consistent public education

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