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December 31, 2019

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RE: Solid Waste Policy Report required by Minn. Stat. §115A.411

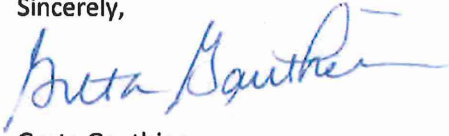
Dear Committee Chairs and Ranking Minority Members:

I am pleased to submit the enclosed Minnesota Pollution Control Agency (MPCA) 2019 Solid Waste Policy Report. Minnesota Statute §115A.411 requires the Minnesota Pollution Control Agency to draft a solid waste policy report for the Legislature every four years. The report must contain information on the status of solid waste management in Minnesota and make recommendations for new or modified policies to advance the management of waste in the state.

Committee Chairs and Ranking Minority Members
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If you would like a hard copy of the report or have any questions regarding this report, please feel free to contact me at 651-757-2031

Sincerely,

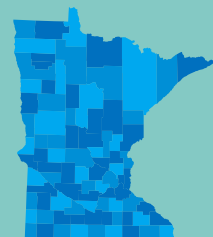


Greta Gauthier
Assistant Commissioner

GG/KW:cbg

December 2019

Solid Waste Policy Report



Legislative charge

Minnesota Statute §115A.411 requires the Minnesota Pollution Control Agency to draft a solid waste policy report for the Legislature every four years. The report must contain information on the status of solid waste management in Minnesota and make recommendations for new or modified policies to advance the management of waste in the state.

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Minnesota Pollution Control Agency

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Acronyms

AD: anaerobic digestion
ASTM: American Society for Testing and Materials
CAP: capital assistance program
C&D: construction and demolition
(C/I/I): commercial/institutional/industrial
CBEI: consumption-based emissions inventory
CO2e: carbon dioxide equivalent
CLP: closed landfill program
EA: environmental assistance
EJ: environmental justice
EPD: (International) environmental product declaration
EPEAT: electronic product environmental assessment tool
EPR: extended producer responsibility
FTE: full time equivalent
FY: fiscal year
GHG: greenhouse gas
GRE: Great River Energy (Resource Recovery Facility)
HBV: health-based value
HHW: household hazardous waste
HRL: health risk limits
IW: industrial waste
IT: information technology
LCA: life cycle analysis/assessment
LEED: leadership in energy and environmental design
LRDG: local recycling development grants
MDH: Minnesota Department of Health
MMSW: mixed municipal solid waste
MSW: municipal solid waste
MNCC: Minnesota Composting Council
MnDOT: Minnesota Department of Transportation
MPCA: Minnesota Pollution Control Agency
MRF: materials recovery facility
OLA: Office of the Legislative Auditor
PCR: product category rule
PFAS: per- and poly fluoroalkyl substances
RMD: recycling market development
REC: Recycling Education Committee
REMI: Regional Economic Models, Inc.
SCORE: select committee on recycling and the environment
SMM: sustainable materials management
SWMT: solid waste management tax
SWPR: solid waste policy report
TCMA: Twin Cities Metropolitan Area
U.S. EPA: United States Environmental Protection Agency
WARM: waste reduction model (from EPA)
WMA: waste management act
WTE: waste to energy

Summary

Minnesota's Waste Management Act has been in place since 1980 and establishes criteria for the management of all types of solid waste including mixed municipal solid waste (MMSW), construction and demolition waste (C&D), and industrial waste (IW). The waste management hierarchy in [Minn. Stat. 115A.02](#) establishes preferred management methods based on environmental impact. Reduction and reuse of materials are at the top of the hierarchy, followed by recycling, composting, and waste to energy, with the least preferable management method being land disposal. The current management system focuses largely on discards and what to do with a material at the end of its life. However, the waste management system is evolving, and sustainable materials management (SMM) approaches are becoming more prevalent.

SMM focuses on the best use and management of materials based on how they impact the environment throughout their life cycle (not only at end-of-life). As the population of Minnesota grows and the economy evolves, new and innovative ways of managing materials will be necessary. An effective SMM approach prioritizes management of materials based on the highest greenhouse gas (GHG) emission savings or other environmental benefits, which oftentimes leads to a focus on prevention and reuse of materials. SMM promotes managing materials in an integrated solid waste system, with the least impact to human health and the environment.

The [2013 Statewide Waste Characterization](#), the [2015 Office of Legislative Auditor's \(OLA\) report](#), the [2015 Recycling and Solid Waste Infrastructure Evaluation](#), and other solid waste data helped guide the MPCA recommendations for the [2015 Solid Waste Policy Report](#). Those recommendations, combined with the [MPCA Strategic Plan](#), and the [Metropolitan Solid Waste Management Policy Plan 2016-2036](#) have helped refine and prioritize the 2019 SWPR recommendations. These reports provide insight into the current solid waste system and point toward recommendations to improve the prevention and management of solid waste in Minnesota. The 2019-2023 Solid Waste Policy Report will also highlight priority areas of the Minnesota Governor and MPCA Commissioner, including equity, climate, community prosperity, engagement and transparency, and data and efficiency. Key issues addressed in this report, as they pertain to solid waste, include climate adaptation, environmental justice, sustainable materials management, and more.

All policy recommendations are listed starting on page 36 of the report. Recommendations are based on MPCA and solid waste priorities. Several recommendations require additional resources and legislative support. Recommendations are labeled as "legislative" when they necessitate legislative action. Recommendations may require long-term commitment, or several stages of implementation. They are not commitments to action, but identifiers for future priorities (short-term and long-term) intended to address barriers and help achieve solid waste goals.

Guiding documents

The recommendations in this report align with solid waste laws including Minn. Statute Chapters 115A, 116, 297H, 400, and 473. The recommendations also follow the mission of the MPCA to protect and improve the environment and human health. Recommendations both draw from and seek to inform the [MPCA Strategic Plan](#), and when appropriate, the [Metropolitan Solid Waste Management Policy Plan 2016-2036](#) (Policy Plan).

MPCA Strategic Plan (2018-2022)

The MPCA's five-year strategic plan charts the agency's direction through 2022.

Cross-agency strategic plan goals include:

1. Incorporating strategies to address environmental justice concerns in all programs.
2. Increasing involvement of communities in decisions and actions that affect them.
3. Acting on opportunities to increase resilience of communities and the environment to climate change impacts.

The land-related goals, which are emphasized in this report, include:

1. Reducing food waste from households and businesses by generating less and rescuing and recycling more.
2. Preventing and reducing risks to groundwater from unlined construction and demolition landfills.

Land-related long-term environmental goals include:

1. Solid waste is managed to conserve materials, resources, and energy.

The [2013 Statewide Waste Characterization Report, OLA report](#), [Waste Infrastructure and Capacity Assessment](#), and other solid waste data helped guide the MPCA recommendations for the [2015 Solid Waste Policy Report](#). Those recommendations, combined with the [Strategic Plan](#), and the [2016 Metropolitan Solid Waste Management Policy Plan](#), have helped refine and prioritize the 2019 SWPR recommendations. These reports are foundational pieces of information that provide insight on the current waste system. They help identify actions necessary to continue to improve the prevention of solid waste and the management of solid waste in Minnesota.

Applicable cross-agency strategic plan goals

Climate adaptation

Act on opportunities to increase resilience of communities and the environment to climate change impacts.

Climate change is already occurring in Minnesota and its impacts are affecting communities, the environment, and the economy. For example, the top ten combined warmest and wettest years on record in Minnesota have occurred since 1980. Heavy rains are now more common in Minnesota and more intense than at any time on record; and quantities of both contact water and landfill leachate are expected to increase with higher average precipitation and more frequent, extreme rainfall.

The MPCA also recognizes the connection between solid waste and climate change, as demonstrated by the GHG emissions identified by the consumptions-based emissions inventory (see page 18). Climate change adaptation includes developing and implementing strategies to help human and natural systems prepare for climate change and address climate change impacts.

Over the last several decades, the state has experienced substantial warming during winter and at night, with increased precipitation throughout the year, often from larger and more frequent heavy rainfall events. There is increased need to properly clean up and manage solid waste, hazardous materials, and debris after floods, storms, and other natural disasters. A higher frequency of natural disasters increases the demand for disaster remediation and coordination efforts, as well as for trained staff to meet these specific needs. Design standards for permitted waste management facilities are linked (by rule) to certain magnitudes of storm events (i.e., 25- or 100-year storms). As storm severity increases, this affects facility needs.

In terms of climate adaptation at permitted solid waste facilities, precipitation data is used for stormwater modeling. For lined landfills, there is a rule requirement that stormwater management systems must be able to cope with a 25-year, 24-hour storm event. When permits come up for reissuance, some of these landfills are voluntarily designing for a 100-year, 24-hour storm event.

The following table, Table 1, identifies the observed trends among common weather hazards in Minnesota, based on information from data analyzed by the Minnesota Department of Natural Resources and the State 2014 National Climate Assessment. In juxtaposition, Table 2 depicts the projected and expected trends among common weather hazards in Minnesota, and confidence that those hazards will be exacerbated by climate change, as reported in the [2017 Report of the Interagency Climate Adaptation Team, Adapting to Climate Change in Minnesota](#).

Confidence that climate change will impact common Minnesota weather/climate hazards beyond 2025

Confidence	Hazard	Expectations beyond 2025
Highest	Extreme cold	Continued rapid decline
	Extreme rainfall	Unprecedented events <u>expected</u>
High	Heat waves	Increases in severity, coverage, and duration expected
Moderately High	Drought	Increases in severity, coverage, and duration possible
Moderately Low	Heavy snowfall	Large events less frequent as winter warms
Moderately Low	Severe thunderstorms & tornadoes	More “super events” possible, even if frequency decreases




Table 1 identifies the observed trends among common weather hazards in Minnesota, based on information from the 2014 National Climate Assessment and data analyzed by the Minnesota DNR State Climatology Office, as published in the [2017 Report of the Interagency Climate Adaptation Team, Adapting to Climate Change in Minnesota](#).

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Table 2 Depicts the projected and expected trends among common weather hazards in Minnesota, and confidence that those hazards will be exacerbated by climate change, as reported in the [2017 Report of the Interagency Climate Adaptation Team, Adapting to Climate Change in Minnesota](#).

In spring 2019, the MPCA solid waste program participated in a climate change adaptation risk assessment which culminated in the publication of the [Climate Change Risk Assessment: Summary of Process and Data](#). The Risk Assessment report provides suggested actions and additional considerations for climate adaptation. Specific to solid waste, the report advises providing appropriate gear and training for emergency response staff; updating landfill design and operations rules so they can properly handle larger rain events; and creating waste management plans for anticipated large livestock and plant die-offs.

Environmental justice

Incorporate strategies to address environmental justice concerns in all programs.

The MPCA is committed to ensuring that pollution does not have a disproportionate impact on any group of people. This is the principal of environmental justice. This means that all people—regardless of their race, color, national origin, or income—benefit from equitable levels of environmental protection and have opportunities to participate in decisions that may affect their environment or health.

MPCA is working to ensure that all of its programs consider and address environmental justice as part of their work. This includes:

- Identifying how low-income residents and people of color may be experiencing disproportionate environmental impacts and harm.
- Identifying ways to reduce disproportionate impacts and prevent future harm.
- Evaluating how policies and programs under development or consideration may impact low-income communities and people of color.

- Conducting extra and early outreach and engagement to ensure that all Minnesotans have an opportunity to participate in decisions about activities that may affect their environment and health.

This 2019 SWPR seeks to highlight opportunities for addressing environmental justice through solid waste programs and policies. To work toward environmental equity, decision makers can actively seek out and facilitate the involvement of potentially affected communities so that all people have an equal opportunity to participate in decisions that may affect their environment and health. Community members can provide authentic, qualitative information about the vulnerabilities and challenges they face, based on their lived experiences, culture, and social context.

Engagement

Increase involvement of communities in decisions and actions that affect them.

Community engagement means building relationships, improving trust, and involving all Minnesotans in our work in an accessible and responsive manner. The MPCA solid waste program works to follow best practices in conducting engagement work, storing and analyzing data, and acting on information. The agency values collaboration, inclusivity, accessibility, transparency, and accountability in public engagement processes.

Effective outreach will require MPCA to use trusted sources of information in the affected community, which may include local newspapers, radio, newsletters, etc. Participation in local organizations' meetings is also important. The MPCA solid waste program can make an effort to ensure that written materials, presentations, and informal communications are accessible, easily understandable, free of jargon, accurate, truthful, and culturally appropriate. If translation is beneficial, languages will be determined based on community information and demographic data.

For some MPCA actions, a formal public meeting is required by state or federal regulations. Whether or not public outreach is formally required, MPCA can seek to provide community members with information early in any process, frequently, and in a variety of mediums.

Examples include holding informal meetings, listening sessions or "office hours" in the community at a variety of times at locations that are convenient for the community; attending other meetings and events being held in the community; supporting the formation of citizen advisory committees; and offering to meet with representatives of community groups.

Minnesota's current solid waste system and dynamics

The Minnesota Waste Management Act (WMA, Minn. Stat §115A.02)

Adopted in 1980, the [WMA](#) established criteria for managing solid waste. The goal of the act is to protect Minnesota's land, air, water, and other natural resources and public health by:

- reducing the amount and toxicity of waste generated.
- separating and recovering materials and energy from waste.
- reducing indiscriminate dependence on disposal of waste.
- coordinating solid waste management among political subdivisions.
- developing waste facilities in an orderly and deliberate way.

The waste management hierarchy

The WMA also fosters an integrated waste management system in a manner appropriate to the characteristics of the solid waste stream. Based on environmental factors, the waste management hierarchy (Figure 1) prioritizes waste reduction, reuse, recycling, and organics recovery above methods that preclude further use of the materials, including waste-to-energy (WTE) (burning refuse to recover fuel or energy) and land disposal.

Minnesota's waste hierarchy

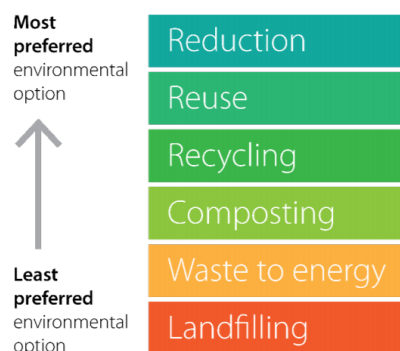


Figure 1. The Solid Waste Hierarchy prioritizes prevention (or reduction of waste), then reuse, recycling, organics recycling, WTE, and landfilling, in that order.

Roles and requirements

In Minnesota, the responsibility of managing solid waste is primarily delegated to the counties, while the state retains oversight authority and supports local efforts through permitting, planning, financial support, and technical assistance. Plans include how the county will ensure waste is managed properly to meet the goals and objectives of the WMA and all efforts that will be undertaken to manage waste in accordance with the hierarchy.

The seven-county Twin Cities Metropolitan Area (Metro Area) and Greater Minnesota counties have different sets of requirements governing their solid waste planning. Metropolitan County Solid Waste Master Plans must comply with the current Metropolitan Solid Waste Management Policy Plan (Metro Policy Plan), which is a 20-year plan updated every 6 years (Minnesota Stat. § 473.149). Greater Minnesota County Solid Waste Plans must conform to WMA and Minnesota Rules. Greater Minnesota County Solid Waste plans are updated every 10 years and Metro County Solid Waste plans are updated every six years.

Case study: Greater Minnesota grants

The 2015 Legislature created a program and allocated two million dollars over two years for recycling and composting grants in Greater Minnesota. The program is now built into the agency's base budget at one million dollars each year. The focus of the funding is to promote and enhance recycling systems in rural areas. The MPCA distributed grants totaling four million dollars between 2015 and 2019 for projects ranging from implementing single-stream curbside collection of recyclables, to recycling demolition debris, to initiating composting programs. Twenty-nine grants have been awarded through this program to date.



The City of Moorhead exemplifies a successful Greater Minnesota grant. Starting July 2017, the City of Moorhead (population 40,500) transitioned from multi-sort recycling to single-sort curbside recycling and provided 5,000 multi-family homes with the opportunity to recycle. In the first six months after roll out, curbside collection increased from an average of 44 tons to 204 tons per month.

The City of Moorhead used a Greater Minnesota Grant to help them purchase over 11,000 96-gallon totes and roll out a brand new, single-sort program. Moorhead can now accept materials that were previously not collected, such as office paper, mail, phonebooks, and more. Moorhead also created a “No-Sort” recycling guide which was posted on the City of Moorhead website and sent to all household residents and multi-family managers in Moorhead.

Waste measurement and the solid waste system

In 1989, the Minnesota Legislature set county recycling goals. Each Greater Minnesota county (outside of the seven-county metro area) must recycle a minimum of 35% (by weight) of total solid waste generation by 2030. The 2014 Legislature increased the recycling goal for the seven-county metro area from 50% to 75% of the MMSW they generate by 2030. In 2016, the Legislature also passed a commercial recycling law (§115A.151) that requires businesses to recycle at least three material types, — like paper, metal, glass, organics, or plastics — if they are in a certain North American Industrial Classification System (NAICS) code and contract for pick-up of at least 4 cubic yards of trash per week.

This report addresses three types of solid waste: municipal solid waste (MSW) (including source separated materials and mixed waste (MMSW), industrial waste (IW), and construction and demolition waste (C&D). The WMA does address all types of solid waste, but there are separate requirements for IW and C&D facilities. There has, historically, been an emphasis on measuring and managing MSW. Most rules, laws, fees, and taxes are aimed at MSW disposal. The focus of state and local programs in the future should ensure that all materials—MSW, IW, and C&D—are managed to their highest and best use.

Each type of solid waste has a different tax structure according to the Solid Waste Management tax law ([Chapter 297H](#)) (Table 3). Non-MMSW is much cheaper to dispose of, with a fee of only sixty cents per cubic yard, whereas commercial MMSW has a 17% state service fee and residential MMSW has a 9.75% service fee. Counties can also tax waste separately.

Waste type	Fee
MMSW – residential	9.75% of service fee
MMSW – commercial	17% of service fee
MMSW – self haul	17% of tip fee
Non-MMSW (industrial, demolition, medical)	\$0.60 per cubic yard of container

Table 3 shows how the solid waste management tax is applied for different waste types.

The MPCA conducted a [waste characterization study in 2013](#) to determine the constituents in MMSW disposal streams across the state. A similar study was conducted in 2000. Comparisons of those two studies show that the composition of disposed MMSW is changing. The top three categories of MMSW — paper, plastics, and organics — remain the largest material types in the waste stream by weight. There was a reduction in the percentage of paper generated and an increase in both plastics and organics (as a percentage of the total waste collected) from 2000 to 2013. Opportunities exist for these materials to be prevented or recovered for reuse, recycling, or organics recycling.

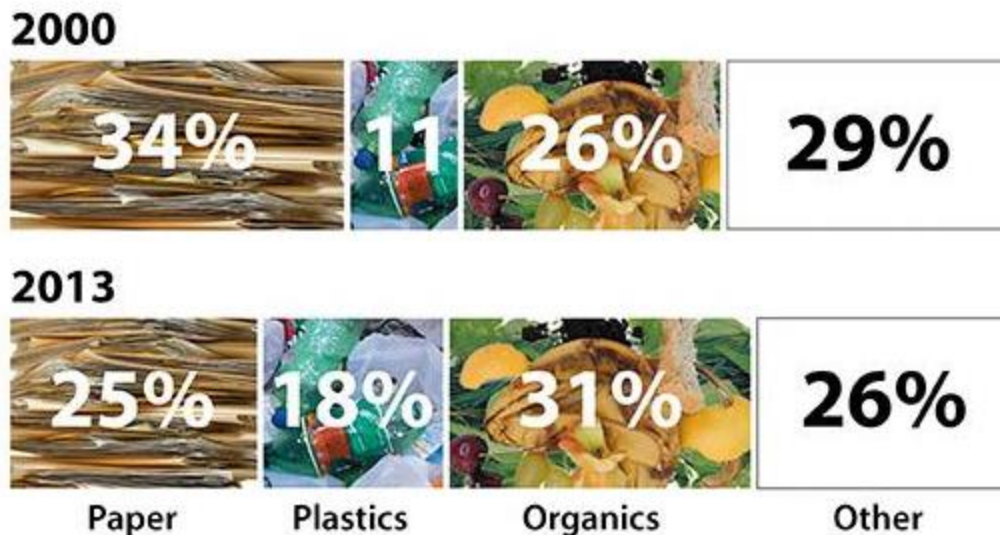


Figure 2. This figure shows a comparison between the 2000 and 2013 waste composition studies. The 2013 study found that Minnesota’s waste stream has changed over the last 13 years. Paper, plastics, and organics are still the top three components of our trash, but the proportions have changed (<https://www.pca.state.mn.us/waste/minnesota-msw-composition-study>).

The [2016 Metro Policy Plan](#) currently has a WTE goal of 35% of total waste managed by 2020. Great River Energy Resource Recovery Facility in Elk River (GRE) stopped accepting MMSW in January of 2019, reducing the capacity for WTE processing in the seven-county metro area by 33%. This is an opportunity to renew efforts to increase reduction, reuse, and recycling of this material. However, if current reduction, reuse, and recycling trends do not improve, this will result in higher amounts of landfilling for 2019 and into the future.

Nearly one third of the material we generate in Minnesota is landfilled. The MPCA’s Closed Landfill Program (CLP) was established by the Legislature in 1994 as an alternative to Superfund. The first such program in the nation, CLP is unique in that the MPCA has assumed the responsibility to manage closed, state-permitted, MMSW landfills, thereby mitigating risks to the public and the environment. There are 114 landfills eligible to be in the program. At the time of this report, 110 landfills have entered the program. Through fiscal year 2019, cumulative expenditures to address human health and environmental risks at the 110 landfills are \$462,712,933.

Geographic maps of Minnesota’s landfills, recycling facilities, transfer stations, waste-to-energy facilities, and compost sites can be found in Appendix A of this report.

Select Committee on Recycling and the Environment (SCORE)

The MPCA uses the SCORE annual report information to tell a more complete story of the state’s solid waste system. The [SCORE report is posted annually on the agency website](#). SCORE uses data from all 87 counties (and Western Lake Superior Sanitary District) to detail trends in waste generation, management, and disposal. SCORE data trends are used to help develop sound policy and solid waste plans to manage waste in a manner that protects the environment and human health. Funding for SCORE grants to assist counties with their solid waste activities comes from the Environmental Fund and allocation is statutorily determined based on a county’s population.

2017 marks the highest documented combined recycling rate (organics recycling and traditional recycling) recorded for Minnesota since the start of the SCORE program in 1991. SCORE shows trends that more paper, plastics, and organics are being diverted from disposal. Those materials make up the majority of waste in the state. The total amount of municipal solid waste (MSW) generated in 2017 for Minnesota was 5.8 million tons, which is a 7.2% increase from 2016. Of that amount, combined recycling and organics makes up 44.8% of the total versus 43.1% the previous year (total tonnage increased 11.2% year-on-year).

The 2017 interactive SCORE report (based on 2017 data and published in 2019) summarizes the current state of recycling and waste diversion of MMSW in Minnesota. The 2017 SCORE report is the first version of an interactive Tableau report, and all data is available online from 1991 to 2017. Figure 3 shows waste-to-energy, landfilling, organics management, and recycling over time, based on SCORE reporting.

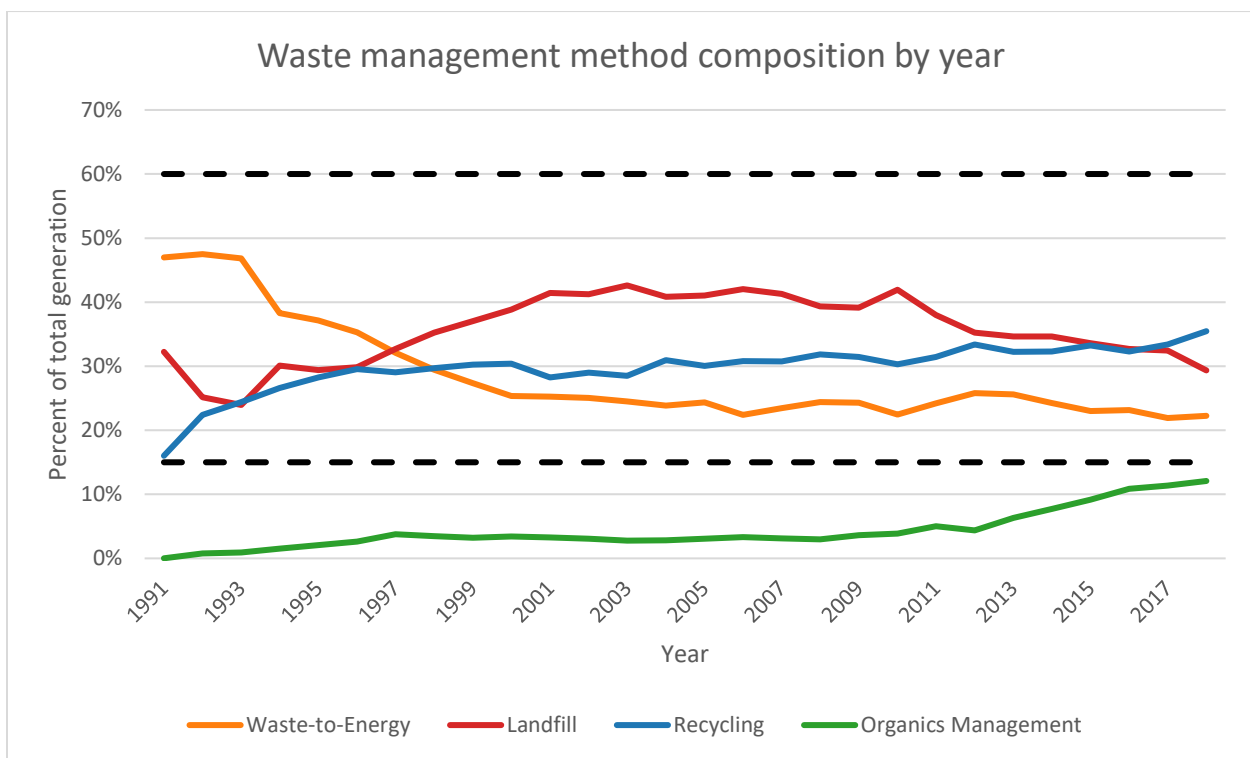


Figure 3. This figure shows waste-to-energy, landfilling, organics management, and recycling over time, as a percentage of total generation, based on SCORE reporting.

Minn. Statute § [115A.93](#) requires haulers to report to the MPCA. Counties, as the licensing entity, have been integral to that process. In order to make this effort successful, MPCA seeks additional support from counties, including follow-up with non-compliant haulers. The goal is to alleviate county reporting responsibilities and create a more efficient and accurate reporting structure.

The MPCA has made several notable changes to SCORE reporting over time. In 1993, the agency started a source reduction credit which added an additional 3% to the recycling rate of a county that demonstrated the implementation of a solid waste reduction program. In 1995, yard waste was no longer included in recycling tonnage. Counties were then granted a 5% credit to their recycling rate if

they had yard waste programs. However, yard waste credits and source reduction credits were both removed in 2013 in order to improve reporting by utilizing actual tonnages.

In 2015, three significant changes happened in SCORE reporting. Source-separated organic materials were added to the definition of “recyclable materials.” Commercial/Institutional/Industrial (C/I/I) estimates were no longer accepted without MPCA approved methodology, due to an emphasis on documenting measured tonnages. Also in 2015 (reporting year 2014), counties began entering their SCORE information online via Re-TRAC software, which was an improvement over the previous online portal.

The current information shown on the MPCA SCORE website reflects these changes. Historical data has been adjusted so that all data is matching the current collection method. All estimates from historical data were removed. Only tonnages are used in calculating recycling rates.

This focus on documented tonnages allows the MPCA to see actual changes in recycling at the county level once a new baseline is achieved. Commercial tonnages are more difficult to collect, since businesses are not required to provide recycling data. MPCA relies on county surveys to businesses for commercial recycling tonnages. The MPCA is currently working with metropolitan counties to identify appropriate methods to address this cumbersome process. Improving compliance from haulers on reporting will help with most of the business recycling data, but the counties will continue to struggle with documenting direct sale of recyclables to end markets. For example, cardboard recycling at big box retail and grocery stores is sold directly to end market without being collected by a hauler.

2018 SCORE reporting has added a form in Re-TRAC for counties for licensed hauler lists. Licensed hauler lists will assist MPCA with compliance and outreach for hauler reporting. As hauler reporting compliance improves, counties will be less burdened by collecting MSW data, and the MPCA will have better documented tonnage from commercial entities.

Source reduction, SCORE data

Preventing waste is the only way to stop or slow the upward trend of total waste generation in Minnesota. While documenting the amount of waste not generated is challenging, ongoing efforts focus on quantifying the avoided waste alongside other standard measurements. In the past, the MPCA has reported on the overall waste generated in the state and the per capita waste generated using population data. The MPCA can also use U.S. Environmental Protection Agency’s (EPA) documented methodology that predicts how much waste should have been generated based on personal consumption expenditure. This section describes MPCA methodology for predicting how much waste could have been generated as compared to our reported SCORE documented waste generation.

This is the first year the MPCA is showing “source reduction” in SCORE reporting at a statewide level. Source reduction (or waste prevention) means not generating any materials that require further management or disposal. An estimate of source reduction is displayed by the orange projection line on Figure 4 labeled “Expected Waste Generation,” and it was calculated using a methodology pioneered by the EPA. Based on per capita expenditure, the “Expected Waste Generation” projects (from 1997) how much waste would be expected in 2017 if we generated waste at the same 1997 rate in waste per millions of dollars spent (Figure 4). SCORE data uses documented tonnages to tell us that waste generation per capita is increasing since 2008. However, waste generation per capita is increasing at a rate slower than the EPA methodology predicted using consumption expenditure numbers.

Total generation of MSW increased by 7.2% from 2016 to 2017, but population only increased by an estimated 0.9%, indicating that we are producing more waste per capita in 2017 than in 2016. However, the EPA methodology predicted that Minnesota was expected to generate even more waste than SCORE

reported. It is positive that we have not generated the numbers predicted by the EPA’s personal consumption expenditure model, but we must take action to promote waste prevention, so that SCORE-reported waste per capita starts to decline.

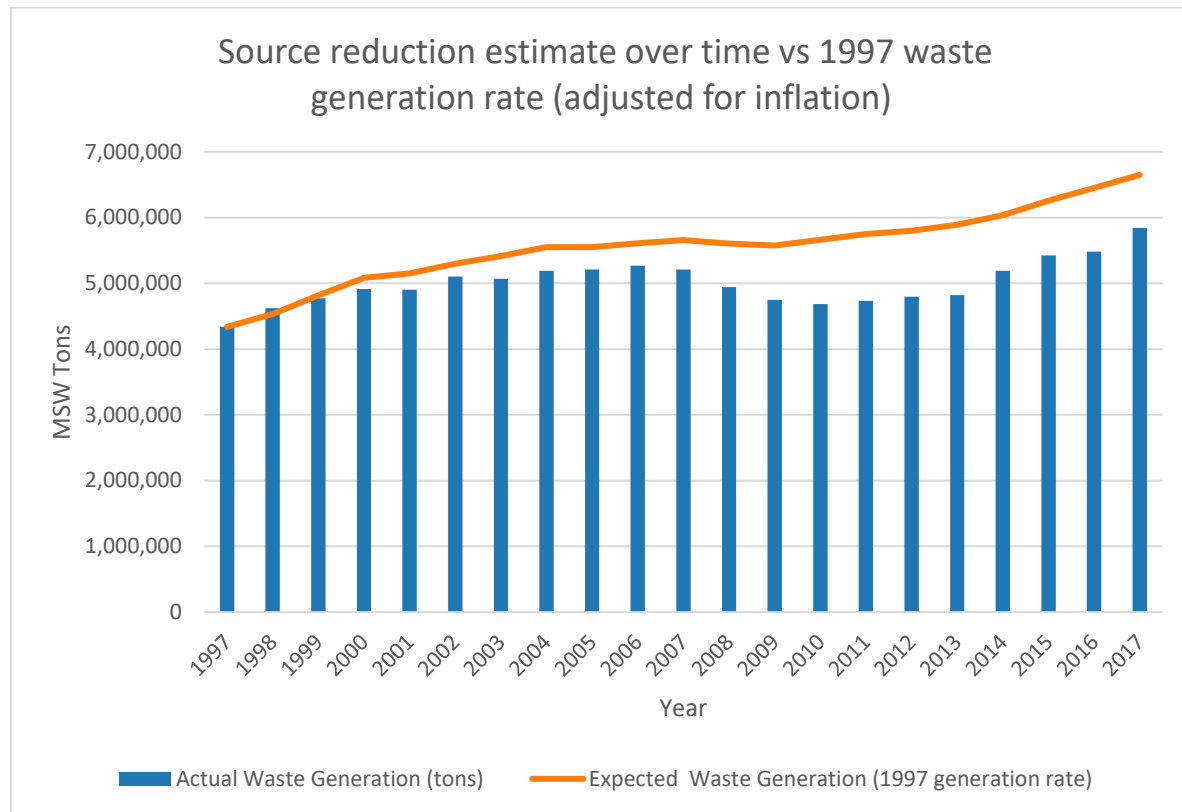


Figure 4. This chart compares source reduction (based on SCORE data) as compared to the expected waste generation (based on a 1997 waste generation rate using per capita expenditure).

Combined recycling, SCORE data

Every year since 2010 has seen an increase in recycling rates. Recycling and organics collection grew to 44.75% in 2017. This is an increase of 11.2% from 2016. All major categories of recyclables increased statewide in 2017 compared to 2016 with the exception of the “other” category (e.g., textiles, mattresses, household hazardous waste). 2017 marks the highest true combined recycling rate (no source reduction or yard waste credits included) for the state ever recorded since the start of the SCORE program in 1991.

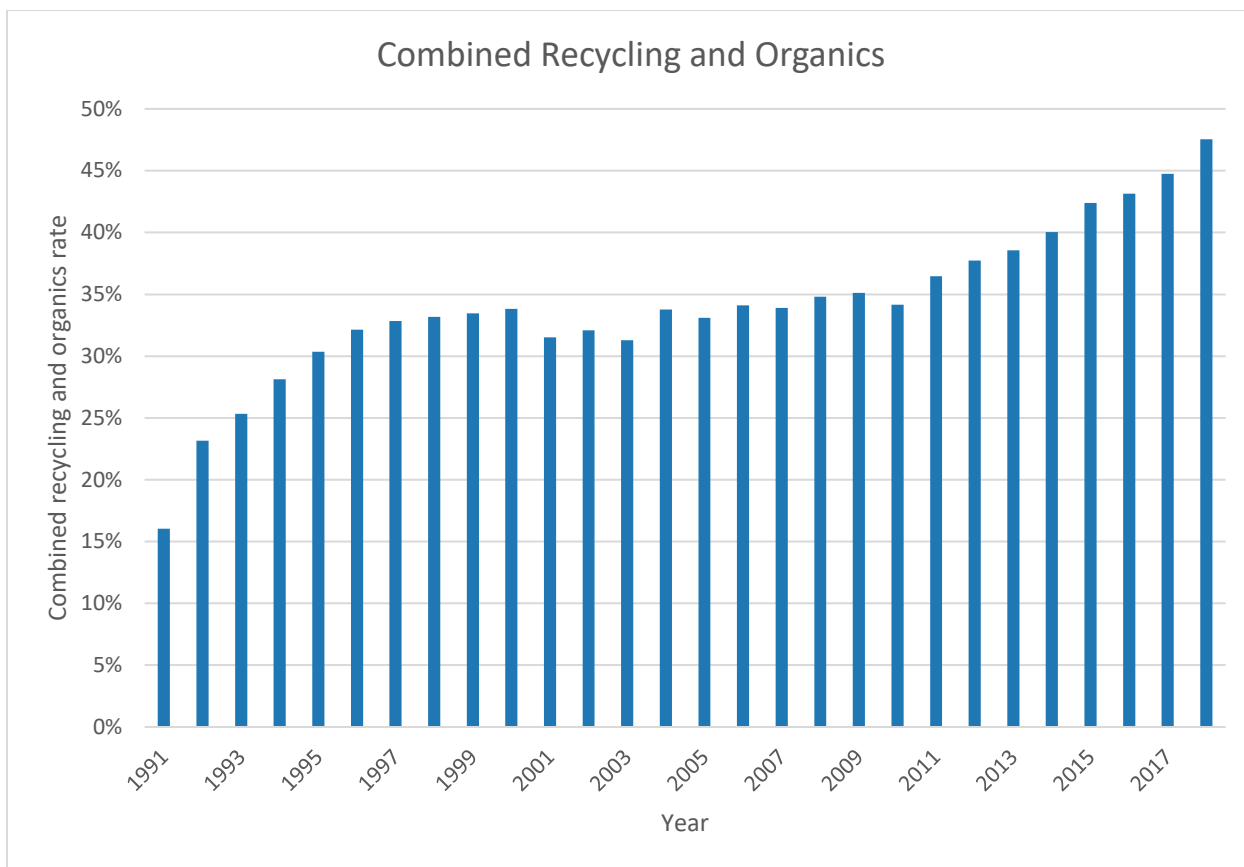


Figure 5. This graph shows Minnesota’s combined recycling goal (traditional recycling and organics recycling) over time using SCORE reporting.

Organics deep-dive, SCORE data

Figure 6 shows various organics management methods, including yard waste composting, source-separated organics (SSO) composting, food-to-animals, and food-to-people. Since 2013, counties have made efforts to document yard waste composting and food-to-people in the SCORE survey (in addition to solid waste or source-separated organics composting). The amount of source-separated organics increased 11.47% from 2016 and continues to show overall positive growth.

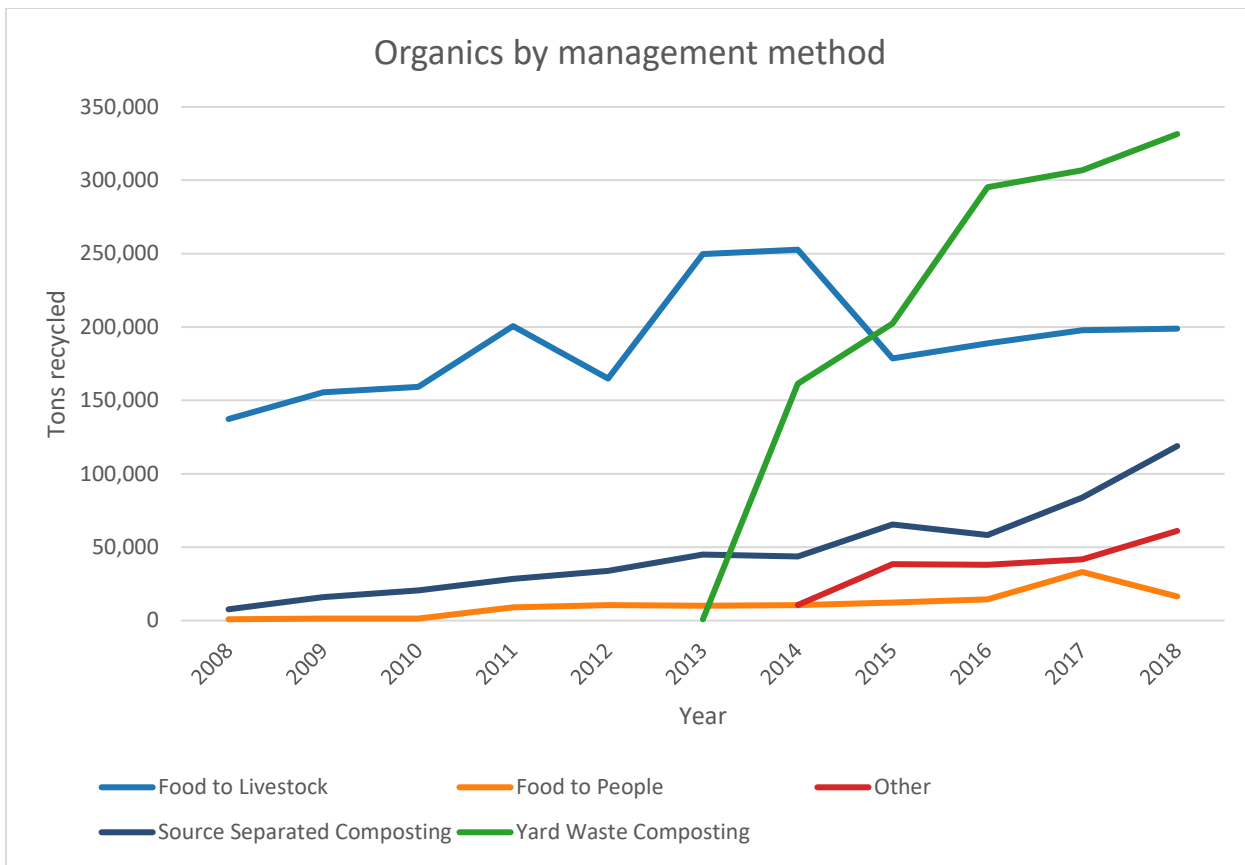


Figure 6. This graph shows organics management methods over time, including food to livestock, food to people, SSO composting, and yard waste composting.

It should be noted that, prior to 2013, yard waste was not included as a measured portion of the organics stream. As previously stated, 5% was added to the recycling rate if county programs demonstrated certain activities. In 2013, the MPCA stopped using estimates and allowed yard waste tonnage, if documented, to count toward the organics data.

Solid waste system: Focus areas and considerations

Minnesota's solid waste system is ever evolving and responding to environmental issues, capacity challenges, and market directions. The MPCA takes a systematic view in sustainably managing materials to accomplish solid waste and agency-wide goals. The following focus areas are points of consideration, ranging from prevention of waste to contaminants of emerging concern. Foundational information in this section will lay the groundwork for this report's recommendations.

Sustainable materials management (SMM)

The MPCA supports a sustainable materials management (SMM) framework. SMM is a systematic approach to minimizing the total environmental impacts of materials over their entire life cycles, including product design, raw material extraction, production, use (and reuse), and best management when discarded (Figure 7).

SMM includes traditional solid waste management, but is also concerned with the larger scope of materials and the toxic chemicals used to manufacture those materials. The MPCA and EPA agree that an SMM approach seeks to:

- use materials in the most productive way with an emphasis on using less
- reduce toxic chemicals and environmental impacts throughout the material life cycle
- ensure we have sufficient resources to meet today's needs and those of the future.



Figure 7 shows the environmental life cycle of materials.

As the solid waste management system matures from the early 1980s and new tools become available, the MPCA is tasked with integrating pollution prevention and solid waste programs to ensure materials and products are managed in the best way for the environment and human health. Without an integrated framework, we could miss opportunities to protect our air, water, land, and health. For example, when a discarded product can be recycled but contains a toxic component, should it still be recycled? A purely solid waste perspective would say yes, recycling is preferred to disposal. A pollution prevention perspective would say no; it's better to design out the toxic material or to remove it during recycling to prevent its recirculation. Electronic products provide another great example of this conundrum. Plastic casings for computers and other electronics often contain toxic flame-retardants that cause harmful worker exposures during recycling. Thus, they should not be present in certain recycled products such as children's toys or food contact packaging.

An SMM approach can help identify greatest environmental impacts at different life cycle stages of a product. Use of life cycle assessment (LCA) and taking an SMM perspective yields information on environmental impacts and helps policy makers focus efforts on high leverage opportunities. Neither SMM nor pollution prevention principals provide information on other important factors such as environmental justice or economic considerations. Life cycle assessment tools cannot tell us which impacts to prioritize. That is ultimately a question of judgement and values, not analysis. Though the focus of the MPCA is primarily on the environment and human health, the MPCA has and will continue to consider implications for all of these factors when making decisions on policy, planning, and implementation.

MPCA has chartered an SMM lateral team to operationalize sustainable materials management. This team finalized and shared an SMM vision (see Appendix B). The SMM team will analyze specific materials to determine if reuse, prevention, or recycling will yield the greatest environmental benefits for specific materials, thus identifying the highest and best use for each material. For example, Figure 8 shows that source reduction (or prevention) of food waste has significantly less greenhouse gas impacts than any form of food disposal, which is one of the reasons why the MPCA SMM team is prioritizing food waste reduction and food-to-people programs in its work.

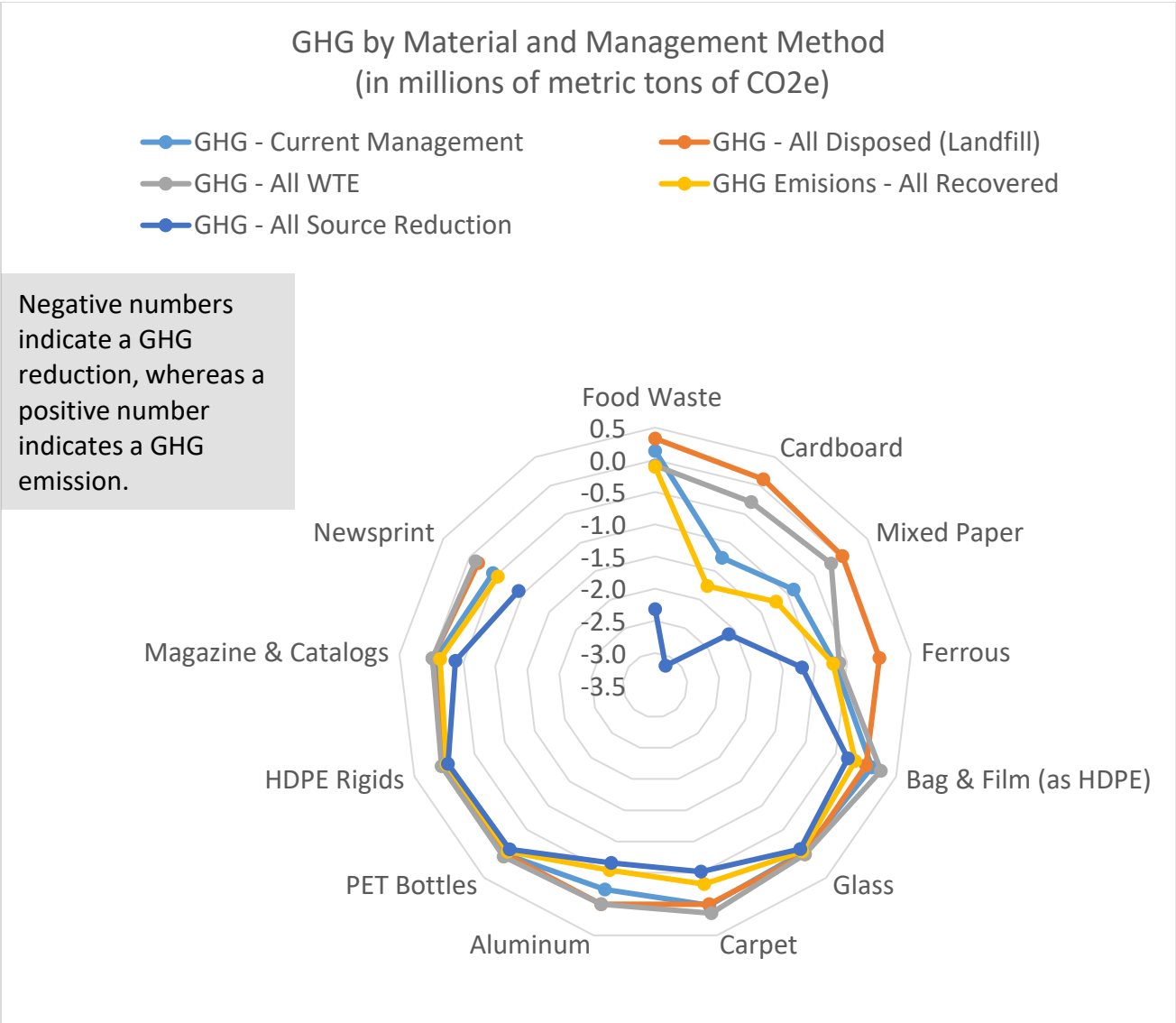


Figure 8. This diagram uses the EPA’s WARM tool (Waste Reduction Model) to show the greenhouse gas impacts of various management methods for various material types. For all material types, source reduction (i.e., prevention) yields the least amount of greenhouse gas emissions. This is but one tool used to evaluate the environmental impact of materials using an SMM approach.

While SMM does tend to favor prevention and reuse, it also reaffirms the importance of recycling. Recycling is commonly lauded for its ability to decrease demand for landfilling. However, there is a greater demonstrated environmental benefit in recycling when it alleviates the need for extracting virgin materials. Although recycling is important, identifying the highest and best use for each material is the primary consideration under this framework. The SMM team will also use an environmental justice lens, in addition to an SMM outlook when prioritizing management methods for material types.

Consumption-Based Emissions Inventory

Under an SMM framework, greenhouse gas emissions data for all phases of a product's life cycle can be used as a measure of environmental impact. To get a clearer picture of Minnesotans' total greenhouse gas (GHG) emissions, the MPCA recently completed a [Consumption-Based Emissions Inventory \(CBEI\)](#). The model uses Minnesota-specific data from 2012.

The CBEI is a method used to estimate the GHG emissions that are created when Minnesotans consume everyday goods and services. The model uses waste generation based on SCORE and uses EPA's Waste Reduction Model (WARM) calculator to show how different materials have highest and best uses.

This approach accounts for emissions through a product or service's entire life cycle. A CBEI includes everything that households and governments purchase for consumption, as well as life cycle GHG emissions resulting from any goods that businesses have not yet sold. The model breaks down emissions by five life cycle phases:

- production (no matter where the emissions occur in the world)
- pre-purchase transportation
- wholesale and retail
- use
- disposal, including recycling, landfilling, WTE

The CBEI can help those looking to minimize the climate impacts of materials and consumption. The CBEI divides consumption-related emissions into about 20 categories such as food and beverages, electronics, and construction. Identifying which parts of a product's life cycle have the largest impacts is an important step in prioritizing materials management policies and actions. For example, if impacts are primarily in the "use" phase, this suggests a need for efficiency gains or reduction in overall use. When impacts are primarily in "production", this might signal a need for cleaner production, extending the life of items, and in some cases, reduction of demand.

The CBEI shows that the biggest opportunity to reduce greenhouse gas emissions for most product categories lies in the phases of "production" and "use"—the upstream design phases of the product. There is often a focus on transportation and disposal of waste, but CBEI data points to the importance of solid waste prevention and reuse. For example, the CBEI reveals that doubling the useful life of clothing and household furnishings and supplies by increasing repair and would be equivalent to increasing vehicle efficiency by 15% or a GHG emissions reduction of 2.5 million metric tons of carbon dioxide equivalent (CO₂e).

The CBEI also shows that some of the largest emissions are "production phase" emissions occurring in the categories of food & beverages, construction materials, and furnishings and supplies (see Figure 9). This is why the SMM team has prioritized working on prevention of wasted food, on food-to-people efforts, and reuse of C&D materials (building deconstruction). These focus areas could result in the greatest marginal environmental benefits. Both of those issues help inform strategic plan goals and serve populations identified as living in areas of environmental justice concern.

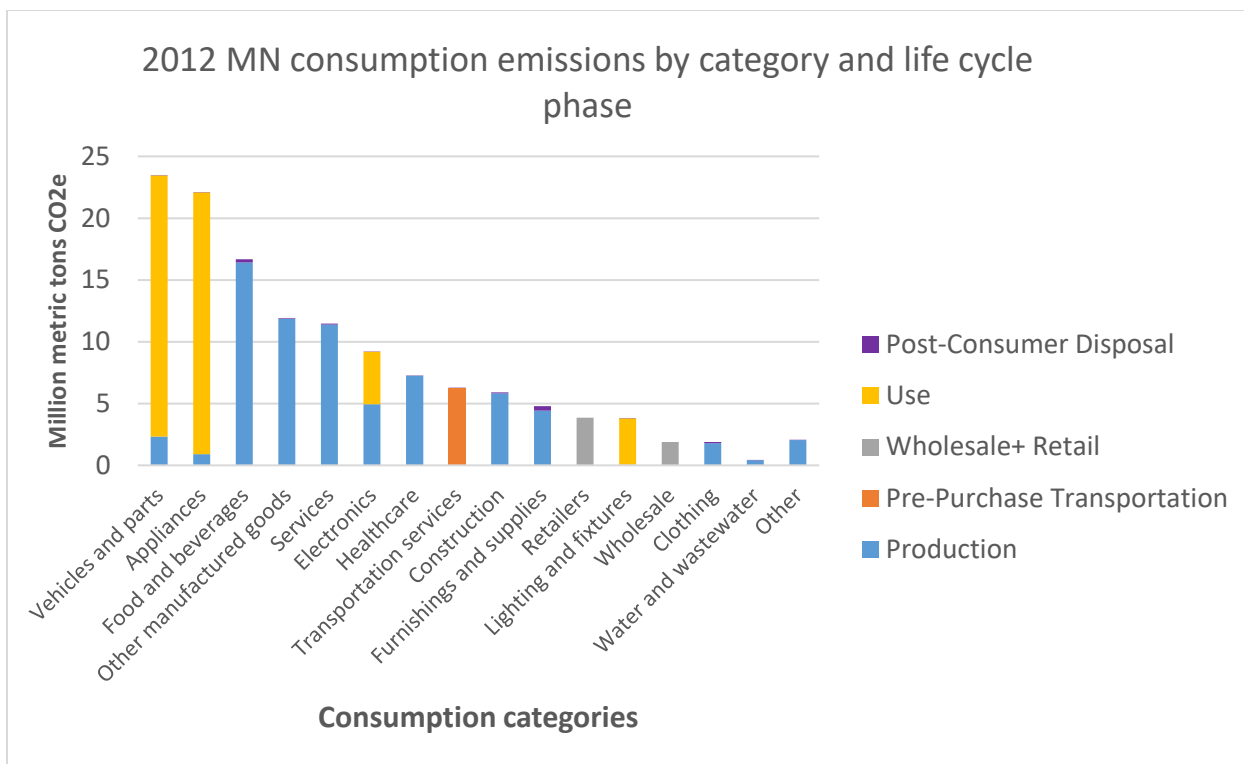


Figure 9. This bar graph shows the consumption-based emissions by sector spend, throughout each life cycle phase including production, pre-purchase transportation, wholesale & retail, use, and post-consumer disposal. The CBEI describes everything Minnesotans make, buy, and use, but it does not specifically account for the GHG impacts of Minnesota’s recycling efforts. Most GHG benefits from recycling arise from reduced need for virgin materials. Oregon DEQ conducted an additional analysis estimating additional GHG reduction from its recycling. The MPCA has not undertaken such an analysis at this time.

Disposal is responsible for a small percentage of the carbon footprint of most products. The CBEI results suggest that post-consumer disposal (landfill and waste-to-energy) is responsible for just 1% of the carbon footprint of Minnesota’s consumption of goods and services. This indicates the biggest opportunity to reduce greenhouse gas emissions lies in the phases of production and use—the upstream design phases of the product—underscoring the importance of solid waste prevention and reuse.

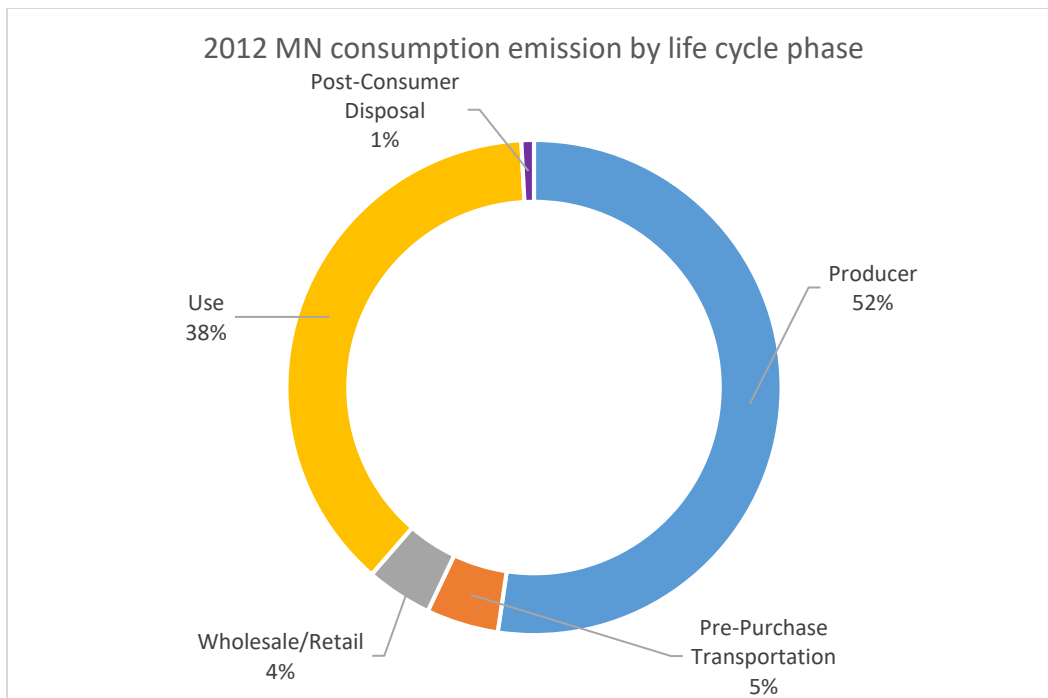


Figure 10. This diagram shows the GHG emissions associated in each life cycle phase of Minnesota products consumed. Most GHG emissions happened in the production and use of products. Emissions that happen after a material is disposed account for only 1% of a product’s total life cycle GHG emissions.

The CBEI captures some, but not all, of the benefits of Minnesotan's recycling efforts. For example, to the extent that industries reduce their GHG emissions by using recycled feedstock instead of virgin, those reductions are included in the CBEI estimate.

The CBEI analysis helps point to the largest carbon footprint areas of consumption in Minnesota. The CBEI is not the best tool for determining best management methods for materials (i.e., whether prevention or recycling is the ideal approach). It does clearly point out that there is no way that changes in disposal are going to impact the 99% of consumption-related emissions that are not from disposal. Only upstream production improvements —including use of recycled feedstock, reduced consumption, and extending use of what is already made — will reduce those emissions.

Case study: Environmental product declarations

The CBEI is a tool that allows us to look at the life cycle of the products we consume in Minnesota at a high level. Another tool that uses life cycle assessment, is a product declaration statement which informs the consumer about the environmental impacts in a particular product. According to the International Environmental Product Declaration (EPD) System, an Environmental Product Declaration is an independently verified and registered document that communicates transparent and comparable information about the life cycle environmental impact of products. A product category rule (PCR) is developed first to ensure the scope of the EPD and life cycle assessment are standardized.



These declarations can be useful because they provide a transparent way to see the impacts from products. The CBEI is a tool that allows us to look at the life cycle of the products we consume in Minnesota. Another tool that uses life cycle assessment in a different way, is a product declaration statement which informs the consumer about the environmental impacts in a product. EPDs are further being incorporated into the building sector. Leadership in energy and environmental design or LEED, the most widely used green building rating system in the world, offers incentives for project teams to specify products from manufacturers that provide full transparency of their product's environmental performance. Points are awarded towards LEED certification for the use of EPDs.

If this type of system were available and required for all building materials it could help architects choose the products that are better for the environment and push manufacturers to continue to develop materials that are more sustainable.

Prevention and reuse

Based on life cycle assessment and an SMM approach, the only way to slow or stop the upward trend of total waste generation in Minnesota is through prevention. Most products cause greater environmental impact through their production (as with cement, clothing, food, packaging) and use (as with furnaces, refrigerators, cars) not in the waste created at the end-of-life. This highlights the importance of prevention and reuse as a means of extending the life of existing materials and products. Examples of waste prevention include providing products as a service, light-weighting materials, producing more durable goods, using less-toxic materials, extending material use through take-back and repair, buying secondhand, or simply not making unnecessary purchases. Prevention involves redesigning the available products and the context in which people operate, and educating for behavior change.

Prevention and reuse have a higher potential to save resources and lessen environmental impacts compared to recycling and organics recycling. While recycling typically requires products to be disassembled and simplified into basic material forms for creating new products, reuse maintains the existing product to make the most of embedded resources (resources already used for original manufacturing).

Once an item is manufactured, it will inevitably become waste to be managed. However, reuse helps to delay the end-of-life management and avoid the need for new or recycled materials to be incorporated into a replacement product. It is important to account for the fact that materials vary drastically in terms of their environmental impact and the type of management strategy best suited to reduce that impact.

MPCA does its prevention work by:

- Promoting all options for extending the life of what has already been made.
- Encouraging thoughtful, informed, and often reduced consumption.

Recently this has included:

- Education and outreach: Presentations at community events and conferences; creation and support of GreenCorps prevention-focused sites.
- Partnership and infrastructure creation: Technical and financial assistance to local organizations and businesses; contract negotiations for government procurement to account for environmental impact; support of policy development to strengthen the reuse, rental, and repair sectors in Minnesota. Priority contracts include high impact purchases such as fuel, information technology services, construction and food.
- Research and data-driven decisions: Completion of a Minnesota Consumption-Based Emissions Inventory (CBEI); product waste management methods based on the largest opportunities to

reduce GHG and human and environmental toxics (prevention of wasted food, sustainable building, and materials management).

- Promotion of Fix-it-clinics, Choose to Reuse, Pack and Give Back, and Master Recycler & Composter classes which are continuing to grow throughout the metro area.

The MPCA has studied the economics of the reuse, rental, and repair industries over the past decade. These studies report on the employment numbers associated with these industries, as well as the economic activity such as gross annual sales information, percent of the state’s gross domestic product, annual wages, and individual income and sales tax. Most of this information was obtained by purchasing information from Dun & Bradstreet, but Regional Economic Models, Inc. (REMI) was also used to model areas such as the indirect jobs, induced jobs, salaries, tax revenue, and gross state product.

Job category	2015 employment
Direct jobs	45,500
Indirect jobs	11,400
Induced jobs	20,900
Total direct, indirect and induced	77,800
Economic output	Dollars
Total wages and salary	\$2.86 billion
Total tax revenue	\$673 million
Total value-added activity	\$6.97 billion
Total output (sales)	\$10.26 billion

The recycling, reuse, rental, and repair sectors of the economy generated an estimated \$1.338 billion in federal, state tax, and local tax revenue and employed approximately 63,500 people in direct jobs in 2015. These jobs, in turn, supported another 74,500 people downstream in indirect and induced jobs. All together, these jobs (which paid a \$6.28 billion in wages) represent a major force in Minnesota’s economy. This sector represents about \$26 billion in sales, which is approximately 6% of Minnesota’s economy. Table 4 shows the economic activity specifically associated with Minnesota’s reuse, repair, and rental sector.

Table 4. This table depicts the value of the reuse economy, based on 2015 Regional Economic Models, Inc. (REMI) modeling.

Prevention of wasted food

Up to 40% of the food in the United States goes uneaten, according to a [Natural Resources Defense Council report](#). At the same time, one in eight Americans struggles to put enough food on the table. The greatest environmental improvement (in energy and GHG emissions) is made when we can prevent food from being wasted, as demonstrated by LCA.

Organics make up about one third of the waste stream in Minnesota. In line with the waste hierarchy, it is first preferable to prevent wasted food, followed by donating food to people, donating food to livestock, then composting. Food rescue, when reported to MPCA through annual reporting, does count toward a county’s recycling rate.

When food is wasted, so are the resources that go into producing it. Food waste is also a significant contributor to climate change, responsible for at least 2.6% of all U.S. greenhouse gas emissions. That’s equivalent to more than 37 million cars, or 1 in 7 cars on the road.

According to the National Resources Defense Council’s 2017 report, [Wasted](#), America throws out more than 1,250 calories per day per person—more than 400 pounds of food per person annually. “If we could redirect just one-third of the food that we now throw away, and give it to people in need, it would more than cover unmet food needs across the country,” (NRDC). The MPCA knows that not all of the organics

management methods have the same impact on the environment and will be working to report the environmental impact from each management method instead of a weight-based organics recycling rate.

In 2019, to help solve the social and environmental issue of wasted food, MPCA sought and received funding to expand efforts to reduce the quantity of wasted food, improve the effectiveness of food rescue programs, and remove barriers to expanding organics recycling programs.

Case study: Open Feasts

Open Feasts is an event series held at Open Streets Events in Minneapolis. Open Feasts is collaboratively hosted by organizations across the MN food system to generate awareness about the issue of wasted food and inspire change in the community. Partners from government, nonprofit, education and for-profit entities came together to spotlight this issue that touches every part of our food system, from the farm all the way to the waste stream.

Three events were held in both the summer of 2017 and 2018. At each event free food is given out as people talk with volunteers about ways to prevent food from being wasted. Prior to each event, food that otherwise would have gone to waste is gathered and prepared to serve over 1,000 participants.

As visitors enjoy the free food they can strike up a conversation with volunteers about specific tips to reduce the amount of food we waste. They learn how to store perishables so they stay fresh longer, how date labels work, and how to cook with leftovers.



Managing organics

If prevention or donation programs are not in place—or the wasted food is not fit for donation—then it is preferable to follow the solid waste hierarchy and utilize food-to-animal programs, then composting. Increasing organics collection and processing infrastructure is necessary to meet statewide recycling goals. Many communities are developing programs and plans to expand both residential and commercial collection of organics. As recently as 2013, the agency estimated 8% to 9% of residents had access to curbside organics recycling. More recent estimates suggest that number has grown to about 11%; and (including dropsites) about a quarter of the state’s population has access to composting.

Contact water management, processing capacity, and transportation are all challenges to growing Minnesota's compost industry. Transfer stations are used by the hauling industry to reduce disposal costs by allowing for more efficient transportation of material. Only a handful of transfer stations currently accept organics. Expanded transfer capacity will aid all facilities and enable communities across the state to start residential or commercial organics collection programs.

Managing contact water has also been a barrier to compost development, largely due to elevated PFAS levels (see page 34 for a discussion on PFAS). Preventing contact water generation, or properly treating contact water is costly for compost operators. More frequent and heavier precipitation events of Minnesota's changing climate further exacerbate the difficulty of managing contact water now and in the future. The MPCA continues to provide technical assistance to composters in Minnesota and encourages methods to prevent contact water generation. The MPCA will continue to advocate for such funding.

The MPCA will continue to support policy that favors prevention of wasted food, food donation, and food-to-animals as strategies for managing organics. The MPCA will also look to expand markets for compost by encouraging use of compost in a wider array of projects. Compost helps landscapes better protect groundwater and surface water and compost prevents erosion. Thus, using compost during construction projects along roadways and in stormwater protection applications will continue to be important.

The MPCA has worked with the Minnesota Department of Transportation to update their compost specifications to be more inclusive of food-waste-derived compost with the intention of expanding compost use in municipal projects across the state. The MPCA will also look to the private sector to support expanded use of compost through landscaping, construction, and with homeowners and farmers.

To ensure clean and marketable compost products, it is important for programs to have the resources to educate participants on how to properly dispose of organic materials. A successful collection program takes advantage of educational materials and provides composters with a less-contaminated feedstock. This includes proper signs and colors for compost collection bins to ensure a cleaner, more marketable compost product with less contamination (e.g., non-compostable wrappers or food service ware).

Many facilities encounter products that appear to be compostable or even claim to be compostable, but are not. Some products are marketed as being biodegradable or degradable. Despite those claims, many of these items do not meet the industry standards for compostability. The issue of compostable plastic bags for yard waste collection has been largely addressed. American Society for Testing and Materials (ASTM) has established standards that have been vetted by government and industry to ensure that plastics are designed properly for composters. Minn. Stat. § [325E.046](#) already establishes proper labeling for plastic bags. This change was effective in reducing contamination, improving worker safety, and improving the quality of the finished compost.

Minnesota would benefit from building upon these existing requirements to ensure that product manufacturers have a clear obligation to honestly market their products. Minn. Stat. § [325E.046](#) could be expanded to include all compostable products including food service items, cups, plates, utensils, and other similar items. Furthermore, use of terms like biodegradable, oxo-biodegradable, and degradable should not be allowed unless the product's claim of an environmental benefit has been scientifically proven.

Yard waste in conventional plastic bags is also a source of contamination at yard waste sites and efforts to remove plastic bags can create worker safety issues. In 2010, Minn. Stat. § [115A.931](#) was amended to require certified compostable bags at yard waste sites. Compostable bags are increasingly available at a

lower cost in all parts of the state, and expanding this requirement statewide would improve contamination rates at compost sites.

Several private and public entities are also interested in anaerobic digestion, particularly as a tool to manage food waste. Anaerobic digestion is a process in which microorganisms break down organic material without oxygen, creating biogas and digestate. There are 57 anaerobic digesters in Minnesota at waste water treatment facilities and many operations at dairy farms. Several metro counties are exploring the feasibility of building an anaerobic digester to manage increased food waste from commercial and residential collection. The type of anaerobic digestion, use of digestate, leachate generation, and energy production of any anaerobic digester differs based on technology type, feedstock, and numerous other factors. Permitting of anaerobic digesters is dependent upon the feedstock accepted, size of facility, technology of digester, and use of digestate. Anaerobic digestion permitting may trigger environmental review according to Minn. R. 4410.4300, subp.5.

Sustainable purchasing

The Minnesota state purchasing program seeks to:

- continuously strengthen the sustainability requirements for the goods and services the state purchases.
- increase the ability of small, targeted group vendors (including women or minority-owned businesses, veteran-owned vendors, and economically disadvantaged vendors) to be competitive to win our more environmentally stringent contracts.
- support efficient government operations, with the best value for every taxpayer dollar.

“Sustainable” in sustainable purchasing means economically, socially, and environmentally sustainable. Purchasing decisions (i.e., consumption) drives most of our environmental impacts. A focus on what the State of Minnesota and local governments purchase allows us the best opportunity to reduce the life cycle environmental impacts of our consumption, including toxic chemicals in products and especially "embedded" emissions. An embedded emission is a GHG emission associated with the resource extraction, manufacturing, production, and use of a product.

State and local purchasing is critical to address because it accounts for a large amount of greenhouse gas pollution, especially when counting both direct emissions (like driving state-owned vehicles) as well as indirect and embedded emissions (like those from making the computers the state purchases). MPCA analysis shows that the direct and indirect emissions from State of Minnesota purchasing of goods and services (not counting road or building construction) is over 900,000 metric tons of CO₂e. Reduction and reuse of these purchases reduce emissions, solid waste, and both renewable and non-renewable resources.

GHG emissions associated with Minnesota state and local government purchasing account for about 8.5% of all the GHG emissions from Minnesota’s consumption-related GHG (not counting road or building construction). This is estimated at 11.5 million metric tons of CO₂e according to MPCA CBEI results.

Since the 2015 Solid Waste Policy Report, sustainable purchasing has improved services, reduced waste, reduced toxics in waste, and reduced air, water, and climate pollution through several contract changes. For example, the statewide hauling contract now requires monthly reporting of collected waste, which will allow tracking of waste trends over time. A “hazardous handful” of chemicals was eliminated from office furniture on the state furniture contract. Flame retardants, formaldehyde, fluorinated chemicals (like PFAS), antimicrobials, and polyvinyl chloride (PVC) are now prohibited from certain furniture and

cannot be purchased without an exception approval. PFAS-containing products were removed from the compostable foodware contract, with cooperation from contract vendors. Additionally, quaternary-ammonium-based surface disinfectants were removed from the cleaning compound contract, reducing harm to aquatic life, endocrine disruption to users, and bioaccumulation.

Case study: Purchasing more sustainable IT products for the state

The State of Minnesota is requiring more sustainable IT hardware in our master contracts, which means agencies purchasing desktops, monitors, laptops, and tablets will be given more sustainable “EPEAT® - registered” (Electronic Product Environmental Assessment Tool) options to choose from. The life cycle of IT hardware includes mining of raw materials, manufacturing, transportation, distribution, use and maintenance, and end of life management. All stages of IT hardware’s life cycle are high-impact in terms of both monetary and environmental cost. Keeping IT products in use longer is a good way to reduce the product’s impact.

The more sustainable options offered to state agencies must meet criteria for product longevity and design for repair, reuse and recycling. When products meet these criteria, it helps reduce the number of products purchased because you can keep your products for longer, and in some cases, even save money. This also decreases the number of products going to a landfill and the embedded emissions associated with IT purchases. In FY18, the State of Minnesota’s purchase of more sustainable IT products saved 4,045 metric tons of CO₂. This savings is the equivalent of taking 866 cars off of the road for a year. The state also saved 6,988 megawatt hours, or enough energy to power 575 U.S. households for a year.

Purchasing products that meet the criteria required in state IT hardware contracts has big benefits. In FY2018, the state’s purchase of more sustainable IT products, including servers, desktops, laptops, tablets, and monitors reduced the state’s non-hazardous solid waste production by 690,777 pounds. That is equivalent to the solid waste generated by 168 U.S. households in one year and saved the state \$17,473 in solid waste disposal costs. It also avoided 3,730 pounds of toxic substances in the products, which means that those toxic substances are not getting into our waste stream. Reducing the products you purchase, and purchasing smarter, can save money, decrease waste and reduce pollution.



Product stewardship

Product stewardship is the idea that manufacturers are stewards of the products they put into the world and that they take responsibility for preventing harm from those products. A subset of that is extended producer responsibility (EPR), where manufacturers help pay for the costs of managing their products after their useful life — either by providing repair and refurbishment options, administering take-back

programs, or by paying for collection and recycling programs. As a result of legislative initiatives, Minnesota has EPR programs for e-waste, architectural paint, and rechargeable batteries. Several other products, such as pharmaceuticals, mercury and LED lamps, solar panels, sharps, carpet, batteries, and mattresses are candidates for product stewardship programs.

There are four reasons to institute product stewardship policies in Minnesota. One is that treating waste as a resource has economic benefits. Minnesota and national manufacturers use recyclable materials, so looking at discarded products as resources rather than waste has the potential to bring additional jobs, economic wealth, and tax revenue to the state. Second, the amount of trash in Minnesota keeps growing. Product stewardship can bring about changes in products so that we have less waste and recycle more. A third factor is that local governments can have high costs to manage material as waste. It's less costly to recycle with financial help from manufacturers. Finally, certain materials used in products are toxic and should be managed properly. Managing in a responsible way means public taxes and fees have to be spent on pollution control equipment or special disposal. Product stewardship can lead to less public money spent on these activities. It encourages redesign of products to remove problem materials before they become environmental issues. Future initiatives by industries and their stakeholders should consider policy or guidelines to limit toxic chemicals used in new products at the same time as end-of-life EPR programs are being developed.

Architectural paint is a successful product stewardship program that started in 2014 and now has 249 year-round collection sites in Minnesota. Collection in the first year of the program totaled about 700,000 gallons. Nearly one million gallons have been collected over the program's lifetime. PaintCare's Architectural Paint Stewardship Program Plan sets a goal of establishing a permanent collection site within a 15-mile radius of at least 90% of Minnesota residences. As of July 1, 2019, Minnesota has achieved 93.6% access to a permanent, year-round drop-off site. This does not include supplemental sites at events or seasonal facilities.

Electronics can be referred to as e-waste. In Minnesota, 93% of residents are within 15 miles of an e-waste drop-off site. Keeping the weight-based e-waste statute in step with the decreasing size and weight of electronics is a challenge. Recycling costs exceed what manufacturers are currently paying, so local governments and individuals are paying for the additional expenses. MPCA continues to work with collectors, recyclers, and manufacturers to make statute changes so that the true cost of recycling is covered by the manufacturers.

Medications and controlled substances are also a candidate for product stewardship. They are found in Minnesota's surface water and groundwater, and they threaten aquatic life. MPCA participates in two multi-agency projects to help manage opioids and antibiotics. In addition, MPCA supports and regulates a statewide collection network of over 350 collection sites. As of January, 2019, 95.4% of Minnesotans were within 15 miles of a pharmaceuticals collection site.

Recycling education and market development

In July 2017, China announced its intent to stop accepting many types of recyclable materials unless bales of recyclable materials had contamination rates of less than half a percent. Recyclable materials from the United States are generally unable to meet this standard. As a result, domestic markets are flooded with recyclable materials and facing record-low prices for items such as plastic, glass, and paper. Minnesota recyclers do better than most other states, producing paper and plastic bales with only a 2-7% contamination rate. Other parts of the country could be up to 30-40% contamination rates in some bales. Recycled material has been disposed of in landfills in other states, especially coastal states whose main buyer was China. Minnesota has good local markets, but recycling facility operators have expressed

concern about the strength of those markets. Minnesota has never approved the disposal of collected recycled materials.

When it comes to recyclable materials, Minnesota is better positioned than other parts of the country because our public and private sectors made strategic investments in recycling over the last thirty-plus years. Minnesota has focused on local use of the material to manufacture products wherever possible. These efforts create local economic development opportunities around the state.

In light of stressors from China and concerns from facility operators, a Recycling Market Development (RMD) Workgroup formed as a multi-stakeholder group (including haulers, material recovery facilities, cities, counties, and the state) to set market priorities and make recommendations to improve recycling end markets in Minnesota. This stakeholder group aims to: bolster local and regional markets for priority recycled materials, provide consistent messaging on the need for and benefits of recycled material markets, and develop good data and information to support materials chosen as RMD priorities. MPCA also sought and received funding for recycling market development from the 2019 Legislature and is now working toward administering funds for market development projects.

Recycling Market Development helps create and maintain demand for recyclables by developing end markets for the materials. RMD has evolved to also include increasing the quality and quantity of recyclables captured. RMD connects private companies with resources to overcome barriers to developing new products made out of recycled material. It also promotes economic growth through environmental innovation, creates recycling manufacturing jobs and recycled content products, and keeps value commodities out of landfills.

Main activities of RMD at the MPCA include:

- Tracking market conditions for all commodities as it relates to Minnesota end markets
- Analyzing economics of the recycling industry
- Managing responses to high profile market barriers
- Maintaining projects already implemented
- Discussing, developing, and implementing policy
- Administering grants and loans

RMD requires coordination among businesses, haulers, end markets, processors of materials, brokers, other state programs, local programs, counties, EPA, national trade associations, and financial institutions. To solve market place problems, RMD has to take a global and local approach.

All Minnesotans are indirectly impacted by the development of recycling markets in the state. By increasing the demand for recyclables, living wage jobs could be created that will be accessible locally to Minnesotans of all backgrounds. By not recovering materials that could be recycled, \$2.3 billion of potential material was thrown in the trash between 1996 and 2013 in Minnesota.

MPCA obtained data for a recycling economic analysis by purchasing information from Dun & Bradstreet, and using Regional Economic Models, Inc. (REMI) to model things such as the indirect jobs, induced jobs, salaries, tax revenue and gross state product. In 2015, based on REMI data, the recycling industry in Minnesota was responsible for 60,200 direct and indirect jobs (Table 5).

Marketable recyclables starts with education. The Recycling Education Committee, composed of state, city, county, and industry stakeholders, is working toward providing better education for residents and businesses to encourage proper recycling, thus keeping recycling streams clean and profitable.

Job category	2015 employment
Direct jobs	18,000
Indirect jobs	18,600
Induced jobs	23,600
Total direct, indirect, and induced jobs	60,200
Economic outputs	Dollars
Total wages and salary	\$3.42 billion
Total tax revenue	\$665 million
Total value-added activity	\$6.68 billion
Total output (sales)	\$15.7 billion

Table 5. Shows economic activity associated with Minnesota’s value-added recycling manufacturers. For the purposes of this model direct jobs are jobs held by employees or workers who are directly involved in the production of goods or services. Indirect jobs are held by those working for companies that supply materials and/or services to companies to produce a final product. Induced jobs are created when employees in direct and indirect jobs purchase goods and services in the community. Total wages and salary is money paid to employees from all sources. Total tax revenue is all business and personal federal and state income, sales, excise and miscellaneous taxes. Total value-added activity is the value a company gives its product or services before offering the product to customers: contribution to Gross State Product, similar to Gross Domestic Product output, excluding all goods purchased to manufacture products as well as wages and profit. Total output (sales) is the amount of production, including all goods purchased to manufacture products, as well as wages and profit.

Case study: Recycling Education Committee

Starting in June 2016, haulers, cities, counties, the state and other organizations met to discuss how to improve recycling efficiency through coordinated messaging and community outreach. Recognizing the discord of recycling messages, the Recycling Education Committee (REC) sought to better coordinate on recycling communications and outreach.

Recycling can be different regionally, or based on market variabilities. REC works to dismantle confusion and make sure residents are receiving consistent information from their cities,



counties, and haulers. REC fosters a space for municipalities and industry to share perspectives, challenges, and work toward a common goal of increasing recycling quality and quantity.

After a series of meetings, the group identified a set of materials that were agreed upon to always or never be acceptable for curbside recycling almost everywhere in Minnesota. Since its inception, REC has grown to over 50 active members. REC can identify problem-materials that threaten the industry (like plastic bags) and communicate uniformly why such products are contaminants.

REC published a Minnesota Recycling Outreach Guide which provides guidance to inform recycling educators across the state. REC partnered with the Recycling Partnership, which is a national non-profit, to develop a toolkit of online and traditional media resources about common recycling contaminants (like no bags, no tangles (i.e., hoses, holiday lights, cords), no lithium batteries, etc.) REC is working with various partners to utilize this toolkit of resources in a coordinated way in 2020. The Recycling Education Committee is excited to become a premier resource for recycling educators.

Construction and demolition (C&D)

According to a peer-reviewed study published in 2019, [*CDDPath: A method for quantifying the loss and recovery of construction and demolition debris in the United States*](#), approximately 600 million tons of C&D materials were estimated to be generated nationally in 2014. Adjusted for the proportion of the population living in Minnesota, we can estimate that there could be 10.2 million tons of C&D waste generated annually in Minnesota. That means that the amount of C&D in Minnesota could potentially be double the amount of MSW. As of 2017, Minnesota reported 1.6 million tons of C&D sent to landfills. This means potentially harmful materials are entering unlined landfills and contaminating groundwater. This 1.6 million documented tons makes up only 15.7% of the possible C&D generated. MPCA does not have the data to conclude if the remaining 84.3% was sent to landfill, transferred out of state, reused, recycled, or managed elsewhere. MPCA is working toward documentation and better data collection to understand the waste flow of C&D materials from generation to reuse, recycling, and disposal in Minnesota. The [*CDDPath study*](#) estimates the national flow of C&D materials as seen in Figure 11. According to the study, “Quantification of end-of-life management pathways is useful for identifying approaches to decrease disposal and increase material recovery.”

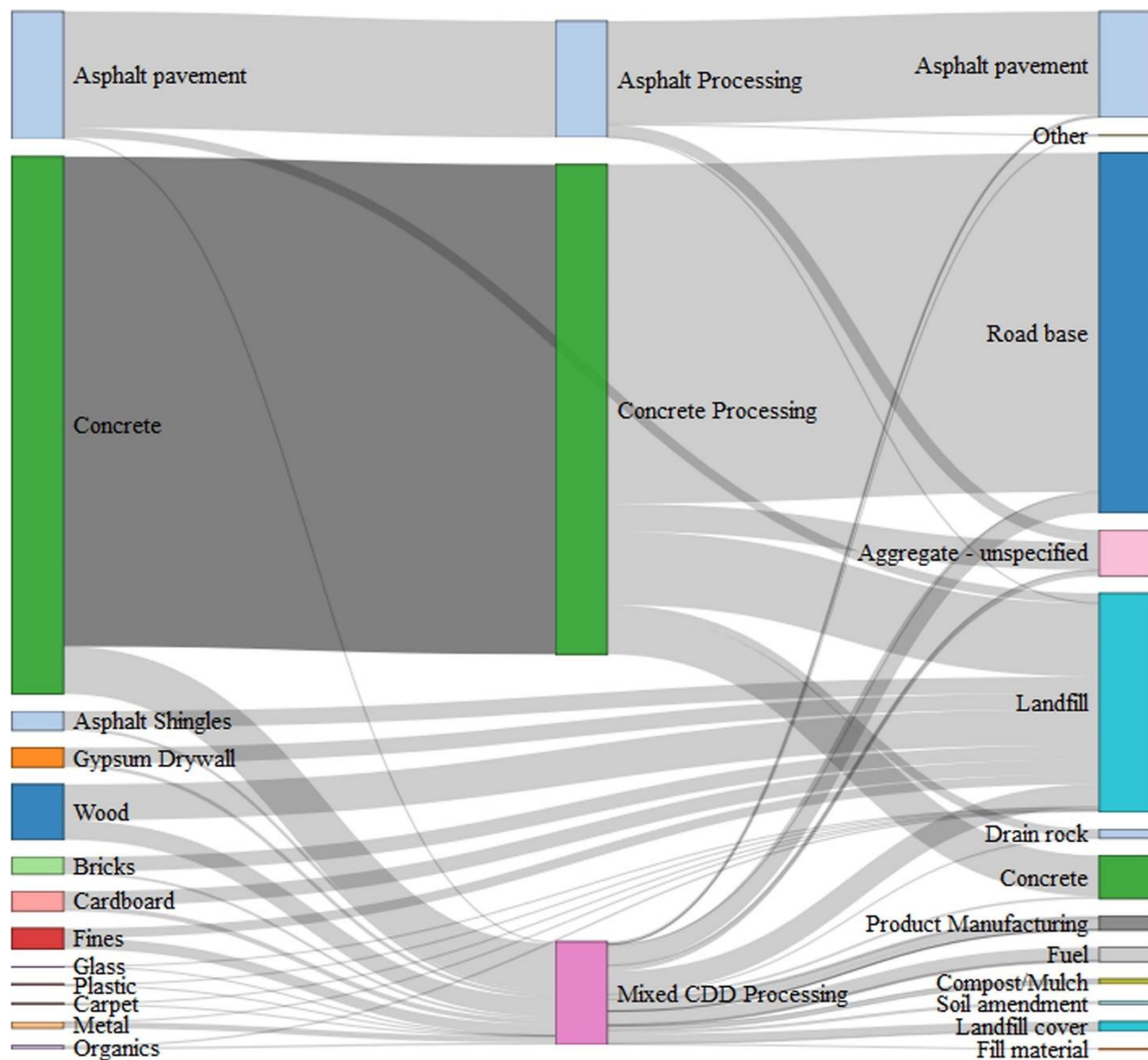


Figure 11 is published in the study, [CDDPath: A method for quantifying the loss and recovery of construction and demolition debris in the United States](#). It illustrates the flow of materials — from generation to processing — and final pathways of C&D materials, nationally.

The MPCA is taking a whole-system look at how to minimize impacts of building materials throughout the life cycles of C&D materials. The MPCA is making a holistic analysis of C&D impacts using an SMM framework to minimize impacts of building materials throughout their life cycles. These wastes include materials such as concrete, bricks, wood, lumber, roofing, drywall, and other wastes.

C&D landfills have largely been managed in the same way since the early 1980s. Almost all landfills collecting IW/MMSW were required to upgrade and add liners and other protections to their facilities, but improvements to C&D landfill design was thought to be unnecessary. C&D was historically assumed to be inert.

There are 379 facilities permitted for C&D land disposal, which consists of 132 permitted solid waste facilities, 199 permit-by-rule C&D landfills, and 48 general concrete burial sites. For facilities able to measure groundwater impacts from only unlined disposal of C&D debris, many have shown elevated levels of boron, manganese and/or arsenic. The MPCA is working to understand the nature and extent of releases from C&D landfills and is moving forward with rule revisions to address these environmental concerns. In 2019 MPCA published a report titled, [Groundwater Impacts of Unlined Construction and Demolition Debris Landfilling](#), which summarizes the groundwater data submitted from these unlined C&D landfills.

Additionally, in late 2018, MPCA held four stakeholder meetings across the state for organizations and individuals involved in the C&D sector to provide feedback and suggestions on how to improve the overall construction and demolition system (including deconstruction and reuse of building materials). MPCA is conducting a more formal stakeholder process to plan a new system that improves how building materials are designed, used, reused, and recycled. This group, called the Sustainable Building Group, is composed of architects, building preservation organizations, local units of government, building reuse retailers, recycling and end markets, developers of building materials, deconstruction companies, disposal companies for building materials, building contractors and remodelers.

A rulemaking process is also underway (and will continue for the next two to three years) that will update the rules applicable to disposal facilities that manage C&D debris. The Rule Advisory Panel has representatives from government, industry, environmental groups, and citizens who will advise the MPCA. The Sustainable Building Group and Rule Advisory Panel will run in parallel to ensure that the entire C&D system is taken into consideration.

The MPCA is also conducting a waste sort of C&D materials found in landfills. This study will identify products and materials discarded in landfills and look upstream to find ways to prevent those materials from being discarded as frequently. This will help in creating a new system to efficiently reuse or recycle C&D materials and help in developing new markets for materials to be recycled.

Case study: Better Futures, deconstruction

Better Futures Minnesota, a nonprofit that does deconstruction, works to support Minnesota's environment and the personal transformation of men through integrated care and community support. Unlike demolition, deconstruction carefully removes a structure so that materials are recycled, repurposed, or reused instead of being sent to a landfill. Through specialized deconstruction services, Better Futures Minnesota works to recover salvageable building materials and divert as much material from the landfill as possible. EPA estimations cite that construction waste accounts for up to 40% of the solid waste going into landfills. Of that, nearly 80% could be recycled or reused. Better Futures Minnesota's deconstruction services recycles or reuses 75% to 85% of all building materials. In 2015, through their deconstruction services and reuse warehouse, Better Futures Minnesota worked to divert nearly 700 tons of construction and demolition waste from Minnesota's landfills.





Landfill closure/post-closure tracking and monitoring

To minimize potential environmental impacts, landfills must be monitored and maintained even after they stop accepting waste. In some cases, contamination issues are only discovered at a landfill after closure. The [Landfill Cleanup Act of 1994](#) created a state-run program that would assume control of certain closed MSW landfills that met legislatively set eligibility requirements (requirements largely based on waste types accepted and when they closed) to monitor, maintain, and—if necessary—clean up contamination. The Closed Landfill Program (CLP) oversees 110 facilities, with a total 114 eligible for it. C&D landfills, IW landfills, and some MMSW landfills are ineligible for the CLP.

As operating landfills close, the MPCA continues to regulate them through the Solid Waste Permitting Program and existing state and federal regulations. When a permitted landfill stops accepting waste, they are required to follow a closure plan that has been approved by the MPCA. This involves constructing the landfill cover and other engineered controls the facility may need. The MPCA approves the constructed elements and issues a closure document to regulate the facility while it is under the post-closure care period. Minnesota rules define this period as a term of at least 20 years throughout which the landfill operator is required to maintain and monitor the facility. Minnesota rules do not give specific direction on what must be done at a closed landfill after the 20-year post-closure period is completed.

Many landfills that closed during the late 1990s and early 2000s—and did not enter into the Closed Landfill Program—are beginning to reach the end of their required 20-year post-closure care period. Of

the approximately 90 closed landfills not in the CLP, only 20 have received official closure documents from the MPCA. Without this regulatory document, it is difficult to track how long a facility has been in post-closure care and whether the facility still presents an ongoing risk to the environment.

Buried waste could potentially pose an environmental hazard even if the MPCA determines a landfill does not require additional monitoring beyond the 20 years. A landfill could be disturbed, a cover destroyed, or leaching could affect groundwater. For example, redevelopment on top of a closed landfill could puncture a landfill cover or liner allowing a pathway for contamination to reach groundwater or surface water. Proper planning and zoning, which could prevent such activities, are controlled by local units of government.

The Unified Environmental Covent Act (Minn. Stat. § 114E) allows the MPCA to place institutional controls on a piece of property that would remain in place regardless of future ownership over the property. Enacting the Unified Environmental Covenant Act, consistently, could prevent future owners of closed landfill properties from using the property in a way that could compromise the environment or human health, ensuring that landfills will remain safe for centuries after closure.

Per- and poly fluoroalkyl substances (PFAS)

PFAS chemicals are an emerging concern that will likely impact most waste facilities in the state.

PFAS is widely used as an oil, water, stain, or grease barrier. It has been found in firefighting foam, cosmetics, commercial household products, non-stick cookware, food wrap or packaging, textiles, furniture, and in single-use disposable foodware products. PFAS is linked to cancer, thyroid hormone disruption, low infant birthweights, immune system effects, decreased fertility, developmental effects, and other health concerns. PFAS health risk limits (HRL) and health-based values (HBV) for certain analytes are set by Minnesota Department of Health (MDH). PFAS is currently regulated at the parts per trillion level. MPCA solid waste uses an intervention limit that is a quarter of the HRL/HBV in order to be protective of drinking water and groundwater for Minnesota.

PFAS can migrate out of products and into the air, water, and our bodies. PFAS from products are entering our waste stream and therefore, creating challenges in managing the contact water and leachate from compost sites and landfills. In a study conducted at Minnesota compost sites, preliminary data reveals PFAS was detected in contact water at both yard waste and SSOM compost facilities at actionable levels, meaning that PFAS levels are above MPCA intervention limits and/or the HRL/HBV determined by Minnesota Department of Health. PFAS has also been detected at actionable levels in landfill leachate.

The predominant challenge of PFAS at solid waste facilities, is that leachate and contact water are sometimes land applied. In addition, if the leachate is sent to a waste water treatment plant, it either passes through or may concentrate in biosolids which are commonly land applied in Greater Minnesota. Both actions cause transfer of PFAS into the environment, specifically to groundwater and/or surface water.

PFAS is manufactured to be persistent in the environment and there are few available, practical treatment options. One of the only proven ways to break the strong carbon-fluorine chains in PFAS is to burn it at temperatures roughly greater than 1,700-2,000 degrees Fahrenheit. MPCA is seeking funding to test compost and biosolids for PFAS and to explore treatment options.

The MPCA will continue to research possible treatment technologies, but PFAS prevention will be key. The MPCA has formed a cross-agency PFAS lateral team to research PFAS, is identifying key areas for treatment, and is working toward finding and promoting alternatives to PFAS in products like fire-

fighting foam, furniture, carpet and rugs, outdoor wear, food packaging, and more. MPCA aims to better understand the sources of PFAS, PFAS levels, and impact of waste management on those PFAS levels. This will inform procedures, policies and facility permits to protect the environment and human health.

In February 2019, EPA unveiled a PFAS Action Plan with the aim to provide a multi-media, multi-program, national research and risk communication plan to address this emerging environmental challenge. The Action Plan is also meant to “respond to the extensive public input the agency has received over the past year during the PFAS National Leadership Summit, multiple community engagements, and through the public docket.

Recommendations

The following recommendations are based on aforementioned reports and agency priorities. Several recommendations require additional resources and legislative support.

The recommendations brought forward in this report, if implemented, could significantly advance the management of materials and waste in Minnesota. However, current staff and funding levels at the MPCA are not sufficient to carry out all activities. Counties are experiencing similar reductions in staff and funding, which inhibits their ability to implement solid waste plans. Additional resources — both staff and funding — are needed to take Minnesota to the next level of materials management.

Recommendations may require long-term commitment or several stages of implementation. Recommendations are not commitments to action, but identifiers for future short-term and long-term priorities intended to address barriers and reach our goals.

Implementation of recommendations is most successfully done in partnership with the Legislature, other state agencies, local units of government, and public and private entities in the solid waste industry.

Each recommendation is labeled with the following tabs to indicate their impact areas.

Recommendations may have more than one label.

- Needs legislative action to receive funding or enact policy: **LEGISLATIVE**
- Aligns with MPCA strategic plan goals: **ENVIRONMENTAL JUSTICE** **CLIMATE RESILIENCY** **REDUCE FOOD WASTE**
COMMUNITY ENGAGEMENT
- Aligns with MPCA solid waste priorities: **SUSTAINABLE MATERIALS MANAGEMENT** **DATA AND EFFICIENCY**

ENVIRONMENTAL JUSTICE

Continue to coordinate with tribes to identify appropriate partnership opportunities in solid waste.

MPCA will work to explore opportunities for partnering with tribal nations in solid waste planning. This may include information exchanges in solid waste planning and methods to improve the overall efficiency of the solid waste system.

ENVIRONMENTAL JUSTICE **DATA AND EFFICIENCY** **COMMUNITY ENGAGEMENT**

Develop a guidance for consistently incorporating environmental justice in permit review and issuance.

The solid waste permitting program will develop a guidance to consistently inform and solicit input from traditionally vulnerable communities on solid waste projects that may affect them. If a facility is located in a documented environmental justice area, staff will determine what additional steps can be taken to identify disproportionate impacts, minimize those impacts, and ensure area residents are informed. Steps may include informational public meetings, collaboration with community leaders, and additional methods of community outreach before and during a public notice period.

Produce small area climate model projections for Minnesota.

The University of Minnesota, or similar research body, should conduct a study that produces high-resolution, dynamically downscaled climate model projections for the entire state of Minnesota, so that state agencies have updated local climate projection data on which to base subsequent program decisions. High quality projections that use atmospheric modeling with updated climate models will enable a prioritized response to a changing climate. Accurate modeling will also allow for more informed rule revisions, permit requirements, and emergency response tactics.

Update solid waste rules to adapt to the changing climate.

Solid waste emergency response programs must be able to respond to flood events, crop failures, livestock die-offs, or diseases that create large amounts of waste in a timely and safe way. Issues such as these are becoming more common with climate change affecting Minnesota. Adapting to a changing climate includes, but is not limited to, updating the landfill design rules so they are equipped to handle larger rain events, having appropriate protections for frequent freeze/thaw events and heavy rain events, and updating design standards for leachate storage ponds. This may also include updating monitoring standards for groundwater at landfills and best practices for land application of leachate to avoid water pollution.

Consult with stakeholders to develop product stewardship programs to address electronic waste, household mercury-containing lamps, LED lighting, and potentially incandescent lighting due to lead content.

The existing e-waste law needs modification to ensure that collection, transportation and recycling of electronic waste is adequately funded by manufacturers. MPCA should also develop standards limiting toxic chemical content in both new, used, and recycled electronic components. The lamps initiative could require producers to file a program plan, which must be approved, to sell their products in the state. The program plans would outline how producers will establish a network of collection sites using existing HHW sites and retailers, including reporting their results. LED lighting products are replacing mercury-containing lamps, but there will be a long tail on the disposal curve for mercury-containing lamps. The LED content of lead and other toxic components is not well-understood at this time. After these priority materials have been addressed, the MPCA plans to work with stakeholders to focus on other candidate materials listed in the product stewardship section of this report.

PFAS: Focus on prevention.

PFAS compounds are persistent and ubiquitous, so there needs to be a strong effort on the prevention of PFAS production and use. Manufacturing bans and searches for alternatives should be considered, especially for items such as food packaging, carpeting and outdoor wear. For example, PFAS-containing Class B firefighting foams are now banned in Minnesota for most training and testing purposes, but may

still be used in incidents. Since fluorine-free Class B foams have been used successfully around the world, a ban on use on fires should now be implemented.

LEGISLATIVE DATA AND EFFICIENCY

PFAS: Prioritize continued research and testing and implement treatment/management methods.

Increased efforts to fund quantitative research on how PFAS affects the solid waste field will be critical. Testing and implementing technology for PFAS treatment will aim to provide MPCA, composters, recyclers, and landfill/incinerator operators better ways to address the impacts of PFAS on human health and the environment. The MPCA should partner with other health and environmental organizations (MDH, EPA, etc.) to develop testing standards and continued research for PFAS in other solids and liquids including but not limited to: incinerator emissions, landfill leachate, groundwater, stormwater, wastewater, compost, biosolids, digestate and other media.

LEGISLATIVE LEGISLATIVE SUSTAINABLE MATERIALS MANAGEMENT

Explore the extent to which toxics are recycled in the waste stream and methods to remove toxic chemicals from circulation.

Some studies have shown evidence of toxic chemicals recirculating in recyclables, such as plastics from electronics containing flame retardants ending up in cookware or children's toys. Further efforts are needed to understand the extent to which this is occurring, and develop technology, policies, procedures, or assistance to avoid it. After researching the issue, guidance can be provided on how this should be handled as part of the waste/recycling stream, along with financial assistance to spur implementation.

LEGISLATIVE SUSTAINABLE MATERIALS MANAGEMENT

Establish Minnesota waste prevention and reuse business development and growth grants.

This recommendation establishes ongoing grants for eligible reuse, repair, and rental business development or expansion. Grant funding should also go toward other waste reduction and prevention initiatives and grow Minnesota's reuse markets. Grants would target areas that show the greatest environmental impact, using a sustainable materials management approach. Grants would establish funds to parallel the Greater Minnesota Recycling Grants and CAP funds.

DATA AND EFFICIENCY SUSTAINABLE MATERIALS MANAGEMENT

Set management goals for specific materials that are high priority based on life cycle environmental impacts.

Designate materials better suited for reduction, reuse, or recycling; set target recycling, reuse or source reduction goals for each of those materials. Target management and goal setting will be based on remaining recovery or reduction opportunity over current management, and best management approach given life cycle assessment (LCA). To accomplish a more nuanced analysis of materials, MPCA will utilize waste composition studies and life cycle assessment as a component in decision-making. For example, a recycling market development stakeholder group is examining various materials. They are using LCA to focus market development efforts on materials with the greatest environmental benefit.

The Sustainable Materials Management Team is working closely with the market development group to provide recommendations based on LCA.

ENVIRONMENTAL JUSTICE REDUCE FOOD WASTE COMMUNITY ENGAGEMENT SUSTAINABLE MATERIALS MANAGEMENT

Create and support a Sustainable Food Management Council.

Establish a group that meets regularly that focuses on food from a sustainable materials management perspective, specifically food waste prevention and food donation. The benefits of this group include efficiency in efforts to strategize on large-scale food donation efforts and maximize existing resources. This will also help coordinate inter-agency efforts on the topics of food waste prevention and food donation. The group will convene private and public stakeholders. Topics for discussion and implementation include but are not limited to: starting and expanding food donation programs to feed hungry people and best management practices to reduce wasted food.

LEGISLATIVE SUSTAINABLE MATERIALS MANAGEMENT ENVIRONMENTAL JUSTICE REDUCE FOOD WASTE

Establish a food management hierarchy (Minn. Stat. Statute §115A).

Food waste and other organic materials comprise 31% of the waste stream in Minnesota. Establishing a Minnesota food management hierarchy would encourage food to be managed according to the hierarchy instead of disposal. Certain management methods are considered to count toward recycling goals but other management methods are not eligible for recycling goals. Creating a hierarchy would encourage food to be managed through prevention first, then rescued for food donation, turned into animal feed, collected for compost and/or anaerobically digested. As a last resort, it would be sent to disposal. Less organics in landfills reduces the release of methane, a high potency greenhouse gas.

LEGISLATIVE REDUCE FOOD WASTE SUSTAINABLE MATERIALS MANAGEMENT

Require sustainable materials management of organics from large food generators.

Commercial and industrial entities that generate large volumes of organics have an opportunity to reduce their environmental impacts, and often reduce their disposal costs, by first preventing food from going to waste, then rescuing food, and finally recycling food waste. (Recycling is not subject to the state solid waste management tax). This recommendation should have a phased-in approach in areas within a certain distance of organics facilities or transfer stations, likely starting in the metro or other large population centers. This recommendation would also prioritize food management in accordance with the proposed food management hierarchy (above).

LEGISLATIVE REDUCE FOOD WASTE

Expand metro requirement that yard waste is collected in compostable bags statewide.

Yard waste in conventional plastic bags is a source of contamination at yard waste sites, and efforts to remove yard waste from plastic bags at the sites can create contamination and worker safety issues. In 2010, Minn. Stat. §115A.931 was amended to require compostable bags at yard waste sites in the Metro Area. Expanding this requirement statewide will increase organics quality and marketability. Compostable bags are meant to replace non-compostable bags.

Amend compostable product labeling requirement to include all packaging/products

Minn. Statute §325E.046 “Standards for Labeling Plastic Bags” already requires plastic bags to meet ASTM standards if the bag has a label indicating it is compostable. The law should be expanded to include other types of products including food serviceware (knives, cups, forks, spoons, etc.) and other items (phone cases, wrappers, etc.). The law should limit the use of other terms – such as biodegradable – that consumers confuse with an indication of compostability. Only claims that can adhere to an appropriate standard should be allowed to use those types of labels. Ensuring that labels meet industry standards will help minimize contamination at compost facilities and will safeguard consumers from being misled.

Explore appropriate waste reporting to measure all waste.

This recommendation proposes measuring and reporting all waste for better data acquisition and policy development that focuses on addressing the environment and human health. Measuring and reporting all waste (including MMSW, C&D, and industrial waste disposal, recycling, reuse, and waste prevention) to accurately represent the waste flow — from generation to disposal — in Minnesota. Alternative measures to weight-based reporting which encompass the environmental impacts of a material should be researched and considered in waste reporting. This could include using SMM tools such as capture rates and human health impact data.

Perform waste composition study on a routine basis (Statute 115A).

Performing waste composition studies at a certain number of solid waste facilities on a regular schedule will help determine generation rates and material type breakdown. Understanding the composition of MMSW, C&D, and IW streams is critical information to perform life cycle assessment. Therefore, waste composition studies should be performed periodically for MMSW, IW and C&D disposal streams.

Measure and report C&D and industrial waste through annual reporting.

The MPCA currently does not have a mechanism to track industrial or C&D debris that is generated in Minnesota unless it is delivered to a landfill or other permitted facility. Hauler reporting does not include C&D at this time (only MMSW and Recyclables). Accurate measurement and reporting means better forecasting. With better forecasting, we will be able to assist in solid waste planning throughout the state. MMSW is the metric that is tracked most directly through SCORE program and hauler reporting, but this does not include all industrial and C&D waste that is generated in the state. Waste that is disposed on site (burying or burning), taken out of state, or sent directly to an end market for recycling is also not reported to MPCA at this time.

DATA AND EFFICIENCY**Create standardization of permit nomenclature and data entry.**

A process to ensure permit limits are in the same units, use standard language, and have standardized data entry will allow for better documentation and data management. This will improve data integrity and visualization while improving communications and efficiencies with the public. This applies to all types of facilities. Steps include creating better permit applications, data management, and updated reporting that reflect modern operations.

LEGISLATIVE**DATA AND EFFICIENCY****SUSTAINABLE MATERIALS MANAGEMENT****Develop permitting system to emphasize the goals of the Waste Management Hierarchy.**

We must also provide more resources and expediency toward permitting in order to allow for more preferable materials management facilities to come online (like compost sites) quicker, in a way that manages risk but also moves waste up the waste hierarchy.

LEGISLATIVE**DATA AND EFFICIENCY****Develop a closure/post closure tracking and monitoring system including facility conditions necessary for exiting post closure care.**

Minnesota Rules require landfills to perform ongoing maintenance and monitoring for at least a 20 year “post-closure care period” after a landfill stops accepting waste. A process is needed to track the post-closure care schedules for landfills that have been closed and to identify facilities that are nearing the end of the required 20-year post closure care period. By identifying and evaluating these sites, the MPCA can make informed decisions on the necessary steps that prevent long-term environmental contamination.

LEGISLATIVE**DATA AND EFFICIENCY****Develop standardized language and protocols for the use of restrictive covenants based on the Uniform Environmental Covenants Act.**

The Unified Environmental Covent Act (Minn. Stat. 114E) provides the MPCA the ability to place institutional controls on a piece of property that remain in place no matter how ownership over the property changes in the future. Even beyond the 20-year post closure period, buried waste in landfills can potentially pose an environmental hazard if any of the constructed engineering features are disturbed or destroyed or if any contaminate leaching occurs that could affect groundwater. Authority under the Uniform Environmental Covenants Act would allow a restrictive covenant to be placed on the property to maintain the final cover and alert potential buyers to the presence of the closed landfill. The solid waste program should develop standardized language to include in landfill closure documents that requires the placement of an environmental convent on the landfill property.

Appendix A: Maps of solid waste permitted activities in Minnesota

The solid waste program at the MPCA uses a variety of regulatory tools to manage the treatment, reuse, and disposal of solid waste in the state of Minnesota including individual permits, general permits, Permits-by-Rule (PBRs) and beneficial use determinations. The types of facilities that are covered under PBRs include yard-waste compost sites and small volume solid waste transfer facilities.

Individual permits are used for major solid waste treatment and disposal facilities. This allows regulators to examine site-specific conditions to ensure that the individual permit requirements for a facility provide the appropriate environmental protections as specified by Minnesota solid waste rules. Facilities that receive individual permits include landfills (MMSW, Industrial, and C&D), combustor ash disposal facilities, refuse-derived fuel (RDF) processing facilities, source-separated organic composting facilities, and larger solid waste transfer facilities.

Closed landfills are not displayed on the maps below and the activities represented are taken from current effective solid waste permits as of November 13, 2019, or in the case of the general concrete burials and demo debris PBRs from the specified time frame (2010–2019). A single facility may appear on multiple maps as they likely have more than one permitted activity. It is also possible for a facility to have a permitted activity but they may be inactive or not accepting material at this time.

Facility locations were mapped using the highest accuracy measuring method available to the MPCA. This location information is primarily from GPS, Address Matching, and Digitized Mapping methods which provide a high amount of accuracy in portraying the correct location of the facility. However roughly 17% of the facilities displayed on these figures were mapped using location collection methods of lower accuracy such as Public Land Surveys or County and Zip Code Centroids. Location information comes from multiple sources, including information submitted by the facility owner, information determined by MPCA staff, and information derived based on the location of the facility.

Composting activity map

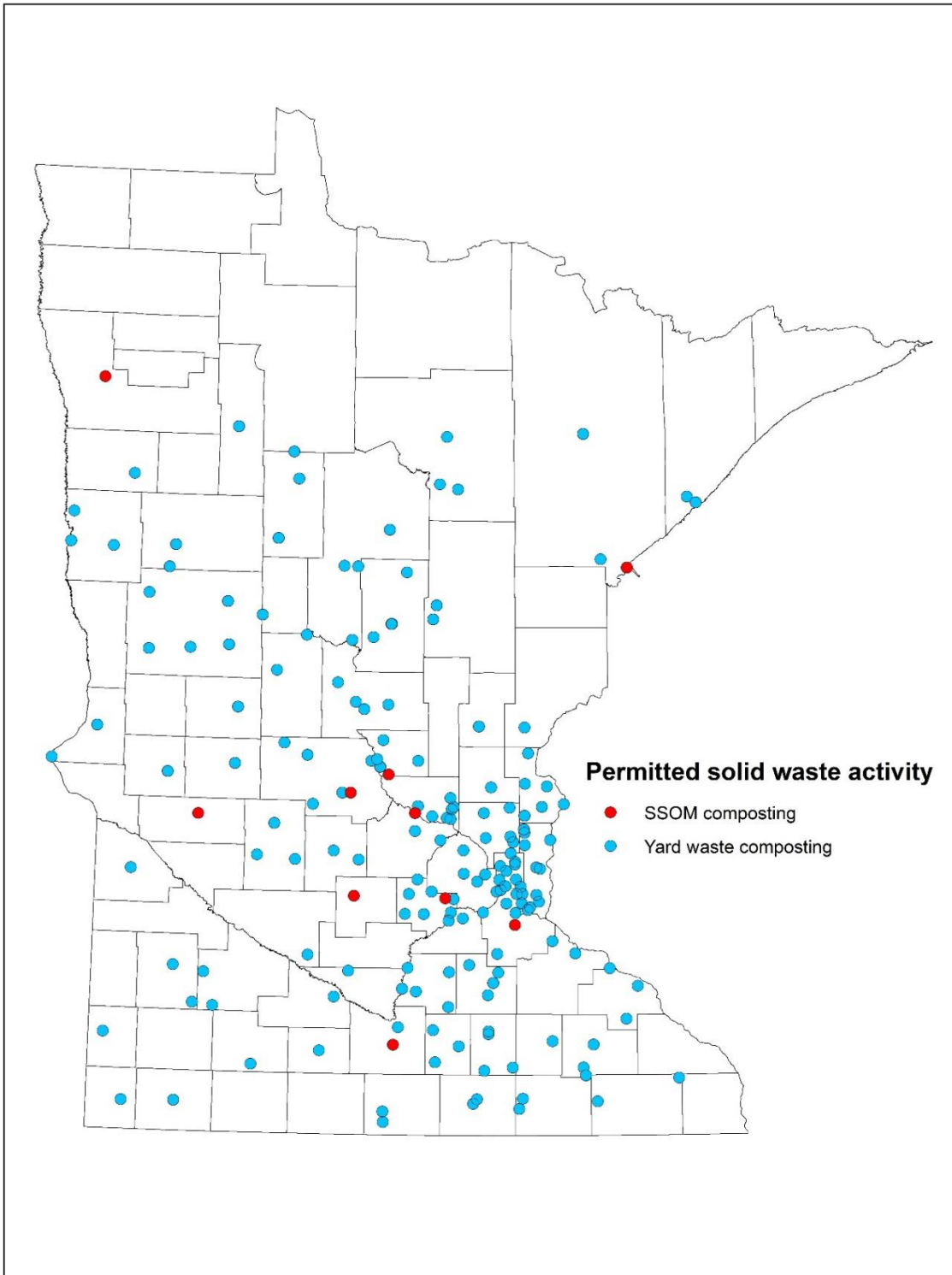


Figure 1. Map of all permitted composting activities across the state of Minnesota. For the purposes of this map, “SSOM” refers to sites that are permitted to accept food waste. There are 182 permitted yard waste composting areas and 10 SSOM composting areas.

Recycling activity map

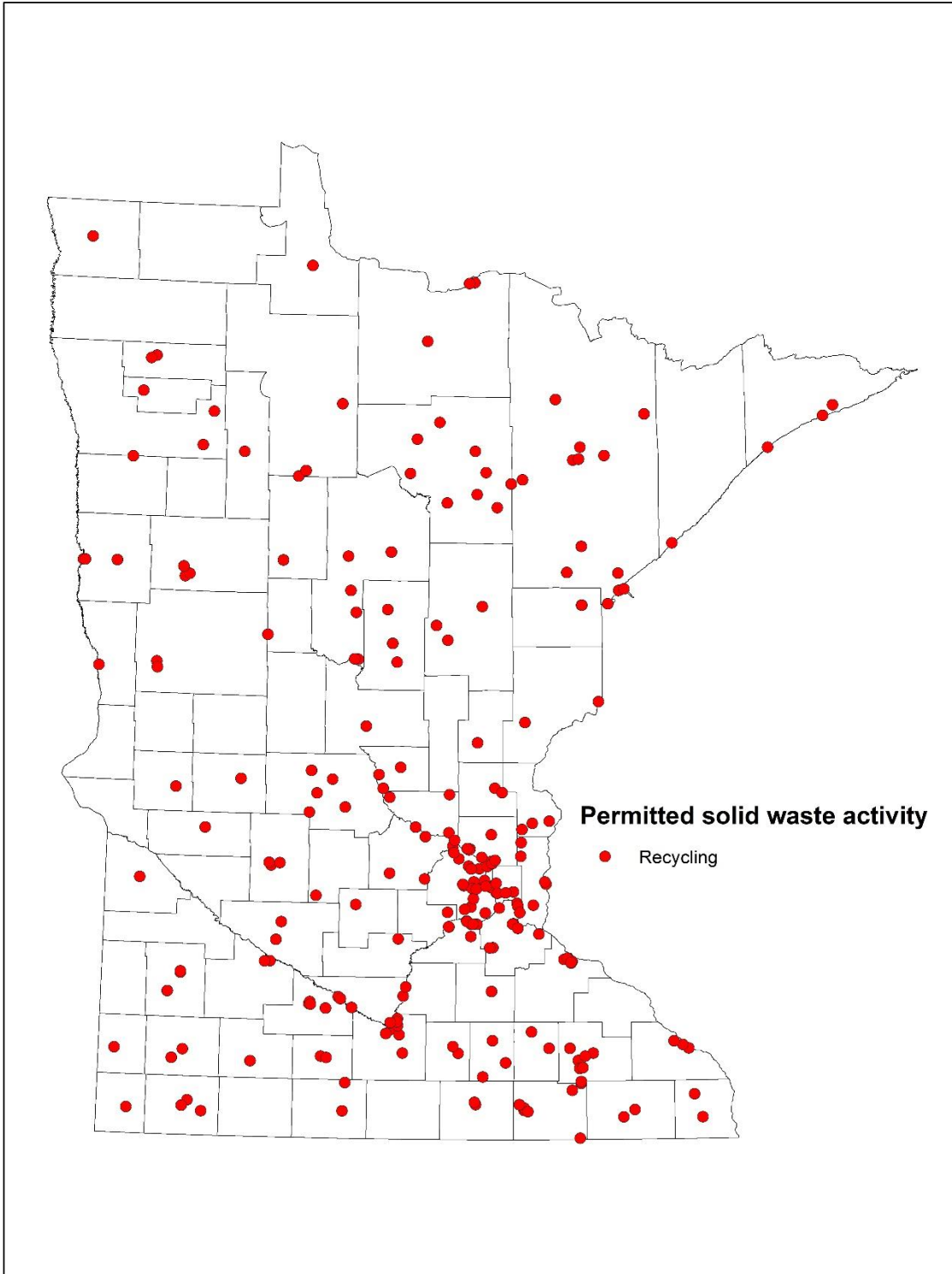


Figure 2. Map of all permitted recycling activities across the state of Minnesota. For the purposes of this map, “Recycling” refers to any site that stores, processes, or transfers recycling materials. There are 236 permitted recycling areas.

Transfer station structure map

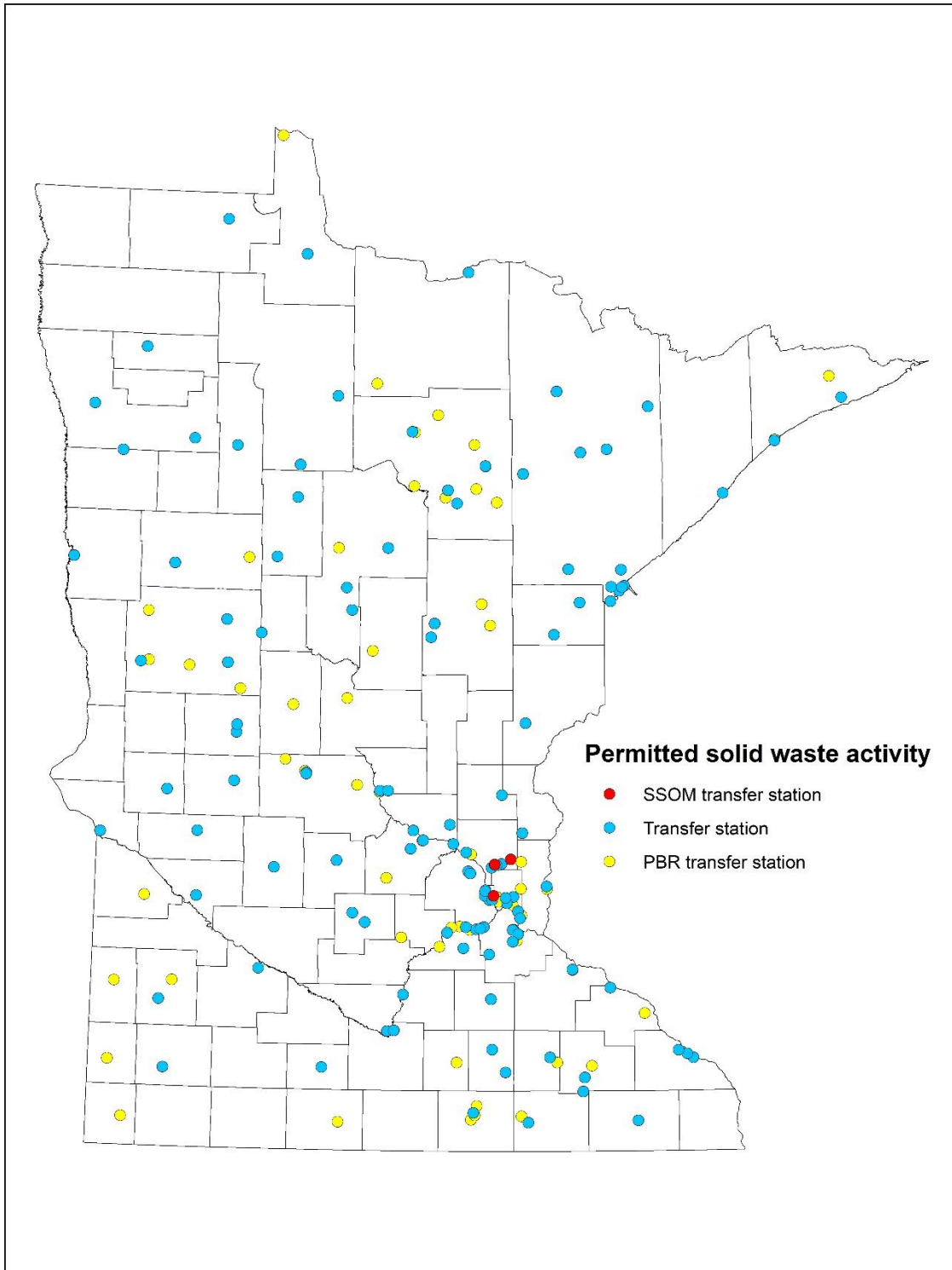


Figure 3. Map of all permitted transfer station structures across the state of Minnesota. PBR transfer stations are only allowed to handle up to 120 cubic yards of material at any given time. Larger facilities must obtain a solid waste permit. There are 64 permitted PBR transfer station structures, 124 individual permit transfer station structures, and 3 transfer station structures that are permitted to transfer SSOM.

Waste-to-energy (WTE) and refuse-derived fuel (RDF) processing map

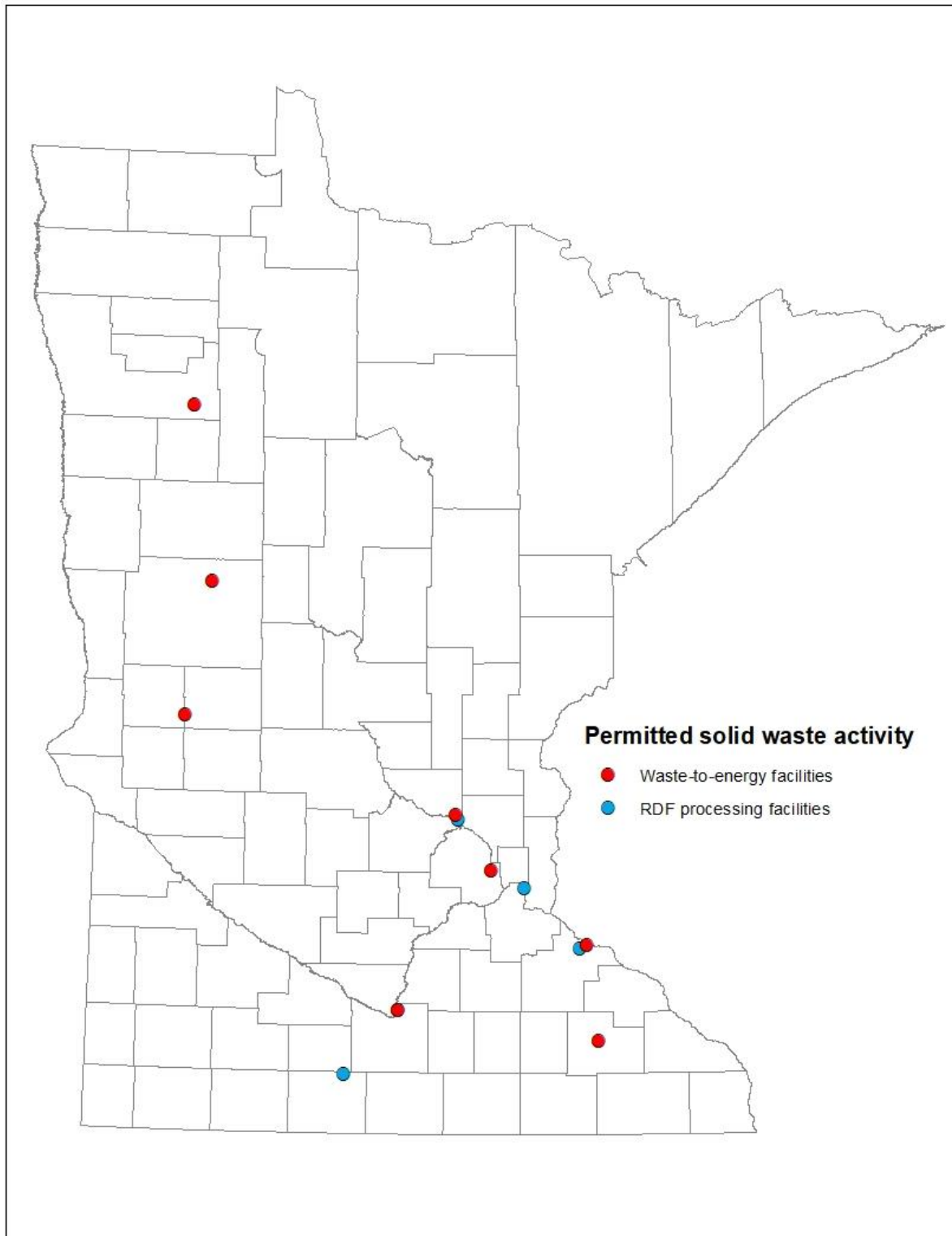


Figure 4. Map of all waste-to-energy (WTE) and refuse-derived fuel (RDF) processing facilities across the state of Minnesota. This map still includes Great River Energy (GRE) as they still have an effective solid waste permit but they stopped accepting waste January of 2019. There are 8 permitted WTE facilities and 5 RDF processing facilities.

MSW land disposal map

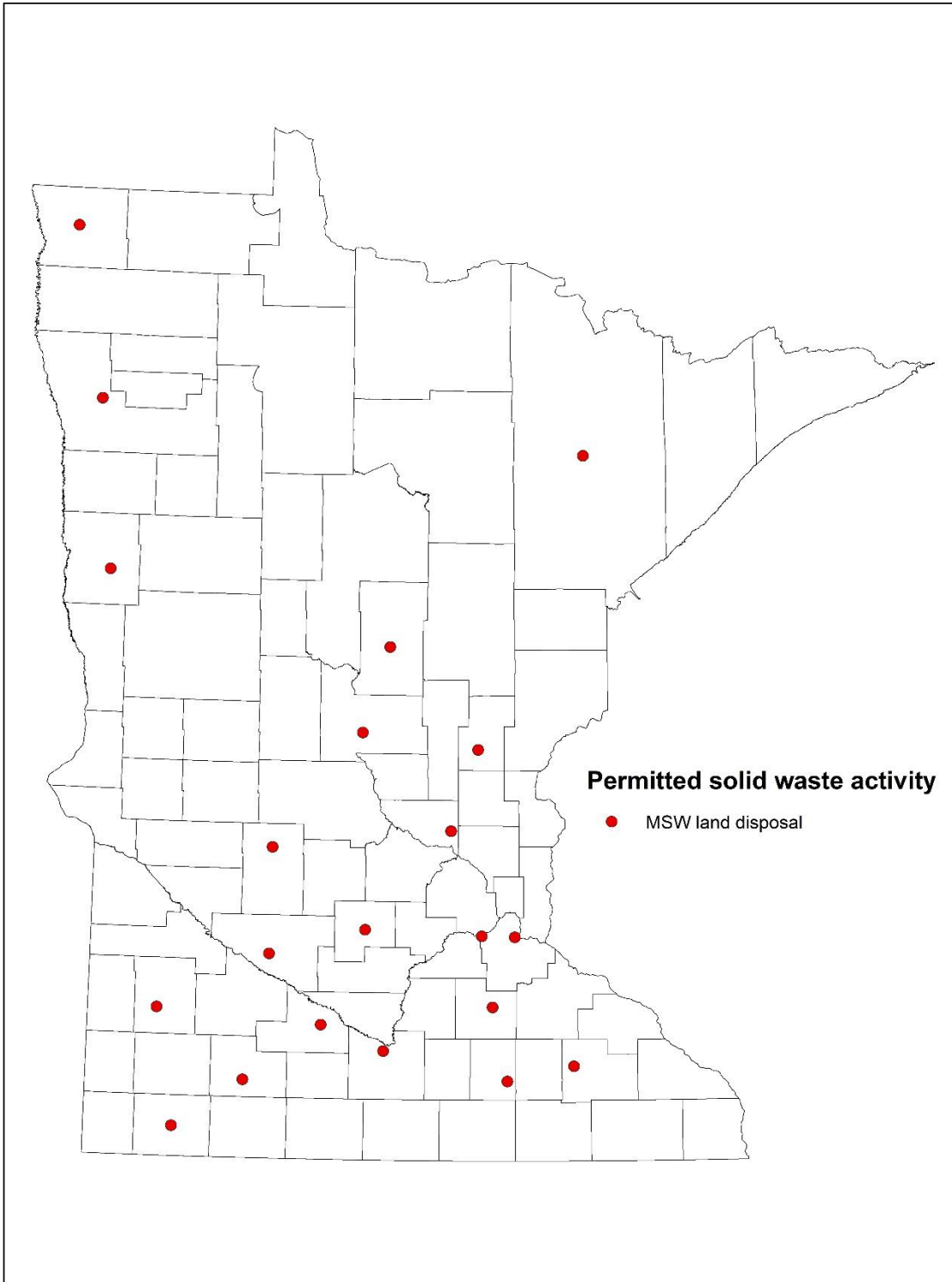


Figure 5. Map of all permitted municipal solid waste (MSW) land disposal areas across the state of Minnesota. There are 21 permitted MSW land disposal areas.

Industrial land disposal map

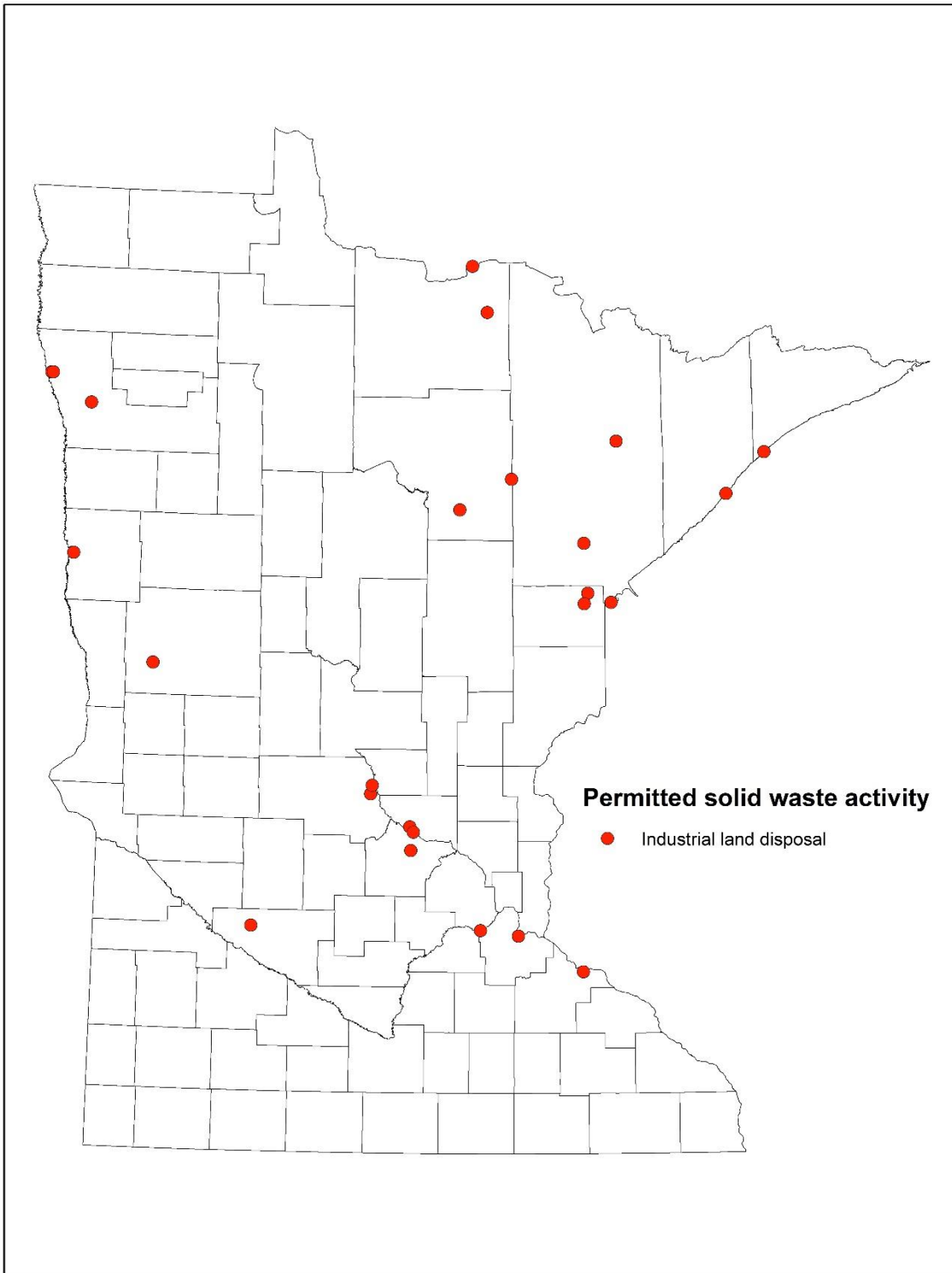


Figure 6. Map of all permitted industrial land disposal areas across the state of Minnesota. Industrial land disposal areas include coal ash disposal and industrial monofills. There are 29 permitted industrial land disposal areas.

Demolition debris land disposal map

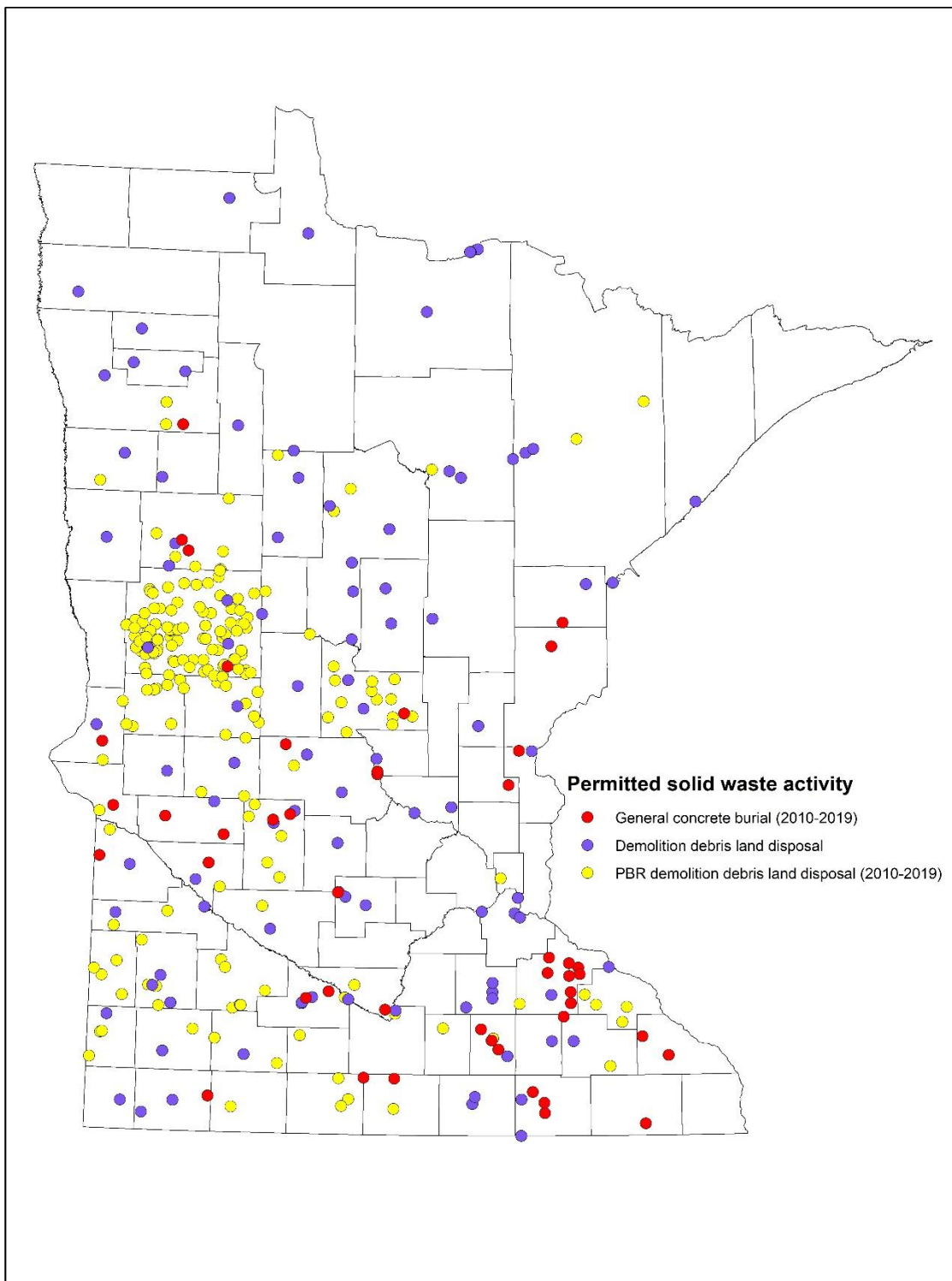


Figure 7. Map of all demolition debris land disposal areas across the state of Minnesota. This map includes PBR demolition debris land disposal areas and general concrete burial land disposal areas permitted from 2010 – 2019. PBR demolition debris land disposal areas can have up to 15,000 cubic yards of material on site at any given time while general concrete burial land disposal areas are limited to only uncontaminated concrete up to 5,000 cubic yards at any given time. There are 127 individual permitted demolition land disposal areas, 180 PBR demolition land disposal areas, and 46 general concrete burial land disposal areas.

Appendix B: Sustainable materials management vision for Minnesota

Minnesotans—in our homes, businesses and communities—design, extract, make and use materials and products in ways that protect and/or enhance the environment, and thereby, human health and well-being.

Recognizing that Earth's resources are limited, we design, make and use materials and products to last as long as possible, to obtain the maximum use from them, and then to recover and regenerate products and materials at the end of each service life. We decrease the total amount of materials used, and the concept of disposal fades as an increasingly circular economy emerges.

Environmental health supports economic productivity and human health. Minnesotans prosper in environmentally just communities with jobs that support a thriving environment, and which conserve material and natural resources for future generations.

We understand that extraction, manufacturing, purchase and use of materials and products have local, state, and global impacts. Minnesotans make consumption decisions that support responsible local, state, and global production and human well-being.

Materials and products are designed, produced and used to minimize and/or eliminate the use and release of toxins and to minimize the use of water and non-renewable energy and the release of GHG emissions and other pollutants. When materials and products are no longer useable or wanted, they are recovered for their next highest and best use in order to minimize the extraction of raw materials.

We take into account the full life cycle environmental, economic and societal impacts of materials throughout their life cycle and implement public policies and financial mechanisms to reflect those impacts so that materials and their use are accurately priced in the marketplace.

We create local and regional economic development opportunities to build an economy that prioritizes sustainable material management actions and use of nature's systems as inspiration for design.

Minnesota's materials economy shifts to primarily local renewable energy sources such as solar, wind, water, and geothermal. Minnesotans preserve, protect and enhance ecosystems, which serve as the foundation for healthy and resilient environments and communities. Minnesota leads in the research and development of renewable raw materials for the manufacturing sector that decrease life cycle impacts.

Appendix C: Progress tracker from 2015 Solid Waste Policy Report

Some, but not all, 2015 solid waste policy report recommendations are reiterated in the 2019 solid waste policy report. See the 2015 report for a full listing of those recommendations.

2015 SWPR Recommendations	Status
Recommendations for moving toward sustainable materials management	
Set goals for reduction and reuse, in addition to existing recycling goals.	This is a goal of the sustainable material management team who continues to evaluate how to proceed.
Measure and report all waste	Hauler reporting is enacted, but compliance is lacking. A framework for reporting structure for construction and demolition and industrial waste is still in development.
Determine a set of priority materials to focus on, based on life cycle environmental impacts	MPCA developed a Sustainable Materials Management team that is working toward identifying material priorities based on life cycle environmental impacts.
Measure the capture rate of recyclables in addition to the recycling rate	A statistician/data steward was hired and MPCA will have the ability to do this once regular composition analysis is achieved.
Require waste composition studies at all disposal facilities.	It is a recommendation in the 2019 SWPR to perform waste composition studies on a routine basis. MPCA has developed a legislative proposal, and conversed with stakeholders.
Reform the waste deposit disclosure requirement and specifically require haulers to provide information to consumers on the final destination of their waste.	No progress toward a waste deposit disclosure requirement; prioritized other hauler reporting.
Recommendations for supporting the waste hierarchy	
Reform SWMT structure to clearly dis-incentivize land disposal. Specifically, change tax/fees, the pay-as-you-throw policy, and other policies to ensure that the least preferable management methods are the most expensive.	Minimal progress; this is a long-term policy requiring long-term commitment and involvement from the legislature and other stakeholders.
Recommendations for clarifying industrial solid waste	

Modify the current industrial definitions to ensure consistency between those found in both rule and statute.	Staff have examined the types of waste being disposed of in industrial cells to understand if there are classification issues. Formulating recommendations toward modifying definitions is ongoing.
Collect additional data on the types of wastes disposed of in Class III and Industrial Solid Waste landfills to determine the composition of these wastes.	MPCA contracted a waste characterization study of C&D landfills, one of which is a class III landfills.
Recommendations for county planning	
Establish a requirement in the Waste Management Act for a statewide solid waste plan (that the existing Metro Solid Waste Policy Plan could be folded into) and require Greater Minnesota county plans to be consistent with state plan.	No progress; however, working towards expanded regional planning for consistency thereby accomplishing some of the goals related to this recommendation.
Develop a stakeholder group consisting of MPCA and county solid waste staff to review the existing plan structure and requirements and develop a proposal for a new planning structure.	Staff met with stakeholders and developed a new greater Minnesota plan schedule and are working on implementation.
Seek out opportunities for collaboration among counties and build on the regionalization and watershed recommendations from the OLA report, waste composition studies, and the Recycling and Solid Waste Infrastructure Evaluation.	Ramsey, Washington, and Hennepin have created a joint powers agreement (JPA) in the metro area that helps them coordinate (particularly on legislative issues and issues related to waste processing). Some Greater MN counties have also created strong JPAs (Redwood/Renville is one example).
System accountability needs to be improved and minimum standards established for all counties such as making annual review and work plan adjustments a standard part of all county plans so they are not a document that is looked at once every 10 years but instead a purposeful and useful planning and policy tool that is used regularly and effectively.	In the metro area, annual report forms have been modified to provide more useful information to evaluate the success of programs. Local Recycling Development Grant (LRDG) agreements were developed with accountability language in them in order to assure that State money is being used as intended.
Recommendations for market development	

<p>Expand MPCA’s recycling market development program based on priority materials identified through a SMM approach and the waste management hierarchy.</p>	<p>Staffing has increased from 1 FTE to 3 FTE. MPCA staff have organized a market development working group that has prioritized materials to focus on based on SMM and a number of other factors. MPCA received an additional \$400,000 per year in its budget during the 2019 legislative session to increase end market capacity for recycled material.</p>
<p>Revive the Market Development Council or create a similar board to provide direction to the State on market development.</p>	<p>MPCA staff has created a market development working group that first met on 11/6/18. This group is made up of cities, counties, haulers, MRF operators, and state agencies. Group membership is voluntary. After process and discussion, mixed paper, glass, and organics were chosen as the priority materials. Three subgroups have formed and have been meeting to address these materials.</p>
<p>Recommendations for new technologies</p>	
<p>Establish a process for the MPCA to evaluate and review new technologies at facilities using life cycle analysis techniques. Outline the resources, barriers, and steps needed to determine where and why they fit into the waste management hierarchy</p>	<p>The SMM team is working towards a framework for implementing life cycle analysis.</p>
<p>Recommendations for organics recovery</p>	
<p>Expand the “Opportunity to Recycle” requirement to include five broad material types instead of just four.</p>	<p>Hennepin County Ordinance 13 was amended to include organics collection for residents phased-in starting 2022.</p>
<p>Explore legislative or rule changes to simplify the process for communities to host organics dropsites.</p>	<p>Completed. Organics dropsites are no longer required to register with the state.</p>
<p>Add capacity to the system to consolidate and transport organics at transfer stations</p>	<p>Some additional transfer stations have come online; but there is opportunity for more growth.</p>
<p>Expand current requirement (Minn. Stat. §325E.046) regarding labeling of compostable plastic bags to include all compostable products, ensuring that only products designed to meet specific scientific standards can make claims about their compostability.</p>	<p>Policy drafted; recommended in 2019 report.</p>

<p>Adopt policies that encourage the use of compost in public construction projects</p>	<p>MPAC worked with MnDOT to update their 3890 compost specification. Some local ordinances were changed, and MPCA lists compost use ordinances as a best management practice for GreenStep Cities Programs.</p>
<p>Recommendations for product stewardship</p>	
<p>Implement changes to the existing e-waste legislation.</p>	<p>In 2016 there were amendments to the Minnesota Electronics Recycling Act. This included updates to definitions, due dates, credits, manufacturer obligation, collector, recycler and manufacturer responsibilities. In 2018, additional changes were proposed to strengthen enforcement of the statute after the MPCA determined that the original intent of the 2016 changes regarding the financial responsibility of manufacturers was not being met. These proposed changes did not receive a committee hearing. MPCA will continue to work with collectors, recyclers and manufacturers to discuss how to get the true cost of recycling covered by the manufacturers according to the 2016 amendments. This could range from the 2018 proposed amendments or a completely new statute</p>
<p>Develop a product stewardship program to address mercury-containing lamps.</p>	<p>Ongoing discussions; Product stewardship program options for mercury-containing lamps have been discussed internally and with counties and other interested parties. Proposals have not moved forward due to competing policy priorities of counties and other parties whose support is needed to move a proposal through the Legislature.</p>

<p>Develop a strategic plan for prioritizing product stewardship focus based on sustainable materials management and life cycle impacts</p>	<p>Ongoing discussions to incorporate SMM aspects into criteria for how to prioritize products for product stewardship based on environmental impacts.</p>
<p>Develop a product stewardship program for agricultural plastic and boat wrap.</p>	<p>No product stewardship group has been developed, material collection programs have been implemented for about 30 counties by Revolution Plastic. Counties are paying for local collection and bailing of material.</p>
<p>Recommendations for financing and resource allocation</p>	
<p>The MPCA and Legislature should allocate sufficient funding and staff resources to carry out the recommendations within this report.</p>	<p>SCORE disbursements received an increase of \$3,000 in Fiscal Year (FY) 2016 from 2014 base disbursements. There was a one-time appropriation increase of \$500,000 to FY 2017 SCORE disbursements. There is also a one-time increase of \$500,000 from 2016 in FY 2020 SCORE disbursements.</p> <p>Appropriations in FY2020 (MN Session Laws – 2019, 1st Special Session, Ch. 4, Subd. 7) include:</p> <p>\$400,000 the first year and \$400,000 the second year are from the environmental fund for grants to develop and expand recycling markets for Minnesota businesses.</p> <p>\$750,000 the first year and \$750,000 the second year are from the environmental fund for reducing and diverting food waste, redirecting edible food for consumption, and removing barriers to collecting and recovering organic waste. Of this amount, \$500,000 each year is for grants to increase food rescue and waste prevention.</p> <p>Greater MN Recycling and Composting Grant program (115A.565) was established in 2016</p>

	and appropriates \$1,000,000 a year.
The state will take steps to better align its funding distribution criteria to encourage highest and best use of materials. A more incentive-based funding approach could include programs such as SCORE, Environmental Assistance (EA) grants, Capital Assistance Program (CAP), Local Recycling Development Grants (LRDG) and other grant and loan programs.	LRDG has improved the process to include grant agreements that clearly articulate the county responsibilities when they accept the funding.
Explore a Green Bond program to fund Sustainable Materials Management (SMM) in Minnesota. Green Bonds are used to raise capital and invest in new and existing projects with environmental benefits. Using green Bonds in Minnesota would enable capital raising and investment for new and existing projects with environmental benefits. The majority of current Green Bonds are being used to fund renewable energy and energy efficiency projects nationally and internationally. In Minnesota, these funds could be used for loans or grants to finance both private and public recycling infrastructure, recycling end market development, the reuse sector and other SMM projects.	No progress; Green Bond programs have been examined through a market development lens and have been discussed with the Market Development Working Group.