Minnesota Pollution Control Agency

Annual Pollution Report to the Legislature

A summary of Minnesota's air emissions and water discharges

April 2011

List of Tables

Table 1: Minnesota Air Pollution Emission Estimates, 2005-2009 2
Table 2: Minnesota Water Pollution Discharge Estimates from Major Point Sources, 2005-2009 .. 4
Table 3: Major Sources of $PM_{2.5}$ Components 12
Table 4: 2005 Minnesota Air Toxics Emissions Inventory Statewide Summary 35

List of Figures

2010 Air Quality Index Days by Category and Reporting Region 9
Sources of Direct Fine Particulate ($PM_{2.5}$) Emissions in Minnesota, 2005 11
Sources of Direct PM_{10} Emissions in Minnesota, 2005 and 2008 13
PM_{10} Point-Source Emission Trends by Sector in Minnesota, 2005-2009 14
Sources of Ammonia Emissions in Minnesota, 2005 15
Sources of Sulfur Dioxide Emissions in Minnesota, 2005 and 2009 16
Sulfur Dioxide Point-Source Emission Trends by Sector in Minnesota, 2005-2009 17
Sources of Nitrogen Oxide Emissions in Minnesota, 2005 and 2009 19
Nitrogen Oxide Point-Source Emission Trends by Sector in Minnesota, 2005-2009 21
Sources of Volatile Organic Compound Emissions in Minnesota, 2005 and 2009 23
Volatile Organic Compound Point-Source Emission Trends by Sector in Minnesota, 2005-2009 ... 24
Sources of Carbon Monoxide Emissions in Minnesota, 2005 and 2009 25
Carbon Monoxide Point-Source Emission Trends by Sector in Minnesota, 2005-2009 26
Sources of Lead Emissions in Minnesota, 2005 and 2009 27
Lead Point-Source Emission Trends by Sector in Minnesota, 2005-2009 28
Actual and Projected Minnesota Mercury Emissions, 2005-2025 30
Contribution of Six Greenhouse Gases to Minnesota Warming Potential, 2008 31
Sources of Greenhouse Gas Emissions in Minnesota, 2008 32
Trends in Greenhouse Gas Emissions in Minnesota by Economic Sectors, 1970-2008 (estimates include net imported electricity) 33
Contribution of Principal Source Categories to 2005 Air Toxics Emissions in Minnesota 39
Contribution of Major Categories to 2005 Point Source Air Toxics Emissions in Minnesota 39
Contribution of Major Categories to 2005 Nonpoint Source Air Toxics Emissions in Minnesota ... 40

some overlap between the Minnesota Air Toxics Emission Inventory and the estimates for VOCs and particulate matter because many air toxics are components of these broader categories. The most recent inventory of air toxics emissions is from 2005.

Table 1 lists the total statewide emissions of the major air pollutants from 2005 to 2009. The percent change from 2008 to 2009 is given in the final column. It is possible to look at emission trends between these years; however, it is important not to place undue emphasis on a yearly change since emission estimates fluctuate as a result of changes and improvements in the inventory and other factors such as the economy and weather.

Table 1: Minnesota Air Pollution Emission Estimates, 2005-2009*
(thousand tons)

Pollutant	2005	2006	2007	2008	2009	2008-2009 % Change
Greenhouse gases**	161,300	160,000	161,800	159,400		-1.5%
Particulate matter (PM_{10})***	778	776	777	776	769	-0.9%
Sulfur dioxide (SO_2)	159	148	138	129	101	-28%
Nitrogen oxides (NO_x)	422	409	408	391	353	-11%
Volatile organic compounds (VOCs)	349	347	347	345	342	-0.9%
Carbon monoxide (CO)	1,771	1,771	1,773	1,771	1,769	-0.1%
Total Criteria Pollutants (not including CO_2)	3,480	3,451	3,443	3,413	3,333	-2.4%

*2005 mobile and nonpoint emission estimates were used in the 2005-2009 emission estimates. The only changes are from point sources. 2008 emission estimates should be available for the 2012 report.
**Greenhouse gas emission estimates include net imported electricity. Data is not available for 2009, so percent change is for 2007-2008.
***PM_{10} emissions represent only primary formation; secondary formation is not included.

The biggest changes in emission estimates between 2008 and 2009 were the 28 percent decrease in SO_2 and the 11 percent decrease in NO_x. These decreases were mainly due to emissions reductions in the electric utilities and mining sectors.

Xcel Energy's Allen S. King coal-fired power plant in Oak Park Heights was renovated with state-of-the-art pollution controls while St. Paul's High Bridge power plant and Minneapolis' Riverside power plant were converted from coal to cleaner-burning natural gas. Minnesota Power also installed modern air pollution controls at its Boswell coal-fired power plant in Cohasset in 2009.

The Riverside plant completed its conversion in 2009 resulting in a decrease in emissions of more than 10,000 tons of SO_2 and nearly 10,000 tons of NO_x. The Boswell plant reduced its emissions by 8,000 tons of SO_2 and more than 4,000 tons of NO_x due to decreased burning of coal during renovation and air pollution control modernization. In addition, Xcel's Sherburne facility decreased its NO_x emissions by nearly 4,000 tons due to improved pollution control equipment. Additional reductions came from facilities such as Minnesota Power's Taconite Harbor power plant and Rochester Public Utilities Silver Lake burning less coal in 2009.

Mining emissions were also significantly lower in 2009. Mining emissions vary annually depending on the demand for taconite pellets. There was a significant reduction in taconite production in 2009 at many

Improvements intended to increase biological nutrient removal at wastewater treatment plants across the state are beginning to have an effect in improving the overall quality of discharges to Minnesota's surface waters. The general trend in total loading of all pollutants examined has been downward during the five most recent years of record, 2005-2009. This is encouraging for the status of Minnesota's surface waters.

As a specific example, phosphorus data at the Metropolitan Council Environmental Services (MCES) Metropolitan Wastewater Treatment Facility, the largest treatment plant in Minnesota, show that biological phosphorus removal has significantly improved the plant's overall performance. Due to the large volume of waste treated by the MCES Metropolitan Wastewater Treatment Facility, improvements like this have contributed to verifiable reductions in reported water pollutant loadings over the past several years. During the period 2005-2009, phosphorus loading from this facility was reduced by 57 percent and total loading was reduced by six percent.

In addition to pollutant loads, the volume of flow through a wastewater treatment plant is also important in assessing statewide data. For example, in 2009 the MCES Metropolitan Wastewater Treatment Facility contributed nearly 45 percent of the total load of the five parameters examined as compared with major industrial and other major municipal dischargers. However, when relative contributions to flow are examined, the MCES Metropolitan Wastewater Treatment Facility contributed only about 20 percent of the total.

Point source contributions of nitrate and phosphorus to waters of the state are still small in many watersheds compared to nonpoint contributions of these pollutants from sources such as agriculture and urban runoff. Point sources tend to have the greatest impact on receiving waters during periods of low precipitation and stream flow, while nonpoint sources are most significant during periods of high precipitation and stream flow. However, it is difficult to measure directly the effects of nonpoint pollution on Minnesota's lakes, rivers and groundwater.