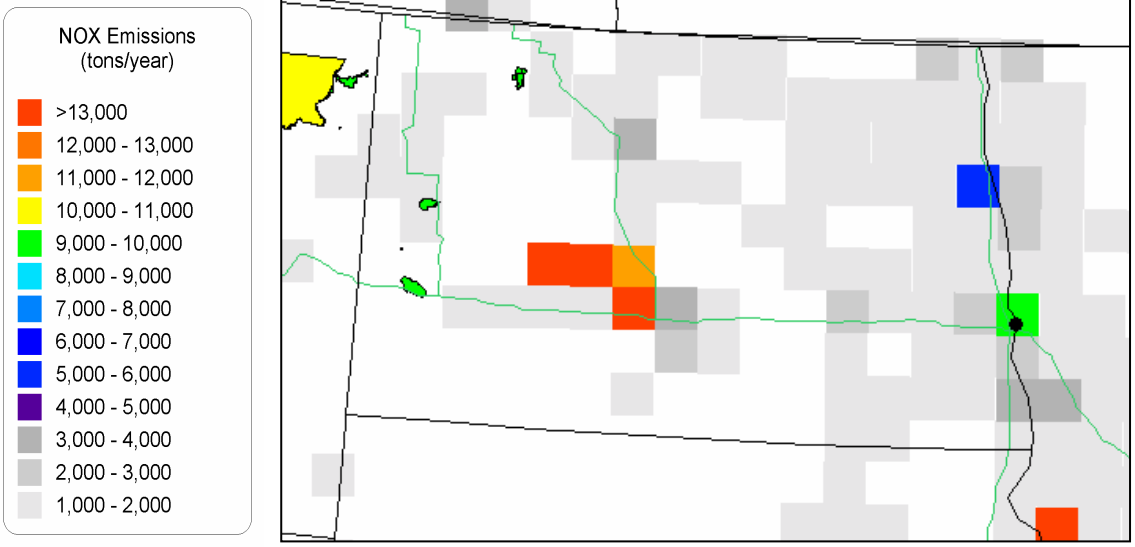
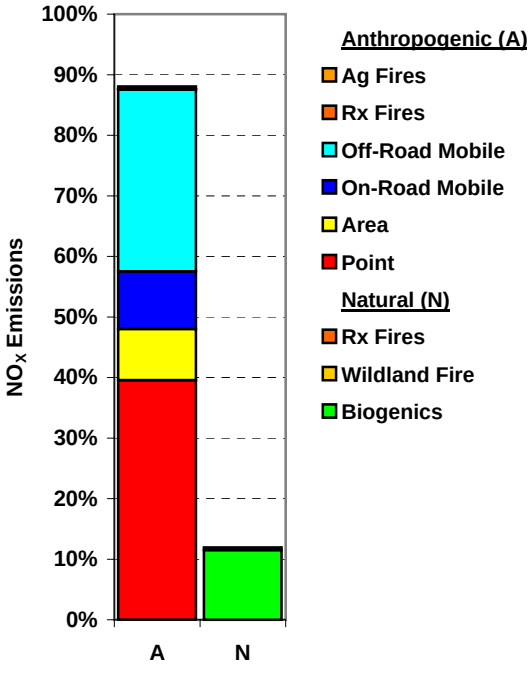
North Dakota NO_X Emissions
WRAP Interim 2002 Inventory



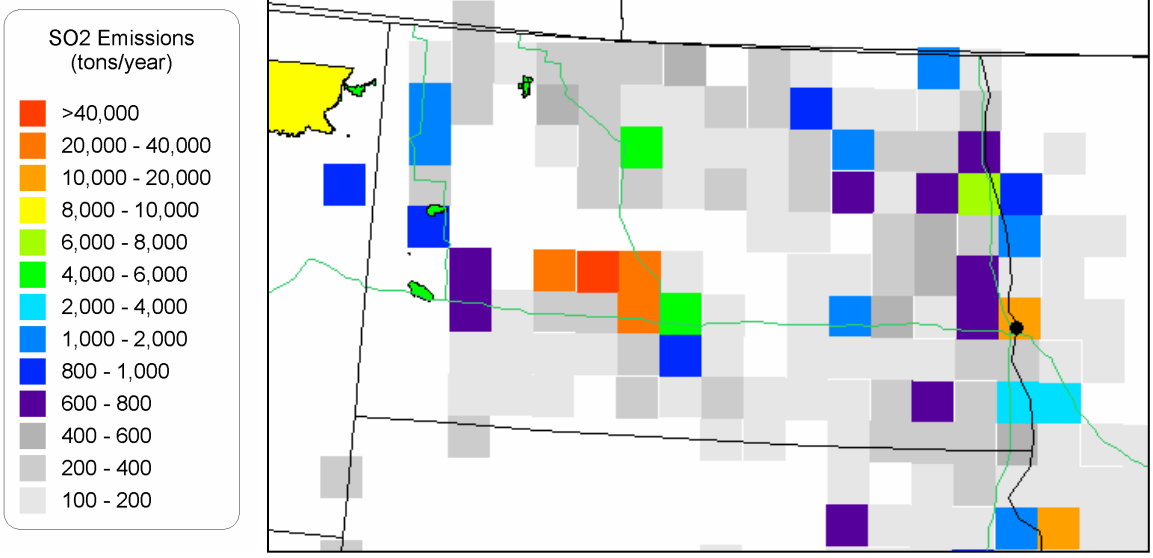
Emissions from all available source categories are indicated according to magnitude in 36x36km squares. Class I Areas are indicated in green, dotted lines indicate interstate highways and black dots indicate major cities.

Nitrogen oxides (NO_X) form when fuel is burned at high temperatures. In North Dakota, 2002 emissions of NO_X were dominated by mobile sources (on-road and off-road) and point sources (industrial, commercial, and residential sources that burn fuel).

NO_X emissions are highly reactive and can form nitrate compounds (e.g. NH_4NO_3). These compounds can block the transmission of light, contributing to visibility reduction on a regional scale in our Class I Areas.



North Dakota SO_2 Emissions
WRAP Interim 2002 Inventory



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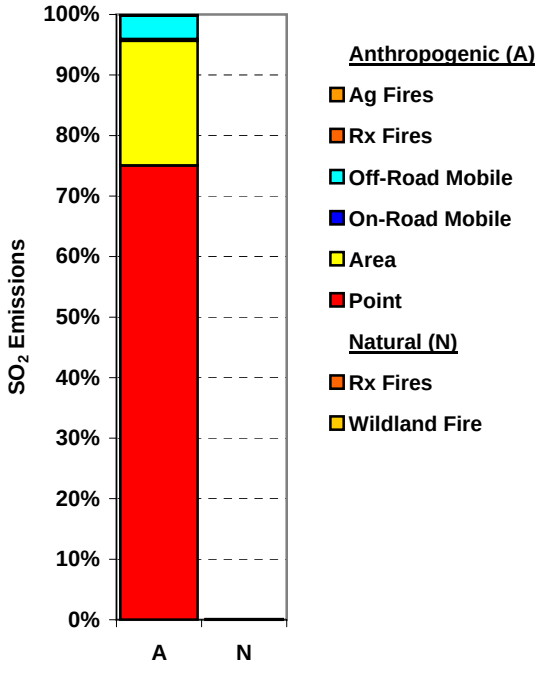
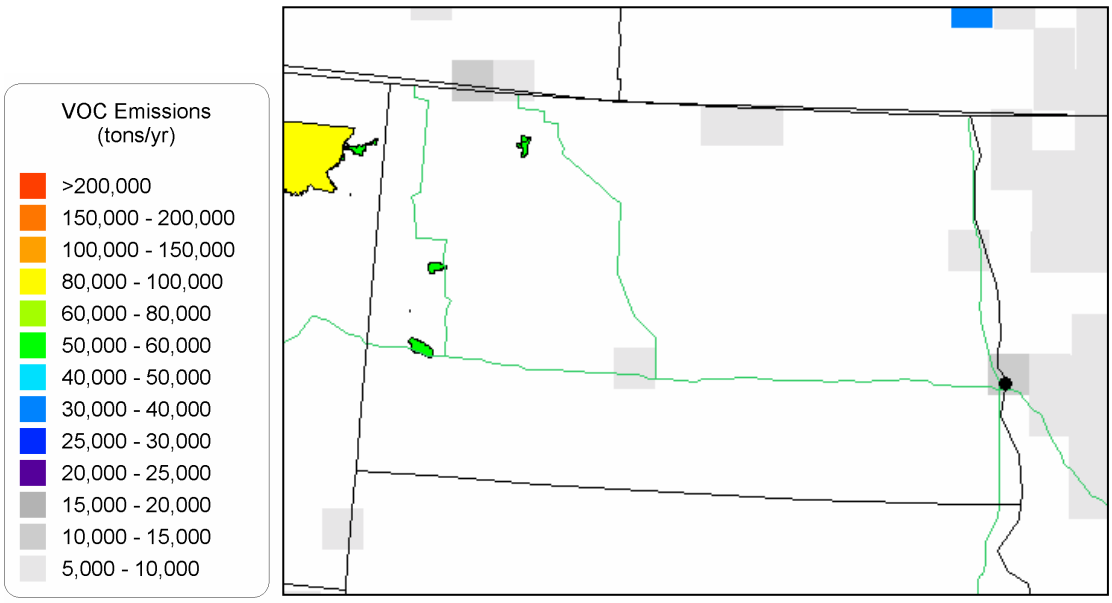
Sulfur oxide gases (SOx) are formed when sulfur containing fuels, such as oil or coal, are burned, when gasoline is extracted from oil or when metals are extracted from ore. In North Dakota, 2002 emissions of SO_2 were dominated by point sources.

SO_2 dissolves in water vapor to form acid, and contributes to the formation of sulfate compounds (e.g. $(NH_4)_2SO_4$). These compounds can block the transmission of light, contributing to visibility reduction on a regional scale in our Class I Areas.



North Dakota VOC Emissions
WRAP Interim 2002 Inventory



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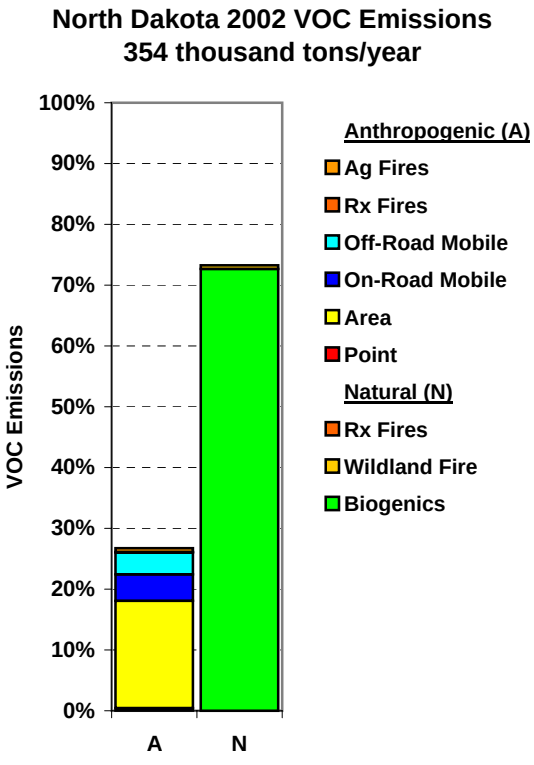
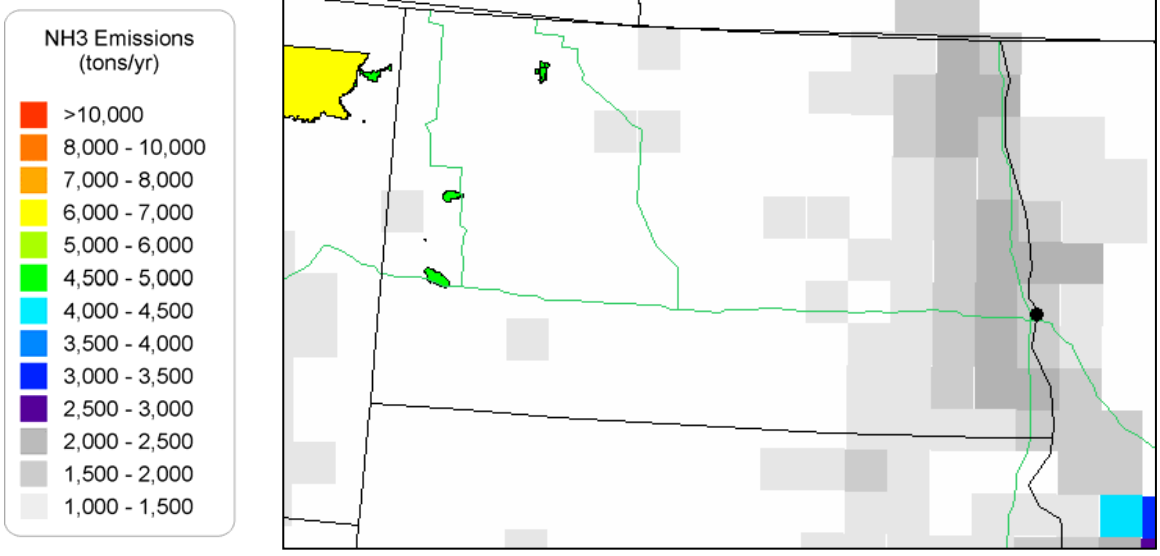
Volatile organic compounds (VOCs) are released predominantly from plants (biogenics). VOCs are also released from burning fuel, such as gasoline, wood, coal, or natural gas, and from products such as solvents, paints and glues.

VOCs in the air react with oxides of nitrogen and sunlight to form ozone, which acts as a catalyst for particulate formation. VOCs may also condense to form particulate organic matter. These particulates can block the transmission of light, contributing to visibility reduction on a regional scale in our Class I Areas.



North Dakota NH_3 Emissions
WRAP Interim 2002 Inventory



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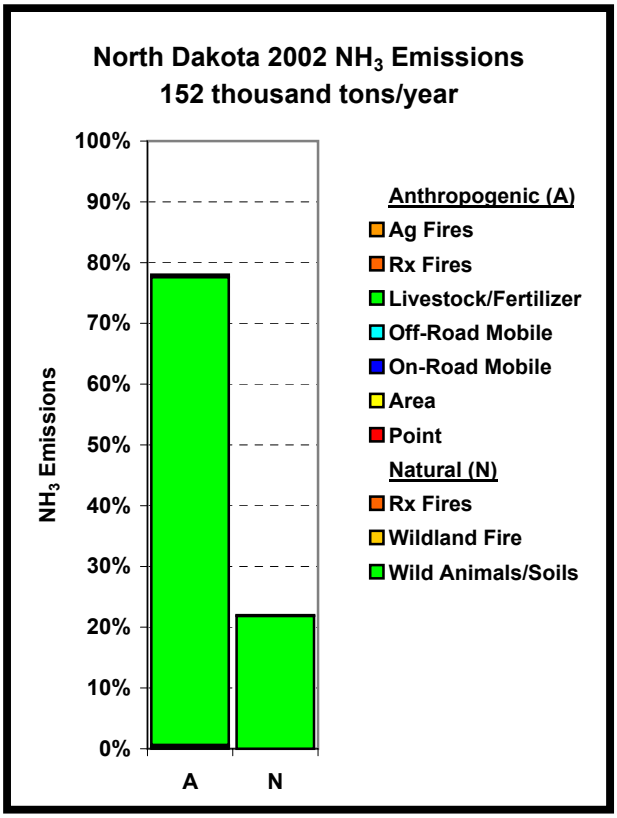
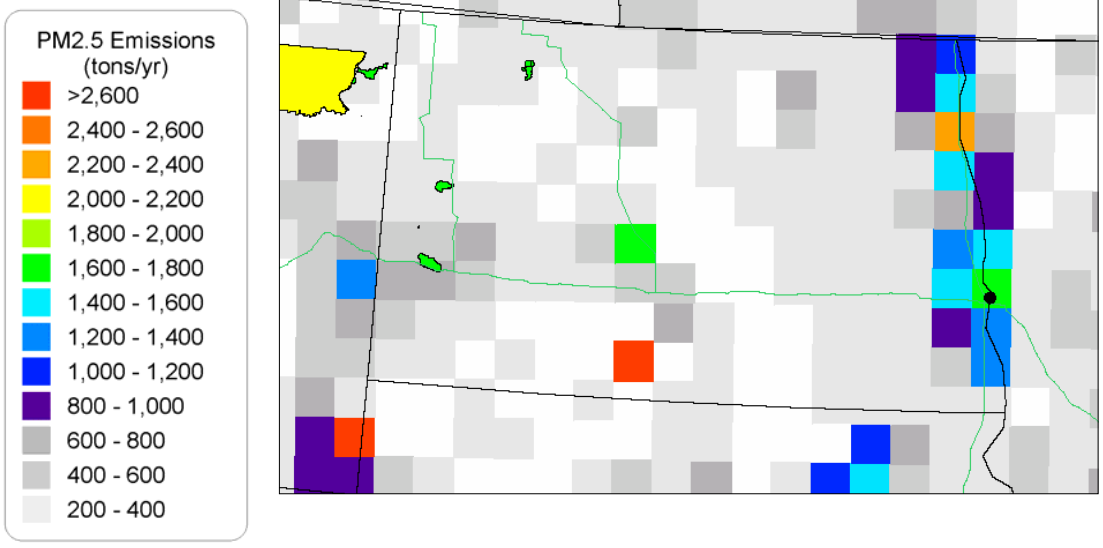
Ammonia (NH_3) is a naturally occurring, colorless gas found in the atmosphere, emitted from livestock or as a result of the breakdown of organic waste. It is also found in industrial activities; mainly the production of fertilizer.

NH_3 can neutralize sulfate aerosols to form ammonium sulfate ($(NH_4)_2SO_4$). Depending on temperature and relative humidity, an excess of NH3 can react with NO_x emissions to form ammonium nitrate (NH_4NO_3) aerosols. These compounds can block the transmission of light, contributing to visibility reduction on a regional scale in our Class I Areas.



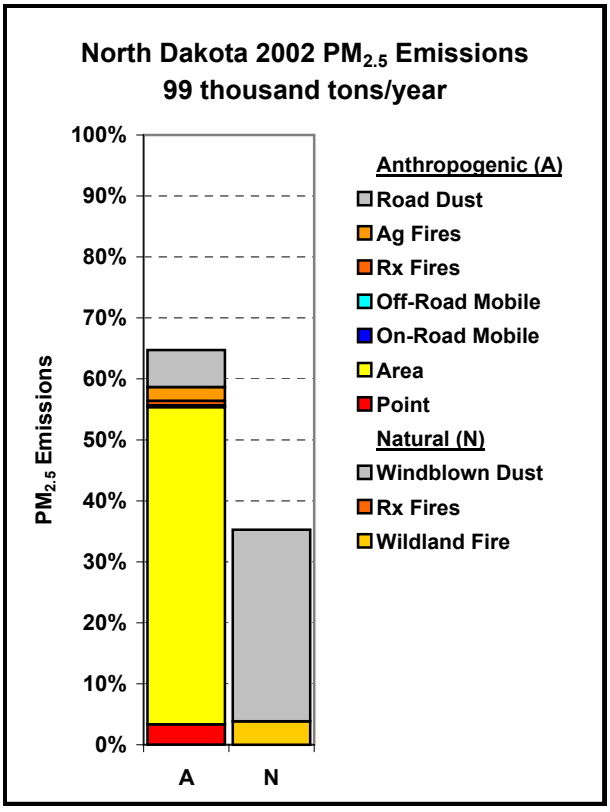
North Dakota $PM_{2.5}$ Emissions
WRAP Interim 2002 Inventory



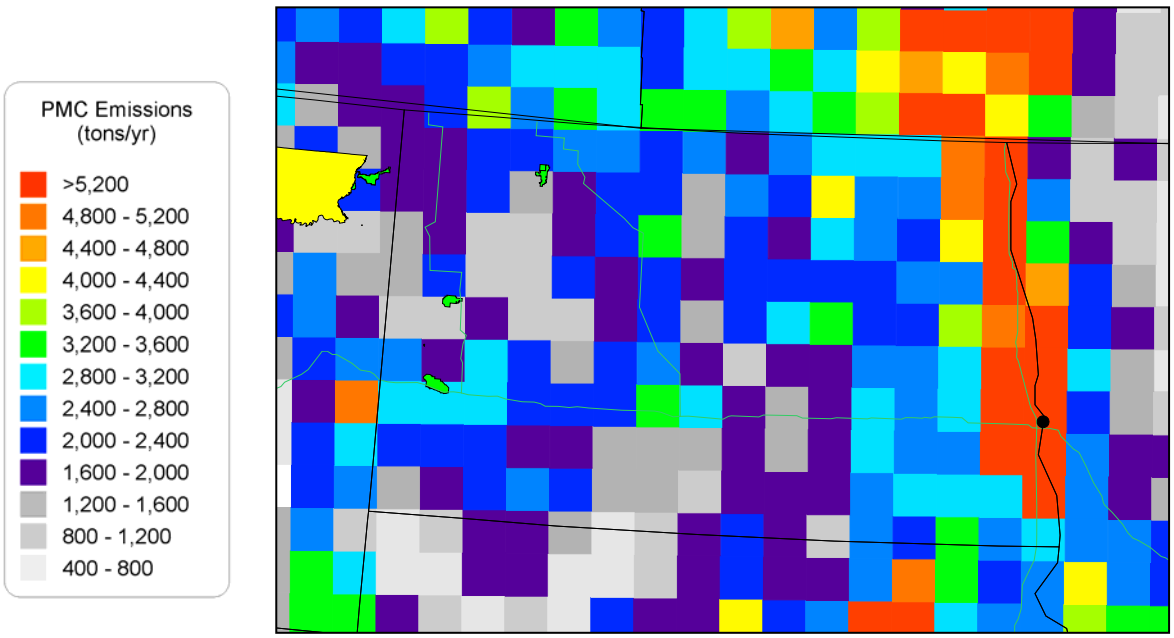
Emissions from all available source categories are indicated according to magnitude in 36x36km squares. Class I Areas are indicated in green, dotted lines indicate interstate highways and black dots indicate major cities.

Aerosols with diameters less than 2.5 microns are referred to as $PM_{2.5}$ or fine particulate matter. Sources of $PM_{2.5}$ include combustion activities or mechanical grinding and soil material.

Fine particulate matter can remain suspended in the atmosphere for long periods of time and travel long distances. This makes $PM_{2.5}$ a major source of haze that reduces visibility on a regional scale in our Class I Areas.



North Dakota PMC Emissions
WRAP Interim 2002 Inventory



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Aerosols with diameters between 2.5 and 10 microns are referred to as coarse particulate matter (PMC). Sources of PMC include crushing or grinding operations, combustion activities and soil materials.

Coarse particulate matter typically does not remain suspended as long or travel as far as $PM_{2.5}$. PMC can be a major source of haze that reduces visibility, especially on a local scale in our Class I Areas.