



REPORT TO THE
LEGISLATURE
JANUARY 2023

The air we breathe

The state of Minnesota's air quality in 2021



Legislative charge

The Minnesota Pollution Control Agency (MPCA) has a statutory requirement (Minn. Stat. § 115D.15 and § 116.925) to report to the Minnesota Legislature biennially on the status of toxic air contaminants, mercury emissions, and the MPCA's strategies to reduce the emissions of air pollutants. The MPCA uses this report as an occasion to discuss the most pressing outdoor air quality issues facing Minnesota and to explore the opportunities available for emission reductions.

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New greenhouse gas emissions report

Minnesota's climate is changing rapidly, and these changes – driven largely by human-caused emissions of greenhouse gases (GHGs) – are affecting our health, communities, natural resources and our way of life. While Minnesota's GHG emissions are declining relative to 2005 levels, we missed the 15% emissions reduction goal set for 2015 by the Minnesota Legislature under the Next Generation Energy Act and we are not on track to meet the 2025 goal or the 2050 goal. To learn more about GHG emissions in Minnesota, you can explore the MPCA's latest report, Greenhouse Gas Emissions in Minnesota: 1990-2020. And to learn how Minnesota is working to get back on track to achieve its goals, and become carbon neutral by 2050, you can visit <https://climate.state.mn.us/minnesotas-climate-action-framework>

Air toxics in Minnesota

Air toxics are a group of pollutants that cause or may cause cancer or other serious health effects or adverse environmental and ecological effects. Air toxics include 187 Hazardous Air Pollutants (HAPs) which are specified in the federal Clean Air Act Amendments. Minnesota also tracks per- and polyfluoroalkyl substances (PFAS) compounds (known as forever chemicals), trichloroethylene (TCE) replacement chemicals, and other chemicals of concern for public health.

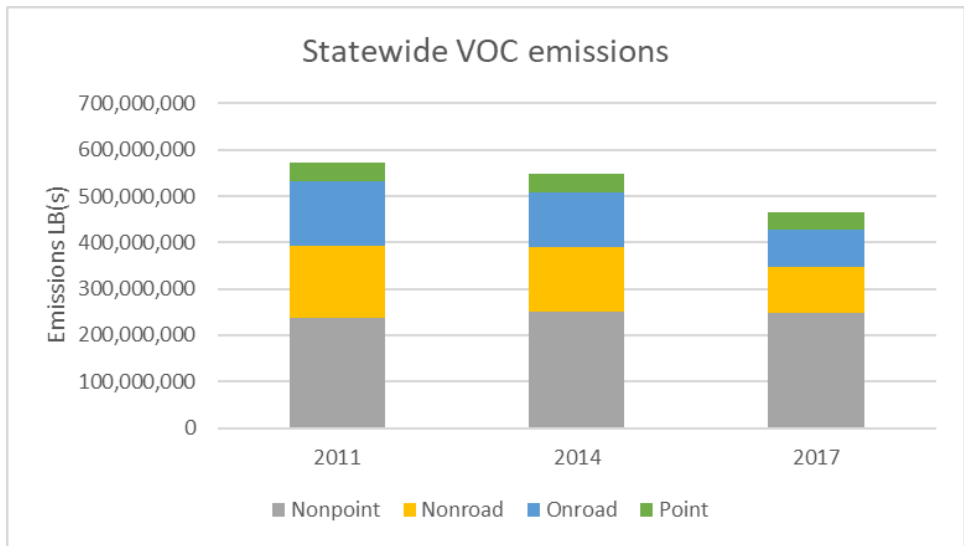
Emissions of air toxics in Minnesota have decreased over time due to federal and state regulations, cleaner vehicles, and pollution prevention at facilities. Air toxics vary in their toxicity but reducing air toxic emissions overall is good for Minnesota's air quality and health. The MPCA tracks air toxics emissions through emissions reporting from permitted facilities and through national emissions estimates for other sources like transportation, fires, and neighborhood sources.

Volatile Organic Compounds

Volatile Organic Compounds (VOC) are a group of air toxics emitted from industrial and commercial processes as well as many of our daily activities. You may recognize them as the fumes coming from paint, solvents, adhesives, gasoline, cleaning products, or other chemicals used in everyday activities. They are also released when fuel is burned in cars, trucks, generators, lawn mowers, machinery, and recreational equipment. VOC emissions can contribute to ground-level ozone formation. Ozone is one of the six common regional pollutants with a federal standard to prevent serious harmful health impacts.

VOC emissions have decreased over time. The largest sources of VOCs statewide (excluding natural sources) are neighborhood sources. Transportation, including non-road and on road vehicle emissions are the second largest source while permitted facility emissions contribute relatively small amounts of VOCs statewide, although some facilities are significant sources in their immediate area.

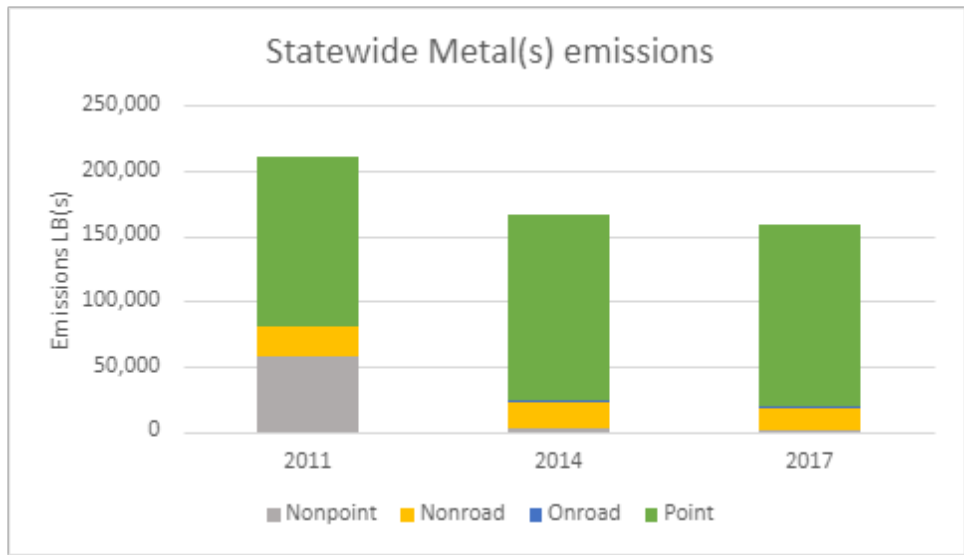
Figure 1. Minnesota emissions of VOCs 2011-2017. Note, biogenic and fire sources of VOCs are excluded from this chart.



Metals

Metals are another group of air toxics emitted from many industrial processes and as a byproduct of fossil fuel combustion. Most metal emissions in Minnesota come from combustion. Metal emissions have decreased over time due to smaller businesses reducing coal and oil combustion. Methods for estimating statewide metal emissions have also changed over time and resulted in lower estimates.

Figure 2. Minnesota emissions of metals 2011-2017.

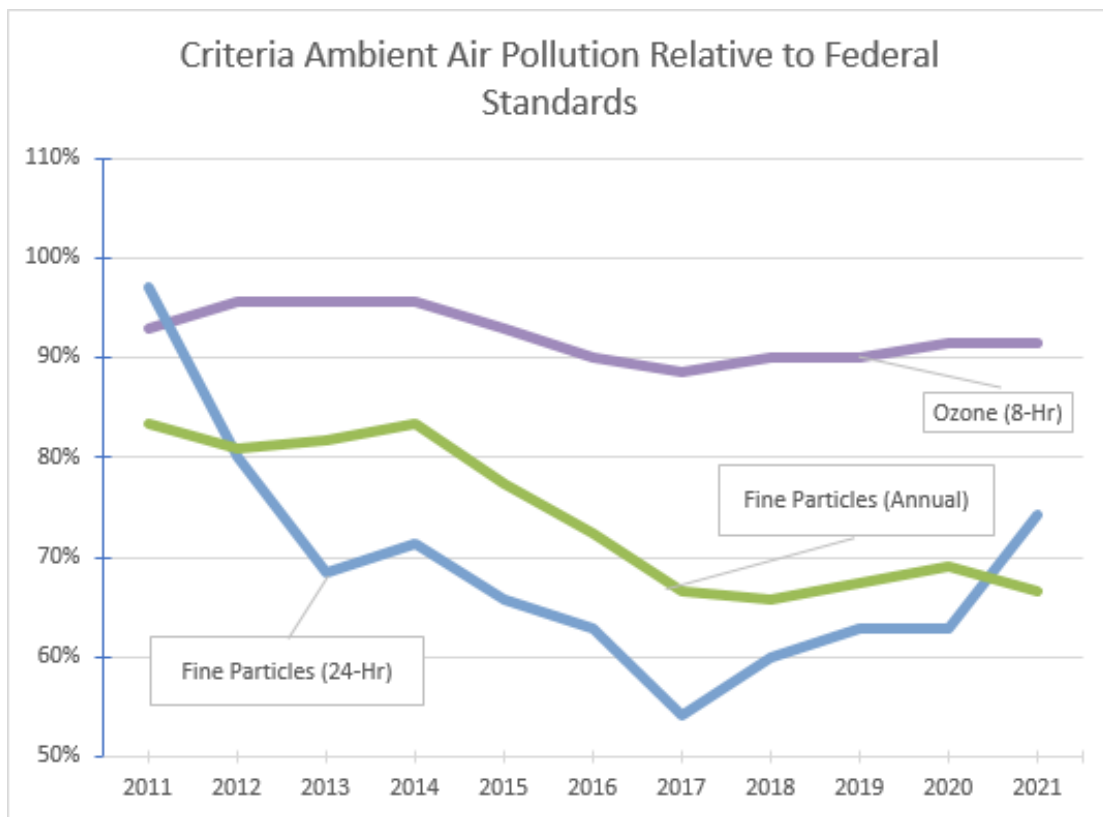


Overall air pollution

In addition to air toxics, Minnesota tracks six criteria air pollutants that have federal standards including nitrogen dioxide and particulate matter. Nitrogen oxides and VOCs can react to form ground-level ozone. Ozone and particulate matter have the most impact in Minnesota and can contribute to health issues even below the federal standards.

Regulation and voluntary actions have reduced air pollution over time. Most reductions have come from permitted facilities and electrical generation. Daily fine particle concentrations have increased in recent years due to wildfire smoke. To achieve further improvements in air quality, transportation and neighborhood air sources will need to reduce their emissions. Minnesota meets all current federal standards, but these standards continue to become more stringent over time and require additional state actions to reduce air pollution. In addition, air pollution levels remain elevated in many areas of concern for environmental justice compared to state averages.

Figure 3. Minnesota air pollution compared to select federal ambient air standards, 2011-2021.



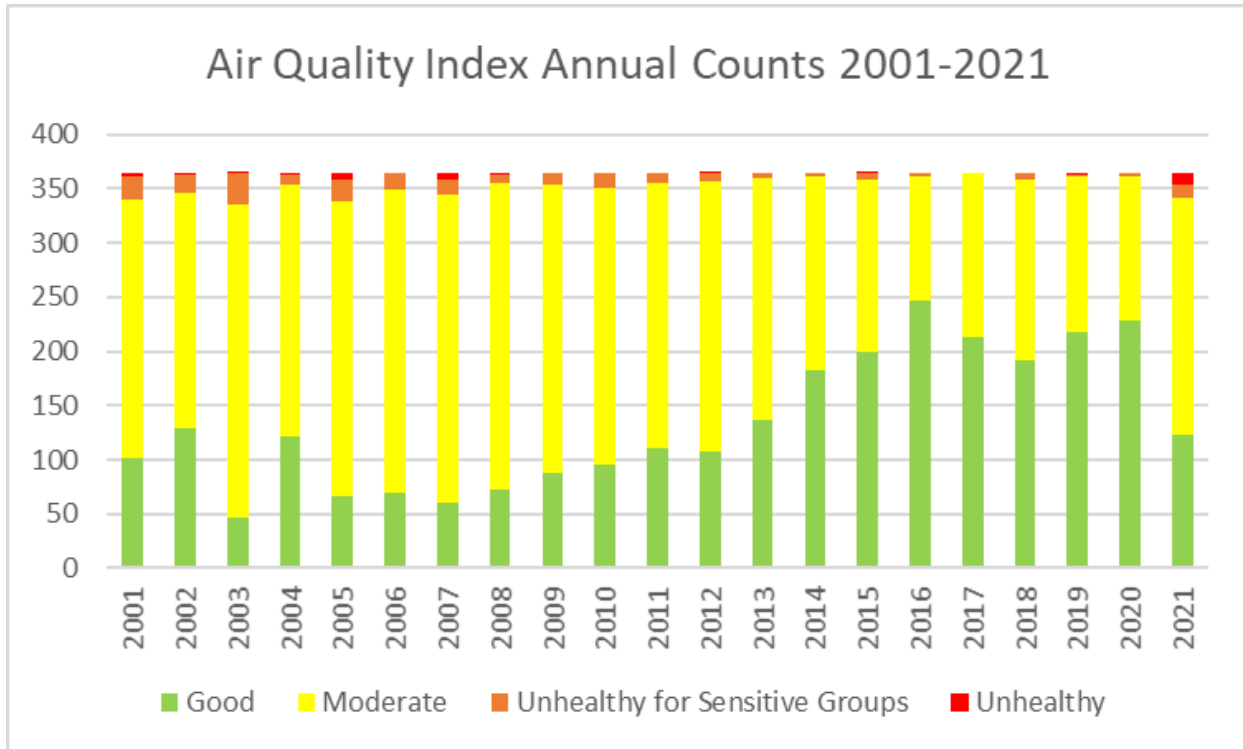
AQI alert trends across the state

On most days, air across Minnesota is healthy to breathe, but on some days each year pollutants such as ozone and fine particles can reach unhealthy levels. The MPCA uses the Air Quality Index (AQI) to rank daily air quality. Air quality is ranked as good, moderate, unhealthy for sensitive groups, or unhealthy for everyone. The MPCA issues an air quality alert when the AQI forecast levels are unhealthy for sensitive groups, which is the orange on the AQI color scale. The AQI shows air quality has trended better over time. However, the number of days with poor air quality varies from year to year.

There was a large and unprecedented increase in the number of days with moderate or worse air quality in 2021 (Figure 4). This increase can largely be attributed to the severe to exceptional drought conditions and wildfire smoke in the Upper Midwest throughout the summer. Ozone formation is typically more robust during drought conditions due to less precipitation and cloud cover. The drought conditions also aided in extensive wildfire activity in Saskatchewan, Manitoba, and Ontario. Smoke from these fires made frequent incursions into Minnesota during July and August 2021, leading to many days with high levels of fine particulate matter (PM_{2.5}). Smoke from wildfires in the western US also made it to Minnesota, though this smoke tended to remain aloft so there were lower smoke concentrations at ground level compared to the Canadian wildfires. In August 2021, several wildfires occurred within Minnesota and just over the border in the Quetico Provincial Park in Ontario, including the Greenwood fire northeast of Duluth that burned over 26,000 acres. Several alert days in late August 2021 can be attributed to the Greenwood fire and fires burning in Quetico.

Wildfire smoke has become an increasingly common occurrence in Minnesota since 2015. This overall trend is expected to continue in the future due to climate change and increasing wildfires across the Canadian provinces and Pacific Northwest region of the U.S.

Figure 4. Annual statewide AQI category counts, 2001-2021



Health Risks from Air Pollution in Minnesota: MNRISKS 2017

Past editions of this report have discussed emissions amounts for individual pollutants, but individual emissions don't tell the whole story. Some pollutants have a greater potential for health effects than others, and Minnesotans are exposed to myriad pollutants at varying concentrations every day. Therefore, MPCA uses a risk assessment tool called MNRISKS to evaluate the potential negative health effects from the air pollutants residents are exposed to.

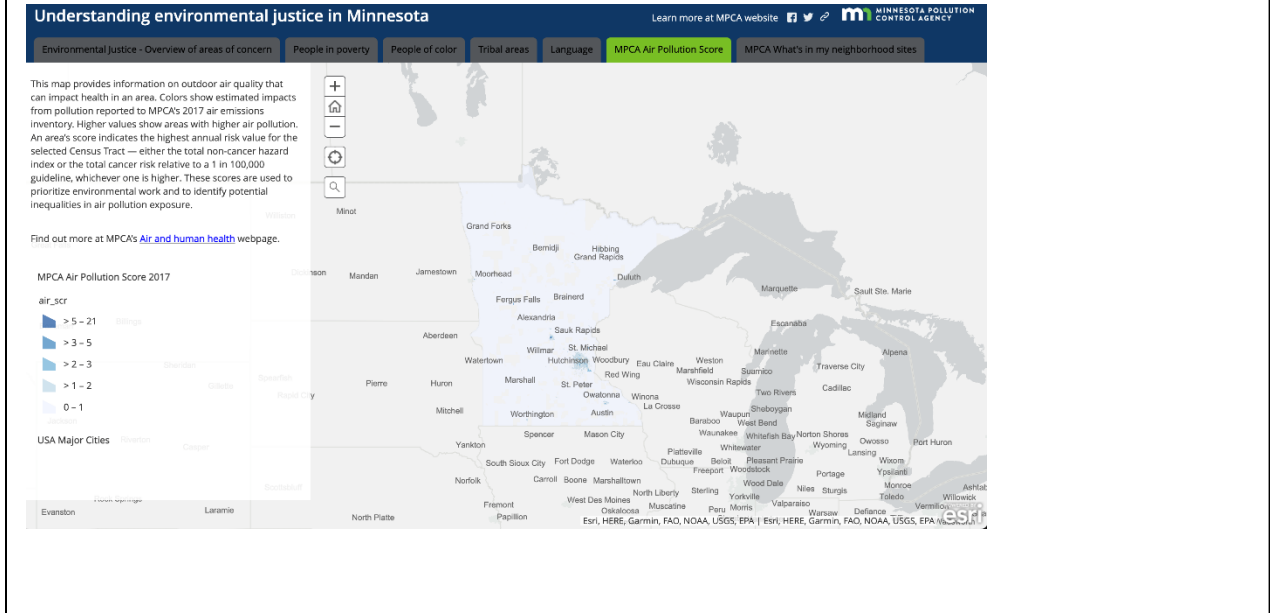
Minn. Stat. § 115D.15 requires MPCA to prioritize air toxics sources. MNRISKS provides a modernized approach to this prioritization that considers emissions, the toxicity of individual pollutants, and peoples' exposure to concentrations of air toxics. The information below is based on emissions from 2017, the most recently available modeling results.

The MPCA uses MNRISKS and emissions from permitted and non-permitted sources to estimate the concentrations of air pollutants across Minnesota. These concentrations are then compared to health benchmarks, which are the concentrations below which a pollutant is unlikely to cause health effects in sensitive populations after a lifetime of exposure.

Because MNRISKS data and health benchmarks are both reported as concentrations, comparing the two will result in a ratio – MNRISKS reports this number as an air pollution score. An air pollution score of one means air pollution levels are at the health benchmarks. An area with an air pollution score at or above one does not necessarily mean that health effects are occurring there, but it does compel further investigation into the contributing sources and pollutants and strategies for reducing emissions.

To learn more about air pollution across the state, visit [MPCA's Environmental Justice Map](#) and check out the Air Pollution Score tab. You can find air pollution scores, pollutants posing the highest potential risk, and types of air pollutant emission sources for any location in Minnesota.

MNRISKS information is reported for census block groups, which are defined and used by the US Census Bureau to count the population. A block group is an area of land where about 600 to 3,000 people live.

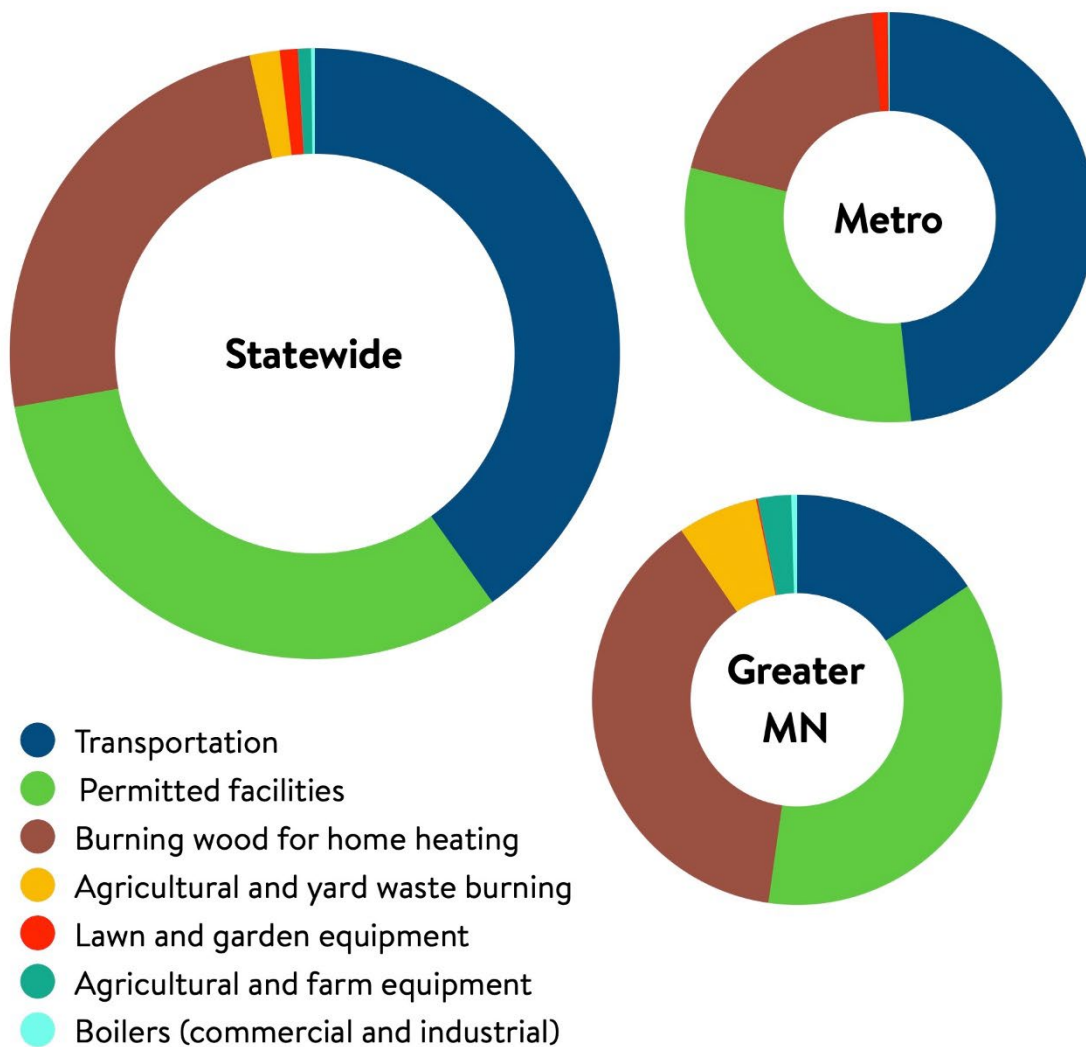


When we compare the sources that contribute to air pollution risk, three sources dominate: transportation¹, permitted facilities, and burning wood for home heating (see Figure 6). These three sources are so dominant that two out of every three Minnesota residents live in an area where these three sources are the top contributors to air pollution risks.

¹ Transportation includes traffic, planes and airport equipment, railyards and trains, commercial boats and ships, and recreational vehicles and boats.

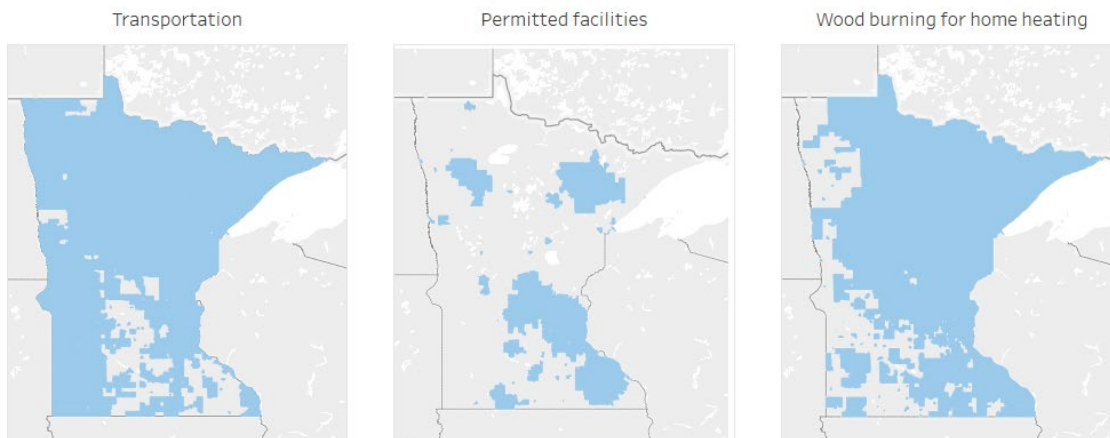
Figure 5: Comparisons of source contributions to air pollution risk statewide, in the Twin Cities metro, and in Greater MN. The sources that contribute the most to air pollution risk are transportation, permitted facilities, and burning wood for home heating. Transportation has a notably outsized contribution in the Twin Cities metro area compared to Greater Minnesota.

Air pollution risk sources in Minnesota



The maps in Figure 6 show where transportation, permitted facilities, or wood burning for home heating are among the top 3 contributors to air pollution risk. The contributions from transportation and wood burning for home heating are particularly widespread.

Figure 6: Areas in blue indicate census block groups where transportation, permitted facilities, or wood burning for home heating are among the top 3 contributors to air pollution risk. Air pollution and related risk from transportation and wood burning for home heating are particularly widespread.



The main contributors to air pollution risk in environmental justice areas of concern are the same as statewide: transportation, permitted facilities, and wood smoke. However, average air pollution scores are higher in environmental justice areas (Table 1), indicating higher potential likelihood of health effects. Additionally, block groups that meet environmental justice criteria for both race and income often have higher average air pollution scores than those that meet the criteria for race or income alone.

Table 1: Average air pollution scores statewide and for block groups that meet criteria to be considered environmental justice areas of concern. Air pollution scores are higher in areas that meet environmental justice criteria for income or race. 1.0 is the health benchmark.

| | Tribal areas | Non-EJ areas | Income | Race | Income and race |
|--|--------------|--------------|------------|------------|-----------------|
| Transportation contribution | 0.03 | 0.2 | 0.3 | 0.5 | 0.7 |
| Permitted facility contribution | 0.06 | 0.2 | 0.5 | 0.3 | 0.5 |
| Wood burning for home heating contribution | 0.04 | 0.2 | 0.3 | 0.25 | 0.3 |
| All sources statewide | 0.13 | 0.8 | 1.2 | 1.4 | 1.8 |

The MPCA considers tribal areas and census tracts with higher concentrations of low-income residents and people of color to be areas of concern for environmental justice.

This includes areas of:

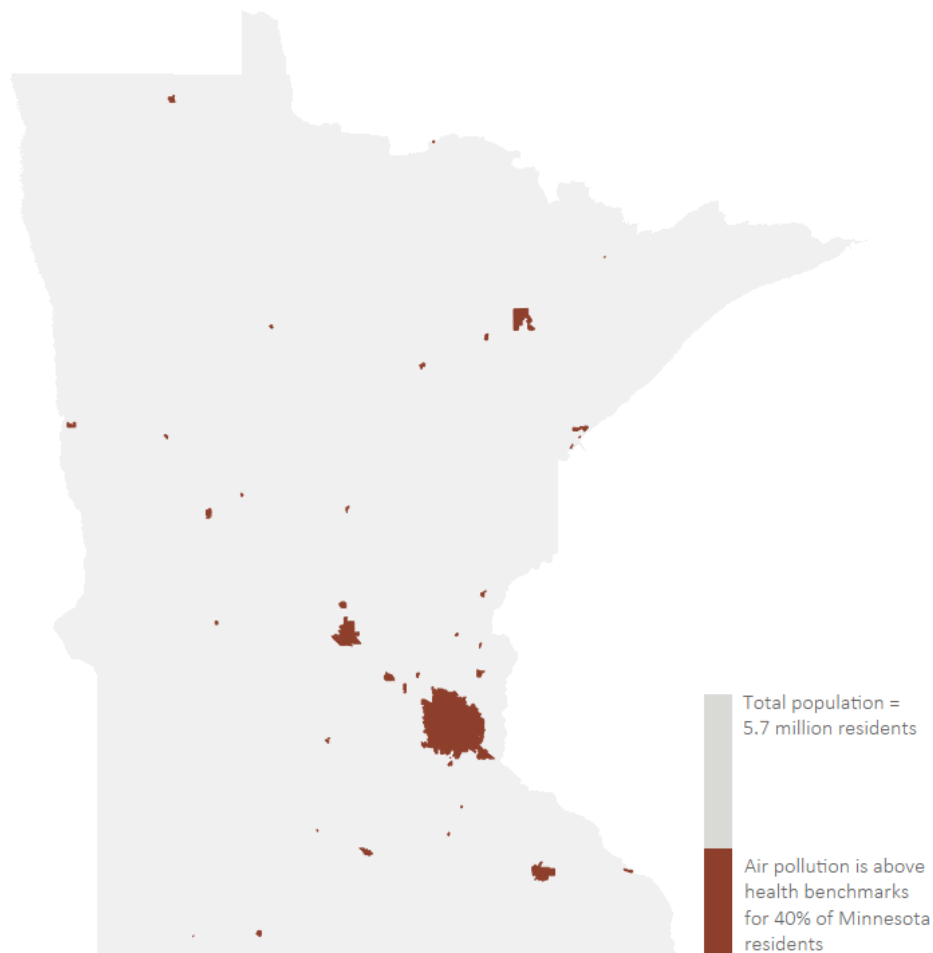
- At least 40% of people reported income less than 185% of the federal poverty level
- 50% or more people of color
- Federally recognized Indian Tribes

We do this to identify areas where additional consideration or effort is warranted to ensure meaningful community engagement and to evaluate the potential for disproportionate adverse impacts.

The map in Figure 7 shows areas where total air pollution is estimated to be over health benchmarks. Although it is a small area overall, more than two million Minnesota residents (40% of the total population) live in areas where air pollution risk is estimated over health benchmarks. These areas are generally found in large and small population centers across the state such as Duluth, Mankato, Moorhead, Rochester, Saint Cloud, and the Twin Cities metro.

Among the residents who are potentially exposed to air pollution over health benchmarks, about half live in areas of concern for environmental justice.

Figure 7: Areas of Minnesota where the combined risk from all sources of air pollution is over health benchmarks. Although it is a small area overall, 2 out of every 5 Minnesota residents live in these areas – half in areas of concern for environmental justice.



Reducing health risks from air pollution

The MPCA works to reduce health risks from air pollution through state and federal regulations and through voluntary measures like grants, loans, and technical assistance. In the last few years, the MPCA has:

- Implemented Minnesota's partial ban on trichlorethylene (TCE)
- Continued work with Clean Air Minnesota, a public-private partnership, to reduce VOCs, PM, and NOx emissions by over 600 tons
- Awarded \$14 Million in Volkswagen Settlement funds to support transportation electrification and the replacement of high-emitting diesel equipment.
 - These grants reduced emissions by 1,900 tons of NOx, 190 tons of PM2.5, and 37,000 tons of GHGs.
 - 29% of funds have been awarded to projects in areas of concern for environmental justice
- Coordinated with tribal nations to swap wood stoves for newer, less-polluting models and store wood to ensure it is clean and dry for burning.
- Supported electric vehicle adoption through EV charging grants, education and Clean Cars MN.
- Prioritized expired permit review and reissuance in areas of concern for environmental justice.
- Prioritized inspections using environmental justice and air pollution risk scores.

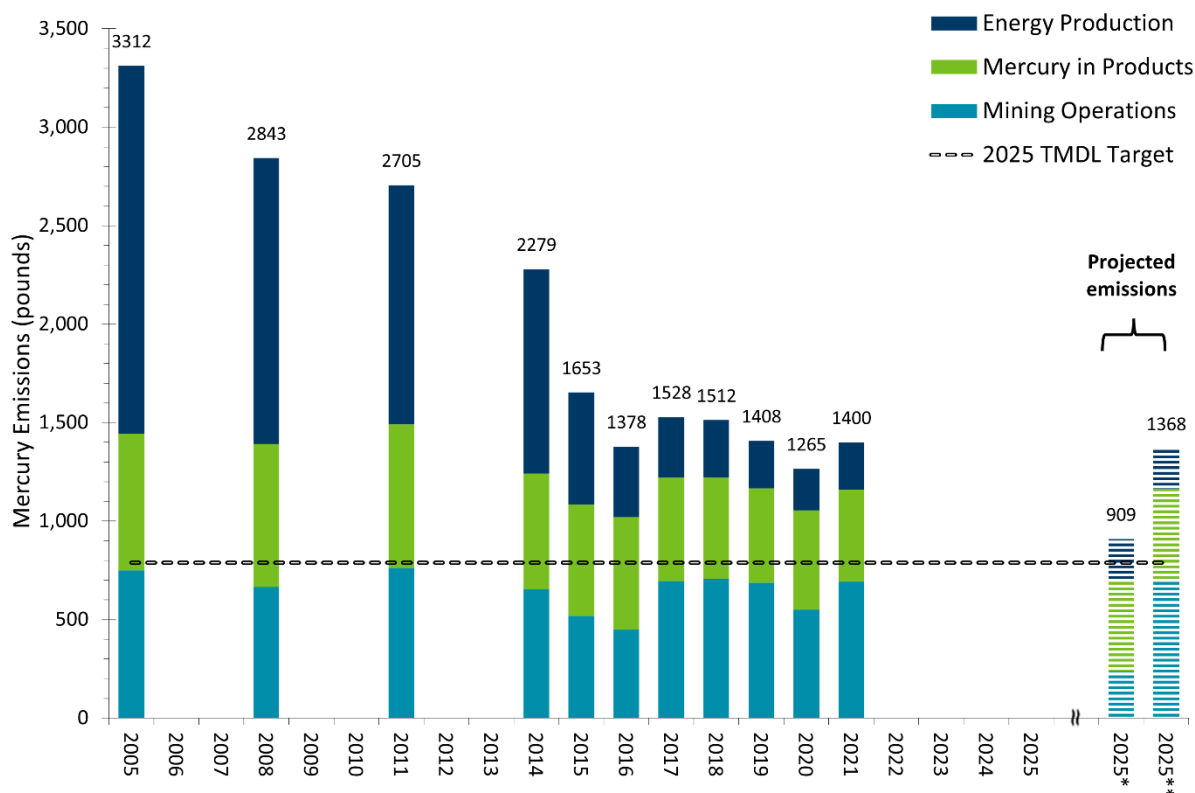
The MPCA will continue to work with permitted facilities, other sources of air pollution, and Minnesota communities to ensure all Minnesotans breathe healthy air.

Reducing mercury in our air and water

This section of the report provides the biannual status update on progress towards Minnesota's 2025 mercury emission goals. Mercury exposure can harm the organs and nervous systems of people, especially children, and wildlife. Minnesota has led the nation in efforts to reduce mercury air emissions, but challenges remain. Mercury released into the air settles into water and accumulates in fish, making them unsafe for people to eat and damaging the ecosystem. In 2007, the MPCA finalized a statewide mercury Total Maximum Daily Load (TMDL) study that determined the emissions reductions necessary to meet water quality standards and protect people from consuming mercury-contaminated fish. The TMDL establishes a goal of 93% reduction in mercury from all human sources including emissions originating from outside of Minnesota using 1990 as the baseline. The MPCA is working to meet the 93% reduction in the state by following the mercury TMDL implementation plan.

To accomplish the reductions specified in the TMDL and implementation plan, the MPCA proposed and later adopted rules regarding mercury reduction plans in Minn. R. 7007.0502. These rules established mercury emissions reductions for certain sources of mercury air emissions in order to ensure we meet the goals of the 2007 TMDL. In order to evaluate the progress of reducing mercury in our waters, mercury emissions inventories are developed and tracked. The MPCA also conducts fish tissue analysis to understand how mercury levels in fish are changing over time.

Figure 8: Minnesota mercury emissions and projections



2025* This projection is based on the ferrous mining/processing industry in northern Minnesota meeting the required 72% reduction specified in Minn. R. 7007.0502.

2025** This projection is based on the ferrous mining/processing industry’s proposed reductions in each mercury reduction plan applied to the baseline emissions as calculated by MPCA.

All the waters in the state will benefit from the statewide mercury reduction plan, but not all waters respond the same to reduced emissions. The primary goal is to substantially lower mercury in fish and make them safer to eat. Minnesota’s 2022 Impaired Waters List includes 6,168 water quality impairments in 2,904 different bodies of water. Of the waters tested, mercury is the cause of 1,671 impairments in 1,316 different lakes and rivers. About 73% of our waters impaired for mercury will reach the goal if the plan is fully implemented. For the remaining 27%, more work is needed to understand why these waters remain high in mercury despite lower emissions.

Sector activities and emissions reductions

A number of efforts are in place to reduce mercury emissions. State statutes and rules, along with national standards for mercury and air toxics emissions from coal-fired utility boilers, have resulted in significant reductions in emissions of mercury and other pollutants in Minnesota. In 2006, Minnesota passed the Mercury Emissions Reduction Act (MERA), which set a schedule for the largest coal-fired utility boilers in the state to reduce mercury emissions by 90% from 2005 levels. As of 2015, all Minnesota utilities have achieved full compliance with MERA. To achieve these reductions, they retrofitted some coal plants with improved pollution controls, switched some to natural gas, and shut down others. The changes these facilities made to reduce mercury emissions also brought 75-80% reductions in emissions of air pollutants such as nitrogen oxides, sulfur dioxide and PM2.5, as well as

significant reductions in greenhouse gases. Utilities continue to shut down coal plants in Minnesota as they rely more on renewable energy and natural gas. Several of the remaining coal plants in Minnesota will close in the 2020s. It is estimated that electric utilities emitted approximately 105 pounds of mercury in 2021 and now represent the smallest of the three source categories. This is a decrease from 182 pounds emitted by electric utilities in 2017.

Emissions from mercury use in various products have generally decreased, dropping from 525 pounds in 2017 to 468 pounds in 2021. Within this category the two largest contributors are mercury in solid waste and dental mercury (via dental preparations and cremation). While the amount of solid waste produced and collected in Minnesota went up roughly 8% from 2017 to 2021, there has been a general downward trend in the mercury content of solid waste. Overall, mercury emissions from waste have decreased from 288 pounds in 2017 to 186 pounds in 2021. Conversely, emissions from cremation have continued to increase as the practice becomes more common in Minnesota. Mercury emissions from cremation has increased from 110 pounds in 2017 to 148 pounds in 2021. The MPCA continues to work to improve the confidence of the mercury emissions inventory through partnerships and research.

Emissions from the taconite mining sector have also remained relatively flat, from 683 pounds in 2017 to 682 pounds in 2021. Per Minn. R. 7007.0502, the taconite mining sector submitted mercury reduction plans to the MPCA in December 2018. The MPCA received eight plans, each varying in the amount of mercury reductions proposed. Two facilities submitted plans with proposed reductions meeting the required 72% reduction specified in Minn. R. 7007.0502, two facilities submitted alternative plans with proposed reductions less than the 72%, and four facilities submitted alternative plans with no proposed reductions but indicated that they would conduct further evaluation beginning in mid-2020.

Despite significant reductions from some sectors, the MPCA projects that the state will not meet the 2025 statewide reduction goal. Meeting that goal will require significant reduction of mercury emissions from the taconite mining sector and further reductions from mercury use in various products.

Regional, national, and international efforts

Mercury pollution from outside the state still impacts fish and waterbodies in Minnesota, and reductions outside of Minnesota remain important. Mercury emitted into the atmosphere can become a global pollutant, which is why mercury deposition and fish mercury concentrations have not significantly declined despite large reductions in North American mercury emissions from human sources. However, while emission inventories indicate global increases in mercury emissions, ambient air mercury concentrations across the United States have fallen due to federal and state regulatory actions and market forces, indicating that local mercury reductions continue to be important. MPCA data show that increases in global mercury emissions are being offset by decreases in local emissions. Still, more reductions are needed globally and locally to reduce fish mercury concentrations for the long term.

Within the TMDL implementation plan the final goal of 789 pounds is a 76% reduction from the 2005 baseline. There is also an interim 2018 goal of 1,464 pounds, a 56% (average) reduction from the 2005 baseline.

Minnesota met our 2018 reduction goals, but more work is needed to meet the 2025 goal.

Regional/national mercury emission reductions have also surpassed the interim 2018 goal and nearly meet the 2025 goal already. Regionally, meaning the States of Minnesota, Michigan, Wisconsin, North Dakota, South Dakota, and Iowa, there has been a 74% reduction from the 2005 baseline (22,170 pounds in 2005 compared to 5,715 pounds in 2017). Nationally, there has been a 71% reduction from the 2005 baseline (225,491 pounds in 2005 compared to 65,668 pounds in 2017).

Furthermore, Minnesota continues to promote mercury emission reductions within the state as well as regionally, nationally, and globally. Recently, Minnesota worked with states and provinces surrounding the Great Lakes to renew commitments to mercury reductions. At its 2021 annual meeting, the Great Lakes Commission adopted an updated policy resolution supporting mercury pollution monitoring, research, and reduction in the Great Lakes-St. Lawrence River basin. The resolution was unanimously passed by all commission member states and provinces: Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Ontario, Pennsylvania, Québec, and Wisconsin. The resolution:

- Delineates the multiple ecological, social, and economic benefits of the Great Lakes and St. Lawrence River for the United States and Canada.
- Asserts that mercury pollution harms these benefits and the health of communities throughout the region, specifically noting that disadvantaged communities and other vulnerable populations are at higher risk and generally experience disproportionate effects from mercury contamination.
- Acknowledges that while governments in the United States and Canada at all levels – tribal nations, states, provinces, and federal governments – are taking action to reduce mercury use and emissions, there is more that can be done. In addition, changes in climate and weather patterns are likely to impact where mercury comes from and where it ends up.
- Offers suggestions and support for actions to understand and reduce mercury pollution.

The resolution replaces the previous mercury policy from 2010 and is available in full on the commission's policy resolution webpage (<https://www.glc.org/work/advocacy/resolutions/>). An issue brief was also prepared to accompany the resolution and is available on the commission's webpage as well (<https://www.glc.org/library/2021-glc-issue-brief-mercury>).

Appendix A: Mercury emissions, 2018 through 2021

In accordance with Minnesota Statute § 116.925, this appendix reports mercury emissions associated with electricity production. In 2007, the MPCA established an emissions reduction goal and is now implementing stakeholder recommendations to meet the goal. The electric utility sector has made changes to reduce mercury and has met the interim mercury emission reduction goals in 2018. More information about Minnesota's mercury emissions and reduction strategies can be found at <https://www.pca.state.mn.us/pollutants-and-contaminants/mercury>. A full table of emission estimates and reports can be found here: <https://www.pca.state.mn.us/sites/default/files/wq-iw4-02j8.pdf>

Mercury emissions from electricity generation

Minnesota Statute § 116.925 requires producers and retailers of electricity to report the amount of mercury emitted through the generation of electricity. This law also requires MPCA to summarize this information in its biennial air toxics report to the Legislature.

Minnesota law exempts certain electric-generation facilities from reporting mercury emissions: (1) those that operate less than 240 hours per year, (2) combustion units that generate fewer than 150 British thermal units (Btu) per hour, (3) generation units with a maximum output of 15 megawatts or less, and (4) combustion facilities that emit less than three pounds of mercury in a given year. Therefore, generation facilities that do not emit any mercury, such as nuclear, wind, and hydroelectric, are not reported here.

Due to variation in operating conditions, some facilities may emit more than three pounds one year and less than three pounds in another. When emissions are less than three pounds, the actual emissions are either given or listed as exempt, depending on the wishes of the facility's management.

The following table shows mercury emissions from electric utilities in years 2018 through 2021. Note that 2021 emissions are considered draft and under quality review by the MPCA.

Table A-1: Mercury emissions from electric utilities, 2018 - 2021

| Company | Mercury emissions (pounds) | | | |
|--|----------------------------|------------|------------|-----------------|
| | 2018 | 2019 | 2020 | 2021 (draft) |
| Blandin Paper Co / MN Power - Rapids Energy Center | 4 | 0 | 0 | 0 |
| District Energy St Paul Inc. - Hans O Nyman | 1 | 1 | 1 | 1 |
| Great River Energy | 9 | 0 | 0 | 0 |
| Hennepin Energy Recovery Center | 1 | 3 | 3 | 19 |
| Hibbing Public Utilities Commission | 4 | 2 | 2 | 1 |
| Minnesota Power - Boswell Energy Center | 21 | 11 | 7 | 15 |
| Minnesota Power - Hibbard Renewable Energy Center | 3 | 3 | 2 | 2 |
| Minnesota Power - Laskin Energy Center | 0 | 0 | 0 | 0 |
| Minnesota Power - Taconite Harbor Energy Center | 0 | 0 | 0 | 0 |
| Northshore Mining - Silver Bay | 23 | 12 | 0 | 0 |
| Otter Tail Power Co - Hoot Lake Plant | 4 | 3 | 3 | 0 |
| Virginia Department of Public Utilities | 5 | 2 | 1 | 0 |
| Xcel Energy - Allen S King Generating Plant | 18 | 11 | 4 | 9 |
| Xcel Energy - Black Dog Generating Plant | 0 | 0 | 0 | 0 |
| Xcel Energy - Key City/Wilmarth | 8 | 6 | 1 | 2 |
| Xcel Energy - Red Wing Generating Plant | 4 | 4 | 4 | 1 |
| Xcel Energy - Sherburne Generating Plant | 89 | 83 | 79 | 79 |
| Grand Total | 194 | 142 | 105 | 129 |

Mercury emissions from industrial facilities

The emissions reduction goal that the MPCA established in 2007 also included milestones for industrial facilities:

- Ferrous mining or processing facilities are required to reduce mercury emissions by 72% from 2008/2010 emission levels by January 1, 2025.
- Facilities with large boilers that had individual emissions greater than 5 pounds were required to comply with the applicable federal regulations and ensure that a reduction of at least 70% was achieved by January 1, 2018.
- Iron and steel smelters were required to reduce mercury emissions to less than 35 milligrams per ton of iron/steel produced by June 30, 2018.
- Other mercury emission sources with processes that individually emit three or more pounds of mercury per year were required to reduce emission emissions by at least 70% by January 1, 2025.

Minn. R. 7019.3000 requires owners and operators of facilities in Minnesota to report the amount of mercury emitted from their facility annually if the facility emits three pounds or more of mercury in a given year. Facilities that emit less than three pounds of mercury must report every three years.

The following tables shows mercury emissions from ferrous mining and processing facilities and other industrial facilities in years 2018 through 2021. Note that 2021 emissions are considered draft and under quality review by the MPCA.

Table A-2: Mercury emissions from ferrous mining & processing facilities, 2018 - 2021

| Company | Mercury emissions (pounds) | | | |
|--|----------------------------|------------|------------|-----------------|
| | 2018 | 2019 | 2020 | 2021 (draft) |
| Cleveland Cliffs Minorca Mine Inc. | 76 | 73 | 45 | 44 |
| Hibbing Taconite Company | 150 | 144 | 139 | 193 |
| Mesabi Metallics Company LLC | 0 | 0 | 0 | 0 |
| Mesabi Nugget Delaware LLC | 0 | 0 | 0 | 0 |
| Northshore Mining Company - Silver Bay | 5 | 5 | 3 | 5 |
| Northshore Mining Company - Babbitt | 0 | 0 | 0 | 0 |
| United Taconite LLC - Fairlane Plant | 199 | 204 | 129 | 128 |
| United Taconite LLC - Thunderbird Mine | 0 | 0 | 1 | 0 |
| US Steel Corp - Keetac | 103 | 102 | 36 | 107 |
| US Steel Corp - Minntac | 163 | 148 | 188 | 207 |
| Grand Total | 696 | 677 | 542 | 684 |

Table A-3: Mercury emissions from other industrial facilities, 2018 - 2021

| Company | Mercury emissions (pounds) | | | |
|--|----------------------------|-----------|-----------|-----------------|
| | 2018 | 2019 | 2020 | 2021 (draft) |
| Alliance Pipeline - Albert Lea 25-A | 3 | 3 | 3 | 3 |
| American Crystal Sugar - East Grand Forks | 15 | 15 | 15 | 20 |
| American Crystal Sugar - Moorhead | 10 | 10 | 6 | 8 |
| American Crystal Sugar Co - Crookston | 12 | 10 | 7 | 9 |
| Badger Foundry Co | 2 | 2 | 1 | 1 |
| Boise Paper LLC | 3 | 3 | 3 | 3 |
| Enviro-Chem Inc - Plant 1 | 0 | 1 | 1 | 1 |
| Gerdau Ameristeel US Inc - Saint Paul Mill | 11 | 6 | 6 | 0 |
| Met Council - Seneca WWTP | 7 | 6 | 7 | 6 |
| Norbord Minnesota | 2 | 2 | 2 | 2 |
| Perham Resource Recovery Facility | 1 | 1 | 0 | 0 |
| Prospect Foundry LLC | 3 | 1 | 1 | 1 |
| Saint Paul Park Refining Co LLC | 1 | 1 | 1 | 1 |
| Sappi Cloquet LLC | 4 | 4 | 2 | 6 |
| Southern Minnesota Beet Sugar Coop | 7 | 6 | 15 | 14 |
| Grand Total | 82 | 70 | 70 | 76 |

Mercury emissions from mercury use in products

The emissions reduction goal that the MPCA established in 2007 also included milestones for mercury use in products. The MPCA keeps track of information, such as the amount of household waste generated in the state, alongside information tracked by other local, state, and federal partners to estimate the amount of mercury emissions from smaller, widespread sources in Minnesota. These estimates are typically prepared every three years for EPA's national emissions inventory, but the MPCA has prepared emission estimates for the off-cycle years to provide additional insight into this category.

The following tables shows mercury emissions from mercury use in products in years 2018 through 2021. Note that 2021 emissions are considered draft and under quality review by the MPCA.

Table A-4: Mercury emissions from mercury use in products, 2018 - 2021

| Category | Mercury emissions (pounds) | | | |
|---|----------------------------|------------|------------|-----------------|
| | 2018 | 2019 | 2020 | 2021 (draft) |
| <i>Mercury in solid waste</i> | | | | |
| Solid waste collection & processing | 235 | 212 | 230 | 186 |
| On-site household incineration | 32 | 31 | 28 | 21 |
| Spill / land dumping | 34 | 34 | 34 | 34 |
| Landfills | 2 | 3 | 2 | 2 |
| Land application of compost | 8 | 7 | 8 | 7 |
| <i>Mercury in liquid waste</i> | | | | |
| Land application of sludge | 0 | 0 | 0 | 0 |
| <i>Recycling activities</i> | | | | |
| Smelters / electric arc furnaces | 12 | 6 | 4 | 3 |
| Shredders that recycle cars & appliances | 6 | 4 | 5 | 2 |
| Recycling mercury from products within Minnesota | 1 | 1 | 1 | 1 |
| Non-ferrous metal recycling | 2 | 2 | 2 | 2 |
| <i>Dental mercury</i> | | | | |
| Dental preparations | 16 | 16 | 16 | 16 |
| Cremation | 119 | 124 | 141 | 148 |
| <i>Incineration</i> | | | | |
| Solid waste combustion | 25 | 18 | 13 | 25 |
| Incineration (sewage sludge) | 9 | 8 | 8 | 9 |
| Incineration (industrial sludge) | 0 | 0 | 0 | 0 |
| Incineration (medical waste) | 0 | 0 | 0 | 1 |
| Incineration (hazardous waste) | 1 | 0 | 1 | 1 |
| Incineration (industrial) | 0 | 1 | 1 | 1 |
| <i>Manufacturing / use of mercury-containing products</i> | | | | |
| Mercury product manufacturing | 0 | 0 | 0 | 0 |
| General laboratory use | 10 | 10 | 10 | 10 |
| Dissipative use (cosmetics) | 0 | 0 | 0 | 0 |
| Grand Total | 514 | 478 | 503 | 468 |