

MPCA Climate Adaptation Strategy and Proposed Near-Term Actions

MPCA Climate Adaptation Team (MCAT)



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Cover Photo: Flooding in Faxon Township, MN (Sibley County), June 24, 2014. Photo courtesy of Sean O'Connor.

Background

The Minnesota Pollution Control Agency's Climate Adaptation Team (MCAT) was created by MPCA senior management in December 2013 with the mission of advancing climate adaptation through collaboration between the Agency's divisions and programs. As of July 2014, MCAT consisted of 26 representatives from programs within each of MPCA's seven divisions.

At the team's inception, members were directed by the MPCA Commissioner to recommend a strategy and near-term actions to MPCA senior management on climate adaptation by June 30, 2014. This document represents MCAT's work product for this effort. This strategy and proposed actions were presented to and accepted by MPCA senior management in July 2014.

MCAT developed this strategy through its Strategy/Project Development subcommittee, several separate working groups, a special team workshop in May 2014, and meetings of the full team. In addition, a survey was completed by each MCAT member to help identify and finalize the top ten proposed actions included in the strategy.

The team started off this effort by carefully reviewing the MPCA Strategic Plan to consider how the agency's plan, vision and goals relate to climate adaptation and resilience.



Photo: Underground petroleum storage tanks exposed from flooding in Albertville, MN (Wright County), June 19, 2014. Photo courtesy of Jake Mueller.

Relationship of Climate Adaptation to the MPCA Strategic Plan

MCAT believes that the MPCA's current Strategic Plan is consistent with immediate implementation of climate adaptation actions throughout the agency. Each major element of the Strategic Plan has specific climate vulnerabilities, described below. Language in bold is from the Strategic Plan. Language describing vulnerabilities reflects MCAT's perspective, informed by U.S. EPA Region 5's 2014 Regional Climate Change Adaptation Implementation Plan.

MPCA Strategic Plan

Mission: Our mission is to protect and improve the environment and enhance human health.

Vulnerabilities: The changing climate will affect all aspects of Minnesota's environment, including pollution of water, air, and land. Human health will be threatened by extreme weather events, increased pollutant levels, new vector-borne disease, more demands on governmental and private sector support systems, and greater personal financial and emotional stress.

Water

Vision: Minnesota's clean water supports aquatic ecosystems, healthy communities and a strong economy

Vulnerabilities: Climate change is expected to affect weather patterns, resulting in more frequent intense storms potentially separated by periods of lower precipitation. Increased runoff from intense storms will lead to more sediment and contaminants mobilized and transported to surface waters. Agricultural and land use practices may contribute to this increased runoff and sedimentation. Increased evaporation caused by warmer temperatures can reduce water availability for humans and ecosystems, and reduce ground water recharge. Warmer air temperatures will also lead to higher water temperatures, which threaten cold-water species, lower dissolved oxygen levels, and create conditions suitable for pathogens and harmful algal blooms. Existing water collection and treatment systems may be inadequately designed to handle these changes in water quantity and quality. A greater number of water bodies may be impaired.

Air

Vision: Minnesota's clean and clear air supports healthy communities and a strong economy

Vulnerabilities: Higher air temperatures expected with climate change will lead to more ozone formation, making it increasingly difficult to achieve or maintain attainment of air quality standards. Hotter temperatures accompanied by dry periods can also increase the incidence of wildfires and dust, thereby generating more particulate matter with associated respiratory and cardiovascular health impacts.

Land/waste

Vision: Minnesota's land supports healthy ecosystems and sustainable land uses

Vulnerabilities: Increased damage to human-built infrastructure as a result of extreme weather events will generate more solid and hazardous waste, and may increase risk of exposure to lead, polychlorinated biphenyls, halogenated flame retardants, asbestos, and other toxics. Climate change may also drive changes in agricultural practices, including the use of and exposure to pesticides.

People and approaches

Vision: Minnesotans and MPCA take actions to protect our land, water and air

Vulnerabilities: More frequent severe weather events expected with climate change increase the resource demand for emergency preparedness and response, which may stress and divert resources from ongoing work. Increased personal and property losses, health impacts, and disruptions to essential services will increase stress for Minnesota citizens. Climate change is expected to have a disproportionately negative impact on already vulnerable populations.

Operations

Vision: The MPCA demonstrates excellence in operations

Vulnerabilities: Climate change will likely impact MPCA's facilities and operations, including higher electrical demands, increased staff demands to address broader environmental impairments and to provide emergency response, more health risks for agency employees, especially those engaged in field work, and increased staffing disruptions from extreme weather affecting employees' home life and property.

Additional background on observed and projected climate vulnerabilities impacting Minnesota and MPCA can be found in the Appendix to this document.

Strategy and Proposed Near-Term Actions

In light of the vulnerabilities described above, MCAT believes that climate adaptation considerations and action are essential to the MPCA's preparedness and resilience to expected changes in climate. Specific recommended actions to senior management that cut across the Agency's programs are offered below, which are consistent with initial implementation within a one to two-year timeframe. These recommendations promise to lead to multiple benefits across MPCA program areas and to better position the agency and its programs for resilience to climate impacts.

The team believes that these actions should be taken sooner rather than later and will provide the greatest impact or benefit in terms of climate adaptation. Implementation of these recommendations is scalable depending on resources available. The 10 recommendations are grouped under broader functional categories, and are not listed in order of priority.

We recognize that these are broad recommendations. MCAT's next step will be to develop a workplan for implementation of these actions. MCAT will seek to update senior management of progress made after six months.

Top 10 Climate Adaptation Recommendations

Expand and deepen community partnerships on adaptation

1. Increase outreach, education, and training to stakeholders and the public
2. Increase financial and technical assistance to local communities
3. Build new partnerships, including vulnerable populations and the insurance industry

MPCA should work with existing and new partners to accomplish climate adaptation goals, including local units of government, federal agencies, higher educational institutions, regulated parties, the private sector, and other state agencies.

Increase internal MPCA capacity for climate adaptation

4. Increase staff training and capacity building

Most MPCA professional staff members do not have adequate knowledge or understanding of climate adaptation. Staff training and professional development, capacity building through the addition of staff focused on this issue, and interdivisional collaboration are needed.

Identify and address barriers to adaptation

5. Prepare one-time report to the Legislature on barriers to climate adaptation

This should explore barriers in agency regulations, resource allocations, financial assistance, and other agency activities.

Understand, prepare for, and address impacts of weather extremes

6. Hold an annual meeting between MPCA programs impacted by extreme weather to discuss and identify risks with high consequences, and to move from being reactive to proactive
7. Increase data collection related to climate trends and impacts to better assess risks
8. Implement hydrologic simulation and other modeling of climate scenarios with greater precipitation and/or temperature

Resources should be focused in particular on impacts of flooding, heat and drought.

Integrate adaptation best practices into MPCA programs

9. Integrate into grant programs
10. Integrate into regulations and environmental review

Specific high priority best practice areas recommended by MCAT for initial focus include: stormwater management best practices, water/wastewater reuse, and water conservation. Climate adaptation best practices should also be integrated into employee workplans, media forums, and other agency efforts.

Conclusions and Next Steps

The process of developing this strategy and recommendations has been positive and informative for MCAT members. It has provided the team with an opportunity to better understand issues related to climate adaptation at the agency, and to identify common challenges faced by MPCA programs across divisions.

MCAT welcomes the opportunity to further discuss these recommendations with MPCA senior management, and appreciates management support to proactively implement the recommended actions. This presents an opportunity for MPCA to stand out as a leader on this issue which has serious implications for our state's environment, economy and communities.

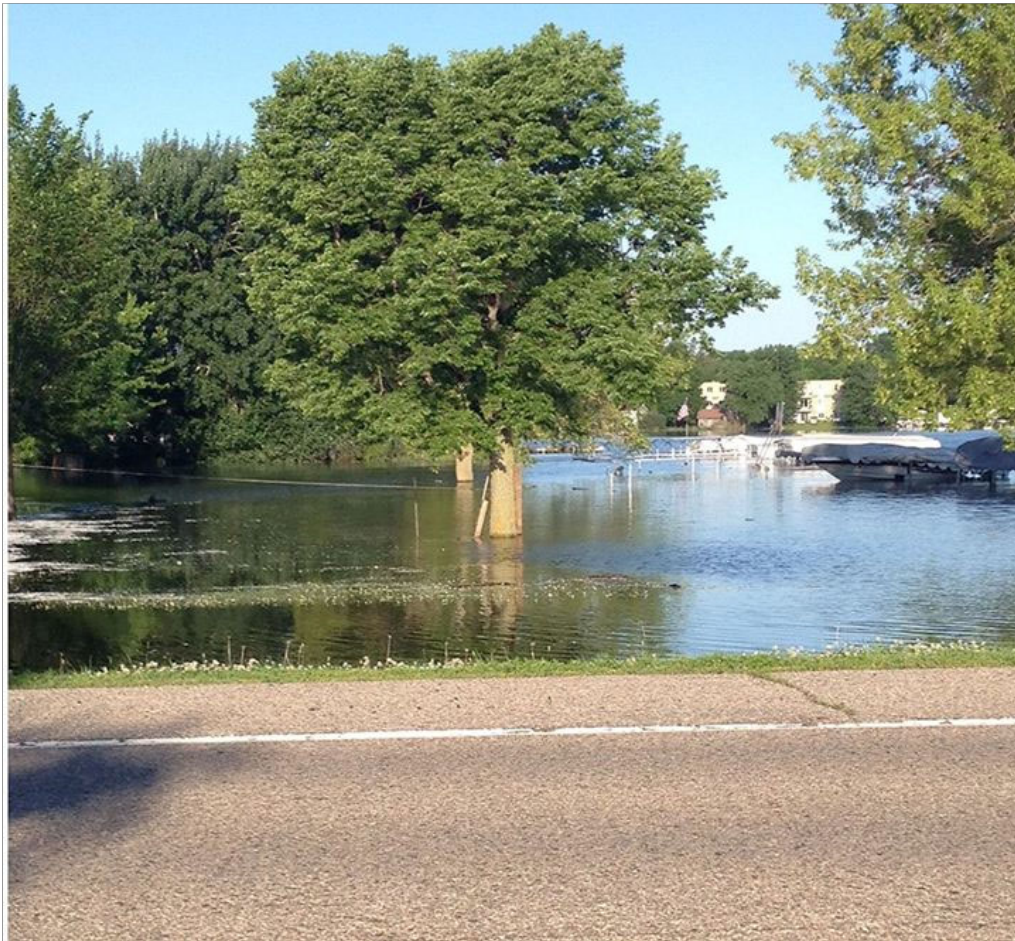


Photo: Flooding in Waterville, MN (Le Sueur County), June 24, 2014. Photo courtesy of the State Emergency Operations Center.

Appendix: Climate Impacts in Minnesota

The following has been excerpted from *Adapting to Climate Change in Minnesota: 2013 Report of the Interagency Climate Adaptation Team*, November 2013, pages 11 – 16, <http://www.pca.state.mn.us/index.php/view-document.html?gid=15414>

The observed measurements and future projections described by the National Climate Assessment provide insight into climate trends that are impacting Minnesota now as well as those anticipated in the future. Complicating the varied impacts of climate change is that these changes also interact with and reinforce each other. For example, drought and heat may both contribute to wildfires, which may in turn lead changes in plant and animal populations as well as other ecological shifts. Extreme precipitation may increase flooding, along with the potential for runoff or combined-sewer overflow and contamination of recreational and drinking water sources, which may already be in short supply due to drought. In addition, climate change will amplify the effects of existing public health and environmental challenges, such as impaired air quality, loss of wildlife habitat, invasive species, and limitations to clean water supplies.

As informed by climate data and trends, Minnesota state agencies are identifying significant current and future climate change impacts. These impacts, including variable and extreme changes in temperature and precipitation, are expected to have substantial effects on public health, community infrastructure, ecosystem health, and environment quality. Climate impacts likely to continue include flooding, extreme heat, intense storms, drought, air and water pollution, vector-borne and other infectious diseases, invasive species, and ecological changes, such as alteration of seasonality.

The following descriptions summarize some currently observed and anticipated impacts of climate change by ICAT member agencies.

Increasing temperature and extreme heat

Climate data for the Midwest show observed increases in average temperatures. Projected temperatures are expected to rise significantly by mid-century, including an increase in particularly hot days. Extreme heat affects human and animal health, agriculture, and infrastructure.

Increasing air temperatures are causing water temperatures to rise, which impacts aquatic species as well as human health. Increased water temperature results in decreased dissolved oxygen and greater vulnerability of aquatic organisms to water pollution. Shifts of population of fish species from coldwater to warmwater species are expected to occur.

Increased water temperatures also may contribute to the occurrence of harmful algal blooms, including potentially toxic algae, in lakes and waterways where people swim, fish, or engage in other recreational activities. Harmful algal blooms can cause painful skin irritation and upper respiratory health problems.

Permitted wastewater treatment ponds experiencing earlier ice-off face greater problems meeting effluent limits as warmer temperatures increase algal growth which affects total suspended solids, pH, and carbonaceous biochemical oxygen demand. In addition, warmer temperatures in summer impact the biological processes in wastewater treatment plants, as higher temperatures increase bacterial reaction rates and the density of settled sludge.

Air quality

Extreme heat is often associated with degradation of air quality. Climate change may affect air quality directly through changes in seasonal climate and weather, and indirectly through drivers of energy use and resulting emissions. Climate change is expected to have a substantial effect on ambient particulate matter and ozone.

Increased temperatures can:

- Increase pollution from fossil fuel combustion.
- Increase the emission of volatile organic compounds from plants and vegetation that contribute to the formation of ozone.
- Increase formation of ground-level ozone.

Higher temperatures contribute to increased pollution from fossil fuel combustion as a result of electricity generated to run air conditioning. Extreme heat may result in deployment of stationary generators to reduce peak power loads, which further increases air pollution. Also, extreme heat and drought can lead to more wildfires, which create more particulate matter.

Increased ground-level ozone pollution and particulate matter associated with warmer temperatures raises the risk of potential nonattainment of air quality standards and increased air quality alerts in Minnesota. The urban heat island effect can also contribute to decreases in air quality through increased ozone formation and greater use of air conditioning. (This effect occurs because urban areas have less cooling vegetation, more heat-absorbing buildings and concrete surfaces, and greater combustion of fuels than surrounding rural areas, thereby typically leading to higher temperatures in cities.)

Exposure to particulate matter can aggravate illnesses, such as chronic obstructive pulmonary

disease (COPD), cardiovascular disease, asthma and development of chronic lung disease. It is also associated with cardiopulmonary mortality. Ozone exposure can exacerbate asthma and COPD.

Air pollution disproportionately impacts certain vulnerable populations. For example, higher ozone levels may cause asthma in children. People with respiratory and cardiovascular diseases and the elderly are particularly susceptible to increases in particulate matter and ozone pollution.

Drought

Although it is not yet clear how climate change will impact the occurrence of drought in Minnesota, drought and dry periods will continue to occur regularly in the state. Drought impacts availability of water for community and industrial purposes, as well as for natural ecosystems. Lack of water has significant economic and ecological effects.

Drought has significant impacts on water quality. For example, stream flow lowered by drought reduces dilution of water pollutants, negatively affecting fish and other aquatic organisms.

Discharge periods for stabilization pond type wastewater treatment systems may need to be modified to minimize impacts on receiving waters at lower flows. Low stream flow data for waters receiving continuous discharges from mechanical facilities may need to be modified to insure that the receiving surface water quality is maintained for the local designated uses. Drought periods increase the value of exploring opportunities for treated wastewater reuse.

Drought has implications for air quality and human health. More airborne particulate matter or greater frequency of low air quality in rural areas may result from drier soil/field conditions. Prolonged drought increases risk of

wildfires that increase particulate matter and reduce air quality, impacting children, the elderly, and those with a range of chronic health conditions. Wildfires also can directly cause injuries or deaths from smoke inhalation and burns. Rural populations dependent on local food sources (such as fish, wildlife, and wild plants) also experience health impacts from drought when these sources are threatened.

Drought impacts certain contaminated site remediation practices, such as phytoremediation (using plants to remediate or stabilize hazardous wastes). Irrigation may be necessary if drought-tolerant plants are not used.

Extreme weather events

Both observed climate data as well as future projections indicate increases in very heavy precipitation in Minnesota. Heavy precipitation events, storms, and flooding have significant impacts on Minnesota's communities and ecosystems. This includes effects on water and soil resources, agriculture, drainage infrastructure, human health, stormwater management, wastewater treatment, solid waste management, and emergency response.

More frequent, heavier, or longer-duration rainfall events will increase soil erosion and runoff, thereby increasing deposition of sediment and contaminants in water bodies. Climate change has the potential to impact the quality of water and soil resources throughout Minnesota.

More frequent extreme weather events will impact Minnesota agriculture, resulting in increased runoff, fertilizers, pesticides, and sediment particularly from agricultural fields that do not have best management practices in place such as buffers, grassed waterways, and crop residue left on the fields. Field flooding can result. There are also costs to the state for disaster assistance (e.g., the Minnesota

Department of Agriculture's Flood Disaster Assistance Program) which will likely increase as a result of climate change. Damage to feed crops from extreme weather also affects livestock. Greater precipitation increases challenges for applying manure in an environmentally safe manner to fields. Flooding can also cause overflow of manure storage basins which have inadequate storage capacity, leading to contamination of nearby water bodies.

Increased extreme weather events put additional pressure on the state's drainage infrastructure. There is a potential for more erosion within older drainage systems that do not have adequate outlets or erosion controls in place.

Flooding contaminates freshwater sources with untreated or partially treated sewage and can contaminate food crops with waste from nearby livestock or wild animals, threatening food safety. Increased water flow from a flood may disrupt municipal water supplies and sewage treatment facilities, as well as private wells and on-site septic systems. Flooding of private wells is a particularly serious public health concern, given that, in general, well owners do not test or treat their water according to health-protective guidelines.

Changes in amount, frequency, and intensity of precipitation impact stormwater management, potentially exceeding the design capacity of stormwater treatment structures or impacting future structure design. Extreme weather also adds to challenges in monitoring water quality.

Higher peak intensity rainfall events may result in bypass of wastewater treatment facilities or sanitary sewer overflows, leading to the release of minimally treated or untreated wastewater. Wastewater facility staff need to track changes in floodplain elevations as peak rainfall intensities increase so that treatment facility infrastructure can be protected during possible flood events.

There is increased need to properly clean up and manage solid waste, hazardous materials, and debris after floods, storms, and other natural disasters. More frequent occurrences of natural disasters increase the demand for disaster remediation and coordination efforts, as well as for trained staff to meet these specific needs. Design standards for permitted waste management facilities are linked by rule to certain magnitudes of storm events (i.e., 25- or 100-year storms), and as storm severity increases, this impacts facility needs. There is accelerated use of existing waste management capacity due to more waste and debris resulting from extreme weather.

Increasing numbers of floods and storms raise the need for state support and response. A greater demand for response from limited staff reduces time available for internal and external preparedness, including partnering and preparing with local units of government, state agencies, and industry. Infrastructure damage due to flooding and storms, such as flooded roads and power and communication technology outages, can disrupt emergency response in affected areas, which also has health impacts.

Populations particularly vulnerable to flooding and extreme weather events include the elderly and those without the ability to evacuate when necessary. Those living in floodplains or other areas subject to flooding are at particular risk.

Changing seasonality and longer term ecological changes

Climate data indicate significant increases in the growing season, a trend that is anticipated to

continue in coming decades. This impacts our state's health, economy and ecosystems.

Climate change has broad, sweeping impacts on ecosystems that impact fish, game, and wild plant populations which are used for food. This may have a particularly negative impact on rural, Native American, and other population groups relying more heavily on subsistence hunting and wild plants.

Climate change also is altering Minnesota's natural lands and waters and the uses they sustain. Examples include:

Lakes, rivers and streams: Likely climate-induced impacts include earlier ice-out dates; less seasonal ice cover; increases in warmwater fish species and decreases in coldwater fish species, such as ciscoes; increased growth of algae and diatom blooms; warmer surface water temperatures in lakes; and increased variability in the seasonal and annual flow volume in Minnesota watersheds. Climate change also reduces the effectiveness of fish and macroinvertebrate indicators currently used as biomonitors to evaluate the ecological health of water bodies.

Wetlands: Climate change threatens to alter physical, chemical, and biological processes.

Forests: Projected climate changes will shift tree ranges, and some common northern tree species such as spruce and fir may become rare in Minnesota.

Prairies: The less than 1% of remaining native prairie will likely become drier, causing declines in mesic and wet prairie plant and wildlife species.

In addition to the Interagency Climate Adaptation Team report excerpted above, additional valuable references on climate impacts include:

- 2014 National Climate Assessment

<http://nca2014.globalchange.gov/>

- Published by the U.S. Global Change Research Program, the National Climate Assessment provides a vetted, up-to-date summary of how the climate of the United States is changing, and includes a section on the Midwest which outlines trends in our region.

- 2014 US EPA Region 5 Climate Adaptation Plan

<http://epa.gov/climatechange/Downloads/impacts-adaptation/region-5-plan.pdf>

- This 54-page plan includes a vulnerability assessment for Region 5 states, as well as outlines regional priority actions on climate adaptation across EPA divisions.

- 2014 US EPA Climate Indicators Report

<http://www.epa.gov/climatechange/pdfs/climateindicators-full-2014.pdf>

- This 112-page report presents 30 indicators to help communicate long-term trends related to the impacts and causes of climate change.

- 2014 Intergovernmental Panel on Climate Change Report

<http://www.ipcc.ch/>

- The comprehensive IPCC report summarizes the current state of science for climate change worldwide, and includes working group reports on climate mitigation and adaptation.

- MN Department of Health Climate Change 101 web site

<http://www.health.state.mn.us/divs/climatechange/climate101.html>

- This site summarizes climate trends, and includes a link to MDH's 59-slide Climate Change and Public Health 101 Training Module.

- 2011 MN DNR report: Climate Change and Renewable Energy: Management Foundations

<http://files.dnr.state.mn.us/aboutdnr/reports/conservationagenda/crest-ccref.pdf>

- This 82 page report was written for DNR staff to provide them with a platform to develop strategies to address climate and renewable energy challenges.

Updated 3/3/15