

520 Lafayette Road North | St. Paul, Minnesota 55155-4194 | 651-296-6300

800-657-3864 | Use your preferred relay service | [info.pca@state.mn.us](mailto:info.pca@state.mn.us) | Equal Opportunity Employer

December 27, 2018

The Honorable Dan Fabian  
Committee Chair, House Environment and Natural  
Resources Policy and Finance  
359 State Office Building  
100 Rev. Dr. Martin Luther King Jr. Blvd.  
St. Paul, MN 55155

The Honorable Rick Hansen  
DFL Lead, Environment and Natural Resources  
Policy and Finance  
247 State Office Building  
100 Rev. Dr. Martin Luther King Jr. Blvd.  
St. Paul, MN 55155

The Honorable Bill Ingebrigtsen  
Chair, Senate Environment and Natural Resources  
Finance Committee  
3207 Minnesota Senate Building  
95 University Avenue West  
St. Paul, MN 55155

The Honorable David J. Tomassoni  
Ranking Minority Member, Senate Environment  
and Natural Resources Finance Committee  
2235 Minnesota Senate Building  
95 University Avenue West  
St. Paul, MN 55155

The Honorable Carrie Ruud  
Chair, Environment and Natural Resources Policy and  
Legacy Finance Committee  
3233 Minnesota Senate Building  
95 University Avenue West  
St. Paul, MN 55155

The Honorable Chris A. Eaton  
Chair, Environment and Natural Resources  
Policy and Legacy Finance Committee  
2403 Minnesota Senate Building  
95 University Avenue West  
St. Paul, MN 55155

RE: The Air We Breathe: The State of Minnesota's Air Quality, 2019

Dear Environment and Natural Resources Committee Chairs and Minority Leads:

Attached please find the report titled *The Air We Breathe: The State of Minnesota's Air Quality, 2019* as required under Minn. Stat. §§ 115D.15 and 116.925. This report describes progress made in improving air quality since the Minnesota Pollution Control Agency's *The Air We Breathe: The State of Minnesota's Air Quality, 2017*. This report also fulfills the required air toxics report under Minn. Stat. §§ 115D.15 and 116.925.

If you have any questions about this report, feel free to contact me (651-757-2031 or [greta.gauthier@state.mn.us](mailto:greta.gauthier@state.mn.us)) or Todd Biewen, Acting Division Director, Environmental Analysis and Outcomes (651-757-2228 or [todd.biewen@state.mn.us](mailto:todd.biewen@state.mn.us)).

Sincerely,



Greta Gauthier  
Assistant Commissioner for Legislative and Intergovernmental Relations

GG/AJS:je

Enclosure

cc: Commissioner Jan Malcolm, MDH  
Representative Jean Wagenius  
Representative-Elect John Persell  
Representative Peter Fischer  
Anna Henderson, Office of Governor Mark Dayton  
Stephanie Zawistowski, Office of Governor Mark Dayton

# The air we breathe



The state of  
Minnesota's  
air quality 2019



## Legislative charge

The Minnesota Pollution Control Agency 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 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.

## Authors

Amanda Jarrett Smith  
Ralph Pribble  
Fawkes Steinwand

## Estimated cost of preparing this report

(as required by Minn. Stat. § 3.197)

Total staff time: 558 hrs.	\$22,320
Production/duplication	\$420
Total	\$22,740

## Editing and graphic design

Scott Andre  
Tanja Michels  
Risikat Adesaogun

The MPCA is reducing printing and mailing costs by using the Internet to distribute reports and information to wider audience. Visit our website for more information.

MPCA reports are printed on 100% post-consumer recycled content paper manufactured without chlorine or chlorine derivatives.

## Contributors/acknowledgements

David Bael	Azra Kovacevic
Hassan Bouchareb	Dorian Kvale
Angela Bourdaghs	Margaret McCourtney
Ned Brooks	Michael Nelson
Anne Clafflin	Rebecca Place
Eric David	Jessie Shmool (MDH)
Daniel Dix	Rocky Sisk
Kristie Ellickson	Mark Sulzbach
Brandon Finke	Monika Vadali
Anne Jackson	

## Contact

---

Todd Biewen  
Acting Division Director,  
Environmental Analysis and Outcomes  
651-757-2228  
todd.biewen@state.mn.us

<b>Executive Summary</b>	<b>i</b>
<b>Introduction</b>	<b>4</b>
<b>Why we care about air quality</b>	<b>5</b>
Clean air equals healthier people, ecosystems, and economy	5
<b>Air pollution doesn't affect everyone equally</b>	<b>8</b>
Air pollution and environmental justice	8
Understanding air quality in communities	11
<b>What is the state of Minnesota's air quality?</b>	<b>12</b>
Meeting the national air quality standards	12
"Bad air" days	15
<b>Long-term goals for air quality</b>	<b>17</b>
<b>Collaborating to reduce pollution</b>	<b>18</b>
Clean Air Minnesota	18
Responding to federal regulatory rollbacks	19
<b>Working across sectors to reduce pollution</b>	<b>19</b>
Air pollution from vehicles and heavy-duty diesel equipment	20
Air pollution from everyday, neighborhood sources	23
Air pollution from industrial facilities	24
<b>Conclusions</b>	<b>26</b>
<b>Appendix A: Mercury Emissions</b>	<b>27</b>

# SUMMARY

Report to the  
Legislature

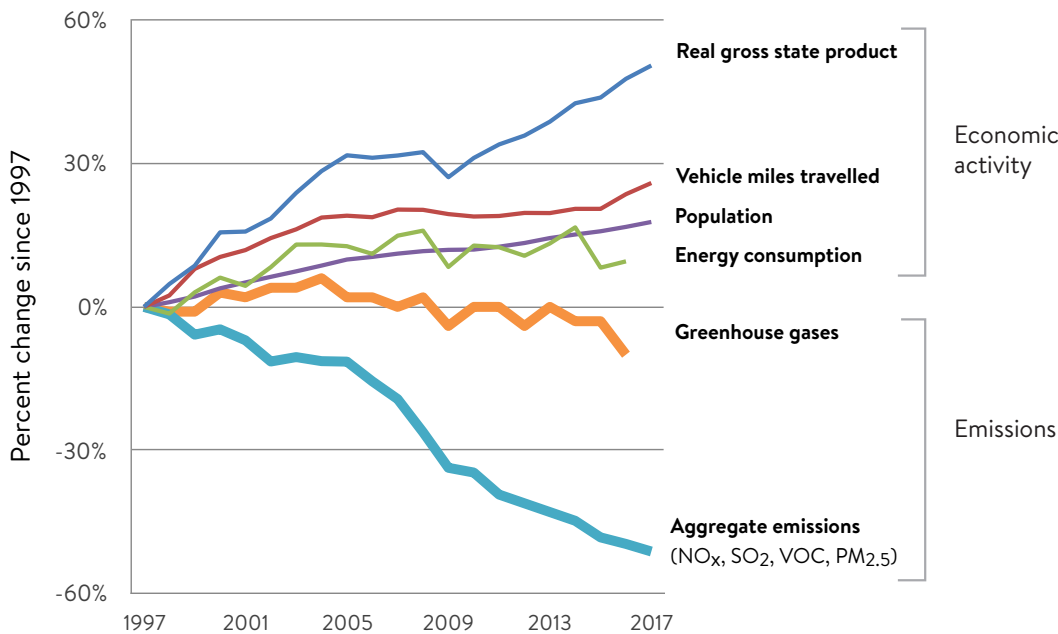


## The air we breathe: Minnesota's air quality 2019

**Air pollution emissions in Minnesota have declined significantly in the past 20 years, while the state's economy has continued to grow.**

Minnesota's air quality is good overall, but it is not the same in all parts of the state and doesn't affect all Minnesotans equally. Statewide, our air meets all federal standards and nearly all health benchmarks. Overall pollution levels have been going down and this trend is expected to continue. But people in some areas either experience pollution levels that, while within federal standards, are nonetheless

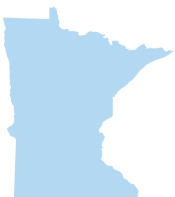
high enough to worsen serious health conditions or are exposed to pollutants that don't have federal standards.



The elderly, children, and people with chronic heart and lung conditions are more vulnerable to the effects of air pollution. In addition, besides some people experiencing higher levels of pollution exposure than others, health inequities make some populations more susceptible to its harmful effects. People of color, indigenous people, and lower-income individuals often do not have adequate access to the conditions that

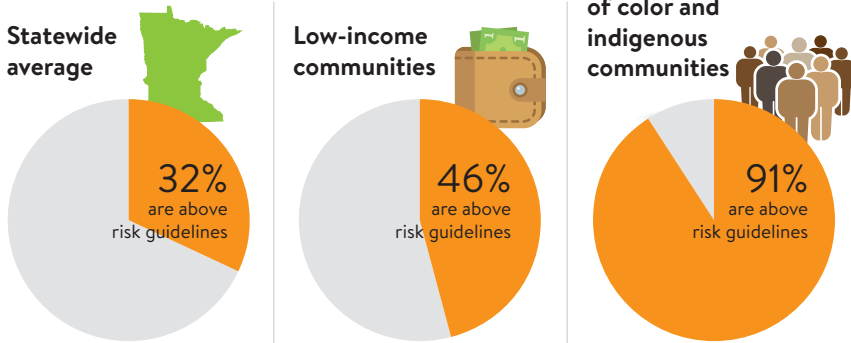
support healthy living, including quality schooling, healthcare, and clean surroundings. When equitable access to these is limited, poor air quality often contributes to, and worsens, health disparities.

The MPCA monitors regional air quality to determine if Minnesota's air complies with national standards. In recent years, however, Minnesotans have become more



## Air quality risk

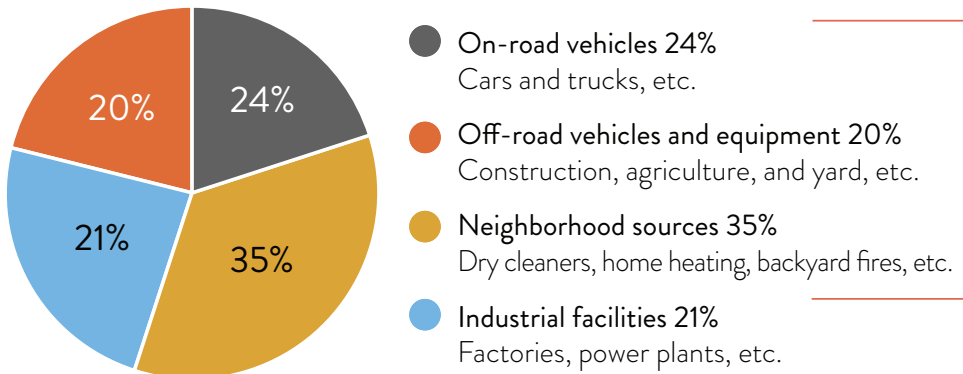
These communities are more likely to be near higher levels of air pollution.



and more interested in understanding air quality on the community scale – what’s in the air in the areas where they live, work, and play. Special monitoring projects at the MPCA are helping us get more information about air quality at the community level.

The MPCA also forecasts air quality to help Minnesotans who are vulnerable to air pollution plan to protect their health on days when air quality is poor. In recent years, Minnesota has seen more “bad air” days caused by smoke from wildfires outside of the state. This trend is likely to continue as climate change worsens heat and drought in North America.

Minnesota has cut emissions significantly in the past 30 years, especially from large facilities like power plants. Today, most of our air pollution comes from vehicles and smaller, neighborhood sources such as home heating, dry cleaners, and backyard fires. These sources are difficult to regulate, so voluntary actions by businesses and individuals will be key to further improving air quality.



**Small and widespread sources are the largest portion of overall air pollution emissions in Minnesota.**

Includes PM2.5, SO2, NOX, VOCs.  
Source: MPCA 2014 emissions inventory

The national Volkswagen emissions settlement, which provides Minnesota \$47 million over 10 years to reduce diesel pollution, offers new opportunities for voluntary actions. The Volkswagen settlement money will be used to replace older, dirty diesel vehicles and equipment with new models that are much cleaner, and will also help install electric-vehicle charging stations across the state. With about half our air pollution coming from vehicles and other mobile sources, more effort will need to be directed toward supporting smart transportation planning and adopting new, cleaner technologies.

As the challenges of improving Minnesota’s air quality continue to evolve, the MPCA will continue to adapt our work to create and take advantage of new opportunities to reduce pollution, understand its effects, and better protect the health of all Minnesotans.

## Contact

Todd Biewen  
Acting Division Director,  
Environmental Analysis and Outcomes  
651-757-2228  
todd.biewen@state.mn.us



# Introduction

Minnesota's air quality is continuously evolving, as are the methods the Minnesota Pollution Control Agency (MPCA) uses to understand and improve our air. Minnesota's air is generally good and statewide emissions are decreasing; however, air quality is not the same in all parts of the state. More and more, Minnesotans want to know about the air quality where they live, work, and play, and how it impacts their health. Many Minnesotans are adopting new clean technologies, like solar energy for their homes and new vehicles and equipment that produce far less pollution – protecting the health of their families and neighbors. You can learn about the state of the air and some of our newest initiatives in this report:

- Minnesotans are excited about clean vehicle technology and have demonstrated enormous demand for funds to replace older, polluting diesel vehicles with Volkswagen settlement funds. (page 21)
- Minnesotans are embracing electric vehicle technology that reduces pollution. The MPCA and its partners are building a network of charging stations to help Minnesotans travel around the state in electric vehicles. (page 22)
- The MPCA is monitoring neighborhood-level air pollution and conducting analyses to understand how air pollution disproportionately impacts some people in our state. For example, the MPCA is working on a project to place an air quality monitor in each ZIP code in Minneapolis and St. Paul. (page 11)



# Why we care about air quality

## Clean air means healthier people, ecosystems, and economy

Clean air helps make everyone healthier. It supports the ecosystems that Minnesotans value, and provides the foundation for a growing economy.

Air pollution can worsen many health conditions. Minnesota's air currently meets all federal health standards, but even levels of air pollution that meet the standards can affect people's health. Having good air quality means fewer missed work and school days and less money spent on air pollution-related illness. The MPCA estimates the overall economic impact of health effects related to air pollution in Minnesota exceeds \$30 billion per year.

### Forecasting air quality

Air quality forecasts are important to help Minnesotans who are sensitive to air pollution plan ahead to protect their health on bad air days. MPCA forecasts air quality for the whole state. You can check the daily forecasts and sign up for the MN Air app at [www.pca.state.mn.us/AQI](http://www.pca.state.mn.us/AQI).

### Air pollution and your health

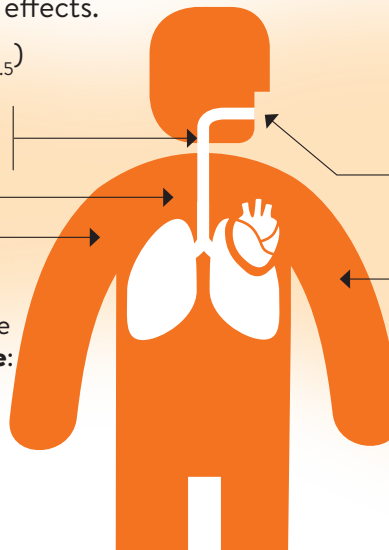
Fine particles and ground-level ozone (often called smog) are widespread pollutants linked to health effects.

**Fine particles (PM<sub>2.5</sub>)** pollution can cause:

- Shortness of breath
- Wheezing, coughing
- Chest pain
- Fatigue

Fine particles can make these conditions **worse**:

- Cardiovascular and heart disease
- Asthma and COPD



**Ground-level ozone** pollution can cause:

- Difficulty breathing deeply
- Shortness of breath
- Sore throat
- Wheezing, coughing
- Fatigue

Ozone can make these conditions **worse**:

- Asthma and COPD
- Emphysema

### 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, well-being, ways of life, and natural resources. Climate change may increase harmful pollutants in our air. 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. To learn more about GHG emissions and Minnesota's work to achieve our reduction goals, explore the MPCA's latest report, *Greenhouse Gas Emissions in Minnesota: 1990-2016*.

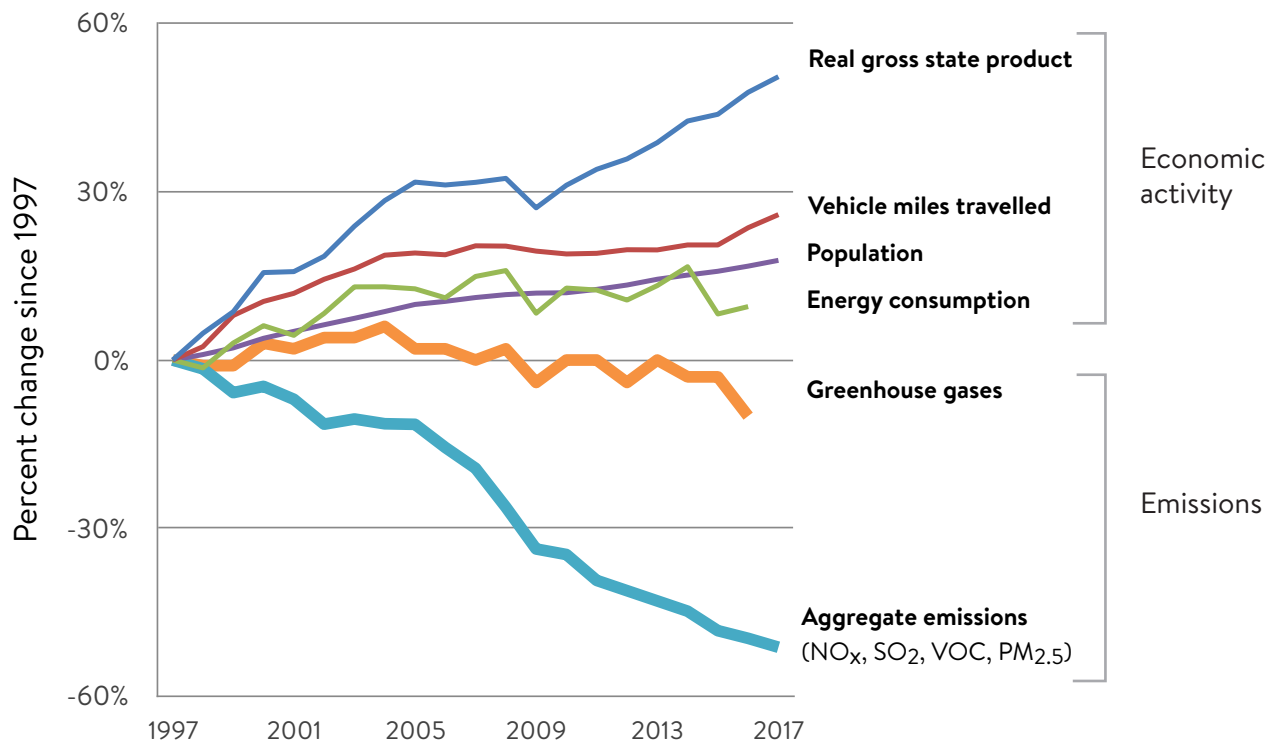
<https://www.pca.state.mn.us/air/state-and-regional-initiatives>



Reducing air pollution protects the wild places Minnesotans enjoy as well as the plants and animals that inhabit them. For example, airborne mercury can enter waterways, making fish unsafe to eat.

Cleaner air and a growing economy go hand-in-hand. Since Congress passed the Clean Air Act in 1970, emissions of common air pollutants in the U.S. have dropped 70%, while the U.S. gross domestic product has grown nearly 250%. Investing in cleaner technology and emission controls to improve air quality costs money, but studies show the societal benefits of meeting air quality standards far outweigh the increased costs.

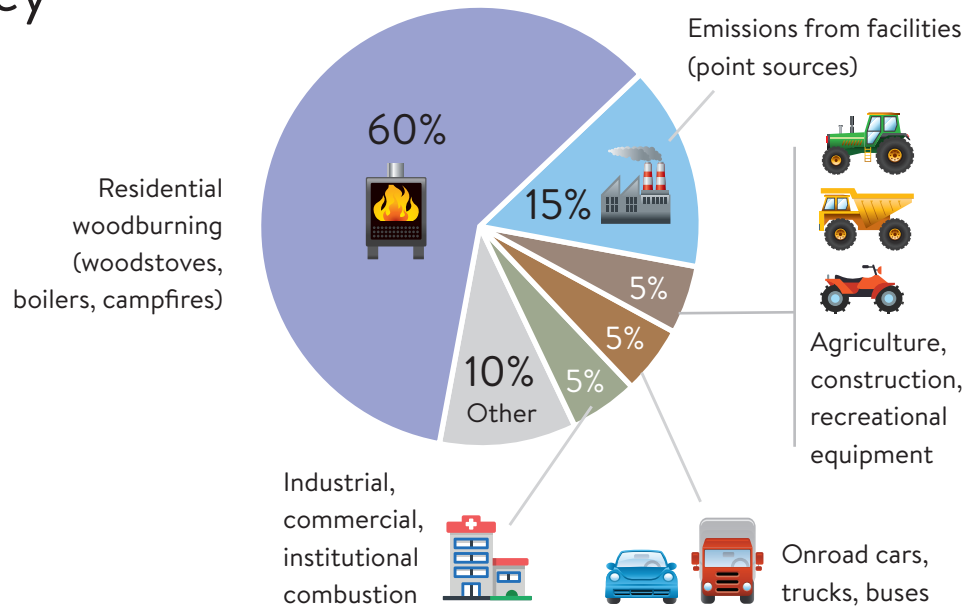
### Emissions in Minnesota have declined significantly in the past 20 years, while the state's economy has continued to grow.



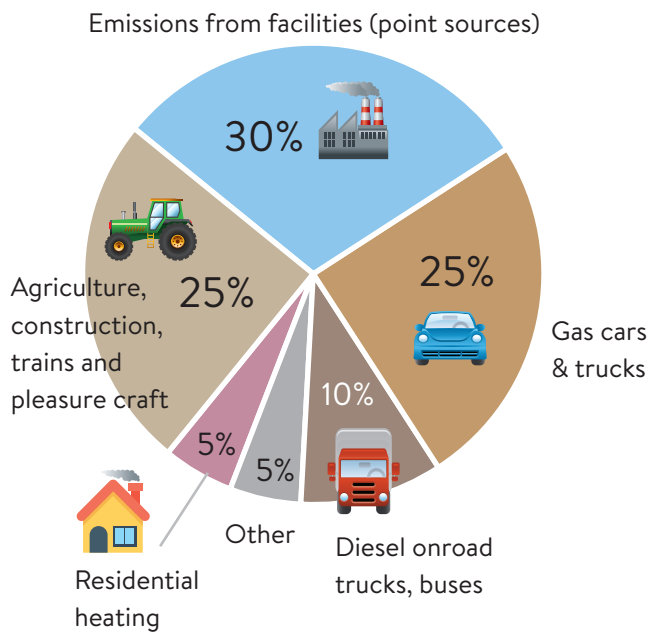
# Air pollutants and where they come from

These pollutants contribute the most to adverse health effects in Minnesota.

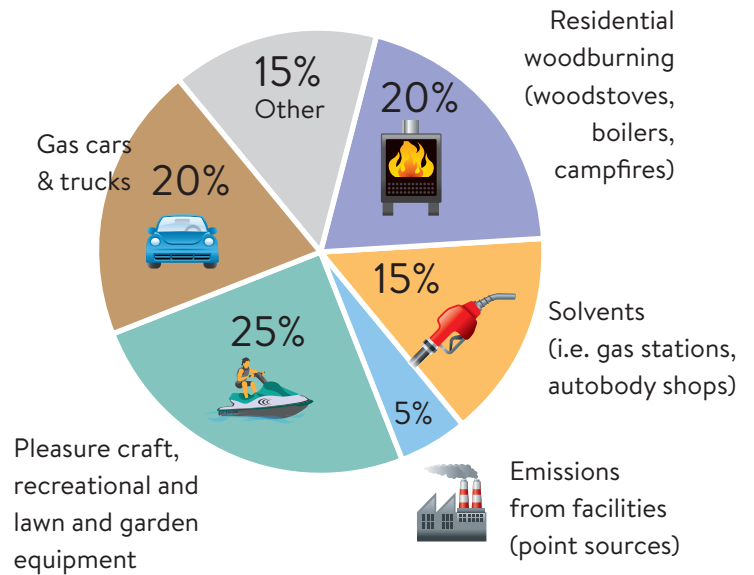
## Fine particles (PM<sub>2.5</sub>) directly emitted from combustion sources<sup>1</sup>



## Nitrogen Oxides (NO<sub>x</sub>)



## Volatile Organic Compounds (VOCs)



Data is from Minnesota's 2014 emissions inventory. Percentages indicate the approximate amount of total emissions of pollutants of concern emitted by primary source categories in Minnesota; for simplicity, sources contributing less than 5% are not listed. Results are rounded to the nearest 5%. Emissions from wildfires, agricultural and prescribed burning are not included.

1. Sources shown here emit PM<sub>2.5</sub> directly; a large amount of PM<sub>2.5</sub> in Minnesota's air is formed indirectly in the atmosphere from reaction of gases.



# Air pollution doesn't affect everyone equally

Our health is shaped by many things. Our physical and mental state, access to quality healthcare, and our families' health histories are all important. The air we breathe also matters. Understanding the relationship between exposure to pollutants and disease is difficult because people move in and out of neighborhoods; they live, work, and play in many settings; and the amount of pollution they breathe varies over time and place.

Despite these challenges, we do know that some people are exposed to more air pollution than others because of where they live or work, and that some people are affected more by it. For example, people with pre-existing heart and lung conditions are at greater risk, and so are the elderly and children. People of color, indigenous people, and people with low incomes face social, economic, and health inequities that often contribute to increased frequency of health conditions that can be affected by air pollution. These inequities mean that communities of color, indigenous communities, and lower-income communities tend to be more vulnerable to the effects of air pollution.

## Air pollution and environmental justice

The MPCA defines environmental justice as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental

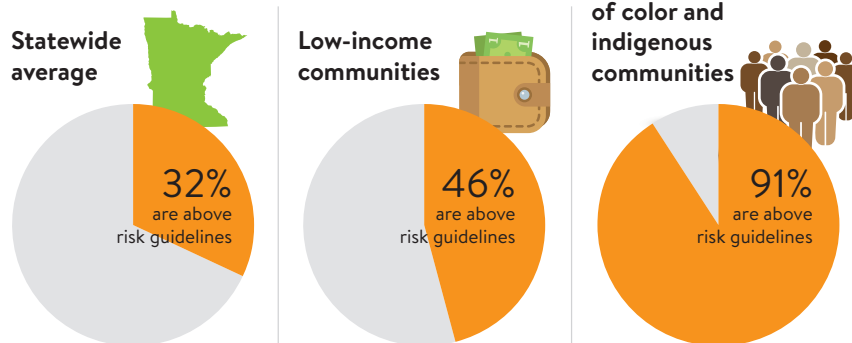
laws, regulations, and policies.” This will be achieved when everyone benefits from the same degree of environmental protection and has equal access to the decision-making processes that contribute to a healthy environment.

Environmental justice has many layers. In addition to experiencing higher levels of pollution, some communities do not have adequate access to the conditions that support healthy living, including quality schooling, healthcare, and safe neighborhoods. When equitable access to these is limited, poor air quality often contributes to, and worsens, health disparities.

Many studies have shown that low-income communities and communities of color are often also exposed to higher levels of outdoor air pollutants or may live in areas with more pollution sources. In Minnesota, for instance, 32% of all communities experience air pollution-related risks above health guidelines.<sup>1</sup> However, the percentages of communities of color and lower-income communities that experience air pollution exposure risks above health guidelines are far higher.

## Air quality risk

These communities are more likely to be near higher levels of air pollution.



To address these disproportionate impacts, the MPCA is placing special emphasis on areas of concern for environmental justice across the state. MPCA has identified areas with more low-income residents or people of color and tribal communities statewide because people in these communities can be more vulnerable to the effects of air pollution. Part of the MPCA’s work to address these concerns includes increased

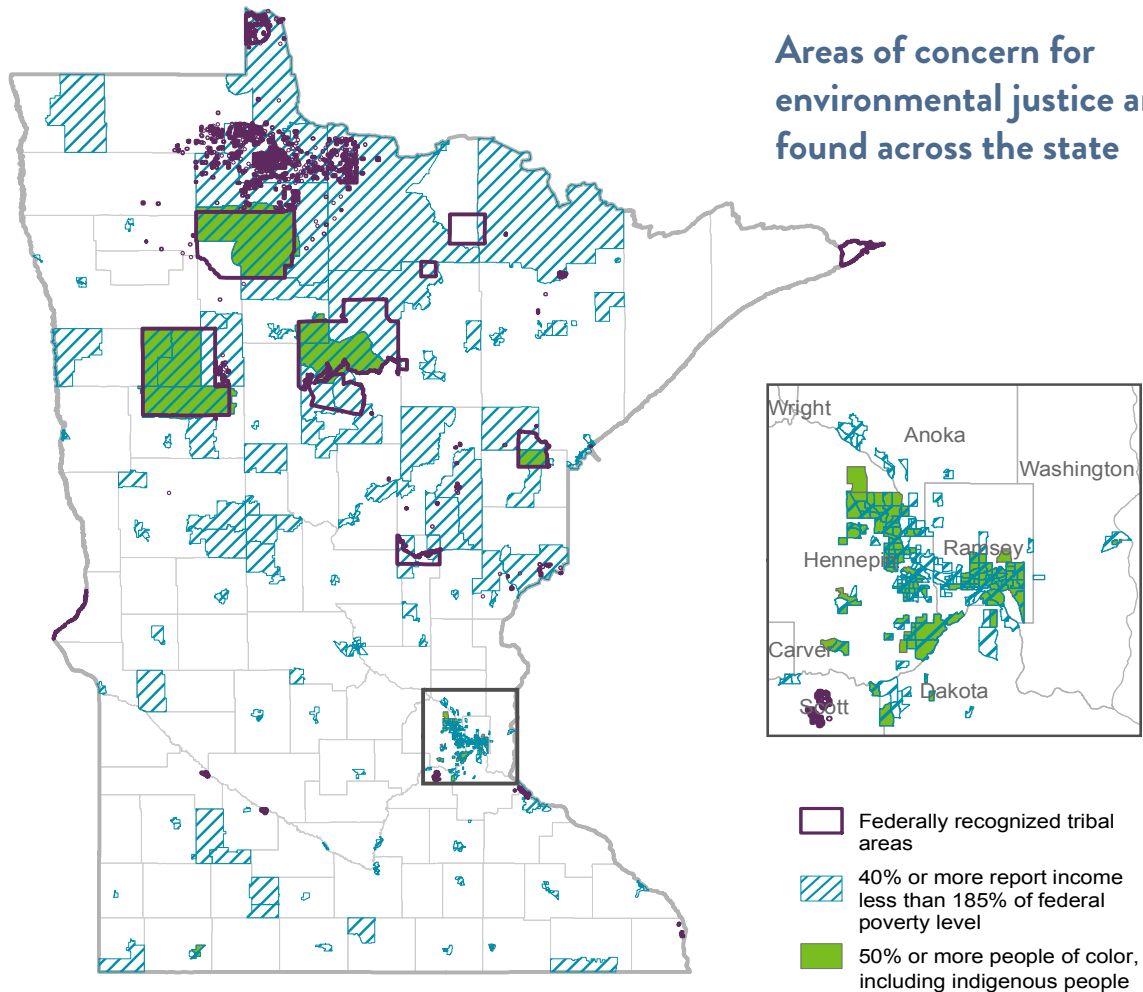
air quality monitoring, targeting grants for air quality improvement projects and assistance for small businesses and community groups, and more scrutiny of emission sources in these areas. To learn more about environmental justice and air quality, visit <https://www.pca.state.mn.us/air/environmental-justice-and-air>.

1. Notes on the modeling:

The data used in the graphics on this page are from a cumulative air pollution model called MNRISKS. The model uses risk assessment methods to examine hypothetical individuals that spend their whole life in one community, breathing only that air. Modeled emissions include all air pollution sources in the state of Minnesota including vehicles, factories, construction equipment, building boilers, residential wood burning, etc.

“Risk guideline” reflects a level of air pollution exposure at or below which health effects would be unlikely. These guidelines were developed in collaboration with the Minnesota Department of Health. A result above a risk guideline indicates a need for further investigation and prioritization of that source and pollutant.

Areas of concern for environmental justice are found across the state



## Life and breath: How air pollution affects public health in the Twin Cities and throughout Minnesota

In 2015, the MPCA and the Minnesota Department of Health (MDH) conducted a study to understand health impacts of air pollution in the Twin Cities metropolitan area. Key findings include:

- During the study period, air pollution contributed to around 2,000 deaths per year as well as hundreds of hospital admissions and emergency department visits annually.
- Air pollution disproportionately impacts the health of some communities. Areas with higher concentrations of people living in poverty and people of color tend to experience higher levels of air pollution-related health impacts, largely due to social, economic, and health inequities.

In early 2019, MPCA and MDH will publish an update of the study, which will estimate health impacts from air pollution in each of Minnesota's counties. To learn more, visit: <https://www.pca.state.mn.us/life-and-breath-report>.

# Understanding air quality in communities

MPCA operates a statewide network of air monitors designed to determine if Minnesota's air quality meets federal standards, but air quality may vary significantly in localized spots between those monitors. For example, air quality near certain facilities in neighborhoods may be poorer than what is represented by network monitors.

Increasingly, Minnesotans are not satisfied just to know that the state's air quality meets state and federal standards. They want to know more about what's in the air where they live, work, and play. To learn more, the MPCA has undertaken a number of special air monitoring projects.

## Factors that affect air quality



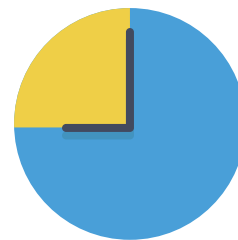
### Location

Air pollution levels are higher the closer you are to an emissions source. For most of us, our highest exposure occurs near busy roadways.



### Temperature

Fine-particle levels can increase on unseasonably warm and cloudy winter days.  
Most unhealthy ozone days occur when daytime high temperatures exceed 85° F.



### Time of day

Fine-particle levels are often highest in the morning, but can be elevated at any time of day.  
Ozone is a summertime pollutant. Ozone levels are highest in the afternoon and evening.



### Weather

Minnesota's weather patterns usually help keep air pollution below unhealthy levels, but on days with fog, light winds, or temperature inversions, weather conditions can allow pollution to build to unhealthy levels.



## Air monitoring across the state

The MPCA operates monitors across Minnesota to understand the levels of a wide variety of pollutants. You can explore the monitoring network and pollutant levels across Minnesota at <https://www.pca.state.mn.us/air/minnesotas-air-monitoring-network>.

## Special projects to understand community air quality

The MPCA received funding through the Legislative-Citizen Commission on Minnesota Resources to conduct a special urban air quality monitoring project to understand ZIP code-level differences in air quality across Minneapolis and St. Paul. The project will place one air quality monitor in each ZIP code in Minneapolis and St. Paul. Installation of the monitors began in 2018 and will continue throughout 2019.

The MPCA and MDH are also working together to better understand what environmental chemicals children are exposed to in urban and rural Minnesota. “Healthy Rural and Urban Kids” is a biomonitoring study with a focus on potential air pollution exposures. The MPCA is supporting this work by collecting air samples at two sites near where MDH is collecting biological samples.

Learn more about special air monitoring projects: <https://www.pca.state.mn.us/air/understanding-air-quality-communities>.

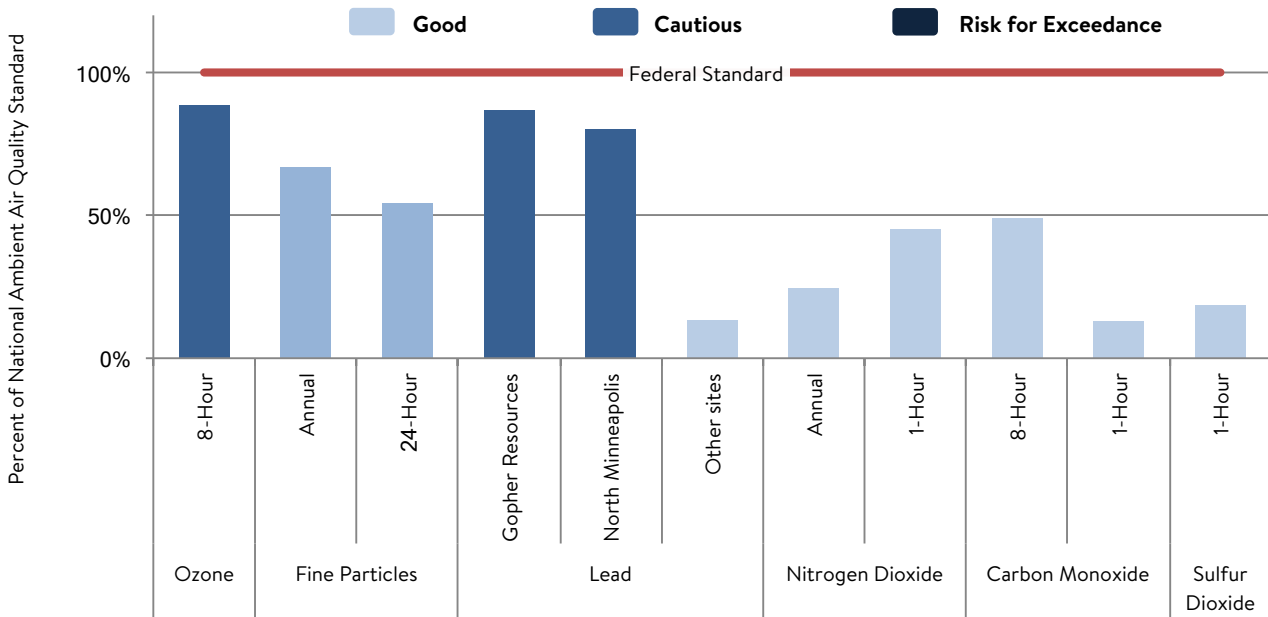
# What is the state of Minnesota’s air quality?



## Meeting the national air quality standards

The U.S. Environmental Protection Agency (EPA) sets national standards for six common air pollutants – ground-level ozone, fine particles, lead, nitrogen dioxide, carbon monoxide, and sulfur dioxide. The MPCA monitors air quality across the state and compares the results to these national standards. In 2017 (latest available data), monitoring showed all areas of Minnesota had air quality better than the federal standards – but not by much in some areas.

## Minnesota's air quality compared to the National Ambient Air Quality Standards (2017)



This chart compares state air monitoring results to the federal standards (each represented by a column). Some pollutants have federal standards for both long-term and short-term averaging times (annual, 1-hour, etc.) to protect against both long-term and short-term health effects. The percentage shown describes Minnesota's maximum pollutant concentration as a percentage of the national standard. Values less than or equal to 100% meet the applicable standard. Note that in the case of lead, two facility-specific monitors are included. Both of these sites experience localized lead levels significantly higher than the rest of the state (see "facility-specific lead emissions" on next page).

The national standards are designed to protect human health and the environment. However, new studies show that health effects occur even at air pollution levels below current standards, and that those health effects disproportionately impact disadvantaged communities. EPA regularly reviews the science on health effects of air pollution. Over the years, as scientists have found health effects at lower and lower levels of air pollution, EPA has regularly tightened the standards. To help protect the health of all Minnesotans, the MPCA works to make air quality better than the national standards.

### State air quality standards

Minnesota also has state standards for a few pollutants, including hydrogen sulfide and total suspended particulate (TSP). These pollutants can cause irritation as well as odor and nuisance dust issues. While Minnesota's air generally meets these state standards, monitoring has shown violations near some local sources. One example is an area in North Minneapolis, which has shown concentrations over state TSP standards since monitoring began there in 2014. These violations are due to local industrial activity. To learn more about monitoring in North Minneapolis, visit <https://www.pca.state.mn.us/air/north-minneapolis-air-monitoring-project>.



## Facility-specific lead emissions

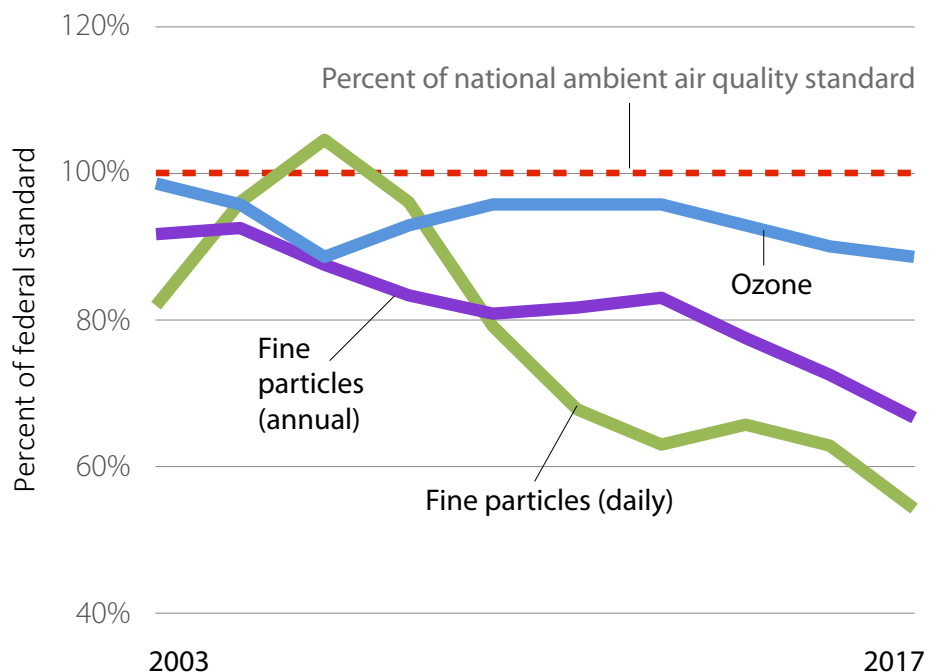
Lead is an air pollutant that does not spread far from its source. Areas around some specific facilities may have higher monitored levels of lead than the rest of the state. The graph on the previous page shows the Gopher Resources and North Minneapolis monitoring sites. Gopher Resources is a lead battery recycler in Eagan that previously violated the federal lead standard, but took action to reduce its emissions and is now in compliance. MPCA monitoring has identified elevated levels of lead and other pollutants in an industrialized area of North Minneapolis. While neither of these sites is violating the federal standard, the MPCA continues to monitor and take regulatory action as needed. Learn more about the North Minneapolis monitoring site here: <https://www.pca.state.mn.us/air/north-minneapolis-air-monitoring-project>.

## Targeting ground-level ozone and fine-particle pollution

Ground-level ozone (often called smog) and fine particles are two of the pollutants closest to potentially violating the national standards and are widespread, affecting many Minnesotans. Current levels contribute to a large number of health impacts in Minnesota, especially in vulnerable areas in the Twin Cities (see “*Life and breath: How air pollution affects public health in the Twin Cities and throughout Minnesota*”, page 10).

Ozone and fine-particle levels in Minnesota have been improving since 2003. However, progress in reducing both pollutants has been affected by year-to-year variability in the weather. Moreover, climate change may cause future challenges, both from increased local temperatures causing more ozone to form, and from longer and more frequent droughts resulting in more fine-particle pollution from wildfires.

### Trends in ozone and fine-particle pollution in the Twin Cities 2003-2017



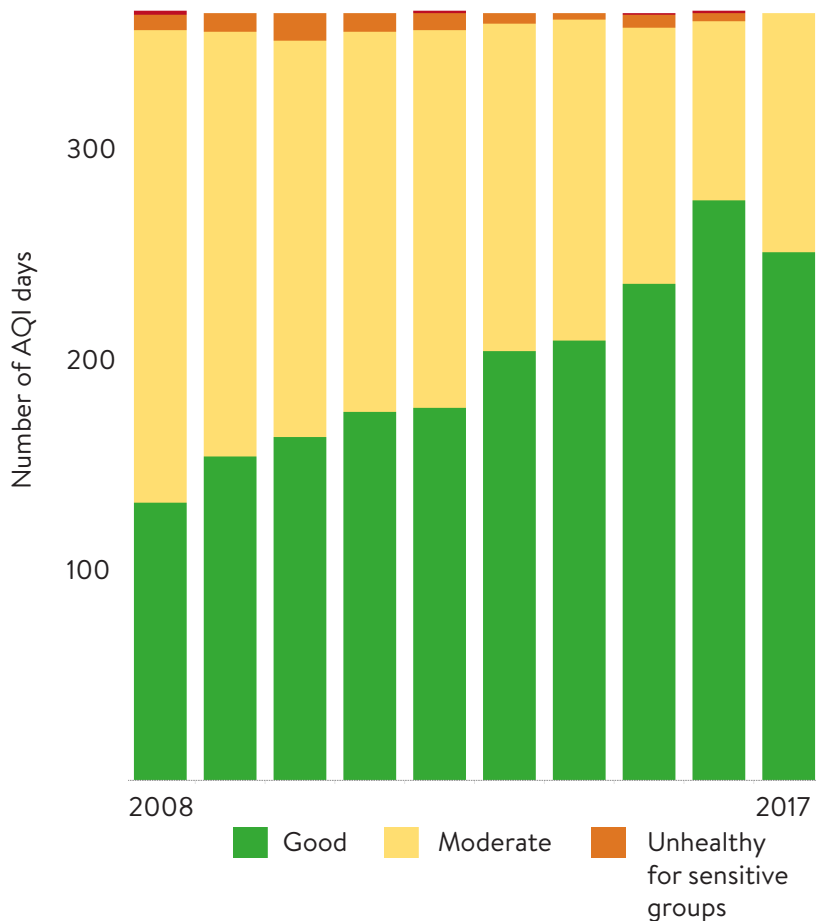
## “Bad air” days

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.

The AQI shows air quality has trended better over time. However, the number of days with poor air quality varies from year to year. In 2017, Minnesota experienced no “bad air” days. However, smoke from faraway wildfires is increasingly affecting our air quality. During the summer of 2018, we had nine bad air days; seven of these were caused by smoke from distant wildfires that was transported into Minnesota.

For current air quality conditions and forecasts, to download the MN Air app, or to receive alerts, visit <https://ww.pca.state.mn.us/aqi>.

### Statewide trend in Air Quality Index



### Faraway wildfires affect air quality in Minnesota

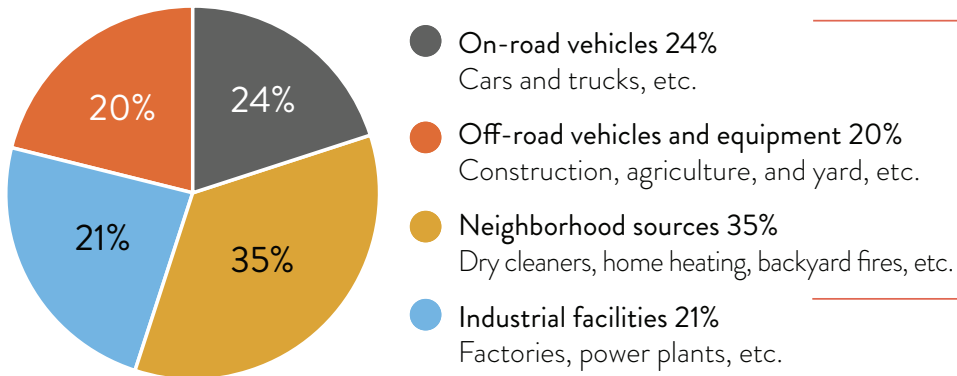
Smoke from wildfires contains a number of pollutants, but the primary pollutant of concern is fine particles. These small particles have the potential to do the most damage to the lungs and the heart. Smoke is especially hard on sensitive populations such as people with respiratory diseases.



When air quality deteriorates to an unhealthy level, the MPCA calls an air quality alert. In recent years, most air quality alerts have been caused by smoke from wildfires in the western U.S. and Canada. Since 2016, the MPCA has issued 11 alerts due to wildfire smoke. With destructive mega-fires becoming the new normal in the west due to drought and increased temperatures linked to climate change, the MPCA expects wildfire smoke to continue to impact Minnesota’s air quality for years to come. [www.pca.state.mn.us/air/wildfire-smoke](http://www.pca.state.mn.us/air/wildfire-smoke)

## Sources of air pollution

Typically, people associate air pollution with facilities that have big smokestacks, like power plants and factories. In reality, these sources make up a relatively small part of our air pollution emissions, about a fifth of overall emissions in the state. Vehicles and other mobile equipment, on the other hand, account for about half of overall emissions. The rest comes from the smaller, “neighborhood” sources such as backyard fires and drycleaners that are in all of our communities.

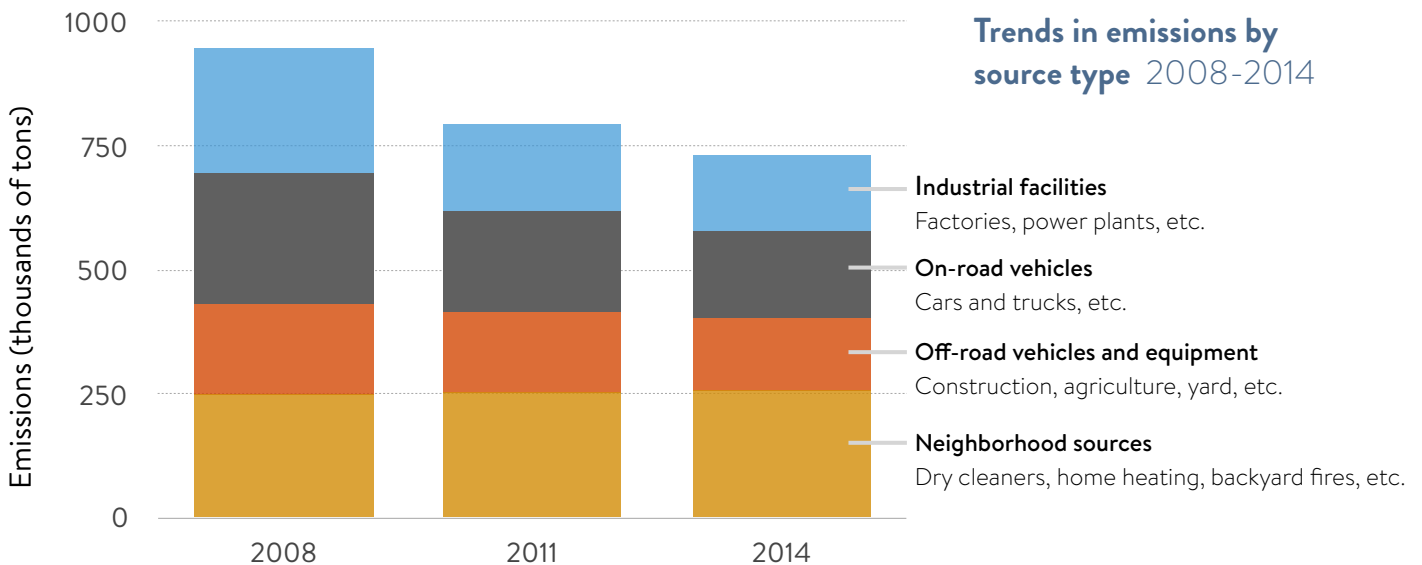


**Small and widespread sources are the largest portion** of overall air pollution emissions in Minnesota.

Includes PM2.5, SO2, NOX, VOCs.  
Source: MPCA 2014 emissions inventory

## Emissions reductions

Since passage of the federal Clean Air Act in 1970, a combination of regulation, technology and process improvements, as well as growing awareness of the health impacts of air pollution, have combined to achieve dramatic air pollution reductions. Over the last 20 years, annual emissions from all types of sources in Minnesota have decreased by nearly 50%. Since 2008, overall emissions have gone down by about 23%. Among all sources, the greatest reductions have been achieved by power plants, with emissions falling nearly 70% between 1990 and 2014.



# Long-term goals for air quality

The federal Clean Air Act has led to cleaner air over the past 30 years. To continue this progress, MPCA sets long-term air quality goals to guide our work. The MPCA's long-term goals for our air quality program are to:

- Ensure ambient air is better than air quality standards and health benchmarks.
- Reduce Minnesota's contribution to global concentrations of greenhouse gases.
- Reduce Minnesota's contribution to global mercury levels.
- Reach natural visibility conditions in Minnesota's national parks and wilderness areas.

## MPCA's strategic plan

For the next five years, the MPCA has four air quality goals that work toward our long-term goals:



Improve air quality in population centers.



Offset excess emissions and advance diesel reductions via the Volkswagen settlement.



Reduce air permitting backlog.



Reduce Minnesota's greenhouse gas emissions from transportation.

We also have agency-wide goals to improve the work of all of our programs. Some of these will be particularly important for our air quality goals:



Incorporate strategies to address environmental justice concerns in all programs.



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

# Collaborating to reduce pollution

State and federal laws and regulations have cut pollution significantly, but regulation isn't always the best solution to complex air quality challenges. There's a lot more we can all do to reduce pollution. The MPCA works with partners to help businesses and individuals act on these opportunities.



## Clean Air Minnesota

Clean Air Minnesota is a public-private partnership working to reduce air pollution from neighborhood sources through voluntary projects. Members strive to better protect public health by going beyond the federal air quality standards. This partnership is led through the joint efforts of the MPCA, Environmental Initiative, the Minnesota Chamber of Commerce and Minnesota Center for Environmental Advocacy, and includes local and tribal governments, businesses, and non-profits. These partners work to raise awareness and foster a sense of priority around Minnesota's air quality. They also connect businesses and people with funding for voluntary air pollution reduction projects.

Clean Air Minnesota's overarching goal is to reduce emissions of certain key pollutants by 10% from 2011 levels through voluntary emission reduction efforts. Among other projects in the past two years, Clean Air Minnesota partners have helped small-business owners make equipment changes; replace an old, dirty diesel engine in a towboat with a new, cleaner version; and replace old wood stoves with cleaner-burning technology. Up to 2017, this work has reduced 247 tons of fine particles and 337 tons of VOCs. For more information, visit <https://environmental-initiative.org/work/clean-air-minnesota>.

## Partnering with tribes

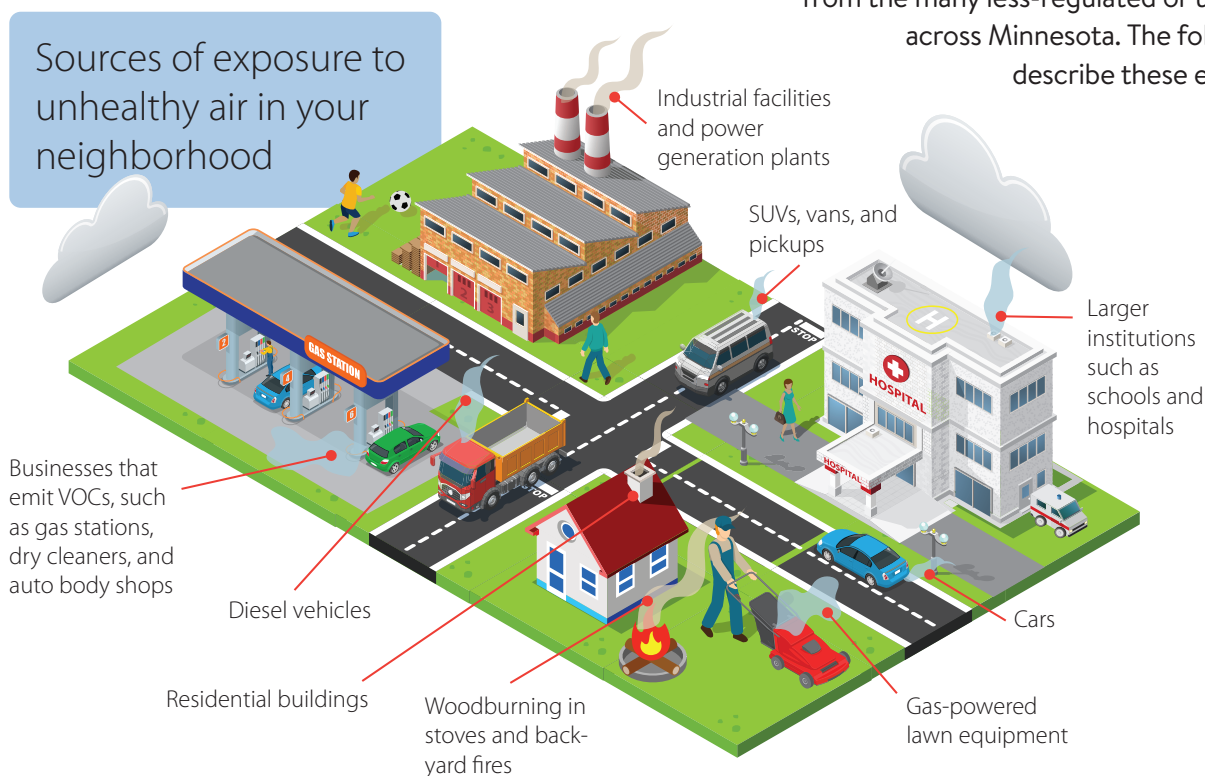
The MPCA collaborates with tribal environmental experts across the state to improve air quality for everyone in Minnesota. Many of the tribes around the state operate air monitors that help inform MPCA's air quality forecasting. The Mille Lacs Band of Ojibwe Department of Natural Resources and the MPCA were co-investigators in a project to monitor and compare air pollution concentrations across the Phillips communities of South Minneapolis and in Mille Lacs. Many tribes also actively share their expertise through comments on MPCA permits. The MPCA and tribes are also collaborating to provide input on federal actions from a local perspective. These partnerships help the tribes and the MPCA understand air quality across the state and keep everyone informed about health effects of air pollution.

# Responding to federal regulatory rollbacks

The Clean Air Act establishes a collaborative relationship between the EPA and state environmental agencies. Since 2016, the EPA has been rolling back numerous air quality regulations. Many of these regulations have been the backbone of Minnesota's clean air progress over the past 20 years and lay the foundation for future progress. The MPCA analyzes these proposed rule changes to understand how they might affect Minnesota's environment, the health of Minnesotans, and the state's regulatory environment. In many recent cases, the MPCA has had serious concerns about these rollbacks, and is working with other Minnesota state agencies and other states across the nation to provide input to EPA on these rule changes. Also, when warranted, the MPCA is working with the Attorney General's office to support legal action to protect Minnesota. To learn more about these actions and read what the MPCA has been saying about them, visit <https://www.pca.state.mn.us/air/responding-federal-actions>.

## Working across sectors to reduce pollution

Sources of air pollution are all around us. Each type of source has its own challenges and requires different strategies for reducing emissions. As well as regulating permitted facilities, MPCA pursues creative ways of reducing emissions from the many less-regulated or unregulated sources across Minnesota. The following sections describe these efforts.



# Air pollution from vehicles and heavy-duty diesel equipment

Vehicles and other mobile equipment (such as that used in construction or agriculture) may not pollute much individually, but together they account for more air pollution in Minnesota than all of our large permitted facilities combined (see page 16). Moreover, pollution from vehicles is an important environmental justice concern. A 2015 study by MPCA researchers found that while people of color and lower income tend to own fewer vehicles, do less driving, and use public transit more

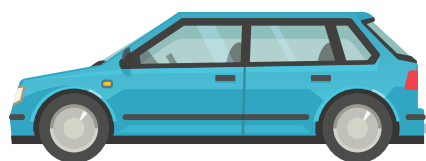
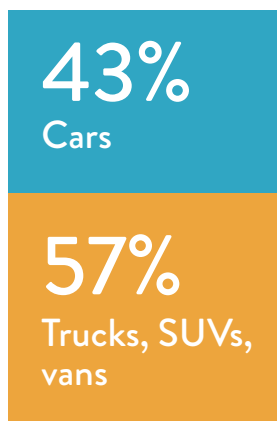


often than other groups, they are exposed to higher levels of traffic-related pollution. This is because busy roadways, and their associated air pollution, often run through communities of color and lower income. Many of these communities therefore bear a disproportionate burden of traffic-related health effects while contributing less to vehicle pollution.

The federal government regulates the fuel efficiency and tailpipe emissions of new vehicles, but federal regulations alone cannot address the impacts of vehicle pollution. We can achieve further reductions through purchasing

decisions and smart community planning. The MPCA serves as an advisor and technical resource for a wide range of transportation planning and funding efforts across the state to promote air quality improvements in this sector.

An important trend in vehicle emissions in Minnesota is the increasing use of larger vehicles like SUVs, crossovers, and pickup trucks, which pollute more per mile traveled than smaller, lighter cars. In 2011, the number of these larger vehicles surpassed the number of cars on the road in Minnesota and became the majority of the passenger fleet. Today, these heavier vehicles comprise 57% of all passenger vehicles and emit 70% of the passenger vehicle-related pollution.



30%  
of emissions

Heavier vehicles such as pickup trucks, SUVs, and crossovers now make up the majority of passenger vehicles in Minnesota and pollute more per mile.

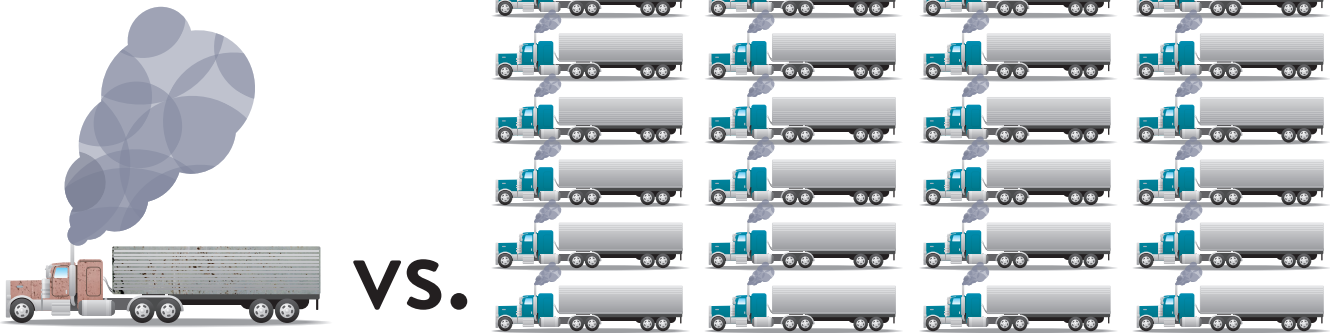


70%  
of emissions

Heavy-duty diesel vehicles and equipment are an area where collaboration can make a big difference. Older diesel engines (pre-2006) are some of the heaviest polluters in the vehicle sector. They can last for decades, so even though recent federal regulations have made diesel engines much cleaner, the old equipment continues to be a significant source of air pollution.

## One old diesel truck can pollute more than 30 new diesel trucks

Depending on factors such as the age of the truck, how far it travels, and how much it idles, one old diesel truck can produce as much particle pollution as 25-50 modern trucks under the same operation factors.



Because the impact of older diesels is so significant, the MPCA and its partners work to encourage owners of diesel vehicles and equipment to retrofit or upgrade their engines and vehicles, and provide grant funding to help owners make the switch to cleaner equipment. Since 2006, the combined efforts of the MPCA's Clean Diesel Program and Clean Air Minnesota's Project Green Fleet have reduced fine-particle pollution from diesel emissions equivalent to taking more than one million cars off the road. Learn more about vehicle pollution: <https://www.pca.state.mn.us/air/vehicles-and-heavy-duty-equipment>.

### Volkswagen settlement

In 2016, the federal government sued Volkswagen for violating the Clean Air Act. The resulting settlement gives states and tribes funding for projects to reduce diesel pollution through upgrading or replacing old diesel vehicles and equipment and installing electric-vehicle (EV) charging stations. Throughout 2017, MPCA staff traveled around the state talking to Minnesotans about how best to invest Minnesota's \$47 million share of the settlement over the next 10 years.

The state's plan divides the available funding into three phases over 10 years. The MPCA began accepting applications for phase 1 grants during the summer of 2018. Demand for funding has been enormous. For the first grant round of \$2 million for the replacement of old school buses, the MPCA received \$9 million in requests.



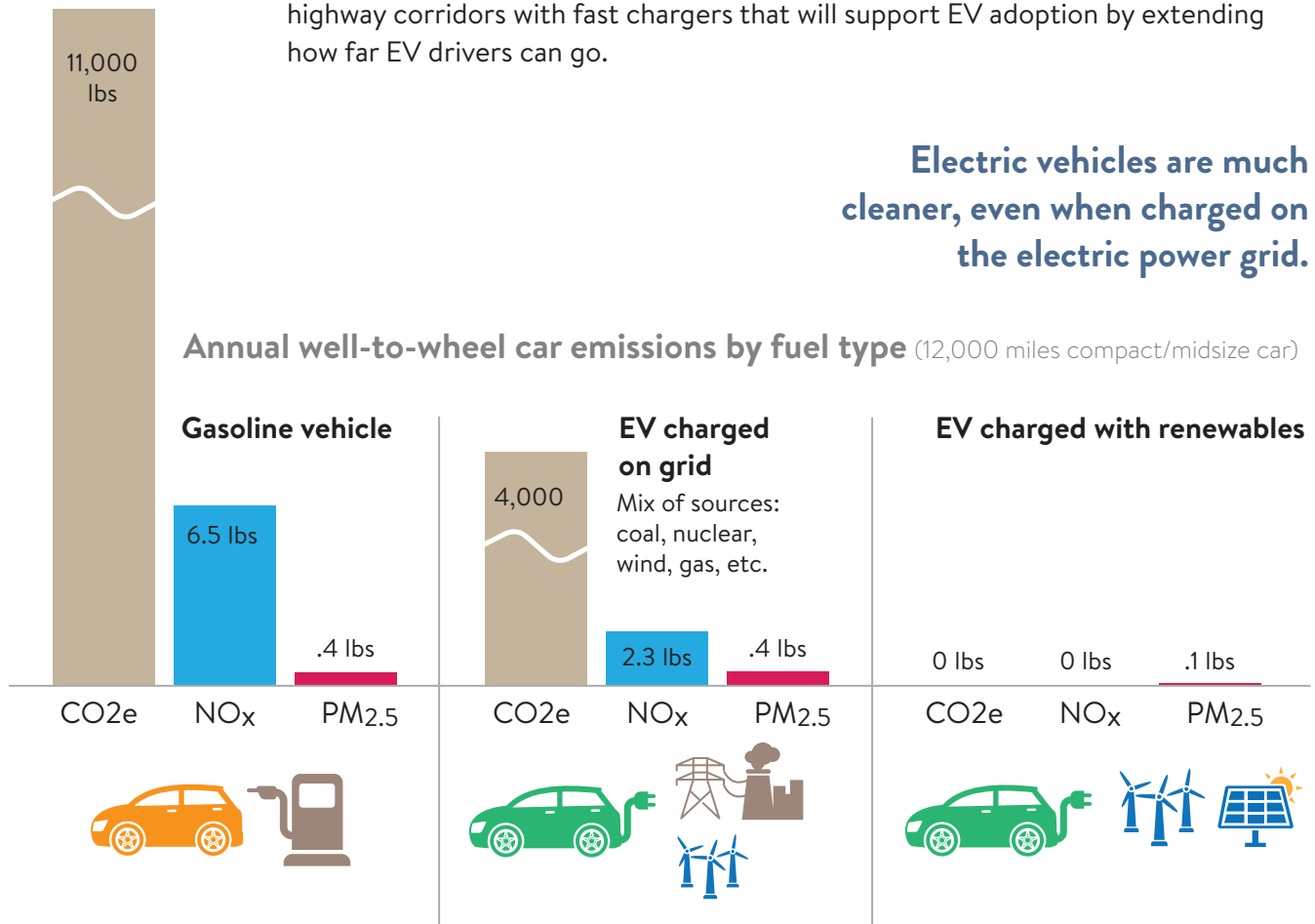
Similarly, we received a total of \$567,000 in funding requests for electric-vehicle charging stations for the \$150,000 available. In 2019, MPCA will announce grant application opportunities for other vehicle types and will be developing a plan for the second phase of funding.

## Electric vehicles

Replacing gasoline-powered cars with EVs can significantly improve local air quality and reduce the costs of vehicle ownership. EVs charged on Minnesota’s electric power grid produce far less emissions on average than standard gasoline-powered cars, and EVs charged with renewable energy, such as wind or solar, are essentially zero-emitting vehicles.

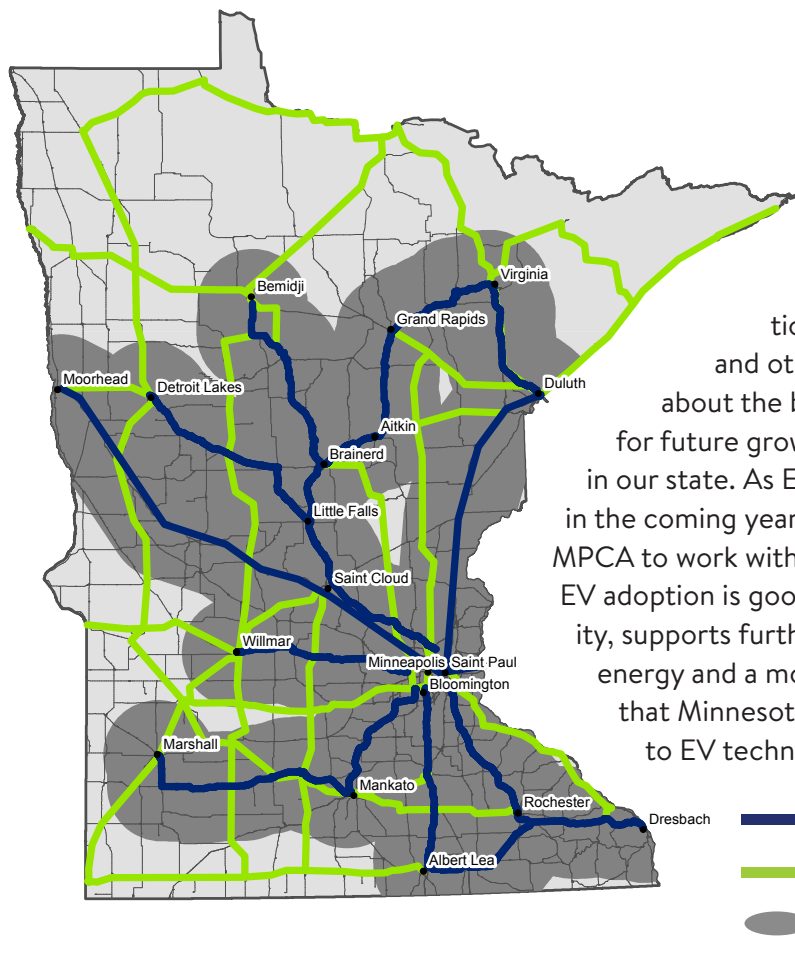
By allowing up to 15% of VW funds to be used to expand EV charging infrastructure, the Volkswagen settlement will give a big boost to adoption of EVs in Minnesota. The MPCA has dedicated \$1.4 million of phase 1 funding to developing a system of highway corridors with fast chargers that will support EV adoption by extending how far EV drivers can go.

**Electric vehicles are much cleaner, even when charged on the electric power grid.**



## Charging on high-way corridors will allow Minnesotans to travel farther with EVs

This map shows existing and funded EV charging corridors in Minnesota (blue) along with a vision of a system that would help more Minnesotans to travel by EV (green). The dark grey areas show the parts of Minnesota that will be reachable using the EV fast-charging highway corridor system by the end of the first phase of VW settlement funding. Map courtesy of Great Plains Institute, 2018.



The MPCA also partners with Drive Electric Minnesota (a partnership of EV champion organizations), local governments, and others to educate people about the benefits of EVs and plan for future growth in the number of EVs in our state. As EVs become more popular in the coming years, it is important for the MPCA to work with our partners to ensure EV adoption is good for Minnesota’s air quality, supports further adoption of renewable energy and a modern power grid, and that Minnesotans have equitable access to EV technology.

## Air pollution from everyday, neighborhood sources

Some of the most challenging sources of air pollution are “neighborhood” sources. These are the sources in our homes and neighborhoods that are small individually, but together can have a big impact on air quality. Sources such as lawn mowers, dry cleaners, backyard fires, and auto-body shops are located where we live, work, and play, which means we are frequently exposed to their emissions, sometimes for long periods of time. Total emissions from neighborhood sources are significantly greater than all the large permitted facilities in the state combined (see page 16).

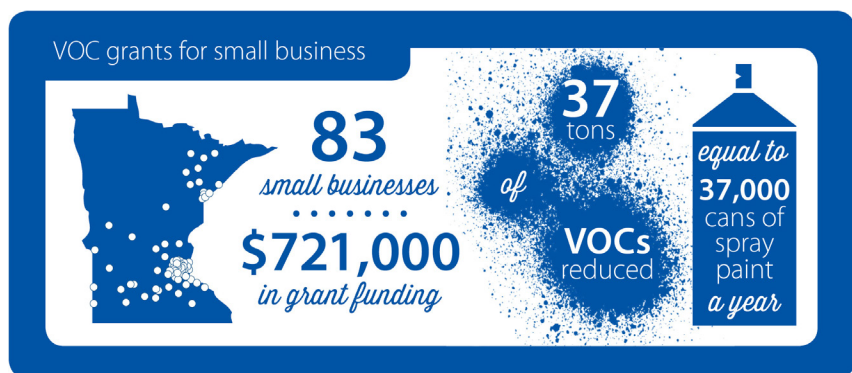
Partnerships and voluntary actions are central to the MPCA’s approach to reducing emissions from these sources. MPCA works with businesses, nonprofits, local and tribal governments, and communities through Clean Air Minnesota (see page 18) and other collaborations, such as MPCA’s Green Step Cities and GreenCorps programs, to develop voluntary emission-reduction programs and assist small businesses in reducing emissions. To learn more, visit <https://www.pca.state.mn.us/air/neighborhood-sources>.

## Helping small businesses reduce VOCs

Employees at facilities around the state breathe in fumes from chemicals that contain volatile organic compounds (VOCs) every day. Released to the outdoors,

VOCs also react with other pollutants to form ground-level ozone (also known as smog) and fine particles. Using different chemicals in industrial processes and

upgrading to low-emitting equipment can reduce VOC emissions. Because the costs of training and new equipment can be a barrier, MPCA and its partners offer grants, loans, and training for small businesses. So far, the MPCA's grants efforts have resulted in 37 less tons of VOCs emitted by small businesses per year, the equivalent of 37,000 cans of spray paint a year.



### Innovative pilot programs

The MPCA is continually looking for new and more cost-effective methods for assisting small businesses to make more environmentally friendly choices. Many businesses use VOC-emitting solvents in the equipment they use to clean tools and parts used in their work. A recent pilot program partnered with vendors to provide direct funding to replace these solvent-based parts washers with ones that use water instead. This program helped the MPCA reach more businesses with less resources invested in outreach, and the program was easier to access for those businesses.

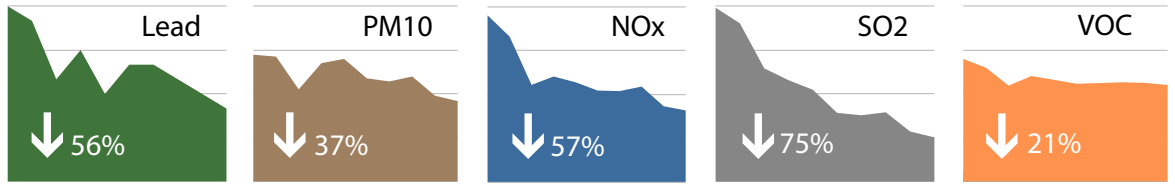
### Reducing exposures to wood smoke

While people have always burned wood, we now know that wood smoke can impact the health of families and their neighbors. Survey data indicates residential wood burning, unlike other air pollution sources, is increasing as more wood is being burned for home heating and in residential backyard fire pits. Residential wood burning is a sizable contributor to fine-particle emissions and can aggravate health conditions such as asthma. The MPCA is partnering with Clean Air Minnesota to help communities and citizens reduce wood smoke.

## Air pollution from industrial facilities

Large facilities with smokestacks, such as factories and power plants, must operate under air quality permits issued by the MPCA. Permitted facilities emit about a fifth of the total air pollution in the state, but they have cut emissions significantly in the past 20 years (see page 16). To learn more, visit <https://www.pca.state.mn.us/air/large-industrial-facilities>.

**Emissions from permitted facilities have significantly decreased 2007-2016**



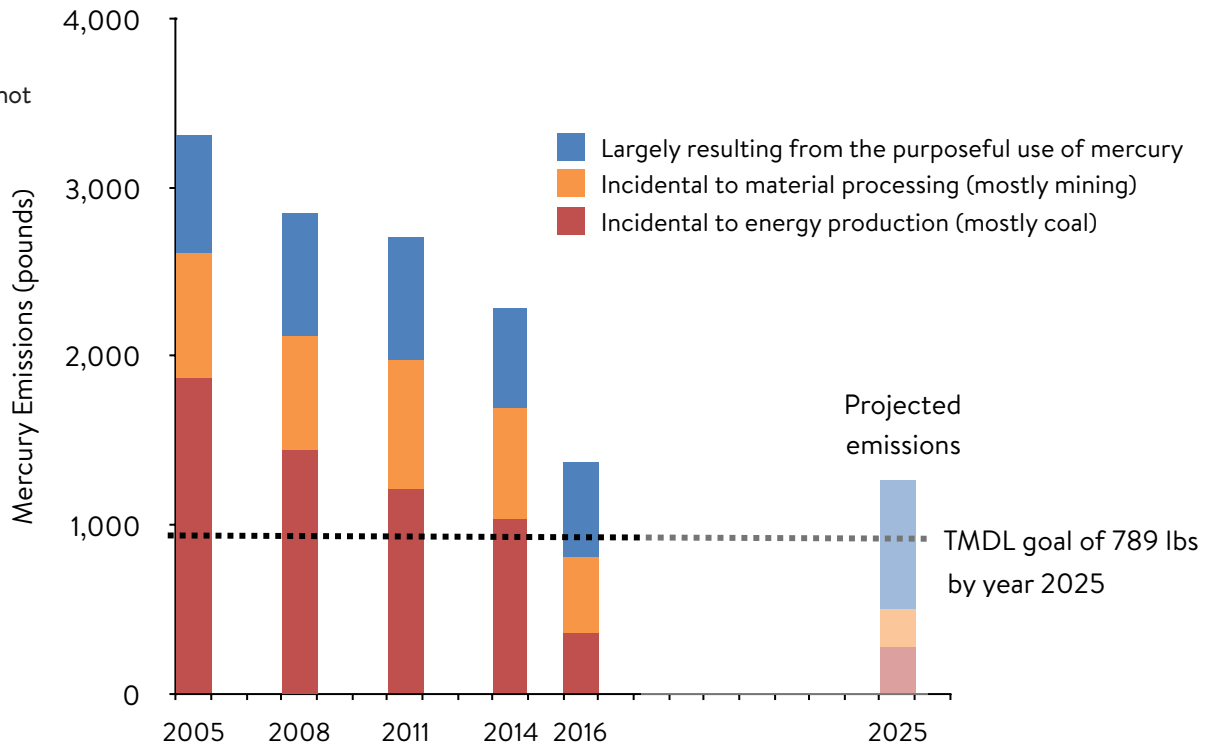
**Reducing mercury in our air and water**

Mercury exposure can harm the organs and nervous systems of people 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 emissions reduction plan to meet water-quality standards and protect people from consuming mercury-contaminated fish. Despite significant reductions from some sectors, the MPCA projects that the state will not meet the plan’s 2025 statewide reduction goal. Emissions from certain mercury-containing products (such as fluorescent lights, certain electrical switches, thermometers, and dental fillings) are holding steady or increasing.

**Minnesota is making progress**

toward meeting the 2025 statewide mercury emissions reduction goal, but is not projected to meet it.



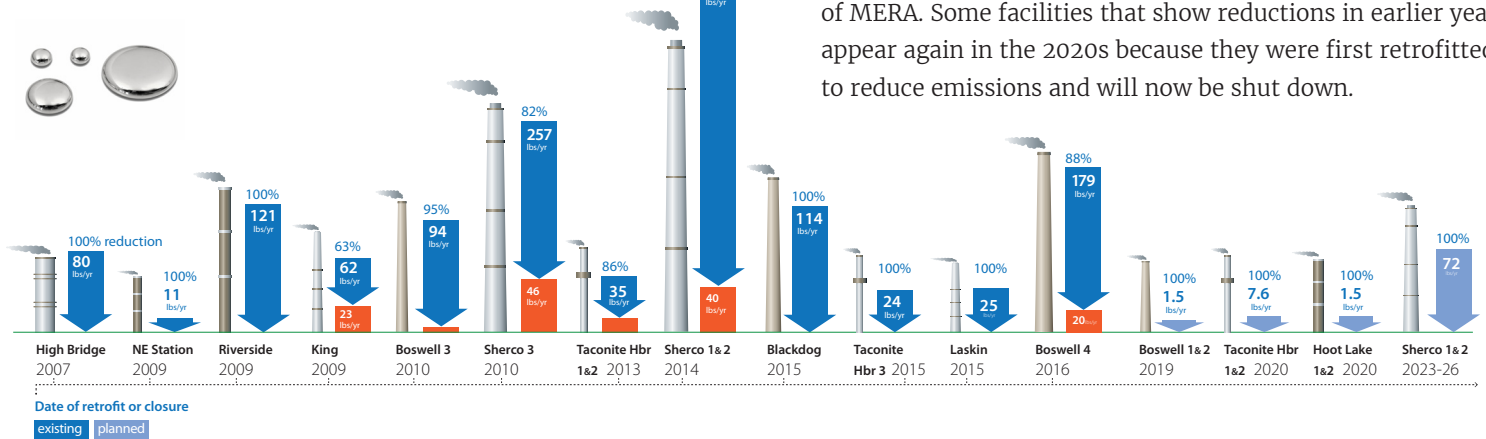
All the waters in the state will benefit from the statewide mercury reduction plan, but not all waters respond the same to reduced emissions. The primary goal is to substantially lower mercury in fish and make them safer to eat. About 90% of our waters will reach the goal if the plan is fully implemented. For the remaining 10%, more work is needed to understand why these waters remain high in mercury despite lower emissions.

## Major emissions reductions from power plants

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 get there, 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 haze-forming pollutants 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.

### Reducing mercury pollution

from coal-fired power plants in Minnesota



Emissions reductions achieved through retrofitting and shutting down coal plants in Minnesota since the enactment of MERA. Some facilities that show reductions in earlier years appear again in the 2020s because they were first retrofitted to reduce emissions and will now be shut down.

## Conclusions

Minnesota's air quality is generally good and continues to improve. Our clean air supports healthier Minnesotans, healthier ecosystems, and a strong economy. However, air quality is not the same in all parts of the state and some people are more vulnerable to the health effects of air pollution. The MPCA must continue to learn more about these disproportionate impacts and find new and creative ways to address this challenge. To those ends, the MPCA collaborates closely with other state agencies, local and tribal governments, non-profits, and businesses to address disparities and improve air quality, especially in the areas that need it the most.

We must continue to adapt our strategies as we learn more about the health effects of air pollution and how climate change is affecting and will continue to affect our air quality. Through these challenges, the MPCA will continue to protect and improve human health and the environment for all Minnesotans.

# Appendix A

## Mercury emissions associated with electricity production and consumption in Minnesota, 2014-2017

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 is on track to meet the interim mercury emission reduction goals in 2018. More information about Minnesota's mercury emissions and reduction strategies can be found on page 25 of this report and at <https://www.pca.state.mn.us/quick-links/mercury>.

### **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 hydro-electric, 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 2014 through 2017. Note that 2017 emissions are considered draft and under quality review by the MPCA.

## Mercury emissions from electric utilities, 2014 through 2017

Company	Mercury emissions (pounds)			
	2014	2015	2016	2017 (draft)
Blandin Paper Co / MN Power - Rapids Energy Center	5.21	4.92	4.57	4.96
District Energy St Paul Inc. - Hans O Nyman	9.50	8.31	4.08	1.45
Great River Energy	15.71	4.07	6.28	9.04
Hennepin Energy Recovery Center	4.85	7.42	7.45	5.28
Hibbing Public Utilities Commission	13.73	13.68	6.62	8.77
Minnesota Power - Boswell Energy Center	249.30	176.77	33.90	31.92
Minnesota Power - Hibbard Renewable Energy Center	3.79	2.60	3.01	3.09
Minnesota Power - Laskin Energy Center	21.63	5.42	0.00	0.00
Minnesota Power - Taconite Harbor Energy Center	44.59	15.82	4.31	0.00
Northshore Mining - Silver Bay	37.72	23.05	14.97	17.74
Otter Tail Power Co - Hoot Lake Plant	25.80	3.21	2.85	2.01
Virginia Department of Public Utilities	10.20	4.92	6.37	6.53
Xcel Energy - Allen S King Generating Plant	17.80	20.60	17.86	20.96
Xcel Energy - Black Dog Generating Plant	85.32	21.78	0.01	0.00
Xcel Energy - Key City/Wilmarth	3.89	6.34	4.25	2.01
Xcel Energy - Red Wing Generating Plant	5.95	11.20	9.98	4.62
Xcel Energy - Sherburne Generating Plant	316.40	77.90	78.50	82.20
<b>Grand Total</b>	<b>877.10</b>	<b>411.72</b>	<b>207.96</b>	<b>200.58</b>