Minnesota Pollution Control Agency (MPCA) logo and Clean Water Land and Legacy logo­

*Picture can be inserted in this space. Right click on this picture, choose Change picture, click on the picture you want, then Insert. Resize/Crop the picture to fit this area. Please try to leave same amount of white space above and below. Landscape pictures work best.*

Watershed

[Month and Year of report]

**Draft [Watershed name]   
Watershed Restoration and Protection Strategy Report, [Year]**

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Edit administrative staff name, project phase (EPA Preliminary Review, Public Notice, or Final), and date review complete.

Cover photo credit

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Please use sentence case and PCA styles within this template.  
Use MS Word’s default **Heading 1** for Contents, Key terms, Executive summary, etc.

These **PCA Report Headings** will be multi-level numbered as 1.; 1.1; 1.1.1; 1.1.1.2; etc.

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* Table lines = **Style:** Solid; **Color:** Automatic; **Width:** ¼ pt. (PCA Bullet List style used here.)
* Before/after spacing 3/0
* Try to **align bottom left** first; however, this is flexible due to the different tables we encounter.
* Repeat header on the top of each succeeding page in the table, when possible
* UPDATE (May 2018): Per MPCA’s Communications Team – Figure and Table captions should appear **above** the Figure and Table (not below). The reason for this was not only for consistency, but the caption title is an introduction to both the Figure and Table.

# Key terms and abbreviations (Heading 1)

**Assessment Unit Identifier (AUID):** The unique water body identifier for each river reach comprised of the U.S. Geological Survey (USGS) eight-digit HUC plus a three-character code unique within each HUC.

**Aquatic life impairment:** The presence and vitality of aquatic life is indicative of the overall water quality of a stream. A stream is considered impaired for impacts to aquatic life if the fish Index of Biotic Integrity (IBI), macroinvertebrate IBI, dissolved oxygen, turbidity, or certain chemical standards are not met.

**Aquatic recreation impairment:** Streams are considered impaired for impacts to aquatic recreation if fecal bacteria standards are not met. Lakes are considered impaired for impacts to aquatic recreation if total phosphorus and either chlorophyll-*a* or Secchi disc depth standards are not met.

**Hydrologic Unit Code (HUC):** A HUC is assigned by the USGS for each watershed. HUCs are organized in a nested hierarchy by size. For example, the Minnesota River Basin is assigned a HUC-4 of 0702 and the Pomme de Terre River Watershed is assigned a HUC-8 of 07020002.

**Impairment:** Water bodies are listed as impaired if water quality standards are not met for designated uses including aquatic life, aquatic recreation, and aquatic consumption.

**Index of Biotic Integrity (IBI):** A method for describing water quality using characteristics of aquatic communities, such as the types of fish and invertebrates found in the water body. It is expressed as a numerical value between 0 (lowest quality) to 100 (highest quality).

**Protection:** This term is used to characterize actions taken in watersheds of waters not known to be impaired to maintain conditions and beneficial uses of the water bodies.

**Restoration:** This term is used to characterize actions taken in watersheds of impaired waters to improve conditions, eventually to meet water quality standards and achieve beneficial uses of the water bodies.

**Source (or pollutant source):** This term is distinguished from ‘stressor’ to mean only those actions, places or entities that deliver/discharge pollutants (e.g., sediment, phosphorus, nitrogen, pathogens).

**Stressor (or biological stressor):** This is a broad term that includes both pollutant sources and non-pollutant sources or factors (e.g., altered hydrology, dams preventing fish passage) that adversely impact aquatic life.

**Total maximum daily load (TMDL):** A calculation of the maximum amount of a pollutant that may be introduced into a surface water and still ensure that applicable water quality standards for that water are met. A TMDL is the sum of the wasteload allocation for point sources, a load allocation for nonpoint sources and natural background, an allocation for future growth (i.e., reserve capacity), and a margin of safety as defined in the Code of Federal Regulations.

# Executive summary (Heading 1)

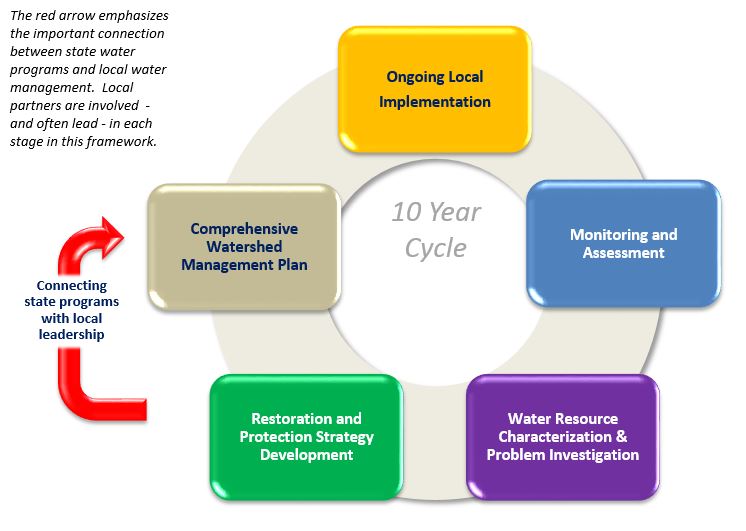
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## What is the WRAPS report? (Heading 2)

Minnesota has adopted a watershed approach to address the state’s 80 major watersheds. The Minnesota watershed approach incorporates **water quality assessment, watershed analysis, public participation, planning, implementation, and measurement of results** into a 10-year cycle that addresses both restoration and protection.

Along with the watershed approach, the Minnesota Pollution Control Agency (MPCA) developed a process to identify and address threats to water quality in each of these major watersheds.



This process is called Watershed Restoration and Protection Strategy (WRAPS) development. The WRAPS reports have two parts: impaired waters have strategies for restoration, and waters that are not impaired have strategies for protection.

Waters not meeting state standards are listed as impaired, and total maximum daily load (TMDL) studies are developed for them. The TMDLs are incorporated into the WRAPS reports. In addition, the watershed approach process facilitates a more cost-effective and comprehensive characterization of multiple water bodies and overall watershed health, including both protection and restoration efforts. A key aspect of this effort is to develop and use watershed-scale models and other tools to identify strategies for addressing point and nonpoint source pollution that will cumulatively achieve water quality targets. For nonpoint source pollution, the WRAPS report informs local planning efforts, but ultimately the local partners decide what work will be included in their local plans. The WRAPS report also serves as a building block for addressing the U.S. Environmental Protection Agency’s (EPA) Nine Minimum Elements of watershed plans, to help qualify applicants for eligibility for Clean Water Act Section 319 implementation funds. [Report authors: see Section 319 guidance attached to this template.]

1. Watershed background and description (PCA Report Heading 1)

[Provide brief overview of the watershed: size, basin, ecoregion(s), overview of land use, major cities. Refer reader to a webpage or other documents for additional information.

***[Insert Watershed Map (e.g., land cover map)]***

A map showing land use or some other basic landscape features should be added here.

This could be a place to identify and briefly summarize past studies in the watershed.]

Figure 1: [Watershed name –Map title A]

Additional [watershed name] watershed resources

U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Rapid Watershed Assessment for the [Name] Watershed: [include link to watershed if useful/appropriate]

Minnesota Department of Natural Resources (DNR) Watershed Assessment Mapbook for the [Name] Watershed: [include link to watershed if useful/appropriate]

1. Watershed conditions

[This section is intended to satisfy several required WRAPS elements provided in Minn. Stat. [114D](https://www.revisor.mn.gov/statutes/cite/114d) (Clean Water Legacy Act): identification of impaired waters, waters needing protection, point sources, nonpoint sources, allocations, current loading, and needed reductions.

***[Insert Watershed Map with no border (e.g., impaired waters)]***

In this intro portion, it is appropriate to provide some high-level overview, e.g., waters assessed for both aquatic recreation and aquatic life use, percent of waters assessed and impaired in the watershed, general spatial trends or patterns. In addition, it may be worth briefly describing the major land-water components that interact to affect aquatic life in the watershed (land use, hydrology, biology, in-channel factors, etc.).

The map should clearly identify impaired waters by name or ID as well as subwatersheds (10-digit HUC scale appears to be a reasonable scale).]

Figure 2: [Watershed name – Map title B]

* 1. Condition status (PCA Report Heading 2)

[Per Minn. Stat. [114D.26](https://www.revisor.mn.gov/statutes/cite/114D.26), subd. 1, (b) (1) Each WRAPS must: **“identify impaired waters and waters in need of protection.”** This can mostly be done in tabular form covering the full range of conventional parameters used in assessment. However, in the narrative it is important to introduce the point that waters that are not listed as impaired will be subject to protection efforts. More on protection considerations can be covered in Section 2.5.]

[Consider including the following regarding mercury impairments (or similar language if other non-conventional listings.) Check to determine if other toxic pollutant work may be planned or underway in some component like monitoring, etc. If underway, note it and how to stay informed.] Some of the water bodies in the [Name] Watershed are impaired by mercury; however, the WRAPS report does not cover toxic pollutants. Toxic pollutants are managed via other programs or methods. For example, for more information on mercury impairments, see the statewide mercury TMDL on the MPCA website at: <http://www.pca.state.mn.us/index.php/water/water-types-and-programs/minnesotas-impaired-waters-and-tmdls/tmdl-projects/special-projects/statewide-mercury-tmdl-pollutant-reduction-plan.html>.

Streams (PCA Report Heading 3)

[Provide narrative to introduce table example below. The blue header shading is not required.]

Table 1: Assessment status of river reaches in the Pomme de Terre River Watershed, presented (mostly) from north to south.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| HUC-10 Subwatershed | AUID (Last 3 digits) | River | Reach description | Aquatic life | | | | Aq rec |
| Fish Index of biotic integrity | Macroinvertebrate index of biotic integrity | Dissolved oxygen | Turbidity/TSS | Bacteria |
| Upper  Pomme de Terre River | 528 | Unnamed Creek | Long Lake to Stalker Lake | IF | IF | NA | NA | NA |
| 506 | Pelican Creek | T130R41W S4, N line to PdT River | Sup | Sup | NA | Sup | IF |
| Middle  Pomme de Terre River | 504 | Pomme de Terre River | Pelican Creek to PdT Lake | Sup | Sup | NA | NA | NA |
| 558 | Pomme de Terre River | N PdT Lake to Middle PdT Lake | IF | IF | NA | NA | NA |
| 562 | Pomme de Terre River | Perkins Lake to Muddy Creek | Imp | Sup | IF | Sup | IF |
| Dry Wood Creek | 556 | Dry Wood Creek | Dry Wood Lake to PdT River | Imp | Imp | Imp | Imp | Imp |

Sup = found to meet the water quality standard (supporting), Imp = does not meet the water quality standard and, therefore, is impaired,  
IF = the data collected was insufficient to make a finding, NA = not assessed, IC = Inconclusive

Lakes (PCA Report Heading 3)

[Provide narrative to introduce table below. Important to explain parameters used in eutrophication assessment and that it is an aquatic recreation-based standard.]

Table 2. Assessment status of lakes in the Pomme de Terre River Watershed, presented (mostly) from north to south.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| HUC-10 Subwatershed | Lake ID | Lake | Aquatic recreation | |
| Upper Pomme de Terre | 56-0379 | North Turtle | Imp | |
| 56-0377 | South Turtle | Sup | |
| 56-0639 | Indian | IF | |
| 56-0651 | Larson | IF | |
| 56-0781 | Swan | Sup | |
| 56-0437 | Stalker | Sup | |
| 56-0390 | Long | Sup | |
| Pelican Creek | 56-0252 | Middle | IF | |
| 56-0253 | Eagle | Sup | |
| 56-0160 | Spitzer | IF | |
| 56-0408 | Sewell | IF | |
| 21-0375 | Christina | Imp | |
| Imp = impaired for impacts to aquatic recreation, Sup = fully supporting aquatic recreation, IF = insufficient data to make an assessment, IC = inconclusive | | | |

* 1. Water quality trends

[This section can report any observed overall trends in stream and/or lake monitoring, if available. Indicate the time period and discuss the significance of these trends. Use caution when evaluating data for trends—a long-term record is needed. See the example table below (for the main stem river only). Refer the reader to other documents for more information on historic water quality results.]

Table 3. Water quality trends of the Pomme de Terre River at Appleton (just upstream from the mouth of the river), green values indicate an improving trend in water quality for that parameter while red values indicate a degrading trend in water quality for that parameter.

|  |  |  |
| --- | --- | --- |
| Parameter | Historical trend (1971-2009) | Recent trend (1995-2009) |
| Total suspended solids | no trend | -38% |
| Biochemical oxygen demand | -56% | no trend |
| Total phosphorus | -42% | no trend |
| Nitrite/Nitrate | +280% | no trend |
| Chloride | +89% | no trend |

* 1. Stressors and sources

[Insert brief introductory narrative, such as provided below. Be aware of some readers’ confusion over the terms ‘stressor’ and ‘source’ (in spite of their being defined in the Key Terms section). Also note that the content below is largely focused on restoration, rather than protection (mainly because it is summarizing impairment-focused reports), but consideration should be given to protection-related stressors/sources. Section 2.5 Protection Considerations may be an appropriate place to provide such information.]

In order to develop appropriate strategies for restoring or protecting water bodies, the stressors and/or sources impacting or threatening them must be identified and evaluated. Biological stressor identification (SID) is conducted for river reaches with either fish or macroinvertebrate biota impairments, and encompasses the evaluation of both pollutant and non-pollutant-related (e.g., altered hydrology, fish passage, habitat) factors as potential stressors. Pollutant source assessments are done where a biological SID process identifies a pollutant as a stressor, as well as for the typical pollutant impairment listings. Section 3 provides further detail on stressors and pollutant sources.

Stressors of biologically-impaired river reaches

[Per Minn. Stat. [114D.26](https://www.revisor.mn.gov/statutes/cite/114D.26), subd. 1, (b) (2) Each WRAPS must: “**identify biotic stressors causing impairments or threats to water quality.**” Information should come from the stressor ID report summarizing, at a minimum, the primary stressors identified. Information should be summarized in a table if possible (see example below), but should be accompanied with some narrative to provide, at a minimum, further explanation and discussion for some of the less self-explanatory stressors, like “altered hydrology” or “habitat.”

Table 4. Primary stressors to aquatic life in biologically impaired reaches in the Pomme de Terre River Watershed.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| HUC-10 Subwatershed | AUID (Last 3 digits) | River | Reach description | Biological impairment | Primary stressor | | | | | | |
| Dissolved oxygen | Nitrate | Phosphorus | Turbidity | Fish passage (dams) | Altered hydrology | Habitat |
| Middle Pomme de Terre River | 563 | Pomme de Terre River | Barrett Lake to North PdT Lake | Fish | ● |  |  |  | ● | ● | ● |
| 562 | Pomme de Terre River | Perkins Lake to Muddy Creek | Fish |  |  |  |  |  | ● | ● |
| Dry Wood Creek | 556 | Dry Wood Creek | Dry Wood Lake to PdT River | Fish & Macroinvert. | ● | ● | ● | ● |  | ● | ● |
| Lower Pomme de Terre River | 551 | Unnamed Creek | Unnamed Creek to Unnamed Creek | Fish |  | ● |  |  |  | ● |  |
| 501 | Pomme de Terre River | Muddy Creek to Minnesota River | Fish & Macroinvert. |  | ● |  |  |  | ● | ● |

Pollutant sources

[Per Minn. Stat. [114D.26](https://www.revisor.mn.gov/statutes/cite/114D.26), subd. 1, (b) (3) Each WRAPS must “**summarize TMDLs…and resulting pollution load allocations and identify areas with high pollutant-loading rates.”**

The table and figure examples below should meet the requirement of the statute with respect to sources. The permit table examples are from the North Fork Crow WRAPS. See that document for more examples for data population or see other completed WRAPS relative to permitted sources. Nonpoint source documentation will be more of a challenge. The nonpoint table below is a potential way to summarize source information. If you indicate relative magnitudes of sources, explain in the narrative how that was done. Inclusion of the figure below portraying nonpoint vs. point source is recommended as it provides important basic source information and context (information can be derived using HSPF; right-click on pie chart to edit data). More detailed information from the HSPF model and other targeting tools may also be described in Section 3 to meet requirements. Some WRAPS may use HSPF data converted to GIS map products as graphics. Careful planning and review of GIS products is critical.

In partial fulfillment of element ‘a’ of the EPA’s 319 non-point source program “Nine Minimum Elements to Be Included in a Watershed Plan…” there should be a map “**that locates the major causes and sources of impairment.**” Such a map (or maps) may be included in this section or, if more appropriate, Section 3.1.] More info on the nine elements is found in Section 319 guidance documents.

Figure 3: Overall breakdown of nonpoint source vs. point source pollution in [Name] Watershed.

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  | | |

Table 5: Point sources in the [Name] Watershed. (General permits for industrial stormwater and construction stormwater may be represented in the table with just one line per permit type, as shown in this example.)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| HUC-10 Subwatershed | Point source | | | Pollutant reduction needed beyond current permit conditions/limits? | Notes |
| Name | Permit # | Type |
|  | Belgrade WWTP | MN0051381 | Municipal wastewater | [Yes / No] No | WLAs based on current permitted TSS limit of 45 mg/L, fecal coliform limit of 200 organisms/100 mL |
|  | Bushmills Ethanol | MN0067211 | Industrial wastewater | No | WLAs based on current permitted TSS limit of 30mg/L |
|  |  |  | Municipal stormwater |  |  |
|  | Various | MNR050000 | Industrial stormwater |  |  |
|  | Various | MNR100001 | Construction stormwater |  |  |
|  | Jennie-O Turkey Store - Roseville Farm | MNG440097 | CAFO | No | Zero Discharge Permit |

Table 6: Nonpoint sources in the [Name] Watershed. Relative magnitudes of contributing sources are indicated.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| HUC-10 Subwatershed | River/Reach (AUID) or Lake (ID) | Pollutant | Pollutant sources | | | | | | | | | | | | | |
| Fertilizer & manure run-off | Livestock overgrazing in riparian | Failing septic systems | Wildlife | Poor riparian vegetation cover | Upland soil erosion |  |  |  |  |  |  |  |  |
| Middle Pomme de Terre River | Pomme de Terre River (563) | *E. coli* | ● | 🞇 | ○ | ○ |  |  |  |  |  |  |  |  |  |  |
| TSS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| TP |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| N |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pomme de Terre River (562) | *E. coli* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| TSS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Perkins Lake (75-0075) | TP |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dry Wood Creek | Dry Wood Creek (556) | TSS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| TP |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| N |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Key:**  ● = High 🞇 = Moderate ○ = Low

* 1. TMDL summary

[The CWLA requires inclusion of TMDL information in the WRAPS report. Specifically, per Minn. Stat. [114D.26](https://www.revisor.mn.gov/statutes/cite/114D.26), Subd. 1, (b) (3), Each WRAPS must “**summarize TMDLs, watershed modeling outputs, and resulting pollution load allocations and identify areas with high pollutant-loading rates.”**

It would be cleaner to limit the TMDL summary section of this report to the allocations and current loading and reductions, and to defer the modeling outputs and priority areas to section 3. The allocations, etc. can be summarized by bringing in specific tables from the TMDL report. However, given that there may be dozens of impairments with completed TMDLs it may be best to place a general summary table here (simply listing which water bodies have a completed TMDL for example) and put the actual TMDL tables in an appendix to this report. Also, some TMDL summary tables do not include current loads or reductions, so those elements will need to be addressed in some alternate way.]

* 1. Protection considerations

[If not already covered elsewhere, this section should further highlight protection needs in the watershed. This can take on various forms. Possibly highlight waters that are trending toward impairment, outstanding resource value waters (or other waters the state considers to be of high value), or highlight particular pressures on waters (e.g., land development issues). Strategies for addressing these waters can be part of Section 3.]

1. Strategies for restoration and protection

[Below is narrative to consider for the introduction to this section. In addition, there should be narrative regarding the entities/collaboration/compromises/etc. involved to develop these tools/strategies. The introduction to Section 3 can be used to reiterate that the intention of the WRAPS is to use all technical resources to identify and prioritize strategies and geographies in the watershed in an effort to inform subsequent local planning efforts.]

The Clean Water Legacy Act (CWLA) requires that WRAPS contain strategies that are capable of cumulatively achieving needed pollution load reductions for point and nonpoint sources, including water quality goals, strategies, and targets by parameter of concern, and an example of the scales and timeline of adoption to meet water quality protection and restoration goals. This section of the WRAPS report provides the results of such strategy development. Because many of the nonpoint source strategies outlined in this section rely on voluntary implementation by landowners, land users, and residents of the watershed, it is imperative to create social capital (trust, networks, and positive relationships) with those who will be needed to voluntarily implement best management practices (BMPs). Thus, effective ongoing public participation is fully a part of the overall plan for moving forward.

The implementation strategies, including associated scales of adoption and timelines, provided in this section are the result of watershed modeling efforts [specify, if desired] and professional judgment based on what is known at this time and, thus, should be considered approximate. Furthermore, many strategies are predicated on needed funding being secured. As such, the proposed actions outlined are subject to adaptive management—an iterative approach of implementation, evaluation, and course correction.

[Element ‘d’ of EPA’s “Nine Minimum Elements to Be Included in a Watershed Plan…” calls for an “estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan.” The MPCA recognizes that a local plan or project work plan is a more appropriate document for cost estimates. Narrative that focuses on the “sources and authorities that will be relied upon” will provide a building block for meeting element ‘d’ and should include a discussion of available funding sources to be sought (e.g., cost share, grant and loan programs from local, state and federal sources) as well as narrative indicating organizations that could provide technical assistance.]

* 1. Targeting of geographic areas

[Per Minn. Stat. [114D.26](https://www.revisor.mn.gov/statutes/cite/114D.26), subd. 1, (b) (3) and (5) Each WRAPS must: “**summarize TMDLs, …identify areas with high pollutant-loading rates**” and “**contain strategies that are capable of cumulatively achieving needed pollution load reductions for point and nonpoint sources.**” It is generally expected that in order to accomplish these objectives some combination of the tools outlined in the table below will need to be utilized. (**Note: this table is not all-inclusive of the possible prioritization approaches that can be used. Also, the table is not intended to be included in the actual WRAPS report; rather, it is provided as guidance for the project team. Elements of the selected tool(s) should be explained in this section, however.)**

The primary purpose of this section, and the statutory language on which it is based, is to identify priority or critical areas for implementation. In the context of pollutant loading and water quality impairment, these are areas identified by a watershed model or similar tool (and ultimately confirmed by field observation and/or local partners and stakeholders) that show disproportionately contributing pollutant loads or excess flow to surface waters. For protection purposes such areas may include areas that if altered would have a high potential for adversely affecting water quality. This section should describe the selected tools, illustrate overall results/output and outline how the tools will be used over time. Depending on the tools selected, it is important to point out that follow-up field reconnaissance will be part of the process to validate the identified areas potentially needing work. Include maps illustrating priority/critical areas and results of analysis (e.g., top 5% of EBI land areas; pollutant loading by subwatershed using a color-scale, green (low loading) to red (high loading); HSPF-identified scour/deposition reaches). The results of modeling efforts to simulate the types and extent of BMPs (i.e., scenarios) can be summarized in this section as well.

Element ‘c’ of EPA’s “Nine Minimum Elements to Be Included in a Watershed Plan…” calls for “A description of the NPS management measures that will need to be implemented to achieve load reductions under paragraph (b) above (as well as to achieve other watershed goals identified in this watershed-based plan), and an identification (using a map or a description) of the critical areas in which those measures will be needed to implement this plan.” This section is key for addressing the ‘critical areas’ component of this element. To better provide a building block for meeting this EPA element, it is recommended that the narrative of this section specifically use the term ‘critical areas’ when describing the results/output.]

Table 7: Examples of prioritization tools

| Tools | Description | How can the tool be used? | Notes | Link to information  and data |
| --- | --- | --- | --- | --- |
| Board of Water and Soil Resources (BWSR) Landscape Resiliency Strategies | These webpages describe strategies for integrated water resources management to address soil and water resource issues at the watershed scale, and to increase landscape and hydrological resiliency in agricultural areas. | In addition to providing key strategies, the webpages provide links to planning programs and tools such as Stream Power Index, PTMApp, Nonpoint Priority Funding Plan, and local water management plans. | These data layers are available on the Board of Water and Soil Resources (BWSR) website.  The MPCA download link offers spatial data that can be used with GIS software to make maps or perform other geography-based functions. Various data sets described or available. | [Landscape Resiliency - Water Planning](https://bwsr.state.mn.us/practices/climate_change/Water_Planning.pdf)  [Landscape Resiliency - Agricultural Landscapes](https://bwsr.state.mn.us/practices/climate_change/Agricultural_Landscapes.pdf)  [MPCA data download](https://www.pca.state.mn.us/data/spatial-data) |
| Zonation | This tool serves as a framework and software for large‐scale spatial conservation prioritization, and a decision support tool for conservation planning. The tool incorporates values-based priorities to help identify areas important for protection and restoration. | Zonation produces a hierarchical prioritization of the landscape based on the occurrence levels of features in sites (grid cells). It iteratively removes the least valuable remaining cell, accounting for connectivity and generalized complementarity, in the process. The output of Zonation can be imported into GIS software for further analysis. Zonation can be run on very large data sets (with up to ~50 million grid cells). | The software allows balancing of alternative land uses, landscape condition and retention, and feature‐specific connectivity responses. (Paul Radomski, DNR, has expertise with this tool.) | [Software](https://www.helsinki.fi/en/researchgroups/metapopulation-research-centre/software)  Examples  [Pine River watershed](https://www.pca.state.mn.us/water/watersheds/pine-river)  [Cannon River Watershed](https://www.pca.state.mn.us/water/watersheds/cannon-river)  Appendix |
| Restorable wetland inventory | A GIS data layer that shows potential wetland restoration sites across Minnesota. Created using a compound topographic index (CTI) (10-meter resolution) to identify areas of ponding, and U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) soils with a soil drainage class of poorly drained or very poorly drained. | Identifies potential wetland restoration sites with an emphasis on wildlife habitat, surface and ground water quality, and reducing flood damage risk. | The GIS data layer is available for viewing and download on the Minnesota ‘Restorable Wetland Prioritization Tool’ website. | [Restorable Wetlands](http://www.mnwetlandrestore.org/links-contact/data-download/) |
| National Hydrography Dataset (NHD) and Watershed Boundary Dataset (WBD) | The NHD is a vector GIS layer that contains features such as lakes, ponds, streams, rivers, canals, dams, and stream gages, including flow paths. The WBD is a companion vector GIS layer that contains watershed delineations. | General mapping and analysis of surface-water systems. These data have been used for fisheries management, hydrologic modeling, environmental protection, and resource management. A specific application of this data set is to identify riparian buffers around rivers. | The layers are available on the USGS website. | [USGS](http://nhd.usgs.gov/) |
| Light Detection and Ranging (LiDAR) | Elevation data in a digital elevation model (DEM) GIS layer. Created from remote sensing technology that uses laser light to detect and measure surface features on the earth. | General mapping and analysis of elevation/terrain. These data have been used for erosion analysis, water storage and flow analysis, siting and design of BMPs, wetland mapping, and flood control mapping. A specific application of the data set is to delineate small catchments. | The layers are available on the Minnesota Geospatial Information Office (MGIO) website. | [MGIO](http://www.mngeo.state.mn.us/chouse/elevation/lidar.html) |
| Hydrological Simulation Program – Fortran (HSPF) Model | Simulation of watershed hydrology and water quality for both conventional and toxic organic pollutants from pervious and impervious land. Typically used in large watersheds (greater than 100 square miles). | Incorporates watershed-scale and nonpoint source models into a basin-scale analysis framework. Addresses runoff and constituent loading from pervious land surfaces, runoff and constituent loading from impervious land surfaces, and flow of water and transport/ transformation of chemical constituents in stream reaches. | Local or other partners can work with MPCA HSPF modelers to evaluate at the watershed scale: 1) the efficacy of different kinds of adoption rates of BMPs  2) effects of proposed or hypothetical land use changes. | [EPA Models](https://www.epa.gov/exposure-assessment-models/hspf)  [USGS](http://water.usgs.gov/software/HSPF/) |

* 1. Public participation

[Below is a brief introduction for public participation (PP). (Boilerplate language is minimized with more emphasis placed on narrative specific to the watershed). Please also note, as we progress to “Cycle 2” more information on PP is in development. Watch for updates.]

Public participation and engagement refers to education, outreach, marketing, training, technical assistance, and other methods of working with stakeholders to achieve water resource management goals. Public participation efforts vary greatly depending on the water quality topic and location in the state. It is important in any public participation effort to clarify public participation goals, and all efforts should have some evaluative component to show progress towards reaching the identified public participation goals.

Accomplishments and future plans

[Format here can vary. Element ‘e’ of EPA’s “Nine Minimum Elements to Be Included in a Watershed Plan…” calls for “An information and education component….” Completion of the items below should provide a building block for this requirement.

Public Participation (Cycle 1 WRAPS)

This is an area to show where you have explored and documented the social components of the watershed. Some efforts to consider include:

* A brief summary of the public participation plan for the four years of work in the watershed.
* Description of citizen-led groups that are established and contributed to watershed work.
* A list of groups/organizations involved in the development of the WRAPS or focused project.
* A summary of all local involvement in public participation efforts (How many meetings did you have? When in the WRAPS process? Where, when, and how were they held? Would you do anything different to expect different results?)
* A summary of results from event evaluations (meetings, tours, etc.).
* Planned PP efforts moving forward (What did you wish you could have or should have done and why?).
* Other ongoing education/outreach/awareness efforts moving forward, perhaps by other groups or government entities.
* Need for resources to build local capacity or other challenges.

Future updates of WRAPS documents

Revisions and updates of WRAPS documents can also include components of public participation; however, the public participation efforts will be limited in scope to address the focused efforts detailed in the Cycle 1 WRAPS report. Based on the partners’ input, additional public participation activities may be included as part of the WRAPS update. Funds for public participation and engagement activities are also included in some BWSR grants.

Public notice for comments

Providing an opportunity for public comment is an important part of the MPCA’s watershed work and public expectations. If there was extended time given to the public comment period, please indicate that and why extended time was granted. Examples of items that one could summarize include specific public comments that were felt to be special or a common theme running through multiple comments. At a minimum, please include this statement:

An opportunity for public comment on the draft WRAPS report was provided via a public notice in the *State Register* from [XXX] through [XXX]. There were [xx] comments received and responded to as a result of the public comment period.

* 1. Restoration and protection strategies

The strategies for restoration and protection should include supporting, explanatory narrative. In the past, this information has been in the form of a table. **However, a table format is not required; other methods can provide the information. More guidance is in development for “Cycle 2” WRAPS update projects.**

WRAPS strategies provide examples in defined watersheds of the types of change needed to achieve described water quality goals. Subsequent local planning steps (i.e., 1W1P) will describe more specific planning elements such as intended projects and efforts, resource needs for each project, who will be involved, and project timeframes. With growing experience in developing and using different formats to present strategies in the WRAPS report, we aim to continue to adapt and make WRAPS strategies more easily understandable and useful.

The guidance provided below should be used in conjunction with the WRAPS strategies table template provided in spreadsheet format. This spreadsheet table format has been used in many Cycle 1 WRAPS and will likely be helpful in WRAPS updates. Other formats are acceptable if they incorporate the required elements. A more updated guidance describing other formats and tools is in development and will likely be available later in 2020. It is still in a review process. **As noted above, a table is no longer required, it is offered here in more detail as simply one currently available tool that has been used by MPCA staff and stakeholders.**

The template spreadsheet identifies major strategy types and the most commonly used BMPs associated with each strategy type. After a specific pollutant or stressor is selected, the spreadsheet populates a drop down list of strategy types corresponding with that pollutant and stressor. And for each strategy type selected, the BMP drop down list is populated to include many of the more commonly used BMPs fitting for that strategy type.

The CWLA specifies the required components of a strategies format. Per Minn. Stat. [114D.26](https://www.revisor.mn.gov/statutes/cite/114D.26),   
subd. 1(b)(5) Each WRAPS must “**contain strategies that are capable of cumulatively achieving needed pollution load reductions for point and nonpoint sources, including identifying:**

**(i) Water quality parameters of concern;**

**(ii) Current water quality conditions;**

**(iii) Water quality goals, strategies, and targets by parameter of concern; and**

**(iv) Strategies and an example of the scale of adoptions with a timeline to meet the water quality restoration or protection goals of this chapter.”**

Completion of the WRAPS strategies table template (e.g. example spreadsheet template provided) fulfills all of the above requirements. Specific actions that describe how BMPs will be targeted and promoted to achieve accelerated adoption rates are typically deferred to local planning efforts. However, when stakeholders identify such social strategies during the WRAPS development phase, those ideas can be captured and incorporated as notes in an added column on the right-hand side of the strategies table or in a narrative format elsewhere in the WRAPS report.

The needed scale of adoption for each strategy can be most clearly quantified for conventional pollutants that have quantified load reduction needs (i.e., nitrogen, phosphorus, TSS). However, the WRAPS strategies table should include strategies for all major pollutants and non-pollutant stressors, including those for which a TMDL is not required. For example, if fish-biota impairments are identified due to connectivity/passage issues, WRAPS strategies tables may include dam removal or culvert modification practices.

The following sections provide additional guidance on the development of the WRAPS strategies table spreadsheet tool. **Should a different format be used (e.g., GIS maps, Story Maps or other graphics or output derived from watershed models), this information can be a reference for required components.** **Note: Guidance and tools for other strategies format is in development and expected for publication later in 2020. Project Managers may want to contact Eric Alms for further information regarding alternate formats and tools, readiness for use, location in MPCA’s network or other updates**.

**Overview of WRAPS Strategy table columns for spreadsheet tool**

1. **Water body and location**

Three columns fall under the “Water body and location” heading: 1) HUC10 Subwatershed,   
2) Water body ID, and 3) Location and upstream influence counties. Often there are multiple waters needing strategy scenarios in the same proximity and/or in the same nested watersheds. Individual watersheds may have different configurations of restoration and protection needs, and strategies should be developed to be the most useful and practical for that watershed. It’s often the case that the tools, available data/information, and available time with stakeholders do not allow for detailed scenario development for every lake and stream in a given major watershed. As such, in many instances there will be a need to aggregate waters and subwatersheds. The table and this guidance is intended to support such an approach. Use the principles and examples described below to guide table formatting, organizing and development.

* 1. **Multiple impairments in close proximity (single pollutant)**

Every area with impairments should be represented in some way by a strategies scenario. But strategy tables do not necessarily need to be developed separately for each individual subwatershed with an impairment. For impaired rivers extending beyond the HUC12, or for multiple lake impairments within the same HUC10 watershed, strategy scenarios can be developed for either multiple HUC12s combined or the larger scale HUC10 that encompasses the impaired river watersheds.

***For example***

If five lakes and two streams in adjoining or overlapping areas are impaired for phosphorus (i.e., lakes needing 10%, 13%, 25%, 30%, & 30% reductions, a local stream needing 20% reduction, and downstream river needing a 25% reduction), then some options for strategy scenarios include:

* + 1. **Use the highest reduction level in the combined areas** - develop a 30% P reduction strategy over the entire adjoining areas; OR
    2. **Focus on needs of the most downstream river/stream** – develop a 25% reduction scenario for the aggregated area, emphasizing in footnotes or narrative that BMP siting will need to be disproportionately higher in the two areas with lakes needing 30% reductions; OR
    3. **Focus on the average of the lake P reduction needs** – develop a 22% scenario for the entire aggregated area, since average lake P reduction needs are similar to the stream and river reduction needs in this example. Include in a footnote or narrative which lake watersheds and river subwatersheds will need disproportionately higher BMP adoption levels to meet TMDL reduction goals; OR
    4. **Focus on the larger scale watershed strategy, but also include a few smaller scale strategy examples** – develop a strategy scenario for the HUC10 watershed for a 25% reduction, and also develop a couple smaller scale lake subwatershed strategies to show the level of adoption needed in the most severely impacted or highest priority lake subwatersheds.

With the above options, not every sector (i.e., urban, cropland, other rural) and not every BMP would need to achieve the aggregated reduction target percentages, but rather the combined sectors and practices throughout the combined watersheds should cumulatively achieve the reductions.

Note: Where impairments in rivers or regional lakes have large contributing land areas that approach the size of the HUC10 watershed itself, the strategy scenarios can be developed for the entire HUC10 watersheds, using similar principles as noted in the above example.

1. **Multiple parameters with impairments in same area**

Where multiple parameters need improvement within the same watershed (i.e., P & TSS in the same river reaches), scenario tables can either be developed for individual parameters or they can be combined into a single strategy scenario. When combined, the strategy should typically show the higher BMP adoption levels if one pollutant needs more BMPs than another pollutant. Details, methods and assumptions can be included in footnotes, the body of the WRAPS table narrative, or an appendix to the WRAPS.

***For example***

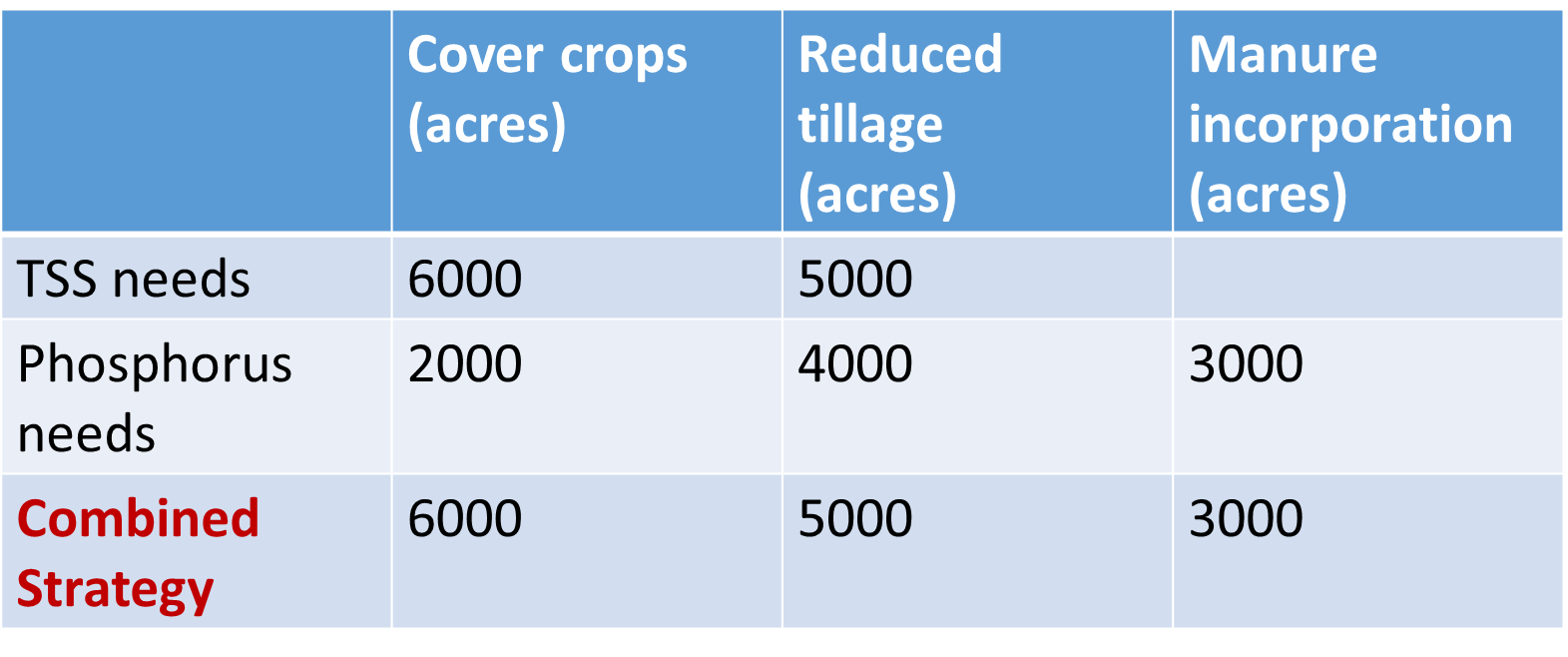
If TSS can be addressed in a given subwatershed through a combination of:

* 6000 acres of cover crops and
* 5000 acres in reduced tillage,

and P can be addressed in the same area with:

* 2000 acres of cover crops,
* 4000 acres of reduced tillage and
* 3000 acres of increasing manure incorporation,

then the scenario to address TSS and P would be the higher acreages of each BMP, which is 6000 acres of cover crops, 5000 acres of reduced tillage and 3000 acres of manure incorporation (see table below).



1. **Options for areas with no impairments**

Where not enough data exist to make assessment of impairment status, but landscape conditions are similar to other landscapes with water quality problems, strategies can incorporate the non-assessed areas as a) part of a larger scale watershed strategy scenario, or b) as a separate scenario assuming similar pollutant reduction needs as impaired watersheds with similar landscapes and land uses.

For watersheds or subwatersheds with no assessed impairments and are not likely to be impaired based on landscapes and land uses, strategies can be developed to address protection needs. No matter the area in Minnesota, water resources protection is a management strategy that makes sense. Preventing degradation can save millions of public dollars. It is a resource smart approach, and is grounded in scientific analysis and public involvement via the WRAPS process.

Protection, as used in WRAPS, is a term applied to water resources that currently meet water quality standards and are not identified as impaired. A majority of the evaluated water resources, 60%, meet water quality standards. Any strategies, actions or conservation practices that address an unimpaired resource or its watershed are considered protection.

Guidance documents have been produced to develop protection prioritization. These are available for lakes and streams and should be consulted during the WRAPS process. Find these documents at <https://www.pca.state.mn.us/water/prioritizing-protection-good-water-quality>.

The guidance for both lakes and streams provides a general step-by-step framework that can be used by a Project Team to identify lakes or streams that need special attention due to their vulnerability to existing and/or new sources of pollution, as well as those having exceptional water quality to be sustained through consistent stewardship actions. The framework starts with reviews of known data and an evaluative process developed and defined from a multi-agency collaboration. The Project Team can then enhance this information with other known specialized or locally derived information. A final step includes prioritizations of the resources for specific strategies and targeted goal setting.

1. **Integrating downstream pollutant reduction needs with local reduction needs**

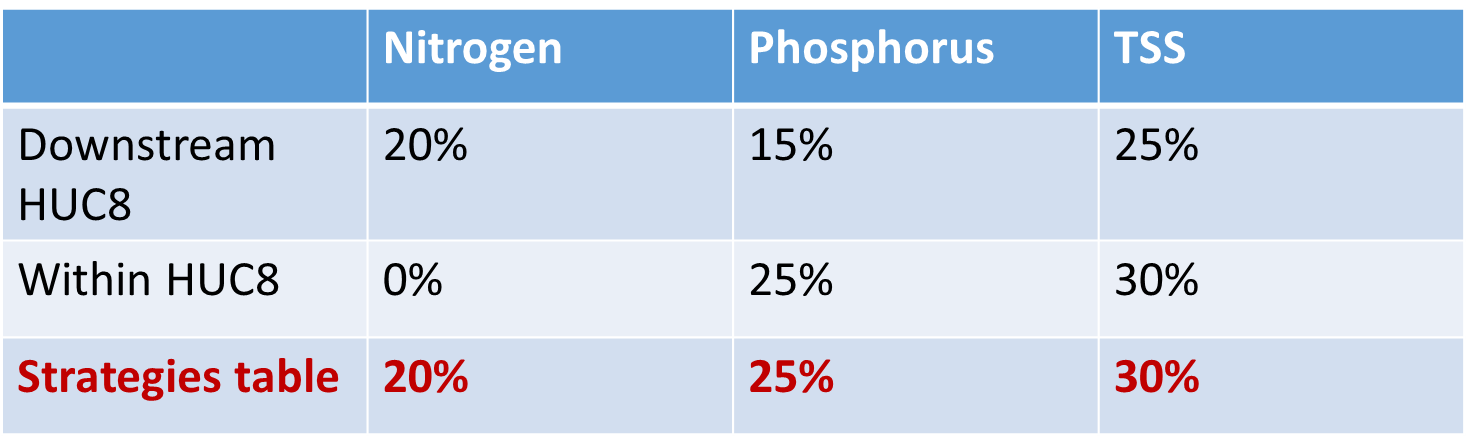
The WRAPS (and subsequent planning work) should be developed to not only address the goal of protecting and restoring water resources within a given Minnesota major watershed, but to also contribute to pollutant load reductions needed for downstream waters (in-state and out-of-state goals for the Mississippi River, Lake Pepin, Gulf of Mexico, Lake Winnipeg, etc., as reported in large-scale strategies).

To address pollutant reduction needs of waters downstream of the HUC8, strategy scenarios should be developed for either the entire HUC8 watershed or for each HUC10 watershed within the HUC8. This can be a separate scenario just for downstream waters that does not account for other strategy scenarios within the HUC8 watershed. Or alternatively, a merged scenario can be developed to address both downstream needs and within-watershed needs in the same scenario (see example below). A merged scenario may provide a more understandable and useable strategy for end-users, and works especially well if downstream reduction needs exceed or are roughly similar to collective needs within the HUC8.

***For example***

* If downstream needs for the South Metro Mississippi, Lake Pepin and the Gulf of Mexico strategies call for identified milestone reductions of 20% N, 15% P and 25% TSS, and
* If impairments in waters within the HUC8 call for average percent reductions of 0% N, 19% P, and 28% TSS,

Then, the strategy can be developed for the entire HUC8 (or each HUC10) to address the downstream needs (20% N, 15% P, and 25% TSS). Since the reduction needs within the HUC8 are similar to or lower than the downstream targets, both scales will be addressed by a scenario developed for the larger scale. Footnotes or narrative can be added to emphasize areas needing disproportionately higher levels of BMP adoption. To increase the usefulness of the strategy table scenarios, subwatershed scenarios can also be developed to show the magnitude of change that will be needed in subwatersheds with particularly high levels of needed pollutant reductions.



If the reductions to address problems within the HUC8 watershed are sufficient to address downstream goals/targets, then it’s fine to simply state that and focus only on the strategies for waters within the HUC8.

Note: Downstream goals set for the Gulf of Mexico and Lake Winnipeg are planning targets that are not the same as a TMDL. Point source reduction targets are often important for reaching large- and small-scale planning goals and within-state TMDLs. But where TMDLs are established, legal requirements affect regulations and permitting. These same regulatory requirements do not apply in the same way to non-TMDL planning goals.

1. **Water quality**
2. **Pollutant/Stressor:**

The pollutant/stressor column includes a dropdown box with the most common pollutants and stressors. For unimpaired waters with numerous possible pollutants and/or stressors, use your best judgement on which parameters to include so that you best balance table length, readability, and usefulness for end-users.

When a pollutant or stressor is selected, the strategy types and BMPs most fitting for that chosen pollutant or stressor will be populated in the drop down boxes in the “strategy types” and “BMPs” columns. The order that the columns are populated is important. First choose the pollutant and stressor, then the BMP strategy type, and finally the specific BMP. Each step builds on the previous step by populating appropriate corresponding drop-down options.

1. **Current WQ conditions**

“Current” condition is interpreted as the baseline condition over some evaluation period for the identified pollutant or non-pollutant stressor. This should be a numeric descriptor and unit of measurement. This can be a current load (from the TMDL or from the load monitoring program if pursuing a downstream goal and not a local goal) or a pollutant concentration (e.g., *E. coli* geometric mean).

Sites/parameters with insufficient water quality data can be nested within the larger HUC10 watershed strategies. In such cases, the associated goals and strategies will not be specific for the subwatershed or AUID, but will be associated with goals and strategies for the higher level watershed within which it resides.

1. **Milestones** – Prior to 2019 legislated changes of the statute, a 10 year milestone target was required. The 2019 statute change removed the required 10 year interim milestone. The current column should be considered **optional**. It can be useful for some specific situations and some partners who use milestones frequently in their watershed efforts. Your watershed team has the option to include or not. Typically the milestone will describe progress toward implementing the strategy in some increment of time. It may be in the form of a percentage, an amount or a narrative descriptor. Milestone situations may include: a milestone included in a 1W1P where the milestone timeframe is clearly defined, nitrogen strategies that align with the Minnesota Nutrient Reduction Strategy (NRS), TP and TSS reductions that CANNOT be realistically modeled to achieve the final goals i.e., 60-90% reductions needed. In the case of nitrogen, current milestones in the NRS are 20% of anthropogenic N in the Mississippi River Basin and 13% in the Red/Rainy watersheds at the outlet of each HUC 8. For TP and TSS, milestones can be based on a) 1W1P milestones, or b) a large-scale-strategy milestone like an approximate 1% reduction per year for a designated number of years.
2. **Final WQ goal:**

The final water quality goal should be expressed in the same terms as used in the “Current WQ conditions” column. For N, P, TSS, and other quantifiable pollutants, the final goal will generally be a load reduction target. For less quantifiable parameters (e.g., *E. coli*) the final goal can be stated as the target concentration or another metric of success established for that parameter. For protection projects, the final goal may be a water quality related load or concentration limit that should not be exceeded into the foreseeable future, maintaining conservation easements and conservation practice coverage, or some other measure of success. Final WQ goals will generally correspond to achieving an overall load reduction target, use support, etc., as compared to local water planning goals which typically operate on shorter time scales (e.g., ten years).

*Estimated Year to Achieve Goal:* Minnesota Statutes require “a timeline to meet the water quality restoration or protection goals.” Where considerable change on the land is needed to achieve water quality targets, future research and development of better approaches, practices and policies may greatly affect the timeframe to achieve final goals. Choosing timeframes for final goal achievement can often seem arbitrary. When available, use final goal timeframes from existing larger-scale strategies (i.e. Minnesota Nutrient Reduction Strategy), or local planning that justifies timeframes for final goals. Where existing timeframes for final goals are not defined elsewhere, work with project partners to select a range of years that the water quality goal could potentially be achieved under a good-case scenario (e.g., 2030-2035 or 2040-2050). Provide a footnote or narrative explaining the assumptions and uncertainty related to the estimated final goal timeframe.

1. **Strategies to achieve water quality goal**

The WRAPS incorporate scientific findings and modeling results to help identify key strategies/BMPs and the associated magnitude of adoption needed to potentially achieve water quality goals. For quantifiable pollutants such as nitrogen, phosphorus and sediment, the scenario includes the basic outcome of a modeling exercise (or similar analysis). Scenarios are intended to show the collective magnitude of effort (over years to decades) it will take to achieve the water quality goal (*final* goals where achievable). This estimate describes approximately what level of effort/change is needed to meet goals, but is not meant to provide details about “how” BMPs will be targeted and promoted or “who” will lead efforts to adopt BMPs.

At a minimum, WRAPS strategies need to include quantified load reduction scenarios for all conventional pollutants (i.e., N, P, TSS) with impairments. For pollutants and/or stressors with less-quantifiable load reduction needs, the strategy scenarios only need to include the key strategies/BMPs that can address the pollutants/stressors, along with a description of the general magnitude of adoption expected to meet goals, if known. Note that some stressors may have a quantifiable target, such as assessment scores.

The strategy scenarios provide a framework for local water planners to think about the science of achieving solutions to water quality challenges (i.e., combinations of practices and associated adoption acreages to achieve goals). The WRAPS strategy scenario provides one combination of practices expected to achieve goals. It is not the only scenario to achieve goals, nor is it necessarily the best strategy. Local water plan writers should consider the WRAPS scenarios practices and scales of adoption when developing more specific plans for addressing local water quality issues. Local water planning teams may decide to use a different combination of BMPs.

When developing the strategies tables from this spreadsheet, use the following guidance:

1. **Strategy type**

The “strategy type” column is intended to provide the higher-level categories of protection and restoration practices used to achieve water quality goals. To the extent possible, use the strategy types as provided in dropdowns to help facilitate potential future entry into data bases.

Once a strategy type is selected from the dropdown list, multiple BMPs associated with that strategy type will be populated as options in the BMP dropdown box. As previously noted, the order that the columns are populated is important. First choose the pollutant and stressor, then the BMP strategy type, and finally the specific BMP. Each step builds on the previous step by populating appropriate corresponding drop-down options.

1. **Which BMPs?**

The BMP scenario tables should provide a starting point for local water planning (i.e., 1W1P) consideration of potentially cost-effective solutions for reducing either single pollutant or multiple pollutants together. At the local level, several considerations will affect which BMPs are promoted and adopted, including: multiple benefits possibilities, land-owner willingness, BMP maintenance & management, cost-share availability, net costs to farmers, etc. The BMP selection and prioritization decisions will be sorted out during 1W1P development and implementation phases.

Practices in WRAPS scenario table drop-downs were selected based on terms and BMP groupings in: NRCS and eLINK practice listings, existing WRAPS, existing state-level strategies, existing models and tools, and other information. Make every effort to use the BMPs in the drop-down boxes since we are seeking to standardize terms and practices to the extent possible/reasonable.

Where deemed important, other BMPs that are not in the drop-downs can be inserted in strategies scenario tables. When an alternative BMP is considered/added, notify staff responsible for the WRAPS strategy table templates/guidance so that those same BMPs can be considered for addition to future templates and drop-down lists.

The “BMPs” for purposes of this table are not intended to include social strategies and other approaches to increase adoption of practices, but rather are intended to be the actual practices that directly achieve pollutant or stressor reduction/protection. Specific actions that describe how BMPs will be targeted and promoted with accelerated adoption rates, are typically deferred to local planning efforts. However, when such social strategies are identified by stakeholders during the WRAPS development phase, those ideas can be captured and incorporated into the WRAPS report as notes in an added column on the right or a separate narrative.

1. **BMP – Amount**

The “BMP Amount” column is the number of BMP units that correspond with the “BMPs” and “Units” columns. The amount is typically a number generated from a model or tool such as HSPF-SAM (SAM). The Units column has pre-populated terms to indicate whether the amount refers to acres of BMPs only, total treated acres by the BMPs, number of BMPs or some other variation of units.

**Tools to determine BMP amounts** – HSPF-SAM (SAM) can be used to generate scenarios showing optimized BMPs and adoption amounts based on maximizing the benefit of government cost-share dollars. The government cost-share optimization tables developed from SAM should be considered when government cost share programs are expected to help fund a large fraction of the local practice adoptions.

When SAM is not used, another agency-approved tool can be used to determine load reductions from specified BMPs adopted at specified assumed adoption levels.

**Extremely high load reduction needs** – In certain parts of the state, the nutrient and sediment reduction needs are so great that it would take a high percentage of land converted to grassland, wetland and/or forest to achieve water quality standards. Strategy scenarios can potentially be developed to show the magnitude of land use change needed to meet such major changes in water quality. However, a more useful scenario may be one based on an extremely high BMP implementation level on existing land uses, showing the level of pollutant reduction that can be achieved with (e.g., 100% BMP adoption on current land uses). Document your modeling approach and assumptions in the WRAPS narrative. In many cases, technical/social advancements will be needed in future decades to enable feasible achievement of final water quality goals.

1. **BMP unit**

When a BMP is selected from the drop-down box, an associated unit, such as “acres” or “number,” is pre-populated in the units column and intended to clarify what the number in the “amount” column is referencing. The BMP selected, along with the amount of that BMP in the units documented, will determine the modeled/estimated load reduction.

1. **Estimated reduction (lbs/year)**

Where feasible, the estimated load reductions from the modeled BMP adoption scenario should match the pollutant load reduction goal for that area.

**SAM load reductions** – HSPF-SAM (SAM) was designed to estimate pollutant load reductions to waters when specified BMPs are adopted in a specified watershed. At the time of this writing, this tool is currently being tested and refined. We anticipate that SAM improvements will enable this tool to be used with WRAPS as one of the primary methods to estimate pollutant load reduction scenarios for phosphorus, TSS and nitrogen. Other models or tools can be used in situations where SAM does not meet the needs of watershed strategy development, or to select the best approach based on results using multiple models/tools. Document all methods and assumptions in the appendix, including changes from the default values currently in the tools.

Another way to use SAM, especially in watersheds with numerous impaired waters and high pollutant load reduction needs, is to model a combination of preferred practices at an assumed high level of adoption (i.e., assume practice YYY on 30% of suitable acres and practice ZZZ on 45% of suitable acres). Run the same adoption scenario percentages on all watersheds of interest. This is a good starting point to understand how close high adoption levels of key practices will bring you toward needed load reduction goals. Follow up modeling can then be used in certain high priority watersheds to try and better match the modeled load reductions with the goals. To see an example of this approach, see the Lower Minnesota River Watershed WRAPS report.

Also, SAM can be used to show how nutrient and sediment load is predicted to change by modifying land use (i.e., converting to more perennials), and land use change scenarios can also be added to the WRAPS report.

**End of Spreadsheet Tool discussion.**

**Climate protection co-benefit of strategies**

(The heading and language below should be included in the WRAPS. Some northern watersheds may have fewer ag-related BMPS but the NRCS manual does include information for riparian buffers, conversion of open lands or fields to forest, such like that.)

Many agricultural BMPs which reduce the load of nutrients and sediment to receiving waters also act to decrease emissions of greenhouse gases (GHGs) to the air. Agriculture is the third largest emitting sector of GHGs in Minnesota. Important sources of GHGs from crop production include the application of manure and nitrogen fertilizer to cropland, soil organic carbon oxidation resulting from cropland tillage, and carbon dioxide (CO2) emissions from fossil fuel used to power agricultural machinery or in the production of agricultural chemicals. Reduction in the application of nitrogen to cropland through optimized fertilizer application rates, timing, and placement is a source reduction strategy; while conservation cover, riparian buffers, vegetative filter strips, field borders, and cover crops reduce GHG emissions as compared to cropland with conventional tillage.

The USDA Natural Resources Conservation Service (NRCS) has developed a ranking tool for cropland BMPs that can be used by local units of government to consider ancillary GHG effects when selecting BMPs for nutrient and sediment control. Practices with a high potential for GHG avoidance include: conservation cover, forage and biomass planting, no-till and strip-till tillage, multi-story cropping, nutrient management, silvopasture establishment, other tree and shrub establishment, and shelterbelt establishment. Practices with a medium-high potential to mitigate GHG emissions include: contour buffer strips, riparian forest buffers, vegetative buffers and shelterbelt renovation. A longer, more detailed assessment of cropland BMP effects on GHG emission can be found at NRCS, *et al*., “COMET-Planner: Carbon and Greenhouse Gas Evaluation for NRDC Conservation Practice Planning <http://comet-planner.nrel.colostate.edu/COMET-Planner_Report_Final.pdf>.

1. **Additional formatting considerations for tables**
2. **Use footnotes and narrative** - Since there are multiple possible ways to configure strategy scenario tables, where tables are used, make sure to specify which water bodies are included in each strategy scenario and how the strategy was developed. Add a narrative description to further explain, when necessary (i.e., explaining which waters, parameters and reduction goals are addressed by the scenario, and whether the scenario overlaps with other scenarios).
3. **Divide by geographic areas** - For ease of use and readability, it is recommended that the table be broken up by geographic area and that a map of the geographic area precede the table. This may be done by subwatershed or some other useful land management-based area. See for example the Sunrise River WRAPS at: <http://www.pca.state.mn.us/zihya01>.
4. **Watershed-wide strategies** - The table may include rows (preferably at the top; in white) for watershed-wide strategies or large divisions of land within the watershed (i.e., ecoregions). For example, wastewater permits and construction and industrial stormwater permit compliance are strategies that are often applicable across the watershed and do not have water body-specific targets associated with them.
5. **Addendums -** Addendums can be added to the WRAPS scenario table to provide additional helpful aids for local planning.

Table 8: Strategies and actions proposed for the [Name] Watershed. [See [Excel spreadsheet](http://www.pca.state.mn.us/index.php/view-document.html?gid=22546) version for structure and example contents. The spreadsheet may be used for drafting purposes and then incorporated into a final PDF report] NOTE: This is an example spreadsheet tool developed for “Cycle 1” WRAPS and likely some WRAPS updates may choose to use this tool. It is not required if all WRAPS elements are addressed via another format.

1. Monitoring plan

[Per Minn. Stat. [114D.26](https://www.revisor.mn.gov/statutes/cite/114D.26), subd. 1, (b) (4) “**Each WRAPS must in consultation with local governments and other state agencies, identify water quality monitoring needed to fill data gaps, determine changing conditions, or gauge implementation effectiveness.**” In addition to specific local monitoring efforts this section can outline the MPCA’s major watershed outlet monitoring program, which will provide a long-term, ongoing data record.

Element ‘h’ of EPA’s “Nine Minimum Elements to Be Included in a Watershed Plan…” calls for “A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards.” EPA’s guidance indicates using water quality benchmarks or waypoints to measure against through monitoring (e.g., direct measures like fecal coliform concentrations or indirect measures like number of beach closings). This generally translates to listing the parameter, implementation phases/years, and parameter concentration to be achieved (e.g., TP: year 10 = 80 µg/L; year 20 = 70 µg/L; etc.). This could get unwieldy given the many parameters covered and varying starting points for the many water bodies in a watershed. Therefore, it may be preferable to use an approach and narrative as indicated below to meet this element:]

It is the intent of the implementing organizations in this watershed to make steady progress in terms of pollutant reduction. Accordingly, as a very general guideline, progress benchmarks are established for this watershed that assume that improvements will occur resulting in a water quality pollutant concentration decline each year equivalent to approximately [one]% of the starting (i.e., long-term) pollutant concentration. For example, for a lake with a long-term growing season total phosphorus concentration of 90 µg/L, by year 10 it would be 90 – (10 \* 0.9) = 81 µg/L. [If the pace varies by parameter then expand this accordingly.]

Again, this is a general guideline. Factors that may mean slower progress include limits in funding or landowner acceptance, challenging fixes (e.g., unstable bluffs and ravines, invasive species), and unfavorable climatic factors. Conversely, there may be faster progress for some impaired waters, especially where high-impact fixes are slated to occur.

[Note: WRAPS authors should consider project modeling/scenario information and also review relevant statewide efforts, e.g., Minnesota Nutrient Reduction Strategy, to align any implementation pace-related information from statewide efforts with water quality projections in this section.

Element ‘i’ of EPA’s “Nine Minimum Elements to Be Included in a Watershed Plan…” calls for “A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h).” Both local and MPCA-led monitoring outlined here should provide a building block for this element.]

1. References and further information

[Include any references cited in the text such as SID reports, monitoring and assessment reports, TMDLs, documentation for tools and implementation strategies.]

[Watershed name] Reports

All [watershed name] reports referenced in this watershed report are available at the [watershed name] watershed webpage: [insert link to watershed from <http://www.pca.state.mn.us/index.php/water/water-types-and-programs/watersheds/watershed-overview-map.html>]

When inserting URLs in the document, please insert only the most important links and select links that should have the most longevity. Instead of inserting URLs in the body of the report, **reference** documents in the report and add links to the reference citations in that section. Be consistent in your citation style. Examples below:

Chandrasekaran, R., M. J. Hamilton, P. Wang, C. Staley, S. Matteson, A. Birr, and M. J. Sadowsky. 2015. Geographic Isolation of *Escherichia coli* Genotypes in Sediments and Water of the Seven Mile Creek — A Constructed Riverine Watershed. Science of the Total Environment 538:78–85. [https://doi.org/10.1016/j.scitotenv.2015.08.013](https://gcc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fdoi.org%2F10.1016%2Fj.scitotenv.2015.08.013&data=02%7C01%7Ckaren.evens%40state.mn.us%7C7041f18c66f24fba538608d7ebbc9d11%7Ceb14b04624c445198f26b89c2159828c%7C0%7C0%7C637237067625026406&sdata=SHyMq0sgXrbcVTY4Soc%2FX7HGva6ilVKII9cB4D7I1Io%3D&reserved=0)

EPA (U.S. Environmental Protection Agency). 2013. A Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program. December 2013. [https://www.epa.gov/sites/production/files/2015-07/documents/vision\_303d\_program\_dec\_2013.pdf](https://gcc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.epa.gov%2Fsites%2Fproduction%2Ffiles%2F2015-07%2Fdocuments%2Fvision_303d_program_dec_2013.pdf&data=02%7C01%7Ckaren.evens%40state.mn.us%7C7041f18c66f24fba538608d7ebbc9d11%7Ceb14b04624c445198f26b89c2159828c%7C0%7C0%7C637237067625036363&sdata=FuLl3c%2B0268E6TODIjc8wTiPpM9CikqmKY%2BJbYJEdwk%3D&reserved=0)

1. Appendix

[The MPCA staff created a guidance document that includes a list of standard maps, with examples for WRAPS reports. The document is titled ‘Maps in Watershed Restoration and Protection Strategy Reports’ and is available at the page identified below, under ‘Step 3: Develop strategies to restore and protect the watershed's bodies of water.’]

[<https://www.pca.state.mn.us/water/watershed-approach-restoring-and-protecting-water-quality>]

**EPA’s Section 319 Nine Elements Summary: Guidance for WRAPS Template**

The EPA requires that 319 grant applications be based on watershed plans that address the nine elements described below. This is from guidance found on EPA’s website at:

<https://www.epa.gov/sites/production/files/2015-09/documents/319-guidelines-fy14.pdf>

The document below addresses the nine minimum elements described in Appendix C of the EPA guidance. Text found in this WRAPS template is taken from that document. The nine minimum elements are required for approval of 319 fund dispersal.

| Element # | Element description | WRAPS section where addressed | Notes |
| --- | --- | --- | --- |
| A | An identification of the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in this watershed-based plan (and to achieve any other watershed goals identified in the watershed-based plan), as discussed in item (b) immediately below. Sources that need to be controlled should be identified at the significant subcategory level with estimates of the extent to which they are present in the watershed (e.g., X numbers of dairy cattle feedlots needing upgrading, including a rough estimate of the number of cattle per facility; Y acres of row crops needing improved nutrient management or sediment control; or Z linear miles of eroded streambank needing remediation). | **Section 2.3 Stressors and sources** should provide the general source ID information needed. **Section 3.3 Restoration & protection strategies** provides more source specific subcategory type of information. | EPA guidance states that the plan should include a map “that locates the major causes and sources of impairment.” Guidance also states, “If a TMDL exists, this element may be adequately addressed.” |
| B | An estimate of the load reductions expected for the management measures. | **Section 3.3 Restoration & protection strategies** should provide source specific reduction information. |  |
| C | A description of the NPS management measures that will need to be implemented to achieve the load reductions under paragraph (b) above (as well as to achieve other watershed goals identified in this watershed-based plan), and an identification (using a map or a description) of the critical areas in which those measures will be needed to implement this plan. | **Section 3.3 Restoration & protection strategies and Section 3.1 Targeting of geographic areas** should provide this via the strategies table and supporting maps/GIS tools showing critical areas. |  |
| D | An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan. | **Section 3 Prioritizing and implementing restoration and protection** should address this. Reference to cost estimates in TMDLs should also be cited. | Based on one recent EPA-approved plan (Bad Axe River, MI), it appears acceptable to focus narrative on the available funding sources and organizations that could provide technical assistance. |
| E | An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented. | **Section 3.2 Public Participation** |  |
| F | A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious. | **Section 3.3 Restoration & protection strategies** Interim 10-year milestones in Strategies table likely address this. |  |
| G | A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented. | **Section 3.3 Restoration & protection strategies** Interim 10-year milestones in Strategies table likely address this. |  |
| H | A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards. | **Section 4 Monitoring** | EPA guidance indicates using water quality “benchmarks or waypoints to measure against through monitoring (e.g., direct measures like fecal coliform concentrations or indirect measures like # of beach closings).” This generally translates to listing the parameter, implementation phases/years and parameter concentration to be achieved (e.g., TP: year 10 = 80 µg/L; year 20 = 70 µg/L; etc.). This could get unwieldy given the many parameters covered and varying starting points for the many water bodies in a watershed. Therefore, see the alternative approach/narrative in Section 4. This element is to be integrated with element I below. |
| I | A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above. | **Section 4 Monitoring** | Per EPA guidance, this is intended to be watershed-scale monitoring and not monitoring for individual BMPs. Both local and PCA-led monitoring (i.e., HUC-8 pour point continuous monitoring and 10-year IWM cycle) should be described. |