

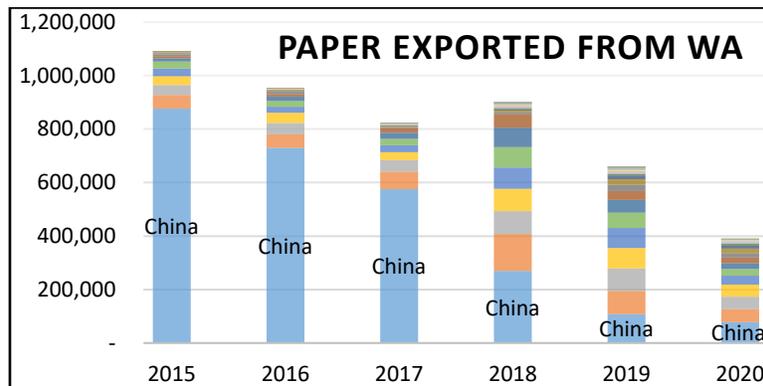
Washington State Recycling Development Center –

DRAFT PAPER SUMMARY

MARKET NEEDS:

- Contamination Reduction in paper/fiber bales delivered to end users, especially curbside collected paper materials. Meet ISRI standards for mixed paper¹.
- Sorting Technology at all material recovery facilities – optical sorters, robotic sorting – will result in cleaner materials going to end markets. These technologies are expensive, financial support for those infrastructure improvements is needed.
- Recycled Content in manufactured paper products would increase demand for postconsumer recyclable paper.
- Direct Connections for delivery of clean sources of recyclable paper to end users would keep clean sources of paper from being mixed with other materials (lowering contamination).
- Policy Changes to improve paper recycling should be considered and recommended, examples include extended producer responsibility, recycled content mandates, state purchasing, and source separation.

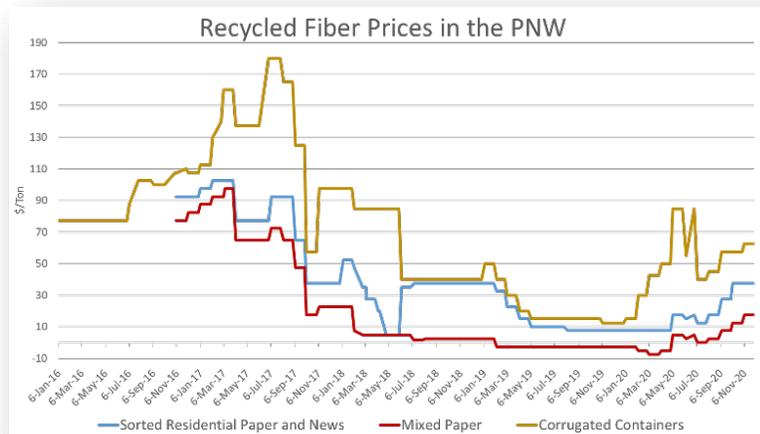
MARKET DRIVERS:



- Impacts on the demand for postconsumer paper/fiber comes from:
 - Overseas demand for paper/fiber results in Washington paper exports (chart above is partial data from 2020).
 - Levels of contamination in postconsumer paper bales impacts the end user, resulting in equipment damage and cost for disposal of contaminants.
- Downward trends:
 - As a result of more information available electronically, there has been decreasing demand for printing and writing paper, magazines and newsprint.
 - Recent reductions in travel (Covid-19) have impacted demand for materials used at conferences, hotels, retail, hospitality: graphic paper (conferences, retail), low end tissue (travel, retail, hospitality)

¹ [ISRI Scrap Specifications Circular 1 \(scrap2.org\)](https://www.isri.org/specifications/circular-1)

- Due to many businesses working from home, there has been reduced demand in copy paper, printing paper, and low end tissue products.
- Increasing trends:
 - Increases in online ordering resulted in higher demand for packaging, cardboard, and light weight shipping products.
 - Another impact from remote working for many businesses, there has been an increase in demand for high end tissue products.
 - Recent pressure to reduce the use of plastic has increased demand for paper bags to replace plastic bags and for void fill and fast food products to replace Styrofoam.
- Value of recyclable paper/fibers:
 - Paper/fiber prices dropped in 2017-18 in response to the overseas ban on incoming contamination in recyclable material bales. Recyclable fiber prices have seen increase since the lows experienced in 2019.

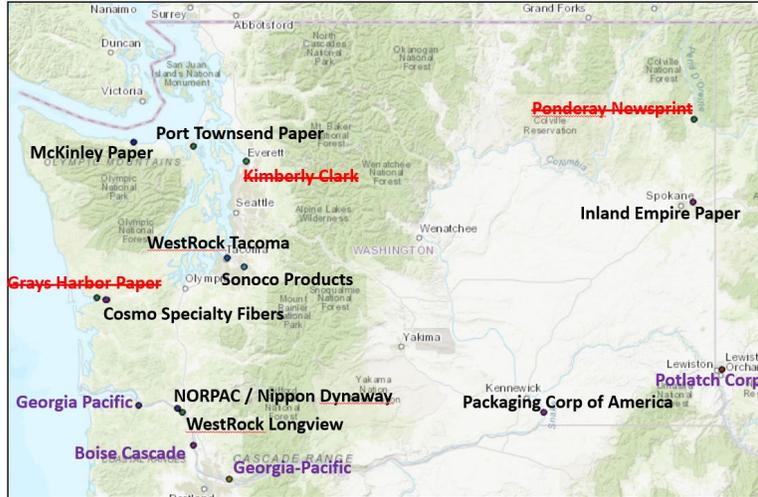


WASHINGTON PAPER INDUSTRY

- Paper Manufacturers: Washington has 10 pulp/paper mills and 69 converting facilities; employing 8,000 workers with an annual payroll of \$790 million; providing \$4.5 billion in product sales.^{2, 3}
- Washington map of pulp and paper mills: the EPA’s toxic release inventory data reported 13 pulp and paper mills in Washington State (based on 2006 data), three of those facilities are closed (red font). There are several facilities along the border located in Oregon and Idaho (purple font).

² [Presentation](#) from Terry Webber, American Forest & Paper Products at the Recycling Development Center Advisory Board meeting on February 10, 2021.

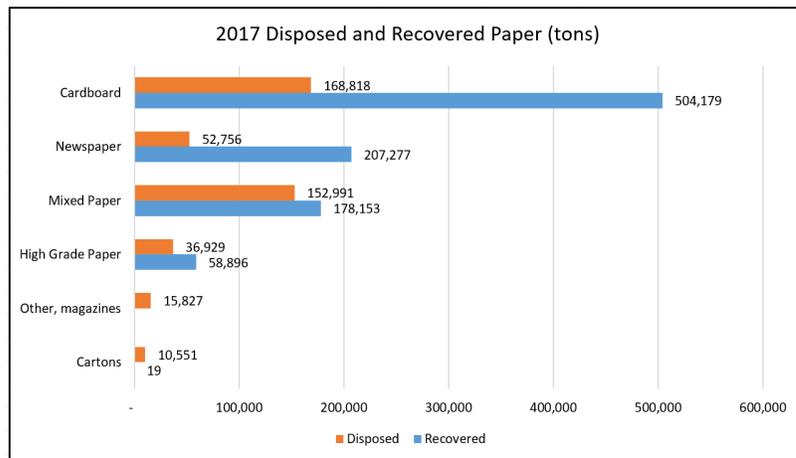
³ [U.S. Pulp and Paper Mills | Data Basin](#)



PAPER DATA

This information comes from data reported to Ecology⁴ and using results from the most recent waste characterization study⁵. The most recent data available is for 2017.

- **Generated:** In 2017, an estimated total of 1.7 million tons of paper material was generated in Washington State.
- **Recovered:** Nearly 950,000 tons of paper was recovered for recycling. That material included high grade paper, mixed paper, newspaper and cardboard, with a small amount of cartons.
- **Disposed:** Disposed paper products/packaging represents 14.9% of municipal solid waste, a total of 780,000 in 2017. About 250,000 to 400,000 tons of that landfilled material could have been recycled (cardboard, newspaper, high grade and mixed paper).
- **Data Gaps:** Work to fill in data gaps: brokered paper materials, postconsumer feedstock used by manufacturers (we have some but not all), paper packaging and paper products sold to consumers in Washington.



⁴ [Solid waste & recycling data - Washington State Department of Ecology](#)

⁵ [2015-2016 Washington Statewide Waste Characterization Study](#)

Recycling Development Center PAPER Summary – April 2021 Update – With all the details, text, notes, and graphics

This document summarizes information about waste paper/fiber materials collected for recycling in Washington State. This summary was created at the request of the Recycling Development Center (Center) advisory board for the purpose of building an understanding of how paper materials move through the recycling system. It is intended to clarify how paper materials are managed in the current recycling system, with a focus on market development for this material, in support of the Center's mission. Recycling is important to both the environment and the economy and good markets are vital to truly recycling materials.

The Center advisory board discussed recyclable paper at the December 2020 and January 2021 meetings. Notes and slides from those meetings are available at the advisory board [website](#). Board member discussion of potential actions and recommendations related to recyclable paper are listed below.

Actions to be considered to improve markets for paper/fiber

- **Reduce contamination in the paper materials collected for processing**
 - Ecology and local jurisdictions are currently working together on Contamination Reduction and Outreach Plans (CROPs) focused on this issue for residential curbside collection. Implementation of those plans are expected to result in contamination reduction in recyclable materials collected curbside. Other efforts to increase education to residents about proper recycling and to reduce problematic materials (like plastic or food) being placed in curbside bin is also needed.
 - Changes in how materials are collected in curbside recycling programs from residential sources could improve the quality of paper materials processed for end market use. Key contaminants identified in the paper stream include glass, plastic, and food.
 - Potential collection changes include: removing glass from the single curbside bin or creating a two-bin system, one for paper products and the other for containers.
 - Move cleaner sources of recyclable paper out of the MRF process and deliver directly (through brokers) to end users. Many MRFs mix commercial sourced materials with residential sourced materials at the receiving end of the facility, potentially resulting in lower quality end product paper bales.
 - King County's paper market research identified two challenges to using postconsumer fiber: (1) contamination in the feedstock contributing to yield loss, reduction in capacity, equipment damage, increased production costs, and increased disposal costs; and (2) product quality concerns mostly from the degraded strength of recycled fibers (shorter fiber length) compared to virgin fibers⁶.
- **Make infrastructure improvements to create cleaner streams of recyclable materials, which would make them marketable to the end users.**
 - Material recovery facilities (MRFs) could improve the sorting process with the addition of automated infrastructure resulting in higher quality materials delivered to end users.
 - Financial resources are needed to add optical sorters or robotic sorting at MRFs across the state. See the anecdotal example below:
 - The cost to a MRF for an optical sorter ranges from \$3 to \$5 million. In one example, the optical sorter improved end product bales, lowering the contaminant level to less

⁶ [Puget Sound's Paper Trail - Seattle and King County Paper Market Assessment - LinkUp program - King County Solid Waste Division](#)

than 0.5%. However, the increase in value of those bales was \$5, resulting in a 20 years return on investment. Financially, that does not provide sufficient revenue to justify the purchase of the optical sorter.

- End market paper processing infrastructure improvements could increase demand for recyclable fiber. Those improvements require significant financial support.
- **Support infrastructure improvements for users of recyclable paper/fiber to improve markets.**
 - There are 10 pulp and paper mills in Washington state that receive postconsumer material as incoming feedstock. One mill expansion is underway:
 - The North Pacific Paper Company (NORPAC) is a manufacturer of paper products including packaging, located in Longview Washington. NORPAC is undergoing an expansion to add a third processing line projected to increase regional demand for postconsumer fiber. Financing for that expansion is supported by the Washington Economic Development and Finance Authority through loans of \$112 million.
 - Identify other users of postconsumer recyclable paper/fiber, identify opportunities for technological improvements.
 - Several Washington facilities report use of postconsumer recyclable paper: Keyes Packaging Group, Wenatchee and Michelsen's Packaging, Yakima
- **Conduct an analysis of policy changes to identify those that result in improvements to the collection, processing, sorting and recycling of paper.** Policies to be evaluated include:
 - Extended producer responsibility for packaging
 - Recycled content requirements for paper packaging and paper products
 - Purchasing requirements for paper that meets higher postconsumer recycled content
 - Source separated collection – at a minimum remove glass from curbside programs (any other materials)
- **Research recyclable paper collection to build a more complete understanding of the system, fill the current data gaps, and identify where improvements would help deliver cleaner fiber product to end users.** Topics to research include:
 - What fiber continues to be landfilled that could be recovered for recycling?
 - How is commercial paper/fiber delivered directly to end users (brokers)?

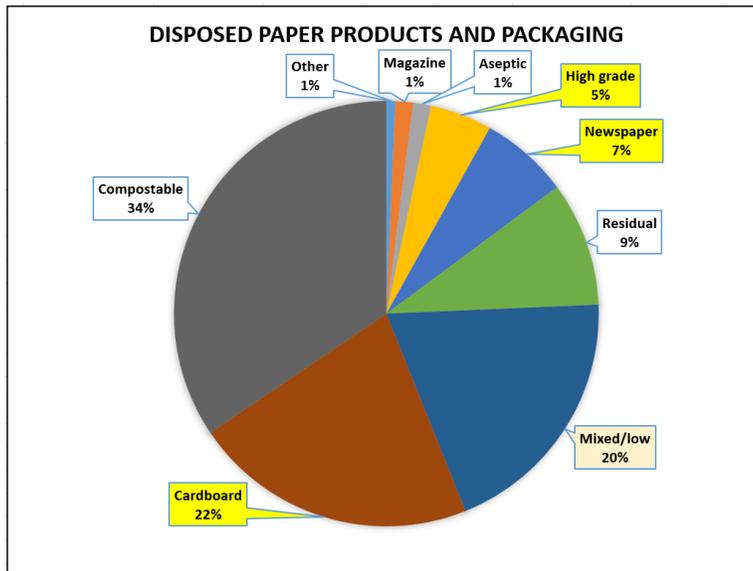
Data about paper collection, disposal, and recovery

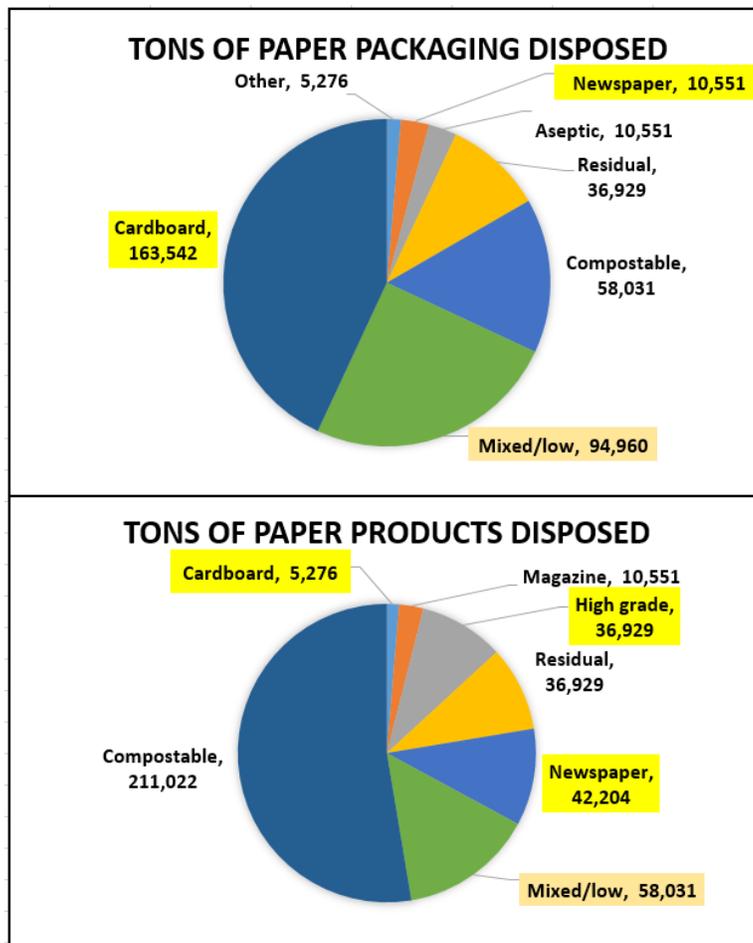
- **What paper is in the waste stream?**
 - Every five years, Ecology contracts for characterization study of municipal solid waste (MSW). The most recent study was conducted in [2015-16](#). A current waste characterization study is underway that should be published by 2022. These studies conduct in-depth examinations of materials and resources being disposed in Washington. The study categories of paper are listed below – the report provides more detailed definitions of these materials in appendix b:

Table 25: List of Material Types

Material Class Material Type	Material Class Material Type
Paper Packaging	Paper Products
Newspaper Packaging	Newspaper Products
Cardboard/Kraft Packaging	Cardboard/Kraft Products
Other Groundwood Packaging	Magazines
Mixed/Low Grade Packaging	High-grade Papers
Aseptic and Polycoat Packaging	Groundwood Products
Compostable Paper Packaging	Mixed Low Grade Paper Products
R/C Paper Packaging	Compostable Paper Products
	Paper Processing Sludge
	R/C Paper Products

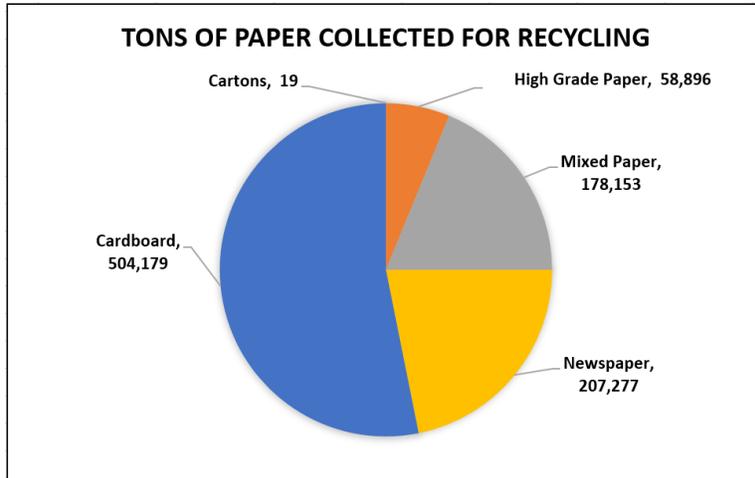
- In the 2015-16 study paper products and packaging represents 14.9 % of all disposed MSW. Of this paper packaging was 7.2% and paper products were 7.7%
- The study also tracked the source of the disposed paper: 44% was from commercial sources, 34% from residential sources, and 22% self-haul which can be both commercial and residential.
- An estimated 786,000 tons of paper was disposed in 2017 (based on 2017 total disposal of 5,275,558 tons of MSW), and using the study estimate of 14.9% of MSW is paper packaging and products. Not all of this material would be recyclable. Several of those categories of landfilled materials could have been recycled: high grade paper, newspaper, cardboard, and possibly mixed paper, representing 250,000 to 400,000 tons of paper/fiber.
- The following pie-charts show the types of paper packaging and products disposed in 2017 in tons, using the waste characterization study percentages. The yellow highlighted categories represent recyclable materials.



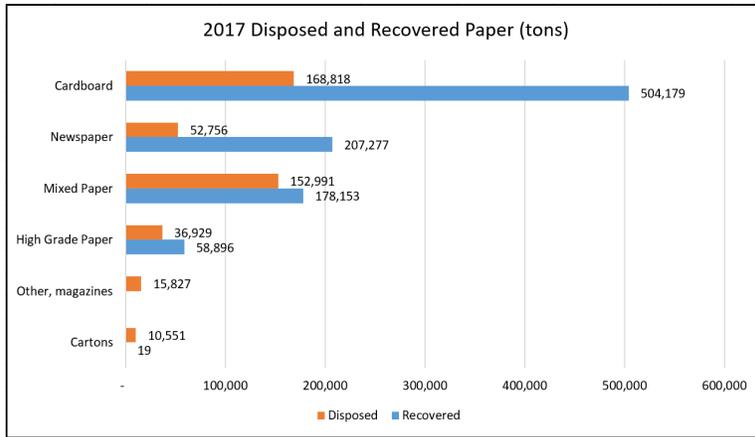


- **How much paper is recovered for recycling?**

- In 2017, nearly 950,000 tons of paper was reported to Ecology as recovered for recycling. The most recent data is available for [2017](#). Ecology uses the term “recovered” to describe these materials, as the actual recycling is often not tracked. Ecology recognizes that not all recovered paper is included in the annual reports we receive.
 - This data comes from facilities that submit annual reports to Ecology for the materials collected, delivered and processed.
 - Some commercial and most industrial and institutional materials are not reported to Ecology. Material that is brokered from one source to another may not be reported to Ecology.
 - Use of paper to remanufacture paper packaging or products are Ecology receives reports from some businesses who use recovered paper to remanufacture paper packaging or products. Ecology recognizes that not all companies that use recovered paper submit reports to the agency. This creates a knowledge gap in the overall understanding of the flow of paper from consumer to manufacturer.
- From the data reported to Ecology for 2017:
 - types of paper recovered for recycling in tons:



- Total paper recovered for recycling and paper disposed in 2017 in tons:



- **How much paper products and paper packaging is generated and used?**
 - In order to more fully understand the market for paper/fiber, the Center should conduct additional research into the manufacturing of paper products and packaging in Washington State. This effort could include purchase of market or sales data.

Data summary by Waste Generation Area (WGA) in the 2015-16 study:

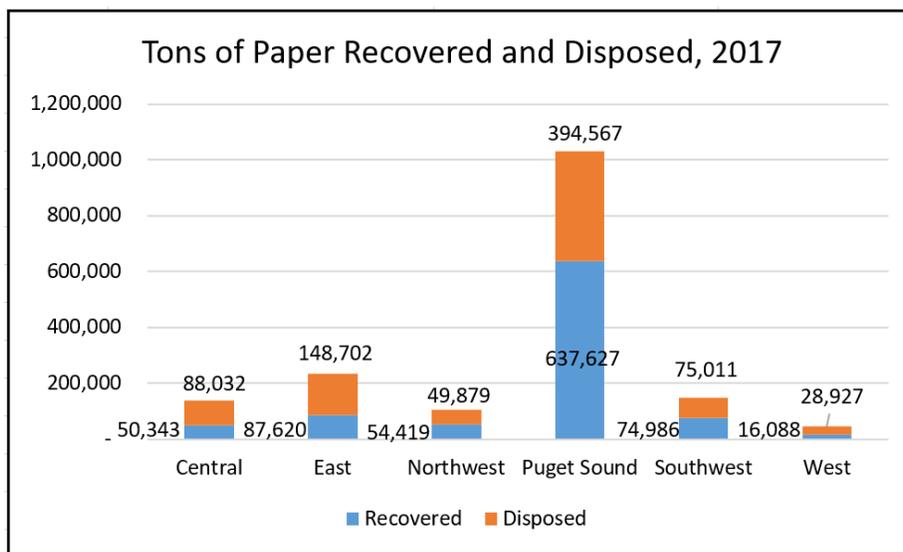
- The 2015-16 [waste characterization study](#) provides analysis of materials in the municipal solid waste stream. The data is provided by material class and type, waste generation areas (WGA), and residential, commercial, and self-haul sectors.
- Paper products and packaging in the municipal solid waste stream in 2017 by waste generation area are presented in the tables below. Disposed paper is based on the waste characterization study percentages. Recovered paper is based on facility reports to Ecology for 2017.

Figure 6: Map of Waste Generation Areas



Paper data by WGA – recovered and disposed for 2017

WGA	Recovered paper (tons)	Disposed paper (tons)	MSW Disposed (tons)
Central	50,343	88,032	590,822
East	87,620	148,702	844,896
Northwest	54,419	49,879	334,760
Puget Sound	637,627	394,567	2,818,338
Southwest	74,986	75,011	500,073
West	16,088	28,927	186,626
Unspecified	27,444	-	42
Washington State	948,524	786,058	5,275,558



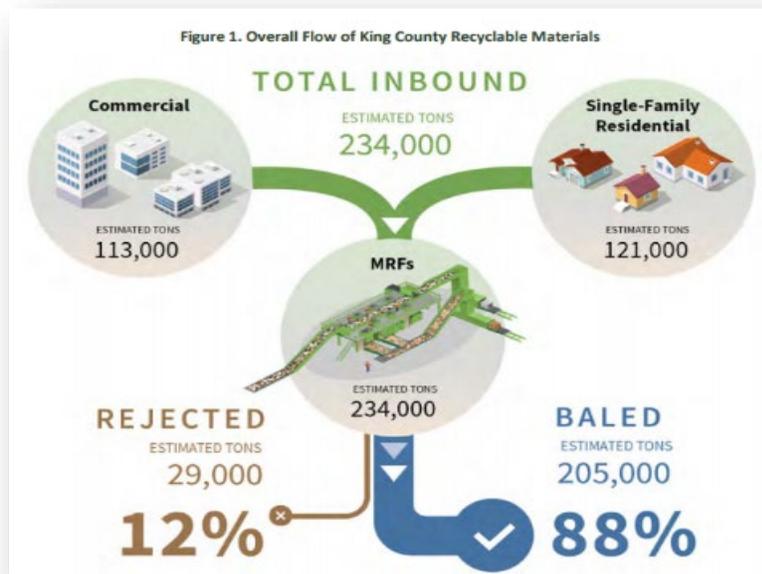
Paper data by WGA based on per capita for recovery and disposal in 2017

WGA	Per Person in Pounds per Year		Population
	Recovered paper	Disposed paper	
Northwest	248	227	439,700
Puget Sound	294	182	4,343,700
West	122	220	263,010
Southwest	224	224	670,060
Central	175	306	575,380
East	172	292	1,018,450
Washington State	260	215	7,310,300

Some of the problems using recyclable paper

Contamination: Facilities receiving post-consumer paper bales as incoming feedstock have reported contamination in the supplied paper at rates as high as 20 percent. A King County study in 2020⁷ reported an overall contamination rate of 12 percent at selected material recovery facilities (MRF). That same study reported a 7.5% contamination rate for mixed paper.

Manufacturers using recyclable paper feedstock often receive contamination of non-fiber materials in the incoming bales of paper. Those non-fiber materials include plastic, broken glass, food debris, liquids, and metal. Those contaminants result in damage to the paper processing equipment, impact the quality of the end product, and result in increased waste and costs.



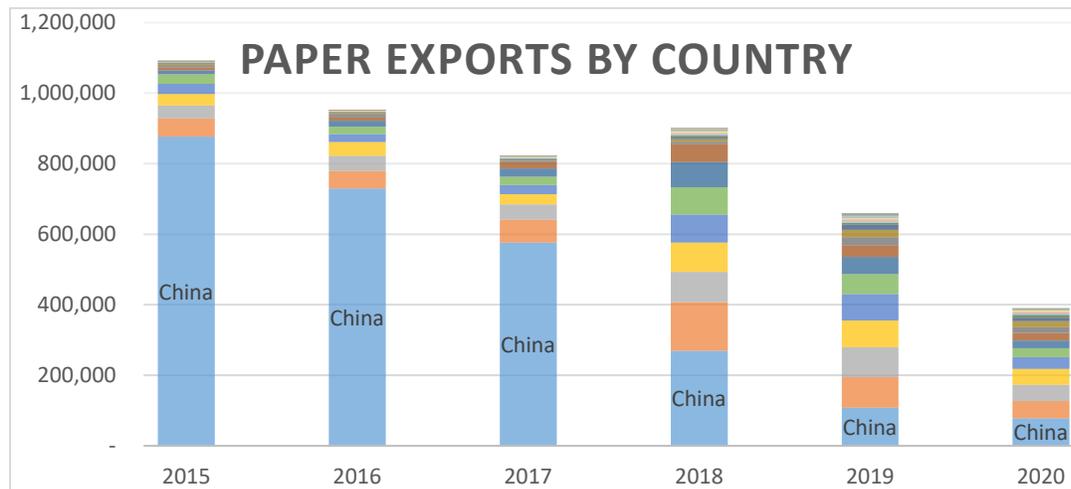
⁷ [2020 Material Recovery Facility \(MRF\) Assessment](#)

Contamination has increased since the advent of single stream recycling, where all recyclable materials are placed in one bin. Collection, processing, and sorting of single stream recyclable materials needs to improve or collection systems may need to change, such as to a two stream – one for fibers and another for containers.

Market fluctuations: Domestic paper manufacturing markets fluctuate with economic and global changes. For example, demand for domestic paper products decreased as a result global or national crisis such as of September 11th, the 2008 great recession, demand from overseas, restrictions on export markets, and the COVID-crisis. The paper industry has experienced a general downward trend as we’ve moved to a more paperless society.

Graphic showing decreasing demand by material type – with increase for packaging.

Export markets: Ecology recently subscribed to WISERTrade’s export data service. The following graphic shows the history of paper exports since 2015. In 2020, the top five export countries for paper exported from Washington were (in descending order): China, Vietnam, Thailand, Taiwan, and South Korea.



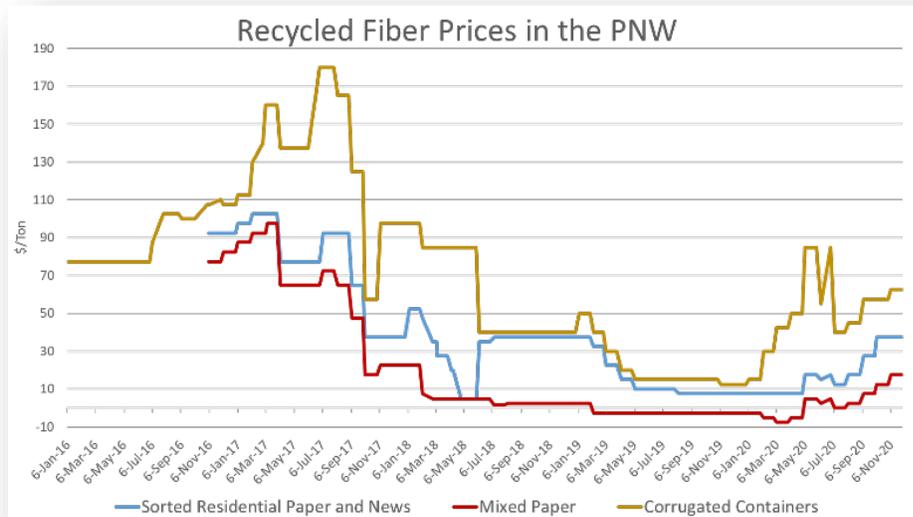
Material loss: A 2016 Ecology study⁸ reported ranges of system loss (recoverable material lost in the process of collecting, sorting, and processing) at material recovery facilities, for paper the loss rates range from 7.4 to 19.1 percent. The study estimated paper utilization rates (material recycled into new products or reused) for paper of 80.9 to 92.6 percent. System losses occur from incomplete sorting of materials at the MRF and loss of recoverable material as it is processed by the end user.

Anecdotally, for the average single-stream residential collection program, if you collect 100 tons of recyclables (not just paper) at the curb, about 75 tons will actually be recycled into new products, the rest ends up landfilled⁹. For the 950,000 tons of paper collected in 2017 for recycling, an estimated 237,000 tons might have been landfilled.

⁸ <https://apps.ecology.wa.gov/publications/documents/1607007.pdf>

⁹ [Understanding Economic and Environmental Impacts of Single Stream Collection Systems \(container-recycling.org\)](http://Understanding Economic and Environmental Impacts of Single Stream Collection Systems (container-recycling.org))

Value of recycled paper: In recent years, prices for recycled fiber plummeted due to overseas restrictions on exported paper materials which limited contamination to less than 0.5 percent. This loss of export markets resulted in lowered value of the recycled paper materials and impacted domestic markets. The change in recycled fiber prices in the Pacific Northwest are shown for January 2016 to November 2020¹⁰.



¹⁰ www.recycle.net