Technical Memorandum

To: Root River Planning Partnership

From: Rachel Olm, M.S.
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Subject: Five-Year Assessment of the Root River One Watershed, One Plan

Date: December 4, 2023

Project: 8861-0002

ACRONYM SUMMARY

1W1P	One Watershed, One Plan
AGOL	ArcGIS Online
BEAST	Benefits Estimator and Summary Tool
BMP	Best Management Practice
BWSR	Board of Water and Soil Resources
Esri	Environmental Systems Research Institute
HEI	Houston Engineering, Inc.
HSPF SAM	Hydrologic Simulation Program FORTRAN Scenario Application Manager
HUC	Hydrologic Unit Code
MDA	Minnesota Department of Agriculture
MPCA	Minnesota Pollution Control Agency
NRCS	Natural Resources Conservation Service
PRAP	Performance Review and Assistance Program
PTMApp	Prioritize, Target, and Measure Application
RR 1W1P	Root River One Watershed, One Plan
RRW	Root River Watershed
SMUMN	St. Mary's University of Minnesota
SWCD	Soil and Water Conservation District
WBIF	Watershed-Based Implementation Funding

INTRODUCTION

In 2014, the Root River One Watershed, One Plan (RR 1W1P) Planning Partnership was selected as a pilot on an evolutionary planning process to develop one of the first 1W1Ps in the state. The 1W1P initiative is designed to align water planning on major watershed boundaries to create prioritized, targeted, and measurable watershed plans developed and implemented locally.

The RR 1W1P is a 10-year comprehensive watershed management plan aimed at better managing water within a larger watershed planning area. The RR 1W1P planning area encompasses more than 1.3 million acres, which is spread across six counties: Dodge, Fillmore, Houston, Mower, Olmsted, and Winona. The local partners involved in implementation include counties, Soil and Water Conservation Districts (SWCDs), and a watershed district (Figure 1). In December 2016, the RR 1W1P was approved by the Minnesota Board of Water and Soil Resources (BWSR).

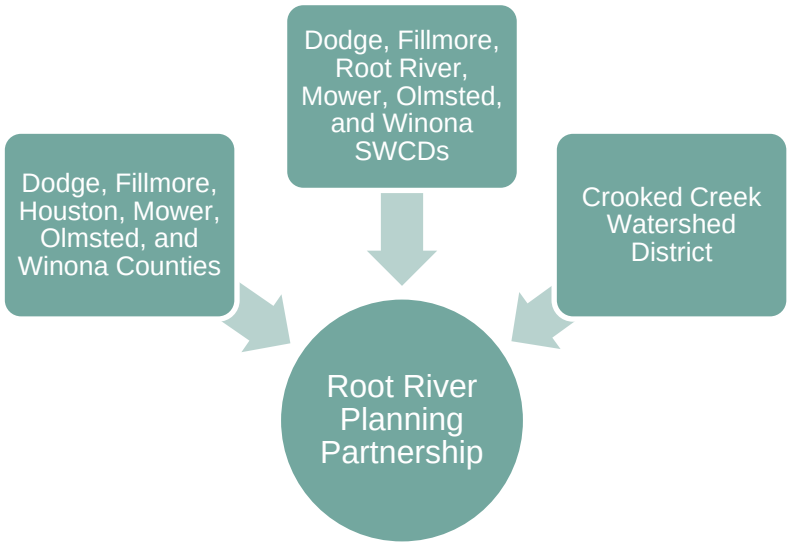

Figure 1. Local governments in the Root River Planning Partnership that partnered for plan implementation

In 2023, the RR 1W1P reached the midpoint in its 10-year plan lifespan. After six years of plan implementation, the Partnership is again piloting a new process to evaluate implementation efforts and assess progress toward plan measurable goals. The intent of the Five-Year Assessment of the RR 1W1P ("Project") was to:

- Gather and compile data about work activities (projects, practices, or programs) implemented by local government implementers and their partners that contributed to reaching goals in the plan;
- Compare the work activities (projects, practices, or programs) the Partnership completed with the work activities they set out to accomplish in the time frame specified by the plan;
- Compare the resource results associated with projects, practices, or programs to the stated resource goals/outcomes in the plan.

The process and outcomes from this Project are summarized in this memo.

BACKGROUND AND PLAN ORIENTATION

The RR 1W1P outlines priority issues, resource goals, and expected actions to be implemented in the Root River Watershed from 2017-2027. Part of BWSR's Plan Content Requirements is for plan goals to be measurable so that progress toward goals can be evaluated and connections can be made between state funding and quantifiable resource improvements. As such, the RR 1W1P sets measurable goals for all priority resource concerns in Table 4-4 of the plan. Within Table 4-4, each priority resource concern is assigned two measurable goals:

Quantitative Measurable Goals are technical goals that are more quantitative in nature, such as target load reductions in sediment, nutrients, or runoff. These goals are generally connected to statewide strategies, such as the Minnesota Nutrient Reduction Strategy. Target dates for meeting these goals oftentimes fall outside of the 10-year lifespan of the plan.

Example: 45% reduction in nitrogen by 2040 to align with Minnesota Nutrient Reduction Strategy

Reporting Measurable Goals use metrics to track progress towards the quantitative measurable goals. These metrics are tracked at the HUC-10 scale and represent implementation outputs.

Example: 10 BMPs implemented in Bear Creek planning region per year

Many of the reporting measurable goals are to implement practices in each HUC-10 annually as defined in the "implementation approach". The RR 1W1P implementation approach was defined by the Planning Work Group during the RR 1W1P planning process, and includes the BMPs selected using the Prioritize, Target, and Measure Application (PTMApp) to provide the greatest total nitrogen reduction locally and the greatest sediment reduction downstream. The reporting measurable goals for each HUC-10 are further defined in the "field practices table" (Plan Table 4-7) of the plan. PTMApp was also used to provide quantitative measurable goals for each HUC-10 in the field practices table, based on the modeled sediment, nitrogen, and phosphorus benefits of implementing BMPs within each HUC-10's implementation approach.

Progress towards both quantitative and reporting measurable goals is made through the implementation of actions, specified in the "targeted implementation schedule" (Plan Table 4-6) of the plan. Together, actions were developed to address issues identified in groundwater, surface water, infrastructure, landscape features, and social capacity/sustainability of communities.

ASSESSMENT PROCESS

Compiling Information

Over the last six years of implementation efforts, progress towards plan goals has been made through implementation of field practices, education and outreach, and research initiatives. Implementation of field practices has been a prominent means of addressing priority issues and making progress toward plan goals.

Field practices can be defined as projects that are implemented on the landscape to prevent or reduce water pollution. Within the plan, these practices are categorized based on their primary treatment mechanism to prevent or reduce pollution as modeled by PTMApp: storage, filtration, source reduction, or infiltration.

From 2017-2022, local planning partners recorded information about field practice implementation in two primarily locations: a “Local Tracking Table” and eLINK, BWSR’s conservation tracking system for practices implemented using BWSR grants. The Local Tracking Table is a spreadsheet maintained by Fillmore SWCD which included information at a per-practice scale on the BMP/conservation practice implemented, the location of the practice implemented (at least to the township level), and the load reductions estimated for sediment, phosphorus, nitrogen, and soil loss reductions. The eLINK system summarizes information at a per-practice scale on the BMP/conservation practice implemented, the location of the practice implemented (using x and y coordinate systems), the load reductions estimated for sediment, phosphorus, nitrogen, and soil loss reductions, and more.

To compile all relevant field practice activity over the past six years, HEI downloaded statewide eLINK data from Minnesota Geospatial Commons, then clipped actions to only those implemented within the watershed boundary from 2017- most current. There were 289 entries for field practices entered into eLINK for that specified time within the watershed. BWSR also provided HEI a dataset of additional actions not yet available on the Minnesota Geospatial Commons eLINK dataset. This added another 157 entries for field practices. Lastly, HEI received the Local Tracking Table from Fillmore SWCD, which included a list of 116 NRCS practices implemented in the watershed.

Since Local Tracking Table actions could be entered in eLINK as well, these were checked against each other for duplicates so that field practices and associated load reduction benefits were not unintentionally counted twice. Actions in the Local Tracking Table were matched with duplicate entries in eLINK by matching the reported reductions in sediment, phosphorus, and nitrogen. Local Tracking Table actions that had identical load reductions to multiple eLINK actions were matched by further checking the NRCS practice, the location, and the acres of the practice. One practice in the Local Tracking Table was flagged as an outlier and was removed based on local planning partner feedback due to likely user error in entering the action load reduction benefits.

An “Implementation Spreadsheet” was created as a comprehensive list of all field practice implementation actions from the three sources along with any data associated with those actions. It indicates if actions came from eLINK, the newer BWSR-provided eLINK, the Local Tracking Table, or multiple. **In total, 487 unique field practices are inventoried in the Implementation Spreadsheet from 2017-2022.**

St. Mary’s University of Minnesota (SMUMN) added subwatershed (HUC-10 and HUC-12) attributes to this table based on the known practice location at the finest scale provided. eLINK practice data came with x and y coordinates, so the exact location is known. The Local Tracking Table data was only identified to the township/section/range scale, thus specific practice location was set to be in the center of this range. Associating each action with its HUC-10 and HUC-12 subwatershed is useful for tracking the density of actions, or where in the landscape implementation was occurring most. This allows the Partnership to compare where implementation has been most prominent and if it aligns with the subwatershed that have been prioritized during annual work planning efforts.

Summarizing Implementation

SMUMN created an interactive ArcGIS dashboard (available at https://smumn.maps.arcgis.com/apps/dashboards/549404b784ed4218a5aae23e9e352129) that visually summarizes field practice implementation efforts over the past six years. The dashboard includes an interactive map of the watershed in which the view can see the locations where field practices have been implemented, and the density of practice implementation in a geographic area compared to the subwatersheds that have been prioritized by annual work planning efforts. In addition to a map, the dashboard also has a histogram summarizing the count of field practices that have been implemented in each HUC-10 subwatershed. This information is also summarized in a static map later in this memo (Figure 2).

Tables in the RR 1W1P were amended to add on additional information gathered from the assessment. The targeted implementation schedule was delivered to the Partnership to review the progress. The targeted implementation schedule (Plan Table 4-6) lists all actions, their categories, lead and partners, along with a year and cost planned for implementation. To support the Partnership in their Performance Review and Assistance Program (PRAP) process, the following columns were added to the table:

- Accomplishments to date
- Actual implementation date
- Next steps
- BWSR Scoring (left blank for BWSR to complete)

The field practices table (Plan Table 4-7) summarizes the quantitative and reporting measurable goals for each HUC-10 based on the modeled sediment, nitrogen, and phosphorus benefits of implementing BMPs within each HUC-10's implementation approach. Through the assessment process, additions were made to the table to show the following for each HUC 10:

- 5-year goal for number of BMPs
- Actual number of BMPs implemented
- Percent progress towards Number of BMP goal
- Types of BMPs implemented
- 5-year actual load reduction
- Percent towards the 5-year load reduction goal

A summary of the field practices table that only shows the load reductions for each drainage basin is included in the Executive Summary BMP table (Plan Table ES-2). This sums the total load reductions in each HUC-10 either draining into the Mississippi River or to Iowa and shows the percent progress towards the 5-year goal for sediment, nitrogen, and phosphorus.

FINDINGS

During implementation, the estimated sediment and phosphorus load reduction benefits of a given BMP were estimated using the BWSR calculator. This calculator estimates sediment loss pre and post implementation then uses a sediment to phosphorus relationship to estimate TP reduction. Nitrogen load reduction estimates were obtained for some BMPs using HSPF SAM or literature values. It is important to note that these load reduction numbers are modeled based on inputs about the BMP type and location, and not measured load reductions. It is also important to note that PTMApp was the tool used to model the implementation approach

and set quantitative measurable goal numbers found in the field practices table. As PTMApp, HSPF SAM, and the BWSR Calculator all estimate mass load reduction benefits of BMPs differently, this creates a challenge in comparing load reduction benefits in the Implementation Spreadsheet to HUC-10 quantitative load reduction goals in the field practices table (Plan Table 4-7). For this reason, and based off input from BWSR and the Partnership, this assessment compares progress towards HUC-10 reporting goals as the mechanism for evaluating implementation efforts in this Project.

Within the field practices table, the HUC-10 reporting measurable goals are reported as the number of BMPs that should be implemented per year. For purposes of this mid-point (5-year) evaluation, this Project multiplied the number of BMPs shown in the reporting measurable goals by five to create a mid-point reporting goal. Then, the number of unique BMPs inventoried in Implementation Spreadsheet were summarized for each HUC-10. It should be noted that implementation dates in the Implementation Spreadsheet ranged from 2017 – 2022. The final progress to-date toward the mid-point reporting measurable goal is shown for each HUC-10 below in **Table 1**, with entries in yellow showing over 50% of progress made and entries in green indicating the reporting measurable goal has been achieved to-date.

Table 1. Progress towards mid-point reporting measurable goals.

HUC 10 Name	Number of BMPs (Mid-Point Reporting Goal)	Number of BMPs Implemented	Progress Towards Mid-Point Reporting Goal
Bear Creek	50	19	38%
Canoe Creek	18	0	0%
City of Rushford - Root River	45	29	64%
Cold Water Creek-Upper Iowa River	50	6	12%
Crooked Creek	52	47	90%
Headwaters Upper Iowa River	50	9	18%
Middle Branch Root River	51	36	71%
Money Creek	51	19	37%
Mormon Creek-Mississippi River	44	10	23%
North Branch Root River	51	34	67%
Root River	52	44	85%
Rush Creek	53	34	65%
South Branch Root River	51	48	95%
South Fork Root River	52	111	216%
Trout Run-Root River	50	20	40%
Upper Iowa River	14	0	0%
Winnebago Creek	52	21	41%

The most common BMPs implemented in the RRW are grassed waterways and swales, cover crops, and grade stabilization structures. The number of BMPs was recorded as the total number of field practices implemented (487). However, some field practices were implemented with multiple components- for example a landowner may have 5 grassed waterways installed. If the count within each field practice project is summed, the total is 716 BMPs. To be on track to meet the 10-year goal of 1,562 BMPs, the midpoint BMP goal would be 781. Additionally, the Implementation Spreadsheet only considers the field practices that have been implemented with state funding (primarily Watershed-Based Implementation Funding). It is very likely that additional progress toward reporting measurable goals has been made through other sources of funding (i.e., federal funding, EQIP).

These are not the only actions being implemented in the watershed. As part of the Healthier Watershed effort, the Minnesota Pollution Control Agency (MPCA) tracks additional BMPs including those from NRCS, Minnesota Department of Agriculture (MDA), and BWSR. These are summarized in **Table 2** and are likely making additional progress towards plan goals.

Table 2. Healthier Watersheds data by BMP installed in the RRW 2017-2022.

	Easements (BWSR)	Agricultural BMP Loan Program (MDA)	Minnesota Agricultural Water Quality Certification Program (MDA)	Conservation Stewardship Program (NRCS)	Environmental Quality Incentives Program (NRCS)
Acres	2,140	10,070	2,220	2,390	18,640
Feet			48,200	3,850	89,360

Figure 2 summarizes the number of practices that have been implemented in each HUC-10. The South Fork subwatershed is the largest hotspot for implementation activities- 111 BMPs have been installed there, more than doubling its reporting measurable goal. This is largely due to the targeted implementation efforts associated with the Field to Stream Partnership in this subwatershed.

Figure 2 also shows the subwatersheds that have been prioritized during annual work planning efforts. Showing these two data sets together allows the Partnership to evaluate if implementation efforts have been effectively targeted to priority subwatersheds. Most practice efforts have been focused in priority subwatersheds, reflecting a change in how conservation has been delivered since the RR 1W1P. However, there is opportunity to implement additional conservation efforts in the Money Creek and a subset of Trout Run-Root River priority subwatersheds, as these priority areas have the least amount of BMPs implemented.

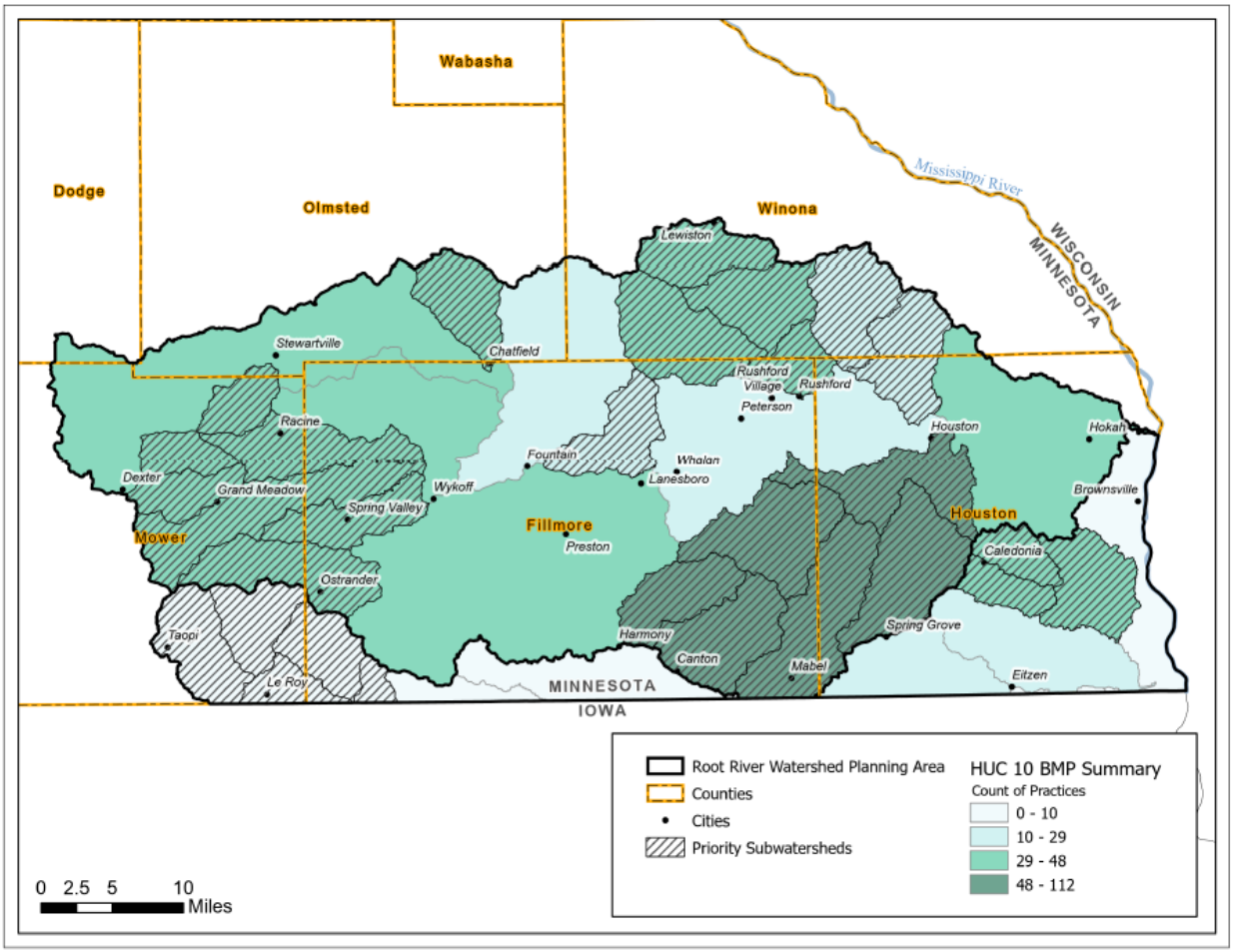

Figure 2. Count of BMPs implemented in HUC-10 subwatersheds and priority subwatersheds.

The cumulative load reductions from field practices in the Implementation Spreadsheet are summarized in **Figure 3**. **This graphic was created to align with the Executive Summary BMP table, showing the cumulative benefits of conservation practices either flowing to the Mississippi River or south into Iowa**. It should be noted that this benefit takes into account estimates from HSPF-SAM and the BWSR calculator cumulatively. Practically, these estimators have different means of estimating the load reduction benefit of conservation practices implemented on the landscape.

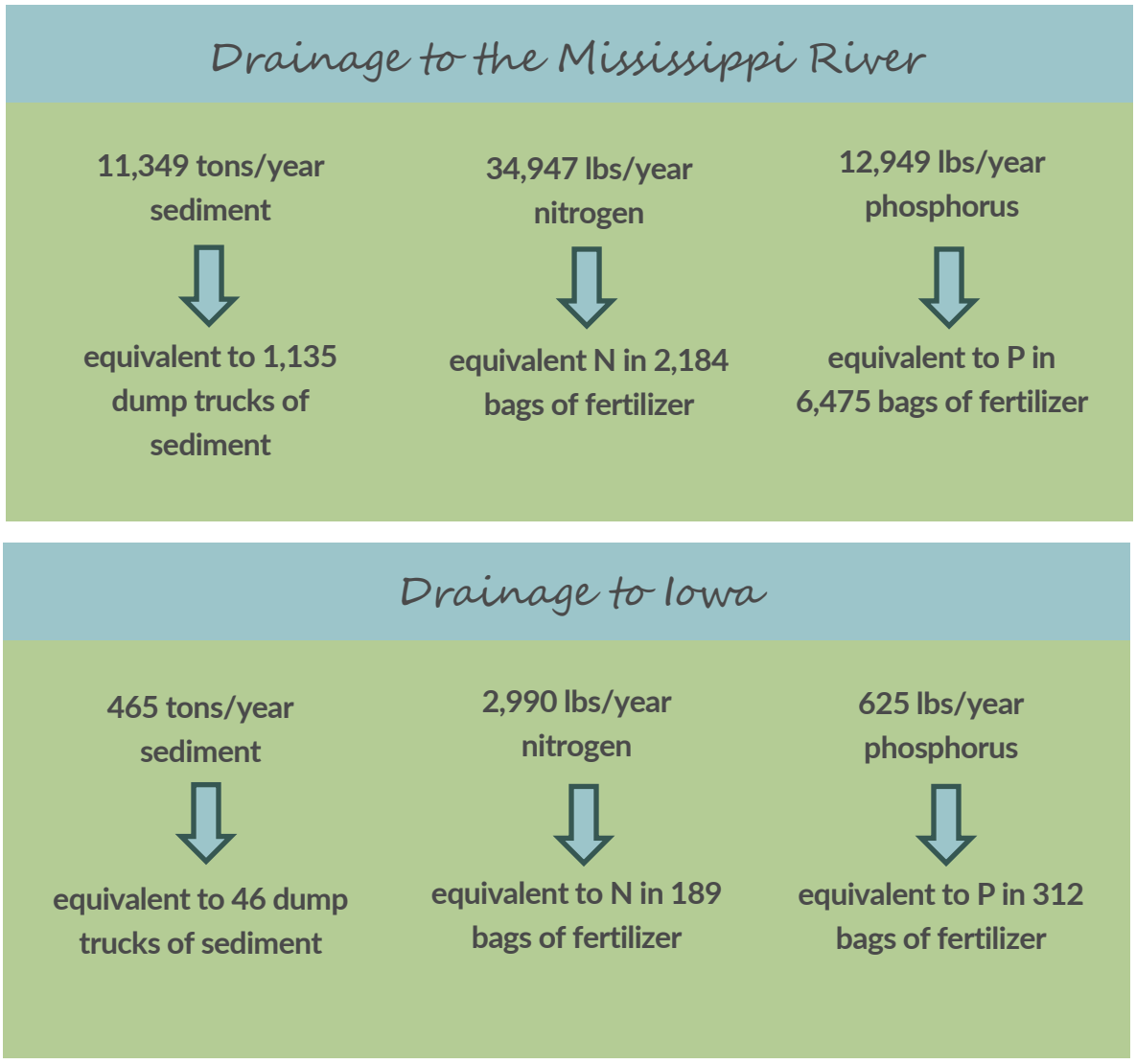

Figure 3. The load reduction due to the RR1W1P implementation in the Mississippi River and entering Iowa (edge of field benefits cumulatively reported).

The MPCA collects water quality samples and conducts pollutant concentration trends at multiple locations across the watershed. Trends for the Root River near Mound Prairie for 2008-2020 show significant decreases across all flow regimes for phosphorus and total suspended solids and no significant trend for nitrate + nitrite. While data to support this trend analysis began prior to plan implementation, continuing to reevaluate water quality trends will be important for understanding the resource impacts of conservation action on the landscape.

EVALUATING IMPLEMENTATION

HEI facilitated a workshop with the Planning Work Group and Advisory Committee in May 2023 to show findings from the assessment. As part of this workshop, an activity was conducted with the Planning Work Group to identify conservation barriers they experienced or became aware of while implementing the plan. Barriers were

organized into themes of staff capacity, staff expertise, political support, regulatory, social acceptance, and financial barriers. Outcomes from the activity are summarized in **Figure 4.** Identifying barriers to conservation action is useful for guiding implementation efforts in the next five years.

Figure 4. LGU-identified barriers to plan implementation efforts

HEI then facilitated a discussion with Planning Work Group members about the plan and the achievability of its measurable goals. Outcomes from the discussion included:

- Quantitative measurable goals are useful guides for resource improvements;
- Reporting measurable goals for each HUC-10 are useful guiding targets, but for some HUC-10s, accomplishing the reporting measurable goals will only be attainable with additional staff;
- Utility of the RR 1W1P would be improved with simplified and a reduced number of goals
- Utility of reporting progress toward quantitative goals would benefit from using a consistent tracking system for estimating the load reduction benefits of field practices, informed by PTMApp data.

RECOMMENDATIONS

Based on outcomes from this Project, HEI has summarized recommendations for the Partnership in three categories, which will be summarized in the following sections below.

- Plan Amendments
- Estimating and Tracking
- Utilizing Geospatial Information

Plan Amendments

The RR 1W1P is a ten-year plan that extends through 2026. As such, the plan will need to be amended before it expires. In accordance with BWSR 1W1P Operating Procedures, HEI recommends a Plan Renewal Amendment to incorporate results of this assessment and new data, remove actions that are no longer relevant, and simplify RR 1W1P priority concerns, resources, and most notably, measurable goals.

Estimating and Tracking

HEI recommends utilizing a consistent method across plan implementors for estimating the benefits of field practices implemented. HEI also recommends this method align with new PTMApp data available for the Root River Watershed. This could be accomplished through use of the Benefits Estimator and Summary Tool (BEAST). The BEAST is a calculation spreadsheet for consistently estimating water quality benefits (sediment, total phosphorus, and total nitrogen load reduction) and storage volume of implemented BMPs on the landscape. The spreadsheet can provide load reduction and water storage estimates with as few as two inputs, general location of an implemented or proposed BMP, and the treated acreage of that BMP. It is built using watershed-specific PTMApp data and presented in a simplified and generalized manner to reduce the necessary effort of PTMApp data analysis. The Benefits Estimator and Summary Tool is provided as an excel file and includes a user guide.

HEI also recommend use of a common platform for tracking implementation efforts consistently and aggregating outcomes compared to measurable goals in real time. There are several mechanisms for tracking implementation efforts, including:

- Tracking excel spreadsheets that automatically calculate progress toward goals
- ArcGIS Online dashboards
- Software systems, such as MS4Front

Selection of one of these systems would be dependent on the Partnership's desired outcomes and weighing of cost, ease of use, and consistency with neighboring planning efforts.

Utilizing Geospatial Information

Accurate geospatial data is useful for informing implementation efforts and tracking projects implemented. Sharing large geospatial datasets can be challenging across 13 unique entities in the Partnership. As such, SMUMN recommends the implementation of Environmental System Research Institute (Esri) ArcGIS Online (AGOL) organizations as the best strategy to facilitate the sharing of geospatial information across Partnership organizations. Esri is the developer of the world's leading GIS software and is also a leader in the creation of

cutting-edge web GIS technology. Esri developed AGOL as part of this initiative, which has become the world's largest and most comprehensive web GIS platform. For creating, managing, analyzing and sharing geographic data across partner organizations, AGOL would offer the most comprehensive and cost-effective solution.

The creation of AGOL organizations would provide partners with a number of major advantages, including the following:

- AGOL is based on the software-as-a service (SaaS) model and managed entirely by Esri IT and GIS professionals on a cloud-based architecture, requiring no investment in additional hardware, staff or training.
- AGOL provides tools for creating geospatial data, interactive web maps, 3D scenes and web applications to share internally, with other partner organizations, or with the general public.
- With AGOL you can set up group collaborations with partner organizations to share and work on each other's content.
- AGOL provides templates to create powerful, interactive web applications such as story maps and dashboards, without the need to write code.
- Data and applications published to AGOL can be accessed through web browsers running on PCs and mobile devices and requires no prior GIS training or experience.
- The AGOL platform and data published to AGOL easily integrate with current and popular Esri GIS software products such as ArcGIS Pro.
- AGOL provides free access to a sizable collection of authoritative GIS data, basemaps and imagery maintained and continuously updated by Esri.
- Flexible licensing based on user types can be used limit costs based on the capabilities and apps required for your organization's work.
- Esri is constantly developing the AGOL platform to accommodate the changing needs of the AGOL user community, and to incorporate the latest advances and innovations in web GIS technology.

In sum, AGOL would offer partners with a cost effective, ready to use platform for developing and disseminating geospatial content online. Partners will be able to start using the platform without making significant investments in computer hardware, software or training. AGOL would provide instant access to powerful, interactive web applications and tools for sharing of geospatial data with the local community, local organizations or internally with colleagues.