MINNESOTA NUTRIENT REDUCTION STRATEGY
RESPONSES TO COMMENTS ON THE
2025 DRAFT NUTRIENT REDUCTION STRATEGY

The 2025 Minnesota Nutrient Reduction Strategy (NRS) was open for public review from June 14, 2025, to September 10, 2025. Sixty-two comment letters were received via the designated submittal methods during the public review. Responses to those comments are contained in this document. The 2025 NRS was developed by a multiagency working group that included staff from the U.S. Geological Survey (USGS), the U.S. Department of Agriculture (USDA), the Metropolitan Council (Met Council), the University of Minnesota (UMN), the Minnesota Board of Water and Soil Resources (BWSR), the Minnesota Department of Health (MDH), the Minnesota Department of Agriculture (MDA), the Minnesota Department of Natural Resources (DNR), the Environmental Quality Board (EQB), and the Minnesota Pollution Control Agency (MPCA; the coordinating agency). Responses to most comments are from the multiagency 2025 NRS Team. However, some comments required a response from the agency with regulatory authority on the pertinent issue. Agency-specific responses are noted.

A list table of comments from the Bois de Sioux Watershed District is included in **Appendix A**.

COMMON TOPICS

Many comment letters included the following recurring (common) topics:

1. Support for further reducing nitrogen pollution by requiring the use of conservation practices and regulating fertilizer and pesticide use, manure application, and tile drainage.
2. Support for increasing education, incentives, and networking opportunities for landowners and farmers to increase adoption of conservation practices and increased support for watershed organizations.
3. Support for increasing the use of continuous living cover (CLC), including winter annuals, perennial crops, pasture, small grains (e.g., oats), and harvested cover crops.
4. A request for more, or specific types of, water quality monitoring
5. Development of an aquatic life nitrate toxicity standard by the MPCA.

The following are responses to these common topics; they will not be repeated in responses to individual letters.

Common Topic # 1 – Regulations

Overview of sample comments received:

- Manure application should be regulated and better managed.
- Chemical fertilizer and pesticide use should be regulated.
- Regulation of agricultural drainage (tiling) should be expanded, such as the development of a permit-based system.

Response to Common Topic #1:

Approximately 33 of 62 letters submitted during the public review period of the 2025 Minnesota NRS called for additional regulations on various sources of excess nutrients. Seven letters opposed new regulations or additional limits in existing permitting structures. Regulation as a method to achieve goals within the NRS is complicated, as nutrient sources are both regulated and non-regulated, and laws

governing nutrient sources are federal, state, and, in some instances, local. Below is a summary of nutrient-related regulations noted in the 2025 NRS, along with updates on decisions regarding other current regulatory topics.

The nutrient reduction strategies in Mississippi River Basin states were established in response to a 2011 memo from the U.S. Environmental Protection Agency (USEPA) calling for voluntary reductions in nutrient loss to waters draining to the Mississippi River. One of the 2011 memo recommendations for a statewide NRS was to make use of existing programs. Consequently, the 2014 Minnesota NRS assessed the existing state nutrient-related regulations, as well as the context of the federal Clean Water Act, an exercise repeated in the 2025 NRS.

Regulatory elements reported in the 2014 NRS and updated in 2025 included:

- Comprehensive Groundwater Protection Act of 1989 (Minnesota Statute § 103H)
- MDA Nitrogen Fertilizer Management Plan
- Groundwater Protection Rule
- National Pollution Discharge Elimination System (NPDES) permit program for point sources
- Water quality standards, as called for by the federal Clean Water Act and in Minnesota Rules Ch. 7053. These include:
  - Current Drinking Water Nitrate Standards
  - Future Aquatic Life Nitrate Toxicity Standards
  - Lake Eutrophication Standards
  - River Eutrophication Standards
  - Turbidity/TSS Standards

Other regulatory programs documented are:

- Feedlot Program and rule, including Minn R. Ch. 7020 (Section 5.5.1)
- Subsurface Sewage Treatment Systems (SSTS) (Section 5.5.2)
- Municipal Separate Storm Sewer Systems (MS4s) (Section 4.2.1)
- Phosphorus Lawn Fertilizer Law (Section 4.2.1)

Despite its treatment of regulations, the 2025 NRS itself does not hold regulatory authority, and it cannot be used as a platform for rulemaking. However, a number of the rules and regulations suggested in the comments have been addressed recently by the state agencies involved in developing the NRS, including the following.

Manure application. In January 2025, MPCA finalized updates to the NPDES and State Disposal System general permits for large feedlot operations. These changes aim to enhance protections for Minnesota's water resources by reducing pollutants, particularly nitrates, from manure applications and build on the additional protections added to the NPDES permits in 2021. Large feedlot operations located in areas vulnerable to groundwater contamination (see the MPCA Feedlot Program Vulnerable Groundwater Areas map tool), including the karst region in southeast, shallow aquifers in southwest, and the sand plain in central Minnesota, will be required (starting in 2027) to implement best management practices (BMPs) aimed at mitigating nitrate leaching from fields that receive manure applications. The practices vary according to time of year and include options of:

- Applying manure to growing perennial or row crops
- Planting a cover crop prior to or within 14 days of application
- Nitrogen stabilizers
- Ensuring perennial crops are included in the rotation at least two years within any five-year period (MPCA Feedlots Program webpage)

Tile drainage. On October 27, 2025, MPCA responded to a petition for rulemaking dated August 28, 2025, that requested that the MPCA, through rule, adopt a regulatory permitting program under Minn. Stat. § 115 (Minnesota's Water Pollution Control Act) that would require the MPCA to review and approve drainage projects established under Minn. Stat. § 103E (Minnesota's Drainage Law). After careful consideration, the petition was denied, given that a state agency cannot adopt rules unless it has a grant of authority from the Legislature to do so.

Fertilizer application data collection. The MDA provided the following response: The MDA works with agricultural retailers and farmers to encourage proper recordkeeping and the alignment of nutrient application with UMN fertilizer guidelines. Proper recordkeeping is important for all agricultural producers. Records help ensure nutrients are properly managed and applied at the correct rate and time so they stay on the fields and are utilized by crops.

Under Minnesota Statute 18C, the Commissioner of Agriculture has the authority for the regulation of fertilizer, including storage, handling, distribution, and disposal. Included is a requirement for agricultural retailers to obtain a license to sell or distribute bulk fertilizers for use on agricultural lands, and everyone who has a license must report and pay a fee on the tonnage sold. However, the MDA does not have the authority to require recordkeeping of nitrogen fertilizer applications. Additional recordkeeping requirements would require legislative action and changes to Minnesota Statutes.

Mandatory BMPs. Regulatory mechanisms and voluntary practices together shape a collective effort toward nitrogen pollution reduction. Fall application of nitrogen in bedrock-dominated areas of southeastern Minnesota has been banned. The new feedlot permit requires conservation practices on fields that receive manure (approximately one-third of the manure generated in the state is generated by permitted facilities), to reduce nitrate leaching loss (another regulatory approach). Companion voluntary approaches are a necessary component of management and have been demonstrated to be effective in reducing nitrate loss from cultivated acres.

Common Topic #2 – Farmer, landowner, and local watershed education, incentives, and networking

Overview of sample comments received:

- Educate residents about the dangers of chemical fertilizers and pesticides.
- Provide incentives to farmers to transition from conventional farming practices to organic and regenerative agricultural systems; educate them about the potential cost savings and benefits.
- Use a mixture of education, incentives, and regulations to engage farmers in implementing various conservation practices that are effective in reducing nutrient impacts but also have multiple benefits (e.g., climate resiliency, flood damage reduction).
- Increase investment in local water resource management staff capacity (e.g., soil and water conservation districts, watershed districts, watershed management organizations) and certified crop advisors as trusted local partners and effective delivery mechanisms for nutrient reduction strategies.
- Support farmer-to-farmer networking and education to help achieve wide-scale adoption of new and innovative conservation practices.
- Empower and grow farmer networks via locally led, flexible and outcome-based approaches like the Olmsted County Groundwater Protection and Soil Health Program.
- Build a Small Grain Initiative and a safety net for farmers who want to reduce their nitrogen fertilizer applications by transitioning to more diverse cropping systems.

***Response to Common Topic #2**:*

The most common topic of feedback on the 2025 Minnesota NRS was to call for greater support of Minnesota's farmers (37 letters out of 62) and watershed organizations (27 letters out of 62). Generally, commenters felt that innovative programs, such as the Olmsted County Groundwater Protection and Soil Health Program and other farmer-led conservation or soil health programs, should be expanded across the state, farmers should receive financial and technical support for adopting experimental conservation practices, and crop diversity should be increased. Commenters also felt that the work of local watershed organizations, such as watershed districts and soil and water conservation districts, was vital and should be supported.

The 2025 Minnesota NRS, likewise, recognizes the work of Minnesota producers and their partners in installing over four million acres of government-funded conservation practices since 2014 (Chapter 5). These practices have contributed to documented decreases in nitrogen in both the Mississippi River and Red River, and more of these practices are needed for continued nutrient reductions. Section 5.1 provides an overview of the nutrient reductions that different types of agricultural practices achieve, including an evaluation of the co-benefits of practices, such as water storage or wildlife habitat. Appendices 5-1 and 5-2 contain the full documentation of practice evaluation. Section 5.2 looks at existing programs that support practice implementation, such as the Olmsted County program, and Section 5.3 identifies commonalities of successful programs and the feasibility of expanding such programs as needed. These analyses are documented in Appendix 5-4. Section 5.3.2 looks at the socioeconomic and human dimension of practice adoption, and, like the commenters, concludes that trusted programs and advisors are key to practice implementation.

The 2025 NRS also affirms the value of watershed organizations and partners in accomplishing nutrient reduction goals. Chapter 6 provides background and detail on Minnesota's Water Management Framework, which was just being implemented when the 2014 NRS was released. The Watershed Restoration and Protection Strategies (WRAPS) and the One Watershed, One Plan programs are key implementation pieces for the NRS goals, but these programs also rely on local watershed partners and the previously developed Metro Area watershed plans. Section 6.3 describes how watershed work and the NRS interface, and Section 6.4 lists additional supports that are needed in watersheds to accomplish more nutrient reduction work. Part of the NRS updates included interviewing local watershed staff to gather details on the type of support that was most needed. These interviews are detailed in Appendix 6-2; the kinds of tools identified as needed during those interviews are listed in Appendix 6-1.

Generally, the findings of the 2025 NRS closely match the comments from the public review process on the value of the work of Minnesota's farmers and watershed organizations.

Common Topic #3 – Continuous living cover and small grains as a foundational strategy for nitrogen leaching loss reduction efforts

Overview of sample comments received:

- Expand implementation of CLC to reduce nutrient runoff and leaching loss.
- Accelerate a transition to perennial crops, pasture, small grains (e.g., oats) and harvested cover crops to better protect surface water and groundwater sources.

***Response to Common Topic #3**:*

About half the comment letters expressed strong support for the CLC campaign and the need for more CLCs described in the NRS. CLC includes a wide array of cover on agricultural lands, including traditional cover crops that are temporal in nature, diversified systems provide extended living cover during the

growing season (e.g., alfalfa, pasture), emerging novel perennial crops, and permanent cover such as prairie and wetland restorations. The NRS Team acknowledges this support from stakeholders and, as described in the document, will work to implement a CLC workgroup going forward. The 2025 NRS makes it clear throughout the strategy that increasing living cover is foundational to progressing nutrient reduction work and achieving both in-state and Gulf Hypoxia goals. See chapters 5 and 8 for details.

A number of experts in the field of CLC noted via comments that the 2025 NRS should be more specific in differentiating market-based CLC and traditional cost-share cover crops. The NRS Team adopted these recommendations and updated the glossary and references to reflect these two types of CLCs.

Common Topic #4 – Data and monitoring

Overview of sample comments received:

- Reduce reliance on modeling. Use actual private well test data to determine levels of target achievement, increase monitoring wells in Southeast Minnesota, locate monitoring wells near industrial-scale operations, establish well test frequency, or use continuous monitoring, mandate monitoring wells where infractions have occurred, and make well test data easily accessible to the public.
- For load progress, measure it in situ (e.g., farm-field scale), not on a computer.
- The NRS could benefit from a more strategic placement of real-time sensors in watersheds to provide more granular and immediate data on nutrient loads.
- Invest in better data collection technologies, such as satellite imagery and remote sensing, to track the adoption of cover crops and reduced tillage more efficiently and at a larger scale.
- Cooperate on a standard open-source and open-access data and modeling system.
- Provide public reporting of all nitrate monitoring data.

***Response to Common Topic #4**:*

Many comment letters raised questions or concerns about data and monitoring. This was a theme the NRS Team noted and believes is important to track. The feedback on this topic was varied and most required individual answers. A few facts about NRS data are stated below:

The strength of Minnesota water monitoring programs. Minnesota has a many-decades-long history of monitoring surface water and groundwater quality and quantity, as well as the status of aquatic life in lakes, rivers, streams, and wetlands (see more information in chapters 2, 3, and 6). Multiagency efforts to collect more robust data were put in place to assess impaired surface waters and develop total maximum daily loads (TMDLs) across the state starting in the 1990s. This work was further accelerated by the passage of the Clean Water, Land, and Legacy Amendment (2008) and the Clean Water Legacy Act, which provided the structure and funding at the state level to systematically tackle surface water and groundwater monitoring efforts through a watershed-based approach in Minnesota. Since then, watershed monitoring networks have been expanded, intensive surface water monitoring has occurred in every major watershed, monitoring databases have been greatly improved to assist in water quality analysis and assessment, and online tools have been developed to provide this data transparently to the public. Due to these efforts over the last few decades, Minnesota is recognized as a national and international leader in water monitoring.

All trend and nutrient load data reported in the NRS are based on monitored data. Figure 2-3 maps permanent monitoring stations used to collect the data used to calculate river nutrient loads and trends. Data used in the NRS are reported in Appendix 2-1, appendices A–L. Data from the Manitoba

Department of Environment and Climate Change were shared with the NRS Team on request and are not posted online. Other data used in the NRS are publicly available at the following locations:

Groundwater data:

- MPCA well monitoring data are publicly available on the MPCA webpage: https://www.pca.state.mn.us/air-water-land-climate/groundwater-monitoring
- MDA's Township Testing Program data: https://www.mda.state.mn.us/township-testing-program
- The Minnesota Department of Health reports groundwater testing data: https://www.health.state.mn.us/communities/environment/water/data.html
  The Minnesota Groundwater Atlas provides multiple resources on groundwater: https://www.dnr.state.mn.us/waters/groundwater_section/mapping/index.html

Surface water data:

- USGS data are stored on the National Water Information System: https://waterdata.usgs.gov/nwis/sw
- MPCA
  - Water Quality Dashboard: https://webapp.pca.state.mn.us/wqd/surface-water
  - Surface water data: https://webapp.pca.state.mn.us/surface-water/search
  - Watershed Pollutant Load Monitoring Network, which also contains Met Council and USGS data: https://data.pca.state.mn.us/views/WatershedPollutantLoadMonitoringNetworkwatermonitoringdata/ProgramOverview?%3Aembed=y&%3AisGuestRedirectFromVizportal=y
- The Met Council maintains the Environmental Information Management System: https://eims.metc.state.mn.us/

Models were used to convert monitored data. It is not feasible or economically practical to monitor everywhere, so modeling based on excellent monitoring networks is advantageous to extend the use of monitoring data.

The concentration data collected at the monitoring stations listed in Figure 2-3 and Table 2-3 were converted to nutrient load format using modeling software. Models were also used to analyze nutrient levels with and without including river flow variability. Section 2.3.1 explains how models were used to evaluate monitored data. Appendix 2-1 provides further detail.

NRS Dashboard. The NRS Team recognizes that the long reports at the center of the NRS are cumbersome. Consequently, the NRS will be transitioning to a more flexible format based around a dashboard. The NRS Dashboard will track nutrient reduction progress, nutrient levels in waters within and leaving the state, and provide a one-stop location for NRS-related tools, research, and guidance. The Dashboard is in the planning stages and will be designed and built over the next two years. Additional details are provided in 2025 NRS Chapter 7.

Common Topic #5 – Aquatic life/nitrate standards

Overview of sample comments received:

- MPCA should promulgate a nitrate toxicity water quality standard to protect aquatic life.
- The NRS should not use draft standards for analyses.

***Response to Common Topic #5**:*

The MPCA provided the following response: MPCA recognizes the need to reduce nitrate in Minnesota waters to protect aquatic life and drinking water sources. USEPA has not developed nitrate water quality criteria for states to implement, and no states to date have adopted nitrate aquatic life standards. MPCA

has developed a technical support document that includes a scientific analysis of the impacts of nitrate on aquatic life and is a foundational step in the process to adopt water quality standards. The schedule for completing the rulemaking process required for adopting a nitrate standard has not been determined.

The largest contributing sector of nitrate to Minnesota's waters is the agricultural/rural land use sector. While the adoption of a nitrate standard would establish regulatory nitrate values to protect aquatic life, it would not have a direct impact on nitrate contributions to surface waters from agriculture, as most agricultural runoff is exempt from existing permitting under federal and state law. The NRS contains extensive strategies for addressing this sector.

The NRS Team provided the following response: The 2025 NRS made use of the publicly available *2022 Aquatic Life Water Quality Standards Draft Technical Support Document for Nitrate*, and the findings of that report that aquatic life in non-salmonid waters is harmed at chronic values of nitrate at or above 8 milligrams per liter (mg/L). This value was used as a means of determining which waters are most in need of nutrient reduction and, therefore, should be considered a priority watershed. Chapter 3 notes that over 75% of assessed streams in most southern Minnesota watersheds have nitrate concentrations over 8 mg/L, which could potentially harm aquatic organisms. The highest-priority watersheds identified in the 2025 NRS for nitrogen reductions are those with overlapping priorities for drinking water, aquatic life toxicity, and meeting downstream nutrient load reduction goals.

COMMENT LETTER 1. BRUCE HALL

Comment 1-1: We need more regulated management of manure application, and we need mandatory vegetational buffers to road ditches, tributaries and water management ditch systems NOW as a start to nutrient reduction in our waters.

> ***Response 1-1:*** See response to common topic 1 (regulation).

COMMENT LETTER 2. TERESA WHITMAN

Comment 2-1: Residential use of chemical fertilizers on lawns, especially next to lakes and rivers, should be banned. So should most pesticides. Educate residents.

> ***Response 2-1****:* See responses to common topics 1 and 2 (regulation; education, incentives, and networking).

COMMENT LETTER 3. TERESA PETERSON

Comment 3-1: I have been concerned for some time on the amount of tiling that has occurred and its impact on water quality, flooding downstream, aquatic life, etc. We cannot continue to drain all the water into straightened "private ditches" to avoid policies that would impact them as public waters. This needs regulation for the betterment of all, our neighbors downstream, the land, water quality, and all plant and animal relatives.

> ***Response 3-1****:* See response to common topic 1 (regulation).

COMMENT LETTER 4. DALE STEVERMER

Comment 4-1: As changes are being made to the Nutrient Reduction Strategy, please continue to keep some agronomic and business factors in mind.

Response 4-1: The NRS Team agrees that agronomic and economic considerations are critical in strategizing nutrient reduction work. The 2025 NRS acknowledges and includes these considerations in chapters 4, 5, and 8. Going forward, the NRS team will enhance existing and develop additional tools that incorporate economic considerations in the steering of nutrient reduction efforts.

Comment 4-2: The other concern I have centers around changing the feedlot size for reporting at the state level versus local / county control. I am a one man show here, and I would probably bump just over the 600 au level, creating more costs and time to create reports, but not really have a fundamental improvement in how I am managing my manure and crop ground. I am concerned that such reporting may reduce the value of my site as I look to make management changes in the future.

Response 4-2: This comment pertains to the State of Minnesota General Animal Feedlot NPDES Permit MNG440000 and Minnesota General Animal Feedlot State Disposal System Permit MNG450000 rather than the 2025 NRS and has been forwarded to the MPCA Feedlot Program for consideration.

COMMENT LETTER 5. BRIAN WAGENAAR

Comment 5-1: Additionally, we must use a mixture of education, incentives and regulations to engage farmers in a variety of practices, including conservation tilling, using cover crops and buffer strips, and deploying detention basins. In certain cases, implementing solutions from a list of best management practices (including those just listed) should be required by the MPCA. This requirement could fall under a general permit system for agricultural drainage, which is within the MPCA's statutory authority and scope to implement.

Response 5-1: See response to common topic 1 (regulation).

Comment 5-2: Restore wetlands and their vital ecosystem functions on the landscape. MPCA should invest in programs that create and restore wetlands in areas that are heavily impacted by agricultural drainage pollution.

Response 5-2: The NRS Team agrees that wetland restoration is a viable practice to treat both excess nutrients and address ecosystem functions such as resistance to flooding and improved wildlife habitat. Chapter 5 includes wetland restoration as an agriculture BMP that includes multiple benefits and encourages its adoption. Additional information on how much nitrogen and phosphorus wetlands can treat is included in Appendix 5-1.

COMMENT LETTER 6. BARBARA POSSIN

Comment 6-1: I fully support the plan to increase CLC crops along the Mississippi River to reduce runoff of nutrients downstream, are environmentally friendly, and can be profitable as well.

Response 6-1: See response to common topic 3 (CLC and small grains).

COMMENT LETTER 7. AMELIA NARIGON

Comment 7-1: I strongly support the proposal to integrate continuous living cover into Minnesota's agricultural practices.

Response 7-1: See response to common topic 3 (CLC and small grains).

COMMENT LETTER 8. CHERIE HALES

Comment 8-1: Our state agencies have known for 40 years that our ground and surface waters here in the Driftless are contaminated with nitrates and ag chemicals. Obviously, continuous cover crops would help. More small grains and alternative crops would be a benefit. More animals on pasture rather than confined should be a goal as well. Voluntary, self-reported BMPs have not been successful in improving water quality. There needs to be a more regulated, monitored system with penalties. Everyone deserves clean, safe drinking water.

> ***Response 8-1:*** See response to common topic 1 (regulation).

COMMENT LETTER 9. NEIL TRYGESTAD

Comment 9-1: The Minnesota Pollution Control Agency (PCA) is proposing new regulations requiring manure applications before October 15th to include either a nitrogen stabilizer, a cover crop, or both. Fifty years ago, N-Serve and Instinct NXTGEN were classified as "general use" pesticides, not "restricted use" compounds. However, more recent nitrogen stabilizers are classified as fertilizer amendments, which do not require rules, regulations, or third-party verification. This inconsistency in classification creates challenges in the marketplace and does not align with Minnesota's environmental goals.

Solution: Give Instinct NXTGEN an exemption for the pesticide custom applicator license for manure applicators or applications only. No exemption needed for applications with Urea or UAN. Provide extra training requirements within the manure custom application license to address the classification of Instinct NXTGEN a pesticide.

> ***Response 9-1****:* This letter pertains to the State of Minnesota General Animal Feedlot NPDES Permit MNG440000 and Minnesota General Animal Feedlot State Disposal System Permit MNG450000 rather than the 2025 NRS and has been forwarded to the MPCA Feedlot Program and the MDA for consideration.

COMMENT LETTER 10. PAT PAWLOWSKI

Comment 10-1: Would offer that for stream bank improvements working with DNR and TU [Minnesota Department of Natural Resources and Trout Unlimited] would facilitate efforts as DNR and TU have and acquire easements which commonly include stream and bank improvements which minimize farm operation adverse erosion effects.

> ***Response 10-1:*** The NRS Team agrees that streambank and habitat improvement work can also reduce nutrient loading to streams. The Minnesota Department of Natural Resources provided extensive information on stream and bank improvements. Their full report, titled *Nutrient Reduction Strategies for Stream and Gully Systems,* can be found in Appendix 5-5 and is summarized in NRS Chapter 5, Section 5.5.3.

Comment 10-2: Would suggest inclusion of restriction of use of muni waste water plant sludge that is not tested for and cleaned of heavy metals. Heavy metals on their own are hazardous contaminants and they increase the activity of nitrogen contamination. Despite prior comments I am aware of non-tested sludge being offered to farmers as free nutrient. Tests are only and inconsistently made on land long after application. Testing is not made before hand and small community treatment plants are underfunded and often inadequate to the job.

Response 10-2: The MPCA Municipal Division provided the following response: Biosolids, also called sludge, are generated during the treatment of domestic wastewater in a wastewater treatment facility. Biosolids are an acceptable and beneficial form of recycling on land as a soil conditioner and nutrient source. Biosolids applied to land must be analyzed prior to land application for nutrient content, pollutant concentrations of nine metals, and, as of September 1, 2025, per- and polyfluoroalkyl substances (PFAS). Biosolids rules focus on the biosolids quality and the sustainable use of biosolids. For more information, see the MPCA's Land application of biosolids website, https://www.pca.state.mn.us/business-with-us/land-application-of-biosolids; the Code of Federal Regulations Title 40 Part 503 – Standards for the use or disposal of sewage sludge; and MN Rule Chapter 7041, Sewage Sludge Management.

COMMENT LETTER 11. ANTHONY STANS

Comment 11-1: I live in Rochester township and drink/use water from a shared well. Past testing of wells in SE MN demonstrated elevated levels of nitrates and other nutrients. In addition, I enjoy flyfishing in SE MN streams. In the past several years there have been fish-kills on SE MN streams, with the most likely cause being excessive nutrient/run-off from agricultural practice. Finally, I also swim/recreate in MN lakes where elevated nutrient levels have let to algae blooms which potentially negatively affect fish and wildlife, in addition to making it unpleasant for recreation. The MN Dept of Agriculture has done a poor job of regulating/enforcing agricultural practices and the result has been elevated nutrient levels in all of our natural water sources, which has harmed our aquatic life and potentially harmed the lives of Minnesotans.

Response 11-1*:* The NRS Team acknowledges the value of the cold water resources in southeast Minnesota. In response to the USEPA petition pertaining to nitrate pollution of the region's groundwater, the NRS was described as the long-term solution to this decades-long issue. The strategies in the NRS for reducing nitrate leaching loss from cultivated acres, including those in southeast Minnesota, were echoed by a regional work group as indicated in the following report: *Report of Recommendations: Southeast Minnesota Nitrate Strategies Collaborative Work Group*.

COMMENT LETTER 12. HEATHER CASPER

Comment 12-1: We must take action now re: agricultural drainage, and nitrogen fertilizers. We know there are technological and regulatory solutions available. I implore MPCA to implement them by using education, incentives and regulations to engage farmers in a variety of practices, including conservation tilling, using cover crops and buffer strips, and deploying detention basins. I believe these should be required by the MPCA.

Response 12-1*:* See response to common topic 1 (regulation).

COMMENT LETTER 13. IAN RADTKE-ROSEN

Comment 13-1: Strengthen data collection and reporting requirements for fertilizer retailers by MDA and documentation of nitrogen fertilizer application rates by responsible parties (e.g. crop retailers to MDA).

Response 13-1*:* See response to common topic 1 (regulation).

Comment 13-2: Build a Small Grain Initiative and a safety net for farmers who want to reduce their N fertilizer application.

***Response 13-2**:* See response to common topic 3 (CLC and small grains).

Comment 13-3: Grow farmer power, farmer networks and locally led, flexible and outcome-based approaches like Olmstead County Soil Health Program

***Response 13-3**:* See response to common topic 2 (education, incentives, and networking).

COMMENT LETTER 14. JANE DOW

Comment 14-1: I am impressed that you emphasize using cover crops, no till, diversification, rotational grazing to reduce nitrogen and phosphorous run off in section xxiv (water shed based strategies). I hope you are giving incentives to farmers to make the transition from conventional farming practices to organic using compost instead of chemical fertilizers and natural pesticides like Neem oil instead of chemical fertilizers. Educating farmers on the fact that they save money by having less costs for inputs and a higher yield from doing organic farming should be done.

***Response 14-1**:* See response to common topic 2 (education, incentives, and networking).

Comment 14-2: Please make livestock farmers practice rotational grazing to restore the soil to health and decrease contamination of air and water. Don't allow manure pools anymore which means limit the number of animals and no confined operations.

Response 14-2: See response to common topic 1 (regulation).

Comment 14-3: All in all the benefits to our environment and health from using organic farming practices far outweigh the harm caused by conventional farming and are the only path forward if we are to save our planet. That's why strong incentives are needed to encourage farmers to take the risk like monetary incentives and lots of coaching and assistance to them in how to make a successful transition. I hope you allocate funding for that.

***Response 14-3**:* The NRS Team agrees that there are many agricultural practices that protect water quality and provide other ecosystem benefits. The NRS points to CLCs and grazing as critical components to the long-term solution of nutrient pollution. Chapter 5 supports and suggests the expansion of programs that help farmers use these practices.

COMMENT LETTER 15. ELIZABETH JARRETT ANDREW

Comment 15-1: As an urban homesteader and CSA subscriber, I'm a firm advocate for clean water and the farming practices that support it. Small and mid-sized regenerative farmers are leading the way in their rural communities, advancing solutions to nitrate pollution through adoption of diversified cropping systems, conservation tillage, cover crops, perennial crops and rotational grazing. Please add governmental muscle to protecting our waters.

***Response 15-1**:* The NRS includes diversified cropping systems, conservation tillage, cover crops, perennial crops, and rotational grazing as important practices to reduce excess nutrients in waterways; these are emphasized in chapters 5 and 8.

COMMENT LETTER 16. ANGELA ANDERSON

Comment 16-1: This overabundance of manure promotes run-off and groundwater pollution when spread on dead soil, (alive soil needs to be nurtured carefully to maintain its biological health) heavily compromised through compaction by machinery endless monoculture practices and oversaturated by poisonous manure.

Response 16-1: See response to common topic 1 (regulation).

Comment 16-2: All life needs clean water to drink and clean air to breathe. Our local natural resources and the health of our communities should not be sacrificed for the profits of large agricultural enterprises, exploiting our resources only to export their product to countries like China. This unfair, unethical market competition destroys all sustainable practices in service of global enterprise. This 'robbing-Peter-to-pay-Paul' form of resource management is unacceptable and to our communities' detriment.

Response 16-2*:* The 2025 NRS emphasizes sustainable agriculture through consideration of agricultural practices that protect water quality as well as provide multiple ecosystem benefits in Section 5.1.3. Chapter 8 calls for sustained landscape changes in agricultural practices to protect both water quality and Minnesota agriculture into the future.

COMMENT LETTER 17. MARY VOIGHT

Comment 17-1: Please strengthen data collection and reporting requirements for fertilizer retailers by MDA and documentation of nitrogen fertilizer application rates by responsible parties (e.g. crop retailers to MDA).

Response 17-1*:* See response to common topic 1 (regulation).

Comment 17-2: Please build a Small Grain Initiative and a safety net for farmers who want to reduce their N fertilizer application.

Response 17-2*:* See response to common topic 3 (CLC and small grains).

Comment 17-3: Please duplicate the outcome-based approaches like Olmstead County Soil Health Program.

Response 17-3*:* See response to common topic 2 (education, incentives, and networking).

COMMENT LETTER 18. MADELINE NEENAN

Comment 18-1: Strengthen reporting requirements. I want the MN government to protect our drinking water by closely monitoring farm runoff and working with fertilizer retailers and farms to reduce it when it is important to do so.

Response 18-1*:* See response to common topic 1 (regulation).

Comment 18-2: Financially support small farmers trying to do the right thing by supporting research and financial viability of small, innovative farms.

Response 18-2*:* See response to common topic 2 (education, incentives, and networking).

COMMENT LETTER 19. KELSEY FITZGERALD

Comment 19-1: Minnesota does a lot of things right when it comes to preserving the environment and caring about natural resources. We need to do more and lead the way in creating a different type of agriculture system. To that point, we need to change our Ag policies and not support this type of large-scale farming any more. We need to support those who do conservation or grow food in a manner that benefits the rivers and lakes, but also all of the environment including animals and people. We need to create avenues for farmers to sell the different products they grow and encourage diversification.

> ***Response 19-1****:* The 2025 NRS also calls for a change in agriculture systems to achieve more roots in the ground and more cover for more months of the year. Chapter 5 and its appendices provide extensive detail on ways to do this, and Chapter 8 emphasizes that nutrients cannot be reduced without this change.

COMMENT LETTER 20. WILLIAM LYTLE (LOWER MINNESOTA RIVER WATERSHED DISTRICT)

Comment 20-1: We urge you to utilize this draft Strategy as a springboard for: Cooperate towards a standard open-source and open-access data and modeling system so we can work across jurisdictions to coordinate cumulative impacts when reviewing permits.

> ***Response 20-1:*** Your request for open source, open data modeling and permitting system will be forwarded to the interagency Drainage Management Team for consideration.

Comment 20-2: Have watershed-specific models interface with the land use and food, fiber, and fuel produced in the Minnesota River Basin so we can assign fair values across urban, suburban, rural, and industrial supply chains — e.g., regenerative agriculture and payments for ecosystem services.

> ***Response 20-2:*** 2025 NRS Section 4.1.3 details the MPCA water quality credit trading program (https://www.pca.state.mn.us/business-with-us/water-quality-trading). Your comment will be forwarded to MPCA staff working with water quality credit trading.

Comment 20-3: Bringing more funding and innovative strategies to address nutrient and sediment contamination in the Minnesota River Basin.

> ***Response 20-3:*** The NRS Team agrees that additional financial and technical resources, along with innovative technologies and ideas, are needed to address nutrient and sediment pollution issues in the Minnesota River Basin.

Comment 20-4: Help us set an ambitious goal that can be written into our plans, rules, and budgets.

> ***Response 20-4:*** Chapter 2 of the 2025 NRS sets broad goals for nutrient reduction, and a guidance document available through the NRS webpage provides watershed-specific goals for nutrient reduction. MPCA and BWSR will be developing guidance to better connect data and the priorities of the NRS into comprehensive management plans (see Chapter 6).

COMMENT LETTER 21. AMY CORDRY

Comment 21-1: Strengthen data collection and reporting requirements for fertilizer retailers by MDA and documentation of nitrogen fertilizer application rates by responsible parties (e.g. crop retailers to MDA).

> ***Response 21-1****:* See response to common topic 1 (regulation).

Comment 21-2: Build a Small Grain Initiative and a safety net for farmers who want to reduce their N fertilizer application.

> ***Response 21-2****:* See response to common topic 3 (CLC and small grains).

Comment 21-3: Grow farmer power, farmer networks and locally led, flexible and outcome-based approaches like Olmstead County Soil Health Program

> ***Response 21-3****:* See response to common topic 2 (education, incentives, and networking).

COMMENT LETTER 22. THOMAS HANSON

Comment 22-1: I am a homeowner on Goodners lake in Stearns County. I have observed the quality of the water in this lake deteriorate to a point where it's obviously toxic. The farm fields around this lake are green, bountiful, and weed free. Our lake is NOT! I have so many weeds in front of my home I can barely get a boat through them. My State Senator advised me that this lake was on a list to be cleaned up in 2021. Well, I'm still waiting! The farmers around here pipe in all kinds of liquid every spring and fall - who knows what they pipe in. All I can tell the public is that I've watched this lake go from clean to almost unusable. What can be done to help the quality of Goodners lake return to earlier times? Please help this body of water!

> ***Response 22-1:*** This concern has been shared with MPCA staff working in Stearns County who have reached out to Mr. Hanson.

COMMENT LETTER 23. LEE HELGEN (MINNESOTA CROP PRODUCTION RETAILERS)

Comment 23-1: Recognize Farmer Progress – Many farmers are already implementing split applications, cover crops, reduced tillage, precision nutrient technologies, and improved nutrient timing. Recognizing this progress helps build trust, confidence, and momentum for future adoption.

> ***Response 23-1:*** Farmer progress is noted in the 2025 NRS in chapters 1, 2, 3, and 5 and is included as a necessary building block for future progress in Chapter 8.

Comment 23-2: Promote Flexibility – Nutrient management must remain adaptable to soils, weather patterns, and crop rotations. Flexibility allows farmers and retailers to tailor practices to local conditions and maximize both environmental and agronomic outcomes.

> ***Response 23-2:*** Chapter 5 of the 2025 NRS underscores the importance of responding to local conditions.

Comment 23-3: Invest in Research and Demonstration – Minnesota-based research and on-farm trials are essential to refine recommendations. Ag retailers are willing partners in hosting demonstrations and helping transfer results directly to farmers.

> ***Response 23-3:*** The 2025 NRS calls for continued research and demonstration; it also identifies gaps in the current literature for specific agricultural practices as noted in Chapter 5 and appendices 5-1 and 5-2.

Comment 23-4: Partner with Ag Retailers – Retailers are the trusted first point of contact for most farmers. Explicitly involving them in education, technical support, and BMP adoption can help scale conservation practices more effectively and rapidly.

> ***Response 23-4:*** The role of agricultural retailers is noted in NRS Chapter 5; an additional reference was added in Chapter 6.

Comment 23-5: Expand Incentives and Risk Protection – Programs that reduce economic risk, such as cost-share opportunities, crop insurance flexibility, and indemnity options, will encourage broader and faster adoption of nutrient management practices.

> ***Response 23-5:*** The NRS Team will coordinate with state and federal agencies and UMN to promote programs and approaches to reduce risk while reducing nutrient loss to waters.

Comment 23-6: Encourage Continuous Improvement – The strategy should reward progress and innovation over time rather than relying on one-size-fits-all requirements. A collaborative, incentive-based approach will deliver better results than additional regulation.

> ***Response 23-6:*** The 2025 NRS documents the value of collaborative, incentive-based approaches in sections 5.2 and 5.3.

COMMENT LETTER 24. KELLEY STANAGE

Comment 24-1: The 2025 Minnesota Nutrient Reduction Strategy must establish mandatory groundwater quality targets below 10 ppm nitrate and implement strict regulatory enforcement to address this ongoing public health crisis.

Establish groundwater quality targets that address the problem directly:

- Reduction of nitrate levels to below 10 ppm in Southeast Minnesota groundwater
- Specific timelines with interim milestones for achieving these targets
- Consequences for failure to meet established deadlines

> ***Response 24-1:*** While the 2025 NRS does set goals of nitrate levels below 10 mg/L in southeastern Minnesota groundwater by 2040 (see Section 2.2.4), it is not a regulatory framework and does not have the authority to establish consequences for a failure to meet deadlines. The NRS points to the market support for crops that will reduce nitrate leaching loss as the primary means of making progress toward reduction goals.

Comment 24-2: Reduce reliance on modeling:

- Use actual private well test data to determine levels of target achievement
- Increase monitoring wells in Southeast Minnesota
- Locate monitoring wells near industrial-scale operations
- Establish well test frequency, or use continuous monitoring
- Mandate monitoring wells where infractions have occurred
- Make well test data easily accessible to the public

> ***Response 24-2:*** The NRS Team agrees that additional wells for ambient monitoring would be beneficial, as is stated in Chapter 3. At the same time, the practicality and affordability of additional monitoring are limited. The 2025 NRS is not a regulatory program and can only recommend well location, testing, and frequency. All groundwater analysis in the NRS is based on monitoring data (see Section 3.3.1 for complete information sources). Private well data was included in NRS analyses through the MDA Township Testing Program. All groundwater data sources used in the NRS are available to the public through the agency-specific webpages. For a list of publicly available data sources, see response to common topic 4 (data and monitoring).

Comment 24-3: Implement scaled regulatory enforcement. Industrial-scale operations pose the greatest threat and must face proportional consequences. Large row-crop operations and large feedlots / CAFOs should operate under strict, mandatory regulation, monitoring and reporting with penalties proportional to scale and severity of violations.

Response 24-3: See response to common topic 1 (regulation).

Comment 24-4: Promote sustainable agricultural practices:

- Incentivize pasturing animals and rotational grazing over concentrated animal feeding operations
- Mandate cover crops in vulnerable watersheds during critical periods to reduce fertilizer and manure runoff
- Require fertilizer management plans with third-party verification for both commercial fertilizers and organic manure applications

Response 24-4: The 2025 NRS points to pastures, rotational grazing, cover crops, and fertilizer management as critical for managing excess nutrients. Proposed scales of adoption of these practices are described in chapters 5 and 8. Regulations cannot be established via the NRS. See response to common topic 1 (regulation).

Comment 24-5: Restructure regulatory authority:

- Transfer fertilizer regulation authority to MPCA for water quality protection
- Maintain MDA's role in agricultural promotion and technical assistance
- Establish independent oversight of agricultural water quality impacts

Response 24-5: Restructuring regulatory authority is beyond the scope of the NRS and rests with the state legislature.

Comment 24-6: Create dedicated funding:

- Establish a cleanup fund financed through the legacy fund and fees on large-scale agricultural operations based on nitrate loading potential
- Increase technical assistance funding for implementation of sustainable practice
- Fund independent water quality monitoring

Response 24-6: While the 2025 NRS is not a funding vehicle, the NRS Team believes that the use of the 2025 NRS and NRS tools can help determine where funding can most effectively reduce excess nutrients.

Comment 24-7: Require transparency:

- Public reporting of all nitrate monitoring data
- Annual progress reports with specific metrics
- Public accountability measures for regulatory agencies

Response 24-7: See response to common topic 4 (data and monitoring).

Comment 24-8: The 2025 Minnesota Nutrient Reduction Strategy represents a critical opportunity to implement the mandatory regulations and enforcement mechanisms necessary to protect Southeast Minnesota's groundwater.

Response 24-8: See response to common topic 1 (regulation).

Comment 24-9: Southeast Minnesota residents deserve the same clean drinking water enjoyed by all Minnesotans. This Strategy must deliver a strategy to make that basic right a reality.

Response 24-9: The NRS Team agrees and believes the steps laid out in Chapter 8 will, if fully implemented, help ensure clean water for all Minnesotans.

COMMENT LETTER 25. GARY DUKES

Comment 25-1: The NRS could incorporate more rules and regulations, especially for critical source areas. These are areas that contribute a disproportionately high amount of nutrients due to factors like karst geology, vulnerable soil types, proximity to waterways, and specific agricultural practices. For example, the state could implement stricter rules on fall manure and fertilizer application, as it has begun to do in a limited capacity in southeast Minnesota with its Groundwater Protection Rule. Strengthened "No-Till" and "Cover Crop" Mandates: The NRS recognizes the importance of practices that keep the soil covered year-round. An effective strategy would move beyond voluntary encouragement and into stronger, more widespread mandates for practices like reduced tillage and the use of continuous living cover crops, especially in high-risk watersheds.

> ***Response 25-1:*** See response to common topic 1 (regulation).

Comment 25-2: Emphasize continuous living cover. The NRS 2025 draft has rightly identified continuous living cover as a cornerstone of nutrient reduction. This is a crucial and transformative shift. The strategy needs to go all-in on this concept, mandating the widespread adoption of winter annuals like pennycress and camelina, as well as perennial crops. This would create a system that not only sequesters nutrients but also offers new economic opportunities for farmers.

Support for innovative cropping systems. The NRS could provide technical assistance for farmers to experiment with and adopt new cropping systems that are inherently less nutrient-intensive. This includes using precision agriculture technologies and supporting the development of markets for new, low-input crops.

Soil health. A healthier soil ecosystem is better at retaining water and nutrients. The strategy should more explicitly link nutrient reduction to soil health, providing incentives for practices like diverse crop rotations, reduced tillage, and the application of compost and other organic matter. This not only reduces nutrient runoff but also improves agricultural productivity and resilience to climate change.

> ***Response 25-2:*** The 2025 NRS highlights CLC, innovative cropping systems, and soil health practices in Chapter 5 and appendices 5-1 and 5-2.

Comment 25-3: An effective strategy is only as good as its ability to track progress and adapt. The NRS needs to enhance its data and monitoring capabilities.

> ***Response 25-3:*** Chapter 7 in the 2025 NRS lays out plans and next steps for building an NRS dashboard to make progress tracking clear and easily accessible.

Comment 25-4: Improved water quality monitoring. While Minnesota has a significant monitoring network, the NRS could benefit from a more strategic placement of real-time sensors in watersheds to provide more granular and immediate data on nutrient loads. This would allow for faster feedback on the effectiveness of on-the-ground practices.

> ***Response 25-4:*** See response to common topic 4 (data and monitoring).

Comment 25-5: Better practice tracking. It is often difficult to get an accurate picture of the extent and location of voluntary conservation practices. The NRS could invest in better data collection technologies, such as satellite imagery and remote sensing, to track the adoption of cover crops and reduced tillage more efficiently and at a larger scale. This would help to close the gap between on-the-ground efforts and the observed changes in water quality.

> ***Response 25-5:*** One of the next steps, once the 2025 NRS is published, is to work on data collection techniques based on satellite imagery and remote sensing. UMN and BWSR have been

utilizing remote sensing techniques since 2016 to quantify fall cover crop emergence and spring crop residue levels. This work continues to be improved over time. The 2025 NRS identifies a future effort to develop a living cover index based on remote sensing technology, and the NRS Team members and UMN have held preliminary discussions on this work. Some federal funds to support this work are available, and the underlying framework for this project will be outlined by the end of 2026. MPCA plans to provide updates on all future supporting research and analysis related to the NRS on the NRS website.

Comment 25-6: Raise taxes on fertilizer. Raise taxes on fertilizer, including nitrogen fertilizer, to fund programs for cleaning up nitrogen contamination and programs to reduce fertilizer use in the first place, as well as other programs (see above). In this way it is polluters that pay.

Response 25-6: See response to common topic 1 (regulation).

Comment 25-7: Nutrient reduction is not an isolated issue. The NRS needs to be more formally integrated with other state plans, especially those related to climate change, water, and soil health. By aligning these goals, the state can maximize co-benefits. For example, healthy soils that sequester carbon also reduce nutrient runoff in water. Furthermore, nitrate runoff and nitrate leaching from farm fields can naturally convert into nitrous oxide, a very potent greenhouse gas.

Response 25-7: The 2025 NRS was developed in keeping with the Minnesota Climate Action Framework, and the Minnesota Environmental Quality Board and staff from numerous state agencies working on climate resilience were consulted during various stages of development. Nutrient-reducing practices that result in multiple benefits are extensively covered in Section 5.1.3.

Comment 25-8: We need individual nutrient reduction strategies for these lakes and other lakes like them, both urban and rural.

Response 25-8: Individual lakes are not the scope of the 2025 NRS. However, local lake needs can be addressed through both the WRAPS Update process and Comprehensive Watershed Plans developed through the One Watershed, One Plan program (as detailed in Chapter 6). The NRS-related *Watershed nutrient loads to accomplish Minnesota's Nutrient Reduction Strategy Goals* document can also be used in developing specific lake nutrient plans.

COMMENT LETTER 26. RENEE KEEZER (WHITE EARTH NATION)

Comment 26-1: The White Earth Nation supports and urges MPCA to incorporate the following policy recommendations [for] Private homes. More outreach and education needs to be conducted on the products that people use in their homes that are sources of nutrient pollution. Many laundry, dish, and car washing soaps contain a form of phosphates which are carried from our homes into the wastewater system. Another common source of nutrient pollution is pet waste.

Education on the importance of cleaning up pet waste in their yards or neighborhoods. Pet waste contributes to nitrogen, phosphorus, parasites, and bacteria to water bodies when it is not disposed of properly. Pet waste that is not properly disposed of can lead to conditions in local water bodies that are unsafe for human recreation. A potential solution could be implementing ordinances to ensure pet waste is not washed into waterways.

Response 26-1: The NRS Team agrees on the importance of these topics. Many educational resources that reference these topics are listed in Chapter 4, including the *Minnesota Stormwater Manual*.

Comment 26-2: Many Minnesotans use on-site septic systems, decentralized wastewater systems. These systems can malfunction or fail and easily become a source of nutrient pollution to local waterways. The White Earth Nation suggests more restrictive laws on septic systems including regular testing requirements for functionality to ensure the system is operating as intended.

> ***Response 26-2:*** While new septic system regulations are beyond the scope of the NRS, Section 5.5.2 documents the extensive progress made in addressing and fixing failing septic systems in Minnesota through existing regulatory and incentive-based programs at the state and local levels.

Comment 26-3: Shoreline properties can have a significant impact to nutrient loading in water bodies. Educating property users and owners as well as implementing regulations for the prohibition of use of certain nutrients for lawn care on shoreline properties would decrease the amounts of nutrients that runoff into the waterbodies and waterways. The majority of shoreline properties are at a slope towards the waterways, With this type of topography, any amount of precipitation would result in nutrients applied to lawns and gardens running off into the water.

> ***Response 26-3*:** The NRS Team agrees that shoreline properties can be an important part of nutrient loading as well as part of the solution to the problem. The scale of the 2025 NRS is not at the individual property level; however, many programs are available that provide outreach on this topic, and they are referenced in chapters 4 and 5.

Comment 26-4: Wastewater treatment facilities are one of the largest regulated discharge sectors in the United States with over 17,200 permitted facilities nationwide. Wastewater treatment facilities are significant sources of nitrogen and phosphorous from human waste, food, and certain soaps and detergents. With this being a point source pollution that is readily regulated, White Earth suggest implementing the Wastewater Nitrogen Reduction Strategy fully, with phased permit limits, optimization, and eventually a statewide TN discharge restriction of 10 mg/L.

> ***Response 26-4*:** The NRS Team agrees that the 2025 NRS goals cannot be met without including permitted sources. Chapter 4 details the impacts of the Wastewater Nitrogen Reduction Strategy on statewide nutrient reduction potential.

Comment 26-5: Stormwater runoff in urban and suburban areas includes nutrients from household uses such as lawn and garden fertilizers, pet waste, and detergents along with other pollutants such as trash, bacteria, oil, sediment, and other household or pharmaceutical chemicals. During periods of heavy rainfall or snowmelt some wastewater treatment plants can overflow and discharge untreated sewage directly into waterways-this is known as combined sewer overflows (CSOs). Roadside storm drains often directly lead to local streams, rivers, or waterbodies so anything that flows into them often makes it to local waterways without any treatment. White Earth suggest expanding stormwater BMPs and green infrastructure in urban growth areas, prioritizing nutrient hotspots.

> ***Response 26-5:*** Chapter 4 highlights the need for continued stormwater management in urban areas and identifies the One Watershed, One Plan program, as well as the many seven-county Twin Cities Metro Area water management plans, as a means to do this.

Comment 26-6: Agriculture. The current voluntary BMP of a 50 foot buffer does not adequately mitigate runoff and erosion issues. There needs to be more extensive buffer systems implemented. A 50 foot buffer of turf grass is not going to filter nutrients and pesticides. The buffers need to have more phytoremediation potential. A protective buffer would include native grasses with longer root systems, trees, and shrubs. This type of buffer would reduce the sediment erosion that enters the waterways and

waterbodies and the extensive root Systems would absorb a significant amount of nutrients before they reach the water.

Response 26-6: Comment has been noted and shared with BWSR Buffer Program staff.

Comment 26-7: Drain tile is a growing concern for the White Earth Nation. We have expressed our concerns to the watershed districts in the issuance of these permits. There has not been enough research conducted on the impacts of drain tile, nutrient and pesticide movement as well as the impacts of drain tile on ground water recharge. This seems like a new fad in northern Minnesota. We have seen an increase in drain tile permits and installation of drain tile in the region and on the reservation. This also introduces a new source of other contaminants including plastics that will eventually break down to microplastics in the ground. There needs to be regulations for testing and filtration of the effluent from the drain tile pumps. White Earth supports drainage water management and treatment practices in tile-drained areas, paired with incentives for adoption. With agriculture being the largest contributor to nutrient pollution, it would be efficacious to make voluntary BMPs and mandatory Statutes. This would include larger buffers and more extensive laws on the application of nutrients. Currently neither the MPCA or the MDA regulates nutrients aside from the application of manure. Without regulation of key agricultural inputs that are a source of pollution for our waters, particularly nitrates and phosphorous, the chances of reaching Minnesota's nutrient reduction goals are next to zero.

Response 26-7: The NRS Team agrees that more research is needed on agricultural drainage impacts and the effectiveness of novel drainage water management practices and has listed that need in Chapter 5 and appendices 5-1 and 5-2. See the response to common topic 1 (regulation) for more information.

Comment 26-8: Collaboration. Minnesota’s land use and land cover has changed immensely in the past 100 years. In the early 1900s, after the passing of the Nelson Act, Dawes Act, Steenerson Act, and Burke Act, White Earth Nation saw significant changes in the landscape. Thousands of acres of previously forested land was converted to agriculture. The changes to the land, have negatively impacted our environment, water quality, and ways of life. Prioritizing conversion of agricultural lands that are no longer utilized back to forested lands or native prairies would improve water quality by reducing the amount of erosion of the fields and associated runoff. White Earth suggests the MPCA collaborate with the MN DNR, BWSR, and USDA to work together more efficiently to achieve Minnesota's Nutrient Reduction Strategy goals. White Earth suggests the MPCA collaborate with NRCS to provide and accelerate adoption of continuous living cover (CLC) crops. This is essential for achieving nitrogen reduction goals. We suggest expanding Minnesota's Ag Water Quality Certification Program and soil health initiatives to reach more producers.

Response 26-8: The NRS working groups will continue to collaborate with these organizations and many others, including Tribal Nations, to implement the 2025 NRS goals. Plans for scaling up CLC are documented in chapters 5 and 8, along with suggestions to expand the Minnesota Agricultural Water Quality Certification Program (MAWQCP).

Comment 26-9: Stream bank stabilization. White Earth Nation encourages increased technical and financial assistance for streambank stabilization and erosion control, which contribute substantially to phosphorous loads. White Earth Nation suggests that streambank stabilization programs should be offered to Animal Feeding Operations that have riparian areas which are impacted by their farming practices.

Response 26-9: Language has been added to Section 5.5.3 about targeting streambank stabilization programs for animal operations with riparian areas.

Comment 26-10: Continuing research, innovation, and monitoring. White Earth Nation suggests to continue strong investment in LIMN research and demonstration projects on nutrient reduction practices and new technologies, expand nutrient recovery research in wastewater and agriculture to make marketable byproducts. Maintain and expand river load monitoring and modeling through 2040 and beyond to track progress.

> ***Response 26-10:*** These recommendations are part of the key messages of the 2025 NRS in chapters 2, 3, 4, and 5.

Comment 26-11: Funding and incentives. White Earth Nation suggests developing a long-term funding strategy beyond the 2034 expiration of the Clean Water Legacy Amendment. Engage private industry, agribusiness, and landowners with incentives and market- based approaches to reduce reliance on public funds and support public-private partnerships to scale up conservation and nutrient reduction investments.

> ***Response 26-11:*** Developing a long-term funding strategy and economic analysis are part of the 2025 NRS next steps in Chapter 8.

Comment 26-12: Equity, awareness, and engagement. White Earth Nation suggests increased outreach to landowners and communities, especially absentee landowners, using trusted networks like SWCDs, NRCS, and agronomists to promote public awareness of nutrient reduction successes to build support and participation, and ensure Tribal and community engagement in nutrient reduction planning and implementation with early and often consultation, coordination, and collaboration.

> ***Response 26-12:*** Increased outreach is necessary to achieve 2025 NRS goals, and outreach to absentee landlords is identified as a key need in chapters 5 and 8.

COMMENT LETTER 27. MAYA KORB (NATURAL RESOURCES DEFENSE COUNCIL, ON BEHALF OF MULTIPLE ORGANIZATIONS)

Comment 27-1: In an effort to support MPCA in achieving these [nitrogen] goals, we urge the agency to advance data collection and reporting approaches within existing programs and to introduce additional policies or programs that can help ensure that the state's downstream nitrogen reduction targets are met by 2040 and that significant progress is made to meet drinking water and aquatic life standards within the state.

> ***Response 27-1:*** The NRS Team agrees that additional progress tracking for the 2025 NRS goals is needed. An NRS Dashboard will be developed after publication of the 2025 NRS to help make nutrient reduction information more readily accessible. Federal funds are available to support future work. Once the 2025 NRS is finalized in January 2026, an interagency group will begin working on this task (see Chapter 7 for timelines).

Comment 27-2: In the Draft NRS, MPCA targets cropland nitrogen reductions over the next 15 years through three main pathways: the University of Minnesota (UMN) Continuous Living Cover campaign, agriculture improvement programs (e.g. the Agricultural Water Quality Certification Program), and increased research and development. These strategies build on existing efforts focused on developing and adopting effective best management practices through education and incentive-based voluntary approaches. To estimate progress, the Draft NRS relies on proxy indicators for nitrogen pollution reduction: theoretical estimates of nitrogen reduction for each BMP and the number of acres adopting a practice.

Response 27-2: The 2025 NRS cites the UMN Forever Green Initiative as an example of diversifying cropping systems in Minnesota. However, it is the change in cropping systems that is needed to achieve lasting nutrient reduction, not the specific program.

The 2025 NRS uses monitoring data from permanent monitoring stations in streams and rivers throughout Minnesota to calculate actual measured nitrogen and phosphorus concentrations in the Mississippi River, the Red River, and Lake Superior. The application of monitored data is extensively documented in Chapter 2 as well as in appendices 2-1 through 2-3.

For evaluating nutrient reduction potential from conservation practices, the 2025 NRS is constrained to use models and literature values to estimate load reductions from various scales of adoption of BMP combinations. These estimates are an integral part of the strategy to estimate progress.

Comment 27-3: The Draft NRS leans heavily on a 2025 UMN literature review. The literature looks at four practice types where better nitrogen management can be scaled up, including nitrogen fertilizer management practices, cover cropping, land use change to perennials, and conservation drainage practices. These in-field management practices have a wide range of nitrogen reduction potentials that are thoroughly explored and documented in the literature review. However, to ensure that MPCA can meet its targets, these estimates of nitrogen reduction efficiencies are not sufficient to ensure MPCA can meet its targets. There needs to be greater focus collecting in-field practice performance data.

Response 27-3: As detailed in Appendix 5-1, the UMN literature review relied on monitored data to calculate nutrient reduction efficiencies of each BMP and specifically excluded modeling studies.

Comment 27-4: MPCA also rolled out the BMP Effects Estimator Tool (BEET), which utilizes practice performance estimates and acreage enrolled to report an estimate of the load reductions to water from the adoption of BMPs through local, state, and federal programs. The tool reports that since 2014, over 4 million acres of land have been treated by new practices adopted through government programs (roughly 18% of cropland). The tool estimates that in the last 19 years, BMP adoption has only resulted in between 4-5% of nitrogen reductions at the watershed level. Not only has practice adoption resulted in marginal water quality improvements, but MPCA is not collecting the data needed to ground-truth whether these practices are working in the field. Without outcomes-focused metrics, policymakers cannot determine or track whether programs are reducing nitrogen pollution in a meaningful way.

Response 27-4: The BEET Planner and Tracker are tools based on existing HSPF models. They can calculate outcomes based on information input by users. Consequently, the BEET tools were used in the 2025 NRS development to test if the nutrient trend information determined from monitored water quality data was correlated to the reported number of government-funded BMPs installed. The numbers generated by the BEET tools closely matched the reported, monitored nutrient reduction results. This analysis provided validation for the BEET tools. Please see Section 2.6 for an extensive description of this analysis.

Comment 27-5: Tracking acres enrolled and relying on theoretical estimates of nutrient reductions from BMPs does not help MPCA determine if its nutrient reduction programs are effective. Instead, MPCA must consider collecting and publishing data which take an outcomes-focused reporting approach – focusing on measuring, monitoring and reporting nutrient reductions at spatial scales that are relevant to groundwater quality in nearby wells, which is often at the field or per-acre level.

Response 27-5: Estimates of nutrient reduction were based on the findings of the UMN literature review of agriculture practices, which specifically excluded modeled studies. Chapters

2 and 3 of the NRS are based on outcome-focused monitoring. However, the scale, because of the statewide focus of the NRS, was on major river basins and not on local drinking water wells. The spatial scale needed for addressing local watersheds and individual drinking water wells is found in the WRAPS as well as the Comprehensive Watershed Management plans developed through the One Watershed, One Plan program. On a minor watershed scale, MPCA is working with local and state partners to pilot effectiveness monitoring of implemented practices for long-term federal Clean Water Act Section 319 program-focused projects. The 2025 NRS is intended to be used in cooperation with those programs to achieve nutrient reductions at both the statewide and local scale. This question of scale is addressed in detail in Chapter 6.

Comment 27-6: MPCA should coordinate with the Minnesota Department of Agriculture (MDA) to require nutrient management plans for all cropland farmers, similar to what is required by MPCA of livestock farmers through Manure Management Plans. These plans should be submitted to a state agency (MDA or MPCA) and used to track progress on fertilizer management approaches, including overall application rates. Additionally, agencies need to employ occasional field audits of BMP effectiveness, to better track outcomes associated with nutrient reduction BMPs. For example, farms enrolled in programs like the Agricultural Water Quality Certification Program should be subject to occasional field audits, where water and soil data can be measured to track BMP effectiveness. We also support the recommendation of the Nitrate Working Group to require collection of finer scale fertilizer sales reporting, moving from the township to field scale, in areas where groundwater vulnerability is high.

Response 27-6: See response to common topic 1 (regulation).

Comment 27-7: MPCA should expand the tracking of groundwater and well testing. This data should be publicly accessible and available similar to data collection and reporting for nitrates in rivers and streams throughout the state. This should also involve more regular groundwater and well testing, particularly in vulnerable groundwater areas.

Response 27-7: The NRS team agrees that more ambient well monitoring would be helpful and that recommendation, contingent on available funding, is included in chapter 3. For a list of publicly available data sources, see response to common topic 4 (data and monitoring).

Comment 27-8: We urge MPCA to pursue in-field nutrient reduction measures for croplands, focusing major efforts on limiting manure application rates, and coordinating with MDA to do the same with chemical fertilizer.

Response 27-8: See response to common topic 1 (regulation).

Comment 27-9: The literature review conducted by UMN estimated that bringing application rates down to the maximum return to nitrogen level would reduce nitrate leaching by 15%. Yet, the Draft NRS concluded that there is "limited ability to reduce large-scale fertilizer rates by an amount expected to substantially decrease nitrate losses to waters". The extent of overapplication indicates that application rate reductions are possible without reducing yield, and that MPCA and MDA should implement programs that limit nitrogen application rates to UMN recommended rates.

Response 27-9: The estimated 15% reduction pertains to the estimated cropland acres currently receiving overapplication of nitrogen and is not a statewide value. Nutrient management is an important part of the 2025 NRS; this is described in detail in sections 5.1 and 5.5.1.

Comment 27-10: To successfully reach the MPCA's goal of a nitrate load reduction of 40% by 2040 in Minnesota's rivers and vulnerable groundwater, we recommend that the MPCA consider alternative approaches to managing nutrient pollution from croplands, including establishing numeric limits on

fertilizer applications. A literature review prepared by Dr. Daniel Rath of the Natural Resources Defense Council (NRDC) for a California proceeding shows how Denmark, the Netherlands, Germany, and parts of Belgium have improved their water quality after setting numeric limits on fertilizer applications under the European Union's (EU) Nitrates Directive. The Nitrates Directive requires countries in the EU to designate Nitrate Vulnerable Zones (NVZs) with regulatory action programs, establish voluntary BMPs for all regions, and limit the application of nitrogen from manure to 170 kg N/ha.

> ***Response 27-10:*** Thank you for this resource. The NRS team will review it for applicability and consider it for future applications.

Comment 27-11: Minnesota should adopt regulatory approaches in the most at-risk areas of the state.

> ***Response 27-11:*** See response to common topic 1 (regulation).

COMMENT LETTER 28. ROBERT SIP (RED RIVER WATERSHED MANAGEMENT BOARD)

Comment 28-1. Best management practices (BMP). The two BMP documents below have been developed specifically for the Red River Basin (RRB) and should be referenced in the draft Strategy, as BMPs in one part of the State of Minnesota may not be appropriate for other regions.

- Best Management Practices for Controlling Runoff From Agricultural Land, RRB Flood Damage Reduction Work Group (FDRWG), Technical Paper NO. 3, Updated July 2021. This technical paper can be found in the "Reference Documents" section of this website: https://www.rrwmb.org/fdrwg.
- Agricultural Practice Effectiveness for Reducing Nutrients in the Red River Basin of the North, October 2020. This document can be found at the following link: https://www.redriverbasincommission.org/beneficial-management-practices.

> ***Response 28-1:*** Links to those documents and a descriptor paragraph have been added to Chapter 5. *Note:* Invalid link noted in first bullet above has been replaced with https://www.rrwmb.us/fdrwg.

Comment 28-2: The RRWMB specifically requests that MPCA acknowledge in the Strategy that regional differences in BMPs occur. In addition, the International Red River Watershed Board (IRRWB), under the International Joint Commission (IJC), is in place to guide water quality goals at the international border along with its partners. Deference should be given to the IRRWB and IJC as these entities continue their work in the RRB.

> ***Response 28-2:*** The regionality of BMPs is discussed in detail in Chapter 5, including research gaps to address. The 2025 NRS was developed to provide a framework to meet the water quality goals laid out by the International Red River Watershed Board and the International Joint Commission.

Comment 28-3: RRB Flood Mitigation — Water Storage Study on Water Quality. The study is being conducted over a five-year period, which commenced in 2024, and is currently underway in the RRB, with the RRWMB acting as the fiscal agent and the RRB FDRWG managing the Study, which is funded through the Minnesota LCCMR. The Study has three main purposes that are discussed on the next page:

- The outcomes of past flood mitigation — water storage projects to better understand how well they are achieving their original objectives for natural resource enhancement.
- Determine whether re-investment in existing project features, and/or adjustment of project operations, could improve outcomes at existing projects.
- Improve the planning, design and operation of new projects that will be developed across the RRB in the future.

We suggest recognition of this effort in the Strategy to illustrate that such efforts are underway and will yield useful data and information.

> ***Response 28-3:*** While water storage and impoundment expansions are already detailed within the 2025 NRS, mention of this study has been added to Section 5.1.2. The Legislative-Citizen Commission on Minnesota Resources-funded study will be helpful long-term to provide additional data and research on the water quality benefits of large-scale water storage impoundment projects and will be important to add the current limited availability of research related to this practice.

Comment 28-4: Suggested stand-alone chapter for flood mitigation — water storage. While there is discussion of impoundments in the Strategy on Pages 49, 51, 164, 165, 182, 194, 214, and 286, the RRWMB suggests a separate chapter of the Strategy could be designated to illustrate the status of flood mitigation — water storage projects across the State of Minnesota.

> ***Response 28-4:*** Adding an additional chapter to the 2025 NRS is not possible at this time. However, the NRS Team agrees this is an important topic in need of additional consideration. A reference has been made to the report "Involvement in Agricultural Land Protection in the Red River Basin of Minnesota" in Section 5.4.2, which was published after the public notice of the 2025 NRS. This topic will be shared with the interagency Drainage Management Team for continued discussion.

Comment 28-5: We suggest more information be included in the Strategy to illustrate regional differences in how drainage systems are managed.

> ***Response 28-5:*** This topic will be forwarded to the interagency Drainage Management Team (DMT) for future consideration.

Comment 28-6: It is suggested that the MPCA consider including discussion of how regional programs such as the RRWMB Water Quality Program can have positive effects upon water quality.

> ***Response 28-6:*** The interagency NRS team has reviewed the regional programs section in Chapter 5 and has included some additional content about the Red River Watershed Management Board's Water Quality Program.

Comment 28-7: Precision agriculture. We believe that a high percentage of farmers in the RRB use LiDAR data, precision agriculture, variable rate fertilizer application, certified crop advisors, soil nutrient testing, and the 4Rs of fertilizer application that relate to timing, placement, amount, and source. The RRWMB recommends that case studies be included in the Strategy to illustrate how advanced technology is being used by Minnesota farmers.

> ***Response 28-7:*** The NRS Team does not have the capacity to complete the suggested content additions to the 2025 NRS. Producers across Minnesota are implementing novel and innovative practices that help reduce nutrient losses from agricultural fields. The NRS Team will look to provide examples of farmers implementing cutting-edge nutrient reduction practices in future outreach materials, newsletters, and reports.

Comment 28-8: 1998 RRB Mediation Agreement. The MPCA along with the Minnesota Board of Water and Soil Resources (BWSR), Minnesota Department of Natural Resources (DNR), Minnesota Department of Health. Minnesota Department of Agriculture (DA), and the RRWMB recommitted to the Mediation Agreement in January 2021. These five state agencies and the RRWMB recommit to the Mediation Agreement and process approximately every five years. We recommend reference in the draft Strategy

to the Mediation Agreement and how regional agreements are used to work on water quality issues using a regional approach.

> ***Response 28-8:*** The Mediation Agreement for the Flood Damage Reduction Work Group (FDRWG) provides a regional framework for addressing flooding and natural resource issues in the Red River Valley. Reference has been made to the FDRWG in Section 6.5.2 related to regional approaches to meet water quality issues.

Comment 28-9: Funding for water storage. The current known need for the State of Minnesota Flood Hazard Mitigation Grant Assistance Program was approximately $140 million as of April 2025. We recommend that the MPCA work with DNR, BWSR, and the MDA and cooperatively with the RRWMB and other local governmental units statewide on a comprehensive strategy to fund water storage needs across the state.

> ***Response 28-9:*** A coordinated, statewide approach to water storage is an important topic for the State of Minnesota. This suggestion was shared with the interagency NRS Steering Team and the interagency Drainage Management Team for future consideration.

COMMENT LETTER 29. MEGHAN ANDERSON (FRIENDS OF THE MISSISSIPPI RIVER)

Comment 29-1: The Draft 2025 NRS notes that achieving our water quality goals will require 7.8 million acres of CLC cropping systems in Minnesota. Given the staggering $1 billion per year cost estimate for implementing the recommendations of the MRS, we ask the MPCA to focus primarily on market-based, rather than traditional cost-share-based, CLC strategies, and to differentiate between the two categories throughout the NRS.

> ***Response 29-1:*** The 7.8 million acres of CLC is a number used in one possible scenario of combinations of practices to achieve nutrient reduction goals; it is not a specific recommendation of the number of acres of CLCs required to meet NRS goals. The NRS Team agrees that greater emphasis should be placed on market-based CLCs and has adjusted the language in chapters 5 and 8.

Comment 29-2: Specifically, we recommend enhancing the market-based CLC focus in the NRS through the following adjustments:

- Include both "Market-based Continuous Living Cover" and "Continuous Living Cover" in the glossary. Continuous Living Cover (CLC) refers to the presence of living plants aboveground and/or living roots in the soil year-round. CLC can be achieved with perennial species or rotations of summer and winter annual species. Market-based Continuous Living Cover refers specifically to harvestable CLC crops and cropping systems whose costs of production, processing, and marketing can, in mature markets, be borne by market actors rather than taxpayers.
- Distinguish between market-based and non-market-based CLC strategies in text and tables wherever appropriate.
- Distinguish between market-based and non-market-based CLC strategies when evaluating the cost of implementation, including scenarios where long-term adoption of market-based CLCs can be achieved through market forces rather than direct state assistance. For example, Table 5-4 (p.177) lists Kernza as incurring a $63/acre lifecycle cost. While early-adopter Kernza growers in MN are currently eligible for risk mitigation and ecosystem services payments via the of Minnesota's Forever Green EECO Implementation program, perennial grains like Kernza are ultimately intended to be profitable on the open market, meaning they will not require such state funding.

Response 29-2: Please also see the response to Comment 29-1. The 2025 NRS does point to market-based CLCs as a foundational part of lasting nutrient reduction. The glossary has been updated, and language has been added where appropriate to distinguish between market-based and non-market-based CLCs. There was insufficient economic data to include the difference between the cost of market-based and non-market-based CLCs in scenario development, but future updates will be made to the NP-BMP tool, and more information on market-based CLCs will be obtained during NRS implementation.

Comment 29-3: We strongly support the creation of a statewide CLC Campaign and Task Force. Such an initiative can help market-based CLC systems reach self-sustaining market parity with conventional systems through increased support for market and infrastructure development, crop research and farmer assistance. To optimize progress toward NRS goals, we recommend the following:

- Revise the proposal to refer to a "Market-Based Continuous Living Cover Campaign and Task Force" to emphasize the unique and timely opportunity to prioritize market-based CLC cropping systems rather than traditional cover crop cost-share programs or land set-asides.
- Design the Campaign and Task Force in consultation with the University of Minnesota's Forever Green Partnership, a collaborative that unites members from private, public, and advocacy sectors around a common interest in increasing CLC in agriculture to capitalize on its many economic and environmental benefits.
- Revise the goal of the campaign to specify a two-phase CLC strategy: Phase I (near term): 1 million acres of CLCs [and] Phase II (long term): 7.8 million acres of CLCs.

We support the development of an agricultural CLC index to track annual changes in landscape coverage over time, and support including that information in a future NRS dashboard. One potential model is found in our 2023 "Putting Down Roots" report (see Figure 6, page 54) that measures the proportion of the year that Minnesota's crop portfolio provides living vegetative cover on the landscape (excluding those months when the ground is frozen and accounting for a delay from planting date to establishment of living cover). Coordinate this work with the ongoing Pathways to 1 Million Acres Scaling Study underway through the Forever Green Partnership. Structure the Task Force in a manner that reflects the deep complexity of the market-based CLC commercialization, adoption, and scaling challenges we face.

The Task Force should include perspectives from farmers, agribusinesses, CPG businesses, research institutions, NGOs, lenders and financial institutions, rural development experts, policymakers, and other supply chain actors. As no single stakeholder group has clear lines of sight to a ll of the diverse needs of building emerging markets and industries, no single perspective should dominate the group. Include the MN Departments of Commerce and Employment & Economic Development alongside traditional agricultural and environmental agencies in the CLC Task Force and broader campaign. Consider Task Force subcommittees that may integrate perspectives from a larger variety of voices within a specific interest group.

Include a summary of potential state and non-state funding sources that might be tapped to support the establishment and ongoing operations of the Task Force and CLC Campaign itself.

Response 29-3: The NRS Team has reviewed your suggestions and will include them where possible when work begins on the CLC working group and campaign.

Comment 29-4: Commitment to developing numeric nitrate standards for Class 2 waters. Minnesotans have now waited fifteen years for this work to be completed. The MPCA is well-positioned and sufficiently resourced to complete this long-promised nitrate standard. We urge the MPCA to follow through on its commitment to resume the nitrate standard development process immediately following the completion of the 2025 NRS.

***Response 29-4*:** See response to common topic 5 (aquatic life/nitrate standard).

Comment 29-5: Align CLC research and implementation funding with NRS strategies. We urge the state to align its budgetary ambitions with the highest priority strategies in the NRS. We strongly endorse the NRS's recommendations to invest in novel crop research and recommend placing a major focus on market-based CLC cropping systems that deliver multiple benefits.

We encourage the state to align future legislative appropriations requests with the proportional acreages shown in Fig. ES 12 ("Example scenario showing the magnitude of change needed to achieve nutrient reduction goals in the Mississippi River Basin"). This would elevate market-based CLC programming above other higher-cost, lower-acreage, and lower-impact interventions.

Modify Table 5-1 to include updated information from the University of Minnesota on nitrate reduction efficiencies for winter hardy oilseeds and Kernza, which were listed as "TBD".

Modify Table 5-7 to include a third column that assigns the estimated total costs of each category of activity, along with potential cost savings associated with reduced nitrogen fertilizer application.

The economic analysis referenced in Section 5.4.3 Funding of Chapter 5 Roadmap Actions includes an analysis of "the total costs to landowners, city residents, and government agencies" and "the best ways to pay for the practices." We recommend that the economic analysis evaluate the potential for market-based CLCs and the costs that would be borne by the market. This market-based CLC analysis should align with the findings of the Market-Based CLC Campaign Task Force as discussed in the section Financial Obstacles to CLC on page 200 of the 2025 Draft NHS.

We urge agencies to exercise caution when designing "batch and build" programs for BMPs. The Iowa program on which this concept is based has been shown to prioritize service delivery over environmental outcomes: and any Minnesota analog should be underpinned by rigorous cost-benefit analyses of the specific BMPs available.

Response 29-5: Tables 5-1 and 5-7 were modified as possible. Not all information was available to make every suggested update.

Comment 29-6: Overemphasis on voluntary BMPs and on-farm certification. The NRS relies too heavily on a significant increase in participation in voluntary BMPs and on-farm certification programs that may not deliver adequate pollution reduction results. The report found annual average nitrate concentrations in drain tile effluent of 14.81 mg/l to 50.52 mg/l over a 3-year period. Despite these high pollution levels, several of the site/year combinations scored high enough on the assessment to earn MAWQCP certification without any additional conservation practices.

We recommend that the NRS specify the following:

- A nitrogen endorsement should be included as a baseline performance requirement for all certified farms.
- The nitrogen endorsement threshold should be compatible with draft water quality standards for nitrate on acres draining to Class 2A and 2B waters.
- In addition, we note that the MN Office of the Legislative Auditor is undertaking a review of the MAWQCP for the 2026 legislative session. We advise that specific NRS recommendations regarding the program factor in the results of this audit.

Response 29-6: The MDA MAWQCP provided the following response: MDA provided a direct response to the 2015 Minnesota Center for Environmental Advocacy (MCEA) report, "*Minnesota Agricultural Water Quality Certification Program: Is It Working for Water Quality*?" The MDA response outlined concerns stemming from the MCEA's analysis and report.

MAWQCP continually looks for ways to improve the effectiveness and efficiency of its work in helping farmers better protect and promote water quality. This includes incorporating emerging recommendations and findings from rigorous scientific research around the impact of agricultural practices on water quality into the MAWQCP assessment/certification processes. Because of this continuous improvement approach, many aspects of MAWQCP's processes and criterion have evolved and improved considerably since MCEA's 2015 report was published. The MAWQCP Team is, however, always open to considering well-informed and timely recommendations for program improvements. We look forward to seeing any recommendations that may come out of the current ongoing Office of the Legislative Auditor's review of MAWQCP.

MAWQCP already requires that farms/farmers meet or exceed a baseline performance threshold for nitrogen management to become certified. Nitrogen management factors (rate, timing, source, placement) are among the most heavily weighted factors in MAWQCP's field assessment scoring process. The MAWQCP Team is willing to explore a Nitrogen Endorsement (and its requirements) if there is meaningful value in going beyond what MAWQCP is already doing pertaining to nitrogen management in its base assessment and certification process.

COMMENT LETTER 30. MARSHALL ERICKSON (CLEAR WATER NITRATE REDUCTION)

Comment 30-1: We think the report is comprehensive and communicates the need to deploy multiple solutions to meet 2040 nutrient reduction goals. Especially in TN reduction and treating tile drainage. Our concern is the report's depiction of EoF [edge-of-field] Structural BMPs (Bioreactors, Saturated Buffers, and Constructed Wetlands for tile drainage). Specifically, nutrient reduction performance projections.

The report's BEET BMP (Efficiencies) table is using TN reduction input values for bioreactors that are less than 1/2 of what is used for saturated buffers and constructed wetlands (tile drainage). In table 5.4 (page 209) projected bioreactor TN reduced is less than ½ of saturated buffer and less than 1/3 of constructed wetland projections. These examples and other instances in the report do not accurately reflect bioreactor performance compared to other EoF solutions. Increase bioreactor denitrification projections to 50%-60% average over 10 years. Reflect this throughout the report.

Response 30-1: The nutrient reduction efficiencies in the BEET BMP table were developed through a literature review conducted by a research team at UMN for the 2025 NRS updates. The material covering bioreactors can be found on pages 154–159 of their report in Appendix 5-1. Materials included in the evaluation were: field or plot studies, not modeling studies; studies with a control versus a conservation practice treatment; studies reporting annual nutrient loss values; and studies that were performed in Minnesota or in areas of similar climatic and cropping conditions. The NRS Team will continue to evaluate peer-reviewed research and studies in subsequent updates to the BMP efficiencies as well as the BEET BMP efficiencies.

COMMENT LETTER 31. FRESHWATER SOCIETY

Comment 31-1: Implementation of comprehensive watershed plans. It is a great accomplishment that Minnesota has developed a One Watershed One Plan for nearly every watershed across the state. Now is the time to put all available resources into implementing these plans, and this may require shifting state priorities away from new studies or other programs and activities that do not directly support implementation. The nutrient reduction benefits from on-the-ground projects may take years to fully realize, so time is of the essence as we work to reduce nitrate levels in groundwater and clean up our

rivers, lakes and streams. Furthermore, it is important to study the effectiveness of the practices being implemented to ensure state dollars are being spent effectively.

> ***Response 31-1:*** Chapter 8 of the 2025 NRS calls out the support for and implementation of local watershed work as one of the key actions that will achieve lasting nutrient reduction. Chapter 6 provides details about what kind of support the 2025 NRS provides to these efforts. Chapter 6 also identifies the need to better connect data analysis from the 2025 NRS with local watershed planning efforts. Guidance will be developed by BWSR and MPCA in 2026 to support this effort, and the final guidance document will be posted on the BWSR One Watershed, One Plan Program webpage.

Comment 31-2: Water storage program. The MPCA has discerned that tile water is the largest source of nitrogen in drained farmland. That source, along with the nutrient-rich legacy sediment entrained by high flows that result from agricultural drainage are best controlled by water storage in headwaters areas of agricultural watersheds through a variety of means including wetland construction. If we do not offset the impacts of agricultural drainage, we will lose ground (literally) and fall behind in our efforts to reduce nutrient runoff.

> ***Response 31-2:*** The NRS Team agrees that treating agricultural tile drainage is a key facet of nutrient reduction efforts. The 2025 NRS has identified specific practices that can help mitigate nutrient impacts from tile drainage, as described in NRS Section 5.1 and appendices 5-1 and 5-2.

Comment 31-3: Soil Health Financial Assistance. We are pleased to see continued support for this program, which is a powerful tool for driving adoption of soil health practices by providing farmers with better access to specialized equipment.

> ***Response 31-3:*** The NRS Team agrees that the Soil Health Financial Assistance Program has been successful in providing access to equipment. It is listed in 2025 NRS Section 5.2 as an example of a successful government program that helps increase adoption of nutrient-reducing cropland practices.

Comment 31-4: Incentivizing measurable soil health practices. During the 2025 legislative session, the Omnibus Agriculture bill included a $75,000 appropriation to conduct a study of the practices and performance of the Olmsted County groundwater protection and soil health initiative. This program has been successful at incentivizing and educating farmers to implement practices that can reduce nitrate – such as cover crops, small grains, and haying or grazing. Since 2023, the program has reduced an estimated 295,000 pounds of nitrogen and could serve as a model for other parts of the state. We are interested in working with state agencies and legislators to refine this concept and develop programs that directly incentivize farmers for implementing measurable, long-term improvements on their land.

> ***Response 31-4:*** The NRS Team agrees that the Olmsted County Soil Health Initiative could serve as a model for other parts of the state and included it in Section 5.2 of the 2025 NRS as a successful government program that helps increase adoption of nutrient-reducing cropland practices. During the 2025 NRS implementation phase, the NRS team will work on developing tools to facilitate statewide adoption of such programs. The upcoming results of the report that was cited will help inform future actions related to this work.

COMMENT LETTER 32. LORI HAAK (CITY OF EDEN PRAIRIE)

Comment 32-1: Pages xxi, 57, 59; Figure ES-7, Table 2-16, Table 2-17: It is clear the largest sources of phosphorus and nitrogen to Minnesota's rivers are related to agriculture. As a result, the approaches to nutrient reduction should be implemented holistically based on watershed loading sources.

Response 32-1: The NRS Team agrees that nutrient reduction should be implemented on the local watershed scale and has outlined in Chapter 6 how the NRS interfaces with the WRAPS and One Watershed, One Plan programs to achieve this goal.

Comment 32-2: Page 15: Addressing streambank erosion is a reasonable initiative for municipal and WD/WMO partners, SWCDs, and counties to undertake with funding assistance from the State. State agencies need to align on permitting requirements (e.g., DNR vs. MPCA on erosion and sediment control) and pollutant reduction TMDL accreditation for in-creek stabilization projects.

Response 32-2: These suggestions have been shared with multiple state agency leaders through the NRS Steering Team.

Comment 32-3: Chapter 3: Nutrients are not the whole story. Climate (temperature + precipitation) are also likely to exacerbate eutrophication. According to Meerhoff et al. (2022), "Based on a complex combination of models, Ockenden et al. (2017) suggested that the effects of climate change on surface runoff and consequent increase in diffuse P loading to freshwaters might be limited only by large-scale agricultural changes (e.g., 20–80% reduction in current levels of P inputs)." This suggests a future where agriculture is the only realm where nutrient loading can be substantially reduced.

Response 32-3: Chapter 1 of the 2025 NRS lays out the impact of climate conditions and weather extremes on nutrient reduction.

Comment 32-4: Chapter 4, Urban Nutrient Reduction: Stormwater staff at MPCA are already under resourced. MPCA must work closely with stakeholders to prioritize items, design programs, and make substantial investments primarily in practices that yield measurable results when it comes to nutrient reduction in urban stormwater.

Response 32-4: Comment noted.

Comment 32-5: Page 144: While important as tools in a multi-faceted campaign, guidance and fact sheets will not result in significant behavioral change. The potential of community-based social marketing (CBSM) in nutrient reduction (and other areas of sustainability) is significant but underutilized. One idea would be to house several CBSM positions at MPCA and allow regulated MS4s, WWTFs, SWCDs, etc. to enlist these specialists to develop new programs. Such a program would be more likely to affect sustained, widespread behavioral change.

Response 32-5: The NRS Team agrees that the human dimension is an important component of lasting nutrient reduction work. While the NRS does not provide funding to support community-based social marketing positions at MPCA, your ideas have been documented for future consideration and will be shared with the NRS Team and partners at the UMN who work directly on this issue.

Comment 32-6: Page 151: The State should provide solid, unified, statewide messaging and branding to foster public awareness and engagement and support local efforts. The State cannot undertake this in isolation, but with meaningful, continued collaboration with stakeholders.

Response 32-6: 2025 NRS Chapter 6 stresses the importance of watershed-level work and the engagement of local stakeholders in achieving nutrient-reduction goals.

Comment 32-7: Page 241: Conservation agronomist positions like the one hired in Morrison County seem like an important first step in meaningful agricultural nutrient reduction. SWCDs are uniquely qualified to provide practical guidance for the agricultural sector.

Response 32-7: See response to common topic 2 (education, incentives, and networking).

Comment 32-8: Page xviii: "Minnesota's 45% phosphorus reduction goal for the Gulf will be met if the in-state goals for local and regional lake eutrophication, in-state river eutrophication, and reductions in southeastern Minnesota tributaries to the Mississippi River are achieved." Which "in-state goals" does this reference? TMDLs? TMDLs + additional work?

> ***Response 32-8:*** Meeting in-state goals is defined as meeting nutrient water quality standards for both lakes and rivers. TMDLs are written to attain water quality standards. This is described in Chapter 3.

Comment 32-9: Page xix: "If nitrate concentrations are reduced by about 40% in rivers and vulnerable groundwaters…" How far will current TMDLs get us toward that benchmark? Page xix: "About two-thirds of the TP load reduction is attributed to point source wastewater improvements and the rest from agricultural and urban nonpoint source reductions." How far will current TMDLs get us toward that benchmark?

> ***Response 32-9:*** Evaluation of all current TMDLs was not part of the 2025 NRS analyses.

Comment 32-10: Page xxix: It seems the funding provided by the Clean Water, Land and Legacy Amendment is central to achieving these (and many other) clean water goals. Is renewing the amendment prior to its expiration in 2034 being prioritized by the State?

> ***Response 32-10:*** The Clean Water, Land, and Legacy funds have been critical to help meet goals in monitoring and assessing the state's water, develop plans and strategies to meet water quality goals, implement projects to restore and protect surface water and groundwater resources, and develop systems to track long-term trends and progress. State agency personnel cannot directly advocate for or against amendment renewal.

Comment 32-11: Page 5: "Updated science on climate and other external influences." What is the anticipated impact of ATLAS 15 on NRS projections?

> ***Response 32-11:*** The 2025 NRS did not evaluate the anticipated impact of ATLAS 15.

Comment 32-12: Page 285, Section 8.3: Are the answers provided based on this report? If so, provide citations for sections. If not, provide more context about who answered the questions.

> ***Response 32-12:*** The questions in Section 8.3 are a writing structure. They were not asked by a specific person but rather were considered by the NRS Team (listed in its entirety under the Acknowledgments pages ii–iii) to help organize final recommendations. They reference the entire report, and it would not be possible to attach each question to one specific section of the 2025 NRS.

Comment 32-13: Page xviii, Figure ES-2: 15 years is an aggressive timeline. Does the funding allocated match the need?

> ***Response 32-13:*** Section 8.2 notes that current funding will not fully support the full attainment of the 2025 NRS goals.

Comment 32-14: Page xxvi: Do the 22 practices take land out of production? Is this an issue?

> ***Response 32-14:*** This depends on the practice. Some on-the-ground practices, such as a treatment wetland, might take marginal lands out of production. Other practices, like nutrient management planning, would not. The impact of lost production was not evaluated as part of the 2025 NRS development. This would be a consideration for local planning efforts.

Comment 32-15: Page xxvi: Is it possible to provide a matrix showing recommended practices with co-benefits?

Response 32-15: A table showing co-benefits on agriculture BMPs is available in 2025 NRS Section 5.1.3, Table 5.3.

Comment 32-16: Page xxvii: Is it feasible to install millions more acres of practices in Minnesota to realize the nutrient reduction goals?

Response 32-16: Many of these practices provide multiple benefits, such as improved soil health or water storage/flood reduction, and so they pay for themselves through reduced costs to farmers or communities. The NRS Team does realize the magnitude of change needed is substantial and the rate of BMP adoption would have to increase in comparison to current levels.

Comment 32-17: Page 70, Section 2.10, Items 6-8: These actions are vague for the magnitude of reductions needed.

Response 32-17: These bullet points have been expanded.

Comment 32-18: Page 241: While a large majority of farms in Minnesota are currently family farms, the number of acres moving into larger, corporate operations is likely increasing. Consider developing new/different approaches where there may not be a direct connection between local natural resources/land stewardship and business.

Response 32-18: The NRS Team agrees that different outreach and education methods are needed for different audiences and supports these efforts in chapters 5, 6, and 8. UMN and other land grant universities are also investigating new ways to connect with the changing rural demographics.

COMMENT LETTER 33. ARIEL KAGAN (MINNESOTA FARMERS UNION)

Comment 33-1: Expanding soil health grant opportunities and other funding: The MDA Soil Health Financial Assistance program has been a hugely successful and popular program with farmers and SWCDs, which are able to use to the funding to purchase equipment that supports soil health. Equipment costs are an often cited barrier to soil health practices, and few programs offer this kind of financial assistance for purchasing no-till drills, cover crop seeders, and other types of equipment. Other kinds of programs, including cost-shares and direct grants for soil health practices are also important. These soil health practices are often expensive to implement and while there are often benefits including reduced input costs, more resilience to extreme weather, and improved soil health, these are often longer term and hard to account for. Financial supports help farmers start implementing practices, and are an important strategy for expanding conservation on the landscape.

Response 33-1: The NRS Team agrees; details on these practices and the Soil Health Financial Assistance Program are included in Chapter 5.

Comment 33-2: Support for the Minnesota Agricultural Water Quality Certification Program: The Minnesota Agricultural Water Quality Certification (MAWQCP) is an important program that provides farmers with one-on-one technical assistance to address resource concerns. Many of our members are Ag Water Quality certified, and we've long supported the program. MAWQCP certified farms on average see a 49 percent reduction in nitrate loss through the adoption of conservation practices like reduced tillage, cover crops, and nutrient management. MAWQCP certifiers work with farmers to help them meet their goals, and the recognition from certification and the endorsements reflect the stewardship of the operators. As the certification continues to grow, we support further funding and staffing to ensure

that the same quality of service can continue. The over one-million acres now certified is a testament to the power of the program, and the work that farmers can do to improve and protect water quality.

> ***Response 33-2:*** The NRS Team agrees on the importance of the MAWQCP. The program is listed as example of a successful government program aimed at increasing cropland practices in Section 5.2 of the 2025 NRS and calls for its expansion in Chapter 8.

Comment 33-3: Increasing workforce capacity for conservation: We've heard from many farmers and partners that there is a lack of technical assistance providers and training resources available to develop new providers. Leadership from ag retailers like Centra Sota Co-op to develop a conservation agronomy program shows the power of providing conservation delivery from multiple sources. We support the proposals included in the NRS around training, public-private partnerships for staffing, and working with universities to draw new people into conservation as a career.

> ***Response 33-3:*** The NRS Team agrees that the conservation workforce capacity is key for lasting nutrient reduction. The 2025 NRS calls for greater support for and expansion of this profession in chapters 5, 6, and 8.

Comment 33-4: MFU is currently working with UMN Extension Climate Adaptation Partnership (MCAP) to assess and develop training curriculum through Extension around conservation agronomy and climate resilience. We see this as a critical need for the next generation of farmers and agricultural professionals.

> ***Response 33-4:*** The NRS Team welcomes continued updates on this partnership.

COMMENT LETTER 34. PEGGY KNAPP

Comment 34-1: Make clean water BMPs mandatory, monitor the water leaving fields (especially tiled fields) and stop wasting time, effort, and resources on updates like this. We can study this issue to death, and the answer will be the same as it was in 2015. And in every study before that. Modern industrial agriculture is at the root of the problem. Rescind the exemption under the Clean Water Act, and get serious. Finally.

> ***Response 34-1:*** See response to common topic 1 (regulation). Revision of the federal Clean Water Act is the purview of Congress. The NRS provides nutrient reduction strategies for practices, actions, and plans that work within the current row crop agricultural system, but it also recognizes that, in order to meet NRS long-term goals, profound change will be needed (e.g., increased use of CLC, diversified crops, novel edge-of-field treatment practices).

COMMENT LETTER 35. JENNIFER VALENTINE

Comment 35-1: Strengthen data collection and reporting requirements for fertilizer retailers by the Minnesota Department of Agriculture (MDA) and documentation of nitrogen fertilizer application rates by responsible parties (e.g. crop retailers).

> ***Response 35-1:*** See response to common topic 1 (regulation).

Comment 35-2: Build a Small Grain Initiative and a safety net for farmers who want to reduce their nitrogen fertilizer applications by transitioning into more diverse cropping systems.

> ***Response 35-2:*** See response to common topic 3 (CLC and small grains).

Comment 35-3: Grow farmer power, farmer networks, and locally led, flexible and outcome-based approaches like the Olmsted County Groundwater Protection and Soil Health Program.

> ***Response 35-3:*** See response to common topic 2 (education, incentives, and networking).

COMMENT LETTER 36. STEVEN MAYER

Comment 36-1: Please do everything you can to preserve and improve the quality of Minnesota's water, soil nutrients, and air, and to keep our food and food crops safe from the increasing pressure to add dangerous chemicals to everything.

> ***Response 36-1:*** The NRS stands as an interagency statewide strategy for reducing nutrient pollution, which in turn conserves soil and protects and improves the water resources of the state.

COMMENT LETTER 37. LISA TILMAN (MINNESOTA CITIES STORMWATER COALITION)

Comment 37-1: To make significant gains in nutrient reduction across the state, MCSC encourages the state to prioritize its nutrient reduction efforts toward these larger sources—agricultural and rural runoff—to achieve measurable and cost-effective outcomes and avoid additional regulation of smaller contributors including the state's MS4s.

> ***Response 37-1:*** The Minnesota NRS does not propose any new regulations for the MS4s, and Section 4.2 acknowledges the excellent and innovative work Minnesota communities are doing to manage stormwater.

COMMENT LETTER 38. BEN LILLISTON (INSTITUTE FOR AGRICULTURE AND TRADE POLICY)

Comment 38-1: Align resources and programs for nutrient reduction. We urge MPCA to align nutrient reduction strategies where appropriate with the Climate Action Framework the state is currently updating. Additionally, the state should work with the U.S. Department of Agriculture to steer federal farm conservation resources within the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program (CSP) toward farming practices and systems that reduce synthetic fertilizer use and shift animals to pasture. These efforts can be augmented by state programs such as the Minnesota Agricultural Water Quality Certification Program.

> ***Response 38-1:*** The 2025 NRS updates were written with the Climate Action Framework in mind. Many of the actions recommended by the 2025 NRS serve to reduce excess nutrients, store carbon, or provide resilience to landscapes in the face of greater climate extremes. USDA and MDA are part of the interagency 2025 NRS update effort; they participated in the development of the nutrient-reduction strategies outlined in Chapter 5, which include efforts to reduce synthetic fertilizer application and increase pasture.

Comment 38-2: We support the NRS recommendation to "accelerate the transition to perennials, pasture, small grains, and harvested cover crops," through "creating a task force to develop a CLC campaign to establish the next million acres of CLC."

> ***Response 38-2:*** See response to common topic 3 (CLC and small grains).

Comment 38-3: Bolster the MPCA's feedlot program to go beyond a single feedlot assessment model within watersheds. A cluster of feedlots within regions of the state can pose particular risks to watersheds. In addition to stronger permit requirements on manure storage and application, the state

should consider the cumulative effects of feedlot clusters within watersheds when considering the approval of new or expanding feedlots.

Response 38-3: See response to common topic 1 (regulation). The NRS Team has shared these suggestions with the MPCA Feedlot Program.

Comment 38-4: Strengthen data collection and reporting requirements for fertilizer retailers by the MDA and document nitrogen fertilizer application rates from retailers. This data addresses a gap in the reliability and frequency of data that can be used to inform actions needed to hold retailers accountable to nitrate reduction goals. As part of this strategy, we urge MDA to set reduction targets for synthetic fertilizer use and sales.

Response 38-4: See response to common topic 1 (regulation).

Comment 38-5: We support the Land Stewardship Project's call for a Small Grain Initiative, with similar levels of funding and a long-term commitment from the MDA and the University of Minnesota, modeled after the visionary Forever Green Initiative.

Response 38-5: See response to common topic 3 (CLC and small grains)

Comment 38-6: Expand investment in Soil and Water Conservation Districts (SWCDs) as a trusted local partner for nutrient reduction strategies. A model to consider statewide is the locally led, flexible, and outcome-based approach adopted by the Olmsted County Groundwater Protection and Soil Health Program.

Response 38-6: See response to common topic 2 (education, incentives, and networking).

COMMENT LETTER 39. KIM BARTMANN

Comment 39-1: I'm hoping the MPCA prioritizes clean drinking water for everyone, and a big part of that is supporting farmers in changing and or improving some practices. Please adopt the suggestions made by the Land Stewardship Project to that end.

Response 39-1: MPCA and all the state, federal, and local entities involved in developing the NRS prioritize clean water for everyone. See responses to common topics 2, 3, and 4 for additional details regarding the Land Stewardship Project suggestions.

COMMENT LETTER 40. PAUL BURCK

Comment 40-1: Strengthen data collection and reporting requirements for fertilizer retailers by the Minnesota Department of Agriculture (MDA) and documentation of nitrogen fertilizer application rates by responsible parties (e.g. crop retailers).

Response 40-1*:* See response to common topic 1 (regulation).

Comment 40-2: Build a Small Grain Initiative and a safety net for farmers who want to reduce their nitrogen fertilizer applications by transitioning into more diverse cropping systems.

Response 40-2*:* See response to common topic 3 (CLC and small grains).

Comment 40-3: Grow farmer power, farmer networks, and locally led, flexible and outcome-based approaches like the Olmsted County Groundwater Protection and Soil Health Program.

Response 40-3*:* See response to common topic 2 (education, incentives, and networking).

Comment 40-4: Minnesota needs family farmers who will use regenerative agriculture practices and we need to stop so heavily subsidizing corporate farm corporations who are not supporting agricultural communities so that our small towns are dying and families are being forced off the farm.

Response 40-4: Comment noted. This is beyond the scope of the NRS.

COMMENT LETTER 41. TOM WOLNER

Comment 41-1: My comment is concerning agricultural or crop land nutrient reduction strategies. From what I understand, the proposed reduction strategies are voluntary on these lands. Although a voluntary approach may be desirable, it thus far has not been significantly effective. Could it be proposed that a voluntary approach be continued for crop land primarily used to produce food or animal feed but impose mandatory requirements for crop land use to produce fuel (ethanol, biodiesel, jet fuel, etc.). I believe that use of land to produce fuel is no longer "farming" in the traditional sense, but part of an "industrial process" and should be regulated as such. .

Response 41-1*:* See response to common topic 1 (regulation).

COMMENT LETTER 42. CATHERINE M DOLAN

Comment 42-1: I strongly agree with the findings of the Updated Nutrient Reduction Strategies that align with the recommendations from the Southeastern Minnesota Nitrate Strategies Work Group to accelerate a transition to perennial crops, pasture, small grains and harvested cover crops on millions of acres.

Response 42-1*:* See response to common topic 3 (CLC and small grains).

Comment 42-2: I strongly agree that social factors are important to achieving wide-scale adoption of practices. Unpublished results from the Minnesota Office of Soil Health survey lifted up the key role of other farmers in the adoption process. Other farmers were top-ranked as the group with the most influence when farmers want to learn more about a new soil management practice. Expanded and increased investment in Soil and Water Conservation Districts (SWCDs) as a trusted local partner and effective delivery mechanism for these nutrient reduction strategies.

Response 42-2*:* The NRS Team agrees that SWCDs and local watershed partners are key to any lasting nutrient reduction, and the 2025 NRS identifies greater support for watershed practitioners in chapters 5, 6, and 8.

COMMENT LETTER 43. BONNIE HAUGEN

Comment 43-1: I am very pleased with much of the proposed draft.

Response 43-1: The NRS Team appreciates your time spent on the Southeast Minnesota Nitrate Work Group. The 2025 NRS strategies for nitrate reduction complement those described in the work group deliverable.

Comment 43-2: I strongly agree and am pleased to see alignment with the SE NWG recommendations to accelerate a transition to perennial crops, pasture, small grains and harvested crops on millions of acres.

Response 43-2: The NRS Team is also pleased with this alignment. The 2025 NRS Chapter 5 and appendices 5-1 and 5-2 underscore the foundational importance of perennials, pasture, and small grains in reducing nutrient leaching.

Comment 43-3: Variations of venues and education styles should be utilized to maximize exposure, access and explanation of recommendations. The farmer-to- farmer networks should be supported and encouraged.

Response 43-3: See response to common topic 2 (education, incentives, and networking).

Comment 43-4: In addition, our Soil and Water Conservation Districts, along with Soil Health groups, need increased funding to administer programs that increase nutrient reduction strategies. Financial packages to help farmers transition in any market shortfalls are needed.

Response 43-4: See response to common topic 2 (education, incentives, and networking).

Comment 43-5: Increased data reporting is needed to bring awareness of current applications and help in identifying places where over-application of fertilizer needs to be reduced.

Response 43-5: See response to common topic 1 (regulation).

COMMENT LETTER 44. CAROLINE VAN SCHAIK

Comment 44-1: The outcomes of 10 years of this Nutrient Reduction Strategy are the best reasons why my first suggestion must be to exchange "voluntary" to "required." "Voluntary" is why you could predict 40 years ago that agency rules and farmland practices would poison drinking water wells and by extension, the in-state and out-state destinations this NRS is meant to address.

Response 44-1: See response to common topic 1 (regulation).

Comment 44-2: My second recommendation begins with Section 2.3 and the concept of load progress. Measure it in situ, not on a computer. Monitor it on farms where, as your own data tell you, 85-91% of nutrient loads are sourced. Measure against benchmarks of water health and make the polluter pay (not just a $100 fine per a recent fish kill). The state says you can do this. Please do this.

Response 44-2: The 2025 NRS uses water quality monitoring data from permanent monitoring stations in streams and rivers throughout Minnesota to calculate actual measured nitrogen and phosphorus loads in the Mississippi River, Red River, and Lake Superior. The reliance on monitored data is extensively documented in Chapter 2 as well as in appendices 2-1 through 2-3. Section 2.3.1 describes all the monitored data sources used in the 2025 NRS to calculate river trend data. Modeling was used to analyze the many years of nitrate and phosphorus concentration data collected at Minnesota monitoring sites to calculate an annual total nitrogen or total phosphorus load. All models used in the 2025 NRS require monitored data for validation and calibration. The NRS Team has reviewed the first three paragraphs of Section 2.3 and edited them for clarity.

Comment 44-3: My third suggestion is that you recognize that the fractured soluble bedrock of our Driftless region requires additional attention because surface water is ground water is our drinking water.

Response 44-3: The NRS Team agrees that areas with karst bedrock need additional action to address high nutrient levels in groundwater and surface water. Section 3.3.1 goes into extensive detail regarding priority areas and strategies to protect drinking water from excess nitrogen. Recent efforts and a detailed report of recommendations by the Southeast Minnesota Nitrate Strategies Collaborative Work Group summarized localized strategies to work towards reducing nitrate impacts to groundwater in the karst region of Minnesota.

Comment 44-4: And my fourth and final suggestion is that MPCA remove the territorial barriers with MDA that allow each agency to pretend that fertilizers and manure are two separate and wholly unrelated evils. Nutrient loads, drinking water, fish habitat, swimmable rivers all stem from agriculture that is your shared responsibility.

> ***Response 44-4:*** The interagency NRS Team agrees that fishable, swimmable, and drinkable waters are a shared responsibility among MPCA, MDA, and the eight other state, federal, and local entities that worked on developing the 2025 NRS updates. Chapters 5 and 8 were co-authored by MPCA and MDA staff, and these agencies plan to continue working together to address excess nutrients from both manure and synthetic fertilizer during the NRS implementation phase. MPCA is currently updating its Nutrient Management Tool used for permitted feedlot facility manure management planning to be more comprehensive, to include both manure and commercial fertilizer when developing plans.

COMMENT LETTER 45. COOPER SILBURN (MINNESOTA ENVIRONMENTAL SCIENCE AND ECONOMIC REVIEW BOARD)

Comment 45-1: In general, MESERB commends the MPCA and its partner agencies for developing a coordinated, statewide approach to nutrient reduction. However, the burden of nutrient reductions falls disproportionately on municipal point sources. Municipal wastewater treatment facilities are being required to spend millions of dollars to address impairments overwhelmingly driven by nonpoint sources, with their individual contributions often amounting to a single percentage point (or less) of the overall nutrient load.

> ***Response 45-1:*** The MPCA provided the following response: Minnesota's NRS is predicated on the idea that all contributing sectors have a role in accomplishing the phosphorus and nitrogen reductions needed to achieve its stated goals. The municipal wastewater sector contributes a minor overall percentage of the total nitrogen load to Minnesota surface waters; however, local impacts of certain individual wastewater discharges are sometimes significant. The 2025 NRS itself does not establish any regulatory obligations, although its goals do inform the development of policies and strategies that are implemented through NPDES permit programs.

Comment 45-2: These concerns are particularly acute with respect to nitrogen. Last year, MESERB submitted a detailed letter and technical comments on the draft nitrogen criteria, raising concerns about the significant costs such standards would impose on both municipalities and the state, the reliance on limited scientific data, and the importance of expressing any new limits as nitrate rather than Total Nitrogen (TN). The proposed 10 mg/L state discharge restriction modeled after Gulf of Mexico TN reduction goals would require extremely costly treatment upgrades across Minnesota while achieving only a modest percentage reduction in nitrogen loading.

> ***Response 45-2:*** The MPCA provided the following response: The practice of nitrogen removal from domestic wastewater is viable, well understood and is already being accomplished by many Minnesota wastewater treatment facilities (WWTFs). MPCA acknowledges that the costs associated with upgrading and optimizing existing WWTFs for denitrification will, in some cases, be significant, and that the resulting benefits will also be significant. The MPCA's NPDES permit programs have evaluated the questions you have raised and have reconfirmed that total nitrogen is the appropriate parameter for nitrogen effluent limits.

Comment 45-3: As indicated by the MPCA's most recent WINS Survey, the costs associated with operating and maintaining wastewater infrastructure are increasing, and there is a tremendous unmet need for ongoing infrastructure funding at the state and federal levels. Our concern is that the 2025

Strategy could lead to exponentially increased costs for municipalities to remove nutrients, and that there simply are not enough local, state, and federal resources available to cover the costs. As a result, the MPCA must consider how to best prioritize its clean water efforts to ensure that limited local, state, and federal resources are put to maximum effect.

> ***Response 45-3:*** The NRS Team also identified the growth of capital, operational, and maintenance infrastructure costs as important and listed it as one of the "challenges" in Section 4.1 to achieving nutrient reduction in wastewater treatment.

Comment 45-4: The 2025 update to the MNRS emphasizes broad TN reductions across all watersheds. MESERB supports nitrogen reductions where they are scientifically demonstrated to protect human health and aquatic life, but the updated Strategy does not provide adequate support for imposing a categorical statewide requirement for TN reduction.

> ***Response 45-4:*** The MPCA provided the following response: MPCA acknowledges your comment and notes that the nitrogen reduction goals established in the 2014 NRS and reaffirmed in the 2025 NRS are derived from the goals established by the Gulf Hypoxia Taskforce (Mississippi River) and the International Joint Commission (Red River of the North) and agreed to by multiple jurisdictions in addition to the State of Minnesota. The MPCA developed its 2024 wastewater nitrogen reduction and implementation strategy in consultation with a representative group of professionals in the municipal and industrial wastewater sectors.

Comment 45-5: Focus on nitrate where risks are demonstrated. Nitrogen reduction efforts should be prioritized where nitrate poses clear human health or aquatic life risks, such as Class 1 drinking water impairments, IBI impairments, or toxicity-based aquatic life standards. This focus aligns with scientific evidence and with the MPCA's Wastewater Strategy.

> ***Response 45-5:*** The NRS Team agrees that a focus on the protection of drinking water sources and aquatic life is of primary importance. The 2025 NRS also supports the MPCA Wastewater Strategy for proposed nitrogen reductions.

Comment 45-6: Phosphorus-first and cost-effective measures. TN reductions should not be imposed where phosphorus or other cost-effective measures (e.g., riparian buffers, canopy restoration, nonpoint source practices) are sufficient to control algal growth.

> ***Response 45-6:*** The MPCA provided the following response: No further wastewater phosphorus reductions are needed to achieve 2025 NRS goals, and, while the adoption of biological nutrient removal (BNR) technologies at some Minnesota WWTFs has resulted in site-specific total phosphorus and total nitrogen reductions, in general the significant wastewater phosphorus reductions achieved by Minnesota WWTFs have not also resulted in effluent total nitrogen reductions. With regard to nitrogen reductions, drinking water and aquatic life toxicity are the primary concerns, rather than algal growth.

Comment 45-7: Rulemaking and transparency. Any new nitrogen-based water quality standard, including the proposed 10 mg/L State Discharge Restriction (SDR), must undergo a formal rulemaking process. This ensures public access to supporting science, a transparent evaluation of costs and benefits, and a meaningful opportunity for comment.

> ***Response 45-7:*** See response to common topic 5 (aquatic life/nitrate standard).

Comment 45-8: Economic impacts and local priorities. The proposed 10 mg/L SDR, modeled on national nutrient reduction goals for the Gulf of Mexico and international nutrient reduction goals for Lake Winnipeg, will impose significant costs on municipal facilities for limited local benefit. The MPCA should

prioritize standards that directly protect Minnesota waters and conduct a thorough cost-benefit analysis of implementing the SDR and Lake Winnipeg-based targets before imposing any requirements associated with these efforts. Further, any nutrient reduction efforts tied to the Gulf of Mexico or Lake Winnipeg should be voluntary for municipalities, and the MPCA should prioritize cost- effective and flexible implementation strategies like nutrient trading.

> ***Response 45-8:*** The MPCA Provided the following response: The proposed 10 mg/L total nitrogen SDR effluent limits for major municipal and other high-concentration wastewater dischargers are indeed intended to achieve downstream water quality objectives consistent with designated uses established for Class 6 waters in Minn. R. Ch. 7050. Any future rulemaking for the adoption of a 10 mg/L total nitrogen SDR will include an analysis of associated costs as required in Minnesota Statutes. While we agree that cost-effective, voluntary approaches, including water quality trading, are viable and potentially beneficial alternatives, voluntary measures alone will not achieve the desired NRS or in-state nitrate reduction goals for the wastewater sector.

Comment 45-9: Nitrate vs. total nitrogen limits. Limits should be expressed as nitrate, not total nitrogen. As we have previously noted, soluble unbiodegradable organic nitrogen (SON/DON) cannot be feasibly removed through current treatment processes. Expressing limits as total nitrogen risks forcing unnecessary and costly facility upgrades for reductions that may be technologically infeasible and environmentally insignificant.

> ***Response 45-9:*** MPCA provided the following response: MPCA intends to express nitrogen effluent limits as total nitrogen. MPCA believes that a 10 mg/L total nitrogen effluent limit is achievable for most WWTFs but acknowledges that some site-specific waste stream compositions may require additional considerations. The 2019 Soluble Organic Nitrogen in Biological Nutrient Removal paper published by the Water Research Foundation, which you have provided for review, asserts that the limit of technology for well-designed and operated BNR facilities is 3–6 mg/L total nitrogen. It does note that soluble organic nitrogen may constitute 40% of a 3 mg/L BNR effluent concentration, but also notes that, "For applications with an effluent total nitrogen concentration goal of less than 10 mg/L (typical value for water reuse applications), the Effluent Soluble Organic Nitrogen (ESON) concentration is not a great concern."

Comment 45-10: Without these adjustments, Minnesota communities risk expending substantial resources on TN control measures that will have limited impact on local water quality while increasing energy use and greenhouse gas emissions. MESERB strongly urges the MPCA to refine the Strategy to focus on standards that are scientifically supported, locally relevant, and cost-effective for both municipalities and the state.

> ***Response 45-10:*** MPCA provided the following response: We agree that cost- and ecologically effective wastewater treatment solutions are of paramount importance. We do not necessarily agree that denitrification will result in increased energy use and greenhouse gas emissions over the life of treatment facilities. While pumping requirements are expected to increase due to increased recirculation requirements for BNR facilities, the introduction of anaerobic and anoxic zones will decrease aeration requirements, which may lead to decreased power consumption. The adoption of BNR is expected to reduce direct emission of nitrous oxides (N_2O) from aeration tanks and, therefore, reduce the emission of greenhouse gases from activated sludge tanks.

Comment 45-11: [Re: The proposed 10 mg/L SDR to protect the Gulf of Mexico] The Gulf of Mexico ("Gulf") has long been identified as an area adversely impacted by nutrient loadings from the Mississippi

River Basin. The 2013 Strategy emphasized Minnesota's role in protecting the quality of downstream waters, and the 2025 Update reiterates this connection in the context of Gulf hypoxia reduction goals. MESERB supports voluntary reduction efforts and nutrient trading to address these goals. However, while some studies and modeling (such as the 2008 Action Plan) have been completed under the MNRS, they have not been subject to formal public scrutiny, nor has a Total Maximum Daily Load (TMDL) been developed that clearly identifies the nutrient reductions required to protect the Gulf. As a result, the public has never been provided with a meaningful opportunity to evaluate the science or the fairness of the responsibility assigned to Minnesota sources beyond any voluntary reduction efforts.

> ***Response 45-11:*** The MPCA provided the following response: The 2008 Gulf Hypoxia Action Plan was prepared by the USEPA Mississippi River Gulf of Mexico Watershed Nutrient Task Force. We acknowledge that a TMDL has never been developed for the Gulf's nutrient impairment. However, the scientific underpinnings of the nutrient reduction goals for the Mississippi River Basin have been published and widely reviewed, and they are generally accepted as necessary to reduce the five-year running average areal extent of the Gulf's hypoxic zone to less than 5,000 square kilometers by the year 2035. Minnesota and 11 other Mississippi River states have developed nutrient reduction strategies in accordance with the USEPA's 2011 memorandum titled "Working in Partnership with States to Address Phosphorus and Nitrogen Pollution through Use of a Framework for State Nutrient Reductions." Quoting the USEPA's webpage: "The memorandum lays the foundation for a partnership among states, the U.S. Environmental Protection Agency and stakeholders to make greater progress in reducing nutrient pollution. The framework provides for: prioritizing watersheds on a statewide basis for nitrogen and phosphorus loading reductions, ensuring effectiveness of point sources permits, integrating innovative approaches into agricultural practices, identifying and using government tools to assure reductions in stormwater and septic systems, verifying that load reductions are in place and the measures implemented are effective, and developing a plan for adoption of numeric nutrient criteria."

Comment 45-12: [Re: The proposed 10 mg/L SDR to protect the Gulf of Mexico] This lack of due process is especially significant for municipal facilities given the concerns we have raised in past comments on nitrogen criteria. As we noted in 2024, the proposed 10 mg/L state discharge restriction (modeled in part on Gulf reduction goals) would impose substantial costs for only a modest percentage reduction in statewide nitrogen loading. The reliance on limited scientific data, and the decision to express limits as Total Nitrogen (TN) rather than Nitrate (NO_3-N), compounds these concerns. Agricultural sources remain the primary contributors to Gulf hypoxia, while the degree to which municipal discharges from Minnesota affect Gulf conditions is negligible. Without a clear, science-based demonstration of the need and benefit of reducing municipal TN contributions beyond what is required to protect human health and aquatic life in Minnesota, applying a uniform 10 mg/L TN limit across the state risks imposing extraordinary costs with little measurable benefit.

> ***Response 45-12:*** MPCA provided the following response: Gulf Hypoxia data and studies have been well publicized, and reports are submitted to the U.S. Congress on a regular basis. Minnesota's 2014 and 2025 Nutrient Reduction Strategy reports, along with the 2020 Progress Report, were developed in collaboration with a variety of experts and have been widely publicized and made available for public review and comment. The proposed nitrate aquatic life water quality standards and 10 mg/L total nitrogen SDR will be subject to formal rulemaking processes in accordance with Minnesota's administrative procedure statutes.

Comment 45-13: [Re: The proposed 10 mg/L SDR to protect the Gulf of Mexico] The attenuation of nitrogen through natural denitrification further reduces the likelihood that most municipal discharges in

Minnesota reach the Gulf. Research shows that TN is lost at rates of roughly 0.1 per day in smaller rivers and streams, such that discharges north of the Twin Cities metro area are highly unlikely to exit the state. Given this physical reality, there is no reasonable basis to assume that all municipal wastewater loadings of TN must be reduced to protect Gulf waters. We encourage the MPCA, before advancing large-scale TN reductions, to first conduct targeted monitoring and load analyses to better understand attenuation in the Minnesota River, other major tributaries, and between the Metro area and Lake Pepin. This step is essential to determining whether there is any actual need for Minnesota-wide TN controls tied to Gulf protection.

> ***Response 45-13:*** MPCA provided the following response: Nitrogen loads discharged by Minnesota municipal WWTFs are constituents of the totality of nitrogen loads in Minnesota surface waters, and the nitrogen loads delivered from Minnesota to downstream waters are constituents of the totality of nitrogen loads delivered to the Gulf, Lake Winnipeg, and the Great Lakes. The source and meaning of your reference to a 0.1 per day attenuation rate does not reference a source or a unit. The 2025 NRS River Loads working group has conducted targeted total nitrogen monitoring and load analyses at the major watershed and basin scale. For more details, please refer to Chapter 2 of the 2025 NRS and its supporting documentation, as well as the MPCA's watershed pollutant load monitoring network data.

Comment 45-14: The 2025 Strategy Update itself acknowledges that agriculture is by far the largest contributor of nutrients to Minnesota's waters and to downstream impairments in the Gulf, with over 70% of statewide nitrogen and phosphorus loadings originating from agricultural nonpoint sources. Unlike municipal point sources, agricultural sources are not subject to NPDES permitting requirements under the Clean Water Act. This disparity means that while municipalities face increasingly stringent and costly permit obligations, the dominant sector contributing to nutrient loading remains largely outside regulatory control. Without addressing agricultural contributions in a meaningful way, the Strategy risks imposing disproportionate burdens on municipal wastewater treatment facilities without producing significant improvements in Gulf water quality.

> ***Response 45-14:*** MPCA provided the following response: We acknowledge that the wastewater sector and the agricultural sector are subject to different regulatory responsibilities. While some components of the agricultural sector are largely exempt from Clean Water Act permitting requirements, agricultural nonpoint sources have made many improvements that have resulted in measurable nutrient load reductions. Much remains to be accomplished, but we are optimistic that nonpoint sources and point sources will continue to contribute significant nutrient load reductions over time.

Comment 45-15: If the MPCA determines that a 40% reduction in TN leaving the state remains a priority, the most effective and equitable approach would be to focus advanced treatment requirements on the three largest municipal facilities located directly on the Mississippi River. Enhanced nitrogen removal at these facilities alone is projected to reduce TN loadings by 60–70%, which would exceed the 40% target identified in the Strategy. This focused approach would achieve meaningful reductions where they are most effective, while avoiding the unnecessary financial and operational burdens that broad, statewide TN requirements would place on smaller communities.

> ***Response 45-15:*** MPCA provided the following response: The three largest total nitrogen discharging facilities discharging directly to the Mississippi River are the Met Council's Metropolitan and Empire WWTFs and the Saint Cloud WWTF. Reducing effluent total nitrogen concentrations from those three facilities to 10 mg/L at current flows would result in an overall reduction of 3,485 metric tons (MT)/yr, which would reduce overall end-of-pipe wastewater total nitrogen loads to the Mississippi River by 26%.

Comment 45-16: [Lake Winnipeg] Minnesota has already made meaningful progress in reducing phosphorus discharges from municipal wastewater facilities. Looking ahead, the state should direct its resources toward areas where further reductions are necessary to improve aquatic health and water quality within Minnesota. While we recognize the importance of regional and interstate cooperation on nutrient reduction, Minnesota's immediate focus must remain on addressing in-state needs before asking municipal facilities to bear additional costs to solve problems that originate outside of Minnesota's borders.

> ***Response 45-16:*** MPCA provided the following response: The nutrient reduction goals of the Red River of the North at the United States–Canada border were proposed by the International Red River Watershed Board in 2019, approved by the International Joint Commission in 2020, and supported by Global Affairs Canada and the U.S. Department of State in 2022. Minnesota's 2025 NRS adopts the nutrient load targets proposed by the International Red River Watershed Board and endorsed by the International Joint Commission and the governments of Canada and the United States.

Comment 45-17: MESERB believes that phosphorus reduction efforts aimed at Lake Winnipeg should be voluntary for wastewater facilities and that the multiple City effort administered by the Red River Basin Commission should continue to receive MPCA and state support. Importantly, municipal wastewater facilities in Minnesota, including the Red River Basin, have already achieved substantial phosphorus reductions since the inception of the Nutrient Reduction Strategy more than a decade ago. These reductions have largely come from facility upgrades and optimization efforts, and they demonstrate that meaningful progress has been achieved without mandating additional phosphorus controls in this basin.

> ***Response 45-17:*** MPCA provided the following response: A Red River Basin Plan is currently being developed by the Red River Basin Commission in conjunction with the cities of Breckenridge, Moorhead, Roseau, Thief River Falls, and Warroad to establish wasteload allocations and a water quality offset methodology for the five communities. The MPCA supports development of the plan and has been working with the Red River Basin Commission, the cities, and their consultant to ensure a successful outcome.

Comment 45-18: We are concerned that further phosphorus mandates on municipal facilities would impose disproportionate costs without providing measurable improvements toward the Lake Winnipeg goal, particularly given Minnesota's limited overall contribution to the basin relative to upstream and Canadian sources. Wastewater recommendations in the update should therefore remain focused on voluntary, collaborative approaches to phosphorus control and be encouraged where cost-effective and supported by local partners.

> ***Response 45-18:*** The MPCA provided the following response: The MPCA supports voluntary WWTF optimization and water quality trading initiatives to reduce effluent and nonpoint source nutrient loads in the Red River Basin. However, we also maintain that the total phosphorus effluent limits proposed for major and significant minor wastewater dischargers represent reasonable and economically achievable targets that contribute to Minnesota's phosphorus reduction goals for the basin.

COMMENT LETTER 46. AMELIA KROEGER

Comment 46-1: Strengthen data collection and reporting requirements for fertilizer retailers by MDA and documentation of nitrogen fertilizer application rates by responsible parties (e.g. crop retailers to MDA).

***Response 46-1**:* See response to common topic 1 (regulation).

Comment 46-2: Build a Small Grain Initiative and a safety net for farmers who want to reduce their nitrogen fertilizer application.

***Response 46-2**:* See response to common topic 3 (CLC and small grains).

Comment 46-3: Grow farmer power, farmer networks and locally led, flexible and outcome-based approaches like Olmstead County Soil Health Program.

***Response 46-3**:* See response to common topic 2 (education, incentives, and networking).

COMMENT LETTER 47. MIRAE GUENTHER (MISSISSIPPI WATERSHED MANAGEMENT ORGANIZATION)

Comment 47-1: The MWMO appreciates the technical detail that has gone into the Minnesota Nutrient Reduction Strategy update, including loads and trend calculations updated with more recent monitoring data, and the integration of more up-to-date modeling results. We will look for ways to incorporate the scientific information and strategies identified in this 2025 update in our next watershed management plan, which will be updated for 2031.

Response 47-1: Please reach out to the NRS team for any assistance in using NRS tools in your watershed management plan update.

Comment 47-2: After reviewing the NRS update document, we request clarification pertaining to total phosphorus (TP) and total nitrogen (TN) exports and concerns for the Mississippi – Twin Cities HUC-8 watershed (07010206). The Mississippi – Twin Cities watershed is identified in Figure 2-29 as a high priority watershed for both TP and TN impacts downstream of Minnesota. In addition, the HUC-10 watershed that includes the MWMO is identified in Figure 3-12 as highest local priority for TP and in Figure 3-26 as medium local priority for TN. As outlined in Section 2.8, the Mississippi – Twin Cities watershed is estimated through modeling to contribute TP yields that are multiple times higher than the next highest watershed value (Figure 2-31).

In our review of the report, we were not able to understand the reason for significantly elevated phosphorus and nitrogen loads from the Mississippi – Twin Cities watershed compared to other watersheds. The largest contributing sources of pollutant loads in the Mississippi River Basin are summarized in Table 2-24 to be cropland runoff for TP and tile drainage for TN. These sources have a small impact in the highly urbanized Twin Cities watershed. Are there different source rankings or unique nutrient pollution sources in the Mississippi – Twin Cities watershed that increase estimated loads compared to other watersheds? Separately we note that seven of the 80 HUC-8 watersheds in Minnesota, including the Mississippi – Twin Cities watershed, were modeled with SPARROW while the rest used HSPF modeling. Are the observed elevated loads an artifact of trying to combine and compare the results of two different models in one analysis? Given how much the TP load for the Mississippi – Twin Cities watershed stands out in Figure 2- 31 particularly, we request a re-evaluation of the loads presented in the report or dedicated space to explain the drivers of these elevated loads, and strategies for effective nutrient management in this watershed.

Response 47-2: These elevated loads in the Twin Cities are due to wastewater discharges. USGS SPARROW model results for the Twin Cities (HUC 07010206), and USGS reports the following distribution of sources for total phosphorus loads: 90% point sources, 8% urban land, 1% farm fertilizer, 1% forest/wetland, <1% agricultural land, and <1% manure. Of all the Minnesota HUC-8 watersheds, SPARROW predicts the highest total phosphorus load (sum of all sources) and the

highest point sources total phosphorus load for the Twin Cities HUC8. These SPARROW-estimated loads are also larger than the HSPF-estimated loads for other HUC-8s. SPARROW results are long-term, delivered loads that represent the 2002–2014 time period. As such, BMPs implemented in the 2015–2024 time period would not be reflected in SPARROW results. For the Twin Cities, that means any point source control measures implemented after 2014 are not included in the SPARROW point sources total phosphorus loads. Regarding Table 2-24 (key sources by major basin), the Twin Cities HUC-8 is an anomaly amongst the Mississippi River major basin HUC-8s because the Twin Cities is predominantly urban, while most of the HUC-8s in the Mississippi River major basin are predominantly rural/agricultural. The NRS Team has added clarifying language.

Comment 47-3: We would also like to suggest an appendix with more detail on the model inputs and the identified sources of nutrient loads at the HUC-8 watershed scale. Additional details will help to inform management and planning in the state, as well as at the HUC-8 scale, including in our watershed.

Response 47-3: Major watershed modeling data was provided at the HUC 8 level in Appendices 2-3, 2-4, and 2-5. The MPCA will be working with members of the NRS Team to update the trends data (2028) and update the source assessment (2030) in the future and will take your comment into consideration for updating or creating new documents that provide additional modeling input detail. Although data was provided by HUC-8, HUC-10 level data could be summarized and provided in the future, which may provide additional utility for watershed managers.

Comment 47-4: In addition to the feedback above, we have some editorial comments:

- It could be helpful for background and narrative to move Chapter 6 up to be the second chapter in the NRS update.
- On page 44, we believe Figure 2-19 is a figure of TP load at Mississippi River La Crosse, not TN load as intended, and should be replaced.
- In the appendix document, Table 60 starting on pg. 207, we believe the values have been switched between the TN and TP columns.
- We found several figures to be too blurry to read detailed text (2-26, both 2-31s, both 2-33s, 3-1, 3-14, and others). This may reflect the draft form of the document and resolve when the document is published in full.

Response 47-4: The NRS Team has reviewed and made corrections to Figure 2-19 and Table 60. The blurry figures in the document were an artifact of converting a Word document to a PDF. This has been corrected. Chapter 6 has not been moved, but training materials will be developed to make this background material more accessible.

COMMENT LETTER 48. SAM PASKE (METROPOLITAN COUNCIL)

Comment 48-1: The 'Met Council' is the appropriate way to reference our agency. Please replace 'MCES' with "Met Council' throughout the document, including tables, graphs, and footnotes.

Response 48-1: Specific citations in the 2025 NRS have been edited.

Comment 48-2: Many of the maps in the Executive Summary and subsequent chapters have multiple sources of information on them, which makes it difficult to read. Consider simplifying the amount of information displayed on each map or have side by side maps to compare and contrast the information.

The color scales of the maps (red-green scales) may be difficult for people with colorblind vision impairments to interpret.

Response 48-2: Map color scales have been updated to address accessibility concerns, and figures have been saved with greater resolution.

Comment 48-3: On page xxviii, under the Strategies of other sources section, the word 'sewage' is missing from the subsurface treatment system program. It should read Minnesota's subsurface sewage treatment system.

Response 48-3: This edit has been made.

Comment 48-4: Consider adding the term 'geologically vulnerable' to the glossary.

Response 48-4: "Geologically vulnerable" has been added to the glossary.

Comment 48-5: Chapter 2 comments.

- Consider adding a similar bar for the forms of phosphorus (Total, dissolved, particulate, soluble reactive P) in Figure 2-1.
- When describing the river basins in the state in section 2.2, consider including the percentage of land area each has in the state.
- In the figures that show flow and load timeseries (e.g., Figure 2-10, Figure 2-11), having the flow as decimals with a multiplier in the axis label is overcomplicating the message. Consider having the axis steps as whole numbers with a smaller multiplier.
- Figure 2-15 should be two different graphs. Having two different data sources on the primary x axis is too complicated, especially since the scale of the axis flattens the 5-year rolling average. If you have this as two graphs (one of flow and TP load and one of flow and FWMC) it would be clearer.
- Figure 2-19's secondary x axis is mislabeled, it should be TN Load, not TP Load.
- Figure 2-23 does not show FWMC, the primary axis is incorrect.

Response 48-5: Revisions have been made based on the preceding suggestions.

Comment 48-6: Chapter 3 comments.

- In the Key Messages, there should still be a bullet for the Superior Basin for both N & P, while there might not be basin-wide needs for reduction, there are still local concerns for eutrophication-impaired lakes and river concentration trends.
- On pages 72 and 74, the term 'Gulf of Mexico' is used to describe the Gulf. The naming should be consistent with other mentions of the body of water.
- In Figure 3-11, it is very hard to understand/see the stream assessment line work.
- On page 91, in the numbered list at the bottom of the page, there is a differentiation between local and regional lakes impaired by eutrophication. Can you add more context about how the NRS defines these categories?
- Figures 3-16 and 3-17 are misleading. The category of "unchanging conditions" could imply nitrate trends that are flat but exceed drinking water quality standards OR trends that are flat but below drinking water quality standards. Perhaps there should be four categories on these pie charts for clarity?

Response 48-6: Revisions have been made where possible based on the preceding suggestions.

Comment 48-7: Chapter 4 comment. If the Met Council explores nutrient trading, we will need to partner with producers outside of the metro area, as this is where the majority of nutrients in the Minnesota River originate. This may require changes in statute or other policy to be implemented for our system.

Response 48-7: MPCA provided the following response: We defer to your expertise regarding the need to consider statutory changes for the Met Council to establish water quality trading relationships with entities outside the metropolitan area; however, we believe there are also significant trading opportunities for nitrogen reduction within the seven-county metro area.

Comment 48-8: On page 116 and in many subsequent areas of this chapter, it is noted that the number of permits with TP effluent limits increased. What is the total number of permits? The increase is good to note, but without this context it's hard to establish the magnitude of this change. Additionally, are there any permits that are in violation for TP? This gives insight into the complete picture of permitted TP limits.

Response 48-8: MPCA provided the following response: There are currently 479 wastewater permits containing effluent phosphorus limits (413 domestic; 66 industrial). The number of permits with phosphorus limits by year is shown in tables 4-2, 4-3, and 4-4. Some wastewater permittees report violations of their phosphorus effluent limits. Some are discharge monitoring reporting errors; some report low frequency, some are low percent exceedance violations; and some have significant compliance challenges. However, phosphorus is not unique in this respect. The same pattern of compliance challenges is observable for other pollutants.

Comment 48-9: Section 4.1.3 identifies current funding sources for wastewater treatment in the state; however, it must be stated that with the cost of process changes, these will not be sufficient to meet the goals in the NRS. Additional funding sources must be identified.

Response 48-9: The NRS Team agrees that the overall costs for attainment of nitrogen reduction goals for the wastewater sector will be significant. This is noted under "challenges" in Section 4.1 and is stated as a major challenge for the entire 2025 NRS in Section 8.3.

Comment 48-10: In Section 4.1.4 it was noted that high costs are a concern for utility managers. That is true, but the Met Council has a larger concern that the proposed state discharge restriction (SDR) is both high cost and minimal impact to the Gulf. There is also concern that stricter rules are being developed for sites that can meet the proposed nitrate WQS.

Response 48-10: Comment noted.

Comment 48-11: On page 144, the One Watershed One Plan program is identified as a platform for achieving stormwater management goals. The 33 metro watershed plans should also be identified as a pathway for achieving these goals.

Response 48-11: Metro area watershed plans have been added to this section.

Comment 48-12: Chapter 5 comments. Almost half of the metro area is comprised of agricultural land uses. Like greater Minnesota, we have been encouraging our rural residents to adopt best practices to keep nutrients on the landscape and out of our waterbodies. In section 5.2, the NRS highlights local program successes, and it would be a good opportunity highlight the success of metro-area programs as well. The Dakota County's Agricultural Chemical Reduction Effort (ACRE) has used a variety of approaches to engage with the agricultural community and other stakeholders to develop, consider, and refine this program's strategies and tactics to reduce nitrate contamination in water supplies. It combines groundwater quality monitoring and modeling and other technical assistance to improve the water quality in the county. By highlighting programs like ACRE, the NRS can show the metro region and greater Minnesota have shared agricultural water challenges.

Response 48-12: This relatively new program will be very important for implementing strategies to complement past efforts to reduce groundwater nitrate contamination in Dakota County. The

NRS Team is looking to highlight new and novel approaches in future public outreach efforts and will connect with Dakota County and SWCD staff on this program as more results become available.

Comment 48-13: In Figure 5-12, consider adding an inset map of the whole state to identify where the area shown is located.

Response 48-13: Figure 5-12 was updated to include an inset map.

Comment 48-14: Chapter 6 comments.

- Thank you for highlighting the Minnesota Water Management Framework in this chapter. It is a very important collaboration between all the MN water agencies and deserves this attention.
- On page 223, there is a sentence that states, "Metro municipalities are also required to develop and implement local water management plans," as a part of the metro watershed management process. These local water plans are also important elements of the metro area's Comprehensive Planning Process led by the Met Council. This is another opportunity to show the interwoven water planning process between the region and the state.
- In section 6.3.3, the NRS highlights the need to tie the 1W1P and WRAPS plans to the overall NRS goals. On page 235, the NRS states that BWSR and the MPCA will cooperatively develop guidance for these programs. If this will apply to the metro watersheds, then there should be language to be clear about this expectation in the NRS.

Response 48-14: Language has been added to both these sections to include the metro area.

Comment 48-15: Chapter 7 comments. On page 264, the NRS identifies needs for expanded and improved data collection methods on agricultural practices, including the tracking of small-scale stormwater practices and long-term forest management practices. These are not just an agricultural area need, but something that should be implemented across the whole state. It is vital for us to track urban stormwater practices and the urban forest to understand how upland practices affect our water quality.

Response 48-15: On page 264, the word "agriculture" has been changed to "multiple."

Comment 48-16: Chapter 8 comments. On page 287, bullet j states "Urban stormwater management. As described in in the Agricultural BMP Handbook and the Minnesota Stormwater Handbook, including MIDS." Consider removing the word Urban from the start of this sentence. Stormwater management is important to both agricultural and urban areas.

Response 48-16: This edit has been made.

COMMENT LETTER 49. PAULA MACCABEE (WATERLEGACY)

Comment 49-1: WaterLegacy recommends that the MPCA take seriously the term "Strategy" for Nutrient Reduction and implement measurement and documentation, specific changes in practices, and ongoing verification of whether tactics are actually achieving nutrient reduction objectives.

Response 49-1: The Minnesota 2025 NRS is the work of 10 state, federal, and local entities and UMN. A work group of over 100 individuals assessed decades of monitoring data and compared it to set baseline data (1980–1996 in the Mississippi River Basin; 1996–2000 for the Red River) to identify pre-strategy nutrient levels in major rivers and local watersheds and determine what has changed from 2014 to 2024. Chapters 2 and 3 detail the measurement of nutrient levels, as well as the specific changes in agriculture BMPs implementation, wastewater treatment, and stormwater management practices that are achieving nutrient reduction. The NRS Team will

continue to evaluate the effectiveness of strategies to meet the 2025 NRS goals long-term and make adjustments to these strategies through adaptive management.

Comment 49-2: Specific recommendations to achieve the MPCA's 45% nutrient reduction goal:

- Define "excessive fertilizer use" or "overapplication" of nitrogen fertilizer to prevent leaching of toxic nitrogen runoff and production of nitrous oxide—a potent greenhouse gas produced by overstimulation of soil microbes. This definition should be based on achievement of human health, ecosystem restoration, and climate sustainability. These and other specific requirements should be adopted in rulemaking within two years.
- Compile and analyze all existing data regarding in-field fertilizer levels and water run-off from applying chemical fertilizers and manure at different concentrations, at different times, and with different cover cropping and conservation drainage regimes to specify and set the conditions necessary to avoid and prevent excessive fertilizer use or fertilizer overapplication.
- Conduct rulemaking to mandate in-field management practices to prevent excessive fertilizer use and meet public health, ecosystem restoration, and climate sustainability goals. Use limits adopted as a result of the European Union Nitrates Directive as a template. Other requirements that may be needed in Minnesota include cover cropping, drainage management, and limits on the timing of chemical fertilizers and manure applications. Standards should be more stringent in karst areas and other areas with fissures in bedrock.
- Allow growers using Best Management Practices (BMPs) to obtain an exemption from mandates for no more than five years, and only if the grower verifies through in-field, surface water, and groundwater measurement that the fields using BMPs are preventing excessive fertilizer use and achieving reductions that will allow the state to meet its targets.
- Maintain an ongoing statewide database of on-farm data such as drainage tiling, chemical fertilizer and manure application levels and timing, correlated with monitoring of surface water runoff and groundwater quality. Use this data to identify priorities for action and areas where tactics have been effective, and make data accessible to the public.
- Set limits on fertilizer application in urban and suburban areas as well as agricultural areas. Require measurement, verification, and drainage reduction practices in all watersheds where downstream wetlands, lakes, streams, or groundwater have elevated levels of nutrients or algae blooms.

Response 49-2: See response to common topic 1 (regulation).

Comment 49-3: Continually update strategies to consider impacts of new technologies that may improve targeting, verify that application of fertilizers is not excessive, or make it more difficult to document when application occurs. Consider how remote sensors, variable-rate application, and drone use could affect implementation of nutrient reduction strategies.

Response 49-3: See response to common topic 4 (data and monitoring).

COMMENT LETTER 50. ELIZABETH WEFEL (COALITION OF GREATER MINNESOTA CITIES)

Comment 50-1: We are concerned that this strategy continues to place most of the cost on regulated point sources, such as municipalities. Municipal facilities are already facing increasingly restrictive phosphorus limits. The Strategy signals the implementation of future nitrogen and nitrate requirements on municipalities, even though their individual contributions often amount to a single percentage point (or less) of the overall nutrient load.

Response 50-1: The Minnesota 2025 NRS reports on the existing Wastewater Nitrogen Reduction and Implementation Strategy. While each individual wastewater treatment facility's

effluent load is a minor portion of the statewide total nitrogen load to Minnesota surface waters, collectively the wastewater sector is estimated to contribute 8% of the load in average conditions. It is the second largest controllable source in the Lake Superior Basin after forest runoff, the third largest controllable source in the Mississippi River Basin after agricultural tile drainage and cropland groundwater, and the third largest controllable source in the Red River Basin after cropland groundwater and forest runoff.

Comment 50-2: As indicated by the MPCA's most recent WINS Survey, the costs associated with operating and maintaining wastewater infrastructure continue to grow exponentially, and there is a tremendous unmet need for ongoing infrastructure funding at the state and federal levels. Our primary concern is that the 2025 Strategy could require municipalities to spend even more on upgrades to remove nutrients, especially nitrogen, and that there simply are not enough local, state, and federal resources available to cover the costs. As a result, it is imperative for the MPCA to consider how to prioritize its clean water efforts to ensure that limited local, state, and federal resources are put to maximum effect.

Response 50-2: Section 4.1 of the 2025 NRS lists the growth of capital, operational, and maintenance infrastructure costs is a challenge that all WWTFs face.

Comment 50-3: The 2025 update to the Minnesota Nutrient Reduction Strategy emphasizes broad, statewide reductions in total nitrogen. While the CGMC supports nitrogen reduction where it is scientifically demonstrated to protect human health and aquatic life, the updated Strategy does not provide adequate justification for imposing a categorical statewide requirement for total nitrogen control. A more targeted approach is needed to ensure that resources are invested where they will deliver meaningful environmental outcomes.

Response 50-3: The 2025 NRS supports a targeted approach to nutrient reduction. Please see chapters 2 and 3 for details on priority watersheds for nutrient reduction.

Comment 50-4: Nitrogen reduction efforts should focus on the areas where risks from nitrate are clearly demonstrated, such as drinking water impairments, aquatic life toxicity, or stream health impairments identified through biological monitoring. This approach reflects the scientific evidence and is consistent with the MPCA's own Wastewater Strategy, which prioritizes nitrate where it threatens human health or aquatic ecosystems. By contrast, imposing total nitrogen limits across the board risks misallocating limited resources toward reductions that do not provide measurable local benefits.

Response 50-4: Chapters 2 and 3 provide details on how the 2025 NRS prioritizes drinking water and aquatic life needs for nutrient reduction. Section 4.1 includes details on how the 2025 NRS supports the MPCA's Wastewater Nitrogen Reduction and Implementation Strategy.

Comment 50-5: The Strategy also places undue weight on out-of-state and even extraterritorial goals, such as the Gulf Hypoxia Task Force targets and the Lake Winnipeg Action Plan. While the CGMC recognizes the importance of regional collaboration, these targets should not dictate binding requirements for Minnesota cities, particularly when the benefits to local waters are minimal and the costs are substantial. If Minnesota continues to engage in these efforts, meeting these extraterritorial goals should remain voluntary for municipalities.

Response 50-5: MPCA provided the following response: We acknowledge your comment and note that the nitrogen reduction goals established in the 2014 NRS and reaffirmed in the 2025 NRS are derived from the goals established by the Gulf Hypoxia Task Force (Mississippi River) and the International Joint Commission (Red River of the North) and agreed to by multiple jurisdictions in addition to the State of Minnesota. The proposed 10 mg/L total nitrogen SDR

effluent limits for major municipal and other high-concentration wastewater dischargers are indeed intended to achieve downstream water quality objectives consistent with designated uses established for Class 6 waters in Minn. R. Ch. 7050. Any future rulemaking for the adoption of a 10 mg/L total nitrogen SDR will include an analysis of associated costs as required in Minnesota Statutes. While we agree that cost-effective, voluntary approaches, including water quality trading, are viable and potentially beneficial alternatives, we do not believe that voluntary measures alone will achieve the desired NRS or in-state nitrate reduction goals for the wastewater sector.

Comment 50-6: Finally, nitrogen limits should be expressed as nitrate rather than total nitrogen. Municipal wastewater facilities cannot feasibly remove all forms of organic nitrogen, and forcing costly upgrades to chase reductions that are technologically impractical and environmentally insignificant is counterproductive. Without refinement, the current approach risks diverting substantial public resources into measures that have little impact on local water quality, while increasing energy use and greenhouse gas emissions. New statewide mandates, such as the proposed 10 mg/L State Discharge Restriction, must also proceed through the formal rulemaking process so that the supporting science, costs, and alternatives can be fully evaluated in a transparent and public manner. The CGMC strongly urges the MPCA to revise the Strategy to focus on scientifically supported, locally relevant, and cost-effective approaches that protect Minnesota's waters without imposing unnecessary burdens on communities.

Response 50-6: MPCA provided the following response: MPCA intends to express nitrogen effluent limits as total nitrogen. The MPCA believes that a 10 mg/L total nitrogen effluent limit is achievable for most WWTFs but acknowledges that some site-specific waste stream compositions may require additional considerations. The 2019 Soluble Organic Nitrogen in Biological Nutrient Removal paper published by the Water Research Foundation, which you have provided for review, asserts that the limit of technology for well-designed and operated BNR facilities is 3–6 mg/L total nitrogen. It notes that soluble organic nitrogen may constitute 40% of a 3 mg/L BNR effluent concentration, but it also notes that "For applications with an effluent total nitrogen concentration goal of less than 10 mg/L (typical value for water reuse applications), the ESON concentration is not a great concern." We agree.

Comment 50-7: [Re: The proposed 10 mg/L SDR to protect the Gulf of Mexico] The 2025 Nutrient Reduction Strategy update emphasizes Minnesota's role in addressing Gulf of Mexico hypoxia. The CGMC supports voluntary reduction efforts and nutrient trading to advance these goals, but we remain concerned that Minnesota communities are being asked to shoulder obligations without a clear scientific or regulatory basis. No TMDL has been completed for the Gulf that identifies the reductions required of Minnesota sources, and the public has not had an opportunity to fully evaluate the science underlying these targets. Applying a uniform 10 mg/L total nitrogen limit across all municipal facilities (based in part on Gulf reduction goals) would impose extraordinary costs on cities while providing little measurable benefit, particularly given that agricultural nonpoint sources contribute more than 70% of statewide nutrient loadings.

Response 50-7: MPCA provided the following response: The 2008 Gulf Hypoxia Action Plan was prepared by the USEPA Mississippi River Gulf of Mexico Watershed Nutrient Task Force. We acknowledge that a TMDL has never been developed for the Gulf's nutrient impairment. However, the scientific underpinnings of the nutrient reduction goals for the Mississippi River Basin have been published and widely reviewed, and they are generally accepted as necessary to reduce the five-year running average areal extent of the Gulf's hypoxic zone to less than 5,000 square kilometers by the year 2035. Minnesota and 11 other Mississippi River states have

developed nutrient reduction strategies in accordance with the USEPA's 2011 memorandum titled "Working in Partnership with States to Address Phosphorus and Nitrogen Pollution through Use of a Framework for State Nutrient Reductions." Quoting the USEPA's webpage: "The memorandum lays the foundation for a partnership among states, the U.S. Environmental Protection Agency and stakeholders to make greater progress in reducing nutrient pollution. The framework provides for: prioritizing watersheds on a statewide basis for nitrogen and phosphorus loading reductions, ensuring effectiveness of point sources permits, integrating innovative approaches into agricultural practices, identifying and using government tools to assure reductions in stormwater and septic systems, verifying that load reductions are in place and the measures implemented are effective, and developing a plan for adoption of numeric nutrient criteria."

Comment 50-8: If Gulf-related reductions remain a priority, the MPCA should pursue a more focused approach: enhanced nitrogen removal at the few largest municipal facilities located directly on the Mississippi River. This targeted strategy would achieve meaningful reductions where they matter most while avoiding unnecessary costs for smaller communities.

Response 50-8: MPCA provided the following response: The three largest total nitrogen discharging facilities discharging directly to the Mississippi River are the Met Council's Metropolitan and Empire WWTFs and the Saint Cloud WWTF. Reducing effluent total nitrogen concentrations from those three facilities to 10 mg/L at current flows would result in an overall reduction of 3,485 MT/yr, which would reduce overall end-of-pipe wastewater total nitrogen loads to the Mississippi River by 26%.

Comment 50-9: [Re: Lake Winnipeg] Minnesota's municipal wastewater facilities have already made significant progress in reducing phosphorus discharges over the past decade through upgrades and optimization efforts. These improvements have delivered meaningful water quality benefits within the state, and future resources should be directed toward areas where additional reductions are necessary to protect Minnesota's own waters. While the CGMC supports regional cooperation on nutrient reduction, Minnesota's immediate priority must remain on addressing in-state needs before imposing additional costs on municipal facilities to address problems that originate outside of Minnesota's borders.

Response 50-9: The nutrient reduction goals of the Red River of the North at the United States–Canada border were proposed by the International Red River Watershed Board in 2019, approved by the International Joint Commission in 2020, and supported by Global Affairs Canada and the U.S. Department of State in 2022. Minnesota's 2025 NRS adopts the nutrient load targets proposed by the International Red River Watershed Board and endorsed by the International Joint Commission and the governments of Canada and the United States.

Comment 50-10: With respect to Lake Winnipeg, phosphorus reduction efforts by municipal facilities should remain voluntary and supported through collaborative initiatives like the multi-city program administered by the Red River Basin Commission. Given Minnesota's relatively small contribution to the basin compared to upstream and Canadian sources, additional mandates on our facilities would impose disproportionate costs without measurable improvement toward the Lake Winnipeg goal. Voluntary, locally driven efforts have proven effective and should continue to be encouraged where they are cost-effective and supported by local partners.

Response 50-10: MPCA provided the following response: A Red River Basin Plan is currently being developed by the Red River Basin Commission in conjunction with the cities of Breckenridge, Moorhead, Roseau, Thief River Falls, and Warroad to establish wasteload

allocations and a water quality offset methodology for the five communities. The MPCA supports development of the plan and has been working with the Red River Basin Commission, the cities, and their consultant to ensure a successful outcome. The MPCA supports voluntary WWTF optimization and water quality trading initiatives to reduce effluent and nonpoint source nutrient loads in the Red River Basin. However, MPCA also maintains that the total phosphorus effluent limits proposed for major and significant minor wastewater dischargers represent reasonable and economically achievable targets that contribute to Minnesota's phosphorus reduction goals for the basin.

COMMENT LETTER 51. BOB GUTHRIE

Comment 51-1: Missing Information. Historical information about fertilizer application rates in relation to current recommendations will be instructive and should be included in the update. This information is available from the University of Minnesota Extension (Historical Guidelines), Minnesota Department of Agriculture (Fertilizer Sales Data), the USDA National Agricultural Statistics Service (e.g., Quick Stats), and USDA's Census of Agriculture Historical Archive (Census Archive, to incomplete archival record keeping.). In general, the rate of nitrogen fertilizer application on a per acres basis for most major commodity crops has increased during the past few decades. This could be problematic if the rate of nitrogen assimilation remains unchanged.

Response 51-1*:* The NRS Team worked with the USDA Agricultural Research Service to evaluate nutrient balances for manure and commercial fertilizer (see chapters 5 and 7 and Appendix 5-3), based on the best available information. UMN Extension develops and updates recommendations for phosphorus and nitrogen application rates, which were used in the nutrient balance analysis conducted by the USDA Agricultural Research Service. This work will be revisited in the future to track changes in the levels of nutrient application over time.

COMMENT LETTER 52. ADAM BIRR (MINNESOTA CORN)

Comment 52-1: Direct financial support and funding transparency. Expanded workforce capacity and streamlined systems are helpful but cannot replace direct investment in farmers. Sustained cost-share and incentive programs—such as the Soil Health Financial Assistance Grants and AgBMP Loan Program—are essential to drive large-scale adoption. Reporting should clearly distinguish dollars spent on practices versus program administration to ensure resources directly advance NRS goals. Action: Prioritize farm-level cost-share or other forms of financial assistance to farmers and require transparent accounting of practice vs. administrative spending.

Response 52-1**:** The NRS Team agrees. The 2025 NRS Section 5.3.1 lists dependable financial assistance as a key feature of successful BMP programs. Many of these programs already report the amount spent on practice adoption versus administrative costs.

Comment 52-2: Elevate proven farmer-focused programs**.** Minnesota has multiple programs with proven adoption, measurable impact, and unmet farmer demand that are ready to scale. The Soil Health Financial Assistance Grants, University of Minnesota (UMN) Nitrogen Smart Program, and AgBMP Loan Program should be prominently featured throughout the report, alongside the Minnesota Agricultural Water Quality Certification Program (MAWQCP) and Office of Soil Health programs. Elevating these programs signals confidence in farmer-led solutions and builds momentum where success is already demonstrated. Program descriptions should focus on Minnesota- specific initiatives, with out-of-state examples moved to an “illustrative” section. Action: Highlight support and expansion of proven, existing farmer-focused programs in MN as cornerstones of the NRS update.

Response 52-2: The UMN Nitrogen Smart program has now been called out in Chapter 5.2.1, and a reference to the MDA Ag BMP Loan program has been included as well. Also, see the response to comment 52-13.

Comment 52-3: Address research and data gaps**.** Future research should quantify nutrient reductions from stacked practices on the same acres to better reflect real-world conditions. Minnesota-specific studies must be prioritized, as most efficiency data in the current review come from out of state. Additional research is also needed on in-field nutrient management—specifically the role of biologicals and fine-tuning crediting of mineralization rates—as well as groundwater dynamics, including nitrate lag times and legacy effects. These efforts will help clarify when improvements can be expected and strengthen the connection between practice adoption and measurable outcomes. Action: Fund Minnesota-specific research on stacked practices, in-field nutrient management, and groundwater dynamics to close critical knowledge gaps.

Response 52-3: Additional specifics on research needs related to agriculture and nutrient management have been added to Chapter 5. See the response to comment 52-7.

Comment 52-4: Adoption feasibility and capacity**.** In-field nutrient management should be recognized as essential, with practices like timing, split applications, variable-rate fertilization, and enhanced incorporation offering opportunities on nearly every row-crop acre in Minnesota—up to 8 million corn acres. Collectively, adoption of these practices, along with targeted use of cover crops and reduced tillage, could deliver significant water quality gains. Scenario goals should emphasize the practices farmers are most likely to adopt and acknowledge that drainage water retention and treatment are costly and best targeted to specific settings. Projections must be realistic, grounded in farm economics and current income data, to avoid unachievable expectations and more accurately reflect adoption potential. Action: Emphasize scalable nutrient management practices and align goals with farmer adoption potential and economic realities.

Response 52-4: Additional emphasis on the importance of in-field nutrient management was added to Chapter 5. See the response to comment in 52-11.

Comment 52-5: Program tracking and web tools**.** New tracking platforms should not be developed until existing tools are fully evaluated and optimized. Priority should go to farmer-facing decision-support tools that directly enable adoption and ensure resources deliver measurable outcomes. Tracking efforts should align with existing methodologies, practice-level frameworks, and the nutrient reduction and environmental benefits already documented through state and federal programs. Action: Streamline programs and optimize existing tools before creating new platforms.

Response 52-5: Clarification language was added to Chapter 7 that priority will be given to the enhancement of existing tools. New tools will be added with input from NRS partners if they provide direct support for the forthcoming 2025 NRS dashboard and funds and staff capacity available to develop and support new applications.

Comment 52-6: Federal policy and continuous living cover (CLC) crops. The NRS includes statements suggesting that federal farm policy prevents widespread adoption of continuous living cover (CLC) crops, such as winter oilseeds or perennial wheatgrass, on Minnesota cropland. These statements misrepresent federal policy and overlook opportunities within existing programs that can support CLC adoption while managing farmer risk. Federal crop insurance can serve as an effective tool for mitigating risk associated with CLC crops. Under the Federal Crop Insurance Act, private companies or individuals may propose new insurance products through the 508(h) process (URL: https://www.rma.usda.gov/about-rma/fcic/private-sector-developed-plans), and crops with a purchase contract can be insured under the Crop Insurance Title of the Farm Bill. Scaling up CLC crops requires

companies to commit to purchase these crops. Adoption limitations are often driven more by market prices than policy constraints.

The Commodity Title of the Farm Bill provides additional risk management through programs such as Agriculture Risk Coverage and Price Loss Coverage, which currently cover 22 commodities, including crops grown in Minnesota such as wheat, oats, barley, corn, dry peas, soybeans, sunflower seed, canola, and flaxseed. Many of these crops are cited in the NRS as needing increased acreage to support nutrient reduction. Importantly, several, such as oats, already have access to commodity program supports, highlighting that federal programs can provide both income and production risk mitigation. Participation in federal programs requires compliance with conservation provisions established in the 1985 Farm Bill, including Swampbuster and Sodbuster requirements. Farmers must annually demonstrate compliance with highly erodible land conservation (Sodbuster) and wetland conservation (Swampbuster) on acres enrolled in federal programs. These provisions ensure that participation in the federal safety net supports both risk management and environmental stewardship. Action: Revise NRS language to accurately reflect federal policy opportunities and emphasize pathways—including crop insurance and commodity programs—that enable Minnesota farmers to adopt continuous living cover crops or other crop rotations while managing risk.

> ***Response 52-6:*** Revised language was added to Key Messages in Chapter 5 and Section 5.4.2 to include the references to the Commodity Title in the Farm Bill and provide some clarification.

Comment 52-7: Section 1.2.4 – Updated science on nutrient-reducing practices. Over 80% of studies informing updated nitrogen removal practice efficiencies are from outside Minnesota, limiting their relevance to the state's unique soils, climate, and cropping systems. Incorporating locally generated research—including data from Discovery Farms, UMN studies, extension work, and local experts—is critical to ensure nutrient-reducing practices are accurately represented. Until sufficient Minnesota-specific research is incorporated, recommended updated nutrient removal efficiencies should remain advisory in nature. Additional clarification is needed on how these efficiencies align with existing methodologies, practice-level tracking frameworks, and the nutrient reduction and environmental benefits already reported through various state and federal programs.

> ***Response 52-7:*** NRS partners believe there is sufficient research to use the data in the science assessments completed by UMN. The language was revised to acknowledge the need to strengthen the research infrastructure and continue to strive to fill research gaps over time. Research needs were also updated with suggestions above. Updates were made in sections 5.1.2 and 5.4.2.

Comment 52-8: Section 1.2.6 – Updated science on climate and other external influences. The fourth bullet in this section, titled "More tile drainage," suggests that this will lead to increased nitrogen loss to Minnesota's surface waters. This oversimplifies nitrogen loss pathways. Nitrogen can also be lost through denitrification in the form of nitrous oxide which can be magnified in anoxic conditions encountered when drainage is not present. Crop uptake can be compromised in these circumstances and lead to overall greater loss of nitrogen in the form of nitrous oxide. Given the cost of fertilizer, it is in the best interest of farmers to maximize productivity and crop uptake. Efforts should be made to minimize nitrogen losses in all forms and suggesting that the elimination of tile drainage will reduce overall nitrogen losses is a fallacy. This phenomenon applies to any crop that requires nutrients and is being optimized for production.

The Kuehner et al. (2025) study referenced multiple times in the report with respect to in-state nitrate trends (section 3.3.1) also included an analysis of nitrate concentrations in 18 tile-drained watersheds in the glacial till landscape of the Western Corn Belt Plains (WCBP). The study found that "56% (10) of the

sites showed no trend, while 6% (1) were increasing, and 39% (7) were decreasing." The peer-reviewed paper goes on to say, "Analysis of stream trends over different climatic periods showed there were more 'no trend' or 'decreasing trends' in the glacial till landscape during wet years compared to the streams in the Driftless Area." These findings suggest that tile-drained watersheds reflect contemporary nitrogen management practices and can be used to document near-term effectiveness of these practices which may be delayed at the mainstream river locations.

> ***Response 52-8:*** Chapter 1 provides information about trends that impact nutrient loading and management, and agricultural tile drainage can also impact sediment and phosphorus dynamics. Section 1.2.6 was updated for greater clarity.

Comment 52-9: The fifth bullet in this section (1.2.6), titled "More row crops," oversimplifies land-use dynamics and is misleading. Since the 2014 NRS draft, total row crop acres—particularly corn and soybeans—have remained stable. The claim that corn and soybean acreage has increased by about 140,000 acres per year implies a consistent, well-defined trend. Annual fluctuations of this scale fall within normal variation, driven by commodity prices, management decisions, crop rotations, and other factors. Moreover, declines in other row crops, such as wheat, are not a direct one-to-one offset. Without citing datasets or methodologies, the 140,000-acre figure overstates precision and underrepresents current realities. This bullet should be removed entirely. In fact, more than 300,000 acres of total cropland have been lost since 2018 according to the BWSR Statewide Conservation Lands Summary (URL: bwsr.state.mn.us/summary-conservation-lands-county). According to this summary, the proportion of cropland enrolled in conservation programs has grown modestly since 2018.

> ***Response 52-9:*** Section 1.2.6 has been edited for clarity.

Comment 52-10: Section 2.6.1 – Effects of added agricultural practices. The current framing risks overstating the scalability of drainage water retention and treatment practices. While acknowledging limited adoption, it does not reflect the substantial government investment required, nor the hesitation among many farmers to adopt these complex and costly practices. A more balanced framing would recognize that these practices play an important role in targeted settings but may not represent broadly scalable solutions across Minnesota. The limited adoption feasibility of this practice category should be reevaluated and framed accordingly throughout the entire report.

> ***Response 52-10:*** Additional language was added to Section 2.6.1 to note complications in adopting drainage water retention and treatment practices, which are covered in detail in Chapter 5.

Comment 5-11: Chapter 5 Key Messages. The current framing of in-field nutrient management practices downplays their role by emphasizing limited per-acre potential, even though collective improvements across large acreages can have a significant impact, which may give the impression that in-field management is a secondary or "less important" practice. Additionally, recent research suggests predicting N mineralization and the use of biologicals also presents significant opportunities for in-field nutrient management, further increasing their nutrient reduction potential. Refined language for balance: "In-field nutrient management is an essential component of the solution. Implementing in-field fertilizer and manure practices across millions of acres yields significant collective water quality benefits. Continued work to improve precision N and P management on every acre remains critical to achieving NRS goals."

> ***Response 52-11:*** This section was edited to expand upon the suggested language and provide additional detail on context for in-field nutrient management under key messages for Chapter 5.

Comment 52-12: Section 5.1.6 – Mississippi River Basin Scenarios. The proposed 2040 scenario underutilizes opportunities to leverage stacked practice efficiencies and to maximize implementation on acres where practices are readily feasible. For example, field-edge treatment of tile water would require a nearly 25-fold increase over current adoption levels, yet experience and evidence indicate that such practices are unlikely to be scaled without substantial government assistance. As currently framed, the scenarios could make many producers feel that the 2040 goal is unachievable, given how far it is from a realistic adoption pathway. To improve both feasibility and impact, 2040 scenarios should emphasize increased adoption of nutrient management, continuous living cover, and reduced tillage, which align with farmers demonstrated willingness to adopt and for which the existing infrastructure and technical support are already in place. Prioritizing these practices can maximize both adoption and measurable water quality benefits while avoiding over-reliance on highly intensive practices unlikely to scale under current conditions.

> ***Response 52-12:*** NRS partners looked to balance the types of practices included in the scenarios, which included management, structural, and engineered agricultural practices. In the NRS, the following caveat is stated: "While the working group aimed for practical and effective practice combinations, with multiple benefits and a high potential to add new adoption acreages, the magnitude of reductions needed to meet goals required more acres of practices than could be practically installed. To achieve the nitrogen goals, the scenarios include a dramatically higher level of adoption compared to historic rates of adoption, and the feasibility of such high levels of adoption is unlikely." Scenario development is an iterative process and will be revisited in the future as part of the implementation of the NRS.

Comment 52-13: Section 5.2.1 – Government and private sector nutrient management programs since 2014. Recommend including narrative callouts only for programs that currently exist. For example, remove the Iowa Batch and Build program from this section and instead highlight the AgBMP Loan Program, which has demonstrated both high demand and scalability. The AgBMP Loan Program also maximizes private investment by leveraging low-interest financing, whereas Batch and Build would require more direct federal support. In regard to the "lessons learned" regarding the MAWQCP, it's important to note that the "indications of higher average net income that participating farmers earn" is corollary rather than causative. Farmers enrolled in the program likely manage all aspects of their operation economically and the fact that they are profitable is not attributed to the program. Finally, the information in section 6.2.3 would fit more appropriately in section 5.2 to complete the list of available programs and reduce redundancies.

> ***Response 52-13*:** Language was revised in Chapter 5 to remove the detail on the Iowa Batch and Build Program; detail related to UMN Nitrogen Smart and MDA Ag BMP Loan programs was added to Section 5.2.1. Revised language on the Iowa Batch and Build Program was added to Section 5.3.1.

Comment 52-14: Section 5.4.2 – Cropland management for landscape-level changes. Under the section on conducting a statewide CLC campaign, the following statement appears: "If SAF is based on corn instead of CLC, this could work against making nutrient reduction progress in our water." However, Table 23 found within Chapter 5 of the appendix notes "Insufficient data" for winter oilseed relay crops relative to nitrate leaching. This section of the appendix cites a report by Ecotone Analytics et al. (2023) suggesting adoption potential in Minnesota of 12 million acres by 2050 for perennials and winter annual oilseeds. The report also states that this level of adoption could provide 23% N loss reduction for the state. This report was commissioned by an advocacy group called Friends of the Mississippi River and the report is only available for download after submitting personal information to the organization. The

advocacy report has not been conducted by an agency, nor has it been through a peer-reviewed process and thus should be omitted from the NRS.

> ***Response 52-14:*** Language on sustainable aviation fuel (SAF) has been adjusted to indicate that SAF feedstocks should be derived from crop types and rotations that are environmentally favorable and will help in making progress in nutrient reduction to waters.

Comment 52-15: Section 7.3.3 – Soil nutrient balance – estimating inputs and outputs. Caution is warranted in interpreting watershed trends from fertilizer sales data and other sources with varying degrees of resolution. These data do not reflect fertilizer actually applied in the field (e.g., storage, off-season purchases) and can create a false sense of precision. Given these limitations, investing in a public-facing visualization tool at the HUC 10 watershed scale may be premature and of limited value, as the statewide trends identified align with patterns already observed through MDA fertilizer survey data. A more effective approach would focus on targeting rotation years where over-application is occurring and promoting broadly applicable practices such as timing, split applications, variable-rate fertilization, and enhanced incorporation—strategies with potential across up to 8 million acres to deliver significant water quality benefits.

In the case of phosphorus, the analysis in section 5.1.4 suggests that soil phosphorus build-up across watersheds appears to be highest in central Minnesota watersheds from a combination of manure and fertilizer. Soil testing is the best indicator of phosphorus build-up, thus promoting regular soil testing in the watersheds would be a more effective strategy for reducing potential exceedances of phosphorus applications. Farmers generally use soil testing as part of their nutrient management program particularly those that apply manure.

> ***Response 52-15:*** Soil nutrient balance maps were adjusted to better visualize the categorical differences, and the color schemes were adjusted to meet accessibility standards. Details on limitations related to the research from Appendix 5-3 were summarized in Section 5.1.4. The NRS Team agrees that additional soil test data for phosphorus would be helpful for this analysis; however, soil test data for phosphorus collected by farmers is predominantly private data and was not available for the 2025 NRS analyses.

Comment 52-16: Section 7.5.1 – Indicators for change. The last paragraph of this section discusses farm size and income trends. We recommend refocusing it on recent data rather than comparisons to the 1980s. Current financial pressures are central to understanding the feasibility of conservation practice adoption, as farm income levels directly affect a producer's ability to invest in new practices. Refined language for balance: "Significant changes in farm size and income have occurred in recent decades, shaping the dynamics of conservation practice adoption. The 2022 Census of Agriculture (USDA 2024b) reported 65,531 farms in Minnesota, down from 94,382 in 1982, with the average farm size increasing from 294 to 388 acres over that period. Since the last version of this report in 2014, farm income trends in Minnesota have been highly variable, with sharp declines in recent years. In 2024, median net farm income fell to just $21,964 — the lowest level this century — driven by declining crop prices and below-trendline yields. Farm profitability has eroded since 2022, leaving many producers with reduced working capital, limited net worth growth, and minimal profitability. These financial realities are critical context for assessing farmers' capacity to adopt conservation practices. Looking forward, farm income trends will remain one of the most important factors influencing whether producers can invest in new conservation measures."

> ***Response 52-16:*** Suggested language has been incorporated into Chapter 7.5.1.

Comment 52-17: Section 7.6.5 – Concepts for future tracking and visualization tool development. Table 7.8 lists eight potential tools to support NRS progress tracking. Before investing in new platforms, it

would be useful to assess whether existing tools are being used, by whom, and how effectively. Adding layers to current tools may offer greater efficiency than creating new ones. Importantly, there is a notable gap in tools designed to directly support farmer decision-making—resources that are essential to drive practice adoption and landscape-scale change. Without careful coordination, additional tracking tools risk creating confusion, redundancy, and unnecessary costs.

Response 52-17: See response to comment 52-5.

Comment 52-18: Section 8.3 – Next Steps: an Updated Roadmap for NRS Success. Item number 3 under Question 3 second bullet may unintentionally suggest inadequacy or non-compliance with the Groundwater Protection Rule, which is already fully implemented and enforceable. Suggest removing "including regulatory requirements where voluntary efforts are unsuccessful" as the language implies inadequacy and/or non-compliance. Refined language for balance: "Through continued implementation and enforcement of the Groundwater Protection Rule, alongside local and state support efforts."

Response 52-18: Suggested language has been incorporated into Chapter 8.

Comment 52-19: Section 8.3 – Next Steps: an Updated Roadmap for NRS Success. Item 4 under Question 3 suggests developing a nitrogen endorsement for the Minnesota Agricultural Water Quality Certification Program (MAWQCP). Instead, the UMN Nitrogen Smart certification program should be offered as an alternative. For clarity, we recommend ending the third sentence of this section at "leaching." In addition to continuing and expanding MAWQCP and Minnesota Office for Soil Health programs, this section should also reference the Soil Health Financial Assistance Grants and the AgBMP Loan Program. Finally, we recommend removing the linked Iowa Nutrient Research and Education Council example, as it is not currently operational and does not directly support on-farm practice improvements.

Response 52-19: Adjustments have been made to the language in this section of Chapter 8 based on the suggestions above and in consultation with MDA.

COMMENT LETTER 53. SIERRA CLUB (PETER WAGENIUS)

Comment 53-1: Expeditiously promulgate the nitrate ambient water quality standards. Adoption of the Nitrate Water Quality Standard (WQS) is critical to establishing numerical and narrative goals for the health of people, aquatic life, and all ecosystems and in the implementation of the NRS. The WQS proposed is the result of research on aquatic life toxicity due to nitrate in surface waters and is a numerical standard to protect aquatic life Class 2 waters, 2A cold water uses and 2B cold/warm water uses. The draft plan discusses the nitrate WQS development and inclusion in the 2025-2027 Water Quality Standards Triennial Review (MPCA, p. 105). Adoption of the WQS was halted by PCA, claiming that more recent water quality findings in Southern Minnesota required further consideration. Completion of the NRS and WQS are separate processes, but both are needed to improve Minnesota's waters. We urge the MPCA to complete the work needed to finalize the WQS once knowledge of the updated nitrate and total nitrogen reduction targets and proposed approaches are determined with the completion of the NRS.

Response 53-1: See response to common topic 5 (aquatic life/nitrate standards).

Comment 53-2: Emphasize continuous living cover (CLC). The NRS 2025 draft has rightly identified continuous living cover as a cornerstone of nutrient reduction. This is a crucial and transformative shift. The strategy needs to go all-in on this concept, mandating the widespread adoption of winter annuals like pennycress and camelina, as well as perennial crops.

Response 53-2: See response to common topic 1 (regulation).

Comment 53-3: Support for Innovative Cropping Systems: The NRS could provide more funding and technical assistance for farmers to experiment with and adopt new cropping systems that are inherently less nutrient-intensive. This includes using precision agriculture technologies and supporting the development of markets for new, low-input crops.

Response 53-3: Chapters 5 and 8 of the 2025 NRS highlight as foundational the use of new cropping systems to reduce excess nutrients.

Comment 53-4: Soil Health: A healthier soil ecosystem is better at retaining water and nutrients. The strategy should more explicitly link nutrient reduction to soil health, providing incentives for practices like diverse crop rotations, reduced tillage, and the application of compost and other organic matter. This not only reduces nutrient runoff but also improves agricultural productivity and resilience to climate change.

Response 53-4: Soil health is a key component of nutrient reduction and is covered in Section 5.1.

Comment 53-5: Minnesota can and must develop its own statutes and implement regulations for managing tile drainage pollution. This could be done through changing the Minnesota Drainage Law to include water quality management via permitting and treatment of the discharge.

Response 53-5: See response to common topic 1 (regulation).

Comment 53-6: The voluntary approach to BMP implementation for agriculture is not working, and Minnesota must consider developing and implementing a regulatory scheme with authority to mandate BMP planning and use. There are several approaches used in the US that can be considered in Minnesota and these include:

- Nutrient Management Plans (NMPs). Manure management plans (MMPs) are currently required for feedlots under MPCA permitting, and this approach could be extended to all fertilizer applications to croplands in Minnesota. These plans cover the timing and amount of agricultural nutrients applied, along with other BMPs, to manage nutrient pollution. NMPs are required in Maryland, Delaware, and Vermont, and include enforcement authority with administrative penalties. Ohio requires NMPs in targeted areas where the waters are impaired or there is a concern for drinking water. NMPs should include water quality testing at intervals and a number of locations to monitor for their effectiveness. NMP implementation by MDA staff can be done on a routine basis, as done in Maryland (Fernholz & Feeney, 2018, Hall & Essman, 2019). As in the Southeast Minnesota Nitrate Strategies Collaborative Work Group Report of Recommendations, utilize teams of experts, agronomists, water quality specialists, Soil and Water Conservation District staff and well management experts. Go on-site to assess and consult with farmers and feedlot owners on their use of best management practices and provide recommendations on improvements and changes that would best prevent water quality impacts
- Certification of Fertilizer and Manure Applicators. A number of states require a certified fertilizer and manure applicator for both commercial and private applications of fertilizer and manure, and the states sponsor certification programs (Hall & Essman, 2019).

Response 53-6: See response to common topic 1 (regulation).

Comment 53-7: Water Quality Trading. While it is not an enforcement approach, water quality trading allows regulated point sources to meet their permit requirements by buying nutrient reduction credits for nonpoint sources from farmers who implement BMPs. It is an incentive for farmers to install BMPs and provides cost savings to point sources, usually in the same watershed.

Response 53-7: Minnesota's water quality trading program is described in Section 4.1.3 and noted as a useful approach for nutrient reduction in multiple chapters of the 2025 NRS.

COMMENT LETTER 54. AMY BACIGALUPO (LAND STEWARDSHIP PROJECT)

Comment 54-1: Expanded and increased investment in Soil and Water Conservation Districts (SWCDs) as a trusted local partner and effective delivery mechanism for these nutrient reduction strategies.

Response 54-1: Greater support for SWCDs and watershed districts is called for in chapters 5, 6, and 8. See response to common topic 2 (education, incentives, and networking) for details.

Comment 54-2: Add language to pages 190 and 289 to create a Small Grain Initiative, with similar levels of funding and a long-term commitment from the Minnesota Department of Agriculture (MDA) and the University of Minnesota, modeled after the visionary Forever Green Initiative.

Response 54-2: See response to common topic 4 (CLC and small grains).

Comment 54-3: Develop a program that offers a safety net for farmers who want to reduce their nitrogen fertilizer applications. Add language on page 285 to require the state, in partnership with private organizations, to develop a safety net for farmers who want to trial reduced amounts of synthetic fertilizers modeled after other successful indemnification programs.

Response 54-3: Development of a safety net program for farmers to reduce fertilizer application has been added to suggested future actions in Chapter 5. Crop insurance and commodity support programs are beyond the authority of state agencies.

Comment 54-4: Add language on page 292 to require that the new Continuous Living Cover Task Force have representation of 50% farmer and farmer-led organizations.

Response 54-4: A recommendation that the Continuous Living Cover Work Group contain many producers and producer-led organizations has been added to Chapter 8.

Comment 54-5: Replicate approaches like the Olmsted County Groundwater Protection and Soil Health Program to all SWCDs across MN. On page 288 add a bullet that describes a plan with the leadership of BWSR and SWCDs to replicate a similar approach to the Olmsted County initiative in phases across the whole state, starting with southern Minnesota.

Response 54-5: Language has been added to page 288 in support of expanding the Olmsted County Groundwater Protection and Soil Health Program-style approach.

Comment 54-6: Strengthen data collection and reporting requirements by adding documentation of nitrogen fertilizer application rates by responsible parties (e.g. crop retailers). Request a change to the language on page 262 under "Nutrient Management Tracking" to expand manure application reporting to ensure proper crediting of all nitrogen sources when both synthetic fertilizers and manure are applied. Also require MDA to set a goal for reducing synthetic fertilizer use. Require that this reporting is mandatory and that MDA publishes the data annually.

Response 54-6: See response to common topic 1 (regulation).

Comment 54-7: Change the language from state agencies "can" support to "must" support programs that prioritize funding for farmer-to-farmer efforts that support adoption of Soil Health practices on page 192.

Response 54-7: Because the 2025 NRS is not a regulatory document, it does not contain regulatory language.

Comment 54-8: Change the language on page 299 to specify that the continuation of the MAWQ Program includes new measures that require edge of field water quality testing at least three times throughout the 10-year contract. Also, on page 299 change the language from 'self-monitoring' to mandatory monitoring by MDA to document the levels of nitrates in the edge of field water drainage and ensure that it is below the 8 – 10 mg/L standard. On this page add language that requires MDA to pilot a groundwater endorsement for vulnerable soils starting in Southern Minnesota.

Response 54-8: The suggestions regarding the MAWQCP have been shared with MDA.

Comments 54-9: On page 150 microplastics are listed as an emerging contamination of concern for wastewater treatment. Add language to this section that requires MDA and MPCA to develop approaches that reduce the use of microplastics in agricultural practices especially in the dairy and specialty crop farms.

Response 54-9: While concern about microplastics is valid, microplastics in agriculture is outside the scope of the 2025 NRS Chapter 4, which addresses urban nutrient sources. The MPCA has an emerging contaminants program with which the NRS Team coordinates, and this concern has been shared with them.

COMMENT LETTER 55. MATT DOLL (MINNESOTA ENVIRONMENTAL PARTNERSHIP, ON BEHALF OF MULTIPLE ORGANIZATIONS)

Comment 55-1: The [CLC] task force should focus on the highly beneficial market-based CLC crops and link with the work underway at the University of Minnesota's Forever Green Partnership that has developed a highly successful collaborative that includes stakeholders from academia, agriculture, business, policy advocacy and government.

Response 55-1: See response to common topic 3 (CLC and small grains).

Comment 55-2: We recommend that the discussion of CLC strategies recognize this characteristic as part of the definitions and only include market based crops as CLC crops or, at a minimum, those that are market based, should be analyzed and assessed separately from non- marketable crops. Non-market based plants can be considered separately.

Response 55-2: Multiple letters have recommended defining market and nonmarket-based CLC crops and highlighting market-based opportunities. Changes have been made throughout the NRS to clarify the two types of CLCs.

Comment 55-3: Using this definition, we question the assessment in Table 5-9 on page 186 that the Forever Green strategies are rated as a medium level of innovation. Considering the historic reliance on government incentives for the adoption of traditional modestly impactful best management practices over the last several decades, the Forever Green approach is not only highly innovative, it is transformative in developing new systems that not only protect our water and other valuable natural resources but also return a profit to farmers. We recommend that Forever Green be recognized as highly innovative.

Response 55-3: Table 5-9 has been updated.

Comment 55-4: Align allocation of state water resources with strategies that show the most potential to reach water quality goals. With the NRS recognition that "Nitrogen reduction goals cannot be achieved without transformative changes in crop system rotations and maintaining living cover for more months each year;" it is past time for the state to better align its investment of funds to support the development and use of CLC crops. This includes the Clean Water Fund resources that were specifically

adopted to achieve clean water goals, yet as we approach the twenty year mark of this voter approved initiative, the state is falling well short of meeting expected clean water outcomes with these funds. Now is the time to pivot allocation of these funds to better support those strategies capable of meeting water quality goals. Not only will this produce better, more durable results for our water, it will all shore up public support for the continuation of this funding in future years by demonstrating the state's ability to follow the science and take steps that will achieve water quality goals.

> ***Response 55-4:*** NRS recommendations have been, and will continue to be, broadly shared with state agencies and the Clean Water Council, which advises the Minnesota Legislature on the use of Clean Water Funds.

Comment 55-5: Support active measurement and tracking of CLC development. We support the draft NRS's commitment to develop new ways to track CLC acreage changes and to make this and other NRS data available on a central dashboard. Using currently available technology, the state should develop an annual CLC Index to track the CLC coverage over time. This will serve as a key source of information for farmers, researchers, government agencies, and the public.

> ***Response 55-5:*** The NRS team has begun discussions with researchers in Minnesota and with other Hypoxia Task Force states to work on developing a cover crop/CLC index.

Comment 55-6: Support adoption of state nitrate standard for class II waters. We appreciate the State's commitment in the draft NRS to adopt nitrate standards to protect aquatic life in Class 2 waters. These streams and rivers have tremendous importance to ecological and public health. We hope that the MPCA will stay the course in finalizing years of work to develop and implement this standard.

> ***Response 55-6:*** See response to common topic 5 (aquatic life/nitrate standard).

Comment 55-7: Further, we support the Strategy's inclusion of measures to address pollution from other sources of nutrient pollution: feedlots, septic systems, forestry, and streambank erosion, including those recommendations included in the comment letter referenced in the second paragraph.

> ***Response 55-7:*** The NRS Team appreciates this support. Including details on these sources of nutrients required significant interagency involvement and added foundational content to Section 5.5 and Appendix 5-5.

Comment 55-8: We recognize that the measures laid out in the nutrient reduction strategy will require expanded state strategies and commitments. We regard this as well worth the cost. Minnesotans and our downstream neighbors are currently facing the costs of decades of nitrogen and phosphorus pollution: in far too many communities, groundwater is unsafe, lakes are unfishable, and health costs are rising. We strongly encourage the MPCA and the State to adopt and prioritize measures to ramp up our nutrient pollution prevention efforts.

> ***Response 55-8:*** The NRS Team appreciates this support and agrees that prioritizing the key actions outlined in the 2025 NRS Chapter 8 would ramp up nutrient-reduction efforts.

COMMENT LETTER 56. JAKE KUNDERT (UNIVERSITY OF MINNESOTA AGROECOLOGY)

Comment 56-1: Definition of "cover crop." The language of cover cropping describes "living cover crops" (page 199), which is unclear language. There is a need in the NRS document to clearly differentiate "classic" cover crops which are not fertilized or harvested versus "cash" or "commodity" cover crops such as winter annual crops which receive some fertilization and are harvested for profit. Both have their place in Minnesota agricultural systems, but function differently and can have different end results. For example, additional fertilizer applied to a "cash cover crop" grown in a vulnerable watershed may

have differing implications for nitrate reduction than a cover crop for which no added fertilizer is applied.

> ***Response 56-1:*** Several commenters have recommended defining market- and nonmarket-based CLC crops and highlighting market-based opportunities. Changes have been made throughout the 2025 NRS to clarify the two types of CLCs.

Comment 56-2: Research priorities. We see important research needs that will support the success of the NRS. We ask the State to support–financially and otherwise–the following priority research needs:

- Comprehensive breeding efforts are urgently needed to improve cover crops, develop winter-annual "cash cover crops" that provide direct economic returns, and continuous living cover (CLC) cropping systems;
- Breeding programs should incorporate traits that improve nitrate uptake and winter hardiness while improving soil health parameters;
- Development of a suite of perennial grains, forages, and agroforestry species, to be grown alongside cropping systems like silvopasture and riparian buffers, that can support diverse landscapes and agricultural business models;
- To ensure CLC adoption at scale, social science research must be meaningfully integrated to identify equipment, labor, supply chain, and knowledge barriers, support peer-to-peer learning networks, and communicate the impact alternative cropping systems can have on rural livelihoods;
- Novel systems, such as manure injection into cover crops or pairing cover crops with short-season summer cash crops to extend the fall-to-spring growing window, should be tested for their combined nutrient-reduction and economic impacts;
- A systems-focused research program should weave together plant breeding, agronomy, ecosystem science, and human dimensions. By coupling biophysical and participatory action research, Minnesota can develop resilient, diverse, and CLC cropping systems that mitigate nutrient runoff while meeting farmers' operational realities.

> ***Response 56-2:*** The NRS Team maintains a list of nutrient-related research needs and will add these recommendations to that list.

Comment 56-3: Economic incentives and market-based solutions. While research has shown that CLC crops have environmental benefits to farmers and the public, farmer adoption of these systems is slowed by the limited economic support. We urge the adoption of a cooperative strategy among farmers, researchers, crop educators, non-profits, agency-run cost-share programs, and supply chain partners to implement these changes. There is an opportunity to help farmers economically in their transition to these systems through ecosystem service incentives and supporting the development of alternative supply chains that can provide a stable market for nascent CLC crops. In addition, cost-share dollars would be more beneficial if these were tied to ecosystem outcomes rather than just practice implementation (e.g., the Olmsted County Soil Health Program, the Economic Clusters of Opportunity (EECO) Implementation Program). Research on experimental programs like these is critical to ensure that these models will be successful, as is farmer education and peer-to-peer learning through programs including UMN Extension, MN Soil Health Coalition farmer mentors, and Land Stewardship Project's soil health hubs.

> ***Response 56-3:*** See response to common topic 2 (education, incentives, and networking).

Comment 56-4: Climate adaptation. The Minnesota Climate Mapping and Analysis Tool (MN-CliMAT) is a powerful application that predicts future climate scenarios in Minnesota. In general, the state of Minnesota is expected to experience an additional 0.5 - 3.5" of annual precipitation, and daily average temperatures are expected to rise by 3 to 5°F by mid-century. With a changing climate, producers need

to adapt their practices to be resilient to many stressors and uncertain weather patterns, while ensuring these adaptations do not incur greater nutrient losses to the environment. The majority of the expected increase in rainfall is projected to occur in the spring, when soils are most vulnerable to nutrient losses. "Classic" and "cash" cover cropping can help mitigate nutrient losses during this period. However, as discussed above, better education, risk mitigation, and crop genetics are needed to incorporate CLC crops into climate-resilient cropping systems.

> ***Response 56-4:*** The NRS Team agrees that market-based and traditional CLCs are key to building farming resilience to climate extremes and includes this information in Section 5.1.3.

COMMENT LETTER 57. HUNTER PEDERSON (MINNESOTA FARM BUREAU)

Comment 57-1: We support practical, science-based approaches to nutrient management that both improve water quality and keep farms economically viable. We oppose additional mandates that place one-size-fits-all regulations on farmers. Minnesota farms are diverse and produce many different commodities across the state in different soils and climate types. Due to this complexity, regulatory approaches may not account for this operational diversity and could cause undue hardship. Instead, we encourage the state to continue pursuing voluntary, incentive-based approaches that have proven to generate meaningful improvements in conservation outcomes.

> ***Response 57-1:*** See response to common topic 1 (regulation).

Comment 57-2: Regarding nitrate levels, we would encourage MPCA to take a closer look at Kuehner, Runkel, and Barry (2025). In the karstic geology of southeast Minnesota, nitrates persist in groundwater, and improvements in agricultural best management practices (BMPs) may not immediately translate to reductions in nitrate. Accordingly, reductions resulting from BMPs may take more time to become evident. In gauging progress and revising the NRS, this must be considered.

> ***Response 57-2:*** The NRS working group consulted the authors of this study throughout the development of the 2025 update and is aware of nitrate lag time implications pertaining to gauging nutrient reduction progress. The 2025 NRS evaluates multiple decades of data and uses an established "baseline" in measuring progress to account for lag times. For more details, please see Section 2.3 for the overall 2025 NRS approach and Section 7.7.1 on lag times in detecting changes in water quality.
>
> Even though some watersheds in southern Minnesota may be exhibiting decreasing nitrate concentrations or show no trend in nitrate concentrations,[1] soil water and tile water data collected over the years (including recently) confirm that corn/soybean rotations are still generally leaching high nitrate concentrations.[2]

Comment 57-3: Further, we would recommend replicating this study in other areas of Minnesota, such as the central sand plains. This would build on our current understanding of nitrate persistence and better inform approaches to nitrate reduction.

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[1] Kuehner, K.J., A.C. Runkel, and J.D. Barry. 2025. Informing nitrate concentration trends: estimating groundwater residence time in karstic, multiaquifer system using anthropogenic tracers. *Hydrogeology Journal* 33:167–192. https://doi.org/10.1007/s10040-024-02871-2.

[2] Kuehner, K., T. Dogwiler, and J. Kjaersgaard. 2020. *Examination of Soil Water Nitrate-N Concentrations from Common Land Covers and Cropping Systems in Southeast Minnesota Karst*. Minnesota Department of Agriculture, Minneapolis, MN. https://bearworks.missouristate.edu/articles-cnas/3639/.

Response 57-3: The NRS Team agrees replicating this study throughout Minnesota would be useful and has added language to Section 2.10 recommending such activities in the future.

Comment 57-4: The draft updates to the NRS place much emphasis on adoption of novel crops and continuous living cover (CLC). MFBF recognizes that novel crops and CLC have a role in nutrient reduction, but we would caution against mandating the use of novel crops or CLC. As with any technology, there are challenges in developing markets for new crops, regardless of how promising they seem. Ultimately, farmers' decisions about what to produce are driven by markets and the opportunities they present. Economically, adoption of crops and practices that (1) do not have markets or (2) provide little to no agronomic benefit or cost savings, is difficult if not impossible for farmers to justify. Without some level of payoff, the State cannot expect such drastic adjustments to occur.

Response 57-4: The 2025 NRS does not recommend any mandates for novel crop or CLC adoption, but it does recognize the need for market development to support crop production. One of the goals of the CLC Work Group identified in Chapter 8 is to determine how to support market development for market-driven CLCs.

Comment 57-5: Given that draft nitrate standards have been in development for nearly 15 years and have not been finalized, the use of these draft values in the NRS is unjustified. It is troubling that the MPCA nitrate standard development process will not be resumed until after the current NRS updates are completed and finalized, especially since they are being applied in the NRS. Transparency is critical; the methodology, scientific research, and any stakeholder input used to arrive at these draft standards should be made fully available to the public.

Response 57-5: See response to common topic 5 (aquatic life/nitrate standard).

Comment 57-6: Value of voluntary, incentive-based programs:

- Flexibility for farmers. The Minnesota Agricultural Water Quality Certification Program and state cost-share programs such as the Soil Health Financial Assistance Program demonstrate that conservation efforts are most effective when farmers have the flexibility to choose practices that work for their individual operations. We appreciate the updated NRS's acknowledgement of the characteristics of successful programs, with flexibility at the top of the list.
- Adoption rates. Farmers are far more likely to adopt new practices when they are supported with technical assistance, cost-sharing, and peer-to-peer learning. Additionally, adoption is increased when such recommendations come from sources trusted by farmers. Again, we appreciate the NRS's recognition of these factors.
- Continuous innovation. Agriculture is constantly evolving. More farmers are adopting cover crops, precision nutrient management, edge-of-field practices, and experimenting with new technologies. Great strides have been made in nutrient efficiency and these will continue, as farmers are always pursuing ways to be profitable.

Response 57-6: The 2025 NRS sections 5.2 and 5.3 assess BMP programs across Minnesota and identify commonalities of successful programs. The characteristics described here are also documented in these sections and in Appendix 5-4.

Comment 57-7: Concerns with regulatory approaches:

- Economic burden. Additional mandates or compliance costs reduce farm profitability, making it harder for farm families to stay in business, especially during periods of low commodity prices and high input costs.
- Disproportionate impact on small & mid-sized farms. New mandates often create paperwork and compliance burdens that fall the hardest on small and medium-sized farms, with the potential of accelerating consolidation and reducing the diversity of Minnesota agriculture.
- Limited measurable gains. Many nutrient loading factors, such as weather events, soil type, or upstream sources, are outside of farmers' control. Policy changes should reflect the actual circumstances of nutrient concentrations and not be solely placed on farming activities.

Response 57-7: See response to common topic 1 (regulation).

Comment 57-8: Recommendations:

- Continue and increase incentives. Increase state investment in voluntary conservation programs, cost-share opportunities, and technical assistance that help farmers adopt nutrient reduction practices. Incentives will be especially key in adoption of practices that do not provide any agronomic return or cost savings. The NRS points out that incentives help reduce barriers to adopting new practices, and that they are a component of successful programs.
- Support research & innovation. Continue research partnerships with the University of Minnesota and ag organizations to identify and validate new practices that can improve water quality while supporting farm profitability. The best up-to-date science should be reflected in nutrient management.
- Recognize farmer progress. Minnesota farmers have already made substantial investments in nutrient management and efficiency, soil testing, precision technology, and conservation practices. These successes should be acknowledged and built upon.
- Maintain flexibility. Avoid statewide, uniform mandates that fail to account for on-the- ground practices. What may work on one farm may not work on the next.

Response 57-8: The NRS Team reviewed the pertinent sections of the NRS for possible inclusion of these recommendations and believes they have already been incorporated. Support for farmers, nutrient-related research, farmer recognition, and flexibility are key components of the 2025 NRS.

Comment 57-9: We urge MPCA to engage with farmers to learn and continue investments in programs that achieve the goals of the Nutrient Reduction Strategy.

Response 57-9: The interagency NRS Team agrees working with farmers is key to achieving 2025 NRS goals and hopes to continue to do this during the 2025 NRS implementation phase.

COMMENT LETTER 58. NICHOLAS JORDAN (UNIVERSITY OF MINNESOTA FOREVER GREEN)

Comment 58-1: Our primary recommendation for the NRS is to distinguish between CLC practices (nonmarket-based) and prioritize harvestable and marketable (market-based) CLC crops throughout the report.

Response 58-1: Several commenters provided feedback about making this distinction between market- and nonmarket-based CLCs; the 2025 NRS has been edited accordingly.

Comment 58-2: We call for sustained and robust public investments in research on these crops and systems. At the same time, further economic analysis should be done to evaluate the potential of market-based CLCs and the associated costs and benefits that would be borne by the market.

> ***Response 58-2:*** The NRS Team maintains a list of research needs in the state. These suggestions have been added to that list.

Comment 58-3: We strongly endorse the proposed CLC Campaign and Task Force. On the basis of our research findings, we also strongly concur with the acknowledgement that our state's water quality goals (and we would argue enhancements to soil health, air quality and the agricultural economy) "cannot be achieved without transformative changes in crop system rotations and more months of living cover each year." This provides a compelling rationale for a sustained, strategic, cross-agency, cross-sector, and cross-scale campaign, so we strongly endorse the proposed CLC Campaign and Task Force. We see great value in setting a concrete goal for that campaign, namely the 8 million acre target stated in the draft report. Finally, we see a well-resourced task force as an essential vehicle for the implementation of a CLC campaign.

> ***Response 58-3:*** See response to common topic 4 (CLC and small grains).

Comment 58-4: We strongly endorse recognition that infrastructure and market development support will be critically important to advancing CLC toward that target. That is to say, a push for acres will need to be very closely tied to, if not preceded by, a major market development investment and strategy to recruit industry players of all sizes (e.g. agribusiness, small and medium sized enterprises, entrepreneurs and start-ups, investors, etc.). Without capital, talent, and long-term commitment, this will end up a supply side push, limiting its effectiveness. We believe that strategic investments on the public side are needed to support development of market demand for the products of CLC agriculture. For these reasons, we believe that market and demand-side development must be a focus for the proposed CLC campaign and task force.

An initiative is currently underway that can serve as a central organizing resource and prototype for this work. The multi-sector effort, 1MASS or the One Million Acres Scaling Study for Winter Camelina, is looking at the pathway to putting 1 million acres of winter camelina on the landscape. It is investigating and defining what (and when) investments are needed from the public, private, nonprofit, philanthropic and investor communities to achieve that scale. We recommend the proposed campaign be similarly specific, actionable and focused on scaling harvestable CLC crops that will stimulate economic growth and achieve the desired environmental outcomes.

Further, the task force that serves this purpose must be multi-agency and multi-sector. In addition to providing guidance and oversight to the campaign, it needs to consider what new and enabling strategies will allow us to move faster, and in bigger ways, to achieve the transformative change called for in the draft. Their charge should include the responsibility to secure the buy-in of a market-based CLC investment strategy across state government, from agriculture to natural resources to economic development. Such a coherent state investment strategy can be catalytic for other sectors, including foundations, private investors and the federal government.

> ***Response 58-4:*** The NRS Team agrees and will be mindful of your statements moving forward on these projects.

Comment 58-5: CLC Index. We concur with and are enthusiastic in our support for the need for an "index to track annual changes in living cover on agricultural lands over time." We stand ready to contribute to shaping such an instrument and to drawing on it to inform our research on the environmental services provided by the crops in our research portfolio. In alignment with the proposed

multi-agency strategy for the campaign and task force, we recommend that tracking select additional variables beyond water quality be considered to make the index valuable across multiple dimensions of achieving a market-based CLC system at scale. These will include measures of soil health, wildlife diversity, climate resilience, and farm and rural economy and community vitality.

> ***Response 58-5:*** The NRS Team agrees that additional measures as part of the living cover index would be useful and have documented this suggestion for use in the development of this project during the 2025 NRS implementation phase.

COMMENT LETTER 59. RICHARD BISKE (THE NATURE CONSERVANCY)

Comment 59-1: A key component of achieving nutrient reduction goals will be a review of historic, current and potential strategies.

> ***Response 59-1:*** A review of historic and current strategies was begun in the Five-Year Progress Report: Appendix A. This included an evaluation of programs addressing these strategies, which was updated as part of the 2025 NRS development. See the response to Comment 59-2 for more details.

Comment 59-2: This NRS and future updates should also include economic and social science data and analysis necessary to inform, evaluate and prioritize strategies. At an estimated cost of over $1B per year, the next 10 years of nutrient reduction will require prioritization, innovation and barrier removal. Current and proposed programs should be evaluated for effectiveness. Ineffective programs should be adapted or discontinued in favor of those with greater impact and financial sustainability.

> ***Response 59-2:*** The NRS Team agrees economic analysis is needed as part of the 2025 NRS implementation. Chapter 8 lays out a plan for this analysis. Social science assessments are included in Chapter 5. Chapters 4, 5, 6, and 7 evaluate multiple programs for effectiveness.

Comment 59-3: Include private sector to develop markets for crop diversification. TNC supports the development of a Continuous Living Cover Campaign to expand markets and support increased adoption. Expansion of novel crops and the infrastructure to support their production and markets could take decades. This effort must include private sector actors and the role of traditional small grains like oats in addition to novel crops. Winter oil seeds as a relay crop are mentioned, but it is not clear how nitrogen (N) reductions from winter oil seed crops are quantified and factored into reduction scenarios.

> ***Response 59-3:*** Winter oil seeds were not included in any of the reduction scenarios for the 2025 NRS due to the current low acreage in these crops. The NRS Team looks forward to the Forever Green-led analysis on the 1 Million Acres of Camelina analysis for more insight on this topic. Emerging markets for crops with low nutrient impacts (e.g., food-grade oats) have begun to open in Minnesota and have the potential to increase crop diversification in the near term.

Comment 59-4: Explore durable drainage water management. The report notes an increase in tile drainage and the role of agricultural drainage on nitrogen loads. The report notes 43% of total nitrogen (TN) in the Mississippi River basin coming from tile drainage, and Table 5-1 indicates that controlled drainage can reduce TN by 45%, yet one scenario only expects tile drainage to provide 18% of the TN reduction. Limited attention is given to drainage water management practices or the enabling conditions for expanded use. This should be an emphasis in future updates to explore durable drainage water management infrastructure that reduces nutrients and regulates hydrology.

Response 59-4: The NRS Team agrees and believes that additional agricultural drainage management research is a statewide need as well. Appendix 5-1 covers this topic in depth, but additional detail has been added to Chapter 5 to ensure this need is clearly documented.

Comment 59-5: As noted elsewhere in our comments, cost should be a factor when evaluating Best Management Practices (BMPs) as well as the durability of the BMPs.

Response 59-5: The NRS Team intends to update the NP-BMP tool to provide more BMP cost information as part of the NRS implementation phase. Durability of BMPs has been an ongoing conversation among MPCA, USDA, and BWSR, but this also remains a research gap, as documented in appendices 5-1 and 5-2.

Comment 59-6: The report lacks clarity on costs associated with meeting nutrient reduction goals for in-state waters or downstream.

Response 59-6: The 2025 NRS includes costs for meeting out-of-state goals. Many local waters cost estimates are contained in TMDLs and comprehensive watershed management plans, but local costing is outside the scale of the 2025 NRS.

Comment 59-7: The report makes several references to BMPs adopted since 2014 as depicted in figure 2-25. It is not clear the duration of previously adopted BMPs or the cumulative acres of BMPs. This section would benefit from a clear explanation on annual BMPs along with an explanation of the known or unknown duration of BMPs from previous years. An additional figure similar to 2-25 showing the annual and cumulative cost of the BMPs by category similar to figure 7- 8 in the progress tracking section.

Response 59-7: BMP costs data are not available by specific practice for all funding sources, so the data are not available to create a map as suggested.

Comment 59-8: Another figure should be added that shows the source of funds to date by landowner/operator, state, federal, local and private. Knowing the historic sources of funds is important to understand trends over time, particularly as federal funding becomes less certain and Clean Water Funds enter the last decade.

Response 59-8: The NRS Team agrees that information would be helpful, but unfortunately, not all those data are publicly available. The NRS Team worked with local, state, and federal partners. The data from the Healthier Watersheds website is the best available data set we can access, and that is included in Figure 7-7.

Comment 59-9: The NRS would benefit from stronger integration with the Minnesota 4R Certification Program, which provides a science-based, auditable framework for nutrient service providers. These standards—*Right Source, Rate, Time, and Place*—are referenced in Chapter 5, Table 5-3 as part of the BMP efficiency matrix, but could be more explicitly incorporated into implementation strategies. Recommendations: (1) Reference the 4R Certification Program in Section 6.4.2 (Policy and Program Recommendations) as a model for scaling nutrient stewardship through retail channels. (2) Use 4R audit data to support tracking and evaluation in Chapter 8 (Tracking Progress and Adaptive Management), especially where metrics for BMP adoption and nutrient reductions are discussed.

Response 59-9: Section 6.4.2. has been updated to include the 4R Certification Program. MDA has posted a request for proposals to study the effects of the 4R program, and the results of that study will be used to guide next steps.

Comment 59-10: Include agricultural retailers as strategic partners in Section 6.4.2, especially in the context of expanding conservation agronomist roles and peer-to-peer learning networks.

Response 59-10: This edit has been made.

Comment 59-11: Expand prioritization to account for key waterways and watersheds. Section 3 and tables 3-5, 3-6 and 3-7 are an excellent addition to the NRS update. As noted later in the report the cost of achieving the total reduction goal and the associated cost is very ambitious if not unlikely at current pace. Prioritizing waters Minnesotans value using benefit-to-cost analysis is an excellent framework for the entire Nutrient Reduction Strategy. This approach should be applied to rivers and streams as well. The recommendations for continuation of existing programs, new programs and the state's watershed approach should use this prioritization approach.

Figure 3-4 shows many lakes with worsening lake phosphorus concentrations. Section 6 of the report goes on to describe the watershed framework, however, it is unclear how the priorities for in-state waters are included in Comprehensive Watershed Management Plans. Are Nutrient Reduction Strategy priorities for the protection and restoration of in-state waters based on benefit to cost analysis consistent with priorities included in watershed implementation plans that direct the use of state funds? The Nutrient Reduction Strategy was developed in partnership with each state water agency, yet -- beyond descriptions of programs administered by each agency-- it is unclear what commitments have been made by agencies to prioritize based on the NRS.

Response 59-11: MPCA and BWSR are working on developing guidance for how to use the 2025 NRS prioritization process in local watershed planning (expected in 2026). Local watershed planning is a critical mechanism to prioritize nutrient reduction efforts for local rivers, streams, lakes, and wetlands. Local plans bring together decision-makers, citizens, and local conservation staff to help determine specific water bodies of concern that local people value and where monitoring and implementation efforts should be focused to help restore and protect these resources.

Comment 59-12: Prioritize and track multiple benefits. Discussion in Section 6 building on the idea of more holistic and comprehensive watershed goal-setting might help envision feasible cost/investment scenarios for achieving the goals laid out in the strategy. For example, if upstream investments in climate/flood risk reduction or water storage would "pencil out" in some cases and at the same time pay for BMPs associated with the NRS; or if habitat/conservation/ biodiversity/comprehensive land use planning investments through other funding sources would simultaneously contribute to achieving certain NRS goals, it could lower the overall cost estimate for achieving the NRS goals using water quality BMPs alone. This approach would also contribute to several actions included in the recently released Climate Action Framework working lands and resilience sections.

Response 59-12: The NRS Team agrees that including the multiple benefits of nutrient-reducing practices is key, and it is looking at how to continue to build out the BEET tools over time to do this. Work with 2025 NRS partners, such as The Nature Conservancy, to garner feedback on next steps and provide training on these tools as they evolve will be a key step.

Comment 59-13: Establish a consistent monitoring and evaluation system across programs. Progress tracking and intermediate results or key performance indicators (KPIs) continue to be incomplete and disjointed. TNC recommends MN water agencies, the U of M and private sector partners develop a system to track BMP adoption and landscape change that is not limited to cost- share practices. Basing BMP adoption rates on public incentive programs is an incomplete description of activities and does not allow for the evaluation of the programs themselves.

Minnesota needs a system that correlates remote sensing with government programs, water quality data and modeling to evaluate practice adoption and effectiveness at the watershed scale. The recent Southeast MN nitrogen working group report identified the need for fertilizer application reporting. This

should be considered in the NRS as another data point to calibrate nutrient management effectiveness. Public funding alone cannot reach the estimated $1B annual cost, therefore a monitoring and evaluation system needs to be established to improve efficacy of current and proposed efforts and elevate the private sector to achieve nutrient reduction goals.

> ***Response 59-13:*** The NRS Team agrees this is a gap. One goal for the 2025 NRS implementation phase is to work with the UMN and other Hypoxia Task Force partners to develop a living cover index using remote sensing. The NRS Team is looking forward to working with The Nature Conservancy and the Clean Water Council to continue these efforts. The NRS Team also believes that maintaining the nutrient balance work referenced in Section 5.1.4 and Appendix 5-3 could be used, in part, to track fertilizer application. All these tracking tools will be incorporated into the NRS Dashboard, which will help create a comprehensive monitoring and evaluation system for nutrient loading throughout the state.

COMMENT LETTER 60. JAMIE BEYER (BOIS DE SIOUX WATERSHED DISTRICT)

Note: This comment letter was submitted in a table, and the responses are provided directly in the same format (see Appendix A).

COMMENT LETTER 61. BENJAMIN MAAS (METRO STATE UNIVERSITY)

Comment 61-1: In the executive summary the progress of the Nutrient Reduction Strategy is a bit overstated as most of the progress in lower phosphorus concentrations has been achieved by improvements from urban sources, due largely from improved regulations, as shown in Figure ES-6.

> ***Response 61-1:*** The text surrounding Figure ES-6 includes the following statement: "About two-thirds of the [total phosphorus] load reduction is attributed to point source wastewater improvements and the rest from agricultural and urban nonpoint source reductions."

Comment 61-2: Without meaningful regulations on agricultural activities, it is unrealistic to think that appreciable changes to phosphorus pollution from agricultural practices will improve.

> ***Response 61-2:*** See response to common topic 1 (regulation).

Comment 61-3: Throughout the report, the improvements in lower nitrate concentrations in surface waters and groundwater in the agricultural areas is overstated.

> ***Response 61-3:*** The 2025 NRS is a data-driven assessment of nutrient levels in Minnesota waters. Data were collected by MPCA, MDA, Minnesota Department of Health, Met Council, USGS, and Manitoba over multiple decades and assessed by both a third-party consultant and members of the listed organizations. The 6% (Mississippi River) and 9% (Red River) decreases in total nitrogen loads leaving the state are the flow-normalized values found by this investigation. Trends in groundwater nitrate were likewise based on data from multiple state agencies and verified by members of the NRS interagency working groups.

Comment 61-4: Furthermore, the scale of the overuse of fertilizer, both natural and artificial, is vastly understated. For instance, in 2023, the US Environmental Protection Agency (EPA) advised the state of Minnesota to decrease nitrate concentrations (resulting from agricultural practices) in the impaired karst aquifers of southeastern Minnesota to protect the health of residents who use these aquifers as a source of their drinking water. This request was made by the US EPA in part due to the stable or increasing nitrate concentrations in not only groundwater but surface water. Recently published research indicates that nitrate concentrations not only have not reached a point that they will stabilized,

but may in fact increase (Kuehner et al., 2025). Kuehner et al. (2025) also indicated that understanding the slow spread of agricultural best management practices would be complicated by legacy nitrate pollution, primarily from agricultural practices.

> ***Response 61-4:*** Fertilizer overapplication was evaluated using state and federal survey data, and the findings are documented in Section 5.1.4 and in the full report in Appendix 5-4. Historic rates of overapplication were not included in the analysis. Lag times, as reported in Kuehner et al. (2025), were included in Section 2.3 as one of the challenges in measuring and reporting nitrogen levels in surface water and groundwater.

Comment 61-5: The role of climate change, i.e., wetter springs and stronger precipitation events, was acknowledged. However, the chances of more precipitation occurring and nitrate being "flushed" during so called "weather driven events" from the soil or the aquifers to the Mississippi or Minnesota Rivers is more likely to occur than not (Shrestha et al., 2023). Indeed, in section 2.5.1 the authors acknowledge that when annual river flows were not normalized, higher nitrate loads have been recorded during the most recent round of monitoring. This means that even with drastically improved conservation efforts, a wetter climate will result in higher nitrate loads leaving Minnesota and not lower loads.

> ***Response 61-5:*** Yes, as noted throughout chapters 2 and 3, higher precipitation has offset some of the water quality gains made in the state.

Comment 61-6: However, for Minnesota to achieve its nutrient reduction strategy goals, meaningful regulations of agricultural practices will need to be enacted.

> ***Response 61-6:*** See response to common topic 1 (regulation).

COMMENT LETTER 62. TIM VELDE (MINNESOTA AGRICULTURAL WATER RESOURCE CENTER, ON BEHALF OF MULTIPLE ORGANIZATIONS)

Comment 62-1: Regarding the key messages in the NRS, we agree that it's complicated, and we encourage the MPCA to work toward messaging that is more understandable to the average Minnesotan, who has a strong interest in protecting water resources but doesn't have the wherewithal to sort through a document of more than 1,500 pages. Concentrations, loads, flow weighted, flow normalized – pick the most relevant and make it understandable.

> ***Response 62-1:*** The NRS Team recognizes that the 2025 NRS is a complex document, and key messages were developed for each chapter to provide a high-level summary of the chapter content. The NRS Team acknowledges that multiple means of measuring nutrients in water are needed; the document strives to provide clarity regarding the various measures applied and discussed. Additional training and outreach materials are planned for development in the coming months to continue to make 2025 NRS messaging and tools more accessible to a wide range of users.

Comment 62-2: Overall, nutrient trends are good, as noted in the updated NRS. This is a very important message and should be highlighted. That there is still more work to be done is understandable but should not detract from the general improvement message.

> ***Response 62-2:*** The NRS Team agrees, though nitrogen gains are modest and should be contextualized with the nutrient reduction trends for multiple audiences.

Comment 62-3: We appreciate the inclusion of drainage water recycling as a part of the plan. The Board of Water and Soil Resources has a program that could be modified to accommodate drainage water recycling. The program currently supports modification of drainage systems to include water storage but

does not include provisions specific to reusing this captured water for irrigation. Interagency coordination would be required to allow drainage water recycling to grow and contribute to the MPCA's desired nutrient reduction goals.

Response 62-3: These suggestions will be shared in future NRS working groups.

Comment 62-4: The updated NRS seems to suggest that these advances will stop. They will not. We suggest that the MPCA pivot, supporting more nutrient efficiency research. This would most efficiently be done by providing matching funds to the Agricultural Fertilizer Research and Education Council (AFREC) program administered by the MDA.

Response 62-4: The language surrounding nutrient efficiency has been updated to remove suggestions that nutrient efficiency progress will stop.

Comment 62-5: We do not agree with the exaggerated emphasis on CLC practices. While we continue to support programs like CRP and rational investment in exploring new crops, we believe the agency approach is too critical of current cropping systems which provide the commodity crops society depends on. In addition to exploring new crops, the agency should help farmers build on their "good progress" in producing the current mix of crops. Minnesota is home to the most diverse crop mix in the Midwest.

Response 62-5: The 2025 NRS calls for more roots in the ground for more months of the year. These roots can come from novel crops such as camelina, but nutrient loss reduction is also achieved through the roots of traditional cover crops planted in a corn-soybean rotation, alfalfa, hay fields, pasture, or even orchards. The 2025 NRS approach will reduce nutrient loss within the current cropping system, maintain flexibility for farmers, and continue to develop new market opportunities to expand their options in rapidly changing commodity markets.

Comment 62-6: The NRS includes mentions of state buffer requirements, noting the near-100% compliance with the current buffer law. Does monitoring show improved water quality due to passage and implementation of the buffer law?

Response 62-6: The 2014 NRS conducted a buffer analysis as reported in Appendix A, but this analysis was not repeated for the 2025 NRS.

Comment 62-7: We are very concerned with the MPCA's use of draft nitrate standards for analysis. While the NRS notes that standard development is independent of the NRS, these draft values are referenced. Nitrate standards have been under development for more than a decade with little progress. We ask for greater transparency and public availability of all research being used in the process. As the agency has stated in the past, nitrates are relatively low in toxicity. Let science guide the process, not alarmist rhetoric.

Response 62-7: See response to common topic 5 (aquatic life/nitrate standard).

APPENDIX A: RESPONSES TO BOIS DE SIOUX COMMENT LETTER (#60)

Comment Letter #60 (Bois de Sioux Watershed District) with Reponses

#	Section	Specific NRS narrative	Comments from Bois de Sioux Watershed District and NRS Team's responses
1	NRS xvii PDF 19	"Nutrients are important for human and aquatic life; however, when levels exceed natural conditions, excessive algae growth, low oxygen levels, toxicity to aquatic life, and unhealthy drinking water can result."	***Comment:*** False. Please rewrite. This statement attempts to present universal truths, but is loaded with falsehoods. 1) This statement leads the reader to believe natural conditions themselves cannot rise to levels that produce 4 described properties (algae growth, oxygen levels, "toxicity," and drinkability). This is obviously false. Waterbodies can naturally experience exhibit any of the 4 properties completely on their own, absent of human influence. MPCA staff subjectively define parameter levels based on broad simplifications and generalizations. There is no natural law that requires that nature can't or won't exceed MPCA-defined parameter levels. In fact, "natural condition" levels have been set so low that nature easily and commonly exceeds these levels. For eg: anyone who has waited a week in July heat to empty their rain gauge can observe that excess algae growth can result from 100% natural conditions; anyone who has suffered from giardia understands intimately the potential for goose poop to result in unhealthy drinking water; the notorious meme "Sometimes a hippo poops and all the fish die" describes a common natural condition – but in our area, the hippo is a moose, deer, or a lake full of waterfowl, etc, with similar toxicity to aquatic life. Natural conditions easily produce any of the 4 common properties. 2) This statement also leads the reader to believe that the four properties will only go in one direction and that they are not desired ("excessive growth" / "low" / "toxic" / "unhealthy"). The qualifications of the described properties as negative, and unrelated to each other, is disingenuous. For example. low oxygen can be used to decrease phosphorus: https://www.mprnews.org/story/2024/04/03/small-solutions-to-the-big-phosphoruswater-quality-challenge ; goldfish can't live in municipal drinking water, so health drinking water can result in toxicity to aquatic life ***Response:*** Comments noted and minor language adjustment made.
2	NRS Xviii PDF 20	"In-state phosphorus concentration trends are generally improving…."	***Comment:*** Is "in-state" meant to apply to lakes? Or does it mean waterbodies that are completely enclosed within the state border? It is not apparent to a reader how "in-state phosphorus concentrations" are a category exclusive of the subject of the next paragraph "river phosphorus concentrations" – 2 of 52 especially considering rivers that are on the border with other states/Canada vs. within the borders of the State of Minnesota. ***Response:*** Comment noted and minor language adjustment made.
3	NRS xviii PDF 20	"Statewide goals and progress" "Statewide, high phosphorus concentrations cause eutrophication impairments in 686 Minnesota lakes and 50 river reaches.	***Comment:*** Please change this header and bookmark. These are not statewide goals, these are basin wide goals. As described in the 2014 NRS "statewide" goals are those like groundwater, that apply equally statewide. "Statewide" does not mean the same thing as "various places across Minnesota." "Statewide" in this sentence means high phosphorus concentration conditions are similar across the state. This sentence is not true. Per NRS xx PDF 22: "Because relatively few in-state waters in the Red River Basin are impaired by nutrients, the primary water quality drivers for these large nutrient reductions in this part of the state are the goals for Lake Winnipeg." ***Response:*** Heading changed to "Goals and progress overview."
4	NRS xix PDF 21	"If nitrate concentrations are reduced by about 40% in rivers and vulnerable groundwaters, Minnesota will meet its goals for	***Comment:*** Is this 40% reduction required of all three major basins? Please add basin qualifiers.

#	Section	Specific NRS narrative	Comments from Bois de Sioux Watershed District and NRS Team's responses
		state-line TN load reductions and most in-state targets for protecting drinking water and aquatic life."	***Response:*** Reduction applies to Mississippi and Lake Winnipeg basins, but not the Lake Superior Basin. The language was clarified.
5	NRS xix PDF 21	…" in 3% of wells between 2007 and 2023."	***Comment:*** Please change to: "in 3% of tested wells between 2007 and 2023." ***Response:*** Change made as suggested.
6	NRS xix PDF 21	"Because the groundwater nitrate discharging into rivers and streams contributes a substantial amount of the TN load to the Mississippi River"	***Comment:*** This is not what the 2014 and 2025 NRS state. The cropland groundwater category is defined by MPCA staff as, "Refers to nitrogen leaching into groundwater from cropland land uses." No relationship between groundwater discharge and surface water nitrate levels is described except for the table. This data is dubious anyway because – as stated Please change to: "in 3% of tested wells between 2007 and 2023." document describes a statewide groundwater protection rule, its inclusion makes sense; ***Response:*** Comment noted. See the change made in response to the previous comment.
7	NRS xix PDF 21 Repeated on NRS 73 PDF 105	"In upper aquifers, which are geologically vulnerable, across agricultural and urban parts of the state, nitrate concentrations have been decreasing (improving) in 24% of ambient monitoring and domestic wells while increasing (worsening) in 3% of wells between 2007 and 2023."	***Comment:*** As written, this sentence only applies to "upper aquifers." Is that MPCA's intent? As written, this sentence compares "ambient monitoring and domestic wells" to "wells between 2007 and 2023." What does this even mean? Are these two exclusive categories without overlap? I think MPCA are not referring to wells of different types, but are referring to different monitoring systems, which shouldn't matter anyway if MPCA staff are trying to say something true about wells instead of something true about how wells are monitored. ***Response:*** Comment noted and minor language adjustment made.
8	NRS Xviii – xix PDF 20 - 21	Mississippi River phosphorus concentrations have decreased by over 40% since the 1980s. In-state phosphorus concentration trends are generally improving River phosphorus concentrations have generally decreased or remained stable	***Comment:*** Please add brief comments as to how these results have been achieved. ***Response:*** Reference made to Chapter 4 Urban Nutrient Reduction and wastewater sector.
9	NRS Xviii PDF 20	Figure ES-3	***Comment:*** Please update this graphic to include the obligation of state, federal, and NGO land managers to address water quality issues on, and downstream from, public and conservation land. Please update this graphic to include a reference the fact that work on waterbodies is exclusively controlled by the "public waters" permitting system administered by the Department of Natural Resources. The permitting framework puts hard limits on the realm of project possibilities/locations/extents/costs – so is the most important aspect, as it defines the universe for all 5 columns of support, work/practices, adoption, and improvements. Any column described can be held hostage between the pressures of MPCA and the costs and limits and improbability of MN DNR permitting. ***Response:*** The intent of this graphic is to show at a very high level the flow of data and information from the NRS supports and how it supports work at various scales. Your comment is noted, but the intent of this graphic was not to get that level of specifics that you have listed out.

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10	NRS Xviii PDF 20	"Minnesota's 45% phosphorus reduction goal for the Gulf will be met if the in-state goals for local and regional lake eutrophication, in-state river eutrophication, and reductions in southeastern Minnesota tributaries to the Mississippi River are achieved."	***Comment:*** Please insert a citation for this statement. Is this referring to the Gulf of Mexico? If Minnesota has its own phosphorus reduction goal for the Gulf of Mexico – is Minnesota's goal separate from the Gulf of Mexico's goal for the Gulf of Mexico? Why is Minnesota setting this goal for the Gulf? Maybe the sentence just needs to be rewritten to clarify the subject of the sentence. ***Response:*** Reference to the Gulf Hypoxia Task Force has been added to this section.
11	NRS Xviii PDF 20	Between 2007 and 2024…. 2008–2022…	***Comment:*** Overall, it is difficult to rectify all of the different reporting periods, and in some cases, very short term data sets are included or compared against long term data sets. Could a great effort be made to more accurately match data periods? Could less data be used in comparisons than were presented for studies to more closely match differing time periods for studies? ***Response:*** Your feedback has been shared with the interagency NRS Technical Coordination Advisory Team. Generally, it is desirable to use the longest, most robust data sets available.
12	NRS Xviii PDF 20	In-state phosphorus concentration trends are generally improving, although 54% of 260 lakes assessed for trends had no trend detected. Of lakes with detectable phosphorus trends, 73% showed decreases in P, while 27% were increasing between 2007 and 2024.	***Comment:*** Please include the total number of lakes, so the reader can understand how the 260 assessment sample relates in size to the total set of lakes in Minnesota and border waters. For readability, please included actual numbers as percentages mask the scale of what is being discussed and cause the reader pause to make calculations that could more easily be included in the text. Please edit to something like, "Of the 119 assessed lakes with detectable phosphorus trends, 86 lakes (73%) showed decreases in P, while 32 lakes (27%) were increasing between 2007 and 2024. ***Response:*** Suggested change made.
13	NRS Xviii PDF 20	Twin Cities metro area sites	***Comment:*** Please add somewhere how "Twin Cities metro AREA" defined in this document, ie 2-county, 7- county, 11-county, etc…. ***Response:*** Clarified that this is the seven-county Twin Cities Metro Area.
14	NRS xix PDF 21	Nitrate is the most dominant form of TN in waters that are impacted by human activity (Figure ES-4).	***Comment:*** Is it also true that nitrate would be the most dominate form of TN in waters downstream of natural plant decomposition? ***Response:*** Plant decomposition does result in nitrate release to the environment, but that does not infer the nitrate loss from this source is dominant; it depends on all sources within a watershed of concern to account for nitrate loss.
15	NRS Xx PDF 22	Mississippi River account for 83% of total nitrogen (TN) loads and 74% of total phosphorus load reduction goals of 45% for both TN and TP based on average conditions between 1980 and 1996 About 22% of the TP and 13% of TN statewide loads leave Minnesota through the Red and Rainy rivers goals represent load reductions of about 53% and 50% of TN and TP loads, respectively, from the 1996-2000 average	***Comment:*** Based on the text: Mississippi River has larger runoff proportions, but lower goal reduction rates based on an evaluation period of 14 years; the Red River has lower runoff proportions, but higher goal reduction rates based on an evaluation period of 4 years. As written, this information seems incorrect or incomplete. It does not make sense. Please add additional explanations for why this is the case. The Red River is a border water. Is this runoff percentage for the Red River calculated by using both sides of the river (ie the Minnesota-North Dakota-South Dakota-Canada area)? Are the percentage reduction goals the sole responsibility of Minnesota or the combined responsibility of Minnesota-North Dakota-South Dakota-Canada? Please add clarifying language.

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			Response: The reduction goals were set by the Gulf Hypoxia Task Force (Mississippi River Basin) and International Red River Watershed Board, and the goals were set irrespective of the relative distribution of loading between the basins within Minnesota. Note that the absolute loading goals for the Mississippi River are much larger than the absolute loading goals for the Red River, even though the reduction percentage goals are larger for the Red River. The Red River reduction goals are for the Red River at Emerson, Manitoba, Canada (i.e., the Canada-United States border) and apply to the cumulative loading from Minnesota, North Dakota, and South Dakota. Monitored and modeled loads are further discussed in Chapter 2 and Appendix 2-1, which also discusses apportioning loads between Minnesota and the other states.
16	NRS xx PDF 22	"Other" includes sources such as atmospheric deposition…"	***Comment:*** Please include a description of how "atmospheric sources" deposit nitrogen/nitrates? Some of the text leads the reader to believe this refers only to wind-driven soil erosion, but if that is the case, that would include phosphorus also. Please describe in more detail what atmospheric sources refers to in order to understand what activities are proposed for mitigation. It is purported to be a top source for the Red River Valley. ***Response:*** Reference made to the Nitrogen in MN Surface Waters Study (MPCA 2013).
17	NRS Xxi PDF 23	ES-7 The estimated statewide sources of phosphorus…	***Comment:*** Please consider removing this information. The modeled data conflicts with MPCA's own data which states: "Most phosphorus loading comes from nonpoint sources such as stormwater runoff or stream bank erosion." This is not reflected in the graphic. "The concentration of phosphorus in our lakes, streams, and rivers depends on how high water levels are and how fast that water is flowing." This seems like a very important qualifier, and would likely result in great swings in "sources" between spring, summer, fall, and winter. This is not reflected in the graphic. On Page xxviii, MPCA author states, "Streambank erosion. Studies of streambank and other near-channel erosion show that it can contribute substantially to river phosphorus loads. To achieve the final in-state and downstream goals for phosphorus, increasing practices to reduce streambank and gully erosion will be needed." Why is this not reflected in the graphic? On Page 212, the report states: "A substantial body of research has established that streambank erosion can be a significant source of nutrients…streambank erosion ranged widely, from 6% to 93% of total stream phosphorus loads." Appendix 5-1 page 38 states: "Society's perception of the effectiveness of N management practices may exceed water quality benefits that have been documented using empirical measurements in the field." Are these statewide sources of phosphorus or basin-wide sources of phosphorus? ***Response:*** The graphic is a simplified representation of two separate source assessments that each present long-term average distributions of sources on a statewide scale. Only sources with sufficient data at the statewide scale are included. The 2014 source assessment is from the 2014 NRS. The 2024 source assessment is presented in Appendix 2-3. To summarize, the 2024 source assessment is derived from HSPF and SPARROW modeling for all the HUC-8 watersheds in the state. Source distributions will vary at smaller scales (e.g., HUC-8, HUC-12).
18	NRS Xxi PDF 23	ES-7 The estimated statewide sources of phosphorus….	***Comment:*** Please clarify in the text: are Figure ES-7 percentages estimations or model results? The preceding paragraph says these are model results. Estimations are based on observed data, while models produce results from

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			user-defined parameters that may or may not be based on observed data. Has any effort been made to verify that MPCA models accurately predict conditions during historical periods? Please include in the text the MPCA's reasonable overall accuracy rates for the modeled data. 1. Please clarify in the categories. It is confusing as to why urban/developed is separate from wastewater. Does the wastewater category cover State's WWTF point sources? Which category includes stormwater point sources? For all permitted point source allocations, are they included in these modeled percentages or are the actual permit allocations presented? 2. Please clarify - the header says "Minnesota rivers" – so does this graphic include modeled data for the Red River, which has contributions from the Dakotas and Canada? Does this graphic represent Mississippi and Minnesota Rivers? Or does this graphic represent every single river within the borders? That would be a heck of a model, the processing power needed would be phenomenal. ***Response:*** See NRS Chapter 2 (2.8.1) and Appendix 2-1 for more detailed information.
19	NRS Xxi PDF 23	Table ES - 7	***Comment:*** Please provide a reference, as it is not clear if this table is defined by the Agriculture Aggregate Source Categories described in Appendix A page 36 (PDF page 292). If so: Is Riparian double counted? MPCA used "Agriculture" to include Groundwater and Riparian HSPF Sources (HRU's); the definition of "Various" also includes Riparian HSPF Sources (HRU's). 1) Why is the Riparian category duplicated? Riparian areas include eroding streambanks. Is it fair to include these areas under an "agricultural" designation? Riparian areas can serve as phosphorous sinks and sources. They can be composed of phosphorous rich soils. They can provide runoff of decaying vegetation. Riparian areas can increase phosphorous in nearby waterways. If it stays with Agriculture, please update the chart label to Agriculture & Riparian – readers will assume this category is cropland, as evidenced by all of the cropland HRU categories. 2) Below the ES -7 graphic, text states that "Other" represents streambank erosion, nonag rural runoff, and forest, but that is not how the categories are described on page 36 of Appendix A. Please rectify. 3) In Appendix A, where are the HRU(s) for sediment detachment and transport/erosion from land surfaces and channels/in -stream erosion? They don't appear to be included at all. If this category truly includes Riparian, please change the category name to "Agriculture Aggregate & Riparian." As is stated on PDF Page 279 of the Appendix: The bed/bank erosion simulated in HSPF is presented herein as net gain in erosion; this does not represent the total sediment load that was simulated as eroding. Streambank erosion from the 2014 NRS should not be directly compared with the HSPF -derived bed/bank erosion (net gain)," and on page 282 - Streambank erosion and Individual sewage treatment systems were included in the 2014 NRS but are not included in the new source assessment ***Response:*** Table ES-1 represents both the 2014 and 2024 source assessments but uses the nomenclature from the 2014 source assessment (see also Table 13 of Appendix 2-3). Figure ES-7 presents the averaged source distributions for the 2014 and 2024 source assessments using more general nomenclature. The 2014 and 2024 source assessments used different methodologies, hence the need for more general nomenclature to combine or compare results. The note below Figure ES-7 refers to 2014 nomenclature (see also Table 14 of Appendix

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			2-3). Tables 21 and 22 of Appendix 2-3 present 130+ HRUs aggregated to general source categories. Note that each HRU represents multiple physical characteristics and is individually parameterized; HRUs are more complex than their names. Each HSPF model only used a subset of these HRUs. Some HRUs were used very infrequently; for example, "Riparian" covers 0.002% of the land simulated in the 60+ HSPF models. HRUs are assigned to land areas. Non-land-based processes are simulated differently in HSPF (e.g., atmospheric deposition, in-/near-channel erosion). Streambank erosion and SSTS were simulated, but they're not HRUs, so they don't appear in Tables 21 and 22 of Appendix 2-3.
20	NRS Xxi PDF 23	Table ES-1 Priority phosphorus sources: Lake Winnipeg – "Cropland runoff, nonagricultural rural runoff" Priority nitrogen sources: Lake Winnipeg – "Cropland and other rural runoff and atmospheric Sources"	***Comment:*** Does the text to the left refer to the whole watershed, or just the portion in Minnesota? If it refers to the portion in Minnesota, it is hard to believe that these statements are correct for two reasons. 1) The portion of the Lake Winnipeg Watershed in Minnesota that drains to Lake of the Woods is 730,000 acres; the portion of the Lake Winnipeg Watershed in Minnesota that drains to Red River of the North is and the Red River of the North. The document should update its references to contain the qualifier that this document refers the portion of the watershed located in Minnesota. It is confusing that the document switches between references to the Mississippi River Watershed/Lake Winnipeg Watershed etc. vs of Mississippi River Basin/Lake Winnipeg Basin etc. vs the Minnesota portions of each. Only 17,358,103 (7%) acres (10,481,948 RRVB + 6,876,154 RRB) of 247,105,000 acres of the contributing Lake Winnipeg watershed is located in Minnesota. For all instances in this document that authors use "Lake Winnipeg" watershed to describe only the Minnesota portion, the reference should include text to state that https://canadiangeographic.ca/articles/lake-winnipeg-watershed-then-and-now/ ***Response:*** Added "within the state of Minnesota" to the title of Table ES-1.
21	NRS Xxiv PDF 26	"To meet NRS goals, Minnesota needs to maintain and expand ongoing local conservation practice delivery through comprehensive local watershed planning tailored to local conditions and situations."	***Comment:*** Does the author truly believe that "local conservation practices" are the fastest, most efficient way to achieve major HUC-8 nutrient goals? Conservation practices are rarely permanent or large enough in scale – and are often times counter productive. For example, the Star Tribune's recent article on Urban Rain Gardens. SCALE MATTERS. Why is this report underemphasize the impactful results that can be achieved permanent large-scale capital improvement projects coordinated at the watershed level? Please include references permanent, large-scale capital improvement projects. ***Response:*** A mix of traditional on-the-ground conservation practices and management practices like nutrient management, along with practices like large capital improvement projects to store water in agricultural and urban landscapes, will be needed to meet nutrient reduction goals.
22	NRS Xxiv PDF 26	"Increasing workforce capacity and training for local government and private industry staff to help landowners adopt new conservation practices and actions."	***Comment:*** Please reconsider the recommendation – authors should verify whether this trend has already occurred during the 2014 – 2024 reporting time period. There has been rapid expansion of county & SWCD offices through direct and 1W1Plan funding. Staff numbers have already ballooned during the period being referenced, and just like the water quality data trends, water specialist trends should also be noted in this report. There may be a lag in reality here between the survey and staffing levels – SWCD staffing capacities have ballooned with 1W1Plan. From the work I have seen in the Bois de Sioux Watershed District, SWCD staff are being pressured to secure contracts that far

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			exceed the interest of landowners, due to contract terms being far below market rates. More SWCD staff will not alleviate this disparity, and leads to generational government waste. ***Response:*** Comment noted.
23	NRS Xxiv PDF 26	"Replicating existing successful elements of local and regional soil health programs."	***Comment:*** Modeling does not accurately calculate the purported water quality benefits of soil health programs in a northern cold climates, which leads to government recommendations that are not believable to landowners and also not effective in achieving goals. For example, in our northern climates, it may be possible to seed a cover crop, but the cover crop has very little-to-no time to grow due to freeze-up. Landowners see the futility of impossible and worthless programs, and these nonsensical initiatives erode participation in other programs that actually do provide meaningful benefits. ***Response:*** The NRS points out the need for more Minnesota-specific research on agricultural practice effectiveness in the future.
24	NRS Xxvi PDF 28 NRS xxvii PDF 29	Cropland strategies Cropland implementation	***Comment:*** Please insert a foreshadowing that will later be discussed in the document – that Minnesota agriculture has very recently, and dramatically, be impacted by significant major legislation enacted to address nutrient reductions, including: - 2015 Riparian Buffer Law, effective 2017 for public waters and 2018 for public drainage systems - 2019 Groundwater Protection Rule - 2024 Wetland Act, Public Waters Expansion, and BWSR Ephemeral & Stream Regulations - 2024 MPCA new restrictions/prohibitions on new or expanded livestock operations and manure storage structures in shoreland or floodplain areas. Please include the modeled nutrient reduction results anticipated for each of these initiatives. Each of these represent expansive, wide reaching state-wide changes that should be noted for their commitment by landowners, legislators, and state departments for implementation. These monumental law changes were enacted specifically to address the situations described (nitrate leaching, nitrate loss, phosphorus overland runoff). It is extremely aggravating that major legislation are buried on page 289 or this report, and that the scale of nutrient changes are not described or recognized. Water quality is promoted as a "need" for these policies, but when it comes to quantifying the anticipated or actual results, no calculations are made – so landowners never seem to get credit for the water quality measures the State of Minnesota forces them to adopt, and Nutrient Reduction Standards remain systematically unachievable, because it looks like nothing is happening, when from a farmer's perspective – everything is happening. ***Response:*** Comment noted and forwarded to agencies responsible for specific laws or programs cited.
25	NRS Xxvi PDF 28 NRS xxvii PDF 29	Cropland strategies Continuous living cover campaign	***Comment:*** Nearly all of the recommendations have the potential to increase phosphorous and pesticide use. Please note this eventuality. ***Response:*** Comment noted.
26	NRS xxvi PDF 28 NRS 152 PDF 184 NRS 158 PDF 190 NRS 157	While no single practice will work on every acre or solve all nutrient loss, most land can use one or more of the 22 practices identified as being able to reduce nitrate losses (by 4% to 94% depending on the practice)	***Comment:*** This idea is completely contrary to the findings of the NRS. The three major basins have very different issues. This idea is completely contrary to the basic tenants of CWMP to implement activities that are targeted, prioritized, measureable. Staff for the Department of Agriculture [comment incomplete].

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	PDF 189 Appendix PDF 776	or 1 or more of the 20 practices identified as being able to reduce phosphorus runoff (by 5% to 75% depending on the practice). "No single practice will work on every acre. However, most cropland acreage is suitable for at least one or more practices that would help prevent nitrogen and/or phosphorus loss to waters." "The practices review for nitrogen concluded that no single practice will work on every acre, but to meet in-state and downstream nitrate and TN reduction goals, most acres of cropland will need at least one practice." "It is important to note that "no one practice will work on every acre, but every acre needs at least one practice" (Christianson and Rosen 2025)." "No one practice will work on every acre, but every acre needs at least one practice."	***Response:*** The intent is not to contradict prioritized local CWMPs, but to account for the fact that nutrient pollution is a widespread issue and practices like nutrient management are needed at a large scale to tackle nutrient loss.
27	NRS Xxviii PDF 30	Protection strategies should also consider mitigation actions to address increases in Red River Basin tile drainage.	***Comment:*** Please expound upon, "Protection strategies should also consider mitigation actions to address increases in Red River Basin tile drainage." Protection of what? Mitigation of what? Related how to phosphorous? Is it the assumption of the author that these activities are absent of regulating technical standards implemented both regionally and locally? ***Response:*** This statement was removed and the language in this section was clarified.
28	NRS 2 2.4 35 PDF 67	"The Minnesota portion of the Red River Basin covers about 37,100 square miles in northwestern Minnesota in all or part of 21 counties and flows from the Red River into Lake Winnipeg."	***Comment:*** 37,100 sq miles for the Minnesota portion does not seem likely. https://www.usgs.gov/centers/dakota-water-science-center/science/red-river-basin states: "The drainage area for the Red River Basin is about 40,200 square miles and encompasses parts of eastern North Dakota, northwestern Minnesota, and northeastern South Dakota in the United States and southern Manitoba in Canada. The Red River flows through several urban areas along its path including the cities of Fargo, N. Dak., and Moorhead, Minn., Grand Forks, N. Dak., East Grand Forks, Minn., and Winnipeg, Manitoba." In Table 36 of Appendix 2-1 PDF 70, MPCA staff write that the Red River Basin in Minnesota is 10,481,948 acres => 16,378 square miles. Please correct the square mile figure ***Response:*** Size of the Minnesota portion contributing to Lake Winnipeg was updated in Appendix 2-1.
29	NRS 5 PDF 37	The influence of weather and climate is not consistent across a large state like Minnesota	***Comment:*** Please expound on this idea per Basin. The nature of the Red River Valley, to have its headwaters at the southern/usually warmer end of system, which melts onto frozen ground, is one very important distinction. The frequency of widespread flooding is a key difference. ***Response:*** Comment noted for future consideration, as beyond the scope of the NRS to break down climate impacts by basin or watershed scales.

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30	NRS 10 PDF 42	More impermeable lands. Impermeable urban lands have slightly increased over the past decade from 1.3% to 1.6% of the state's land cover	***Comment:*** This statistic could be calculated in different ways to achieve different numbers. Please provide either a citation or the numerical # of acres so it is clear what the .3% increase represents. This conversion is also reducing ag land for use in modeling calculations ***Response:*** Section 1.2.6 was revised for clarity.
31	NRS 10 PDF 42	More row crops. Total cultivated cropland and perennial lands have remained largely the same since 1982, but corn and soybean acreage has increased by about 140,000 acres per year. Other agricultural cropland losses have offset this, with about half of the offset coming from wheat.	***Comment:*** Why are there significantly less acres in wheat? This answer could reveal why crops like kernza are not being widely adopted ***Response:*** Section 1.2.6 was revised for clarity.
32	NRS 10 PDF 42	More tile drainage. Tile drainage has been increasing in Minnesota. The U.S. Census of Agriculture indicated that between 2012 and 2022, Minnesota had eight of the top 10 counties in the nation with cropland tile drainage increases, due in part to the wetter spring months and warmer, shorter winters	***Comment:*** "Tile drainage has been increasing in Minnesota" is an empty sentence – subsurface tile drainage is rarely, if ever, removed. Tile can become blocked or disconnected and stop working, but there are few, if any reasons, why a landowner would pay to have an existing line dug-up. Because this infrastructure is rarely, if ever, removed, any installation – no matter how large or small - causes the statement, "Tile drainage has been increasing in Minnesota" to be true. This report should instead state more clearly the change of tile, and the reporting in the 2025 NRS should match that used in previous NRCS reports. MPCA's 2020 NRS Progress reported stated: "The 2017 U.S. Census of Agriculture showed 8,079,994 acres of land drained by tile in Minnesota, over 1.6 million acres more than shown in the 2012 census (Table 17). With approximately 20 million acres of row crops, small grains, and hay grown statewide, Minnesota tile-drains affect approximately 40% of the state's cropland." Please add to the 2025 NRS the graphic above, MPCA's 2020 NRS Progress report table with an updated column for the 2022 Acres and an updated column for the Change 2017 to 2022. Below is an excerpt of the 2022 US Census of Agriculture, which shows the acreage change to be 167,276 acres for land drained by tile and -113,539 acres for land drained by ditches. This bullet should instead note something actually meaningful - identify that the pace of tile drainage installation has slowed significantly between census periods (25% 2012 – 2017) to (2% in 2017 – 2022). ***Response:*** Comments noted and Section 1.2.6 was revised for clarity.
33	NRS 10 PDF 42	1.2.6 is entitled "Updated science on climate and other external influences" "The UMN researchers believe this unstable precipitation pattern will continue into the next century, making extended periods of drought and flash flooding more common and intense (Clark et al. 2023) "Longer-lasting weather extremes. Dry and wet weather extremes are lasting longer or are more severe. The Minnesota Department of Natural Resources (DNR) has	***Comment:*** The "updated science" for this statement isn't done by Clark et al. 2023 – the Clark et al. 2023 is a secondary/indirect reference, providing a very brief 4-page summary of other people's work, full of its own references. Clark et al. 2023 states: "In addition, these springtime wet extremes and summertime dry extremes may become more intense and more frequent than in the past (Chen & Ford, 2023). The Chen & Ford appears to be the correct reference: https://rmets.onlinelibrary.wiley.com/doi/full/10.1002/joc.7756 If 2025 NRS authors truly believe and understand that flash flooding will become more common and intense, why doesn't the 2025 NRS document promote clearly projects and goals that specifically address this issue? Flash flooding moves sediment. Nutrients are moved with sediment. Reducing flood damages reduces nutrient transport. There are a diversity of precipitation and flood events that this document is blind to. Soil health and cover crops can alleviate very small amounts of surface runoff, but don't matter when fields are 4"

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		noted on its climate trends webpage that "heavy rains are now more common in Minnesota and more intense than at any time on record." Since 2000, these rainstorms have become bigger and more damaging." "Warmer winters. Minnesota winters have become warmer. From 1970 to 2021, the average daily winter low temperatures increased 15 times faster than summer daily average high temperatures (DNR 2025a)"	under water or are frozen. Please provide an associated link/reference for the science this is based on. Please provide an associated reference for the science this is based on. I cannot find a DNR 2025a citation. ***Response:*** Section 1.2.6 revised for clarity.
34	NRS 10 PDF 42	"While large-scale, consistent changes in the above influences [weather/climate, land use, urban development, wetlands, cropland tile drainage, and irrigated cropland] have not occurred in the decade between the 2014 and 2025 NRS versions, the following shifts are part of the considerations of the 2025 NRS:"	***Comment:*** Does "large-scale, consistent…have not occurred" = small-scale, inconsistent…have occurred? Does this statement mean that these factors are flat from 2014 vs. 2025, and even though they are flat MPCA will proceed to discuss them anyway? It is hard to rectify all of the change date ranges that are used in the document. It seems like the determination on the historical range of data that is used just becomes an opportunity for data manipulation/misrepresentation or to overwhelm the reader with non-comparable details. Just because data is known for a specific date range, doesn't mean that its comparison to a different date range makes any logical sense. ***Response:*** Section 1.2.6 was revised for clarity.
35	NRS 14 PDF 46	More work is needed: (NOTE see PDF realted to MT/year of N/P for each basin	***Comment:*** (Blank) ***Response:*** No comment.
36	NRS 15 PDF 48	"Priority nitrogen sources were verified. The largest contributors of nitrogen loads were found to vary by large-scale basin, as follows: - Mississippi River Basin: (1) cropland via tile drainage and leaching to groundwater and (2) wastewater point sources." (2) wastewater point sources.	***Comment:*** Nitrogen loads were calculated by [incomplete comment] ***Response:*** Incomplete comment.
37	NRS 16 PDF 48	"Watershed nutrient load reduction needs were calculated. For each eight-digit HUC-8 watershed in the state, watershed outlet load reduction targets for TN and TP were developed to show how nutrient load reductions from anthropogenic sources in each watershed can, in aggregate, enable the final goals at state lines to be met."	***Comment:*** Please add text to indicate this was purely a mathematical activity, and that the practicality of reducing loads from anthropogenic sources to enable the final goals at state lines to be met is likely not possible in all cases, as stated on NRS 111 PDF 143: "…meeting all standards for local waters in this region of the state is not expected to substantially reduce the TN loads reaching the Red River and Lake Winnipeg." ***Response:*** A clarifying statement was added to this section.
38	NRS 17 PDF 49	"TN" (dissolved and organic nitrogen forms)…	***Comment:*** The graphic would be more helpful if it described directly the referring text, describing how nitrogen terms are used in this document. As it reads now, for someone with limited knowledge, there are two forms (dissolved and organic), but dissolved doesn't appear on the graphic, so from

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			the starts, initiates confusion. Please add a qualifier for "dissolved" nitrogen to Figure 2-1. Please use Figure 2-1 to demonstrate what is being defined – please indicate on the graphic something that demonstrates the NRS' use of "TN," "nitrate," and "nitrogen. ***Response:*** Clarification was made to Section 2.1.1.
39	NRS 17 PDF 49	2.2 Goals for major river basins and groundwater	***Comment:*** Please insert the justification used by MPCA to attempt to mandate a system of underground water quality goals based on boundaries defined by above-surface land topography ***Response:*** Groundwater nitrate goals are included in the NRS and are statewide and not prescriptive by basin. Clarification made in Table 2-1.
40	NRS 17 PDF 49	"Understanding the needed nutrient load reduction amounts for downstream waters will help us ultimately estimate the levels of rural and urban best management practice (BMP) adoption…."	***Comment:*** Does it make the most sense to have BMP's split by two exclusive categories of "urban" and "rural"? Sometimes these two terms applied to describe proximity to a major city, or to populations. A town of 300 people may consider itself "rural" depending on its location vs. an urban city-block housing 3,000 people. Or is the use here slang for land-use cover? Is "rural" being used instead of "agricultural" and "urban" being used for "non-agricultural?" Where are public lands and wetlands included, and please change the header accordingly to include these sources clearly ***Response:*** This comment does not refer to Chapter 2. This comment refers to Section 6.3.2, page 233, which relates to watershed planning. These terms are used generally in the NRS, but in the context of watershed planning local partners will determine specific definitions.
41	NRS 17 PDF 49	"Emphasize multiple benefits"	***Comment:*** Why is this recommendation exclusive to "rural" sources? Is urban soil health, soil cover, fertilizer use, and water nitrate levels not important enough to influence BMP scenarios? With the limited availability of all of these in paved cities, it seems counter intuitive that these aren't universal objectives. Why wouldn't MPCA recommend that watershed officials promote more impactful practices over less impactful practices? Is barely any improvement over many metrics is preferred to significant improvement over a few metrics? Is this a nutrient reduction strategy document that doesn't prioritize nutrient reduction? Aren't there multiple, significant benefits to nutrient reduction itself? If there are numerous benefits to nutrient reduction, why do there also have to be a maximization of benefits of an activity itself on top of that? Why is there a separation in the number of benefits to describe the action and to describe the benefit ***Response:*** This comment does not refer to Chapter 2. This comment refers to Table 5-3 in Section 5.1.3 pages 161–162, which relates to agricultural practices. Multiple benefits are not exclusive to agricultural practices, but the focus was given to this sector because NRS partners and other local governments have requested more clarity on the multiple benefits of agricultural practices.
42	NRS 17 PDF 49 "	"Use estimates of nutrient load reductions…."	***Comment:*** It should be noted that reduction estimates can vary wildly. Personally, I have used a state department nutrient reduction calculator that either overestimates reductions by 10x compared to other estimators, or other estimators are underreporting reductions by 10x. There is a lack of working knowledge/ familiarity of scale that would allow an official to instantly identify that a calculation/estimate is wildly incorrect. I have seen annual reductions for

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			a cover crop rival a $2,000,000 multipurpose drainage management project with thousands of contributing acres. The calculator used to establish nutrient load reductions should provide functionality for practice reductions so that the same internal system is being used and compared to. Switching between calculators will result in great data integrity and application errors. I am also aware of a state department promoted nutrient reduction calculator that provides phosphorus reduction that simply multiplies one factor by a simplistic U of M "index." In some cases, nutrient reduction estimates seem to be an exercise in just identifying two numbers to multiply together to come up with a unique number. ***Response:*** This comment does not refer to Chapter 2 but refers to pollutant estimators. MPCA and NRS partner agencies have been continually updating and improving our modeling efforts and enhancing how the information is relayed to users through online tools. This work is iterative, and the models and tools used will be continually enhanced and improved over time.
43	NRS 17 & 18 PDF 49 & 50	"Often, conservation practices are targeted in small priority areas to efficiently prevent phosphorus and sediment from entering waters. To achieve downstream nutrient reduction goals, local strategies should additionally consider broad adoption of in-field practices…." "In many cases, broad application of in-field BMPs will be needed to achieve the long-term goals for downstream waters."	***Comment:*** Our 1W1Plans provide targeted BMP's by design. The software watersheds used is called Prioritize, Target, and Measure Application (PTM App). Could conveys possibility. Should conveys an obligation or expectation or duty. It is not apparent from the text given why should is justified vs. could? And does the Should be Broad approach only apply to practices imposed on agricultural fields? The case for "broad application" vs. "targeted application" is not made. ***Response:*** This comment does not refer to Chapter 2, but refers to Section 5.1.1, which relates to broad-scale adoption of agricultural BMPs. The comment was noted and relayed to BWSR staff.
44	NRS 18 PDF 50	"nitrogen cycling and storage in Lake Superior are not well understood"	***Comment:*** Please create a section that lists data gaps. ***Response:*** Added this concern to the list under "#6 Increase research and development" in Chapter 8.
45	NRS 18 PDF 50	Table 2-1	***Comment:*** A reader should be able to glance at this table and understand what the original Minnesota 2014 NRS goals were MT/yr vs. the 2025 NRS updated goals being proposed are MT/yr. As written - without common measureable targets between 2014/2025 columns and between basins – this graphic is very difficult to understand. Presenting a target reduction is meaningless within this graphic without seeking outside the graphic the number that is to be reduced. Please provide both the target and the reduction that would take to get there in MT/yr. Please Change the "Updated 2025 NRS goals" for Lake Winnipeg (Red River at Canada Border) to just the Minnesota portion. Please add the MT/yr for Mississippi River to both columns and rows so readers don't have to delve deeper into the document to ascertain the MT/yr, and so that it can easily be understood in the context of the other water bodies. Please only provide the Minnesota portion. Please note that "Groundwater" is the only "Statewide" goal, and update mistaken references of "Statewide" that were applied to waterbody/watershed wide goals ***Response:*** The details summarized in Table 2-1 are expanded on later in Chapter 2.

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46	NRS 19 PDF 51	"The TMDL aims for a 17.3% reduction in phosphorus loads going into the lake."	***Comment:*** Please qualify which lake – Lake of the Woods or Lake Winnipeg ***Response:*** Clarification has been made to this section to clearly state that the Lake of the Woods is being referenced. A link was also added to the Lake of the Woods TMDL report for excess nutrients.
47	NRS 19 PDF 51	Is this concentration – "The goal is to achieve total in-lake phosphorus concentrations of 30 micrograms per liter (µg/L), which is a reduction from the average concentrations of 36 µg/L determined from limited monitoring in 1999 and 2005–2006 and from an average of 39.8 µg/L found more recently (2005–2014). Equal to, greater than or less than the proposed load reduction of The TMDL aims for a 17.3% reduction in phosphorus loads going into the lake. At the time of the TMDL development, Minnesota contributed about 64% of the load (432.5 MT/yr from Minnesota and 241 MT/yr from Canada). A 17.3% phosphorus reduction from Minnesota's 432.5 MT/yr is a reduction of 74.8 MT/yr.	***Comment:*** It is not stated whether the load monitoring goal is equal to, greater than or less than the phosphorus concentration goal. Please insert language to describe the relationship. If Rain River/Lake of the Woods is being dealt with through a TMDL, why are any of its acres being included in discussions about the Red River Basin? ***Response:*** The TMDL, or loading capacity, is the maximum allowable load that the lake can assimilate and still meet the applicable water quality standard(s). The loading reduction goal of 17.3% represents the minimum reduction needed to bring the lake's concentration down to 30 µg/L. As the question is worded, the loading reduction goal would be equal to, or possibly less than, the numeric value of the concentration required by the water quality standard. Since the Rainy River and Lake of the Woods watersheds drain to Lake Winnipeg, it is appropriate to include references to completed or ongoing work in the NRS from these watersheds.
48	NRS 19 PDF 51	"These goals represent load reductions of about 53% and 50% of the 20,067 and 2,787 TN and TP loads, respectively....."	***Comment:*** Please insert the actual goals, as the percentage for total nitrogen is wrong (53% of 20,067 = 10,635); please correct: The 1400 & 9525 figures were correctly used on page 21 ***Response:*** The goals were checked and are correct as stated.
49	NRS 21 PDF 52	At certain monitoring sites, such as the Red River at Emerson site, a high fraction of the load is coming from other neighboring states.	***Comment:*** Thank you for providing this information. Does this mean that the TMDL's for Red River will be out of sync with NRS goals? ***Response:*** The only TMDLs that the MPCA is working on for the Red River of the North are the 10 TSS TMDLs, which correspond to the 10 segments of the river. The TSS reductions needed to meet Minnesota's 100 mg/L TSS standard range from 42% in the most upstream impaired reach, 67% to 74% in the middle reaches, and 79% in the most downstream impaired reach. The TSS reductions will generally result in corresponding phosphorus reductions. These corresponding phosphorus reductions would support the NRS goals.
50	NRS 22 PDF 54	"Load reductions from all contributing states are important for meeting the downstream goals."	***Comment:*** Please describe how in-channel erosion nutrients contributions handled? Are they considered instate or contributing state? ***Response:*** More analysis would need to be done, in partnership with other states, to accurately break down in-channel erosion from boundary states.
51	NRS 23 PDF 55	"The calculated load changes are driven by changes in river flows and nutrient concentrations."	***Comment:*** Please describe what factors are referred to here as "river flows." Or does this simple sentence attempt to encapsulate "flow alteration" as a candidate of biological stress, which would mean: channel alteration; water withdrawls; drainage systems; land cover alterations; wetland drainage;

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			impoundments; rainfall runoff rates; streamflow quantity and timing; flow change concentrations; "drift" changes; seasonal variability; channel cutting? ***Response:*** This sentence simply states how loads are calculated.
52	NRS Section 2.3.1	River load monitoring	***Comment:*** Please include information on the Red River Riverwatch monitoring system. ***Response:*** There are many local monitoring programs that collect flow, chemistry, and biological information across Minnesota. We did not list all the contributors, such as Red River Riverwatch, in this section. We recognize this is an important monitoring program for the region.
53	NRS 24 PDF 56	The watersheds contributing nutrients to monitoring sites have different fractions coming from neighboring states. For example, the Mississippi River at Red Wing is mostly affected by nutrients coming from within Minnesota (Figure 2-4), whereas the Mississippi River at La Crosse includes additional Wisconsin tributaries (Figure 2-5). The Red River at Emerson (Figure 2-6) has the largest fraction of nutrients coming from neighboring states/provinces.	***Comment:*** How do these sources compare to the in-channel sources at these sites? ***Response:*** Data on the breakdown of in-channel sources from these sites is not available and has been identified as a future research need.
54	NRS 58 PDF 90 Appendix 2 26 PDF 282 2 31 PDF 287	New (2024) modeled nutrient source estimates from existing models. 3.4.2 Lake Winnipeg Major Basin	***Comment:*** Nutrient model results from HSPF (and SPARROW were no HSPF) were compared with the 2014 NRS source load contribution assessment. As stated in Appendix 2-3: "Generally, MPCA (2023, 2024) point source load estimates for individual subbasins and major basins are similar but these two datasets are considerably different than point source loads estimated for HSPF and SPARROW model development. The differences between datasets are due to the use of different averaging periods, model assumptions, and estimation techniques." IE – nothing changed in the real world, but the data differs due to manipulated data parameters. With newly manipulated data parameters, "source assessments" produce significant swings in modeled contributions. Is any of the Red River Basin data ground truthed by oberservable measurements – or are source assessments a computer desktop exercise? Data and graphs in the NRS and Appendix should specify represented data formats – it is extremely difficult to discern in over 1500 pages of information what data is observed/measured, modeled, or estimated. Is the data in Table 19 based on modeling? If so, please add: "Table 19. Average Annual Modeled TN Loading by Source in the RRN" Please provide a qualifier observed/measured/modeled/estimated on all graphs and tables in the NRS and Appendix ***Response:*** MPCA (2023, 2024) point source load estimates are based on DMR data that are monitoring data reported by the facilities; MPCA did need to fill data gaps. Analyses of individual point sources show improvements from 2005 to 2022/2023. For example, Metropolitan WWTP (MN0029815) TP loads decreased from 174,644 kg/yr in 2005 to 57,862 kg/yr in 2022. Table 2-17 uses MPCA (2023) point sources estimates (monitored + filling data gas) and uses HSPF/SPARROW for nonpoint sources. The models are calibrated with

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			measured flow and pollutant datasets. Table 19 in Appendix 2-13 is MPCA (2023) point sources estimates and HSPF modeling for nonpoint sources.
55a	NRS 26 PDF 58	The drainage areas for both Mississippi River sites are diagramed.	***Comment:*** Why is only one of the Red River monitoring sites provided? Please add a diagram of the Grand Forks drainage area. ***Response:*** The NRS emphasized the sites closest to state lines. Grand Forks is mentioned but does not have the proximity or the long history of load monitoring compared to the Emerson, MB monitoring site.
55 b	NRS 37	Per the 2020 NRS Update, Page 37: "The [2014] NRS acknowledged that Minnesota did not have a realistic way of showing how the 45% reduction could be achieved using the current state of scientific advancement… Both scenarios assumed that research would advance the success of cover crops in Minnesota, enabling increases in cover crop establishment and success rates." Per the 2022 NRS, Page 1: "These updated watershed load reduction targets are more realistic since they are established with an assumption that we cannot expect to achieve load reductions from our "natural" lands, and additionally they are developed with considerably more monitoring and more advanced modeling as compared to the preliminary HUC8 load reduction guidance in the 2014 NRS."	***Comment:*** Please add the same acknowledgement prominently and earlier in the 2025 NRS. Please add the same acknowledgement prominently and early in the 2025 NRS. ***Response:*** These challenges are summarized in the executive summary.
56	NRS 36 PDF 68 NRS 45 PDF 77	"Annual TP loads in the Red River were lower than the goal during only four individual years since 1995, all of which were low-flow years (2003, 2008, 2012 and 2021)." "This 5-year rolling average is how the Manitoba Water Stewardship Division is gauging progress toward the goals for Lake Winnipeg. This change does not correct for the weather and river flow variability that has occurred; rather, it reflects a combination of changes made on the land and the full effects of changing weather and climate." "Nitrogen loads during the six lower-flow years met the targeted load goal, but the other	***Comment:*** Annual TP loads in the Red River were lower than the goal during only four individual years since 1995, all of which were low-flow years (2003, 2008, 2012 and 2021). How does the recommended NRS amounts account for variations during extreme flood/drought cycles experienced by the Red River Valley? According to the data presented, Red River Valley landowners are responsible for the "full effects of changing weather and climate." ***Response:*** The NRS includes the implications of climate change in meeting the final nutrient reduction goals.

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		years exceeded final load targets."	
57	NRS 57 PDF 89	There is a difference between the text of the 2014 NRS and what the draft NRS states is the text of the 2014 NRS with regard to phosphorus.NRS 57 PDF 89: "The largest phosphorus sources varied among the three major water drainage areas: • Mississippi River Basin – Cropland runoff, wastewater, streambank erosion • Lake Winnipeg Basin – Cropland runoff, nonagricultural rural runoff, atmospheric deposition • Lake Superior Basin – Nonagricultural rural runoff, wastewater, streambank erosion"	***Comment:*** **NOTE: Go to pdf for strike out and underline.** PLEASE CORRECT THE TEXT ON NRS PAGE 57 TO REFLECT THE 2014 NRS PHOSPHORUS SOURCES STATED BY MAKING THE FOLLOWING CHANGES: Mississippi River Basin – Cropland runoff, wastewater point sources, streambank erosion Lake Winnipeg Basin – Cropland runoff, nonagricultural rural runoff, atmospheric deposition Lake Superior Basin – Nonagricultural rural runoff, wastewater point sources, streambank erosion ***Response:*** Clarifying language was added to the Priority Sources section of 2.8.1.
58	NRS 58 PDF 90	There is a difference between the text of the 2014 NRS and what the draft NRS states is the text of the 2014 NRS with regard to nitrogen. NRS 57 PDF 89: The largest nitrogen sources varied among the three major water drainage areas: • Mississippi River Basin – Cropland (tile drainage, leaching to groundwater and surface runoff), wastewater, atmospheric deposition • Lake Winnipeg Basin – Cropland (tile drainage, leaching to groundwater and surface runoff), atmospheric deposition, forest runoff • Lake Superior Basin – Wastewater, forest runoff, atmospheric deposition	***Comment:*** **NOTE: Go to pdf for strike out and underline.** PLEASE CORRECT THE TEXT ON NRS PAGE 57 TO REFLECT THE 2014 NRS NITROGEN SOURCES STATED BY MAKING THE FOLLOWING CHANGES: Mississippi River Basin – Agricultural tile drainage and other pathways from cropland Cropland (tile drainage, leaching to groundwater and surface runoff), wastewater, atmospheric deposition Lake Winnipeg Basin – Cropland (tile drainage, leaching to groundwater and surface runoff) Lake Superior Basin – Wastewater point sources, forest runoff, atmospheric deposition Did MPCA model results find that these three specific nitrogen sources - tile drainage, leaching to groundwater and surface runoff – were the largest nitrogen sources for MRB and LWB? Or are these three conditions what were used in the model as the definition of "cropland," and may not be reflective of the primary sources for nitrogen in 2014? ***Response:*** See response to comment #57 above.
59	NRS 111 PDF 143	"The Red River Basin has relatively few streams and wells above nitrate drinking water standards or above the proposed draft aquatic life toxicity standard when compared to the Mississippi River Basin; therefore, meeting all standards for local waters in this region of the state is not expected to substantially reduce the TN loads reaching the Red River and Lake Winnipeg. The nearly 50% TN load reduction	***Comment:*** Is this paragraph about the Minnesota portion of the Red River Basin, or the entire Basin? How can MPCA staff justify this fact – that Minnesota waterbodies in general meet all nitrate water quality standards, but this has no impact on Red River and Lake Winnipeg nitrate goal achievement. How can this situation be explained? Contributing Minnesota streams meet nitrate water quality standards, but somehow at a point at the most downstream portion of a border stream, the calculated load exceeds nitrate water quality standards? Either contributions from other states, or the channel itself, must be a significant source. What does this fact reveal about the proposed nitrate goal or the nitrate sources proposed by MPCA? ***Response:*** Nutrient loads and concentrations are two different ways of measuring nutrients in water, and understanding the distinction is important

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		needed in the Red River Basin will require considerable additional nitrogen reductions after addressing local nitrogen priority concerns."	for water quality management. Concentration is the amount of a nutrient present in a given volume of water, typically expressed as mg/L or parts per million (ppm). It describes how "strong" or dense the nutrient content is at a specific point in time. Load is the total mass of a nutrient being transported past a point over a specific time period, typically expressed as kilograms per day or tons per year. It's calculated by multiplying concentration by water flow rate. For water quality management, concentrations describe whether water meets quality standards for drinking, recreation, or aquatic life at a given location. Loads describe how much pollution is actually entering a lake or downstream water body over time, which is crucial for understanding cumulative impacts and setting reduction targets. Nitrogen load contributions from streambank erosion are typically very low and not a significant component of the total load. A combination of cumulative nitrogen loads from MN, ND, and Canada is significant enough to cause nutrient enrichment in Lake Winnipeg, a large, but very shallow water body.
60	NRS 114 PDF 146	Urban Nutrient Reduction	***Comment:*** What to do about management of wetlands and stormwater storage ponds required in urban development planning? They become nutrient sinks and sources. Additionally, planned immense land conversion will have a negative impact on some of the water quality indicators used today. ***Response:*** Comment noted and has been forwarded to MPCA Stormwater staff.
61	NRS 114 PDF 146	"Fully implementing it will result in NRS's wastewater sector nitrogen reduction goals being met"	***Comment:*** I couldn't find any goal #'s – just "predicted loads," and the caveat that they are anticipated to increase. Please clearly label/describe the goals in the section being referenced by this sentence ***Response:*** Please see Table 4-18 for more information.
62	NRS 114 PDF 146 compared to NRS 152 PDF 184 compared to NRS 188 PDF 156	Page 114, 2nd bullet - Urban Nutrient "Reduction" begins by praising WWTFs for cutting loads. Compare this to Page 152 Rural Nutrient "Sources" which takes until the 6th bullet and the second page to acknowledge (without any TP or TN quantified information) that any agricultural changes have recently occurred. Urban Nutrient Reduction Key Messages were summarized in under one page (despite extensive strategies to be implemented). Rural Nutrient Sources Contained 4+(!) pages of "key messages." "Focus on local and statewide strategies. Efforts to decrease stream erosion should occur through Minnesota's Water Management Framework, along with water storage grants through the BWSR. Because the sediment reduction goals around the state are so closely linked to reducing streambank and gully erosion,	***Comment:*** Please more equitably acknowledge the wins for urban and rural, but at least putting them at the top of the list. Please more equitably describe "Key Messages" – less than a page for urban vs. four pages for rural seems exaggerated. Authors have decided to separate "Urban" from "Rural" but there are some topics that do not fit into either category, like this blurb on stream erosion. In-Channel stream erosion is a significant contributor, and can occur anywhere. Please consider a new category or new placement of items like this that absolutely should not be placed under "Section 5.1's Cropland information." One significant Minnesota "key trend" is the increase in public land acquisition, supported by the Legacy Amendment. Please add a section on "Responsible Management of Public Resources" and this section can describe about how the DNR is responsible for the condition and pollution from Public Waters, and how the state intends to manage its expanding list of public wetlands, public waters, and wildlife management areas to ensure these resources don't remain/become nutrient sinks that spill during excess precipitation events. The DNR states on its website that it manages approximately 5.6 millions of land. Please describe the acreages by Basin ***Response:*** Comment noted.

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		both local sediment TMDLs and large-scale sediment reduction strategies are important drivers to reducing this source of phosphorus."	
63	NRS 121 PDF 153	Table 4-7. Baseline effluent TP loads and reduction goals delivered to the state borders. "Effluent phosphorus reductions achieved by the wastewater sector in Minnesota to address state eutrophication impacts have exceeded the 2014 NRS's load reduction goals."	***Comment:*** Do "effluent TP loads" pertain to WWTF and/or point sources? If so, please include these terms in graph and table headers to make the information easier to search/find. ***Response:*** Wastewater was added to the caption in Table 4-7 to be consistent with Table 4-6.
64	NRS 122 PDF 154	Table 4-9. Wastewater effluent nitrogen loads by basin by year (MT/yr)	***Comment:*** Please separate Lake Winnipeg into Rainy River and Red River, as was done for phosphorus on the preceeding page. ***Response:*** Table 4-9 was updated to break out the Red and Rainy Rivers, and an error in the Mississippi River calculation was corrected.
65	NRS 122 PDF 154	"However, future effluent phosphorus loads are likely to increase statewide in coming decades due to increased population and commercial and industrial activity that will result in increased WWTF flows. Although difficult to quantify, it is also possible that effluent phosphorus concentrations may increase somewhat due to future efforts to optimize WWTF operations for nitrogen removal."	***Comment:*** This text in Section 4 Urban Nutrient Reduction stated clearly that both TP and TN are each anticipated to increase despite the efforts described; please add a similar statement in Section 5 that practices with competing TP & TN effects are anticipated to increase TP and/or TN. ***Response:*** Tradeoffs of certain agricultural practices are mentioned in Chapter 5.
66	NRS 162-163 PDF 194- 195	Practices to reduce rural nutrient losses to waters and the associated NRCS/BWSR practice code number(s) for each	***Comment:*** Why is this table blind to large-scale 103D & 103E watershed projects? Please include Appendix 5- 5 Practices (water storage, off-channel storage, on-channel storage, bank stabilization, two-stage ditches, channel gully stabilization, ravine stabilization, grade control structures, stream channel restorations. Specifically, Red River Valley watersheds build: Flood Impoundments just giant, multi-parcel, large-scale WASCOBS. Impoundments allow sediment and nutrients to drop out of the water profile and are retained from discharge downstream. They are a huge endeavor with huge water quality benefits! "H" qualifier. Because of their scale and effectiveness, they should be added with an "H" qualifier under "Hydrologic and other types of restoration." Multipurpose Drainage Water Management are projects that feature of a number of activities defined by BWSR to improve water quality in areas prone to flooding. These projects can be very large in scale, reducing sediment and nutrient delivery on thousands to tens of thousands of acres to downstream waters. Because of their scale and effectiveness, they should be added with an "H" qualifier under "Field erosion controls and tillage." ***Response:*** Added in two-stage ditch, grade stabilization structures, and large-scale impoundments/flood damage reduction control structures. Streambank restoration, floodplain connection, and restored oxbow practices are already included in the table. In the future, this table will be converted to a visual in

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			the future NRS dashboard. MPCA staff will consult with BWSR, DNR, and UMN staff on including additional future practices.
67	NRS 181 PDF 213	"Costs for the Red River Basin scenario described below would add another $110 to $150 million per year, which would make the statewide total likely in the $700 to $850 million per year range."	***Comment:*** Why is this text under the header, "Cost to achieve Mississippi River Basin scenarios"? Please add a corrected header for the Red River Basin. ***Response:*** Title changed to "Costs to achieve basin cropland scenarios".
68	NRS 215 PDF 247 NRS 242 PDF 274 NRS 287 PDF 319 NRS 287 PDF 319 NRS 291 PDF 323	Because the sediment reduction goals around the state are so closely linked to reducing streambank and gully erosion, both local sediment TMDLs and large-scale sediment reduction strategies will be important drivers to reduce this source of phosphorus around the state. "Sediment reduction goals in critical areas like the glacial beach ridge and along eroded streambanks will work towards phosphorus reduction needs." "Practices that reduce streambank and gulley erosion. Stream restoration, off- or on-channel water storage, bank stabilization, buffers, two-stage ditches, near-channel gully/ ravine stabilization, grade control structures, etc. "Practices needed for flat lands, such as in the Red River Valley, will be somewhat different than for sloping lands. Practices to reduce streambank erosion and other near-channel sediment will be important in the Red River Valley, along with practices to reduce wind erosion and CLC designed for colder climates and shorter growing seasons." "Strategies to reduce near-channel sediment needed. To meet phosphorus load reduction goals in some watersheds, the erosion of streambanks, river bluffs, ravines, and gulleys will need to be substantially reduced. Practice effectiveness and feasibility need further examination.	***Comment:*** The NRS emphasizes that sediment is a problem for the Red River of the North (floodwaters and runoff move soil in flatland country), but the NRS and Appendix provide limited information on major large-scale sediment reducing project; 4 of the 5 NRS support documents ignore coordinated, large-scale projects (5-5 only): Please provide a more substantial section on large-scale capital improvement projects, and include the information that there very few current opportunities to utilize Clean Water Funds for flood hazard mitigation projects ***Response:*** The report "Involvement in Agricultural Land Protection in the Red River Basin of Minnesota" has been linked to Section 5.4.2.
69	NRS 234 PDF 266	"As of this writing, only a small number of CWMP assessments have been completed."	***Comment:*** Please correct this sentence, as "only a small number" is not true (see the map below). Also include that MPCA is a required participant for the development, approval, and implementation of these plans

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			Response: This statement refers to BWSR assessments of completed CWMPs that are implementing their plans and does not refer to tracking the status of CWMP development.
70	NRS 237 PDF 269	"This changing landscape of practices, new and improved technologies, and associated support programs will provide opportunities for and put pressure on local practitioners and landowners over the following decades to effectively implement practices and actions that make a difference toward nutrient reduction."	***Comment:*** Please include an acknowledgement that some practices will result in increase nutrient releases. For example, the freeze-thaw cycles of cover crop degradation release phosphorus. If not acknowledged and accounted for in the NRS, the recommended practices themselves amplify "pressure on local practitioners and landowners" in a doom loop. It is important to recognize freeze-thaw cycles can happen seasonally or over months, but they can also happen daily, over the course of many days. By requiring larger land uses to incur larger reductions, this known phenomenon shifts offsets for increasing nutrients on public lands and point sources to ag land ***Response:*** A clarifying statement was added to Section 5.1.1 to further document that some practices, under certain circumstances, can be sources of nutrients.
71	NRS 238 PDF 270		***Comment:*** Please add expedited and simplified state permitting procedures to this list. Watershed scale projects can take up to 2 years to receive a state permit, and the cost for endless requests for hydrologic data and modelling can breach $1,000,000 on a large scale project. These state employee driven barriers can deter, stall, and kill local projects. State agencies should work towards common goals and permitting agreements between themselves – local projects can get caught in the crossfire between competing state agency objectives. ***Response:*** Comment has been shared with the interagency NRS Steering Team.
72	NRS 238 PDF 270	blank	***Comment:*** Please add expedited and simplified state permitting procedures to this list. Watershed scale projects can take up to 2 years to receive a state permit, and the cost for endless requests for hydrologic data and modelling can breach $1,000,000 on a large scale project. These state employee driven barriers can deter, stall, and kill local projects. State agencies should work towards common goals and permitting agreements between themselves – local projects can get caught in the crossfire between competing state agency objectives. ***Response:*** Comment has been shared with the interagency NRS Steering Team.
73	NRS 241 PDF 273	Staffing Support	***Comment:*** Please include steps taken to support staffing efforts for Minnesota's 46 statutory watershed districts, who are tasked most directly with the responsibility and authority to build and maintain watershed-scale projects ***Response:*** Reference to Watershed Districts, as well as to other local government types, was made in Section 6.4.4.
74	NRS 241 PDF 273	Minnesota Water Management Framework, 6.5 & 6.5.1	***Comment:*** This framework = state agency reps + the Met Council, and appears to be important to the Minnesota Metro. The Red River Valley has instituted a similar framework, with state agency partners, in the coordination and funding of the Red River Water Management Board. This would be a great place to describe the technical management of the Red River Valley watershed. Or a caveat should be inserted that the Minnesota Water Management Framework is limited to the metro.

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			Response: See Section 6.2.1 for more detail on the MN Water Management Framework description, which is applicable statewide (outstate and 7-county metro area). The intent here is to better connect information and goals from the revised NRS when WRAPS and CWMPs are updated in the future. A sentence was added that references regional planning efforts like those of the RRWMB.
75	NRS 242 PDF 274	Red River of the North - Relatively few river or lake eutrophication impairments for phosphorus and very few groundwater impacts for nitrogen exist, but large nutrient reductions are still needed to meet Lake Winnipeg goals. - Sediment reduction goals in critical areas like the glacial beach ridge and along eroded streambanks will work towards phosphorus reduction needs.	***Comment:*** The summary is revealing, non-sensical in its simplicity. There are very few EPA/MPCA-based impairments, but water quality reductions must be implemented anyway? We have an extremely young, shallow, unstable, dirt-bottom, dirt channel river systems. No rock-lined channels to reduce the transport of sediments and nutrients ***Response:*** Comment noted. A key point is the need to address the sources to Lake Winnipeg. These are not mutually exclusive.
76	NRS 269 PDF 301	Minnesota had 65,531 farms, down from 94,382 in the 1982 census. This steady decline of around 540 farms per year has seen a complementary increase in farm size, with the average farm size in the 2022 census at 388 acres compared to the 1982 average size of 294 acres.	***Comment:*** Why does this report refer to 1982 land acreages? If it referred to 1950 Farm Operations – Acres Operated, that amount was 33,300,000 acres and now we are well below that. The number of harvested cropland acres in Minnesota has dropped 7% since 1997 (nearly 2 million acres) and remained essentially flat since 2007 ***Response:*** Language was updated to discuss both past and recent trends.
77	NRS 232 PDF 264	"Throughout much of Minnesota, agricultural sources and pathways were the most common sources of impairment…."	***Comment:*** MPCA states that this finding is the result of looking at the complete set of WRAPS and CWMP's. This is statement is the result of circular thought. From what I have read, WRAPS by their very nature identify and describe a wide variety of possible sources that warrant further investigation – both Point Sources and Nonpoint Sources. "Nonpoint Sources" are described by land use, as MPCA staff state that they believe pollution is caused by rainfall or snowmelt moving over and through the ground/land…. Therefore, the statement is completely circular. MPCA staff and models define a "pollution source" as "land use," without investigation or qualification, so by definition MPCA staff and models will deduce that "land use" is the "pollution source." The statement, as written without qualification, asserts that "agricultural sources and paths" are the most common source of all impairments – but impairments include those for fecal coliform, mercury, PCB's, eutrophication, low DO, biota, excess nutrients, sulfates, habitat degredation, excessive sediment, chloride, etc. This does not seem to be true on its face. This statement, as written without qualification, infers that being listed in a WRAPS report = scientific causality. WRAPS reports include generic and boilerplate statements such as, "common non-point pollutant sources are:" followed by a list determined by land use that can include field erosion, stream erosion, failing septic systems, internal loading, upstream lakes and streams, wildlife runoff, fertilizer/manure runoff. In some WRAPS reports, "common sources" are specified by their potential delivery to streams vs. internal loading vs. lakes. That a term would be included as a possibility does not equate to proven causality. This statement is likely false by nature of the order an "impairment" designation is made by MPCA. The current process requires that MPCA note test results outside of their self-determined standards. They then deem the waterbody "impaired," without

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			source investigation. LGU's may conduct an investigation to verify natural background levels. Based on the results of the investigation, the waterbody could have the impairment designation removed due to natural conditions. It is my understanding that these types of investigations are not usually conducted. So, to state definitively that Minnesota agriculture are "the most common sources of impairment," seems like an overreaching conclusion. It seems highly unlikely that this statement is true because: • There are many impairments unrelated to "agricultural sources and pathways" • WRAPS list possible sources, not definitive sources. • Impairments are designated first without consideration to natural background, artificially swelling impairment statistics. ***Response:*** Clarification has been made that agricultural sources outside the seven-county Twin Cities Metro Area were more common from the data collected in the analysis.
78	NRS 156 PDF 188	Section 5.1	***Comment:*** Tables 5-1, 5-3, and 5-4 declare that the conversion of agricultural land to prairie results in the highest and most significant nutrient reductions. Please add a section describing the program and progress made by the DNR and US Fish and Wildlife's Prairie Pothole Joint Venture to convert 4,200,000 acres of Minnesota's 25 million acres of agricultural land to habitat complexes. This document should recognize the multi-jurisdictional partnerships that implement this large-scale Program, and as required by grant agreements, also acknowledge the support of funding from the Legacy Amendment and Clean Water Fund. Please add also the same information for the state's RIM Program. It is curious why these types of coordinated, taxpayer-sponsored, large-scale efforts are not included in this document if they are purported to provide maximum nutrient reductions – especially since tables like 5-7 goes so far as specify an acreage goal to be reached. ***Response:*** MPCA researched this program, and this project has not gone forward to date.
79	NRS 151 PDF 183	Please add the December 2022 Biofiltration Media Optimization Report supported in part by Capitol Region Watershed, South Washington Watershed, and Valley Branch Watershed published by the University of Minnesota, Project Report No. 603.	***Comment:*** This study shows how complicated and unpredictable "mitigation" efforts for NRS are in reality. This study is important, because degrading/composting grasses and vegetation are being used/promoted statewide in both urban and rural settings as mitigation efforts to reduce phosphorous and nitrate (cover crops, buffers, prairie restorations, etc) – but, as has been claimed by many and ignored by state agency officials, these vegetative systems also produce phosphorous and nitrates and impacts are multiplied by cold climate effects. Takeaways: • Vegetation and topsoil/organic material releases phosphorous and nitrates. • Simple tests and metrics do not reliably predict the potential for phosphate release from organic materials.

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			• The amount of phosphate released increased as the amount of compost (yard residue and/or food residue) increases Biofiltration media mixes, including food or leaf compost, release phosphate at 10% and 20% ratios. Biochar or spent lime can reduce this amount, but do still create a net export of phosphate. • Vegetation growth was inversely related to phosphate capture -> tall plants release more phosphate. Tall grasses? They capture less phosphate. • Road salt was found to exacerbate phosphates – in some scenarios, causing double the release of phosphate. • Lime was found to exacerbate nitrates. This study demonstrates the potential that blanket NRS strategies – such as buffers, rain gardens, cover crops, reduced tillage, etc – have to increase phosphate and nitrate runoff. Appendix 5-1 page 90 states, "Cober et al. (2018) implied that cover crops should be used with caution in regions that do not have mild winters because of the risk for increased P losses." ***Response:*** MPCA staff consulted with the lead author of the study referenced. This study was a controlled lab experiment for enhancing soil media in urban situations for plant growth, looking specifically at what media was better for plant growth and also could reduce nutrient loss. According to the lead author, this study cannot be extrapolated to cover crops or reduced tillage in agricultural situations.
80	Chapters 4 & Chapters 5	Blank	***Comment:*** Where is the acknowledgement of the short-term and long-term effects from large scale flood events? Please acknowledge that large scale flood events leave temporary and permanent scars that effect water quality, and landowners in the Red River Valley pay at taxable rates more than anyone in the state to address these issues ***Response:*** Comment noted. This comment does not make a connection to nutrient reduction.
81	NRS 186 PDF 154 NRS 197 PDF 165	"Landscape-level changes require several areas of program modification." "These are most feasible when constructed in unfarmed areas or marginal croplands."	***Comment:*** Landowner support may be difficult to acquire, but permitting is just as difficult. Please include a recommendation to alleviate the burdens of state agency permitting for construction of large scale facilities. ***Response:*** Comment has been shared with the interagency NRS Steering Team.
82	NRS 157 PDF 189	"no one practice will work on every acre, but every acre needs at least one practice"	***Comment:*** Please remove this statement, because the statement itself is scientifically unsound and undermines the purpose of the report highlighting what the nutrient reduction goals are, and where mitigations will be the most effective. Per page 212, this report promotes prioritized, targeted, project-level scaling and proper design and construction; in the subsequent paragraph, acknowledgement is given to strategies that work in concert and not at cross purposes. For example, if landowners implement a large-scale multipurpose drainage management project, costing those same landowners millions of dollars and resulting in annually reducing hundreds of tons of sediment from being discharged from agricultural fields, this sentence would maintain that is not enough - that every contributing acre would need to implement its own practice – blind to effectiveness, prioritization, cost, design, etc. This statement is gimmicky and not accurate. For eg, Lake Superior's 3.8 million acres have been modeled in such a way that it is meeting its TP and TN goals. Rainy River 6.9 million acres have been modeled in such a way that it is meeting it's TP and

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			TN goals. As is pointed-out in various points in the document – nutrient and sediment losses to water are significantly to mostly caused by streambank erosion – and somehow this fact is ignored, page upon page. Ultimately, the argument MPCA report organizers present is: 1. Nutrient and sediment losses to water are significantly to mostly caused by streambank erosion. 2. Instead of promoting practices that directly address the #1, MPCA authors advocate for individually inconsequential per-acre reductions from a very limited list of practices on Minnesota farmland. Result: The modeled volume of agricultural practices required in #2 to offset the scale of erosion happening in #1 are mathematically impossible, which leads this author to believe "every acre needs at least one practice." Additionally, implementing #2 practices does not address conditions caused by #1 erosion…and water quality monitors are seeing this fact in real-time with the lack of measureable reductions following practice implementations. Does this NRS shift naturally occurring conditions of streambank erosion, natural wetlands and land, transportation, and deposition to a burden per-acre for farmland and family farms, who are already subject to an exhaustive list of local, regional, statewide, and federal regulations. ***Response:*** This statement was revised in various sections of the NRS in Chapter 5.
83	NRS 158 PDF 190	"The practices review for nitrogen concluded that no single practice will work on every acres, but to meet in-state and downstream nitrate and TN reduction goals, most acres of cropland will need at least one practice."	***Comment:*** On Page 212, the report states: "A substantial body of research has established that streambank erosion can be a significant source of nutrients…" If streambank erosion poses a significant source, why is the burden of supposed remediation being placed solely on agricultural lands? Because streambank erosion is a significant contributor, its remediation should be included in Table 5-1 – and practices to do this are described in the report! Please add to Table 5-1 the 8 ways described on page 214 that nutrients from streambank and gully erosion can be reduced. ***Response:*** Table 5-1 deals specifically with agricultural practices.
84	NRS 213 PDF 245	"One of the main characteristics of a stable stream channel is lateral connectivity….."	***Comment:*** At no point in this section is the importance of soil type described or referenced; naturally occurring soil conditions can make floodplain establishment impossible. Please add a caveat somewhere in this section so that the reader understands the importance that soil types plays in the possibility of establishment of floodplain and the contingency on soil type. Clay soils have poor erodibility – so instead of deep channels, flooding can be shallow and wide; sandy soils have high erodibility – so narrow, deep channels can be made. ***Response:*** Soils are one of many factors in floodplain establishment. A connected floodplain is defined as one that readily floods and fills the adjacent floodplain at the bankfull or effective discharge elevation. This event typically occurs, on average, every 1.2-2 years and is responsible for the channel's dimension, pattern, and profile. If the floodplain is not active at the bankfull event, then the floodplain is not connected to the channel and is considered incised. Changes in the volume of water and/or sediment or direct channel impacts, such as straightening, are primarily responsible for channel incision statewide.
85	NRS 234 PDF 266	"The MPCA oversaw the completion of WRAPS for all major watersheds by 2023;	***Comment:*** MPCA staff do far, far more than oversee. Please describe more accurately the role MPCA staff play in the creation of a WRAPS document.

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		these WRAPS are now transitioning into the update stage."	***Response:*** Clarifying language was added to this section.
86	NRS 262 PDF 294	"Tracking Minnesota agricultural cropland drainage to gather precise data has been a challenge for decades."	***Comment:*** Drainage ditches and drainage systems are not unique to agricultural cropland. They are vital infrastructure to keep roads and private property from flooding across the entire state of Minnesota. If there is a road, there are likely ditches. I listened to a statewide meeting in 27 of 52 which a 7-county metro watershed representative naively and incorrectly declared, "We do not have any drainage ditches in my county." Ditches and culverts are everywhere. I do think the multi-jurisdictional nature of the responsibility for drainage systems do make understanding the systems difficult for MPCA staff. A true statement is: "Tracking Minnesota's multi-jurisdictional drainage systems has been a challenge for decades." MN-DOT, Counties, Townships, Watershed Districts, and Landowners can all be responsible parties or stakeholders in drainage systems. When public entities are involved, public records are involved. ***Response:*** Your suggested language was added with an additional qualifier for public/private systems.
87	NRS 262 PDF 294	"Some information is available describing drainage ditches and drainage systems overseen by watershed districts or counties that are public drainage authorities."	***Comment:*** Some information is available from watershed districts or counties? All of the information collected/generated by watershed districts or counties is public and extensive, and could go back 100 years depending on the drainage system. Instead, I think the intent of this sentence instead was meant to be: When Watershed Districts or Counties are the public drainage authority, readily accessible information is available describing drainage ditches and drainage systems. Please rewrite accordingly. ***Response:*** Comment was noted, and language was clarified.
88	NRS 262 PDF 294	"Some information is available describing drainage ditches and drainage systems overseen by watershed districts or counties that are public drainage authorities. One example is the Bois de Sioux Watershed District, which collects data on drain tile installation for new drainage permits."	***Comment:*** There are two types of revisions that need to be made. 1) The second sentence infers a connection to the first sentence that is incoherent as written. The first sentence refers to public drainage authorities and legal drainage systems; the second sentence refers to a land use permit process – permits can have multiple layers of permitting jurisdiction – WACA, DNR Public Waters, Counties, Townships, Watershed Districts. The second sentence is not "one example" of the activities described in the first sentence. There are two authorities happening here – authority over legal drainage ditches (county or watershed), and the authority to issue permits. 2) The two sentences together infer a data gap. But, Appendix 5-4 page 2 states, "…the National Agricultural Statistics Services (NASS) report on a select number of practices every five years. Namely tile drainage, ditch drainage, conservation easement, no-till, reduced tillage (excluding no-till), cover crop. Similar comprehensive data sources do not exist for most conservation activities." In actuality, it seems the confusion lies in the multiplicity of where information can be found, a consequence of a multi-level, government regulatory environment. This section ignores the obvious purpose of surface and subsurface drainage as erosion control and increased storage. ***Response:*** Data on the topic of agricultural drainage, as well as other practices, is collected in many different forms and can be challenging to compare. Reference to the Bois de Sioux Watershed District will be removed to lessen any confusion in this section.

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89	NRS 267 PDF 299	"Meeting the NRS goals will require landowners in Minnesota to significantly change their current adoption rates for agricultural, urban, and forestry conservation practices. It will also require technological advances, policy changes, and increased public and private financial support. Human adaption to changing from the current systems and paradigms to a future condition where NRS goals are met will be challenging. The NRS will help facilitate the tracking of demographic and socio-economic changes over time that affect Minnesotans' ability to address nutrient issues. Outreach and engagement efforts with the public will be tracked, along with the capacity of partners to assist in implementing these efforts. This section will explore concepts of how to track and facilitate needed changes."	***Comment:*** A farm family in Minnesota with 1,000 acres of cropland requires multi-million dollars worth of loans for land, equipment, the cost of operations before they can harvest, and on-farm improvements, etc. Distilling NRS goal achievement to "adoption rates" first and foremost is not accurate or helpful. Please combine the first and second sentences to more accurately reflect reality – that the financial pressure put on agricultural, urban, and forestry operations limit opportunities for NRS goal achievement. ***Response:*** A sentence was added related to financial constraints of landowners. Section 5.5.1 was renamed Agricultural Survey Results to be clearer.
90	NRS 267 PDF 299	"The agricultural community is the key audience for making the land use and management decisions that will ultimately affect the pace of change for the NRS."	***Comment:*** The paragraph preceding (and listed above) described different populations and resources needed. It does not seem logical that those heavily loaded sentences above result in this declaration – that the "agricultural community" is responsible for the pace of change? It seems like this sentence is a solution looking for a problem or a villain. In the Red River Valley, natural conditions during spring floods dwarf anthropogenic activities. The largest hydrologic change in the Red River Valley happened centuries before settlement at all – Lake Agassiz was drained – and that had nothing whatsoever to do with the "agricultural community." What we do now to manage flooding is a consequence of that large, extreme event. ***Response:*** The purpose of this section was to summarize survey results from farmers and conservationists and analyze statistics to see what barriers there are for the adoption of conservation practices.
91	NRS 267 PDF 299	7.5.1 Indicators for change	***Comment:*** This has to be one of the most tone-deaf sections in this draft, and reveals how little researchers understand what their subjects are actually saying. Please consider rewriting or removing it to more accurately provide the insight farmers are trying to give with their strong responses, rather than allowing researchers to attempt to portray farmers as simple-minded, fickle, or stubborn. To have survived generation upon generation of increasingly significant farm crises, the small number of farm families in Minnesota that remain must be tech savvy and must be able to pivot and adapt quickly to ever changing conditions. "Over 45% of survey respondents had never met with a conservation professional to discuss soil management." I know why. Your survey respondents may have observed that many "conservation professionals" start with a false, preconceived idea that farmers don't understand soil health. Soil health is their vital to their business - but farmers speak about soil health

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			in detailed terms - of diseases, pest control, nutrients, fertilizer levels, saturation, etc. "Conservation professionals" say the words "soil health" and think there is something magical and new about it – few are ready for the actual, detailed conversations about how soil health interplays with the day-to-day decisions of caring for the soil and plants, and the realization that farmers are expertly in tune with their land's soil health characteristics. "Many producers (63%) feel they have no control over policies that affect their farm and land…" I know why. Take this effort for example. 336 pages, and 1235 pages of an appendix and they are only given a month (during the growing season) to figure it all out – even though content-wise, they are given a disproportionate amount of attention in this report. Do staff find it easier to talk about a minority social group than to talk to them? "Most agree (55%) that economic factors influence their ability to change soil health practices." I know why. The practices that the NRS advocates for are so expensive to implement they could cause a family to lose their farm. Some practices cost money to build, some have the ability to decrease your crop yields, and some can prevent you from being able to plant or harvest a crop at all. The financial risk to implement a practice isn't assumed by the "Conservation Professional," NRS or MPCA; risk falls to individual landowners, and unfortunately, many of the "conservation professionals" advocating for practices are blind to the reality of the potential costs associated. How many MPCA staff have, on behalf of the full footprint of all that contributes to their employment, written a personal check to pay for practices that improve their department's contributions to water quality? And potential for significant financial loss. As stated in Appendix 5-2, page 23: "Together, these findings suggest that cover crops can be an effective strategy to reduce total P losses by protecting the soil surface and reducing erosion. However, their effect on DRP is more variable and may require additional management considerations, such as appropriate termination timing and nutrient balancing, to prevent trade-offs. Additionally, potential yield impacts should be considered in system-level decisions to optimize both environmental and agronomic outcomes." Hints for researchers here: "yield impacts" => less yield per acre, so less gross profit to cover all of the financial expenses pushed on the operation, including taxes and the cost of cover crops; "agronomic outcomes" = risks. Additionally, producers don't need to consult with "conservation professionals" – the same practices are agricultural practices, and there are private agricultural professionals who provide similar – and more detailed and practical – information and consulting. "However, over 75% of producers agree that making sure their land stays in the family for the next generation is an important factor influencing their soil management decisions." This is how a farmer tells you that they do not make rash decisions that could damage their land; this is how a farmer tells you that they are serious caretakers of their land, willing to do what needs to be done in order to ensure the land is left better for the next generation. "Conservation professionals" come and go, conservation trends come and go – practices that are promoted today will be cast aside or even demonized when replaced by better technology. Farming isn't a job that most take for a couple of years and leave; taking care of the land is passed down from a parent to their child, and 75% of producers are telling researchers that they aren't looking for short-term quick fixes. I wish 75% of researchers were able to vouch that the practices they are promoting aren't short-term fixes either. A clear example of researcher overestimating the reductions of their preferred promoted practices over time is found on Appendix 5-2, Page 9: "Table 2 presents the updated TP reduction efficiencies alongside the original MPCA (2013) estimates. For

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			example, while the 2013 strategy estimated cover crops would reduce TP losses by 29%, new data suggest a slightly lower average of 21.5%+/- 16.8%...Conservation tillage was previously estimated to reduce TP by 63%; the revised estimate is 47.0% +/- 3.63%" - and these figures were derived from using a majority of Iowa-based and non-cold climate sources! Another example of overestimating the reductions of agriculture appears on Page 60 of Appendix 2 2.8 (PDF 94), as stated: "However, the percentages of nitrogen sources coming from agriculture, atmospheric deposition, and wastewater are lower than the previous analysis, and the "other" source category is higher (Table 2-19)." Please use some self-reflection and self-awareness to acknowledge that landowners are sometimes ask to believe/use data to make significant decisions, and that there is a precedent that the data can be revised in short order. how many MPCA staff have, on behalf of the full footprint of all that contributes to their employment, written a personal check that exceeds their pay for practices that improve their department's contributions to water quality? Missing in this discussion, but recognized elsewhere, is the ***Response:*** This feedback was shared with the UMN Extension staff conducting farmer surveys.
92	NRS 296 PDF 328	Christianson and Rosen, 2025	***Comment:*** As the citation is written, a reader would have no idea how to find this source. I believe this is a reference to a paper found in the Appendix. If that is a case, please add text to let a reader know this reference is Appendix 5-1. Furthermore - for references that are not published separately/ independently of the NRS draft document and are instead found as part of the Appendix - please make sure that all citations in the list of references indicate the Appendix Section #. I wasted quite a bit of time looking for this paper without knowing it was in the 1,253 page Appendix. This document is Mississippi Basin focused – it makes broad sweeping generalizations based on research limited to conditions in the Mississippi River Basin and is blind to significant differences and features of the Red River Valley Basin. ***Response:*** MPCA will work with UMN to publish this document separately in 2026.
93	Appendix 3-1	Priority watershed categories for in-state nitrate reductions	***Comment:*** Column 4 us titled: "x% of stream miles …" Please title the column "x% of stream miles assessed…" This type of qualifier was correctly used in Column 8 where MPCA reports "x wells sampled" ***Response:*** This comment appears potentially incomplete, but the NRS team will work to include "assessed miles" where appropriate.
94	Appendix 3-1 Figure 9 & Figure 10 Page 20 PDF 336	Figure 9 in appendix 3 -1	***Comment:*** 100% of water flow from the Mustinka River Watershed empties into the Bois de Sioux River Watershed. How are estimated nutrient contributions from Mustinka prevented from doublecounted in the Bois de Sioux River Watershed? ***Response:*** The Bois des Sioux and Mustinka river watersheds are modeled separately and are not double-counted. Figures 9 and 10 show nutrient delivery ratios of all the watersheds in the state and these two watersheds have slightly different nutrient delivery ratios.
95	Appendix 3-1 8 PDF 324	What could potentially be considered as nonreducible loads of TP and TN may result	***Comment:*** Because this is the "potential" list, please provide a similar list of what MPCA actually used as nonreducible loads of TP and TN. Please clarify: Effluent/point source TP and TN contributions are not included by MPCA in the

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		from the following (MPCA, 2018) • Surface runoff from the natural landscape; • Background stream channel erosion; • Groundwater discharge from the natural landscape; and • Atmospheric deposition, including windblow particulate matter from the natural landscape	list to be excluded, so their contributions are included in the Major Basin Final Planning Goals? NRS Table 4-8 lists current effluent phosphorus loads, but does not list a new nutrient standard goal for TP, even though the text below Table 4-8 states, "effluent phosphorus concentrations may increase somewhat due to future efforts to optimize WWTF operations for nitrogen removal. Table 4-18 provides similar information for TN, but again does not designate goals – just "predicted loads." Are the results of spring floods reducible? As alluded to above, is the emptying of one subwatershed into another subwatershed reducible for the downstream subwatershed? Are the contributions from WMA's, wetlands, and public habitat lands reducible? Or are they considered to be included in MPCA's "grassland" "baseline"? ***Response:*** Table 5 on page 11 of the report "Approach and Methods for the interim guidance: Watershed Nutrient Loads to Accomplish Minnesota's Nutrient Reduction Strategy Goals" shows the list of nonreducible categories used in the analysis. Note that "0%" in Table 5 in Appendix 2-4 indicates nonreducible.
96	Appendix 3-1 13 PDF 329	"Reducible Load Estimates – Results The resulting TP and TN nonreducible load fractions for all HUC8 watersheds are shown in Figures 5 and 6, respectively. Both TP and TN nonreducible load fractions follow a spatial pattern that correlates strongly with land cover, with the highest values in the northeast quadrant of the state where forested lands and low human populations dominate. Areas with the lowest nonreducible load fractions are those with high human populations and those where agricultural land dominates the landscape."	***Comment:*** There are many state-sponsored initiatives to systematically separate rural vs. urban, people living densely but requiring large expanses of agricultural lands to support them…paragraphs like this ignore the obvious connection between the two. Without "agricultural land that dominates the landscape," you can't have landscapes where high human populations dominate. These go together. Separating them makes little sense. Is it MPCA's position that urban centers can be preserved through non-reducible numbers, but their food supply is closer to 100% reducible, essentially… ***Response:*** Rural and urban land are a logical dichotomy. Urban land is largely regulated as point sources (wastewater treatment plans, industrial facilities, MS4 stormwater, construction stormwater), whereas rural land is largely nonpoint sources. Different suites of BMPs are often used between the urban and rural land as well.
97	Appendix 4.1.2 29 PDF 285	"…streambank erosion can also contribute high TP loads to groundwater."	***Comment:*** This is a new concept for me - MPCA believes that streambank erosion delivers phosphorus to acquifers? Please provide a citation. The surface water - groundwater interactions don't go oneway so definitively, so I can't quite wrap my head around how this is a final, complete thought. ***Response:*** This sentence will be deleted because it is an artifact of a previous analysis. Formerly, bed/bank erosion and bluff/ravine erosion were combined; they were later replaced with the bed/bank erosion (net gain), which is non-land-based, and bluff/ravine erosion, which is an HRU and thus land-based.
98	Appendix 3 29 PDF 285 Appendix 3 31 PDF 287 Attachmn t A 10 PDF 326	Table 18 Table 19 "HSPF simulates flow and load across surface flow, interflow, and groundwater flow. The total flow and total load from all source categories is the summation of the surface flow, interflow, and groundwater flow pathways.	***Comment:*** For the tables, it is not clear on how to read what is trying to be conveyed. None of these sources just go one direction in relationship to waterbodies, and the waterbodies themselves can be connected in ways. For eg, under varying circumstances, surface water can flood all of the "sources" and sources can contribute runoff to different types of waterbodies. "interflow" "groundwater" "surface water" please take some time to define these. Please include a definition for surface flow, interflow, and groundwater flow

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			Response: The three hydrological pathways (surface flow, interflow, and groundwater flow) can vary by individual model. HSPF simulates runoff in one direction (from the upland surface to a waterbody). Water on the land surface can evaporate, enter soil storage, or run off on the surface. Water entering soil storage can percolate into the unsaturated soil zone or infiltrate to the potentially saturated root zone. Interflow refers to the lateral movement of water through the unsaturated zone, while groundwater flow refers to the lateral movement of water through the saturated zone. In the Minnesota HSPF models, transport through tile drains is represented as part of the interflow component. Each of these pathways can transport dissolved nutrients to waterbodies while particulate matter and associated nutrients are transported primarily by surface flow (and, in some model applications, via tile drains with surface inlets).
99	Appendix iv PDF 6	The percent different between monitored and modeled TN Loads ranged…10% for the Red River and 17% of the Rainy River.	***Comment:*** Please indicate in which direction was the variation – higher/lower? ***Response:*** The percent difference is calculated as the absolute difference between two values divided by the average of the two values.
100	Appendix iv PDF 6	monitored loads represent recent improvements in water quality, while modeled loads do not monitored loads often represent a smaller geography than the modeled loads	***Comment:*** Isn't the purpose of a computer model to receive monitored data? If the modeled data isn't accurate, then the model calibration is incorrect or out of date. If the model does not include recent improvements in water quality - what is this date of the data inputted into the model? It is important for all of us to understand what projects are not being taken into account in the model. Are there intentions to update the models? As of what date(s)? Monitored loads (reality) often represent a smaller geography than the modeled loads? I think this is an important point, but I can't follow the explanation of why this would happen. An unmonitored tributary (reality) discharges to the mainstem between the monitoring site and key location on a state boundary) ***Response:*** HSPF model simulation periods are presented in Table 57 of Appendix 2-1 and SPARROW represents 2002–2014. MPCA updates HSPF models on cycles after intensive monitoring surveys. Every year, MPCA updates several HSPF models. As such, the 60+ HSPF models across the state, at any one time, represent different simulation periods. The model results used in the NRS are for HUC-8, either loads delivered to the HUC-8 outlet or the state border. Monitoring stations are not located at HUC-8 outlets or at state borders but are located upstream of HUC-8 outlets and state borders, for a variety of reasons, including ease of access and backflow. Thus, small portions of each watershed are located between the monitoring station and the HUC-8 outlet or the state border. The models include these small areas, while the monitoring stations do not.
101	Appendix PDF 754 – 1095	See TOC for appendices and dates of documents.	***Comment:*** The ultimate trick reviewing the DRAFT Nutrient Reduction Strategy is how report organizers have embedded 1,253 pages of additional material in the Appendixes – some of the Appendix material are so fresh….less than 4 days older than the DRAFT Nutrient Reduction Strategy itself! This nesting of brand new/never or barely seen before documents, references, and citations is frustrating for those putting efforts into review. The limited amount of time allowed for this comment effort gives the impression – accurate or false – that MPCA is not interested in collecting constructive comments at all. A reviewer must actually read the Appendix first, and then the DRAFT Nutrient Reduction Strategy, to understand how conclusions are drawn. Of the 1,253 document, 627 pages (50%) are dated April 2025 or newer. And three appendices (2-1, 4-1

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			and 5-3) are in draft format. Additionally, the materials found in Appendix 5 are heavily referenced in DRAFT Nutrient Reduction Strategy, but these materials are so new they likely have not have been read. How can reviewers consider conclusions/goals based on assessments that could be changed depending on a comment period? This process seems doomed to fail – the assessments should have been subjected to vetting through their own, previously held comment period; following changes to these documents, then the NRS and its conclusions would be determined. Concurrently examining both premises (assessments) and conclusions (NRS goals) is a nonsensical, logically flawed approach. ***Response:*** Work on the 2025 Minnesota NRS began in late 2022 by establishing technical working groups among the state, federal, and local entities that most use the NRS for planning efforts. UMN was involved to provide technical expertise. Much of the development work for the NRS included the compilation of the research and analyses presented in the support documents. Draft reports on the topics covered in the support documents were shared with the NRS technical working groups for discussion and review during 2023 and 2024. Final edits were made to reflect those reviews, and then most reports were placed into organizational templates in time to be included with the draft NRS for public review. The publication dates on these reports reflect the final formatting dates of documents rather than final content development. The authors of these reports were involved in writing and reviewing the NRS itself. Appendices 2-1 and 5-3 are marked "draft" because the contracts for those projects include revising documents in response to public review comments. Appendix 4-1 should not have been in draft format. This was an editorial oversight and will be corrected. Material in the support documents has been presented at over 30 NRS-related webinars and outreach events during 2023, 2024, and 2025. The NRS Team agrees that the support documents are extensive, and Adobe navigational tools can be hard to find. Consequently, an overview of the appendices was provided during the NRS Overview webinar held on July 15, 2025. The NRS Team is working to post the support documents individually, but due to storage constraints on the MPCA website, this option was not possible during public review.
102	Appendix 5-1 8 PDF 761 5-1 13 PDF 766	Look for all 5.1 – 5.4 references are in the NRS strategy 5.1 Does not look to be limited to cold climate studies	***Comment:*** According to the description of the studies included in this non-metaanalysis metaanalysis, studies were not selected by or limited to cold weather climates. From October thru May, Minnesota/North Dakota agriculture differs significantly from most parts of the world. The impacts of freeze-thaw cycles are most often excluded from research studies – but this is our climate, these conditions exist, are relevant and prevalent, and are significant in their implications for all of the practices promoted in this section and the impacts to releases of nutrients. Specifically in the Red River Valley, nutrient releases and erosion from mid-winter and spring freeze-thaw-flood cycles completely dwarf miniscule field contributions during the rest of the year. I would guess the same goes for the Minnesota River Valley, as in Appendix 5-1 page 10, "…it is the May-June nutrient loadings in the Mississippi River that drive the size of the hypoxic zone." Ignoring the largest elephant of nutrient contributions – the seasonality of contributions – will guarantee failure to meet NRS standards. It is encouraging that according to the map on Page 13, Canadian studies were included and disappointing that North Dakota

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			studies are not. There are several organizations in the Red River Valley that utilize Canadian resources; the relevance of Ohio, Indiana, Michigan, and Illinois information is dubious for Minnesota Red River Valley. The crop diversity in these states alone are a noteable indicator of climatic (and therefore agricultural) differences from Minnesota ***Response:*** Figure 4 of Appendix 5-1 illustrates the 700 studies that were evaluated, but only 270 studies were used for this work and the breakdown in Figure 5. "Other Midwest" included the Dakotas and Canadian studies that were evaluated. Cold climate research is a known gap, but the amount of research continues to grow and has greatly improved the science base we have to work with today in comparison to a decade ago. In the main body of the NRS, we have statements on the need for more in-state research.
103	Appendix 5-1 14 PDF 767	"The focus of this report was the portion of Minnesota that falls within the Mississippi River Basin…."	***Comment:*** The limitation of this research to the Mississippi River Basin is not described in the NRS on the following pages. Please include "in the Mississippi River Basin to: NRS 159, Table 5-1 Title - Nitrate Reduction Efficiencies -> please add "Mississippi River Basin" NRS 164, which states, "there is a high degree of certainty surrounding their water quality benefits" -> please add "for the Mississippi River Basin" NRS 234, which states, "Work by Christianson and Rosen…" -> please add "for the Mississippi River Basin" NRS 189, which states, "no one practice will work on every acre, but every acre needs at least one practice" -> see above comment, but if no change, please add "for the Mississippi River Basin" NRS 189, which states, "…primarily reviewed nitrogen fertilizer management cover crops, land use changes, and in-field/edge of field conservation drainage projects" -> please add "for the Mississippi River Basin." NRS 190, Table 5-1 Title – Visual representation of recommended nitrogen reduction efficiencies…->please add "for the Mississippi River Basin" This report might better have been organized by sections for each Basin. It seems like most of the text in the NRS is about the Mississippi River Basin and most research in the Appendix is based on Mississippi River research. It is actually a lot of work to separate what information is true of the Non-Mississippi basins. Statements in the NRS like: "The influence of weather and climate is not consistent across a large state like Minnesota" occur in many places – warning that the information in the document cannot be consistently applied across all basins, even though the NRS is organized this way. This makes the NRS difficult to use for Non-Mississippi Basin readers. ***Response:*** Comment noted, which was passed to UMN authors of this appendix.
104	Appendix 5-1 14 PDF 767 Appendix 5-2 & Appendix 5-3, 5-4, 5-5	"The focus of this report was the portion of Minnesota that falls within the Mississippi River Basin…." "The updated P reduction efficiency estimates provided here are recommended for future use in scenario development, economic assessments of BMP adoption, and estimates of potential impacts on P loads to the Mississippi River Basin and other regional watersheds."	***Comment:*** This text appears in the Appendix 5-1 MN NRS 2025 Science Report. Please change the title of the Section to reflect that it applies to the Mississippi River Basin. Please update the Table of Contents and Bookmark. Please clearly state this Mississippi River Basin limitation for all references to Appendix 5-1 in the NRS. Is this also true of MN Appendix 5-2, 5-3, 5-4, and 5-5? If so, please change the title of the Sections to reflect that they apply to the Mississippi River Basin. Please update the Table of Contents and Bookmarks. Please clearly state this Mississippi River Basin limitation for all references to Appendix 5-2, 5-3, 5-4, and 5-5 in the NRS. ***Response:*** Comment noted, which was passed to UMN authors of this appendix.

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105	Appendix 5-1 PDF 767 Appendix 5-2 12 PDF 942	Appendix 5-1 is titled: "Science Assessment of Cropland Practices for Minnesota's Nutrient Reduction Strategy: Part 1 Nitrogen" "This approach [P load reductions in NRS 2] differs somewhat from that used in the Part 1 NRS Report, where P losses were assessed separately by water pathway…. Those estimates [in Part 1 NRS Report] were rigorous and valuable, especially given the limited P loss studies available."	***Comment:*** Please reconsider giving Appendix 5-1 and 5-2 a different title, because both Appendices provide P reduction amounts that authors feel should be recognized and utilized. Presently, the titles would not lead a professional to look in Appendix 5-1 for P reductions. ***Response:*** Comment noted, which was passed to UMN authors of this appendix.
106	Appendix 5-1 11 PDF 764	"The lack of winter/early spring and snowmelt monitoring is an especially relevant gap in this Minnesota-focused review."	***Comment:*** Is there a place in the NRS where MPCA make allowances for this fact? The state of Minnesota is a cold weather climate. If the research the NRS is based on does not apply to our conditions from October – May, what does MPCA intend to do with its mandates to recognize this mismatch ***Response:*** NRS partners will work with the UMN in developing and maintaining a research gap list and developing a plan to address those issues. This work will be ongoing, independent of the NRS.
107	Appendix 5-1 8 PDF 761	"use of a 2-y corn and soybean rotation was not possible for all the practices depending upon data availability."	***Comment:*** It is disappointing that researchers don't mathematically recognize the use of crop rotations as a mitigation factor. Crop rotation is a fundamental agricultural tool in Minnesota, and the utilization of soybeans specifically offers a wide variety of benefits. Please update this section with estimates of NRS load reductions based on the inclusion of soybeans and sugarbeets. ***Response:*** The ratio of corn and soybeans in the crop rotation in Minnesota as a whole has been fairly constant over the last few decades, and the number of acres of sugar beets is limited in MN by a number of external factors. Soybean acres have increased in MN since the baseline period starting in the 1980s.
108	Appendix 5-1 10 PDF 763	"Several studies assessed the use of a variety of conservation practices performed together in a field or small watershed. These types of studies produced confounded effects where the impact of one specific conservation practice "treatment" could not be identified	***Comment:*** This is statement exemplifies the crux of MPCA's flawed effort – all we have is the real world in which MPCA's water quality indicators and the reductions practices are being promoted, that we know will result in future confounding effects. Increasing wetlands on the landscape increases nutrient sinks and spills; increasing unharvested vegetation will increase phosphorus; annual weather patterns can result in droughts providing low DO and floods providing excess erosion, no matter whether a cover crop seed was buried before freeze-up or not. What I know about impaired waters, is that any one of 20+ indicators can result in an impairment; and the clearing of all 20+ indicators is the only way to remove an "impairment" designation. Without making statistical allowances for the cross-consequences of MPCA's promoted practices will ensure that systematic water quality indicators will support the continuation of impairments. For Eg, as pointed out on Page 18 of Appendix 5-1, BWSR utilized an unusual aquatic life only definition of "water quality" to describe the purported benefits of Minnesota's Buffer Law – likely because even in 2015 it was widely understood that Minnesota's Buffer Law would increase unharvested vegetation, and this would result in "degrading" water quality chemistry indicators. This is also emphasized on Page 33 of Appendix 5-1: "The impact of snowmelt on annual nutrient loss reduction provided by vegetative practices is a clear data gap. This is especially important in Minnesota given the wide success of the state's Buffer Law, the proximity of

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			these buffers to the freshwater stream network, and the cautions from Canada about limited effectiveness of vegetative buffers for P in runoff." BWSR's utilization of a limited definition for the term "water quality" undermines every reference and conversation about the topic thereafter. Because "water quality" has been defined as this way to the Minnesota Legislature, do we all need to expand present and future usage of the term to "MPCA chemical and biological indicators of water quality" every time the term "water quality" is used now? Do I need to ask when someone states "water quality," whether they are referring to MPCA's chemical or biological indicators of water quality? Maybe we all need to start doing that anyway ***Response:*** Comment was shared with MPCA and BWSR staff working with local partners in watershed work. The UMN report talks about tradeoffs between various practices. The best professional judgement of conservation professionals and agronomists in the field working with landowners will help ensure that practices will have synergistic effects and help mitigate any confounding factors.
109	Appendix PDF 1128	"Overall, there is an interest among state staff for additional training in various tools and models (e.g., HEC-RAS, WASP, QUAL2K)."	***Comment:*** HSPF does not fully capture in-stream nutrient processing. MPCA should be utilizing Water Quality Analysis Simulation Program (WASP) to improve accuracy for TN and TP transport. - WASP would include denitrification – converting nitrate to nitrogen gas. MPCA is overmodeling TN rates. - WASP would account for phosphorus cycling – settling of sediments – MPCA is overmodeling TP rates ***Response:*** The intent of this paragraph was to provide a summary of models for which staff identified that more training is needed to help with the knowledge base of technical modeling staff in Minnesota. Training is limited and costly for some models, so there is a need to coordinate training long-term related to this topic.
110	Appendix PDF 1169	"The approach is based on HSPF modeling to estimate recent loads and quantification of reducible loads for various land covers/uses and non-land-based sources (e.g., point sources).	***Comment:*** If point source contributions are included in the calculation for "reducible loads" – where has MPCA calculated and published the goals for each point source by watershed so we can understand what those are? Without these figures, the NRS is advocating for the full "reducible load" amount to be shifted to the agricultural community. The point source load goals were not included in the Bois de Sioux River and Mustinka River Watershed Joint Comprehensive Management Watershed Plan development, despite participation by MPCA officials in the plan development and plan approval…and was not identified as needed information by the plan consultant, even though consultants are preselected by MPCA ***Response:*** As discussed in Appendix 2-5, point source loads are 80% reducible for the NRS. MPCA issues waste load allocations and reductions to permitted point sources in TMDLs, and the Clean Water Act requires NPDES permits to be consistent with TMDLs. The Clean Water Act and state laws govern how MPCA can issue WLAs and reductions for NPDES permits; the NRS and CWMPs are not means for MPCA to issue WLAs.
111	Appendix PDF 981	See graphic with total manure N and P2O5	***Comment:*** As presented, this scale likely leads the reader to visually overestimate contributions from most watersheds. For Manure N lbs: The difference between 880,000 and 15,000,000 is 17x. The difference between 15,000,000 and 29,000,000 is 1.9x. Please employ a legend graphics that are more appropriate to the scale of the manure categories that are being used, or

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			a completely different system. In an effort to convey the maximum amount of information, this infographic actually makes things more difficult to grasp. I would guess that 880,000 isn't 880,000: is it 880,000 or less? please update the legend text. Does the 15,000,000 category represent watersheds with a minimum 15,000,000? Or does the 15,000,000 category represent the range of 880,000 – 15,000,000? If so, the watersheds that have graphics describing 880,001 – 15,000,000: This is a GIGANTIC range. How many of these watersheds are at the very low end of this range; how many of them are at the very high end of this range. Is this category being used to overestimate the presentation of 15,000,000 level watersheds? These same questions happen with Manure P205 graphic, except even more exaggerated. Please update the legends accordingly and include a table with the data by watershed – that way readers can view the actual figures ***Response:*** MPCA will be working with the UMN to update this report and graphics in early 2026.
112	Appendix 5-3 22 PDF 996 Appendix 5-3 22 PDF 996	Graphics: Estimated Nitrogen Recommendations & Estimated Phosphorus Removal Graphics: Estimated Percent of Nitrogen Recommendations met by Manure & Estimated Percent of Phosphorus Removal met by Manure	***Comment:*** Please indicate the sources that provided this information. No reference is given. Please indicate the sources that provided this information. I can't tell from the preceding text if this is from NASS and & MDA and then modeled? ***Response:*** MPCA will be working with the UMN to update this report in early 2026, and additional citations will be added to clarify.
113	Appendix 5-3 PDF 1005 & 1006 1008 & 1009	"Potential Nitrogen Imbalance between Inputs and Crop Recommendations – lbs/watershed acre" "Potential Nitrogen Imbalance between Inputs and Crop Recommendations – lbs/acre of cropland" "Potential Nitrogen Imbalance between Inputs and Crop Recommendations – lbs/watershed acre" "Potential Nitrogen Imbalance between Inputs and Crop Recommendations – lbs/acre of cropland" "Potential Phosphorus Imbalance between Inputs and Crop Removal" "Potential Phosphorus Imbalance between Inputs and Crop Removal" "Potential Phosphorus Imbalance between Inputs and Crop Removal" "Potential Phosphorus Imbalance between Inputs and Crop Removal"	***Comment:*** Please plot on the map where nitrogen sellers are located. Please create a separate colored category and indicate for watersheds have a negative/deficit for nitrogen. It is a lot of work of extra work to cross-reference this information with the number of acres per watershed. Or is this the number of cropland acres per watershed? For transparency, please include a table with the total imbalance amount per HUC 8/10 watershed. For eg, Mustinka River is a -1/watershed acre – so the actual amount is a deficit over how many acres? Why is phosphorus "crop removal" is used as a title instead of phosphorus "recommendations." ***Response:*** Data exists for sales of fertilizer geospatially, but a dataset of all individual sellers is not available. All maps in this report will be updated to more accessible color scales to better visualize results.
114	Appendix 5-3 PDF 1010	"While we utilized the Census of Agriculture fertilizer expenditures for this redistribution, several disadvantages exist to this dataset, including that values are provided in dollars (not the amount of fertilizer) and that	***Comment:*** Please move the limitations to the beginning of this document, so the reader knows going into the section how reliable the information is that is being presented. As currently ordered, the reader slogs through what look to be highly scientific reports only later revealed to have areas that are dutifully assembled based on best available data. Transparency is important from the start, not as an afterthought.

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		expenditures cover all nutrients (N, P, K) as well as lime and soil conditioners.	***Response:*** Based on comments from multiple comment letters, information on the limitations of this work outlined in Appendix 5-3 was included in the narrative of the work in Chapter 5.
115	Appendix 5-3 PDF 1010	"Phosphorus output was represented by the amount of P2O5 removed at crop harvest, with UMN Extension providing 25th percentile, median, and 75th percintile P205 removal rates for corn and soybeans.	***Comment:*** 1) For the entire document: please combine text references to use one or the other: Either a zero -> P205 or with an O -> P2O5. Both are found in this document and they appear to refer to the same thing. Please describe in more detail the nature of the U of M removal rates. Did U of M provide a statewide removal rate for 25th/median/75th for corn, and then for soybean? Or were the 25th/median/75th removal rates for corn, and then for soybean, described by watershed to match the presentation of the maps? ***Response:*** Comment noted. The final document will be reviewed and corrected for any inconsistencies in language usage.
116	Appendix 5-4 PDF 1017	"It is important to note that changes in cultural practices, which includes most of the BMPs being discussed here."	***Comment:*** One can define a "cultural practice" as a recurring traditional activity, behavior, or ritual that a group of people engages in, reflecting their shared values, beliefs, or identify. Given this definition, modern agricultural activities would be not defined in terms of a "cultural practice." Modern agriculture activities rely heavily on (and are limited by) available technology, and a purpose focused on food/fuel/fiber production for global dependents – equipment technology, seed technology, utilization of precision agriculture, etc. US Farmers are the most technologically advanced, most prolific growers in the world. It does seem the BMP's recommend are more of a cultural practice than agricultural technology. NRS and Appendix authors promote a very limited number of specific practices based on their own identity-based beliefs, and these do seem more ritualistic, than effective, in nature. As stated in Appendix 5-1 page 38: "Society's perception of the effectiveness of N management practices may exceed water quality benefits that have been documented using empirical measurements in the field." A list could be made of far more effective and efficient activities to directly achieve water quality nutrient reductions, but this section, the Appendix as a whole, and the NRS waste the bulk of its pages and promoting cultural practices that authors want to prescribe for use by the agricultural community. ***Response:*** Language in this section of Appendix 5-4 was updated by MDA staff to provide clarity and context.
117	Appendix 5-4 PDF 1020	"…in reference to manure injection take 20 years of work to start catching on…The expectation is that any effort to accelerate adoption of conservation activities will take time."	***Comment:*** This whole paragraph frames practice adoption as if farmers are dumb or stubborn, and ignores the very expensive, invisible complexities associated with the BMP cultural practices that state officials recommended. Let me give you a local example of why a conservation activity "will take time:" In order to grow one of the first 160-acre cover crop fields in Traverse County successfully, a local producer needed to have: ownership of the land in order to make improvements; installation of subsurface tile in order for the land to be sufficiently drained earlier than usual to plant the cover crop before row crops; the ability to pay for and utilize the services of an available aerial sprayer (land free of wind turbines and other obstructions) to seed the cover crop; a new planter that provided more downward seed pressure so the cash crop could be planted to the correct depth into the cover crop; dry enough weather conditions AND the ability to have an available applicator apply glyphosate to terminate the cover crop before the cover crop became too big and started to pull resources away from the growing cash crop. Each of these steps takes a significant luck with the weather, and a whole lot of startup cash. How many

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			years would a researcher expect a farmer to have unallocated funds to be able to 1) install drain tile, 2) purchase cover crop seed and have fields seeded, 3) purchase and operate expertly a new planter, 4) purchase glyphosate and have cover crops sprayed in order to implement a BMP that is purported to provide water quality benefits that decrease over time, as researchers study them. And even with all of these investments, implementation is likely temporary - reliable practices will return in situations where our farms are covered in snow into May, and producers only have a matter of 45 rain-free stress-filled days to plant all cropland in our cold climate ***Response:*** Language in this section of Appendix 5-4 was updated by MDA staff to provide clarity and context.
118	Appendix 5-4 PDF 1020	"Solutions such as a technological advancement (e.g., herbicide resistant cultivars), have the ability to rapidly change management practices, and often come with economic benefits. In these cases, changes will occur rapidly (over a decade or two)."	***Comment:*** Please take some time to think this thru. The BMP's being discussed do not provide the benefits that technological advancements do; they do not come with economic benefits which means they do come with economic costs. Huge economic costs. ***Response:*** Language in this section of Appendix 5-4 was updated by MDA staff to provide clarity and context.
119	Appendix 5-4 PDF 1026	"Alfalfa, for example, which is about 4% of the crop category area, may require replanting after a few years, which would likely require intense tillage."	***Comment:*** It is interesting that the author views a need for Year 3 or Year 4 tillage as more detrimental than the benefits provided by no tillage conducted on Year 2 and/or Year 3. Please rewrite to point out that alfalfa does not require any tillage for 1-2 years. Alfalfa would be a fabulous BMP to promote, except that MPCA livestock permitting regulations are driving farmers out of livestock production, and because so, decreasing alfalfa demand ***Response:*** Language in this section of Appendix 5-4 was updated by MDA staff to provide clarity and context.
120	Appendix 5-4 PDF 1029	"Since the Hypoxia Task Force baseline period is 1980 to 1996, considering the average cultivate land to this period is an important comparison point	***Comment:*** Please do not compare Mississippi River Basin watershed with Minnesota statewide statistics. You can compare the Hypoxia Task Force baseline period with the area covered by the Mississippi River Basin, which is portions of its watershed comprised of 40% of the continental us, all or portions of: Alabama, Arkansas, Colorado, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Mexico, New York, North Dakota, Ohio, Oklahoma, Pennsylvania, South Dakota, Tennessee, Texas, Virginia, West Virginia, Wisconsin, and Wyoming. ***Response:*** This baseline period is helpful to compare not just because of the reference to the Hypoxia Task Force, but because the early 1980s is when significant changes to the Federal Farm Bill were enacted that impacted agriculture. Also, in this time period, significant changes to point source control of nutrients were beginning to be implemented.
121	NRS 138 PDF 291	"Minnesota should partner with other Hypoxia Task Force states to research this topic to maximize use of limited research funds and promote regional solutions for a common challenge." "Minnesota should partner with other Hypoxia Task	***Comment:*** Please remove these sentences – they are outdated; or revise them to let the reader know these things are already happening. The Hypoxia Task Force's research includes a national study on nutrient removal technologies for wastewater treatment plants and the National Aquatic Resource Surveys (NARS) which assess nutrient levels in various water bodies.

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		Force states to research this topic to maximize use of limited research funds and identify solutions needed in other states as well.	***Response:*** The context of these statements is that research funds are limited for any nutrient-related research topic, and there is a need for states and land grant universities to pool their resources and collaborate.
122	Appendix 2-4 PDF 298	"Minnesota is one of twelve states committed to working together on the Gulf of Mexico Hypoxia Task Force."	***Comment:*** As written, the scale of the Mississippi River Basin watershed is significantly minimized. Please add: Minnesota is one of twelve states committed to working together on the Gulf of Mexico Hypoxia Task Force (of twenty-eight contributing states). Minnesota's portion of the Mississippi River Basin watershed acreage represents x% of the total contributing land area (1,245,000 square miles). ***Response:*** A hyperlink to the Hypoxia Task Force website has been included. This website provides more information on membership.
123	Appendix 5-1 PDF 759	"The approach here aimed to be consistent with the processes used for science assessments in other Hypoxia Task Force states (IDALS, 2024; IDOA, 2015; IL EPA, 2023)."	***Comment:*** As written, the scale of the Mississippi River Basin Watershed is clouded. Please add: The approach here aimed to be consistent with the process used for science assessments in three of twenty-eight other Hypoxia Task Force states (IDALS, 2024; IDOA, 2015; IL EPA, 2023). Minnesota's portion of the Mississippi River Basin watershed acreage represents less than 1% of the total land area. ***Response:*** This statement is to convey that similar scientific methods and analysis were used in the MN Science Assessment. A coalition of land grant universities coordinate through the USDA-sponsored SERA 46 project: https://www.sera46.org/.
124	Appendix 2-1 ii PDF 4	Thank you for this analysis.(See narrative in Appendix 2-1).	***Comment:*** Lake Winnipeg major basin: Between the baseline (1996-2000) and the most recent 10-year (2013-2022 or 2014-2023) periods in the Red River of the North at Emerson, Manitoba Canda, flow decreased by 15% to 16%. TP and TN trends were evaluated using results from monthly extrapolations to annual loads by CWSEC and WRTDS by MPCA. Between the baseline and more recent periods (most recent 10-years or 5-years), TP FWMCs increased and TP increased or decreased, depending on the recent period. TN FWMCs and loads decreased. The differences between FWMC and loads are likely the result of less flow in the Red River of the North. ***Response:*** Comment noted.
125	Appendix 2-2 4 60 PDF 74	blank	***Comment:*** In the description of the three watersheds covered by the NRS, please include a complete map of each watershed, so the reader understands the location and proportion located in Minnesota. ***Response:*** This information will be included in a future visualization tool in the NRS dashboard to show the drainage areas of the major basins to specific monitoring points.
126	Appendix 2-2 4.2 63 PDF 77	Red River of the North Basin"	***Comment:*** It is difficult to understand how this information relates or is helpful at all, if the NRS is based on the Lake Winnipeg watershed, to include Rainy River/Lake of the Woods. The NRS and Appendix are constantly shifting the scope/land area: Red River of the North (whole or just Minnesota portion), Lake of the Woods/Rainy River (whole or just Minnesota portion), Lake Winnipeg (whole or just Minnesota portion). Additionally, each of these six areas have very different characteristics, so it is not logical to use one as a substitute for all, or another

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			Response: Water from the Rainy River and the Lake of the Woods watersheds eventually outlets to the Red River and do impact Lake Winnipeg and are encapsulated in the entire basin.
127	Appendix 4 62 PDF 76	"Rainy River" at Lake of the Woods	***Comment:*** Is this supposed to mean xxxx referred to in the NRS? ***Response:*** Referring to Rainy River that outlets to the Lake of the Woods, which eventually outlets to the Red River of the North in Canada.
128		Table 13 from 2014 NRS.	***Comment:*** Please provide this graphic for the 2024 NRS and allow a period for comments. The 2024 NRS graphics included in the report aggregates these categories into only 5 categories (Tables 15 & 16). Including "cropland groundwater" in a source assessment for a surface water nutrients artificially increases the "agriculture" contribution proposed by MPCA, and understanding the limited information collected on behalf of groundwater sources in the Minnesota portion of the Lake Winnipeg watershed, it is unlikely that this number is based on sound science. Commenting on the 2014 table in the absence of the 2024 table: Without including the "cropland groundwater" category, Atmospheric deposition and Forest are the primary contributors for nitrates. According to NRS 65: "Some priority sources cannot be reliably reduced by local- or regional-scale implementation activities, such as atmospheric deposition and loads from forested areas." . Streambank erosion amounts do not make sense for the Lake Winnipeg column – especially since elsewhere in the 2024 document, the contributions for streambank erosion are considered high and significant for this watershed. Appendix PDF Page 29 states, "…streambank erosion can also contribute high TP loads to groundwater." Please explain further how streambank erosion affects groundwater nutrients. ***Response:*** The 2024 source assessment was developed with HSPF and SPARROW modeling for nonpoint sources and MPCA (2023, 2024) estimates for point sources. These methodologies are completely different than the 2014 source assessment, so it's not possible to create a graphic for the 2024 source assessment using the 2014 source categories. Thus, MPCA created generalized categories to allow for comparisons.
129	Appendix 2-1 3.4.2 26 PDF 282	"Cropland is also the largest source of nitrogen and phosphorus in the Lake Winnipeg major basin."	***Comment:*** The only reason this statement is true is how the categories are aggregated, not because it is a true statement in and of itself. Please provide the itemized information. This statement is in conflict to information sprinkled throughout the NRS that states that streambank erosion and atmospheric effects primary sources. ***Response:*** See the itemized list in Table 2-23 in Chapter 2 of the NRS document for more detail.
130	Appendix 2-2 iv PDF 252	Similar to the MRB, cropland is the largest source of TN and TP in the RRNB. Cropland is also the largest source of load simulated in the surface flow (85% TN; 91% TP), interflow (85% TN; 90% TP), and groundwater flow (67% TN; 75% TP) pathways; non-land-based sources are excluded from these calculations. Developed runoff (5%) is the second highest	***Comment:*** Blank ***Response:*** Comment noted.

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		contributor of TN and TP load in the RRNB. Evaluation of aggregated agricultural (i.e., cropland runoff, agricultural tile drainage, and feedlots) source loads was challenging because the Red River of the North is the boundary between the states of Minnesota, North Dakota, and South Dakota, and the HSPF models presented herein are limited to the Minnesota-portions of the subbasins. Generally, the largest TN loads per subbasin are simulated in interflow and groundwater flow pathways throughout the RRNB. Surface flow pathway TN loads are typically higher in the Upper RRN (HUC 090201), and surface flow pathway TN loads exceed interflow and groundwater flow pathways' TN loads in the Buffalo and Wild Rice River subbasins. Trends were not apparent with TP loads across flow delivery pathways.	
131	Appendix 2-2 V PDF 249	Assessment of Nutrient Source Contributions to Major River Basin Loads"	***Comment:*** The Table of Contents and Bookmarks calls this section "Estimate nutrient source contributions." Please change the Table of Contents and Bookmarks to the title of the document: "Assessment of Nutrient Source Contributions to Major River Basin Loads." Please double-check that the Table of Contents and Bookmarks is correct compared to the actual titles of each report and section. Navigating the Appendix is unbelievably difficult without common page numbering. As you are scrolling through the document, there is no way to tell what section you are in – bookmarks only serve as a way to jump between sections – they do not update to tell you what section you are currently viewing ***Response:*** The MPCA will be improving the formatting of the document for the final NRS document publication.
132	Appendix 4.2.1 & 4.2.2 30 & 32 PDF 288 & 290	"…cropland is the largest source of "x" in the RRNB…the non-land-based sources are excluded from these calculations." But immediately following, "Considering both land-based and non-land-based sources…	***Comment:*** So which is it – are non-land-based calculated or not? ***Response:*** Land-based and nonland-based sources are simulated in HSPF and presented in Tables 17 and 18 in Section 4.1 and in Tables 19 and 20 in Section 4.2 of Appendix 2-3. They are discussed separately because land-based sources are further evaluated by hydrological pathway (surface water, interflow, and groundwater flow). Furthermore, watershed managers may be more concerned with land-based sources since nonpoint source controls can be implemented on land-based sources.
133	Appendix 4.2.1 & 4.2.2 31 & 32 PDF 289 & 291	Blank	***Comment:*** Table 19 & 20. Bed/Bank erosion modeled amounts are in Table 20 seem to be in conflict with statements throughout the NRS stating the significance of bed and bank. ***Response:*** HSPF simulations indicate that bed/bank erosion (net gain) is a source of TP but several other sources are much larger. In model simulations,

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			more phosphorus moves through the stream systems via in-channel processes that is represented by the "net gain" summation, as this metric is for "net."
134	Appendix 2-3 5 34 References PDF 290	MPCA. 2023. Point sources loads by point source [MN NPDES nutrients 2022.xlsx]. Provided by Dave Wall (MPCA) via electronic mail on December 20, 2023. MPCA. 2024. Point sources loads by major basin [2005-2023 WW Loads.xlsx]. Provided by Dave Wall (MPCA) via electronic mail on June 10, 2024.	***Comment:*** Are these public sources posted somewhere that a reader can access? If not, please provide in the Appendix. ***Response:*** MPCA is looking to put this type of data and other underlying datasets from the NRS into a future dashboard where the data can be easily accessed.
135	Appendix 7-2 PDF 1230	"Supplemental Visualization Tools and Applications for Tracking Nutrients"	***Comment:*** The graphics on this page are wonky ***Response:*** The resolution issues of all graphics in the NRS document have been addressed.
136	Appendix 5-5 1 PDF 1056	Several studies have recognized that streambank erosion can be a significant non-point source of phosphorus and nitrogen. Most studies have examined individual streams or small watersheds, finding that phosphorus loads from streambank erosion to total export load have ranged widely. A review by Fox et al. (2016) found that streambanks and other near-channel features contributed 7% to 94% of suspended sediment and 6% to 93% of phosphorus across studies. In Denmark, estimates for streambank contribution of phosphorus range from 15% to 93% (Laubel et al, 2003; Kronvang et al., 1997); in Iowa 3% to 38% (Beck et al., 2018); In the Blue Earth River in Minnesota 7% to 10% (Sekely et al., 2002); in the Kinnickinnic River in Eastern Wisconsin 13% (Blount, 2023); and in Oklahoma 31% to 100% (Miller et al., 2014; Purvis et. al., 2016). A study in Iowa estimated the statewide contribution of stream channel sources to the total phosphorus riverine export at 31% (Schilling et. al., 2022). A study in the Le Sueur River in Minnesota found a total of 23% of phosphorus derived from a combination of streambanks, bluffs and ravines (Baker, 2018). Less work has been completed to estimate the contribution of streambank	***Comment:*** Elsewhere in the appendix: streambank erosion can also contribute high TP loads to groundwater This goes on to talk about nutrient cycles, influenced by both biological and chemical factors. Because these factors are complex – not because they aren't real and significant – MPCA instead relies on land use based modeling. As do MPCA's WRAPS reports. ***Response:*** See the response to Comment #97 above.

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		erosion sources to total nitrogen. Jiang et al. (2020) estimated that sediment-bound nitrogen from streambank erosion accounted for 26% of the total load in Big Elk Creek, PA. Noe et al. (2022) estimated the total load of nitrogen from streambanks to comprise 6% of the total load for Chesapeake Bay."	
137	Appendix 5-5 PDF 1056	"Section 3.2 of the 2014 NRS indicated that streambank erosion represented 17%, 15% and 5% of the total phosphorus loads in the Mississippi River, Lake Superior Basin, and Lake Winnipeg Basin."	***Comment:*** Did the 17% apply to the Mississippi River or to the Mississippi River Basin? Please update accordingly. Does this apply to the Minnesota-only portions of those basins, or the basins as a whole? ***Response:*** Refers to the Mississippi River Basin.
138	Appendix 5-5 PDF 102	This section throws around "streambank," "streambed," "inchannel/in channel/in-channel," "near channel," "channel stability," "floodplain" without discernment or definition, sometimes comparing them, but mostly substituting these as swappable concepts in the same paragraph.	***Comment:*** Did the 17% apply to the Mississippi River or to the Mississippi River Basin? Please update accordingly. Does this apply to the Minnesota-only portions of those basins, or the basins as a whole? ***Response:*** Refers to the Mississippi River Basin.
139	Appendix 5-5 PDF 1057	"Higher P concentrations tend to be found near the surface, due to accumulation from litter deposition or anthropogenic enrichment (i.e. manure, fertilizers; Fenton, 1983). Shengnan et al. (2022) attributed P concentrations in the top 30cm to 60 cm of soil to land use, while bedrock and soil sources influenced concentration below. Phosphorus concentrations in streambanks have been found to be highly variable with soil depth (e.g., 300-900 mg kg 1) and unpredictable (Ishee et al., 2015; Schilling et al., 2009). Different soil types have varying concentrations and forms of phosphorus (Cross and Schlesinger, 1995), depending on the age of the soils and past alluvial processes."	***Comment:*** In the descriptions of modeling and monitoring, I don't ever remember reading that soil type can affect nutrient levels. Please provide a table of soil types and their effect on nutrients. A "for example" is used to describe land use, but there is no information on how soil type affects nutrient levels. This section also describes why nutrient monitoring provides unpredictable/ skewed results: higher concentrations are found near the surface, soil depth influences phosphorus concentrations, and the age of soil and past alluvial processes." How does MPCA account for this variability in setting goals and calculating reducible/non-reducible allowances? ***Response:*** Soil types are not directly considered in setting goals and nonreducible fractions because different HSPF models were developed using different sets of Hydrologic Response Units and the NRS is developed at a coarse-scale, which requires aggregating finer-scale data. HRUs are HSPF model computational units that represent land cover and use, soils, and other physical factors. Each model subbasin (i.e., area draining to a pour point) is defined by the areas of each HRU within the subbasin. HRUs vary by HSPF model because land use and other physical characteristics vary by watershed. For example, cropland HRUs in predominantly agricultural watershed models are defined by hydrologic soil group, level of tillage, and manure application, while cropland HRUs in predominantly forested watershed models are defined only by hydrologic soil group. Individual soil types are too fine-scale data for HUC-8-scale models but individual soil types could be used to define HRUs at very fine-scale models (i.e., smaller than HUC-12).
140	Appendix 5-5 PDF 1060	"Incised channels are the predominate form of unstable channels in Minnesota.	***Comment:*** This is not true of the Red River Valley. Please remove it. This is the crux on why we have frequent disaster-level floods. The write should recognize the historic draining of Lake Agassiz and how the loss of this lake left a very

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			young, immature Red River that has not cut a deep channel or floodplain – which is why sediment is a big issue for us during spring floods – water can travel miles wide in unpredictable areas…because additional we melt from south to north – melting snow floods and heads north onto frozen ground ***Response:*** Stream channel incision is an issue statewide as well as nationally and within the developed world, where changes to the water and sediment volume as well as direct impacts, can induce channel incision. Channel incision can be measured by Bank Height Ratio, where 1-1.2 is a stable, functioning channel and floodplain. A Bank Height Ratio of 1.3-1.5 is a moderately incised channel, while a ratio greater than 1.5 is a deeply incised channel. For the Red River Basin specifically, a recent summary of geomorphic survey work completed within the Buffalo River Watershed, roughly half of the sites were moderately-to-deeply incised (greater than 1.4 Bank Height Ratio) and not connected to its floodplain.
141	Appendix 5-5 PDF 1060	"In some areas of the state, especially in agricultural regions, these channels have been artificially manipulated to be incised by channelization and ditching for drainage purposes."	***Comment:*** Please provide a reference that demonstrates that the volume of incised channels that have been artificially manipulated is at such a level that it must be called out in this report. In the Red River Valley, drainage systems were constructed in order to provide water flow through the grid system of roads, because it is the roads that hold back flow ***Response:*** Many ditches in the Red River basin are designed to carry/hold a 10-year flood event within their banks. Natural stream systems hold a 2-year event or less within their banks and access the floodplain at any events larger than this. The increased stream power during these large events can lead to incision of the stream bed and then widening of the banks, causing bank erosion. The drainage practices to remove water from adjacent fields have resulted in deeper (incised) ditches, so more water can be drained off the landscape. Both of these have increased the depth of ditches. Determining whether a stream is "incised" was discussed in detail for the Fargo-Moorhead diversion monitoring sites. The metric used was the Bank Height Ratio, which is measured by taking the elevation of the top of the bank over the elevation of bankfull or effectiveness flow elevation. The higher the ratio, the more incised the channel. Using the Minnesota Stream Quantification Tool, the breaking point at which a channel transitions from slightly incised to moderately incised is 1.3. For a Red River Basin example, DNR geomorphic surveys completed in the Buffalo River Watershed indicate that almost half of the sites had a Bank Height Ratio greater than 1.4, which is considered moderately incised.
142	Appendix 5-5 PDF 1062	"In agricultural areas, peak flows and annual runoff have been increasing for as long as gaging has been in existence (Novotny and Stefan 2007)." "This is all exacerbated by an increase in the frequency of large rain events and the magnitude of the heaviest rainfalls."	***Comment:*** Why are these sentences separated, wouldn't the first be an obvious effect of the second? Separating them by paragraphs and a page change makes the reading think that agriculture activities are inherently the cause, but climate changes accompany these conditions. Please put these sentences together. If there are continued increases in large rain events and heavy rain events, how can any stream be expected to maintain any previous "stable" condition? ***Response:*** They are separate components. First, the land was converted to increase the area for agricultural purposes. Second, climate changes coupled with agricultural mitigation of climate changes (i.e., system tiling) have resulted in more efficient drainage systems and more available water for runoff.

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143	Appendix 5-5 17 PDF 1072	"Nutrient Reduction Strategies for In-channel Sources" "Below is a summary of the commonly used BMPs to address in-channel sources of excess erosion, which, as outlined above, is intrinsically correlated with the quantity and delivery of phosphorus and nitrogen to our river systems."	***Comment:*** THIS SECTION DESCRIBES THE SIGNIFICANT WATER QUAITY BENEFITS ASSOCIATED WITH FLOOD HAZARD MITIGATION PROJECTS. Red River Valley watershed professionals are constantly talking to state officials about water quality benefits associated with projects that reduce erosion – water storage projects are becoming nearly impossible to build, because state officials want to separate the benefits of water quality from the benefits of flood project retention. ***Response:*** The MN DNR utilizes the five-component framework for healthy river systems (Instream Flow Council 2004) to help understand the benefits and tradeoffs of various projects and methods to address a wide range of goals and objectives. As such, water storage and water quality are intertwined. Large water storage projects may impact aquatic organism passage, leading to an aquatic life impairment, may destabilize the downstream receiving waters by increasing bed and bank erosion due to sediment-hungry water, artificially warming the water, resulting in an increase in algal production and associated dissolved oxygen crashes. The level of scrutiny applied to a proposed water storage project is proportional to its size and complexity.
144	Appendix 5-5 23 PDF 1078	"The current implementation of the buffer law does not require larger buffers on larger river systems."	***Comment:*** Does the author have evidence that 50' buffers on either side of a stream are not sufficient? The current law may be requiring too large of buffers on most systems. ***Response:*** Geomorphologically, nearly all stream types require a riparian vegetation component (buffer) to achieve stability. The ability for a buffer to intercept sediment and nutrients, as well as reduce streambank erosion, will depend on vegetation abundance and diversity, stream and valley type, stream size, channel incision, and pattern. A buffer's effectiveness in reducing streambank erosion will depend on the factors above more than a legislatively mandated width.
145	Appendix 6-3 10-2 PDF 1167	"The Lake Winnipeg major basin in Minnesota is composed of two independent basins: the Red River of the North basin and Rainy River basin. Unlike the other two major basins, much of the Lake Winnipeg major basin is not within Minnesota but is within in North Dakota, South Dakota, and Canada."	***Comment:*** Please update to: The portion of Lake Winnipeg major basin in Minnesota is composed of two independent basins: the Red River of the North basin and Rainy River basin. ***Response:*** Clarifying language was added to Appendix 6-3.
146	Appendix 6-3 10-2 PDF 1167	"Unlike the other two major basins, much of the Lake Winnipeg major basin is not within Minnesota but is within in North Dakota, South Dakota, and Canada."	***Comment:*** "Unlike the other two major basins"…. 1. This is not true of the Mississippi River Basin. Nearly all of the Mississippi River Basin is located outside of Minnesota. 796,000,000 acres. 6,340,000 acres are in Minnesota – so less than 1%. Please correct this sentence. 2. This is not true of the Lake Superior Basin. Most of the Lake Superior Basin is located outside of Minnesota. 31,552,000 acres. 5,364,612 acres are in Minnesota – so 17%. Please correct this sentence. ***Response:*** Clarifying language was added to Appendix 6-3.
147	Blank	Blank	***Comment:*** Does this document acknowledge: Unstable channels Public/private flooding Ditch system instability Ditch system inadequacies ***Response:*** Comment unclear or incomplete.

#	Section	Specific NRS narrative	Comments from Bois de Sioux Watershed District and NRS Team's responses
148	Appendix 5-5 PDF 1023	Blank	***Comment:*** For areas of frequent disaster-level flooding, Appendix 5-5 is vitally important to understanding NRS reduction strategies. 1. The PDF Bookmarks for this section are not available, making this section extremely difficult to navigate and would be impossible to find unless you know it is there or you scroll through the 1253 PDF. 2. How is this summary made available 5/2/25 and served as the analysis for a 07/2025 report? Seems like an impossible turnaround ***Response:*** For all reports, drafts were utilized to provide information for the development of the NRS. Many reports were edited based on expert reviews from NRS working group members. The published date reflected when edits were completed, although reports may have been under development much longer.
149	Appendix 2 9 PDF 81	"For example, a common practice in drained landscapes not included yet in the NRS tracking system, especially important in the Red River Valley, is water impoundment used for flood control, wildlife habitat, and nutrient reduction. Also, large acreages of nutrient management and cropland erosion control (i.e., reduced tillage) occur outside the tracked government programs."	***Comment:*** "Drained landscape" isn't why areas need a water impoundment – repeated flooding is why areas need a water impoundment. Please revise the sentence accordingly. ***Response:*** This comment refers to Section 2.61. of the main NRS document. Changed language to "flood prone landscapes."
150	Appendix 2 9 PDF 81	"The NRS tracking system does not represent or track all adopted practices. For example, a common practice in drained landscapes not included yet in the NRS tracking system, especially important in the Red River Valley, is water impoundment used for flood control, wildlife habitat, and nutrient reduction. Also, large acreages of nutrient management and cropland erosion control (i.e., reduced tillage) occur outside the tracked government programs."	***Comment:*** PLEASE UPDATE THE NRS TRACKING SYSTEM TO REFLECT NRS REDUCTIONS FROM WATER IMPOUNDMENTS. The projects are completed following project team participation with state government officials, permitting by state government officials, funding approved by state government officials. Just because these projects are completed locally/regionally, their significant, coordinated impact on nutrient reductions should be included in reduction calculations! Please start tracking these government programs! ***Response:*** This comment refers to Section 2.61. of the main NRS document. This is a known gap that needs to be addressed in the future. This issue has been brought up to the interagency Drainage Management Team.
151	Appendix 3 104 PDF 136	"In this region, nitrate leaches quite slowly below the root zone toward groundwater and is often lost to the atmosphere through denitrification before the groundwater reaches local wells."	***Comment:*** MPCA staff note that denitrification happens quickly enough for nitrates travelling from the root zone to gas off (below the ground) before reaching groundwater. Please include a section on the effectiveness of denitrification a reduction tool for surface runoff, reducing nitrates at the Red River/Rainy River/Lake Superior/Mississippi River Basin flow concentration outlet locations? In these scenarios, delivery to surface waters from tile drainage will accelerate the denitrification process and reduce downstream nitrate concentrations. Stated another way – please note in the NRS report that the denitrification process of upstream waters means that additional nitrate reductions on acres at some predetermined distance upstream of Red River/Rainy River/Lake Superior/Mississippi River Basin flow concentration

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			outlet locations will have absolutely no impact on measureable reductions for NRS nitrate goal achievement ***Response:*** This comment refers to Section 3.3 of the main NRS document and not Appendix 3. This section refers to south central MN and not the Red River Valley. The context of this section is that soil nitrate percolates slowly through soils in this region and tile drainage is present in most agricultural fields that intercepts and transports nitrate to surface waters, which both factor into relatively low nitrate in groundwater in many wells in this part of MN.
152	NRS Xxi PDF 23 NRS 2 16 PDF 48 NRS 65 PDF 97	"Some priority sources cannot be reliably reduced by local- or regional-scale implementation activities, such as atmospheric deposition and loads from forested areas."	***Comment:*** Atmosphere sources / atmospheric deposition is identified by MPCA staff as a Top 3 major source of nutrients, yet is never described in the NRS or Appendix. Please add a description and context for each Basin. If so, I couldn't find any descriptions, BMP's, reducing activities, studies, of this source in either the NRS or the Appendix? Do MPCA staff consider atmosphere / atmospheric deposition considered a reducible, anthropogenic source? Are these contributions calculated and subtracted as "nonreducible"? If atmospheric deposition isn't considered "nonreducible," please incorporate data on the associated reduction BMP's? ***Response:*** Atmospheric deposition and forest are considered nonreducible nutrient sources in the NRS. Atmospheric deposition is the process of particles traveling through the atmosphere and settling on the surface directly (dry deposition) or through precipitation (wet deposition). Atmospheric deposition is included in both the HSPF and SPARROW models.
153	NRS 57 PDF 89	"Table 2-16. Minnesota phosphorus and nitrogen sources by major basin, average conditions (from 2014 NRS).a" a…"From Table 3-2 in the 2014 NRS. Source estimates include more recent MPCA updated wastewater (2011 conditions) and atmospheric deposition sources (2007). Source percentages do not represent what is delivered to the major basin outlets but what is delivered to local waters."	***Comment:*** Although this graphic is separated by major basin, these are not the percentages delivered to the outlet of the major basin. Please change the title of the graphic to reflect what the percentages actually represent: "Table 2-16. Minnesota phosphorus and nitrogen sources estimated delivery to local waters by major basin, average conditions (from 2014 NRS).a" ***Response:*** The context of this table is the breakdown of the fraction of nutrients coming from each source and not load delivery to the outlets of each basin.
154	Appendix 2-3 27 PDF 283	"Atmospheric deposition, point sources, bed/bank erosion (net gain), and septic systems are identified as non-land-based sources and do not have HSPF pathway modeling results."	***Comment:*** MPCA staff have identified atmospheric deposition and bed/bank erosion as significant sources of nutrients, but these sources are not modeled? So how do the NRS goals and estimated reductions reflect this fact? ***Response:*** Atmospheric deposition, point sources, bed/bank erosion (net gain) and septic systems were modeled in HSPF. However, since they are non-land-based sources, they were not simulated and tracked using the three hydrological pathways (surface water, interflow, and groundwater flow) that only apply to land-based source loads.
155	Appendix 2-3 ii PDF 250	"When point source load estimates are needed for analyses at a finer scale, MPCA accepts the use of its point source loads estimated for individual HUC8 subbasins (MPCA 2023). Finally, MPCA	***Comment:*** Does this mean that point source load estimates are not utilized at the major basin scale – pushing reductions onto other sources? Why are models over a decade old? These sources are projected by MPCA to increase nutrient contributions - what justification is there to not keep models more up to date? Is the purpose to keep this source artificially lowered in comparison to others? Please note that HSPF does not fully capture in-stream nutrient

#	Section	Specific NRS narrative	Comments from Bois de Sioux Watershed District and NRS Team's responses
		considers the HSPF models' point source loads to be the least accurate for the 2020s, because these data reflect conditions at the time of model development; many models are over a decade old and may not represent recent conditions."	processing. MPCA should be utilizing Water Quality Analysis Simulation Program (WASP) to improve accuracy for TN and TP transport. - WASP would include denitrification – converting nitrate to nitrogen gas. MPCA is overmodeling TN rates. - WASP would account for phosphorus cycling – settling of sediments – MPCA is overmodeling TP rates ***Response:*** Point source loads are utilized and incorporated into the analysis. HSPF models are updated on an annual cycle, and many of the older models will be updated in the near future to better reflect current flow regimes when the update cycle reaches that watershed.
156	Appendix 4.2 32 Appendix PDF 288	"Again, similar to the MRB, cropland is the largest source" "No bluff/ravine erosion was simulated in the Red River of the North basin."	***Comment:*** If MPCA staff use model parameters that define land use = nutrient source, then the obvious conclusion of large land use = large nutrient source is true, by definition. This is completely maddening, and may not say anything true of reality – especially if the density of nutrient sources (thereby small land use) are ignored. Streambank erosion, bed/bank erosion, bluff/ravine erosion- these types of features in areas are high density, low land use; at some point the irresponsibility of ignoring these nutrient sources is by design. Ravines do occur in the Red River Valley. Please provide an estimate. ***Response:*** The HSPF model uses complex, calibrated algorithms to simulate pollutant fate and transport. The HSPF model simulates in-channel and near-channel processes (these are non-land-based processes), which include "streambank erosion" and "bed/bank erosion." In watersheds with significant bluff erosion, MPCA can delineate ravine and bluff areas and simulate them as distinct land covers. Bluffs and ravines were not delineated into distinct land covers for HSPF models for HUC-8s in the Red River of the North.
157	Appendix 5-1 138 PDF 891	The agronomic benefits of artificial subsurface drainage are well established (Evans and Fausey, 1999; Maas et al., 2022; Paiao et al., 2021; Skaggs and van Schilfgaarde, 1999). Beyond providing proper soil aeration for roots and timely trafficability, drained soils warm faster which is a vital benefit in Minnesota's northern climate (Jin et al., 2008). Improved subsurface drainage lowers the water table and thus can provide water storage in drained soil pore spaces (Skaggs et al., 1994). This often results in reduced surface runoff, sediment-bound pollutants, and peak outflow rates compared to undrained conditions on the same land use (Blann et al., 2009; Gilliam et al., 1999). The climate benefits of artificially improved drainage are becoming newly acknowledged (Fabrizzi et al., 2024; Fernández et al., 2016).	***Comment:*** Agricultural tile seems to be used as a means for MPCA models/estimates to multiply nutrient contributions categories lumped as "agricultural sources" - despite research that demonstrates the reductions they offer. In the Red River Basin, subject to frequent flood conditions, we view subsurface drainage tile as a vital and important tool to provide storage, reduce sediment runoff, reduce TP delivery, and provide opportunities for denitrification. The known/proven benefits of drainage tile isn't recognized until Page 891 of the Appendix – and not one time in the NRS – despite many references to alleged nutrient contributions. Please add a section describing why drainage tile is an important tool to manage water. ***Response:*** Reference to Appendix 5-1, Chapter 6, Conservation Drainage Practices, was added to section 5.1.3. Context was added to the agronomic benefits of agricultural drainage based on research findings.

#	Section	Specific NRS narrative	Comments from Bois de Sioux Watershed District and NRS Team's responses
158	2014 NRS	Basin reduction graphics from 2014 NRS.	***Comment:*** The 2014 NRS utilized this format. It is quick, simple graphic that would be even more helpful if it was updated. Please provide an update in the 2025 update for these scorecards ***Response:*** MPCA will consider developing a similar graphic in a future visualization for the NRS dashboard.
159	Appendix Table 36 PDF 70	Table 36	***Comment:*** Please correct the total TP and TN delivered loads for the Mississippi River; appears to be a much higher difference than a rounding error. ***Response:*** The addition error was corrected for both columns and should be 4,272 and 94,168 for MTA TP and TN, respectively.
160	Appendix 2-4 4 PDF 301 Appendix Table 36 PDF 70	Table 2. Recent load estimates, final goals and remaining reductions for the Minnesota portion of four major basins, for total phosphorus (TP) and total nitrogen (TN) in units of Metric Tons (MT). Vs Table 36. Annual loads and yields (Minnesota-only) delivered to state boundaries	***Comment:*** Table 2 is measured in MT Table 36 is measured in MTA Are these the same units? Please update into one unit or the other accordingly. ***Response:*** See notes to Table 36 that describe the units.
161	Appendix 2-1 61 PDF 75	Table 37	***Comment:*** As such, the monitoring data may reflect recent improvements in water quality, while the modeling does not. Please indicate the likely start year in the text instead of "recent" improvements so watershed professionals have a chance at identify what newly constructed projects are included in the monitoring and not in the modeling. ***Response:*** The "Modeled" columns in Table 37 of Appendix 2-1 represent over 60 models with different simulation periods; see Appendix J for the simulation periods for each model. The "Monitored" columns in Table 37 represent 2014–2023 for the Mississippi River and Lake Winnipeg major basins.