

Final Meeting Notes: Wednesday, October 9, 2024

Badger Mill Creek Stakeholder Group

Agenda, notes, and meeting materials at www.madsewer.org/bmc-plus/

Desired outcomes:

- Decision on which projects to recommend to MMSD Commission for funding
- Project close and shared understanding of next steps

Participants:

- Nick Bower, CARPC
- Jeremy Balousek, Dane County Land & Water Resources Department
- Laura Hicklin, Dane County Land & Water Resources Dept.
- Ben Schulte, City of Fitchburg
- Chris Barnes, Town of Verona
- Martye Griffin, Madison Metropolitan Sewerage District
- Kathy Lake, Madison Metropolitan Sewerage District
- Topf Wells, Trout Unlimited Southern Wisconsin Chapter
- Heather Hasenstein, Upper Sugar River Watershed Association
- Jasmine Wyant, Upper Sugar River Watershed Association
- Greg Fries, City of Madison
- Jamie Aulik, City of Verona
- Alison Lebwohl, Alison S. Lebwohl Consulting (facilitator)
- Mike Rupiper, EOR (facilitator)

Other Attendees:

- Amanda Wegner, Madison Metropolitan Sewerage District
- Bill Walker, Madison Metropolitan Sewerage District
- Jason Valerius, CARPC

<i>Topic</i>	<i>Decisions, information gathered, actions</i>
Survey results and table discussions	Mike presented a summary of the pre-meeting survey results (attached).
Presentations	<p>The group heard 6 project proposal presentations by lead organizations for each project listed below. Presentations focused on changes since the August meeting and estimated impacts. This was followed by a question-and-answer period. The project proposal sheet versions reviewed and discussed at the meeting are attached.</p> <ul style="list-style-type: none">• Watershed Management Plan – USWRA, CARPC, Dane Co.• Agricultural / Urban Phosphorus Management Practices – Dane Co.• BMC Habitat Restoration / Low Flow Channel – Dane Co, City of Verona

- Baseflow Augmentation (Goose Lake) – City of Fitchburg, Town of Verona
- Groundwater Recharge/ Modeling - CARPC
- USGS monitoring - CARPC

The Stakeholder Group voted to eliminate a 7th project proposal - Baseflow Augmentation (Groundwater Pumping – Deep Well) from further discussion due to the lack of a project lead and lack of support in general for this proposal. (SWTU – Opposed).

Vote: Projects & Roles

The Stakeholder Group completed a rank choice voting worksheet by organization of their project recommendations to the District Commission for funding. Friends of Badger Mill Creek were unable to attend the meeting but shared their vote ahead of time for inclusion in the rankings.

The resulting project rank and budgets are:

Rank	Project Proposal	Proposed Budget
1	Watershed Management Plan	\$150,000
2	BMC Habitat Restoration / (Low Flow Channel)	\$425,000
3	Baseflow Augmentation (Goose Lake)	\$280,000
4	USGS Monitoring (5 yrs)	\$161,250
5	Groundwater Recharge (Modeling)	\$130,000
6	Agricultural / Urban Phosphorus Management Practices (5 yrs)	\$200,000
	All 6 Project Proposals	\$1,346,250

Key Decision Points:

- **The Stakeholder Group approved recommendation of all six projects in this priority order to the District Commission for funding.**
- **The Stakeholder Group also approved the creation of an Implementation Team, consisting of the 6 project lead organizations (USWRA, CARPC, Dane County, City of Verona, City of Fitchburg, and Town of Verona), to be jointly responsible for final decisions related to project sequencing, budget revisions, and any other implementation tasks.**
- **The Stakeholder Group also approved a request to the District Commission to fund the BMC Habitat Restoration project as a separate budget amendment. Dane County staff agreed to work with MMSD staff to refine the budget amount and language for that request.**

Project close & Final Steps

The group was asked to complete a project close worksheet, responding to the following questions: Summary attached.

- What is one thing that stands out to you from this experience?

- What is one question that remains outstanding for you?
- What is one thing you are grateful to your colleagues in this room for?

District staff provided noted that presenting to the Commission is a two-meeting process, with the presentations of the work and recommendations first followed by action on the portfolio and funding request. The expected schedule for the Stakeholder Group recommendations to the District Commission:

- **Presentation of work/recommendations: Thur. Dec. 19th, 2024**
- **Commission action on portfolio/funding: TBD in 2025**

Topf made a final comment expressing a concern about the accuracy of the information in the draft report pertaining to the DNR presentations. Mike responded that he would reach out to DNR staff to ensure that the report accurately reflects what they conveyed in their presentations. Other stakeholders were asked to check the report content for accuracy of information related to their presentations as well. The Stakeholder Group will have an opportunity to review the final report again in November prior to its distribution to the District Commission in December.



Watershed Management Plan

Desired Uses

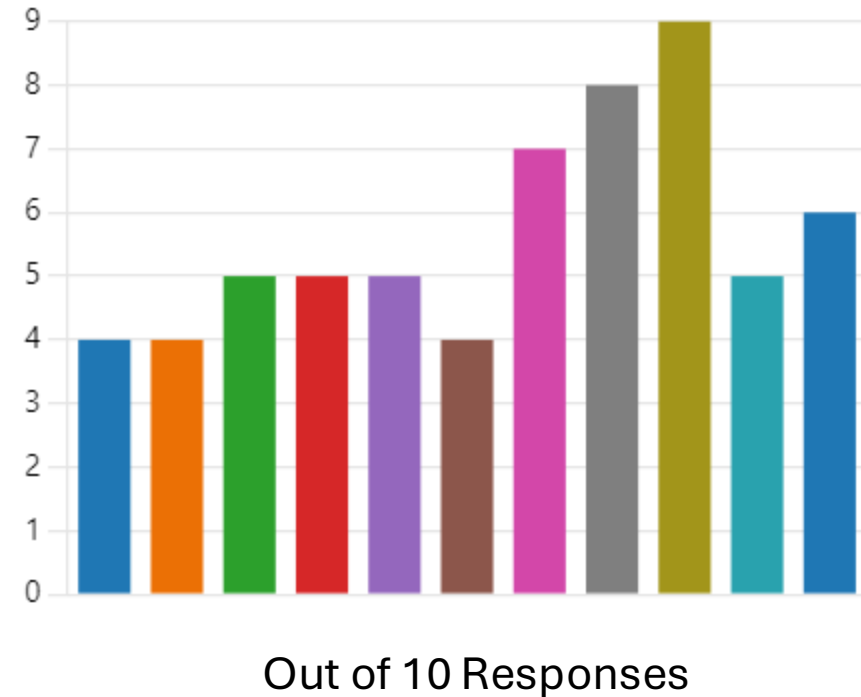
- It will result in a positive impact on nature-based recreation
- It will result in a positive impact on scenic beauty
- It will result in a positive impact on the trout stream
- It will result in a positive impact on wildlife habitat

Physical Landscape

- It will result in a positive impact on in-stream water quality
- It will result in a positive impact on in-stream water quantity
- It will result in a positive impact on riparian corridor health & resilience
- It would result in actionable knowledge to support health & resilience

Desirable Criteria

- It has broad support by the group
- It will receive contributions from other organizations
- The initial investment will lead to sustained effort or ongoing investment



Baseflow Augmentation (Goose Lake)

Desired Uses

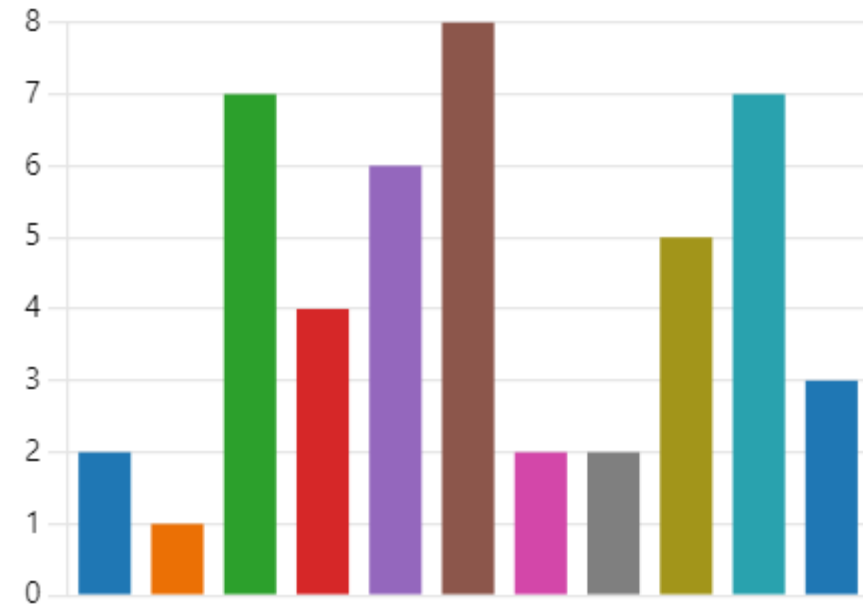
- It will result in a positive impact on nature-based recreation
- It will result in a positive impact on scenic beauty
- It will result in a positive impact on the trout stream
- It will result in a positive impact on wildlife habitat

Physical Landscape

- It will result in a positive impact on in-stream water quality
- It will result in a positive impact on in-stream water quantity
- It will result in a positive impact on riparian corridor health & resilience
- It would result in actionable knowledge to support health & resilience

Desirable Criteria

- It has broad support by the group
- It will receive contributions from other organizations
- The initial investment will lead to sustained effort or ongoing investment



Out of 10 Responses

Groundwater Recharge (Modeling)

Desired Uses

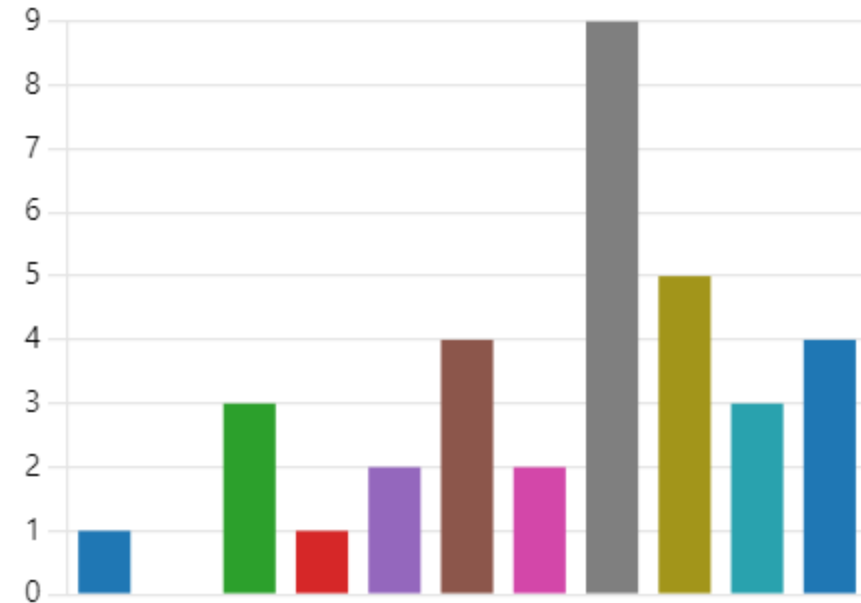
- It will result in a positive impact on nature-based recreation
- It will result in a positive impact on scenic beauty
- It will result in a positive impact on the trout stream
- It will result in a positive impact on wildlife habitat

Physical Landscape

- It will result in a positive impact on in-stream water quality
- It will result in a positive impact on in-stream water quantity
- It will result in a positive impact on riparian corridor health & resilience
- It would result in actionable knowledge to support health & resilience

Desirable Criteria

- It has broad support by the group
- It will receive contributions from other organizations
- The initial investment will lead to sustained effort or ongoing investment



Out of 10 Responses

USGS Monitoring

Desired Uses

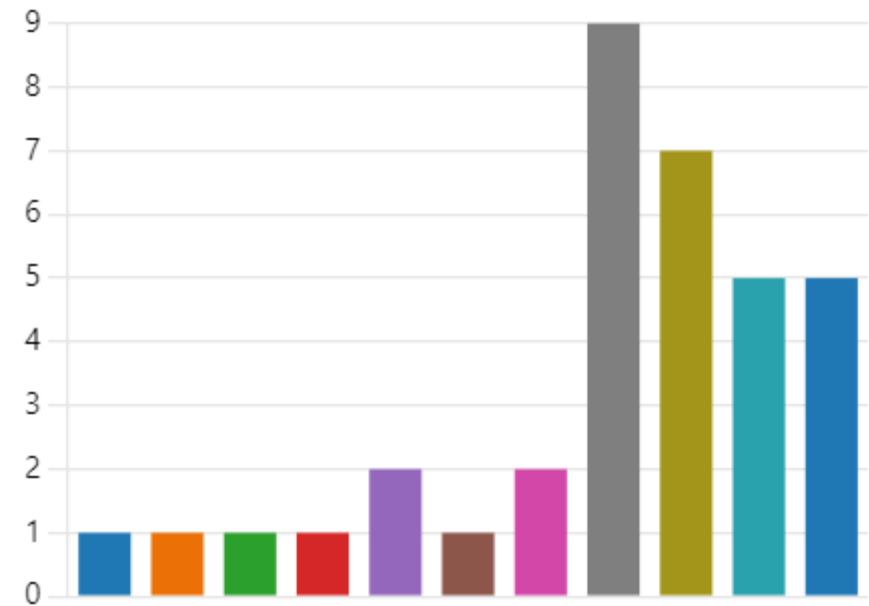
- It will result in a positive impact on nature-based recreation
- It will result in a positive impact on scenic beauty
- It will result in a positive impact on the trout stream
- It will result in a positive impact on wildlife habitat

Physical Landscape

- It will result in a positive impact on in-stream water quality
- It will result in a positive impact on in-stream water quantity
- It will result in a positive impact on riparian corridor health & resilience
- It would result in actionable knowledge to support health & resilience

Desirable Criteria

- It has broad support by the group
- It will receive contributions from other organizations
- The initial investment will lead to sustained effort or ongoing investment



Out of 10 Responses

BMC Habitat Restoration / Low Flow Channel

Desired Uses

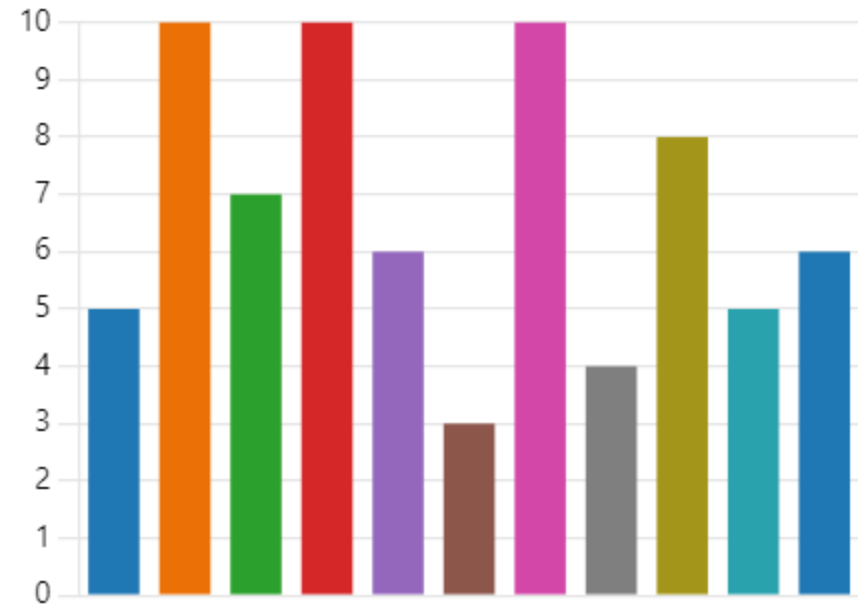
- It will result in a positive impact on nature-based recreation
- It will result in a positive impact on scenic beauty
- It will result in a positive impact on the trout stream
- It will result in a positive impact on wildlife habitat

Physical Landscape

- It will result in a positive impact on in-stream water quality
- It will result in a positive impact on in-stream water quantity
- It will result in a positive impact on riparian corridor health & resilience
- It would result in actionable knowledge to support health & resilience

Desirable Criteria

- It has broad support by the group
- It will receive contributions from other organizations
- The initial investment will lead to sustained effort or ongoing investment



Out of 10 Responses

Agricultural / Urban Phosphorus Management Practices

Desired Uses

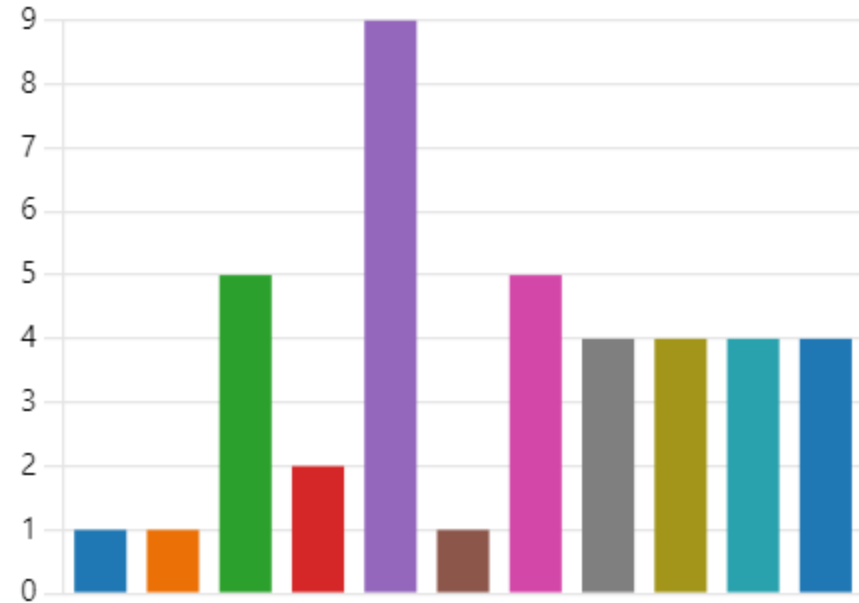
- It will result in a positive impact on nature-based recreation
- It will result in a positive impact on scenic beauty
- It will result in a positive impact on the trout stream
- It will result in a positive impact on wildlife habitat

Physical Landscape

- It will result in a positive impact on in-stream water quality
- It will result in a positive impact on in-stream water quantity
- It will result in a positive impact on riparian corridor health & resilience
- It would result in actionable knowledge to support health & resilience

Desirable Criteria

- It has broad support by the group
- It will receive contributions from other organizations
- The initial investment will lead to sustained effort or ongoing investment



Out of 10 Responses

Baseflow Augmentation (Groundwater Pumping – Deep Well)

Desired Uses

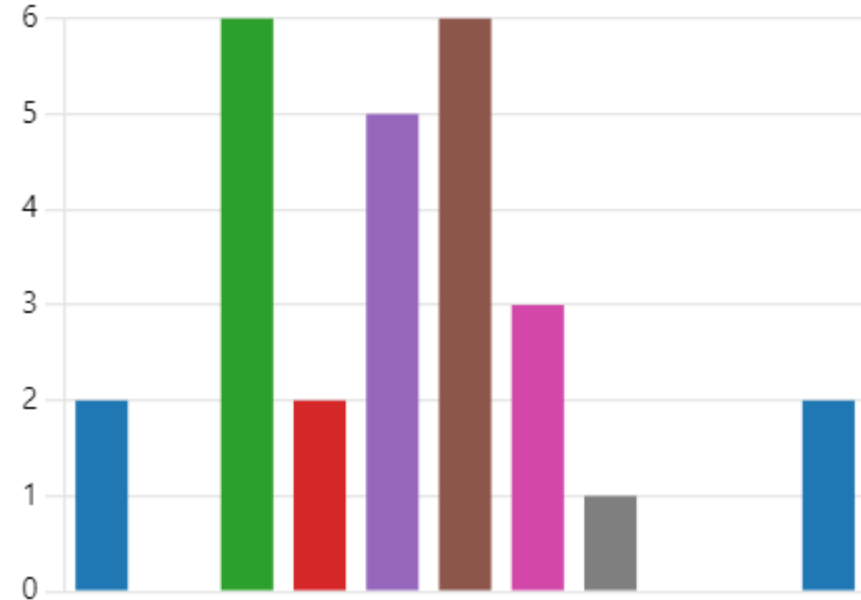
- It will result in a positive impact on nature-based recreation
- It will result in a positive impact on scenic beauty
- It will result in a positive impact on the trout stream
- It will result in a positive impact on wildlife habitat

Physical Landscape

- It will result in a positive impact on in-stream water quality
- It will result in a positive impact on in-stream water quantity
- It will result in a positive impact on riparian corridor health & resilience
- It would result in actionable knowledge to support health & resilience

Desirable Criteria

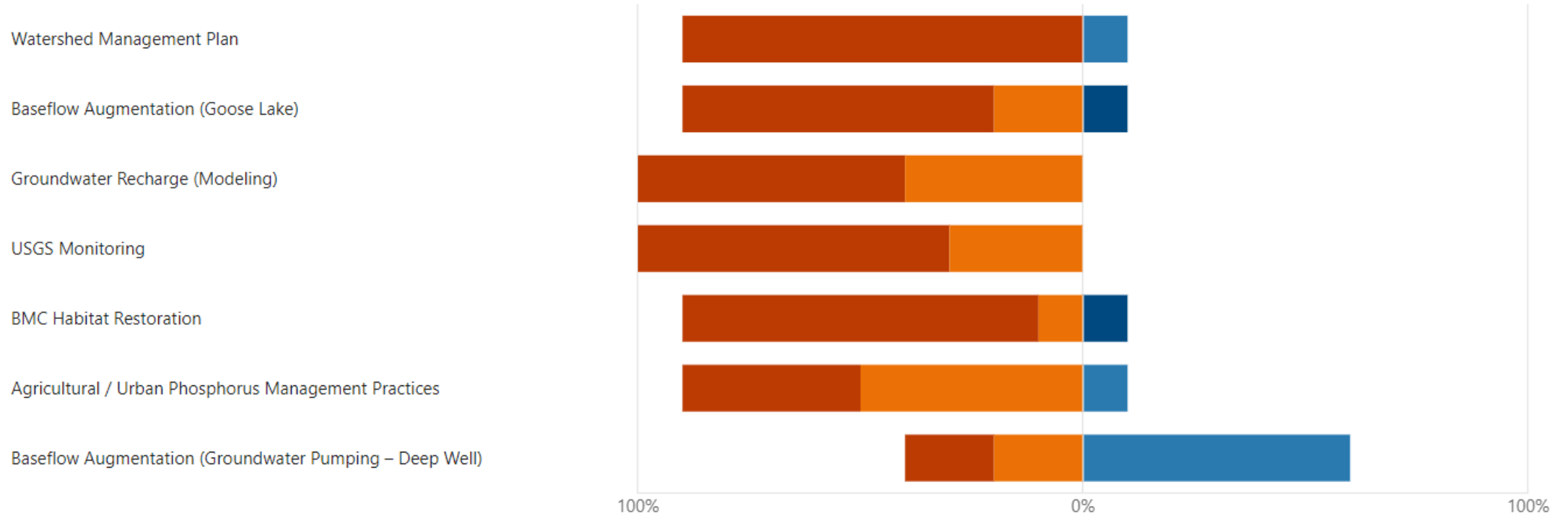
- It has broad support by the group
- It will receive contributions from other organizations
- The initial investment will lead to sustained effort or ongoing investment



Out of 10 Responses

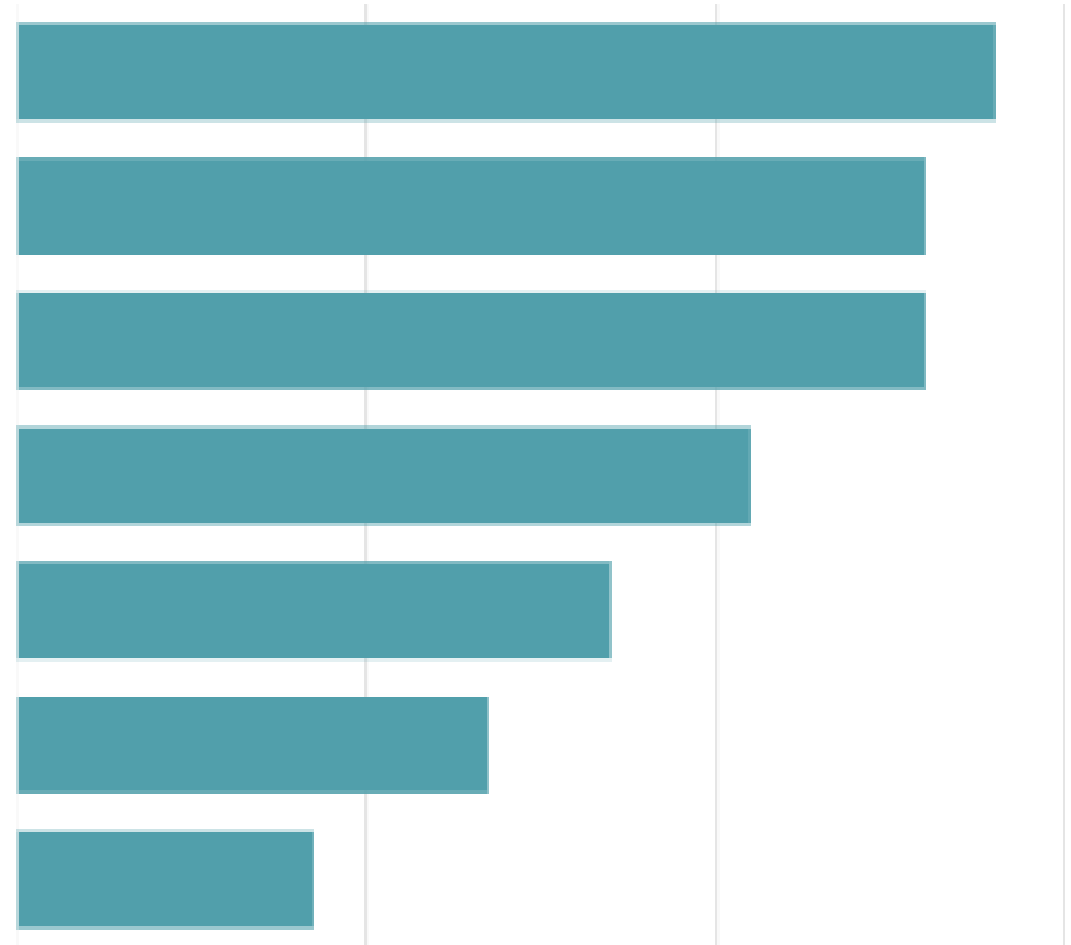
Straw Poll: Level of Support

■ Support ■ Neutral ■ Oppose ■ Abstain



Straw Poll: Priority Ranking

1. Watershed Management Plan
(\$150,000)
2. Baseflow Augmentation (Goose Lake)
(\$280,000)
3. BMC Habitat Restoration / Low Flow Channel
(\$425,000)
4. USGS Monitoring
(\$161,250 - 5-year total)
5. Groundwater Recharge (Modeling)
(\$130,000)
6. Agricultural / Urban Phosphorus Management
Practices (\$200,000 – 5-year total)
7. Baseflow Augmentation (Groundwater
Pumping - Deep Well) (\$1,100,000)



Badger Mill Creek Watershed Management Plan

PROJECT TYPE

Watershed Management Plan

START February 2025

COMPLETION December 2025

LOCATION

Entire Badger Mill Creek Watershed

DESCRIPTION

The purpose of this project is to develop a comprehensive watershed management plan for the Badger Mill Creek Watershed. A central goal of this proposal is to create a plan that supports effective and timely communication among partners, especially organizations developing and implementing projects. An outcome of stakeholder group meetings is that stakeholders, organizations, and municipalities are passionate about not only protecting the Badger Mill Creek Environmental Corridor as a resource, and they collectively are willing and prepared to invest in restoration and other improvements. However, it is imperative that planned projects include coordination so that limited resources are leveraged effectively and necessary approvals are not ignored. The plan would be developed under a contract with (the UW Water Resources Management practicum, or similar entity, CARPC, consultant, or another organization).

Key elements proposed for inclusion in the plan are:

- Asset inventories (species other than fish, recreational amenities, etc.) – could get community participation with inventories.
- Comprehensive set of maps and mapping tools
- Community input – goal to increase public awareness and buy-in.
- Modeling (climate variability, urban development, economic shifts)
- How could community types be affected by projects?
- Issues assessment
- Specific implementation projects with funding tied to each project.
- Establish a coordinating council with representatives from stakeholder groups that meet bimonthly to share and discuss planned projects early in development and progress of ongoing projects.

BACKGROUND

The Upper Sugar River Watershed Association, Dane County Parks, and Capital Area Regional Planning Commission members of the stakeholder group put forward this project proposal to develop a comprehensive watershed management plan for the Badger Mill Creek Watershed. This subcommittee agreed that developing a comprehensive management plan is a logical next step that would also include advancing the other priorities of base flow augmentation and groundwater recharge. The project is recommended to:

- Provide data to make informed decisions both short-term and long-term.
- Generate community awareness, buy-in and support.
- Gain an understanding of the community's watershed priorities across jurisdictional boundaries. (Most planning efforts are within these boundaries, not at a watershed level).
- Mobilize support for a broad range of goals and activities across potentially disparate groups.

PARTICIPATING STAKEHOLDERS

Lead Organization(s): USRWA, CARPC, Dane County Land and Water Resources Department/Dane County Parks

Supporting Organization(s): City of Fitchburg, City of Madison, City of Verona, Friends of Badger Mill Creek, MMSD, Town of Verona, Trout Unlimited

FUNDING

Estimated Project Cost

\$150,000 (100% paid from MMSD BMC funds)

RESOURCE LINKS

PROJECT TYPE

Agricultural / Urban Phosphorus Management Practices in the Badger Mill Creek Watershed

START 2025

COMPLETION Ongoing (Min 5 years)

LOCATION

Badger Mill Creek Watershed

DESCRIPTION

The purpose of this proposal is to provide funding for use as cost-share to support the implementation of existing programs for agricultural and urban phosphorus best management practices in the Badger Mill Creek Watershed to reduce phosphorus loads to Badger Mill Creek.

Phosphorus has long been recognized as a major factor in plant and algae growth in Wisconsin's lakes and streams. Small increases in phosphorus can cause substantial increases in aquatic plant and algae growth, which can harm the natural ecosystem and water quality. It can also reduce recreational use, property values and human health. Phosphorus is a widely used nutrient with varying sources. It's used in detergents, animal feed and fertilizers, and is found in our food and our waste. Non-point pollution occurs when rain and melting snow wash over farm fields, feedlots, streets and parking lots. This can carry with it phosphorus containing pollutants such as fertilizers, manure, and soil from agricultural and urban areas which eventually feed into lakes and streams.

The Dane County Land and Water Resources Department implements a number of programs and initiatives for phosphorus reduction. Since 2005, Dane County has made cost-sharing funds, up to 60% of the total project cost, available to municipalities via their Urban Water Quality Grant Program. The goals of the Urban Water Quality Grant Program are to improve the quality of urban stormwater runoff entering Dane County lakes, rivers and streams, increase public awareness of urban water quality issues, and provide public education about urban stormwater quality improvement practices. The Land Conservation Division also manages a number of voluntary conservation-related projects and programs that can provide financial assistance for landowners and operators for phosphorus reduction.

In addition, since 2016, the Upper Sugar River Watershed Association has been working with a producer-led group - Farmers for the Upper Sugar River to reduce phosphorus in the Headwaters Sugar River and West Branch Sugar River watersheds. The goal of the program is to provide an opportunity for farmers to learn from each other about different types of conservation practices and offer a cost-share program.

PARTICIPATING STAKEHOLDERS

Lead Organization: Dane County Land & Water Resources Department

Supporting Organizations: CARPC, City of Fitchburg, City of Madison, City of Verona, Friends of Badger Mill Creek, MMSD, Town of Verona, Trout Unlimited, USRWA

FUNDING

Estimated Project Cost: \$200,000 (\$40,000 per year for 5 years)

PROJECT TYPE

Badger Mill Creek Stream Habitat Restoration Repairs and Low Flow Channel

START Winter 2024/2025

COMPLETION 2026 - 2031

LOCATION

Badger Mill Creek in the Ice Age Trail Junction Natural Resource Area

DESCRIPTION

The purpose of this project is to repair the stream corridor to reflect post-discontinuance site conditions.

Dane County, in partnership with the City of Verona and the Southern Wisconsin Trout Unlimited Chapter, installed in-stream habitat improvements along Badger Mill Creek in 2021 to mitigate the impact of the City of Verona's Eastside Interceptor and MMSD's Pump Station 17 Force Main Relief Phase I projects.

The restoration project occurred along 5,000 feet of stream and included many instream improvements to enhance wildlife habitat and reconnection of the stream to the floodplain. These improvements were designed with the assumption that flow rates from the effluent return would continue. Without flow from the effluent return, these restoration practices will be much less effective or non-functional. The Dane County investment in the restoration work was approximately \$400,000.

The restoration planning and design was done in coordination with the City and MMSD and bid with phase I of the East Side Interceptor Gravity Sewer Project/Pumping Station 17 Force Main Relief project. This project runs through County parkland and heavily disrupted the Badger Mill Creek Corridor and left abandoned sewer lines in ground while adding new sewer lines.

To rectify the situation, this project would fund the repair of Badger Mill Creek and surrounding lands when the effluent discharge ends.

A new restoration plan and funding for implementation of the plan is necessary to ensure the long-term health and resiliency of Badger Mill Creek and surrounding lands. This plan would be designed to the site conditions that result from discontinuance of the effluence discharge.

PARTICIPATING STAKEHOLDERS

Lead Organization: Dane County Land & Water Resources Department and City of Verona

Supporting Organizations: Upper Sugar River Watershed Association, Trout Unlimited, CARPC, Town of Verona, City of Fitchburg, Friends of Badger Mill Creek, City of Madison, and MMSD

FUNDING

Estimated Project Cost: \$50,000 design
 \$375,000 construction and native vegetation
 establishment

PROJECT TYPE

Badger Mill Creek Stream Habitat Restoration Repairs and Low Flow Depth and Velocity Enhancement

START Winter 2024/2025

COMPLETION 2026 - 2031

LOCATION

Badger Mill Creek in the Ice Age Trail Junction Natural Resource Area

DESCRIPTION

The purpose of this project is to repair the stream corridor to reflect post-discontinuance site conditions by modifying existing installed in-stream habitat improvements intended to enhance wildlife habitat and reconnection of the stream to the floodplain. And to find and implement projects in areas determined to be of the highest potential for contributing to increased depth and velocity of flows within the Badger Mill Creek by changing the habitat available for fish and other organisms by increasing the depth and velocities in a low flow channel.

Dane County, in partnership with the City of Verona and the Southern Wisconsin Trout Unlimited Chapter, installed in-stream habitat improvements along Badger Mill Creek in 2021 to mitigate the impact of the City of Verona's Eastside Interceptor and MMSD's Pump Station 17 Force Main Relief Phase I projects.

The restoration project occurred along 5,000 feet of stream and included many instream improvements to enhance wildlife habitat and reconnection of the stream to the floodplain. These improvements were designed with the assumption that flow rates from the effluent return would continue. Without flow from the effluent return, these restoration practices will be much less effective or non-functional. The Dane County investment in the restoration work was approximately \$400,000.

The restoration planning and design was done in coordination with the City and MMSD and bid with phase I of the East Side Interceptor Gravity Sewer Project/Pumping Station 17 Force Main Relief project. This project runs through County parkland and heavily disrupted the Badger Mill Creek Corridor and left abandoned sewer lines in ground while adding new sewer lines.

To rectify the situation, this project would fund the repair of Badger Mill Creek and surrounding lands when the effluent discharge ends.

A new restoration plan and funding for implementation of the plan is necessary to ensure the long-term health and resiliency of Badger Mill Creek and surrounding lands. This plan would be designed to the site conditions that result from discontinuance of the effluence discharge.

Additionally, there is an opportunity to strategically design the stream to reinforce a narrower, low-flow channel in the upper part of Badger Mill Creek, which could provide natural low-flow channel conditions by allowing for more depth and velocity in low flow conditions. And there is an opportunity to remove removing legacy sediments and muck providing for added phosphorus reductions stemming from the release of phosphorus from the sediments into the water column in the upper reaches of Badger Mill Creek that have significant muck and sediment deposits. In addition, there are a variety of obstructions within the channel that restrict flow that could be removed or changed, including but not limited to: animal structures (e.g. beaver dams); structures that were moved during high flow (e.g. bridges, etc.); sediment deposits, garbage, and vegetation build up in the stream; and culverts that are holding flow back

PARTICIPATING STAKEHOLDERS

Lead Organization: Dane County Land & Water Resources Department and City of Verona

Supporting Organizations: Upper Sugar River Watershed Association, Trout Unlimited, CARPC, Town of Verona, City of Fitchburg, Friends of Badger Mill Creek, City of Madison, and MMSD

FUNDING

Estimated Project Cost:	\$50,000 restoration plan design
	\$375,000 construction and native vegetation establishment
	\$500,000 removal of obstructions and creation of low flow channel

Baseflow Augmentation (Goose Lake) for Badger Mill Creek

PROJECT TYPE

Baseflow Augmentation

START

Design: In progress

Construction: Summer 2025

COMPLETION

Design: Summer 2025

Construction: Spring 2026

LOCATION Goose Lake Watershed

DESCRIPTION

The purpose of this project is to develop and construct a project that would provide baseflow augmentation to Badger Mill Creek from Goose Lake and possibly other regional stormwater facilities. The City of Fitchburg and Town of Verona in conjunction with their consulting engineering team, are evaluating options for controlling and stabilizing water levels at Goose Lake and the Quarry Ridge regional stormwater pond through a steady release of groundwater. The project will be developed in 3 phases, a feasibility/constructability phase, a design phase of the most beneficial option, followed by a construction phase. Key considerations of the design phase include providing sustainable and quality flow to Badger Mill Creek when it is most needed (during periods of dry weather rather than during rain events) and sustaining cool water temperatures and water quality to Badger Mill Creek. The options of open channel or closed conduits, as well as infiltration and filtering beds are some of the design alternatives to be considered. Preliminary estimates indicate that up to approximately 25% of the of the base flow currently provided by MMSD's effluent could be replaced through this project. This project could also be augmented by other water sources, including a deep aquifer well to maintain optimum flow rates and enhance water quality.

BACKGROUND

The City of Fitchburg, Friends of Badger Mill Creek Environmental Corridor, City of Madison, Madison Metropolitan Sewerage District, Trout Unlimited Southern Wisconsin Chapter, WDNR, members of the stakeholder group have put forward project proposals to develop a baseflow augmentation project in the Badger Mill Creek Watershed. The City of Fitchburg and Town of Verona have contracted with a consulting team of AECOM/Ruekert-Mielke to design and permit stormwater improvements for Fitchrona Road and Goose Lake with the intent to mitigate recurring flooding on Fitchrona Road while simultaneously providing base flow to Badger Mill Creek. Initially, the City of Fitchburg and Town of Verona had investigated more conventional approaches to mitigate flooding of Fitchrona Rd, largely based on providing a more efficient conveyance path from Goose Lake to Badger Mill Creek. Through discussion with members of the Badger Mill Stakeholder Group, it was recognized that there may be an opportunity to alleviate flooding while providing base flow to Badger Mill Creek. The City of Fitchburg and Town of Verona desire to provide enhancements to Badger Mill Creek with this proposed project that would not be seen if a conventional approach was pursued and implemented. Dane County is the property owner of much of the land surrounding Goose Lake and WisDOT controls several important culverts and drainage features which may impact the project. Coordination with these stakeholders will be key to the implementation and success of this proposed project.

PARTICIPATING STAKEHOLDERS

Lead Organization(s): City of Fitchburg, Town of Verona

Supporting Organization(s): CARPC, City of Madison, Dane County, MMSD, Trout Unlimited, USRWA

FUNDING

It is anticipated that funding for this project would be contributed by the City of Fitchburg, Town of Verona, and MMSD.

Estimated Project Cost

Design Phase: \$120,000 (100% paid by City of Fitchburg & Town of Verona)

Construction Phase: \$700,000 (\$420,000 paid by City of Fitchburg & Town of Verona and \$280,000 paid by MMSD BMC funds) MMSD BMC funds to solely cover the added cost over the previously proposed flood control work. Items covered by the requested MMSD funding to include construction of low flow pipe and outlet control structures, additional wetland restoration, temperature and DO monitoring, and re-aeration temperature control practices.

RESOURCE LINKS

AE2S Technical Memorandum (2021)

https://www.fitchburgwi.gov/DocumentCenter/View/22192/Final-Tech-Memo_Fitchrona-Road-Flood-Study

Jamestown Watershed and Goose Lake Water Level and Rainfall Monitoring (2007)

<https://www.fitchburgwi.gov/DocumentCenter/View/27108/Quarry-Ridge-Study-Memo-2007-10-25>

Groundwater Recharge (Modeling) for Badger Mill Creek

PROJECT TYPE

Groundwater Recharge – Inset Model

START

Planning: Early 2025

Implementation: TBD

COMPLETION

Planning: 18-24 months

Implementation: TBD

LOCATION

Upper Badger Mill Creek

DESCRIPTION

The purpose of this project is to identify and implement enhanced recharge/infiltration projects in areas determined to be of the highest potential for contributing to increased baseflow within the Badger Mill Creek. The project will entail two distinct phases, including a planning phase to identify and prioritize strategies with the highest recharge potential and an implementation phase. The scope of strategies may include acquisition of high-recharge areas for permanent protection from development, incentive or education programs to encourage new or existing development to infiltration beyond minimum ordinance requirements (i.e., achieve 100% stay-on), subsurface infiltration systems (similar to the Odana Hills Golf Course Recharge System), identification of alternative sources of water for infiltration (such as detained stormwater, landfill leachate, or MMSD effluent), or some combination thereof.

Planning Phase

- The Stakeholder Group determined that further study is needed to identify viable location(s) for potential groundwater recharge project(s). The group agreed that working with the Wisconsin Geological and Natural History Survey (WGNHS) on updating the Dane County regional groundwater flow model to create an inset model for Badger Mill Creek and developing a stream temperature model is a logical first step. WGNHS proposes that this work would be a collaboration between WGNHS and the USGS. The project would entail:
 1. Collecting site-specific field data necessary to refine hydrogeologic and stream conditions near Badger Mill Creek,
 2. Adding detail to the 2016 Dane County regional groundwater flow model near Badger Mill Creek by creating an inset or daughter model and recalibrating the inset model to current conditions,
 3. Developing and calibrating a stream temperature model for the same area, and
 4. Testing different scenarios to investigate the effects of changing effluent discharge or other watershed management strategies on baseflow and temperature in Badger Mill Creek.
- Compile and assess various datasets to identify locations which would have the highest potential for increasing baseflow to BMC—such data may include recharge estimates based on the 2012 WGNHS report *Groundwater Recharge in Dane County Wisconsin, Estimated by a GIS-Based Water-Balance Model* ([link to report](#)); property ownership records to determine locations of existing

public lands (e.g., Reddan Soccer Fields, parks, etc.), lands to target for acquisition, or lands which could have projects implemented upon (e.g., Fitchburg Minerals development site, landfill and solar fields, quarries, etc.); modeling from the [Dane County Groundwater Model](#) to identify the groundwater watershed of Badger Mill Creek (currently understood to generally match the surface watershed, larger scale mapping available [here](#)) and zones of baseflow contribution (e.g., 1- and 5-year return periods); and agricultural management practices being employed.

- Investigate the character and volume of leachate generated at the Verona Landfill (currently hauled to MMSD Nine Springs WWTP) to determine feasibility of treating on-site and infiltrating.
- Investigate feasibility of incentive program (likely in combination with an educational campaign) to promote increased infiltration practices in developments (e.g., payments to Developers).
- Investigate feasibility of infiltrating effluent that is currently being returned to BMC.
- Prioritize sites and projects based on various metrics such as feasibility, costs, and baseflow impacts (volume and period of return).
- Public engagement may be warranted for some projects and sites.

Implementation Phase

Using results of planning efforts, implement one or more projects with the goal of achieving a statistically and biologically significant increase in baseflow over the short- to medium-term. Some projects may be implemented quickly, such as an education campaign. Other projects may require detailed site evaluation (borings, monitoring wells, hydraulic testing, etc.), detailed engineering design, public engagement, and permitting, such as a subsurface infiltration system. Timing of implementation may be tied to availability of lands for acquisition as well as development proposals outside of control of MMSD.

BACKGROUND

The Madison Metropolitan Sewerage District, Dane County Land & Water Resources, and Capital Area Regional Planning Commission members of the stakeholder group put forward this project proposal to develop a groundwater recharge project in the Badger Mill Creek Watershed. A similar 50 million gallon per year project has been operating at the Odana Golf Course for 20 years which takes stormwater from Odana Pond, filters it, and pumps it to a subsurface infiltration bed. Existing recharge mapping is available that can be used in the site selection process.

Groundwater flow models and stream temperature models are powerful tools for understanding stream and groundwater dynamics. The 2016 Dane County regional groundwater flow model can simulate regional groundwater flow directions, capture zones, and travel times. For site-specific questions, an inset model is useful for better understanding groundwater flow. Stream temperature models can work in parallel with the groundwater flow model to simulate stream temperature given changes in effluent discharge, groundwater recharge, air temperature, and physical stream characteristics such as shading. By testing different scenarios, the models can inform the likely effects of management strategies on ecosystem health.

PARTICIPATING STAKEHOLDERS

Lead Organization(s): CARPC

Supporting Organization(s): City of Fitchburg, City of Madison, Dane County, MMSD, Town of
October 2024

Verona, USRWA

The planning phase modeling work will be implemented by WGNHS and USGS under contract with the lead organization(s).

FUNDING

It is anticipated that funding for this project would be contributed by MMSD. Certain components could be funded through various grant programs. The range of costs from incentive programs to land acquisition to infrastructure projects (e.g., Subsurface Infiltration System) will vary substantially, however it is assumed the latter would represent the most expensive option and is detailed below:

Planning Phase: Estimated Project Cost of Model Update

\$130,000 (100% paid by MMSD BMC funds)

Implementation Phase: Estimated Project Cost of Subsurface Infiltration System¹

Design Phase: \$200,000 - \$400,000 (Funding sources TBD)

Construction Phase: \$1,000,000 + (Funding sources TBD)

O&M: (Funding sources TBD)

RESOURCE LINKS

WGNHS Preliminary Scope and Budget Estimate (attached)

Interactive recharge map: [Link to Dane Co map](#) or [Link to CARPC map](#)

Modeled Regional Groundwater Contours: [Link to CARPC map](#)

Odana Golf Course Groundwater Recharge Project: [Link to presentation](#)

2012 WGNHS report *Groundwater Recharge in Dane County Wisconsin, Estimated by a GIS-Based Water-Balance Model* ([link to report](#))

CARPC Groundwater Resources webpage, including Groundwater Divides: [Link to CARPC map](#)

2011 UW-Madison WRM: *Nine Springs Recharge Project* ([link to report](#))

¹ Cost estimate based on costs for the Odana Golf Course Recharge Project (\$400,000 design, \$1,000,000 construction)
October 2024

Simulating groundwater flow and stream temperature in Badger Mill Creek

Wisconsin Geological and Natural History Survey

U.S. Geological Survey

August 13, 2024

Background

The Badger Mill Creek stakeholder group has been tasked with developing a portfolio of recommended projects to support the continued health and resiliency of Badger Mill Creek following the upcoming cessation of effluent discharge by the Madison Metropolitan Sewerage District. To aid the stakeholder group in their assessment of potential projects, we have developed this document which summarizes the approximate cost and scope to update the Dane County groundwater flow model (Parsen and others, 2016) in the vicinity of Badger Mill Creek and develop a new stream temperature model to evaluate potential changes to groundwater baseflow and temperature in Badger Mill Creek.

Groundwater flow models and stream temperature models are powerful tools for understanding stream and groundwater dynamics. The 2016 Dane County regional groundwater flow model can simulate regional groundwater flow directions, capture zones, and travel times. For site-specific questions, the model is useful as a regional framework for understanding groundwater flow. Stream temperature models can work in parallel with the groundwater flow model to simulate stream temperature given changes in effluent discharge, groundwater recharge, air temperature, and physical stream characteristics such as shading. By testing different scenarios, the models can inform the likely effects of management strategies on ecosystem health.

We propose that such a project would be a collaboration between the Wisconsin Geological and Natural History Survey and the U.S. Geological Survey. The project would entail 1) collecting site-specific field data necessary to refine hydrogeologic and stream conditions near Badger Mill Creek, 2) adding detail to the 2016 Dane County regional groundwater flow model near Badger Mill Creek by creating an inset or daughter model and recalibrating the inset model to current conditions, 3) developing and calibrating a stream temperature model for the same area, and 4) testing different scenarios to investigate the effects of changing effluent discharge or other watershed management strategies on baseflow and temperature in Badger Mill Creek.

Scope

We anticipate the scope for this project would include the following:

1. Assemble existing data
 - a. Water levels, streamflow, groundwater pumping, climate data
2. Collect field data
 - a. Synoptic stream baseflow measurements
 - b. Stream and groundwater temperature monitoring
 - c. Stream geometry and shade characteristics
 - d. Local meteorological data including air temperature, humidity, and precipitation
3. Create updated soil-water balance model for refined groundwater recharge estimates
4. Create groundwater flow model
 - a. Generate inset of the 2016 Dane County groundwater flow model
 - b. Recalibrate to current conditions

5. Create and calibrate stream temperature model
6. Analyze possible future scenarios
 - a. Evaluate simulated stream temperature and baseflow under changing effluent discharge, recharge, and/or air temperature
7. Document findings in a summary report

Estimated Budget

We estimate a budget of \$100,000 – 130,000 for updating the Dane County regional groundwater flow model and developing a stream temperature model as described above.

Timing

Start and end dates will be determined once an agreement is finalized, but efforts could begin in 2025, with an estimated project timeline of 18-24 months.

References

Parsen, M.J., Bradbury, K.R., Hunt, R.J., and Feinstein, D.T., 2016, The 2016 groundwater flow model for Dane County, Wisconsin: Wisconsin Geological and Natural History Survey Bulletin 110, 56 p.

USGS Monitoring for Upper Badger Mill Creek

PROJECT TYPE

Stream Monitoring

START 2025

COMPLETION Ongoing (Min 5 years)

LOCATION

Upper Badger Mill Creek (Ex. Old PB or Ice Age Trail Bridge)

DESCRIPTION

The purpose of this project is to implement additional continuous monitoring for Badger Mill Creek (there is an existing monitoring station along Lower Badger Mill Creek at Bruce Street ([USGS Station 05435943](#)), currently being funded by MMSD with USGS cost-share). The monitoring would be conducted by the United States Geological Survey (USGS) who conducts stream monitoring at the existing downstream location and throughout the United States. Ongoing monitoring of Badger Mill Creek at this location would assist with assessing both short-term and long-term effects of discontinuation of effluent flow and help inform better watershed management decisions. For example, watershed projects implemented to sustain the health and resilience of Badger Mill Creek could be measured and adjustments made and/or additional projects implemented over time as needed, based on the results and trends identified by stream monitoring. Additional specific benefits and insights that could be obtained from the data include:

- Determining the ratio of baseflow to effluent
- Determining the contributions of runoff from the urban landscape in the City of Verona and its impacts with and without effluent flow from MMSD
- Comparing contributions of nutrients, temperature, dissolved oxygen (DO), and specific conductance between the upstream and downstream locations
- Determine speciation and ratio of instream phosphorus during baseflow and stormflow
- Inform modeling of DO within different reaches of the stream based on temperature, stage, and historical data (from existing station)

Key parameters proposed for inclusion in the monitoring plan are:

- Discharge (stream flow)
- Temperature
- Dissolved Oxygen
- Specific Conductance or Chloride
- Phosphorus

BACKGROUND

The various members of the stakeholder group put forward this project proposal to aid and supplement a comprehensive watershed management plan for the Badger Mill Creek Watershed. The USGS currently has a monitoring station on Badger Mill Creek at Bruce Street which has measured discharge (stream flow) since 1996 and dissolved oxygen, temperature, and specific conductance since 2007.

PARTICIPATING STAKEHOLDERS

Lead Organization(s): CARPC

Supporting Organization(s): City of Fitchburg, City of Madison, City of Verona, Trout Unlimited

This work will be implemented by USGS under contract with the lead organization(s).

FUNDING

USGS typically shares in the cost in the monitoring stations (~20-25%). It is expected that MMSD will fund the initial 5-year period to aid in assessment of the discontinuation of effluent flow. If desired to continue monitoring beyond this timeframe, additional partners could help fund continuation of monitoring. Potentially, funding may also be supplemented with WDNR Surface Water grants (this has been successfully done in the Black Earth Creek watershed).

Estimated Project Costs

\$215,000 for 5 years (\$161,250 MMSD BMC Funding / \$53,750 USGS – assuming 25% cost-share)

\$15k (Year 1 Start-up/Installation), \$40,000 (Annual Operation)

RESOURCE LINKS

[USGS Monitoring Station 05435943 Badger Mill Creek at Bruce Street](#)

[DNR Surface Water Grants Webpage](#)

Baseflow Augmentation (Deep Well) for Badger Mill Creek

PROJECT TYPE

Baseflow Augmentation – Groundwater Pumping

START

Winter 2024

COMPLETION

Winter 2025

LOCATION

Upper Badger Mill Creek

DESCRIPTION

Based on the information presented by the WGNHS there is potential to draw water from the deep aquifer and provide water to BMC to supplement baseflow in low flow conditions without affecting the shallow aquifer that feeds groundwater to BMC.

It was calculated to replace the flow lost by stopping the effluent return would require an added 2,000 GPM. There are wells that can be drilled into the deep aquifer and provide that volume of water when needed to the stream during drought or low flow conditions when it is needed. Flow can be controlled using a VFD connected to a pump.

There are examples of using make up wells in streams by drawing from the deep aquifer. These types of wells have the potential to receive permits from the DNR. For example, MG&E has a make-up well in the area.

BACKGROUND

The Madison Metropolitan Sewerage District are members of the stakeholder group that put forward this project proposal to develop a baseflow augmentation project in the Badger Mill Creek Watershed.

PARTICIPATING STAKEHOLDERS

Lead Organization(s): None

Supporting Organization(s): MMSD, City of Madison

FUNDING

Cost: \$1,100,000

It is anticipated that funding for this project would be contributed by MMSD.

RESOURCE LINKS

2016 Groundwater Flow Model for Dane County -

https://water.usgs.gov/GIS/dsdl/gwmodels/WGNHS2016-Dane_County/WGNHS_B110-report.pdf

Commented [MR1]: In the August straw poll most organizations (7) said they would not participate. Furthermore, Dane County and City of Verona said this project was a deal breaker for them.

Project Close Worksheet

Responses: 7 sheets submitted

What is one thing that stands out to you from this experience?

- The group members helped each other to answer questions
- Well-done facilitators!
- The real work of figuring out actual costs, schedules and logistics related to implementation of the projects is just beginning
- Not all people want to be collaborative or work in partnership when invited to participate at the table, even when there is a common interest
- While there were a lot of different perspectives from different groups, as a whole we were still able to agree on a portfolio of projects
- Hearing/learning different interests and desires
- The number of people who care for and are stewards of a creek

What is one question that remains outstanding for you?

- Modified budget
- I'm still not quite clear on how the implementation portion of this will work
- Formation of a future implementation group for schedule and status
- Not knowing the effect of effluent until it happens

What is one thing you are grateful to your colleagues in this room for?

- Folks were fairly respectful and all were allowed to speak and ask questions
- Their time and commitment to this process
- A lot of time and effort has gone into this steering committee
- Showing up and sticking it out until the end, and to those who are project leads for continuing the work
- Bringing different thoughts, ideas, and perspectives to the table each month and working as a team in good faith
- Raising awareness and knowledge of many issues in the larger watershed
- The respectful disagreements