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September 10, 2025

Minnesota Pollution Control Agency
Corrie Layfield
520 Lafayette Rd.
Saint Paul, MN 55155

RE: Draft Minnesota Nutrient Reduction Strategy 2025 Update & Appendix: Supporting Documents

Thank you for the opportunity to comment on the Draft Minnesota Nutrient Reduction Strategy 2025 Update ("NRS) & Appendix: Supporting Documents ("Appendix"). The Bois de Sioux Watershed District is comprised of two HUC-8 watersheds: the Mustinka River Watershed & the area of the Bois de Sioux Watershed District in Minnesota. The Mustinka River Watershed empties into the Bois de Sioux Watershed Distrct, forming the headwaters of the Red River of the North.

The NRS & Appendix provide many insights helpful to the administration of our watershed district, and prioritization of potential projects. In response to the Total Nitrate (TN) and Total Phosphorus (TP) goals set exclusively by the International Red River Basin Water Quality Committee, we learned from the NRS:

1) "To meet Lake Winnipeg water quality goals, in 2020 the International Red River Watershed Board (IRRWB) adopted final load targets for TN and TP in the Red River at the border of the United States of America and Canada. The goals represent load reductions of about 53% and 50% of TN and TP loads, respectively, from the 1996-2000 average." *However, MPCA communicates later in the NRS that these percentage are inequitable, and that the amounts should be 39.9% and 34.1%, respectively.*

2) "The scenario feasibility concerns previously noted for the Mississippi River Basin scenarios also apply to the Red River Basin analysis. The Red River Basin scenario would be expected to meet the needed TN reduction *but would fall short of meeting the TP reduction goal.*"

3) "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.*"

4) "River flow variability complicates trend analyses. Recently, repeated periods of wet years followed by dry years have affected load monitoring results. These effects are not the same in the Red River and Mississippi River basins because weather patterns vary across the state. *Changes in river flow can make long-term progress difficult to achieve and detect.* NRS analyses accounted for changing flow regimes and found that reductions in nutrient loads at primary monitoring sites were evident when adjusting or normalizing for river flow variability, except for phosphorus in the Red River at Emerson. *Understanding river nutrient loads with and without adjustments to account for varying river flows is important for long-term NRS progress evaluation, and both types of results are described in Chapter 2."* But, this adjustment was not made by the IIRWB.

On NRS Page 19/PDF Page 51, the NRS states that, "…the MPCA sent a letter of support for the IRRWB's proposed nutrient reduction targets." Were the above objections known by MPCA staff at the time the support letter was drafted and submitted? Red River Valley watershed administrators like myself would have wanted to know in advance of the two public hearings held on adoption of the IIRWB's standard adoption that the goals were inequitable, not feasible, and not adjusted for extreme flooding/flow events. It is my understanding that several local governments have not adopted their respective standards, so it is my hope that this information can be conveyed to decisionmakers ahead of final goal determinations. We would sincerely appreciate the help and support of MPCA officials in this important endeavor.

Beyond the basinwide goals for, other interesting Red River quotes are:

- Monitoring data may reflect recent improvements in water quality, while the modeling does not.
- Costs are generally higher in the Red River Basin per pound of nutrient reduced because the water nutrient levels are lower compared to southern Minnesota (different soils, climate, etc.).
- Few waters are impaired by eutrophication in this region, although many rivers and streams have high phosphorus concentrations.
- In the Red River and Lake Winnipeg Basin, achieving both river eutrophication and lake eutrophication standards will only reduce phosphorus by a small fraction of the total load reduction needed.
- Because phosphorus readily binds to soil particles from upstream tributaries and can be released as dissolved phosphorus further downstream, sediment reduction will also be important for reducing phosphorus loads in the Red River.
- Further study is needed to determine how much of the phosphorus and sediment in the Red River valley is originating from streambank erosion and near-channel sources, and whether achieving sediment standards by controlling those sources will allow us to reach phosphorus reduction goals for Minnesota's phosphorus contribution to the Red River and, ultimately, Lake Winnipeg.
- 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 needed in the Red River Basin will require considerable additional nitrogen reductions after addressing local nitrogen priority concerns.

- Minnesota's portion of the Red River Basin has reduced nitrate/nitrogen by 742 metric tons.
- 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.*
- 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 design for colder climates and shorter growing seasons.
- River flow variability complicates trend analyses. Recently, repeated periods of wet years followed by dry years have affected load monitoring results. These effects are not the same in the Red River and Mississippi River basins because weather patterns vary across the state. Changes in river flow can make long-term progress difficult to achieve and detect.

Attached are comments that would overall improve the NRS by increasing reader understanding, and report clarity. Some items of particular note are:

As increasing acres of private land are converted to public habitat, please incorporate a discussion of the water quality impacts of public water and wetland management. Bois de Sioux Watershed District staff work as equal partners with landowners. Sediment reduction is a primary, common goal for both parties. Stream channels in the Red River Valley are in a constant state of erosion because we have very young waterbodies and no stoney channel bottoms; consequently shallow, cat-tail choked, sediment-filled public waters cut new channels through adjacent agricultural land. Additionally, nutrient-dense, unmanaged wetlands flood and spill onto neighboring lands and ditches, conveying more sediment. This report should include a section acknowledging the increasing conversion of more public waters and wetlands, and the nutrient consequences downstream. This report should include clauses to promote responsible, active management and maintenance of public waters and wetlands.

Please include more references to the consequences of large-scale natural events (ie, snowmelt and precipitation-based flood events). We cannot simply ignore the nutrient contribution consequences caused by freeze-thaw cycles, spring snowmelt, or isolated precipitation events that drop inches of rain in a matter of a few hours. Federal FEMA, State

HSEM, township, county, and watershed staff help landowners repair and maintain roads, drainage systems and culverts that serve to reduce sediment transport. These tools are vital to managing large-scale events, yet their contributions to nutrient reductions are absent, or minimally referred to in both the NRS or Appendix. Recognition of the nutrient reductions of large-scale capital improvement projects and systems – and an appeal to improve and expand these systems - is a gaping hole in the credibility and validity of this report, and jeopardizes future work with landowners and opportunities for significant improvement with project administrators.

Please describe in the NRS the large-scale, basin-wide coordinated efforts supported by the Red River Watershed Management Board. On behalf of seven-eight watersheds in the Red River Valley, the following funds were recently paid by landowners each year to support water quality and quantity projects in the Red River Basin:

2015	$3,525,090	2021	$4,052,969
2016	$4,285,178	2022	$4,122,900
2017	$4,401,891	2023	$4,182,511
2018	$5,507,183	2024	$4,842,568
2019	$3,525,090	2025	$5,680,109
2020	$3,985,339	**Total:**	**$50,025,624**

These regional tax dollars are frequently leveraged for other grant awards - some at a $1:$1 ratio. Please include more robust information on how this significant basinwide budget is reducing nutrients.

We sincerely appreciate the efforts made to assemble these documents, and highly value the connections the documents make between water quantity projects and their water quality benefits. Locally and regionally, we see with our own eyes, and experience that this is the case, but it is important this vital connection is more widely recognized.

Sincerely,

Jamie Beyer

Jamie Beyer
Bois de Sioux Watershed District Administrator

Attachment: BdSWD Comments

<table>
<tr><th>#</th><th>Page</th><th>Reference Text</th><th>Comment</th></tr>
<tr><td colspan="4">NRS = draft Minnesota Nutrient Reduction Strategy 2025 update (wq-s1-87a)

Appendix = Appendix: Supporting documents (wq-s1-87b)

The Appendix is very difficult to use. It is not clear how the 20 items labeled as 2-1 thru 7-2 “Appendix Number” on the table of contents are labeled in the document itself. For example, look for Appendix 6-2. You can find it on Page 2 Documents List, but the 6-2 label does not appear elsewhere within the subsequent 1,250 pages. Nor is the PDF page number provided on Page 2; the lack of common pagination makes this document impossible to coherently provide comments.

The document has not had all text OCR recognized, so it is not useful to use any PDF search tool!

If a reader access the Appendix online, it is nearly impossible to navigate, because there are no bookmarks to click around and view the different chapters/sections. The Appendix is only really useable as a downloaded file.</td></tr>
<tr><td>1</td><td>NRS xvii
PDF 19</td><td>“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.”</td><td>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-phosphorus-water-quality-challenge ; goldfish can’t live in municipal drinking water, so health drinking water can result in toxicity to aquatic life.</td></tr>
<tr><td>2</td><td>NRS
Xviii
PDF 20</td><td>“In-state phosphorus concentration trends are generally improving….”</td><td>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” –</td></tr>
</table>

			especially considering rivers that are on the border with other states/Canada vs. within the borders of the State of Minnesota.
3	NRS xviii PDF 20	"Statewide goals and progress" "Statewide, high phosphorus concentrations cause eutrophication impairments in 686 Minnesota lakes and 50 river reaches."	Please change this header and bookmark. These are not statewide goals, these are basinwide 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."
4	NRS xix PDF 21	"If nitrate concentrations are reduced by about 40% in rivers and vulnerable groundwaters, Minnesota will meet its goals for state-line TN load reductions and most in-state targets for protecting drinking water and aquatic life."	Is this 40% reduction required of all three major basins? Please add basin qualifiers.
5	NRS xix PDF 21	…" in 3% of wells between 2007 and 2023."	Please change to: "in 3% of <u>tested</u> wells between 2007 and 2023."
6		"Because the groundwater nitrate discharging into rivers and streams contributes a substantial amount of the TN load to the Mississippi River"	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." <u>No relationship between groundwater discharge and surface water nitrate levels is described except for the table.</u> This data is dubious anyway because – as stated Please change to: "in 3% of <u>tested</u> wells between 2007 and 2023." document describes a statewide groundwater protection rule, its inclusion makes sense;
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."	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.
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	Please add brief comments as to how these results have been achieved.

9	NRS Xviii PDF 20	**Figure ES-3. Overview of how the NRS strategies and practices lead to water quality improvements.**  	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.
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."	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.
11	NRS Xviii PDF 20	Between 2007 and 2024…. 2008–2022….	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?
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.	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 borderwaters. 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.
13	NRS Xviii PDF 20	Twin Cities metro area sites	Please add somewhere how "Twin Cities metro AREA" defined in this document, ie 2-county, 7-county, 11-county, etc….
14	NRS xix PDF 21	Nitrate is the most dominant form of TN in waters that are impacted by human activity (Figure ES-4).	Is it also true that nitrate would be the most dominate form of TN in waters downstream of natural plant decomposition?
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	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

		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	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.
16	NRS xx PDF 22	""Other" includes sources such as atmospheric deposition…"	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.
17	NRS Xxi PDF 23	ES-7 The <u>estimated</u> statewide sources of phosphorus….	**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?
18	NRS Xxi PDF 23	ES-7 The <u>estimated</u> statewide sources of phosphorus….	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 user-defined parameters that **<u>may or may not be</u>** 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.
19	NRS Xxi PDF 23	Table ES-7	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 <u>Groundwater</u> and <u>Riparian</u> HSPF Sources (HRU's); the definition of "Various" also includes <u>Riparian</u> 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.**

<table>
<tr>
<td></td>
<td>NRS xxi
PDF 23

and

NRS 65
PDF 97</td>
<td>Table 2-24. Priority sources at the major river basin scale, with the highest priority sources in bold.
<table>
<tr><th>Major basin</th><th>Priority phosphorus sources</th><th>Priority nitrogen sources</th></tr>
<tr><td>Mississippi River</td><td>Cropland runoff, wastewater point sources, and streambank erosion</td><td>Cropland leaching loss to tile drainage and groundwater, wastewater point sources</td></tr>
<tr><td>Lake Superior</td><td>Nonagricultural rural runoff, wastewater point sources, and streambank erosion</td><td>Nonagricultural rural runoff, wastewater point sources</td></tr>
<tr><td>Lake Winnipeg</td><td>Cropland runoff, nonagricultural rural runoff</td><td>Cropland, other rural runoff and atmospheric sources</td></tr>
</table></td>
<td>“Highest priority sources” – neither the NRS or the Appendix describes how the “highest priority” is determined. Please include a description of how this was determined.

When it comes to “highest priority <u>watersheds</u>,” the NRS states: Determining the highest priority watersheds for nutrient reduction should consider both priorities for addressing in-state nutrient reduction needs and downstream needs.</td>
</tr>
<tr>
<td>20</td>
<td>NRS Xxi
PDF 23</td>
<td>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”</td>
<td>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 <u>the portion of the watershed located in Minnesota.</u>

It is confusing that the document switches between references to the Mississippi River <u>Watershed</u>/Lake Winnipeg <u>Watershed</u> etc. vs of Mississippi River <u>Basin/</u>Lake Winnipeg <u>Basin</u> etc. <u>vs the Minnesota portions of each</u>. 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/</td>
</tr>
</table>

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."	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.
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."	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 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.
23	NRS Xxiv PDF 26	"Replicating existing successful elements of local and regional soil health programs."	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.
24	NRS Xxvi PDF 28 NRS xxvii PDF 29	Cropland strategies Cropland implementation	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). <u>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.</u> <u>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.</u>
25	NRS Xxvi PDF 28 NRS xxvii PDF 29	Cropland strategies Continuous living cover campaign	Nearly all of the recommendations have the potential to increase phosphorous and pesticide use. Please note this eventuality.
26	NRS xxvi PDF 28 NRS 152 PDF 184 NRS 158 PDF 190 NRS 157 PDF 189 Appendix PDF 776	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) 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."	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
27	NRS Xxviii PDF 30	Protection strategies should also consider mitigation actions to address increases in Red River Basin tile drainage.	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?

			Please add text that protection strategies should also consider mitigation actions statewide to address higher dissolved and total phosphorous increases due to no-till and cover crop practices. As stated in Appendix 5-1 page 18, “Studies of vegetative buffers in the Canadian prairies strongly emphasize there is significant uncertainty in the ability of buffers to reduce P losses in cold climates where a large portion of runoff occurs as snowmelt…. While these earlier findings pertained to conservation tillage and vegetated buffers, similar limitations (and risks) may need to be considered for cover cropping in Minnesota.”
28	NRS 2 2.4 35 PDF 67	“The Minnesota portion of the Red River Basin covers about <u>37,100 square miles</u> in northwestern Minnesota in all or part of 21 counties and flows from the Red River into Lake Winnipeg.”	<u>37,100 sq miles for the Minnesota portion does not seem likely</u>. 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.
29	NRS 5 PDF 37	The influence of weather and climate is not consistent across a large state like Minnesota.	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.
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	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.**
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.	Why are there significantly less acres in wheat? This answer could reveal why crops like kernza are not being widely adopted.
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	“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. <u>MPCA’s 2020 NRS Progress reported stated:</u>

"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."

Table 17. Drained land in the state of Minnesota (2012 and 2017) from the U.S. Census of Agriculture.

Practice	2012 Acres	2017 Acres	Change 2012 to 2017
Land Drained by Tile	6,461,173	8,079,984	Increased 1,618,811 acres
Land Drained by Ditches	4,548,977	4,674,449	Increased 125,472 acres

Source: USDA NASS U.S. Census of Agriculture, Table 41 – Minnesota Land Use Practices

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:**

Practice	2012 Acres	2017 Acres	2022 Acres	Change 2017 to 20
Land Drained by Tile	6,461,173	8,079,984	8,247,260	Increased 167,276 a
Land Drained by Ditches	4,548,977	4,674,449	4,560,910	Decreased 113,539

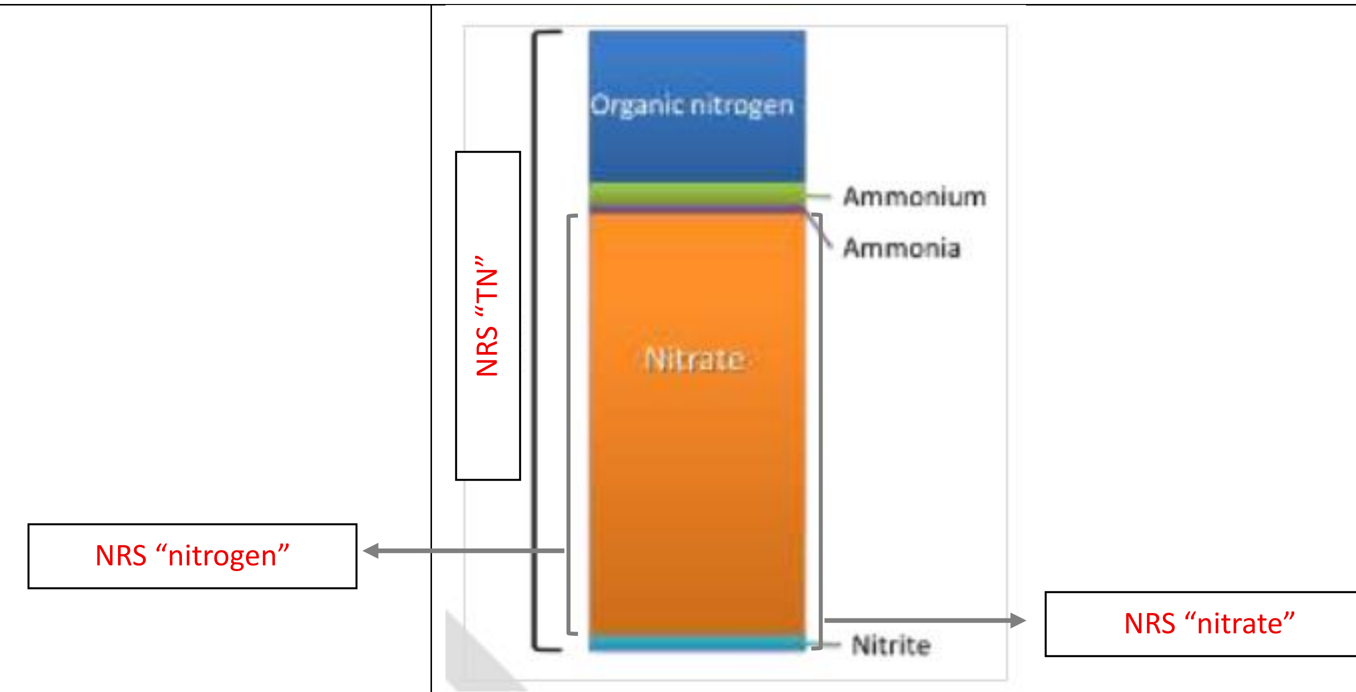
Table 47. **Land Use Practices: 2022 and 2017**

[For meaning of abbreviations and symbols, see introductory text.]

Land use practices	2022		20
	Farms	Acres	Farms
Land drained by tile	19,088	8,247,260	21,249
Average per farm	(X)	432	(X)
Acres drained:			
1 to 9 acres	1,429	6,185	1,522
10 to 49 acres	3,392	84,915	3,669
50 to 99 acres	2,279	158,346	2,550
100 to 199 acres	2,909	402,834	3,454
200 to 499 acres	4,222	1,322,127	4,894
500 to 999 acres	2,533	1,733,744	3,027
1,000 to 1,999 acres	1,469	1,986,151	1,607
2,000 acres or more	855	2,552,958	526
Land artificially drained by ditches	9,435	4,560,910	10,845
Average per farm	(X)	483	(X)
Acres drained by ditches:			
1 to 9 acres	1,091	4,745	1,121
10 to 49 acres	2,409	57,911	2,815
50 to 99 acres	1,128	76,060	1,331
100 to 199 acres	1,177	159,159	1,450
200 to 499 acres	1,374	420,936	1,695
500 to 999 acres	894	625,217	1,031
1,000 to 1,999 acres	712	1,004,234	832
2,000 acres or more	650	2,212,648	570

			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).
33	NRS 10 PDF 42	1.2.6 is entitled "<u>Updated science</u> 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)"	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 <u>very</u> 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" under water or are frozen.**
		"Longer-lasting weather extremes. Dry and wet weather extremes are lasting longer or are more severe. The Minnesota Department of Natural Resources (DNR) has 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."	Please provide an associated link/reference for the science this is based on.
		"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)"	Please provide an associated reference for the science this is based on. I cannot find a DNR 2025a citation.
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:"	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.
35	NRS 14 PDF 46	• **More work is needed**. Much more work is needed before reaching goals for both phosphorus and nitrogen loads leaving the state. The best estimates of the remaining nutrient load reductions needed to meet goals at the state lines are 35,517 MT/yr of TN and 602 MT/yr of TP in Minnesota tributaries to the Mississippi River. The reductions still needed from all combined Red River Basin tributaries in Minnesota are 3,486 MT/yr of TN and 538 MT/yr of TP.	If we have goals of: Nowhere in
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.	Nitrogen loads were calculated by
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."	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."
38	NRS 17 PDF 49	"TN" (dissolved and organic nitrogen forms)….	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 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."

			
39	NRS 17 PDF 49	2.2 Goals for major river basins and groundwater	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.
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…."	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.
41	NRS 17 PDF 49	"Emphasize multiple benefits"	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.
42	NRS 17 PDF 49	"Use estimates of nutrient load reductions…."	It should be noted that reduction estimates can vary <u>wildly.</u> Personally, I have used a state department nutrient reduction calculator that either overestimates reductions by **10x** compared

<table>
<tr><td></td><td></td><td></td><td>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 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.</td></tr>
<tr><td>43</td><td>NRS 17 & 18
PDF 49 & 50</td><td>“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 <u>should</u> 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.”</td><td>Our 1W1Plans provide targeted BMP’s <u>by design.</u> The software watersheds used is called Prioritize, Target, and Measure Application (PTM App). <u>Could</u> conveys possibility. <u>Should</u> conveys an obligation or expectation or duty. It is not apparent from the text given why <u>should</u> is justified vs. <u>could</u>?

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.</td></tr>
<tr><td>44</td><td>NRS 18
PDF 50</td><td>“nitrogen cycling and storage in Lake Superior are not well understood”</td><td>Please create a section that lists data gaps.</td></tr>
<tr><td>45</td><td>NRS 18
PDF 50</td><td>Table 2-1. TP and TN river load goals and timelines in original 2014 NRS and the updated 2025 NRS, along with groundwater nitrate goals.
<table>
<tr><th>Water body</th><th>Nutrient</th><th>Original 2014 NRS goals</th><th>Updated 2025 NRS goals</th></tr>
<tr><td rowspan="2">Lake Superior MN tributaries</td><td>TP</td><td>Maintain protection goals; no net increase from 1979 conditions</td><td>No increase above 245 MT/yr average (combined MN tributaries)</td></tr>
<tr><td>TN</td><td>Maintain protection</td><td>No increase above 2,670 MT/yr average (combined MN tributaries)</td></tr>
<tr><td rowspan="2">Lake Winnipeg (Red River at Canada border)</td><td>TP</td><td>Achieve reductions identified through international efforts with Manitoba (interim milestone: 10% by 2025)</td><td>Reduce to 1,400 MT/yr average load (all states). ~50% reduction from late 1990s (1996–2000)</td></tr>
<tr><td>TN</td><td>Achieve reductions identified through international efforts with Manitoba (interim milestone: 13% by 2025)</td><td>Reduce to 18,687 MT/yr average load (all states). ~53% reduction from late 1990s (1996–2000)</td></tr>
<tr><td rowspan="2">Mississippi River</td><td>TP</td><td>Achieve 45% TP reduction by 2040 (from 1980–1996 baseline)</td><td>Same as original</td></tr>
<tr><td>TN</td><td>Achieve 45% TN reduction by 2040 (from 1980–1996 baseline)</td><td>Same as original</td></tr>
<tr><td>Groundwater</td><td>Nitrate</td><td>Meet 1989 Groundwater Protection Act goals</td><td>Meet 1989 Groundwater Protect Act goals, and reduce groundwater nitrate baseflow into major rivers to enable achieving TN load reduction goals at state lines</td></tr>
</table></td><td>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. <u>Please provide both the target and the reduction that would take to get there in MT/yr.</u>

Please Change the “Updated 2025 NRS goals” for Lake Winnipeg (Red River at Canada Border) to <u>just the Minnesota portion.</u>

Please add the <u>MT/yr</u> 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. <u>Please only provide the Minnesota portion.</u>

<u>Please note that “Groundwater” is the only “Statewide” goal, and update mistaken references of “Statewide” that were applied to waterbody/watershed wide goals.</u></td></tr>
</table>

46	NRS 19 PDF 51	"The TMDL aims for a 17.3% reduction in phosphorus loads going into the lake."	Please qualify which lake – Lake of the Woods or Lake Winnipeg.
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.	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?
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......"	Please insert the actual goals, as the percentage for total nitrogen is wrong (53% of 20,067 = 10,635); please correct: • Total Phosphorus 1,400 tonnes/year • Total Nitrogen 9,525 tonnes/year The 1400 & 9525 figures were correctly used on page 21.
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.	Thank you for providing this information. Does this mean that the TMDL's for Red River will be out of sync with NRS goals?
50	NRS 22 PDF 54	"Load reductions from all contributing states are important for meeting the downstream goals."	Please describe how in-channel erosion nutrients contributions handled? Are they considered in-state or contributing state?

51	NRS 23 PDF 55	"The calculated load changes are driven by changes in river flows and nutrient concentrations."	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; impoundments; rainfall runoff rates; streamflow quantity and timing; flow change concentrations; "drift" changes; seasonal variability; channel cutting; ?
52	NRS Section 2.3.1	River load monitoring	Please include information on the Red River Riverwatch monitoring system.
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.	How do these sources compare to the in-channel sources at these sites?
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** Cropland is also the largest source of nitrogen and phosphorus in the *Lake Winnipeg* major basin. In this new source assessment, cropland is 48% of the TN load and 63% to 64% of the TP load, compared with 53% of the TN load and 42% of the TP load in the 2014 NRS. As previously discussed, four categories from the 2014 NRS were aggregated into cropland for this analysis. Another notable difference is in the loads from atmospheric deposition. In the new source assessment, the loads are 7% for TN and 4% for TP, which are much smaller than the 21% for TN and 18% for TP in the 2014 NRS. Table 19. Average Annual TN Loading by Source in the RRN	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.**
	NRS 26	The drainage areas for both Mississippi River sites are diagramed.	Why is only one of the Red River monitoring sites provided?

<table>
<tr><td></td><td>PDF 58</td><td></td><td>Please add a diagram of the Grand Forks drainage area.</td></tr>
<tr><td>55</td><td></td><td>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.”</td><td>Please add the same acknowledgement prominently and earlier in the 2025 NRS.

Please add the same acknowledgement prominently and early in the 2025 NRS.</td></tr>
<tr><td>56</td><td>NRS 36
PDF 68

NRS 45
PDF 77</td><td>“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 years exceeded final load targets.”</td><td>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.”</td></tr>
<tr><td>57</td><td>NRS 57
PDF 89</td><td>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.

The text of the 2014 NRS:
Table 3. Priority sources for each major basin
<table>
<tr><th>Major basin</th><th>Priority phosphorus sources</th><th>Priority nitrogen sources</th></tr>
<tr><td>Mississippi River</td><td>Cropland runoff, wastewater point sources, and streambank erosion</td><td>Agricultural tile drainage and other pathways from cropland</td></tr>
<tr><td>Lake Superior</td><td>Nonagricultural rural runoff [a], wastewater point sources, and streambank erosion</td><td>Wastewater point sources</td></tr>
<tr><td>Lake Winnipeg</td><td>Cropland runoff and nonagricultural rural runoff</td><td>Cropland</td></tr>
</table>
a. Includes natural land cover types (forests, grasslands, and shrublands) and developed land uses that are outside the boundaries of incorporated urban areas.

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”</td><td>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</td></tr>
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<tr>
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<td>NRS 58
PDF 90</td>
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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</td>
<td>**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?

From the 2014 NRS:

Table 3. Priority sources for each major basin
<table><tr><th>Major basin</th><th>Priority phosphorus sources</th><th>Priority nitrogen sources</th></tr><tr><td>Mississippi River</td><td>Cropland runoff, wastewater point sources, and streambank erosion</td><td>Agricultural tile drainage and other pathways from cropland</td></tr><tr><td>Lake Superior</td><td>Nonagricultural rural runoff [a], wastewater point sources, and streambank erosion</td><td>Wastewater point sources</td></tr><tr><td>Lake Winnipeg</td><td>Cropland runoff and nonagricultural rural runoff</td><td>Cropland</td></tr></table>a. Includes natural land cover types (forests, grasslands, and shrublands) and developed land uses that are outside the boundaries of incorporated urban areas.</td>
</tr>
<tr>
<td>59</td>
<td>NRS 111
PDF 143</td>
<td>“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 needed in the Red River Basin will require considerable additional nitrogen reductions after addressing local nitrogen priority concerns.”</td>
<td>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?</td>
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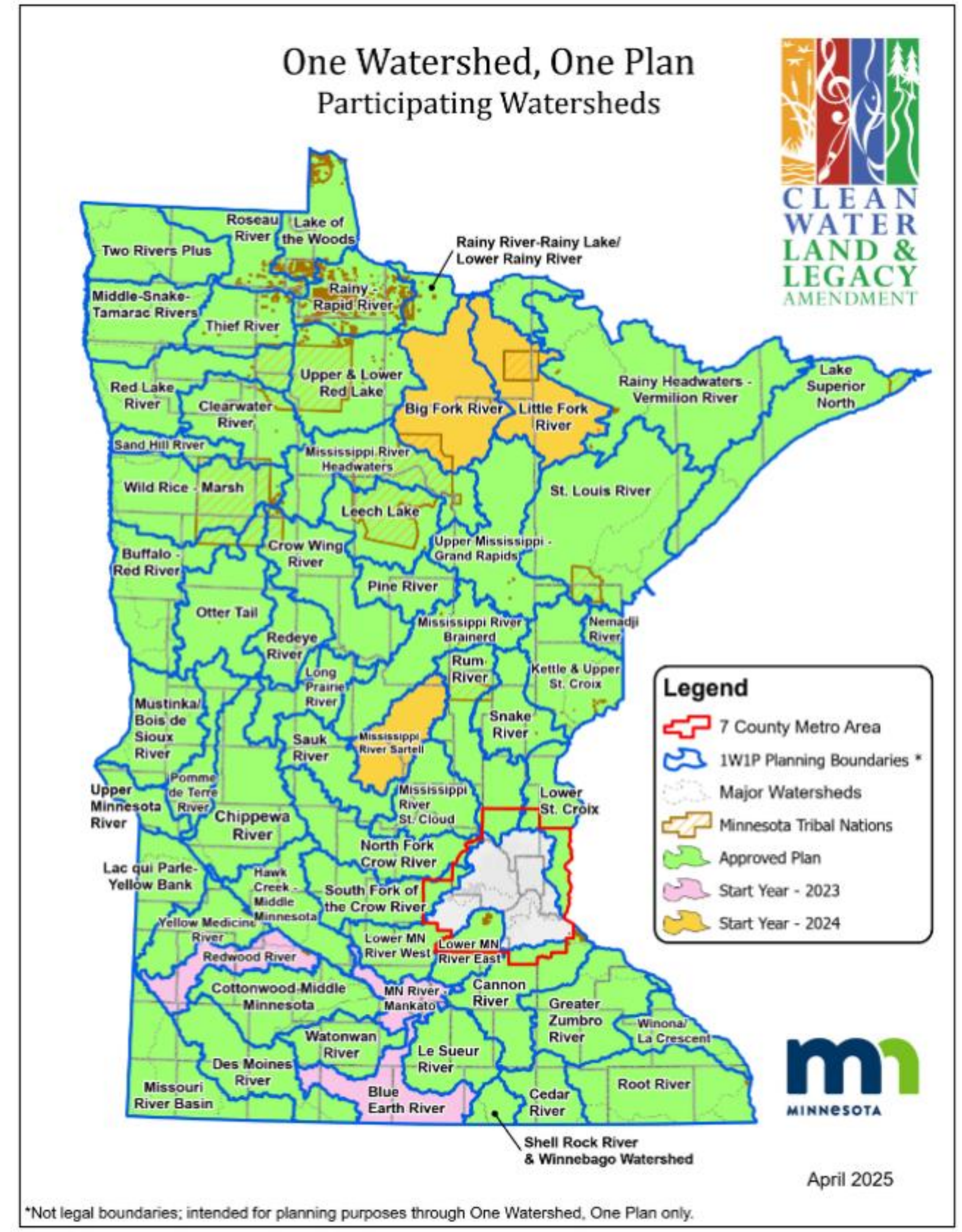
</table>

60	NRS 114 PDF 146	Urban Nutrient Reduction	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.
61	NRS 114 PDF 146	"Fully implementing it will result in NRS's wastewater sector nitrogen reduction goals being met"	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.
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 <u>Reduction</u> Key Messages were summarized in under one page (despite extensive strategies to be implemented). Rural Nutrient <u>Sources</u> 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, both local sediment TMDLs and large-scale sediment reduction strategies are important drivers to reducing this source of phosphorus."	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.
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."	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.
64	NRS 122 PDF 154	Table 4-9. Wastewater effluent nitrogen loads by basin by year (MT/yr).	Please separate Lake Winnipeg into Rainy River and Red River, as was done for phosphorus on the preceeding page.
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."	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.

			Also – this statement stops short of how these increasing conditions will affect NRS goals. Please include a statement of the anticipated impacts. Will MPCA
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	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."
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."	Why is this text under the header, "Cost to achieve Mississippi River Basin scenarios"? Please add a corrected header for the Red River Basin.
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.	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): **5.6 NRS support documents** • 5-1: Cropland Practices Science Assessment for Minnesota's Nutrient Reduction Strategy: Part 1 Nitrogen. • 5-2: Cropland Practices Science Assessment for Minnesota's Nutrient Reduction Strategy: Part 2 Phosphorus. • 5-3: Agricultural Nutrient Balance in Minnesota Watersheds: A Spatial Framework for Estimating the Contribution of Nitrogen and Phosphorus from Livestock Manure and Commercial Fertilizer. • 5-4: Conservation Practice Adoption Trends and Programs. • 5-5: Nutrient Reduction Strategies for Stream and Gully Systems. 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.

<table>
<tr><td>69</td><td>NRS 234
PDF 266</td><td>“As of this writing, only a small number of CWMP assessments have been completed.”</td><td>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.



</td></tr>
<tr><td>70</td><td>NRS 237
PDF 269</td><td>“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.”</td><td>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.</td></tr>
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71	NRS 238 PDF 270	Promote the “batch-and-build" concept when using state and federally funded program funds to implement nutrient-reducing BMPs	Please add locally funded programs to this opportunity.
72	NRS 238 PDF 270		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.
73	NRS 241 PDF 273	Staffing Support	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.
74	NRS 241 PDF 273	Minnesota Water Management Framework, 6.5 & 6.5.1	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.
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.	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.

<table>
<tr>
<td>76</td>
<td>NRS 269
PDF 301</td>
<td>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.</td>
<td>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.
<table>
<tr><th>Value</th><th>Program</th><th>Year</th></tr>
<tr><td>23,754,389</td><td>CENSUS</td><td>2022</td></tr>
<tr><td>23,898,864</td><td>CENSUS</td><td>2017</td></tr>
<tr><td>23,922,658</td><td>CENSUS</td><td>2012</td></tr>
<tr><td>23,789,793</td><td>CENSUS</td><td>2007</td></tr>
<tr><td>24,889,952</td><td>CENSUS</td><td>2002</td></tr>
<tr><td>25,732,346</td><td>CENSUS</td><td>1997</td></tr>
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<tr>
<td>77</td>
<td>NRS 232
PDF 264</td>
<td>"Throughout much of Minnesota, agricultural sources and pathways were the most common sources of impairment…."</td>
<td>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 source investigation. LGU's may</td>
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			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.
78	NRS 156 PDF 188	Section 5.1	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.
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.	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. • The amount of phosphate released increased as the amount of compost (yard residue and/or food residue) increases.

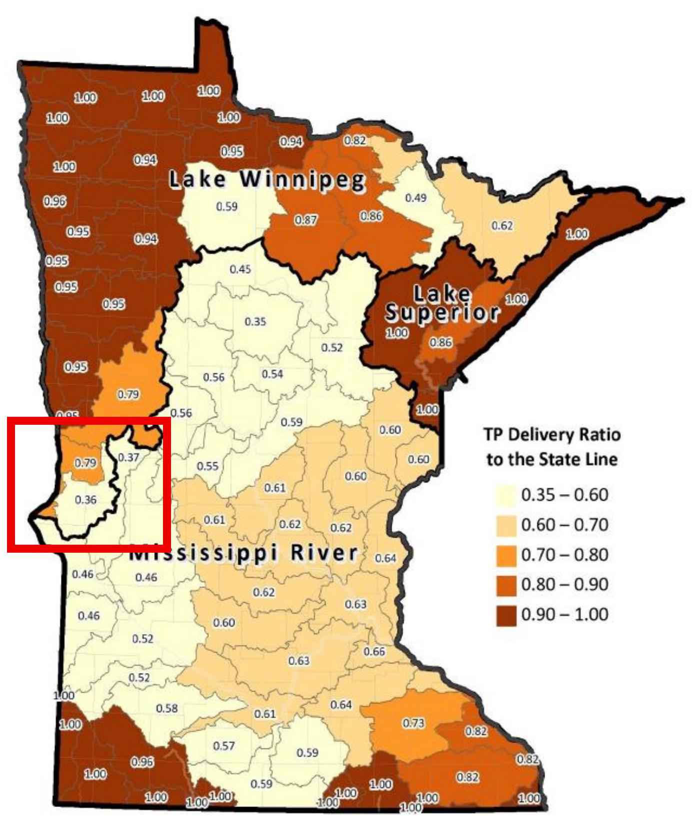
			• Biofiltration media mixes, including food or leaf compost, release phosphate at 10% and 20% ratios. Biochar or spent lime can reduce this amount, but do still create a net export of phosphate. • Vegetation growth was inversely related to phosphate capture -> tall plants release more phosphate. Tall 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 <u>increase</u> 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."**
80	Chapters 4 & Chapters 5		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.
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."	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.
82	NRS 157 PDF 189	"no one practice will work on every acre, but every acre needs at least one practice"	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 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 <u>at least</u> 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.**
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."	**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.**
84	NRS 213 PDF 245	"One of the main characteristics of a stable stream channel is lateral connectivity….."	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.
85	NRS 234 PDF 266	"The MPCA oversaw the completion of WRAPS for all major watersheds by 2023; these WRAPS are now transitioning into the update stage."	MPCA staff do far, far more than oversee. Please describe more accurately the role MPCA staff play in the creation of a WRAPS document.
86	NRS 262 PDF 294	"Tracking Minnesota agricultural cropland drainage to gather precise data has been a challenge for decades."	**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

			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.
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."	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.
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."	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.
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."	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.

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."	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. <u>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.</u>
91	NRS 267 PDF 299	7.5.1 Indicators for change	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 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 <u>can prevent you from being able to plant or harvest a crop at all.</u>* 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 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

			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 <u>need</u> 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 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 <u>Iowa-based and non-cold climate sources!</u>** 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.

92	NRS 296 PDF 328	Christianson, L. and C. Rosen. 2025. Science Assessment of Cropland Practices for Minnesota's Nutrie Reduction Strategy: Part 1, Nitrogen. University of Minnesota, St. Paul, MN.	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.**
93	Appendix 3-1	Priority watershed categories for in-state nitrate reductions	Column 4 us titled: "x% of stream miles …" Please title the column "x% of stream miles <u>assessed…"</u> This type of qualifier was correctly used in Column 8 where MPCA reports "x wells <u>sampled"</u>
94	Appendix 3-1 Figure 9 & Figure 10 Page 20 PDF 336	Figure 9: TP delivery ratios for all HUC8 watershed outlets to the most downstream endpoint evaluated. 	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 double-counted in the Bois de Sioux River Watershed?

95	Appendix 3-1 8 PDF 324	What could potentially be considered as nonreducible loads of TP and TN may result 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	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 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"?
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."	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….
97	Appendix 4.1.2 29 PDF 285	"…streambank erosion can also contribute high TP loads to groundwater."	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 one-way so definitively, so I can't quite wrap my head around how this is a final, complete thought.
98	Appendix 3 29 PDF 285 Appendix 3 31 PDF 287 Attachmnt 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."	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.
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.	Please indicate in which direction was the variation – higher/lower?

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	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) 

Continued on next page

101

Appendix PDF 754 – 1095

Title	Appendix Number	
Assessment Of Major River Basin Loads and Reductions Needed to Meet Goals. Tetra Tech. 2025	2-1	06-11-2025 DRAFT
River Nutrient Concentration Trend Update for Twin Cities Metro Area. Metropolitan Council. 2025.	2-2	03-21-2025
Estimated Nutrient Source Contributions to the River Nutrient Loads. Tetra Tech. 2024	2-3	12-20-2024
Watershed (HUC 8) Load Reduction Needs to Accomplish Minnesota's Nutrient Reduction Strategy Goals - Guidance for Watershed Strategies and Planning. MPCA, LimnoTech, Tetra Tech (Dec 2024)	2-4	12-2024
Methods for Watershed Load Reduction Needs to Accomplish NRS Goals (Attachment A for Appendix 2-3). MPCA, LimnoTech, Tetra Tech (2024)	2-5	12-2024
Priority Watershed Lists for Lake Phosphorus, River Phosphorus, Well Water Nitrate and Stream Nitrate Concentrations for Aquatic Life Protection. MDNR (spreadsheet)	3-1	
Denitrification in Cold Climates--Facility Fact Sheets. Tetra Tech. 2025.	4-1	DRAFT ITEMS
Successful Wastewater Denitrification in Cold Climates. Tetra Tech. 2025	4-2	02-28-2025
Denitrification in Cold Climates—Cost Spreadsheets . Tetra Tech (spreadsheets). 2025.	4-3 *spreadsheet posted sepa from appendices fil*	
Review of MPCA Nitrogen Management Plan Guidance. Tetra Tech. 2025.	4-4	02-28-2025
Cropland Practices Science Assessment for Minnesota's Nutrient Reduction Strategy: Part 1 Nitrogen. University of Minnesota. 2025.	5-1	05-2025
Cropland Practices Science Assessment for Minnesota's Nutrient Reduction Strategy: Part 2 Phosphorus. University of Minnesota. 2025.	5-2	05-2025
Agricultural Nutrient Balance in Minnesota Watersheds: A Spatial Framework for Estimating the Contribution of Nitrogen and Phosphorus from Livestock Manure and Commercial Fertilizer. Agricultural Research Service. 2025	5-3	06-26-2025 DRAFT
Conservation Practice Adoption Trends and Programs. MDA. 2025	5-4	05-01-2025

Continued on next page

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 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.

Nutrient Reduction Strategies for Stream and Gully Systems. 2025. MDNR.	5-5	05-02-2025
Support of Watershed Nutrient Reduction Planning through Tools and Resources: User Survey. BWSR. 2025.	6-1	04-29-2025
Support of Watershed Nutrient Reduction Planning through Tools and Resources: User Survey. Tetra Tech. 2024.	6-2	11-2024
Minnesota Nutrient Reduction Strategy Support - Assessment of Watershed Work (WRAPS & CWMP) to Address Nutrients. Tetra Tech. 2024.	6-3	11-2024
Core Indicators and Social Measures Guide - A Guide to Track and Monitor Human Dimensions of Conservation Action. UMN. 2023.	7-1	07-14-2023
Supplemental Visualization Tools and Applications for Tracking Nutrients. MPCA. 2025.	7-2	06-25-2025

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	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 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.
103	Appendix 5-1 14 PDF 767	"The focus of this report was the portion of Minnesota that falls within the Mississippi River Basin…."	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.
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, <u>and estimates of potential impacts on P loads to the Mississippi River Basin and other regional watersheds."</u>	**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.**
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."	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.
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."	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?

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."	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.
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.	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 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.**

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)."	**HSPF <u>does not fully capture in-stream nutrient processing.</u> MPCA <u>should be utilizing Water Quality Analysis Simulation Program (WASP) to improve accuracy for TN and TP transport</u>.** - WASP would include denitrification – converting nitrate to nitrogen gas. <u>MPCA is overmodeling TN rates.</u> - WASP would account for phosphorus cycling – settling of sediments – <u>MPCA is overmodeling TP rates.</u>
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).	**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 pre-selected by MPCA.**
111	Appendix PDF 981		As presented, this scale likely leads the reader to visually overestimate contributions from most watersheds. <u>For Manure N lbs:</u> The difference between 880,000 and 15,000,000 is <u>17x.</u> The difference between 15,000,000 and 29,000,000 is <u>1.9x.</u> Please employ a legend graphics that are more appropriate to the scale of the manure categories that are being used, or 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.

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	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?
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"	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."
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 expenditures cover all nutrients (N, P, K) as well as lime and soil conditioners.	Please move the limitations to the beginning of this document, <u>so the reader knows going into the section how reliable the information is that is being presented.</u> 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.
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.	1) <u>For the entire document: please combine text references to use one or the other:</u> 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?
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."	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.
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."	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 <u>significant</u> luck with the weather, and a <u>whole lot of startup cash.</u> How many 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.
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)."	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 <u>which means they do come with economic costs.</u> <u>**Huge economic costs.**</u>
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."	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 <u>any tillage for 1-2 years.</u> 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.

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.	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.
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 Force states to research this topic to maximize use of limited research funds and identify solutions needed in other states as well."	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.
122	Appendix 2-4 PDF 298	"Minnesota is one of twelve states committed to working together on the Gulf of Mexico Hypoxia Task Force."	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 <u>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).</u>
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)."	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.
124	Appendix 2-1 ii PDF 4	Thank you for this analysis.	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.
125	Appendix 2-2 4 60 PDF 74		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.
126	Appendix 2-2 4.2 63 PDF 77	"Red River of the North Basin"	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.

<table>
<tr><td>127</td><td>Appendix
4 62
PDF 76</td><td>“Rainy River” at Lake of the Woods</td><td>Is this supposed to mean xxxx referred to in the NRS?</td></tr>
<tr><td>128</td><td>Appendix
2-1 25
PDF 281</td><td>Table 13. 2014 NRS Source Assessment (MPCA 2014)
<table>
<tr><th>Nutrient Source</th><th>Mississippi River</th><th></th><th>Lake Superior</th><th></th><th>Lake Winnipeg</th><th></th></tr>
<tr><th></th><th>N</th><th>P</th><th>N</th><th>P</th><th>N</th><th>P</th></tr>
<tr><td>Cropland runoff</td><td>5%</td><td>35%</td><td>2%</td><td>6%</td><td>11%</td><td>42%</td></tr>
<tr><td>Atmospheric [b]</td><td>6%</td><td>8%</td><td>10%</td><td>7%</td><td>21%</td><td>18%</td></tr>
<tr><td>NPDES permitted wastewater discharges [c]</td><td>9%</td><td>18%</td><td>31%</td><td>24%</td><td>6%</td><td>11%</td></tr>
<tr><td>Streambank erosion</td><td>--</td><td>17%</td><td>--</td><td>15%</td><td>--</td><td>6%</td></tr>
<tr><td>Urban runoff</td><td>1%</td><td>7%</td><td>1%</td><td>10%</td><td>0%</td><td>2%</td></tr>
<tr><td>Nonagricultural rural runoff [d]</td><td>--</td><td>4%</td><td>--</td><td>32%</td><td>--</td><td>15%</td></tr>
<tr><td>Individual sewage treatment systems</td><td>2%</td><td>5%</td><td>4%</td><td>3%</td><td>2%</td><td>3%</td></tr>
<tr><td>Agricultural tile drainage</td><td>43%</td><td>3%</td><td>5%</td><td>0%</td><td>7%</td><td>0%</td></tr>
<tr><td>Feedlot runoff</td><td>0%</td><td>2%</td><td>0%</td><td>0.10%</td><td>0%</td><td>0.30%</td></tr>
<tr><td>Roadway deicing</td><td>--</td><td>1%</td><td>--</td><td>2%</td><td>--</td><td>2%</td></tr>
<tr><td>Cropland groundwater [e]</td><td>31%</td><td>--</td><td>9%</td><td>--</td><td>35%</td><td>--</td></tr>
<tr><td>Forest</td><td>4%</td><td>--</td><td>38%</td><td>--</td><td>19%</td><td>--</td></tr>
</table>
Scale: Low High

Notes
P = phosphorus; N = nitrogen
a. Source estimates were based on Barr Engineering (2004) with 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.
b. Atmospheric deposition is to lakes and rivers (atmospheric deposition to wetlands is not reflected in this table).
c. Nutrient loads in the Lake Superior Major Basin are lower than other major basins in the state and therefore wastewater is a larger portion of the overall sources. The Western Lake Superior Sanitary District (Duluth area) accounts for more than 50%of the wastewater phosphorus load in the major basin.
d. Includes natural land cover types (forests, grasslands, and shrublands) and developed land uses that are outside the boundaries of incorporated urban areas.
e. Refers to nitrogen leaching into groundwater from cropland land uses.</td><td>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 <u>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.</u>

<u>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. A</u>ccording 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.”

<u>. 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.</u>

Appendix PDF Page 29 states, “…streambank erosion can also contribute high TP loads to groundwater.” Please explain further how streambank erosion affects groundwater nutrients.</td></tr>
<tr><td>129</td><td>Appendix
2-1
3.4.2 26
PDF 282</td><td>“Cropland is also the largest source of nitrogen and phosphorus in the Lake Winnipeg major basin.”</td><td>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.</td></tr>
</table>

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 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”	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.
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…”	So which is it – are non-land-based calculated or not?
133	Appendix 4.2.1 & 4.2.2 31 & 32 PDF 289 & 291		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.
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.	Are these public sources posted somewhere that a reader can access? If not, please provide in the Appendix.
135	Appendix 7-2 PDF 1230	“Supplemental Visualization Tools and Applications for Tracking Nutrients”	The graphics on this page are wonky.

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 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."	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.
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."	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?
138	Appendix 5-5 PDF 1023	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.	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?
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."	In the descriptions of modeling and monitoring, I don't ever remember reading that <u>soil type</u> 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?**
140	Appendix 5-5 PDF 1060	"Incised channels are the predominate form of unstable channels in Minnesota."	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 <u>the historic draining of Lake Agassiz</u> and how the loss of this lake left a very 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.

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."	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.
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."	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?
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."	**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.
144	Appendix 5-5 23 PDF 1078	"The current implementation of the buffer law does not require larger buffers on larger river systems."	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.
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."	Please update to: The <u>portion of</u> Lake Winnipeg major basin in Minnesota is composed of two independent basins: the Red River of the North basin and Rainy River basin.
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."	"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 – <u>so less than 1%. Please correct this sentence.</u> 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 – <u>so 17%. Please correct this sentence.</u>

147			Does this document acknowledge: Unstable channels Public/private flooding Ditch system instability Ditch system inadequacies
148	Appendix 5-5 PDF 1023		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.
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."	"Drained landscape" isn't why areas need a water impoundment – repeated flooding is why areas need a water impoundment. Please revise the sentence accordingly.
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."	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!**

Continued on the next page

<table>
<tr><td>151</td><td>Appendix
3 104
PDF 136</td><td>“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.”</td><td>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 outlet locations <u>will have absolutely no impact on measureable reductions for NRS nitrate goal achievement.</u></td></tr>
<tr><td>152</td><td>NRS Xxi
PDF 23

NRS 2 16
PDF 48

NRS 65
PDF 97</td><td>Table ES-1. Priority sources at the major river basin scale, with the highest priority sources in bold.
<table>
<tr><th>Major basin</th><th>Priority phosphorus sources</th><th>Priority nitrogen sources</th></tr>
<tr><td>Mississippi River</td><td>Cropland runoff, wastewater point sources, and streambank erosion</td><td>Cropland leaching loss to tile drainage and groundwater, wastewater point sources</td></tr>
<tr><td>Lake Superior</td><td>Nonagricultural rural runoff, wastewater point sources, and streambank erosion</td><td>Nonagricultural rural runoff, wastewater point sources</td></tr>
<tr><td>Lake Winnipeg</td><td>Cropland runoff, nonagricultural rural runoff</td><td>Cropland and other rural runoff and atmospheric sources</td></tr>
</table>

“Some priority sources cannot be reliably reduced by local- or regional-scale implementation activities, such as atmospheric deposition and loads from forested areas.”</td><td>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?</td></tr>
<tr><td>153</td><td>NRS 57
PDF 89</td><td>“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.”</td><td>Although this graphic is separated by major basin, these <u>are not the percentages delivered to the outlet of the major basin.</u> Please change the title of the graphic to reflect what the percentages actually represent: “Table 2-16. Minnesota phosphorus and nitrogen sources <u>estimated delivery to local waters</u> by major basin, average conditions (from 2014 NRS).a”</td></tr>
<tr><td>154</td><td>Appendix
2-3 27
PDF 283</td><td>“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.”</td><td>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?</td></tr>
</table>

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). <u>Finally, MPCA 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."</u>	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 <u>does not fully capture in-stream nutrient processing.</u> MPCA <u>should be utilizing Water Quality Analysis Simulation Program (WASP) to improve accuracy for TN and TP transport</u>.** - WASP would include denitrification – converting nitrate to nitrogen gas. <u>MPCA is overmodeling TN rates.</u> - WASP would account for phosphorus cycling – settling of sediments – <u>MPCA is overmodeling TP rates.</u>
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."	**If MPCA staff use model parameters that define <u>land use</u> = <u>nutrient source,</u> then the obvious conclusion of <u>large land use = large nutrient source</u> is true, by definition.** This is completely maddening, and may not say anything true of reality – especially if the <u>density of nutrient sources (thereby small land use) are ignored.</u> <u>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.**</u> Ravines do occur in the Red River Valley. Please provide an estimate.
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).	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.

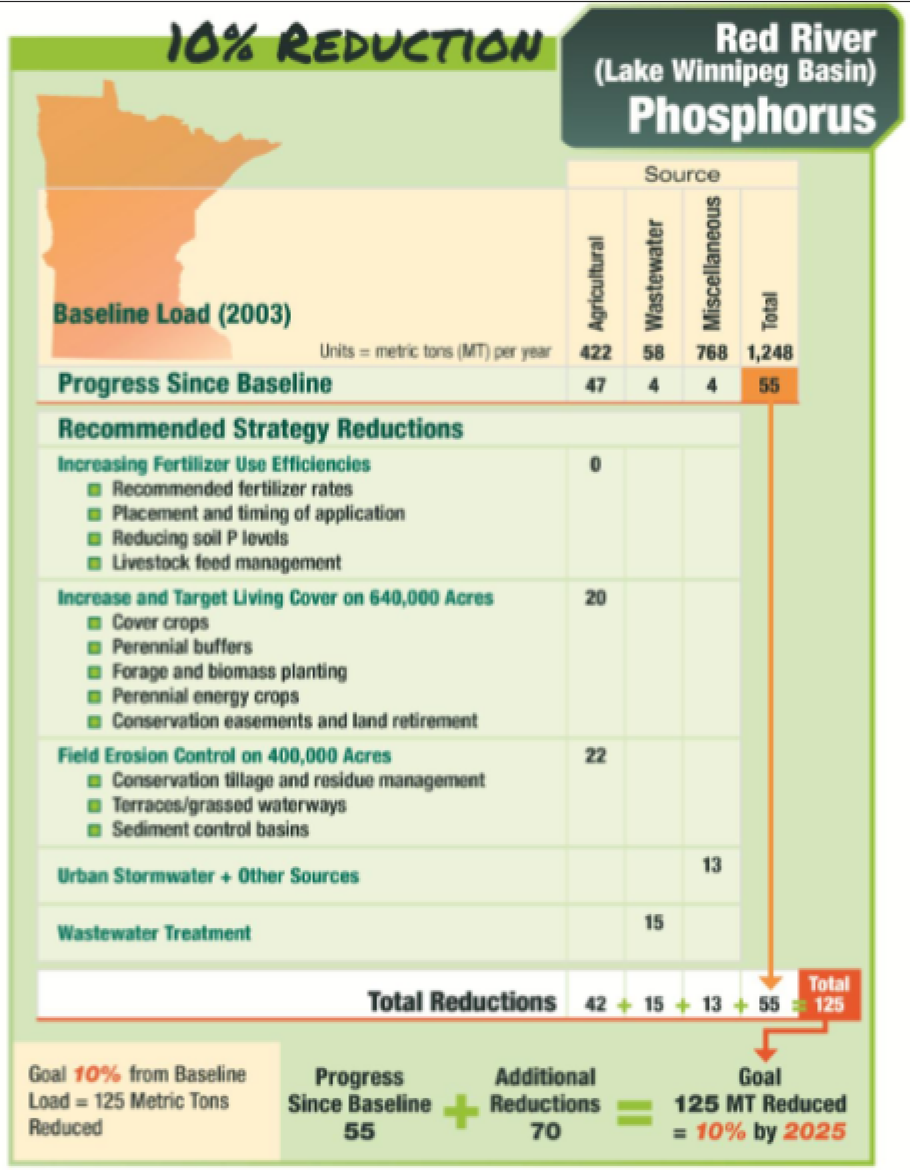
<table>
<tr>
<td>158</td>
<td>2014 NRS</td>
<td>


Figure 5-7. Phosphorus goal reductions for Red River/Lake Winnipeg Major Basin.

Notes:
Increasing Fertilizer Use Efficiency - This load reflects the load reduction from applying conservation tillage that is attributable to fertilizer use efficiency as opposed to field erosion control. The area of conservation tillage listed under field erosion control in Table 5-14 is estimated to achieve load reductions from increased fertilizer efficiency and field erosion control.
Field Erosion Control - This load reflects the load reduction from applying conservation tillage that is attributable to field erosion control as opposed to fertilizer use efficiency.

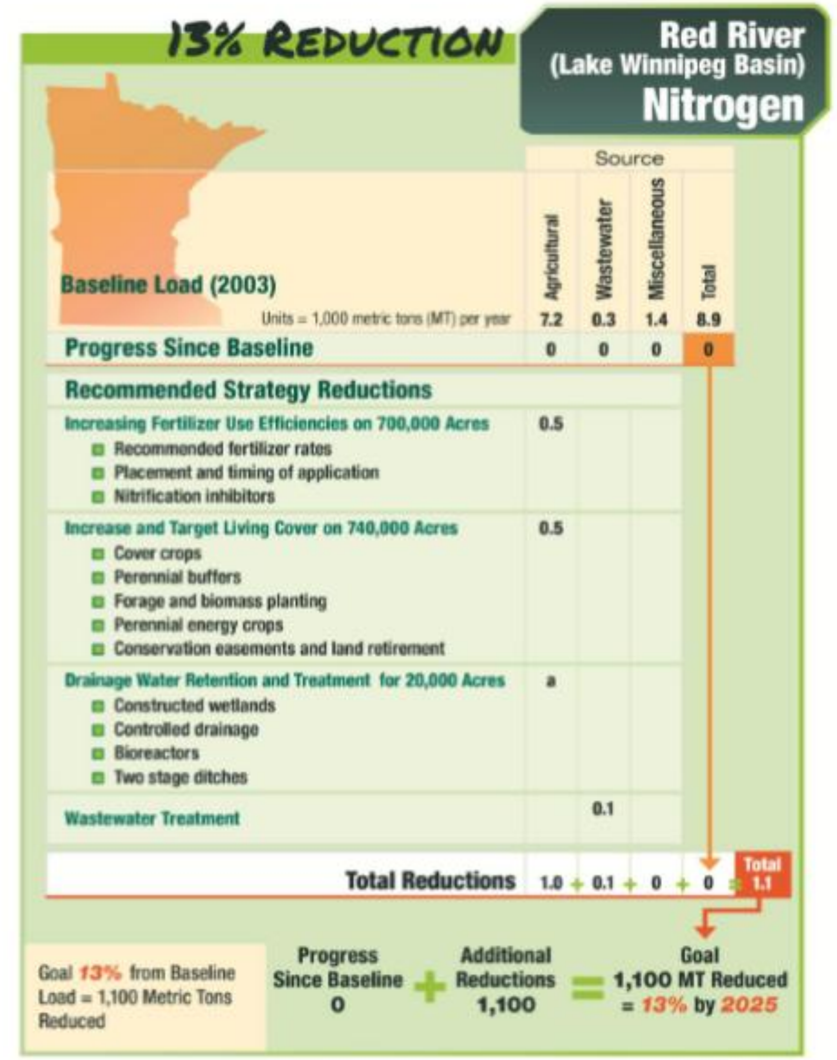


Figure 5-8. Nitrogen goal reductions for Red River/Lake Winnipeg Major Basin.

a. There is very little tile drainage during baseline period in this basin. BMPs are needed to mitigate increases from new tile installation.
</td>
<td>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!</td>
</tr>
</table>

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Table 36. Annual loads and yields (Minnesota-only) delivered to state boundaries

Major basin	Basin	Area in Minnesota (acres)	Delivered load (MTA)		Delivered yield (pounds/acre/year)	
			TP	TN	TP	TN
Lake Superior	Lake Superior	3,804,324	245	4,670	0.14	2.6
Lake Winnipeg	Rainy River	6,876,154	228	4,275	0.07	1.4
	Red River	10,481,948	1,084	8,674	0.23	1.8
	Total	17,358,103	1,312	12,950	0.17	1.6
Mississippi River	Upper Mississippi River	11,493,793	1,396	12,115	0.27	2.3
	Minnesota River	9,399,895	1,192	43,989	0.28	10.3
	St. Croix River	1,627,054	121	1,623	0.16	2.2
	Lower Mississippi River	3,233,412	1,178	22,552	0.80	15.4
	Missouri River	1,135,264	156	4,977	0.30	9.7
	Cedar River	649,823	143	7,657	0.48	26.0
	Des Moines River	969,848	87	1,255	0.20	2.9
	Total	28,509,089	~~4,183~~ 4273	~~93,467~~ 94118	0.32	7.2

Please correct the total TP and TN delivered loads for the Mississippi River; appears to be a much higher difference than a rounding error.

Continued on the next page

<table>
<tr>
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<td>Appendix
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Appendix
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<td>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</td>
<td>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.</td>
</tr>
<tr>
<td>161</td>
<td>Appendix
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PDF 75</td>
<td>Table 37. Comparison of recent monitored and modeled loads (Minnesota-only load) delivered to key locations
<table>
<tr><th rowspan="2">Locations</th><th colspan="2">Total phosphorus (metric tons annually)</th><th colspan="2">Total nitrogen (metric tons annually)</th></tr>
<tr><th>Monitored</th><th>Modeled</th><th>Monitored</th><th>Modeled</th></tr>
<tr><td>Red River at Emerson, Manitoba</td><td>999</td><td>1,084</td><td>5,681</td><td>8,674</td></tr>
</table>
</td>
<td>As such, the monitoring data may reflect recent improvements in water quality, <u>while the modeling does not.</u>

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.</td>
</tr>
</table>