Minnesota Environment and Energy Report Card

MINNESOTA

ENVIRONMENTAL QUALITY BOARD

2024

Introduction

The EQB's mission is to enhance Minnesota's environmental quality for current and future generations by leading interagency work to advance meaningful public engagement and facilitate informed decision-making on critical environmental issues. Compiled with the help of staff from several state agencies, the 2024 Minnesota Environment and Energy Report Card provides valuable information for the public and policymakers on the condition of Minnesota's environment, how it is being impacted by environmental threats, and what is being done in response.

The report focuses on key areas of Minnesota's environment: air and climate, and land and water. Each section presents metrics and information that help assess the condition of Minnesota's environment, along with actions being taken to promote and improve environmental quality and respond to changes by promoting equity and resiliency. In alignment with the Climate Action Framework, many of these environmental issue areas highlight the work currently being done to address climate change. Metrics either have a red, yellow, or green score depending on the changes in environmental condition and whether state goals for progress are being met, and show a projected trend. Many of these metrics have been used since 2017, allowing a look at changes over time. Some, especially those related to state actions, have been updated to reflect changing state goals.

Highlights

The current report card shows mixed results.

Key environmental condition indicators show the continued impact of climate change – in higher temperatures, more extreme precipitation and drought, and in insect damage to our forests. The outcome is better for air pollution and water due to the many statewide efforts to address the root causes of concern.

Action indicators – those metrics that are looking at what we're doing to enhance environmental quality – are also mixed. Our key energy actions that contribute to reducing climate change are making progress. Carbon-free electricity and household energy use are both metrics that have improved due to investments in more energy efficient heating systems and the capacity for more renewable energy generation – with 26% of our energy coming from wind.

Since the publication of the 2019 report card, we faced a global pandemic that impacted every aspect of life across the state. The environmental impacts of that pandemic are highlighted throughout the report from lower fuel use and greenhouse gas emissions to shifting trends in recycling. These effects make it harder to project future trends in these areas, and metrics will have to be watched carefully moving forward.

Working together

Minnesota enjoys abundant natural resources and high quality of life, but not all groups and communities share these benefits equally. Some Minnesotans are disproportionately affected by air and water pollution, climate change, and other environmental challenges. In all our work, we seek to end disparities based on race, income, gender, health, and geography. This is critical for making progress on our statewide environmental goals.

The Environment and Energy Report Card is a living document. We hope that it will inspire new dialogue and forms of action. Tackling the complex issues in this report will require innovative approaches and cross-sector collaboration. The EQB invites you to attend our monthly meetings to learn more and join us in creating solutions. Together we can ensure a clean, healthy environment for all Minnesotans.

Contents

Condition: Air and climate

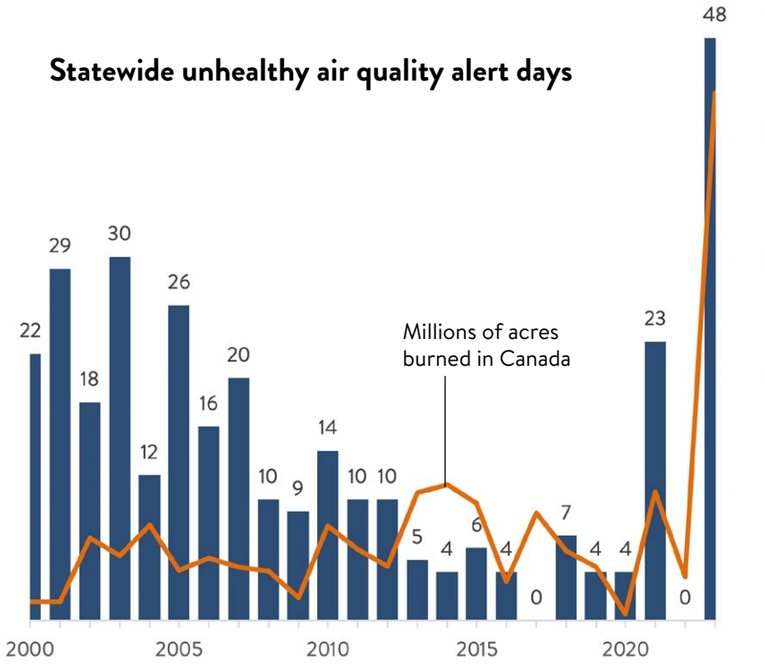
Air pollution

Voluntary efforts and regulation have improved air quality over recent decades, but not for everyone and not enough to ensure that air pollution is not affecting human health. Our air quality meets current federal standards, but environmental standards and conditions are changing, and disparities remain.

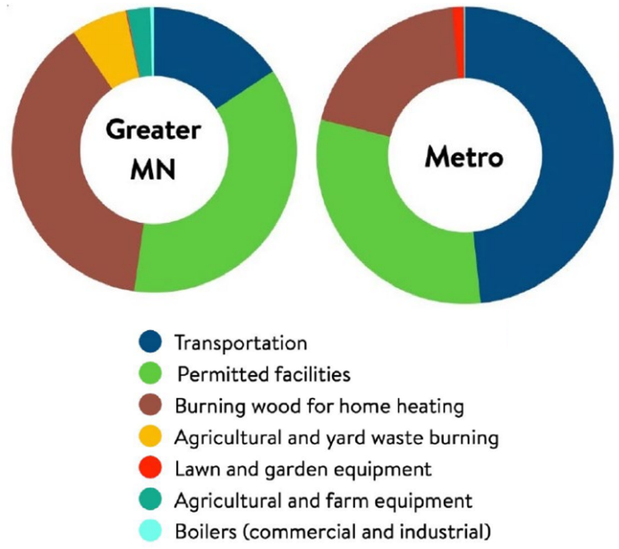
Status FAIR

Trend

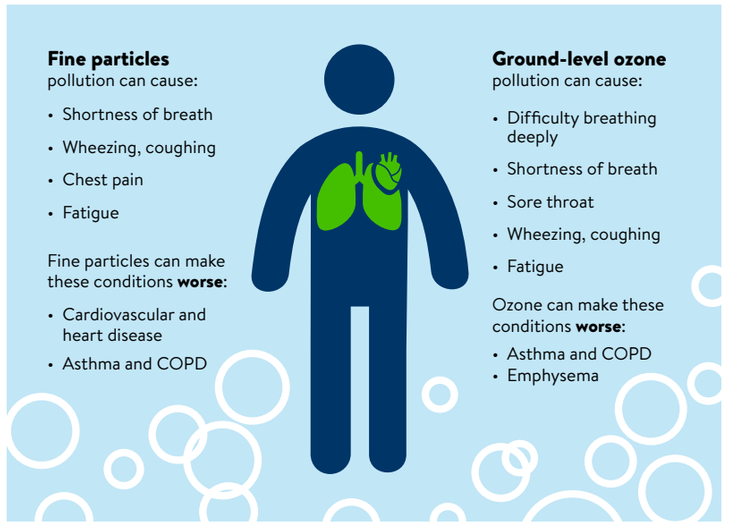
Statewide unhealthy air quality alert days



Air pollution health risk sources in Minnesota



Air pollution and your body



Source: MPCA

What's causing air pollution

Minnesota's air quality can differ across the state and fluctuate often, sometimes quite quickly. Wildfire smoke, ground-level ozone on hot summer days, and temperature inversions that trap pollution on calm winter days can create areas of unhealthy air quality and trigger regional air quality alerts. These events are likely to become more common as the climate continues to change. Local air pollution sources are more concentrated in cities, so people who live in cities are exposed to more air pollution and the resulting potential health effects. For example, transportation is the primary source of air pollution-driven health risks in the Twin Cities metro, particularly impacting those who live near large roadways, while wood burning, and industrial processes are the main sources of air pollution-driven health risks in greater Minnesota.

Health and equity

Air pollution contributed to 10% of deaths in the Twin Cities metro area and 9% of deaths in Greater Minnesota in 2015. Fine particle pollution contains a harmful mix of chemicals. The particles are so small they can be breathed deep into lungs and enter the bloodstream. Wood burning for heat or pleasure, wildfires, and diesel exhaust are common ways we are exposed to fine particles.

While all Minnesotans are susceptible to health impacts from air pollution, low-income residents, residents of color, uninsured residents, or residents living with a disability are disproportionally impacted. Some people are more likely to be impacted by smaller amounts of air pollution, including children, older adults, those who have existing heart or lung conditions or diabetes, are pregnant, or work, exercise, play, or live outdoors.

Efforts to improve air quality

We make decisions every day that can affect air quality, such as the fuel we use in our vehicles and appliances or to heat our homes and buildings. Making progress on air pollution calls for many of the same strategies as the climate and energy goals highlighted in this report card and in the Climate Action Framework. Efforts to reduce greenhouse gas emissions, use less energy, shift to renewable energy, and rely less on burning fossil fuels for everyday needs will help reduce overall air pollution. Due to the enduring legacy of past racist and classist decisions, air pollution exposures are even higher in areas with more residents of color and lower-income residents. Focusing on local impacts and prioritizing pollution reduction efforts in these areas is critical to addressing disparities.

Condition: Air and climate

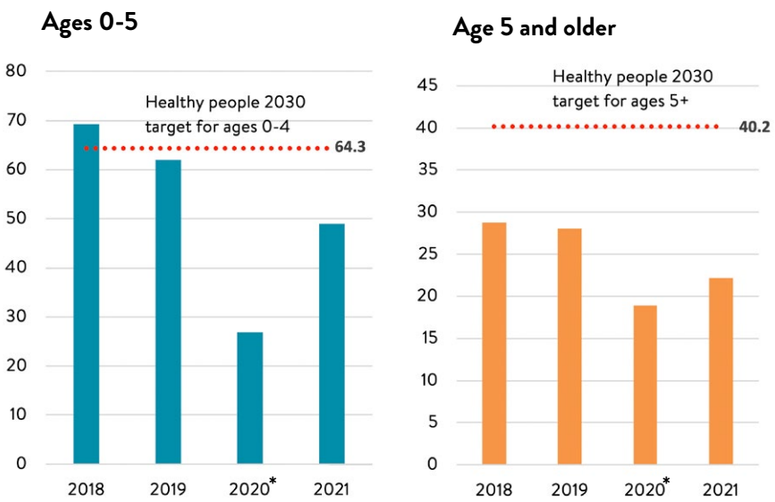
Asthma

While rates for asthma-related emergency room visits still meet national objectives, we saw an increase in 2021, following a steep drop during the pandemic in 2020. Asthma inequities persist and we continue to work to increase access to healthcare and provide asthma management education and resources to remedy those inequities.

Status GOOD

Trend

Asthma emergency room visit rates (per 10,000 people)



* The 2020 drop is consistent across the country and is attributed to factors related to the COVID-19 pandemic, rather than changing factors in asthma etiology or exacerbation triggers.

What asthma can tell us about our environmental quality

Asthma is a chronic condition that affects the lungs and is characterized by coughing, wheezing, and shortness of breath. Minnesota's most recent data indicate that approximately 1 in 17 children and 1 in 10 adults have asthma. Asthma often starts during childhood but can start at any age. Factors that contribute to developing asthma include genetics, allergies, a severe respiratory infection during childhood, and environmental exposures. Pollution from traffic and industry, along with climate impacts including a longer pollen season, changes in vegetation as species spread north, and an increase in wildfires all contribute to health impacts from outdoor environmental exposures. These exposures create or worsen not just asthma, but other health conditions such as chronic bronchitis, emphysema, chronic obstructive pulmonary disease, and cardiovascular disease and can even lead to death.

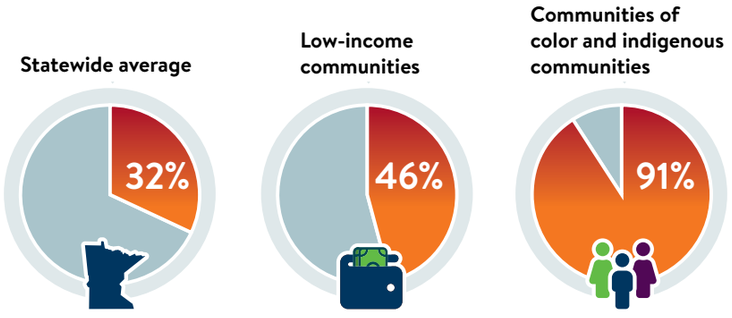
Reporting asthma emergency room visits is just one way in which Minnesota tracks data on asthma. This statewide data for asthma, along with other data relevant to health and the environment, can be found on the Minnesota Public Health Data Access Portal. We can also compare our Minnesota rates to the Healthy People 2030 national goals for improving respiratory disease outcomes for a broader view (which is what the status/trend above are comparing against).

- In 2021, Minnesotans made 13,654 emergency room visits and experienced 1,305 hospitalizations for asthma.
- In 2014, asthma cost an estimated $669 million, including $615 million in direct medical expenses and $54 million in lost workdays. More recent data on cost are not available.
- In 2015, 7.4% of Minnesota adults reported that they had current asthma; in 2022, 10% of adults report that they have current asthma. The percentage of adults reporting that they have ever been told by a health care provider that they have current asthma has increased from 11.1% to 14.3%.

Improving our environment to boost our health and well-being

Minnesota needs to continue to reduce ER visits caused by poor air quality. Improving air quality can provide significant public health benefits. If we reduce fine particles and ground-level ozone by 10% from 2008 levels, we can reduce the annual number of deaths, hospitalizations, and emergency room visits due to heart and lung conditions.

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



Equity

Breathing polluted air is not good for anyone, but health impacts from pollution are not shared equally. Children in the Twin Cities metro area go to the ER for asthma at a rate nearly twice that of children in Greater Minnesota. In some Minneapolis zip codes, asthma hospitalization rates for children are four times higher than the rest of the state.

Due to structural inequities, people living near high-traffic roads and heavy industry bear a heavier burden. The highest estimated rates of air pollution-related death and disease in the Twin Cities occur in neighborhoods with the largest percentage of residents who are Black, Indigenous and People of Color (BIPOC), low-income and uninsured, and who live with a disability. Across Minnesota, Latino, American Indian, and Black adults are 20 to 30% more likely than white adults to have asthma. Further, zip codes with the largest percentage of BIPOC residents had more than five times the rate of asthma emergency room visits related to air pollution compared to areas with more white residents.

Condition: Air and climate

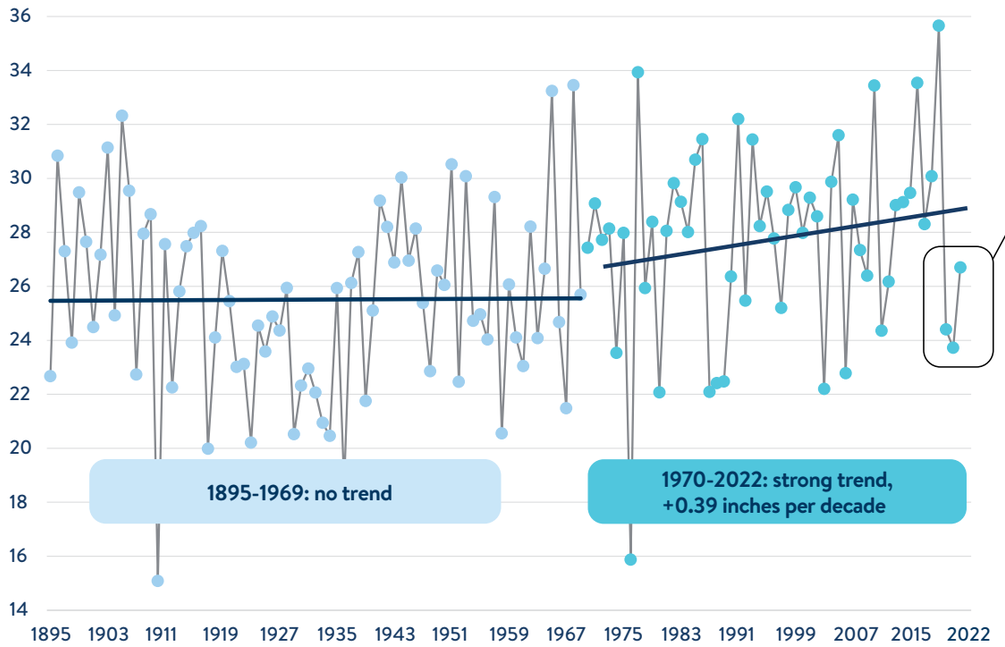
Heat and rainfall

Minnesota has become both warmer and wetter on average as global temperatures have risen.

Status POOR

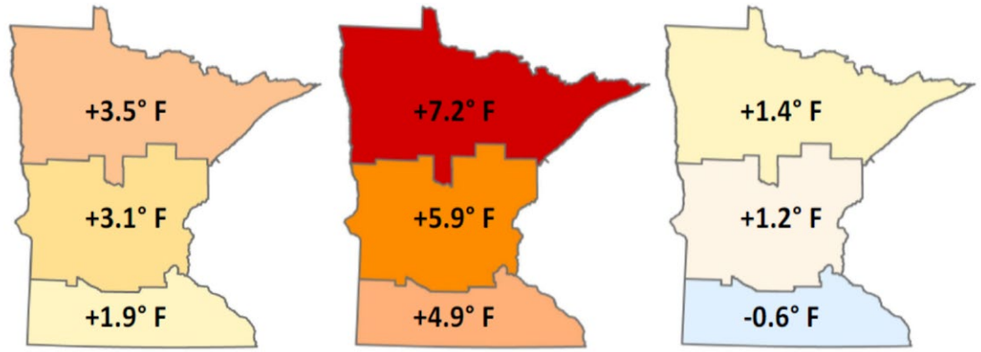
Trend

Minnesota annual precipitation in inches



While the last few years (2020-2022) have been dry in Minnesota, we continue to be on a long-term trend of increasing precipitation.

Total temperature change since 1895



Annual average
(through 2022)

Winter lows
December - February
(through 2023)

Summer highs
June - August
(through 2023)

Minnesota is nearly 3°F warmer than it was 100 years ago.

Warmer

Global temperatures are rising because humans have increased greenhouse gas emissions by burning coal, oil, and gas. Winter has become the fastest warming season globally, at all scales, and is a major driver of annual warming rates. In Minnesota, trends towards warmer years are strongly influenced by winter, which is warming several times faster than summer. Winter nights are warming fastest, as shown by increases in average daily low temperatures between December and February. Extremes of cold are less frequent and less severe than they used to be. Rapid increases in Minnesota's low temperatures during the winter represent a direct impact of our changing climate due to rising greenhouse gas emissions.

Wetter

Despite drought conditions during the early 2020s, Minnesota is still getting wetter over the long-term, and has had damaging rain and snow events each year of the decade through 2023.

Coordination is key

Addressing climate change is a matter of policy, and requires global coordination to stop burning coal, oil, and gas. Many of the goals and initiatives mentioned in this report are key in helping reduce Minnesota's contribution to climate change.

More damaging precipitation

Heavy, wet snows during the 2022-23 winter damaged millions of Minnesota's trees.

Frequency of mega rains of 3+ inches have increased 60% over last 100 years.

15.1 inch daily rainfall record set in Hokah, Minnesota, in 2007. It was 39% higher than the previous record.

Condition: Air and climate

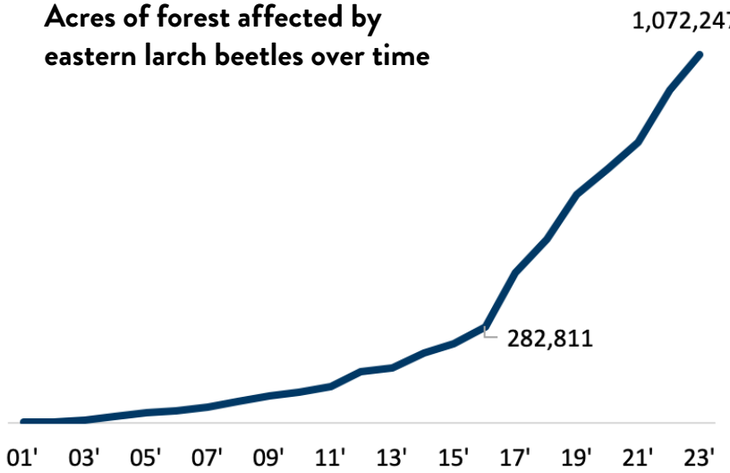
Climate change and forests

Minnesota's forests provide a wide range of important benefits, but they are susceptible to stressors that reduce these benefits and the health of forests. Climate change increases the potential for negative impacts on forest health in the future.

Status FAIR

Trend

Acres of forest affected by eastern larch beetles over time



Climate change and forest health

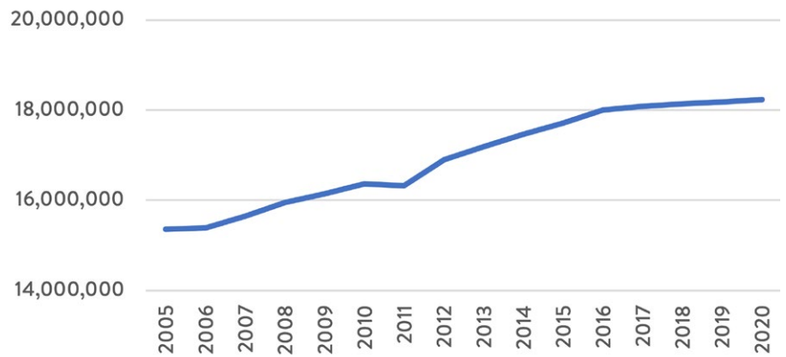
Healthy forests generate a wide range of benefits including diverse wildlife habitat, clean air and water, and carbon sequestration and storage. They also support a robust forest products industry and recreational opportunities. Forest health stressors such as insects, diseases, and invasive plants endanger these benefits by suppressing growth and killing trees across wide areas of the state. In 2023, over one million acres of forest were negatively impacted by at least one of these stressors. Climate, including temperature and precipitation, influences the extent and severity of impacts. Climate change is one of several influential factors driving an unprecedented two-decade outbreak of eastern larch beetle (ELB) in Minnesota's tamarack forests. From 2001 to 2023, ELB affected nearly one million acres, equivalent to 75 percent of all tamarack in the state. Longer and warmer growing seasons have helped extend this outbreak. Climate predictions suggest even longer and warmer growing seasons by mid-century in Minnesota. Other forest health stressors that are partially contained by Minnesota's cold weather, such as emerald ash borer and spongy moth, will also increase in population as winters become warmer.

Eastern larch beetles have killed vast swaths of tamarack forests by feeding under the tree's bark.

Healthy forests help mitigate climate change

Healthy forests are more resilient to stressors that harm trees and impair forest growth. When forests grow they absorb and store heat-trapping gases that are making our winters warmer and precipitation more variable. Currently, Minnesota's nearly 18 million acres of forest actively reduce the concentration of carbon dioxide in the atmosphere, helping to slow climate change. In 2020, Minnesota's forests absorbed over 18 million tons of carbon dioxide, which is about the same amount released by four million passenger vehicles driven for one year.

CO2-equivalent tons removed from the atmosphere by Minnesota's forests



Source: University of Minnesota

Action: Air and climate

Reducing climate pollution

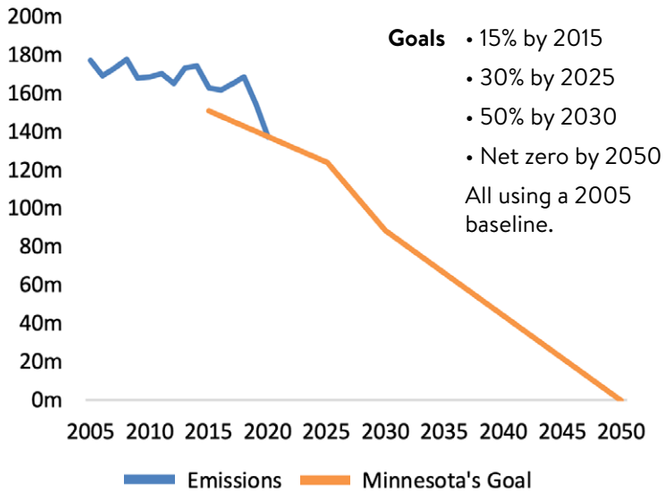
Emissions in 2020 were 23% below 2005 levels. Significant emissions reductions have been made in electricity generation and in transportation. However, because of the unusual impacts of the COVID-19 pandemic, future trends are uncertain.

Status FAIR

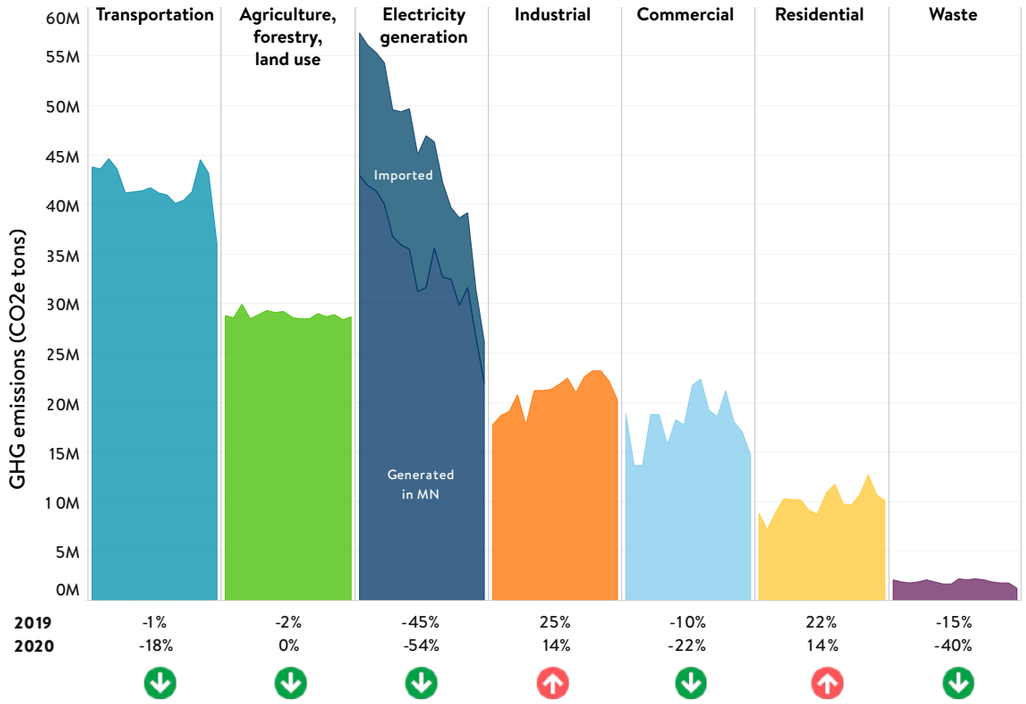
Trend

Not enough information to determine a statewide trend.

Minnesota greenhouse gas emissions 2005-2020 and goals from Next Generation Climate Act



Climate pollution by economic sector in Minnesota, 2005-2020



COVID-19 and greenhouse gas emissions

From 2005-2020, Minnesota achieved a 23% reduction in greenhouse gas emissions, putting the state on track to meet its goals for the first time, all while seeing economic and population growth. The unusual circumstances of the COVID-19 pandemic resulted in more emission reductions than expected, so future years might show an increase in greenhouse gas emissions, particularly in the transportation sector. Although 2020 data shows Minnesota meeting our goals, a rebound in transportation emissions to pre-pandemic levels would result in emissions above targets.

Major sources of climate pollution include burning fossil fuels for electricity, transportation, and other industrial, residential, and commercial uses. The release of greenhouse gases such as methane from agriculture and landfills is another contributor.

Minnesota's Climate Action Framework

MINNESOTA

Minnesota's Climate Action Framework provides a path forward

Major investments from the state and federal governments are accelerating progress in reducing climate pollution. Individuals and communities across Minnesota need to put these tools to work meet Minnesota's greenhouse gas emissions reductions commitments.

- Minnesota has made big progress in the electricity sector, and passage of a new law committing Minnesota to 100% clean energy by 2040 will ramp up progress.
- A key area of opportunity is decarbonizing buildings and industry. Minnesota needs to pursue energy efficiency through better codes and retrofitting existing buildings. Electrifying fossil-fuel-based heating sources will also get carbon out of buildings and industry.
- Minnesota's natural and working lands can be part of the solution through practices that promote carbon storage.
- In the transportation sector, Minnesota is pursuing vehicle electrification, cleaner fuels, and investments that make it easier to get around without a car.

Action: Air and climate

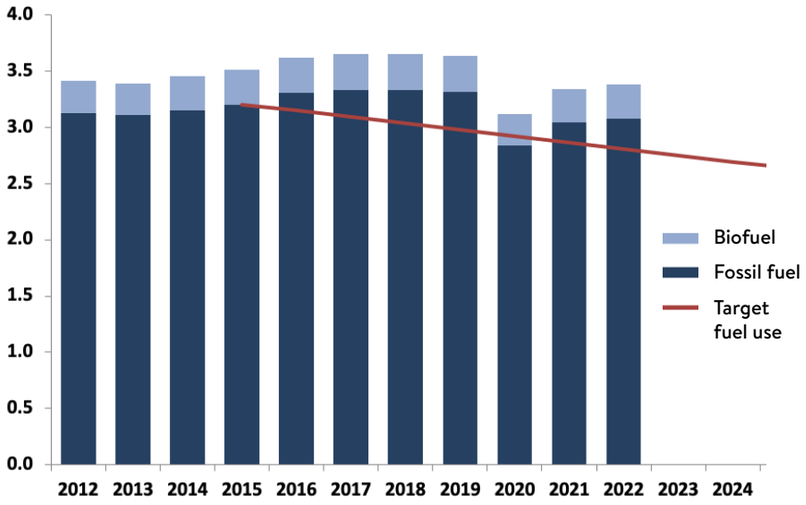
Fuel and transportation

Fuel use gradually increased between 2011 and 2018, nearly returning to peak 2004 level. The COVID-19 pandemic dramatically impacted travel in the state, reducing total fuel usage in 2020 to the lowest point in the 20-year reporting period. Since 2020, fuel usage has continued to increase.

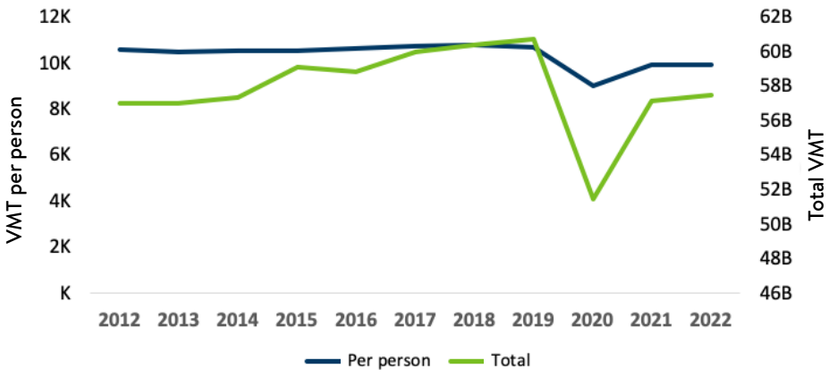
Status POOR

Trend

Fuel use in billions of gallons



Vehicle miles traveled



Travel and fuel use

Transportation is the largest contributor to greenhouse gas emissions in the state. While greenhouse gas emissions from the transportation sector have been declining since 2005, Minnesota did not meet the statewide 2015 emissions target. Although continued declines are projected, emissions from transportation fuel use are still projected to be 10 to 15% higher than the 2030 target. While mass transit is currently available at some level across the state, it is not sufficiently developed to accommodate a wide range of daily trips. With limited multimodal options in many parts of Minnesota, people must rely on single-occupancy vehicles to move around.

The lasting impacts of COVID-19 on travel

Over the last 20 years, total vehicle miles traveled in Minnesota steadily increased until 2020 when they decreased by 15% due the impact of the COVID-19 pandemic on travel patterns. In 2021, mileage increased by 10% and is now similar to levels last seen in the early 2000s. Higher numbers of miles driven per person suggests that people in Minnesota do not have effective transportation options to get places they need to go and that those places are likely farther away than they used to be.

Freeway congestion is likely to remain at low levels in the near future. Recent evidence from traffic volume data in the Twin Cities suggests that while daily volumes are rebounding to near pre-pandemic levels, the distribution of trips throughout the day has differed significantly. Volumes during the traditional AM peak period are lower, consistent with many workers continuing to work remotely, while trips during the PM peak period are returning to higher levels.

According to MnDOT's 2021 Congestion Report, highway volume decreased by as much as 50% in some corridors. In 2020, 0.9% of the freeway system was congested, which was nearly a 25-percentage point decrease from 2019. While freeway congestion increased to 5.8% in 2021, it was still well below pre- COVID-19 trends. Freeway congestion in 2022 increased to 13.7%, which suggests that travel patterns are shifting as more people return to in-person work part-time or full-time.

Working towards cleaner, more equitable, and sustainable travel

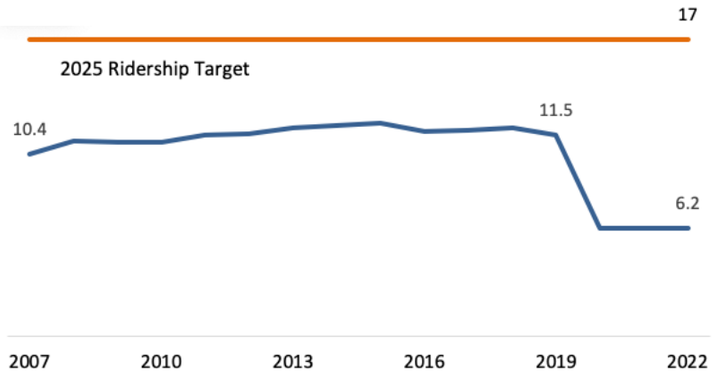
The first goal in the Climate Action Framework highlights making Minnesota's transportation system sustainable, resilient to a changing climate, and supporting equitable transportation options for all people traveling in Minnesota. By doing this, we reduce air pollution, especially in communities most affected by it. Additionally, we continue to work on travel options that are accessible, safe, and plentiful so people can enjoy walking, biking, rolling, and other modes of transit. To achieve our goals:

- **Improve transportation systems to reduce single-person travel.** A transportation system balanced with thoughtful land use patterns can reduce greenhouse gas emissions by reducing per-person trip lengths. Shifting more trips away from single-occupancy vehicles to high-occupancy vehicles can be encouraged through improvements to transit services and frequency. We must also create more reliable and convenient transit networks, prioritize services in communities where transit is essential, and residents are disproportionately affected by air pollution.

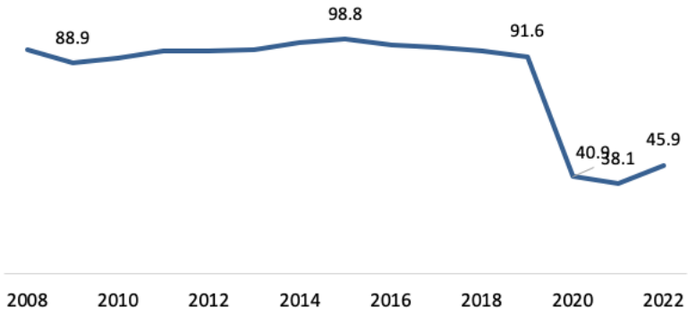
- **Increase awareness to shift behaviors.** Changing the ways people move around requires new and connected infrastructure, changes in land use, and cultural changes that require long-term planning. Public education and advocacy are also needed to increase awareness of the problems associated with fossil-fuel emissions and the impact of individual travel choices.

- **Increase the use of electric, hybrid, or biofuel powered vehicles to reduce fossil fuel use and greenhouse gas emissions.** Reducing the number of vehicles that burn fossil fuel and shifting to new technologies to power cars (such as electric powered batteries, advanced biofuels, and hybrid vehicles) offer ways to reduce fossil fuel consumption. Electrifying and increasing the use of light duty electric vehicles (EVs) are important strategies to meet the state's climate goals. Reducing the initial costs of EVs to consumers and increasing access to fast chargers will enable more people to purchase those vehicles.

Greater Minnesota transit ridership in millions



Twin Cities transit ridership in millions



More electric vehicles
As of July 2023, there were about 7.3 EVs per 1,000 pe ople.

Since 2022, the Active Transportation Program:

1. Provided 13 communities with active transportation planning services.

2. Selected 20 projects for infrastructure funding.

3. Provided five communities with quick build/ demonstration project planning support.

Celebrating progress

Electric vehicles The 2023 Minnesota Legislature approved a new EV rebate up to $2,500 (in addition to the existing $7,500 in federal tax credits). The 2023 Minnesota Legislature also created an Electric Assisted Bicycle ("eBike") rebate program.

Charging infrastructure The 2023 Minnesota Legislature approved $13.6 million in one-time funding for electric vehicle infrastructure to support the National Electric Vehicle (NEVI) program.

Federal funds to reduce climate pollution Through the federal Infrastructure Investment and Jobs Act (IIJA), the Carbon Reduction Program (CRP) was created to reduce CO2 emissions from on-road highway sources. Annually Minnesota receives approximately $20.9 million, with a 1.9% increase each year.

Align transport and climate goals At the direction of the 2023 Minnesota Legislature, MnDOT established a Transportation Greenhouse Gas Emissions Impact Mitigation Working Group to prepare recommendations for implementing transportation greenhouse gas emissions impact assessments for capacity expansion projects on state highways. The goal of an assessment is to align project decision-making with the state's greenhouse gas emissions reductions targets under Minn. Stat., Section 174.01, Subd. 3.

Coordination of clean transportation efforts The 2023 legislature established the Clean Transportation Standard Work Group to prepare recommendations for implementing a Clean Transportation Standard (CTS). The work group convened by the Commissioners of Agriculture, Commerce, Transportation, and the Pollution Control Agency. The goal of a CTS is to significantly reduce transportation emissions, create new jobs, attract new investments, and reduce air and water pollution.

Action: Air and climate

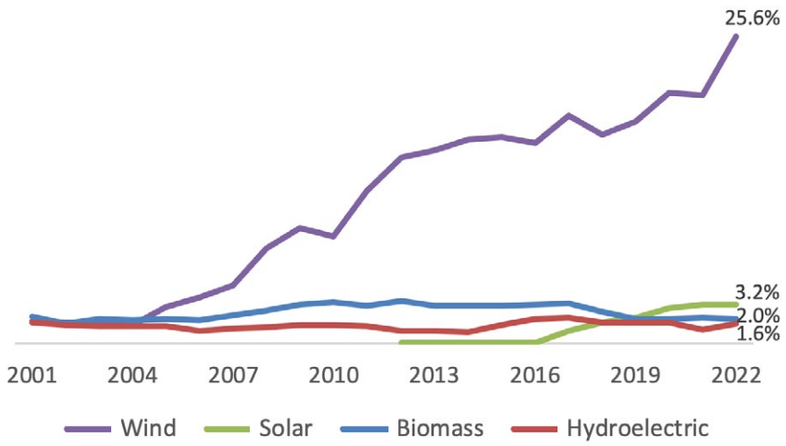
Carbon-free electricity

The trend currently shows carbon-free electricity generation steadily increasing year over year. Due to renewable energy generation, this trend is expected to accelerate in the coming years.

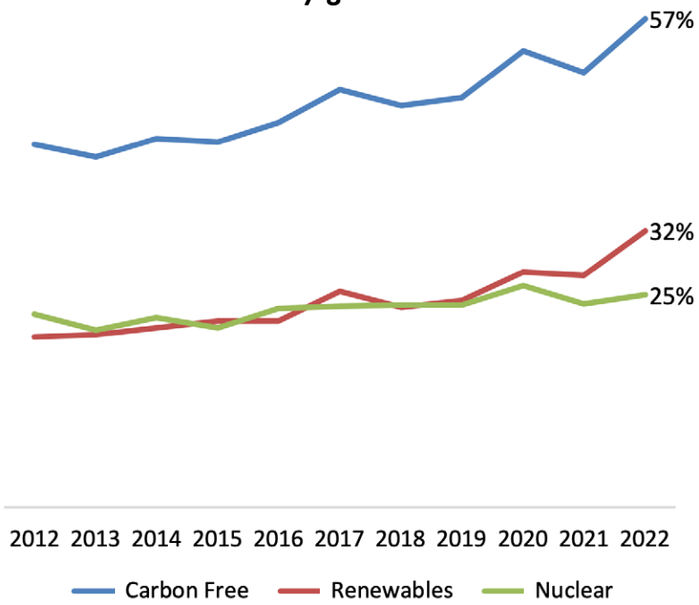
Status GOOD

Trend

Renewable electricity generation



Carbon-free electricity generation



A shift towards more renewable energy

Electricity generation in Minnesota has rapidly decarbonized over the last 20 years. In the early 2000s, generation was primarily provided by coal power plants; today, carbon-free sources of electricity make up most of the generation. Most of the increase in carbon-free electricity generation has come from the increased generation capacity of renewable sources of electricity, with wind being the primary driver. Solar generation has increased in recent years and the trend is expected to accelerate, although solar currently lags well behind wind generation as a source of renewable electricity.

Making sure Minnesota stays on track

Utilities will need to aggressively expand renewable generation capacity to meet the 2040 carbon-free electricity standard. Minnesota will need to see a steady increase in the amount of electricity generated by carbon free sources each year. The share of electricity from carbon-free sources needs to increase by at least 2.6 percentage points each year for Minnesota to reach that goal.

Solar rising: Renewable generation in Minnesota has nearly doubled since 2011. Solar generation in Minnesota has increased by over 300% since 2017.

Minnesota is above average in renewable energy production. Nationwide, renewable energy makes up only about 21% of electricity generation. Minnesota gets 26% of its electricity generation from wind alone.

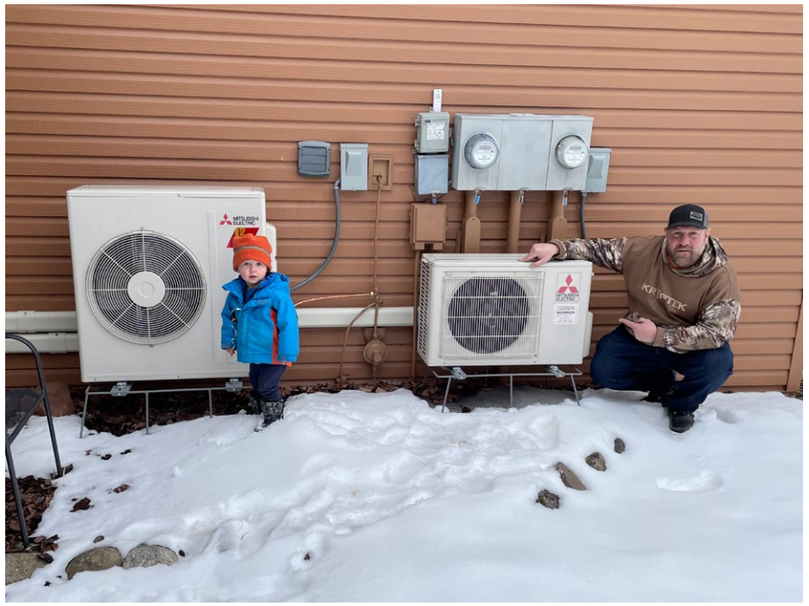
Action: Air and climate

Household heating

From 2020 to 2021, Minnesota saw only a slight increase in the share of households that reported using electricity to heat their homes. Although the current rate of change is relatively slow, the long-term trend is encouraging due to incentives.

Status FAIR

Trend

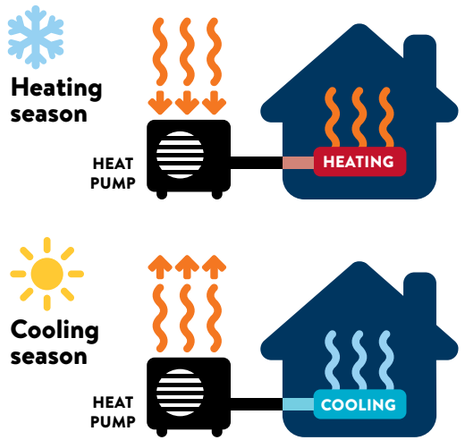


Air-source heat pumps, which use electricity, will likely become a major mode of residential heating in Minnesota.

Staying warm

Residential heating using energy sources such as natural gas and propane release carbon into the air and are prone to price fluctuations that hurt consumers. Household heating is one of Minnesota's biggest residential energy demands, and with the passage of the Inflation Reduction Act, analysts are expecting a shift away from heating homes with natural gas and towards using electricity to heat homes, specifically with the use of heat pumps. We are tracking heating with electricity to gauge heat pump adoption. The assumption is that people are choosing efficient heat pumps over inefficient electric heating technology.

Air-source heat pumps use electricity to heat and cool.

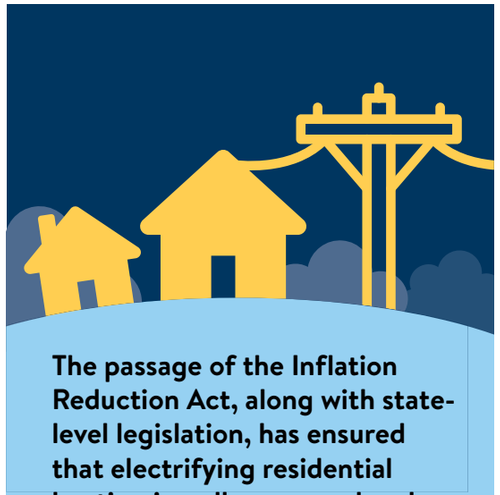


Heat pumps **move** heat and that takes far less energy than conventional heating systems which **create** heat. You can even extract heat from really cold air!

- They work like air conditioners to cool, and work in reverse to move warmth from outside air into your home to heat.
- They heat homes up to three times more efficiently than forced air and electric resistance heating systems.
- Works for homes with and without ductwork.
- Set it and forget it. Air-source heat pumps operate most efficiently without thermostat setbacks.
- They are a good option when adding or upgrading air conditioning.

More efficient heating (and cooling)

Heat pumps are energy efficient alternatives to furnaces and air conditioners. According to the U.S. Department of Energy, they can provide one and a half to three times more heat energy to a home than the electrical energy it consumes. They provide both heating and cooling and make an ideal option for Minnesotans since they're able to perform in colder climates. They work by using electricity to transfer energy between indoor and outdoor air. Because they move heat rather than generate heat, these systems typically consume less electricity than electric-resistance heating systems. In cooling mode, heat pumps function like an air conditioner, moving heat from inside to outside the home. In heating mode, the refrigerant flow is reversed to extract low-temperature heat from outdoors and deliver concentrated high-temperature heat to the home.



The passage of the Inflation Reduction Act, along with state-level legislation, has ensured that electrifying residential heating is well-resourced and a top policy priority.

Opportunities ahead

With electricity generation relying more on renewable sources, electrification presents an opportunity for residential heating to be less carbon intensive. Minnesota's Climate Action Framework calls for the development of incentives to encourage adoption of electric heating technologies, such as heat pumps. Implementing the Inflation Reduction Act and the Minnesota Residential Heat Pump Rebate Program will help residents with the upfront costs associated to the changes of their home heating equipment.

Action: Air and climate

Sustainable materials management

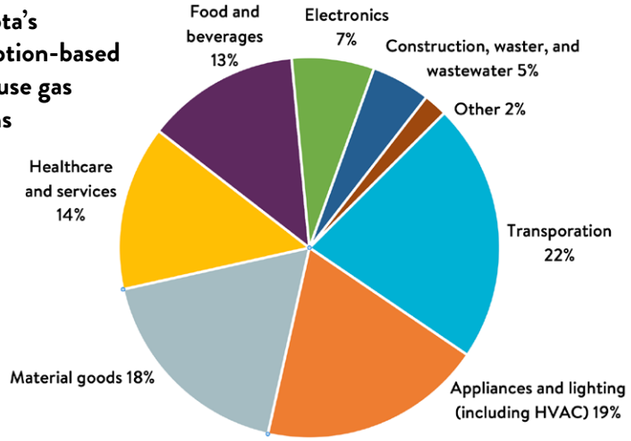
Minnesota is prioritizing a shift to more sustainable materials management. Although the recycling rate has slightly decreased in the last few years, efforts have been made to increase waste reduction and reuse since they offer more greenhouse gas emissions saving than recycling.

Status FAIR

Trend

Sustainable materials management (SMM) is a systematic approach to minimizing the total environmental and human health impacts of products and materials over their entire life cycles. SMM includes traditional solid waste management, but prioritizes actions aimed at more sustainable consumption, waste reduction, and material reuse. This broader focus ensures policies and actions account for more than diversion and responsible disposal, such as conserving natural resources and reducing toxicity and climate pollution generated throughout a material's life cycle."

Minnesota's consumption-based greenhouse gas emissions



Materials management and climate

The way we manage materials – from production to waste management – impacts key environmental metrics like climate pollution. In 2022, 4.4 million metric tons CO2-equivalent was saved because of Minnesota's materials management decisions. Tracking environmental impacts, like greenhouse emissions, in addition to weight-based metrics, like recycling rates, highlights opportunities for more sustainable materials and consumption choices.

Statewide, materials management decisions reduced climate pollution equivalent to removing 900,000 passenger vehicles from Minnesota roads.

Increasing recycling and reuse are important but are only one part of improving materials management. The consumption-based emissions inventory (CBEI) is a method used to estimate greenhouse gas emissions associated with the everyday goods and services people buy. This approach accounts for emissions through a product or service's entire life cycle, regardless of whether those emissions were originally generated in Minnesota, including production/manufacturing, distribution, use, and disposal. Minnesota's CBEI identifies that most climate impacts are from the production and use of goods and materials, not the disposal.

Minnesota's 2030 recycling goals

Individuals and organizations play a big role in reaching our goals. We need to prevent waste, increase reuse, target large commercial waste generators, recover more organics and recyclables, and focus on creating markets for large quantities of material that is currently disposed.

Minnesota has had county-based recycling goals since 1989. Each Greater Minnesota county (outside of the seven-county Metro Area) must recycle a minimum of 35% (by weight) of their total solid waste generation. Goals for the Twin Cities metropolitan area are higher; by December 2030, counties in this area are expected to recycle 75% of the solid waste they generate. Greater Minnesota is currently exceeding its recycling goal with 40.2%. For this measure, recycling includes the reuse of materials.

45.2% statewide recycling rate
49.1% Twin Cities Metro Area
40.2% Greater Minnesota

54.1% is not recycled
Waste-to-energy 18%
Landfill 36.1%

2021 SCORE data

More efforts are needed to reuse and repair

Minnesota is one of the leaders in the country on managing waste, but the CBEI points out the importance of focusing on efforts to reduce and reuse materials. In addition to focusing on reducing climate pollution from industry and electricity generation sectors, everyday Minnesotans can mitigate climate change through individual actions. For example, increasing repair and reuse to double the useful life of Minnesotans' clothing and household furnishings and supplies would be equivalent to increasing statewide vehicle efficiency by 15%.

While Minnesota's statewide recycling rate declined in 2021, the greenhouse gas emissions from materials management also went down. Reusing materials may reduce the recycling rate when there are fewer materials to recycle, but – since greenhouse gas emissions are produced throughout a product's life cycle and are typically higher in the production/manufacturing stage — even with less recycling, increased reuse (and better reuse reporting) results in emissions reductions. Reusing materials means you can avoid the emissions associated with the production of a new material. Recycling offers greenhouse gas emission savings, but reuse offers more; less consumption would save even more greenhouse gases.

Success stories

Reuse in Minnesota is estimated to create between $3.1 and $4.7 billion in revenue per year, creating between 36,000 and 54,000 jobs per year.

Source: Reuse Minnesota

Recycling contributes over 27,000 direct jobs at Minnesota companies using recycled materials in manufacturing and generating almost $8 billion in wages.

Condition: Water and land

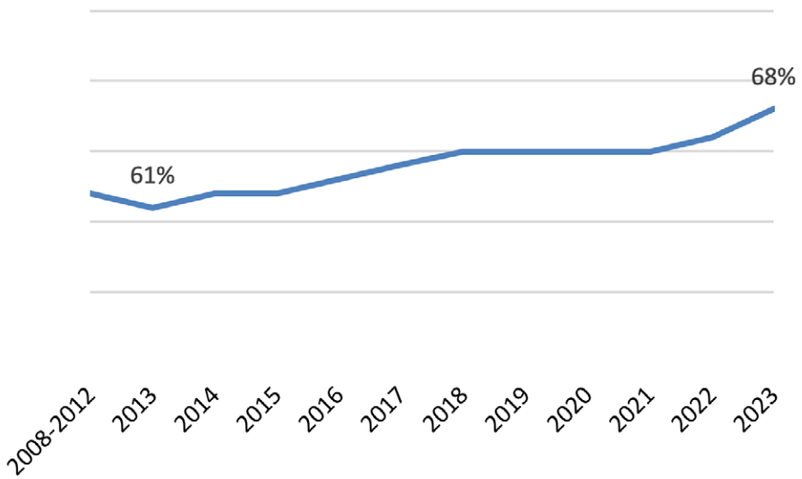
Lakes and rivers

Minnesota's lake and streams are showing improvements. While still not attaining our goals, lakes and streams are showing improving trends in water quality over the last 10-year period.

Status FAIR

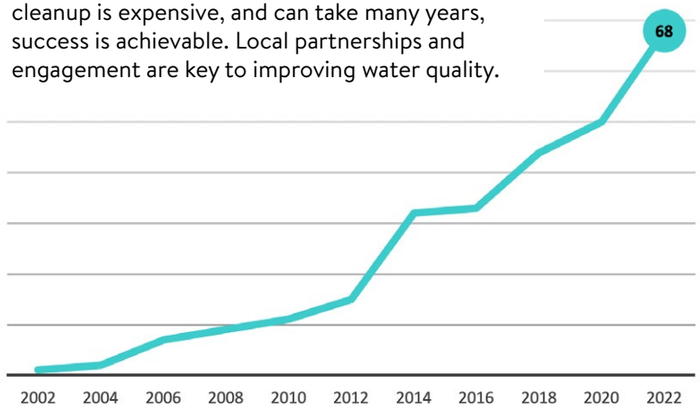
Trend

Percentage of lakes meeting water quality standards for recreation (10-year average)

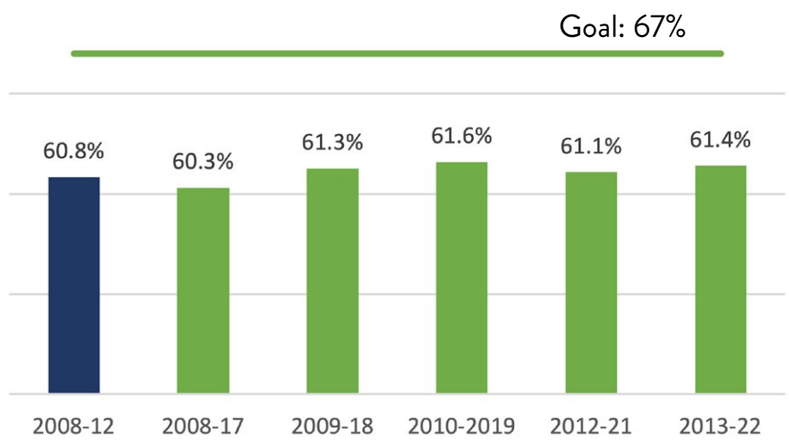


Total lakes and streams restored

Since 2002, 68 waters have been restored. While cleanup is expensive, and can take many years, success is achievable. Local partnerships and engagement are key to improving water quality.



Percentage of healthy streams based on fish population



What's affecting our lakes and streams?

Lakes are evaluated based on water quality factors that influence whether they are enjoyable for recreation such as swimming – the water clarity and amount of nutrients and algae. Excess nutrients (often tied to excess sediment) harm recreational use in lakes by leading to excess algal growth. Higher levels of phosphorus can lead to algae production, which can cause nuisance scum conditions, and the potential for toxic blooms that can sicken humans and sicken or kill pets that drink the water. High levels of nutrients can also lead to large swings in oxygen levels, which stress the fish and insect communities. The health of streams is evaluated based on whether they support a healthy fish and bug community. Excess sediment and nutrients, toxic chemicals (chloride, pesticides), degraded habitat, altered flow, and loss of stream connectivity can all contribute to losses of healthy aquatic communities.

Plans to protect our waters

Water is central to Minnesota's economy and way of life. Supported by the Clean Water Fund, Minnesota has a strong program to monitor our waters and assess how our goals are being met. As of 2022, each of Minnesota's 80 watersheds have been monitored and assessed, giving us a baseline picture of water quality statewide.

The Clean Water Fund Roadmap lays out a path towards achieving water quality goals. **For the 25-year life of the Clean Water Land and Legacy Amendment, an improvement of 8% in swimability of lakes and 7% in fishability of streams is projected.** We need to continue to protect our waters that are meeting key goals and to restore those waters that are not. Restoring impaired waters can be an expensive and time-consuming process, and so efforts to maintain and protect aquatic resources before they are degraded are preferred. All Minnesotans can do their part in protecting and restoring waters.

Some key next steps

- Reduce sediments and nutrients for lakes and streams including continued adoption of stormwater and wastewater management technologies and increased adoption of best management practices on developed land (urban, agricultural, etc.). This includes planting buffer strips along agricultural land and along private residences with shorefront.
- Agricultural lands should be managed to reduce nutrient and sediment runoff into nearby waters. In rural areas, proper upkeep of septic systems is important to prevent leaching of nutrients into surface and groundwater.
- Continued work to strengthen local shoreland ordinances and statewide buffer initiatives will benefit the waters of the state.
- Engage local communities (neighbors, upstream watershed residents) to make sure that everybody understands how their actions contribute to the downstream problem.

Condition: Water and land

Nitrate pollution

Minnesota has abundant water resources, but there are threats to our ability to ensure safe and sufficient drinking water in some parts of the state. In some areas, particularly where there is a strong connection between the land surface and the groundwater, nitrate pollution can be a significant concern.

Status FAIR

Trend

Not enough information to currently determine a statewide trend.

What is nitrate?

Nitrate is a naturally occurring compound made up of nitrogen and oxygen. It moves easily in water. Nitrate occurs naturally from decomposing organic materials like plants, and animal or human wastes. It can also come from synthetic nitrogen fertilizer. Minnesota routinely monitors for nitrate in drinking water because of the potential for adverse health effects, particularly to infants, from drinking water high in nitrate.

Where is nitrate pollution mostly found?

There are naturally occurring levels of nitrate in groundwater; however, the levels resulting from natural processes are usually quite low (<3 mg/L). Nitrate becomes a concern as levels get closer to 10 mg/L, the level set as the maximum contaminant level for public water systems under the Safe Drinking Water Act and the health risk limit for Minnesota's groundwater.

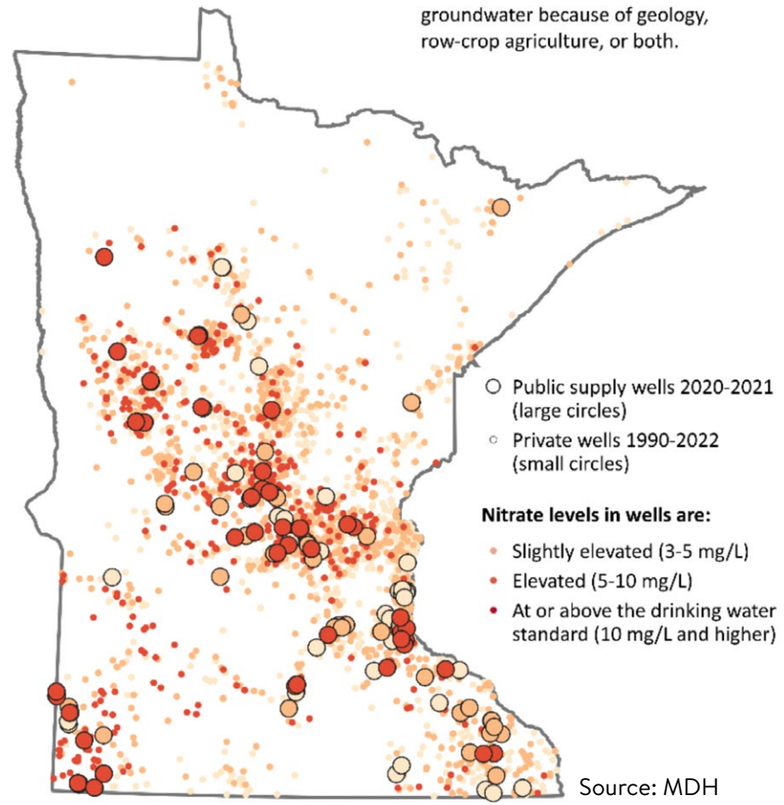
Nitrate pollution reaching levels above 10 mg/L is more commonly found in aquifers that are vulnerable to contamination from the land surface, this is often related to geology and soil type – such as shallow sandy and bedrock aquifers – and with land uses or sources that contribute nitrate pollution to the ecosystem. Septic systems, fertilizers, manure, and sanitary landfills are examples of sources of nitrate pollution.

Drinking water wells in areas with heavy row crop agriculture and vulnerable groundwater, as well as very shallow wells and wells that do not comply with the Minnesota Well Construction Code, have an increased risk of higher nitrate levels.

Nitrate detected in drinking water wells

(Prior to treatment)

Elevated nitrate levels are a concern across the state, and some areas - the areas with many dots - are more vulnerable to nitrate contamination in groundwater because of geology, row-crop agriculture, or both.



Source: MDH

- Nitrate is one of the groundwater contaminants that most often exceeds the drinking water standard set to protect human health.
- Aquifers in certain areas of the state are more vulnerable to high nitrate levels in both public water supply and private wells.

Concerns

- Elevated levels of nitrate are an acute concern for babies fed water or formula made with tap water high in nitrate. Consuming too much nitrate can affect how blood carries oxygen and can cause methemoglobinemia (known as blue baby syndrome).
- A growing body of literature indicates potential associations between nitrate/nitrite exposure and other health effects such as increased heart rate, nausea, headaches, and abdominal cramps. Some studies also suggest an increased risk of cancer, especially gastric cancer, associated with dietary nitrate/nitrite exposure, but there is not yet scientific consensus on this question.

Monitoring

Most of Minnesota gets their drinking water from groundwater. Public water supply wells and private wells have different protections and are monitored differently.

Private wells

The Minnesota Department of Agriculture's (MDA) manages private well monitoring networks in southeast and central Minnesota to determine nitrate concentrations and trends in these two vulnerable areas. MDA also designed a Township Testing Program in areas more vulnerable to nitrate in groundwater to determine nitrate conditions in private wells. From 2013-2019, MDA conducted a significant sampling effort that resulted in nearly 33,000 private wells voluntarily being tested for nitrate in 344 townships. Those results indicated:

In areas where groundwater is vulnerable to high nitrate levels:

- 41% of townships tested (143) had 10% or more of private wells with levels exceeding the nitrate Health Risk Limit of 10 mg/L.
- Statewide, 9.1% of private wells (2,925) overall have levels exceeding the nitrate Health Risk Limit. These initial results reflect nitrate concentrations in private well drinking water regardless of nitrogen sources, or well construction.
- These values are highly variable by individual townships.
- Statewide, 77% of private wells tested have low levels of nitrate (< 3 mg/L).

Test your water.

The Minnesota Department of Health recommends that water from a private well be tested for:

Coliform bacteria every year.

Nitrate every couple years.

Arsenic and lead at least once.

Manganese before a baby drinks it.

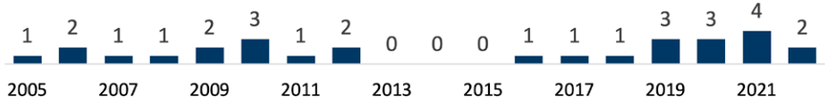
Public wells

Minnesota Department of Health (MDH) works with public water systems to test for nitrate in drinking water at least annually. Public water systems are subject to the Safe Drinking Water Act. The U.S. Environmental Protection Agency sets performance goals for Safe Drinking Water Act compliance, including a goal that 95% of public water systems meet health-based standards. Minnesota consistently exceeds this performance goal and aims to have a decreasing trend of nitrate exceedances over time.

The bar graphs shows the number of community and noncommunity public water systems that have exceeded the maximum contaminant level for nitrate. There are approximately 1,000 community water systems and 6,000 noncommunity water systems in Minnesota. In 2022, the nitrate standard was met by 99.8% of community water systems (962 out of 964) and 99.8% of noncommunity water systems (5,674 out of 5,685).

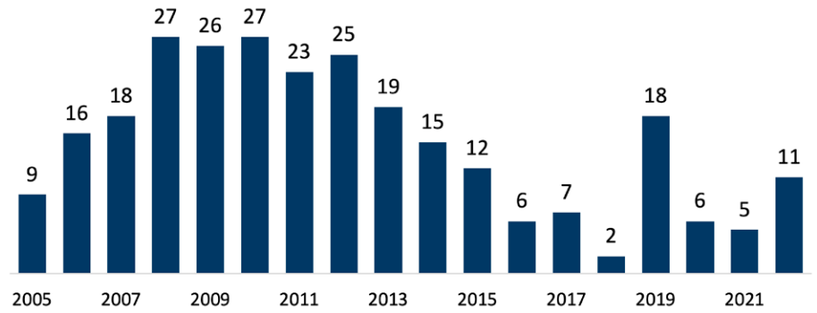
Department of Agriculture staff sampling a private well.

Nitrate violations, community water systems



Community water systems provide water to the public in their primary living space —where people live and sleep.

Nitrate violations, non-community water systems



Non-community water systems provide water to the public in places other than their homes, where people work, gather and play.

Managing nitrate

Public health goals: Our public health goal is for everyone, everywhere in Minnesota to have equitable access to safe and sufficient drinking water, by having zero nitrate exceedances in community and noncommunity water systems and working to ensure private wells are tested and actions are taken to address nitrate. However, nitrate levels in source water can be affected by factors outside of public water systems' and private well users' control, so it is beneficial to have achievable performance benchmarks to mark progress and trends over time.

Key actions: Minnesota has – and needs to continue to – take big steps to reduce nitrate getting into groundwater and impacting both public water supply and private drinking water wells. Key actions include those to increase fertilizer efficiency and decrease potential losses to the environment and leaching of nitrate into groundwater. Also key, are the implementation of nitrogen fertilizer best management practices (BMPs), nutrient & manure management, and implementation of practices protective of groundwater like continuous cover, low nitrogen input crops, or alternative cropping systems in targeted high-risk areas.

Implementing the Minnesota Nitrogen Fertilizer Management Plan (NFMP) and Groundwater Protection Rule

The NFMP and first in the nation Groundwater Protection Rule provide voluntary and regulatory actions to minimize the impact of nitrogen fertilizer on groundwater. These actions will help protect both private and public water supply wells. The plan relies on local teams to advise on appropriate response activities for the area and to support implementation of best practices. These teams play a key role in developing and implementing locally viable solutions to address elevated nitrate in the public water supply well(s) or local area's private wells.

- **Private wells**
  Testing results from the township testing program have identified townships for implementation of voluntary actions in the NFMP, potentially including monitoring and a locally appropriate set of nitrogen fertilizer BMPS.

- **Community Water Systems**
  These systems are addressed under the Groundwater Protection Rule. When community water systems have nitrate concentrations at or above 5.4 mg/L, nitrogen fertilizer best management practices are promoted, and these practices can be required if not adopted voluntarily.

- **Noncommunity water systems**
  MDH monitors trends in nitrate levels over time. When nitrate testing results for noncommunity water systems begin to show increasing trends over time, but are still below the federal standard, MDH staff discuss corrective steps and potential proactive actions with the system operators.

Source water and well protection

Public Source water protection

Some public water systems have surrounding surface and subsurface areas (known as the Drinking Water Supply Management Areas) that are geologically vulnerable with agricultural land uses, which can make their drinking water supply wells susceptible to nitrate contamination. MDH supports these systems through source water protection planning. MDH helps systems develop and implement plans with site-specific, collaborative activities to address drinking water threats, including sources of nitrate pollution. MDH has also established financial and technical assistance programs with partners that public water systems can leverage to address nitrate contamination, such as Source Water Protection Grants.

Special focus on small and noncommunity systems

- Many noncommunity water systems are small businesses or organizations that may be limited in their technical and financial capacities to take on water supply projects.

- Source Water Protection Grants, made possible through the Clean Water Fund, have helped noncommunity water systems resolve nitrate issues by constructing new wells, installing treatment systems, and addressing potential sources of contamination.

- Source Water Protection Grants allow them to take actions that otherwise may not easily or quickly happen, resulting in improved water quality and protection for consumers. Since their inception (2010), grants have addressed numerous critical water issues including nitrate contamination, and resolved instances where the drinking water standards for nitrate were not met.

Private well information and protection

- Private wells must be tested for nitrate when they are first constructed; after construction, testing is largely voluntary.

- Actions need to be taken to prevent contamination in private wells, including ensuring that wells are properly located to prevent contamination from a point source and that they meet well code.

The Minnesota Agricultural Water Quality Certification Program

This voluntary program is an opportunity for farmers and agricultural landowners to take the lead in implementing conservation practices that protect groundwater and reduce nutrient and sediment runoff into nearby waters. Since 2014, the program has worked with over 1,415 farmers to implement conservation practices and commit to sustainability. The program has enrolled over a million acres, saved 282 million lbs. of soil per year, and reduced nitrogen losses on farms up to 49%. Certified farms have also been verified to have consistently higher net income compared to non-certified farms. Executive Order 19-12 mandates that BWSR, DNR, MDA and MPCA are to incorporate and promote this program through other watershed approaches and programs.

Condition: Water and land

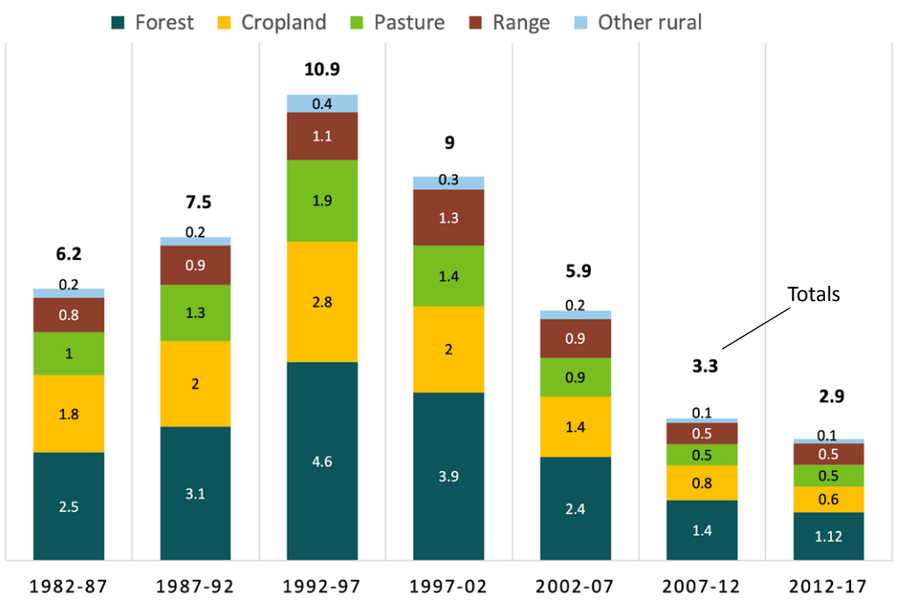
Land conversion

As our population and economy grows, we need room for housing, businesses, recreation, shopping, transportation, government services, and more. Since 2002, the rate at which farmland, forest, wetlands, and wildlife habitat is converted to urban and suburban development has decreased.

Status FAIR

Trend

Rural sources of newly developed land (millions of acres)



The effects of land loss

Problems can arise when land is converted from one land use type to another. For example, loss of forest land can reduce carbon sequestration; loss of farmland will often lead to the transition of other land cover types (marginal land or Conservation Reserve Program land) into active farmland; loss of wetlands to agriculture or urbanization can lead to water quantity and quality impacts to surface water systems; and alteration of natural lands by power line and pipeline expansion can lead to natural habitat disruption or loss. We are focusing our efforts to reduce the amount of land conversion and increase preservation and protection of the most affected land cover types from conversion.

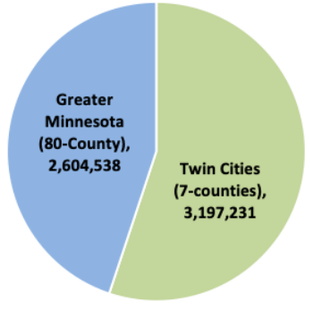
Population and land use

Meeting the needs of a growing population is one of the strongest drivers for land conversion. From 2010 to the present, Minnesota's population grew by 7.6%, from about 5.3 to over 5.7 million. By 2050, the state's population is projected to be almost 6.8 million.

As our population and economy grows, we need room for housing, businesses, recreation, shopping, transportation, government services, and more. Additionally, the state is striving to achieve the Minnesota Renewable Energy Standard that includes a shift toward solar and wind as renewable sources of electricity. In the process, we convert farm, forested, and natural lands, as well as other open areas, to developed lands. By doing so, we lose irreplaceable farmland, natural resources, and risk damaging ecosystems.

Development patterns across the state have been changing. The amount of land per new person and per new household has fallen, while the population continues to grow. Reuse and cleanup of existing contaminated sites, reuse of existing buildings, smaller residential lots, and more apartments and other multi-family dwellings have contributed to this more efficient land use, and reduced the rate we impact our natural areas and farmland.

The benefits of efficient land use include improved accessibility, less costly utilities, public services, and transportation, open space preservation, and less pollution and impervious surfaces (such as pavement).



2022 Minnesota total population

Successful land conversion

The Metropolitan Regional Parks and Trails System offers large-scale, natural resource-based recreation opportunities to all Minnesotans. With 56 regional park and park reserves totaling more than 54,000 acres, over 400 miles of interconnected regional trails, and 8 special recreation features, the regional system provides a wealth of opportunities for recreation as well as protects significant green space and wildlife habitat.

The Metropolitan Council's Park Acquisition Opportunity Fund grant program provides funding for the ten Regional Park Implementing Agencies to acquire park and trail inholdings that are part of the park or trail's long-range plan. Many of the parcels acquired have ecological significance, from prairies and forests to wetlands and shoreline protection. Other parcels may be acquired as trail easements to build out the regional trail system. Funding for the Park Acquisition Opportunity Fund comes from the Parks and Trails Legacy Fund, the Environment and Natural Resources Trust Fund, and the Metropolitan Council.

A recent acquisition for the Minneapolis Park and Recreation Board added land to the Minneapolis Chain of Lakes Regional Park, protecting a view of Lake Bde Maka Ska.

Condition: Water and land

Water sustainability

Minnesota is at risk of depleting its water supplies in several areas of the state. Sufficient water supply and sustainable water management are vital to our public health, economy, and ecosystems. Despite increases in water use in recent drought years, overall water use per person is decreasing.

Status GOOD

Trend

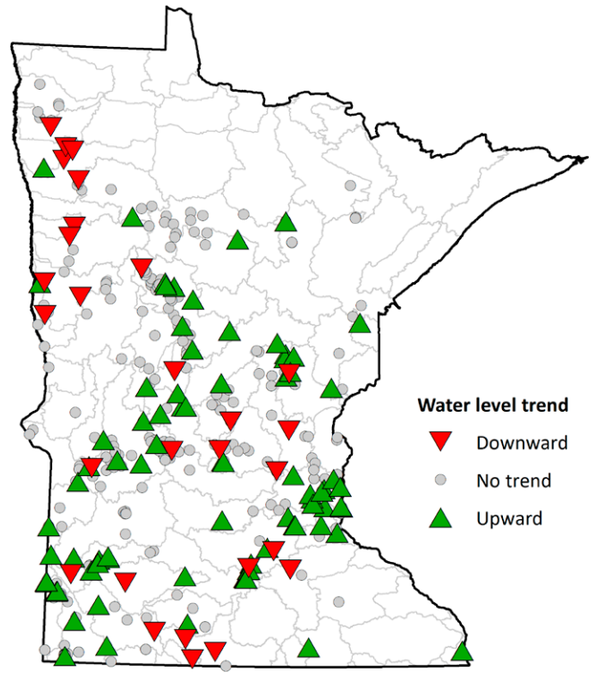
Sustainable water use

Water is our most precious resource, but it's often taken for granted in the "Land of 10,000 Lakes". Although we see a lot of water on the surface, much of what we use in our homes, industries, and agriculture is from groundwater.

Minnesota appears to have a good supply of water, but increasing demand from domestic, agricultural, and industrial users can strain water resources.

When it is dry, people use more water. Drought conditions increase water use that can result in well interferences, water use conflicts, or impacts to aquatic ecology. In some areas, groundwater use has caused aquifer water levels to decline. If this overuse continues, groundwater may not be available as needed in the future.

The Department of Natural Resources is assessing the impacts of groundwater use in areas with historical concerns. They are collaborating with large water users and conducting long-term planning to ensure the sustainability of aquifer resources.



Groundwater level trends

Statewide, only 7% of the wells analyzed show a downward trend for the period between 2003-2022. This is an improvement over the number of wells exhibiting downward trends between 1997-2016 (19%). Water levels in some western Minnesota wells have highlighted local downward trends, while groundwater levels in the metro area illustrated an upward trend. Hydrologists are actively investigating potential causes for the downward trends documented in the parts of the state.

About 50% of Minnesota's rivers have been altered.

About 50% of historic wetlands have been drained.

Less storage means less resilience to shifts in precipitation.

Learning more about our groundwater

Over the past 10 years, we've received new funding to continue expanding the state's monitoring well system to learn more about our groundwater.

The future of sustainable water management

Minnesota has a rich abundance of lakes and rivers, but these surface waters are impacted by our growing needs. By accommodating land use such as our expanding network of roads, cities, industry, and agriculture, we have decreased the amount of water stored naturally on the landscape and the connectivity of surface waters. We will need to manage our connected surface and groundwater resources to ensure that water can cycle sustainably, replenishing water needed for our uses while supporting ecological health and resilience into the future.

Without places to hold water, Minnesota is more vulnerable to both extreme rainfall and extreme drought. During heavy rainfall, there is more water running off and reaching the stream, raising flood water levels. During a drought, there is less water stored in places that would slowly replenish our surface and groundwater. Healthy rivers and lakes have floodplains, shorelines and channels that connect important habitats and protect our communities from extremes in rainfall.

Action: Water and land

Public land protection and management

The State of Minnesota manages public lands to maintain habitat and water quality, protect the state's ecological diversity, provide recreational opportunities, promote sustainable economic development.

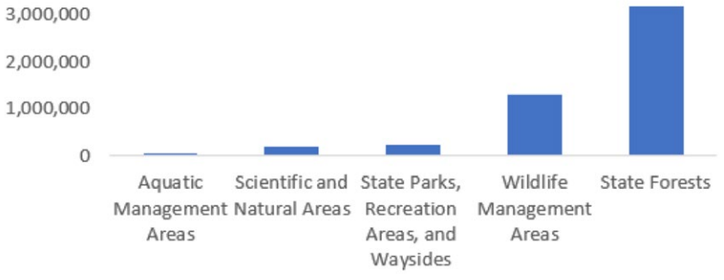
Status GOOD

Trend

Maintaining our public lands

Minnesota acquires and manages many types of public lands to address issues stemming from trends in land use change, spread of invasive species, pollution, and a changing climate to sustain the places and experiences we value. We use a series of six goals to evaluate and prioritize acquisition projects that maintain habitat and water quality, protect the state's ecological diversity, provide recreational opportunities, and promote sustainable economic development. The intent is to prioritize acquisitions that meet multiple Strategic Land Asset Management (SLAM) goals, to leverage and magnify the scope and impact of land acquisition efforts overall.

Acres of public land by DNR management type (2022)



Land in Minnesota by ownership type

11%	5.6 million acres are state-owned, DNR managed lands
7%	3.8 million acres are federally owned lands
6%	2.8 million acres are state-owned, county-administered tax-forfeited lands
2%	0.7 million acres are Tribal owned lands
1%	0.3 million acres are county owned lands
70%	37.8 million is privately owned

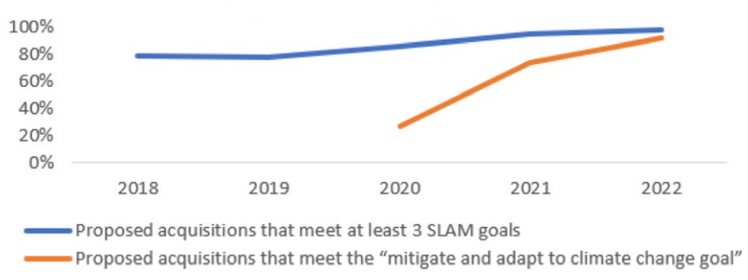
Strategic land asset management goals

- Increase close-to-home outdoor recreation opportunities
- Protect significant and/or rare natural resources
- Protect and restore water resources
- Mitigate and adapt to climate change
- Expand access to existing land holdings
- Consolidate land ownership, creating larger, contiguous blocks

Goal: At least 80% of proposed land acquisitions meet three or more of these goals.

Land aquisitions meeting SLAM goals

(SLAM = Strategic Land Asset Management)



Climate change goals

In 2022, 92% of proposed land acquisitions met the state's goal, up from 74% in the previous year. Acquisitions meet this goal by ensuring lands maintain or increase carbon storage, carbon sequestration or landscape resiliency; create larger blocks of habitat; improve riparian or terrestrial connectivity, or protect specific climate resilient, high biodiversity areas.

Impacts to the land and efforts to protect it

Minnesota is known for its abundant water, but this precious resource is not unlimited and increasing demands for use, as well as water quality degradation, are impacting the long-term sustainability of our water. Invasive species are spreading, threatening native species, and adversely affecting both recreation and natural resource dependent businesses. Prairie, grassland, and wetland habitats are declining, negatively impacting native species and water resources.

Strategic Land Asset Management (SLAM) goals are used to ensure that land acquisitions contribute toward protecting water quality, reducing the spread of invasive species, and protecting prairie, grasslands, and wetland habitats to address the increasing pressures on our natural lands. Our goal is to prioritize acquisitions that meet most of our SLAM goals, increasing the impact of our land conservation activity.

Current trends (past five years)

Stable Statewide, our land portfolio has changed by less than one tenth of a percent.

Aquiring land On average, the state acquires about 9,000 acres of land per year, statewide.

69% of these were adjacent to existing DNR complexes, which increases land access, management efficiency, and conservation impact.

65% of these occurred in counties where 5% or less of the land is publicly owned.

Selling On average, the state sells 508 acres of land per year.

We've exchanged 773 acres out of state ownership for 734 acres received into state ownership (land exchanges are value for value, within statutory parameters, not acre for acre).

MINNESOTA

ENVIRONMENTAL QUALITY BOARD

www.eqb.state.mn.us