

**REGULAR and
PUBLIC MEETING MINUTES**

July 14, 2022

(Action by the SCWMC appears in blue, by the WMWMC in green and shared information in black.
*indicates items included in the meeting packet.)

I. A joint meeting of the Shingle Creek Watershed Management Commission and the West Mississippi Watershed Management Commission was called to order by Shingle Creek Chairman Andy Polzin at 12:45 p.m. on Thursday, July 14, 2022, at Crystal City Hall, 4141 Douglas Drive, Crystal, MN.

Present for Shingle Creek were: David Mulla, Brooklyn Center; Alex Prasch, Brooklyn Park; Randy Bergstrom, Crystal; Karen Jaeger, Maple Grove; Ray Schoch, Minneapolis; Bob Grant, New Hope; John Roach, Osseo; Andy Polzin, Plymouth; Wayne Sicora, Robbinsdale; Diane Spector, Todd Shoemaker, and Katie Kemmitt, Stantec; Troy Gilchrist, Kennedy & Graven; and Judie Anderson, JASS.

Present for West Mississippi were: David Mulla, Brooklyn Center; Alex Prasch, Brooklyn Park; Gerry Butcher, Champlin; Karen Jaeger, Maple Grove; John Roach, Osseo; Diane Spector, Todd Shoemaker, and Katie Kemmitt, Stantec; Troy Gilchrist, Kennedy & Graven; and Judie Anderson, JASS.

Also present were: Mitchell Robinson, Brooklyn Park; Heather Nelson, Champlin; Mark Ray, Crystal; Mark Lahtinen, Maple Grove; Katie Kowalczyk, Minneapolis; Nick Macklem, New Hope; Amy Riegel, Plymouth; Richard McCoy and Mike Sorensen, Robbinsdale; and James Fallon, USGS.

II. **Agendas and Minutes.**

Motion by Schoch, second by Jaeger to approve the **Shingle Creek agenda*** as revised. *Motion carried unanimously.*

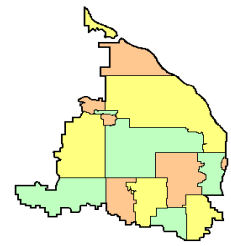
Motion by Roach, second by Butcher to approve the **West Mississippi agenda*** as revised. *Motion carried unanimously.*

Motion by Schoch, second by Jaeger to approve the **minutes of the June 9, 2022, regular meeting.*** *Motion carried unanimously.*

Motion by Roach, second by Butcher to approve the **minutes of the June 9, 2022, regular meeting.*** *Motion carried unanimously.*

III. **Finances and Reports.**

A. Motion by Schoch, second by Prasch to approve the Shingle Creek **July Treasurer's Report* and claims** totaling \$63,612.90. Voting aye: Mullen, Prasch, Bergstrom, Jaeger, Schoch, Grant, Roach, Polzin, and Sicora; voting nay: none.



B. Motion by Butcher, second by Roach to approve the **West Mississippi July Treasurer's Report* and claims** totaling \$11,569.96. Voting aye: Mulla, Prasch, Butcher, Jaeger, and Roach; voting nay: none.

IV. Open Forum.

James Fallon, Data Chief, Minnesota portion of Upper Midwest Water Science Center of the U.S. Geological Survey, was present to give an **update on USGS activities in Shingle Creek** and nearby watersheds. On pages 9 and 10 of these minutes are some links to the new USGS National Water Dashboard interactive map. It allows viewers to access real-time water data from over 13,500 stations nationwide.

[The regular meeting was suspended at 1:24 p.m. in order to conduct a public meeting.]

V. Public Meeting.

A. The Shingle Creek and West Mississippi Third Generation Watershed Management Plan and Capital Improvement Programs (CIP) are proposed for a Minor Plan Amendment (MPA). The Technical Advisory Committee (TAC) and Commissions have discussed creating a Project Maintenance Fund several times over the last few months, most recently at the June 9, 2022 meeting when the Commissions initiated a Minor Plan Amendment to add such a Fund to the CIP.

As proposed, the Minor Plan Amendment would revise the Shingle Creek CIP to add a new project – “Project Maintenance Fund.” This would create a segregated fund similar to the Cost Share programs that would be funded by an annual levy and would be used for non-structural and maintenance activities to improve or maintain water quality. These are activities such as ongoing long-term efforts to manage carp or curly-leaf pondweed, which would be the largest need, but also maintenance of fish barriers or BMPs installed as research projects, etc.

Notice of the public meeting was sent to the member cities, county, and reviewing agencies, and published as required by statute and the Plan. The purpose of this meeting is to discuss the proposed Minor Plan Amendment and any comments received prior to or at this meeting. (This is not a formal public hearing.) After that discussion, the Commissions may consider a resolution adopting the Minor Plan Amendment. As of this date, no comments have been received. The proposed amendment is shown in Staff’s July 8, 2022, memo.*

B. Open public meeting. The public meeting was opened at 1:30 p.m.

1. No comments on the proposed amendment were received from the reviewing agencies, member cities or the public.
2. No one was present from the general public.
3. The public meeting was closed at 1:31 p.m.

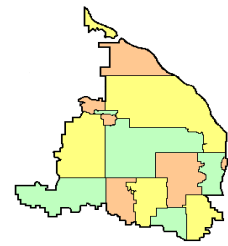
C Commission Discussion.

Motion by Schoch, second by Grant to adopt **Resolution 2022-02 Adopting a Minor Plan Amendment Revising the Capital Improvement Program.* Motion carried unanimously.**

Motion by Jaeger, second by Butcher to adopt **Resolution 2022-02 Adopting a Minor Plan Amendment Revising the Rules and Standards.* Motion carried unanimously.**

[The regular meeting was reconvened at 1:32 p.m.]

VI. Project Reviews.



VII. Third Generation Watershed Management Plan.

VIII. Fourth Generation Watershed Management Plan.

A. Updates – July 6, 2022.*

1. **Schedule.** Staff are a little behind the original schedule but still on track to have a draft document by the end of August for preliminary review. The final topics for general discussion will be budget, JPA, and opportunities for public review of the Implementation Plan.

2. **SCWM Boundary Change.** Staff is progressing on the boundary analysis. Shoemaker presented some preliminary figures showing some of the changes that will affect the Elm Creek and Bassett Creek watershed boundaries. Stantec has confirmed a good “mesh” of those boundaries and is now updating the legal boundaries accordingly.

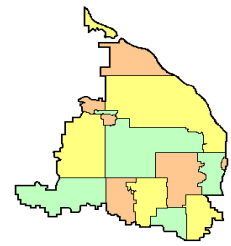
3. **Review of Draft Priorities, Goals, and Policies.** Based on input received at the June meeting Staff have refined the goals and priorities and placed them into textual context. They also met with Hennepin County to discuss climate resiliency and groundwater and incorporated those discussions into the text. Commissioners are asked to review and refine these priorities, goals, and strategies, which are the foundation of the Implementation Plan. In the Plan, these goals and priorities will be followed by a description of the specific actions the Commissions will take, which will be summarized in the Implementation Plan table. (See details in item B., below.)

4. **Review of Preliminary Implementation Plan Table.** Staff continue to flesh out the individual lake and stream resource plans that will help to define both the monitoring program and the Implementation Plan. They have developed a draft Implementation Plan that incorporates Capital Projects, Project Maintenance, and Other Implementation actions such as special studies. While they have tried to set a schedule that both balances workload and keeps annual budget, levy and other expenditures relatively stable, there are a few exceptions to that (notably 2023). They will work with the Commissions and the cities to further refine activities and schedules, so some of these might move around between years and some of the estimated costs might be further refined. The Third Generation Plan enables the Commissions to make annual adjustments to years and costs without having to amend the Plan; a Minor Plan Amendment is only necessary to add a project or significantly alter a project already on the CIP. That provision will be carried over to the Fourth Generation Plan.

B. Priorities and Goals.* Through the identification and prioritization of issues in the watersheds, the Commissions developed goals that will guide activities over the coming decade. These goals were derived from the Gaps Analysis and a review of the accomplishments and unfinished business from the Third Generation Plan; as well as discussions with Commissioners, Technical Advisory Committee members, state agency staff, other city staff; and citizen input.

The framework to achieve these goals is set forth in the Implementation Plan and Capital Improvement Program detailed in Section xx of this Plan. Member cities supplement and complement these actions with additional policies and programs tailored to their unique priorities and needs. The philosophy of the Joint Powers Agreements and this Plan is that the management plan establishes certain common goals and standards for water resources management in the watersheds, agreed to by the member cities, and implemented by those cities through activities at both Commission and local levels. Successful achievement of the goals in this Plan is dependent on the member cities and their dedication to this effort.

Priorities:



- 1. Achieve lake and stream goals.** Continue to work aggressively toward achieving TMDL lake and stream goals.
- 2. Stimulate implementation.** Foster completion of TMDL load reduction and other implementation activities by identifying improvements, sharing in their cost, and proactively seeking grant funds.
- 3. Engage and educate.** Expand the public education and outreach program to reach more stakeholders, including vulnerable communities and historically underrepresented groups.
- 4. Develop climate resiliency and sustainability.** Anticipate and proactively work to understand and minimize adverse impacts from changing environmental and climate conditions.

Water Quality and Ecological Integrity. While the Commissions' First Generation Plans were primarily focused on adopting and implementing standards for development and redevelopment projects to moderate the impacts of stormwater runoff on receiving waters, by the time of the Second Generation Plan water quality monitoring confirmed that several lakes did not meet state water quality standards. Thirteen of the sixteen lakes were subsequently designated as Impaired Waters by the MPCA due to high concentrations of nutrients. The Shingle Creek Commission was an early implementer of Total Maximum Daily Load (TMDL) studies to diagnose the sources of this excess phosphorus and develop implementation plans to reduce nutrient inputs to the lakes.

Shingle Creek and Bass Creek were also found to be high in chloride concentration, low in dissolved oxygen, and non-supportive of fish and other aquatic life. The Second and Third Generation Plans focused on implementing capital and other projects and assessing progress. As noted in this Plan's Self-Assessment of Progress, those efforts have paid off: three of the original thirteen lakes (Schmidt, Ryan, and Lower Twin) have been removed from the official Impaired Waters List, and two more (Bass and Pomerleau) are slated to be removed, or "de-listed" in 2024. Monitoring data also shows a significant improvement in some water quality parameters in Shingle and Bass Creeks, but not all: chloride and bacteria remain stubbornly high. The fish and biotic communities remain impaired in the creeks, and several lakes are infested with invasive aquatic vegetation.

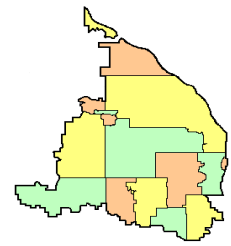
Wetlands also perform a key role in the ecological integrity of the watersheds. Much of the original acreage of wetlands in Shingle Creek has either been filled or significantly altered by development. The northern half of West Mississippi developed much later, under the regulation of the Wetland Conservation Act (WCA). While they have not been filled, many of the wetlands in that watershed have been altered by changing hydrology that redirected runoff and reduced surficial groundwater recharge. While there are a few wetlands of higher quality, most have been impacted to some degree.

The Fourth Generation Plan will continue to focus on improving the lakes and streams in the watersheds to meet state water quality and ecological integrity standards and protecting those that meet those standards. The primary implementation strategies to achieve these goals are shown in Staff's July 6, 2022, memo.

The Commissions will continue to operate a robust monitoring program to track water quality trends and assess progress.

Goal 1: *Protect, maintain, and improve the water quality and ecological integrity of the water and natural resources within the watersheds and the downstream receiving waters.*

Five strategies to achieve this goal are listed in Staff's memo.



Water Quantity, Groundwater and Drainage. One of the statutory responsibilities of the Commissions is to prevent and mitigate flooding. This has been accomplished primarily by ensuring that development and redevelopment does not create new volumes and rates of runoff that may cause downstream flooding. Despite the extensive upper watershed development that has occurred since the Commissions were established in 1985, there are few non-localized flooding problems in the two watersheds. Early on the Commissions and member cities identified this as an important issue and enacted the appropriate controls to limit rates and volumes of runoff from new development and redevelopment. A second Commission responsibility is managing or staying abreast of surface water-groundwater interactions, including groundwater recharge, stream baseflow and lake levels, wellhead protection and maintaining adequate hydrology to wetlands. Hennepin County intends to update its Groundwater Plan in the next several years, and the Commissions will provide input to that analysis and assist in implementing County priority actions.

Shingle Creek from approximately Xerxes Avenue North in Brooklyn Park to Webber Park in Minneapolis was ditched and channelized as Hennepin County Ditch #13 in 1910 and remains under the County's jurisdiction. Hennepin County is willing to transfer authority to the Shingle Creek Commission or the member cities, but neither has expressed an interest.

This Fourth Generation Plan will continue to rely on the development rules and standards to limit new rates and volumes of runoff and to require infiltration or other abstraction such as stormwater reuse to protect and replenish surficial groundwater. The Commission also maintains a hydrologic and hydraulic model for the watershed that was updated in 2021 and will be used to track any impacts to flood flows and elevations due to land use change.

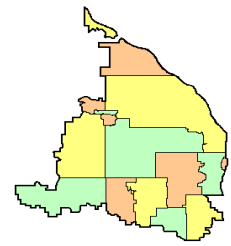
Goal 2: *Reduce stormwater runoff rates and volumes to limit flood risk, protect conveyance systems, protect surficial groundwater, and reduce or mitigate impacts that have already occurred.*

Strategies to achieve this goal are listed on page 3 of Staff's July 6 memo.

Education and Engagement. The Commissions initially established an Education and Outreach Program as part of the Second Generation Plan. At about the same time the member cities were required to develop education and outreach plans as part of their National Pollution Discharge Elimination System (NPDES) stormwater permits. Because these requirements were common across the cities, the member cities requested that the Second Generation Plan be designed to help them fulfill the NPDES Public Education and Outreach requirements, and this was continued in the Third Generation Plan.

The Commissions also collaborate with the Elm Creek and Bassett Creek WMOs as part of the West Metro Water Alliance (WMWA) and participate in Metro-wide education and outreach initiatives such as Blue Thumb, Watershed Partners and Northland NEMO. The WMWA collaboration is an opportunity to pool resources on larger or region-wide initiatives, such as the ongoing Watershed PREP program providing specialized classroom lessons to 4th graders and the shared education and outreach coordinator position proposed jointly with Hennepin County in 2023.

Over the past decades the demographics in the watersheds reflect a growing economic, racial, ethnic, and cultural diversity. Residents living in roughly two-thirds of the land area in Shingle Creek were estimated by Hennepin County to be among the most vulnerable to environmental injustice in the county based on race, income, ability, health, and social status, with parts of West Mississippi also experiencing more moderate vulnerability. As a part of this planning process, the watersheds partnered with Bassett Creek WMO to learn and start a conversation about environmental injustice, how other organizations are increasing their outreach



to underserved communities, and how to begin building relationships and work toward more equitable environmental outcomes.

The Fourth Generation Plan will continue to expand the education and outreach program to meet both the needs of the member cities' stormwater permits as well as other supplemental topics and will continue to partner with WMWA to expand joint offerings, including realizing a vision of a shared education and outreach coordinator. This expanded effort will also include renewed focus on developing more opportunities to engage all communities in the watersheds, and to require an Equity Impact Analysis be completed for all projects receiving Commission funding.

Goal 3: *Educate and engage all stakeholders in the watersheds on surface water issues and opportunities.*

Three strategies to achieve this goal are listed in Staff's memo on page 4.

Climate Resilience and Sustainability. Water and natural resources are directly influenced by climate – precipitation, temperature, and other actors. Our climate is non-static: the Minnesota State Climatology Office has observed and documented changes in our climate since the late 1800's. Research suggests that the state will continue to get warmer and wetter, with more extreme rainfall events. Winters are warming, summers are more humid, and the growing season is expanding.

The highly altered and developed landscape in the watersheds limits options to prevent or mitigate impacts and increases vulnerability to changing conditions. The cumulative impact of development – paving over surfaces that previously could infiltrate precipitation and prevent flooding, loss of woods and grasslands and wetlands – is a loss of resiliency to adapt to the increasing variability in climate.

The types of changes observed in Minnesota also have the potential to more directly and negatively affect water resources. Increased daily temperatures and a longer growing season may cause shifts in lake aquatic vegetation and result in more frequent algal blooms. Runoff from more frequent, higher intensity rain events increases flows, velocities, and shear forces in streams, increasing erosion and stream instability. Biotic integrity is diminished as lake and stream aquatic species select toward those that are more tolerant to pollution or to highly variable flows.

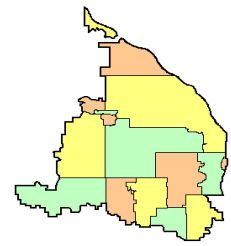
The Fourth Generation Plan will focus on better understanding the magnitude of those impacts both locally and regionally and identifying appropriate responses. The Commissions' hydrologic and hydraulic models will be used to evaluate how future precipitation patterns may affect the extent and duration of flood events, and to identify infrastructure that may be at long-term risk of flooding. It will also be used to evaluate the impacts of potential development rules and standards changes.

Because local and regional partnerships will be necessary to combat non-static climate, the Commissions will collaborate with: (1) Hennepin County in implementing and updating its Climate Action Plan; (2) the Metropolitan Council with its Climate Vulnerability Assessment; and (3) the State Climatology office to better understand and quantify impacts and potential responses.

Goal 4: Anticipate and proactively work to withstand adverse impacts from changing environmental and climate conditions.

To achieve this goal, four strategies are listed on the last page of Staff's July 6, 2022, memo.

C. Capital Improvement Programs. Included in the meeting packet were spreadsheets* showing the Shingle Creek and West Mississippi proposed 2023-2032 CIPs. Annual project costs range from \$340,000



to \$6,480,00 for Shingle Creek and \$150,00 to \$410,00 for West Mississippi. Commission shares range from \$180,000 to \$2,035,00 and \$100,000 to \$225,000, respectively.

IX. Water Quality.

X. Grant Opportunities.

The Board of Water and Soil Resources (BWSR) is now taking applications for its annual **Clean Water Fund grants**, which are funded through the 2008 Clean Water, Land, and Legacy Amendment (CWLA). This statewide competitive program awards grants from several subprograms, including Projects and Practices, the Projects and Practices Drinking Water sub-program, Multipurpose Drainage Management, and Soil Health as well as specialized loan programs. By far the largest program, funded this year by an estimated \$9.7 million from the dedicated sales tax proceeds, is the Projects and Practices program. A description* of this program is included in the meeting packet. Shingle Creek has been very successful over the last several years in obtaining over \$2 million in grant funding from the CWLA to undertake projects, including the Palmer Estates Stream Restoration, Connections II Stream Restoration, Meadow Lake Management Plan, Bass and Pomerleau Alum Treatment, the Becker Park Infiltration project, and the original Connections I Stream Restoration.

Projects and Practices grants require a 25% local match and must be used to implement priority protection or restoration actions listed in or derived from a current state approved and locally adopted plan, and must have clear, measurable outcomes. Grants would be available in Spring 2023 and must be fully expended by December 31, 2025. Eligible applicants include counties, WMOs, cities, and a few other entities. Applications are due August 22, 2022.

At this time Shingle Creek has no pending projects that are positioned for construction or implementation. The next projects that might benefit from grant funding are the proposed Bass Creek Stabilization from TH 169 to 63rd Avenue, and the Eagle Lake Management Plan. Both those projects require additional planning and feasibility work before they would be ready to request grant funding, perhaps in 2023.

There is one potential project in West Mississippi that Brooklyn Park and Hennepin County have proposed in the past, stabilizing severely eroding Mississippi Riverbanks adjacent to several private properties. The city had submitted an application last year, but it was not selected for funding. Presumably this could be submitted again, noting that the West Mississippi Commission is dedicating a majority of its Watershed Based Implementation Funding as well as Partnership Cost Share to the project.

Motion by Roach, second by Mulla to direct Staff to prepare an application for the West Mississippi restoration project for approval at the August meeting. *Motion carried unanimously*

XI. Education and Public Outreach.

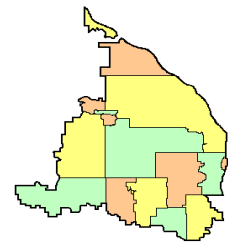
The West Metro Water Alliance (WMWA) will meet via Zoom at 8:30 a.m., August 9, 2022.

At their July meeting, members of WMWA focused on creating a position description for the education and outreach coordinator. This will be a two-year limited duration Hennepin County position dedicated half time to WMWA/funding partners activities and half time to more general County environmental education and outreach activities.

XII. Communications.

A. Staff Report.*

1. Watershed Boundary Adjustments. (See VIII.A.2., above.)



2. Watershed Based Implementation Funding. The Shingle Creek and West Mississippi Convene Groups have made recommendations for funding. They are awaiting a final project description for the proposed joint education and outreach coordinator, which is expected in August. Once that is received, any final adjustments will be made and Staff will proceed to work with BWSR to contract the funds.

3. Crystal Lake Management Plan. Stantec, WSB, and the City of Robbinsdale have been working together to bait and remove carp using box nets on the south shore of Crystal Lake for the second year in a row. Three removal events have occurred in 2022, removing 1,459 carp from the lake, and bringing the total removed for both years to 5,382 carp. At least one more removal is planned for this summer. The second alum treatment is planned for September 2022. Sediment phosphorus release rates measured from cores taken in May 2022 show a significant decrease.

4. Bass and Pomerleau Lakes Native Plant Translocation. Stantec has begun planning the harvesting and transplanting of vegetation to Bass Lake. Vegetation will be harvested with the assistance of the DNR and the Bass Lake Improvement Association from Big Carnelian Lake in May Township, MN. Big Carnelian was chosen because of its extremely diverse vegetation community. Stantec scoped plot locations in Bass Lake and is working to set up plots to be deployed in the lake.

5. Meadow Lake Management Plan. Monthly water quality monitoring has been ongoing on Meadow Lake and the lake appears in good condition. A fish survey and vegetation survey are planned for late July to assess the impact of the drawdown on the fathead minnow and curly-leaf pondweed populations. Sediment cores will be collected from the lake in July to assess the impact of the drawdown on sediment consolidation, phosphorus fractions, and phosphorus release rates.

6. Connections II and Bass Creek Restoration Projects. Connections II has had all major restoration and stabilization elements installed. Vegetation is coming in and the City of Brooklyn Center has removed trees from the stream corridor that fell during a late spring storm event. All that remains from the project is a vegetative maintenance task scheduled for Summer of 2023. Bass Creek has also had all major restoration and stabilization elements installed. The contractor is onsite this week finalizing stabilization and working through a final punch list. The contractor plans to complete the punch list by July 15 so all that will remain for the project is a vegetative maintenance task scheduled for Summer of 2023.

7. Palmer Creek Estates Channel Restoration. 60% plans and permitting are underway for stabilization of Schmidt and Ives Channels at Palmer Creek Estates. Construction is planned for this winter. Stantec expects to present the final design at the August TAC meeting, and the City will host a public meeting in September.

B. June Communications Log.* No items required action.

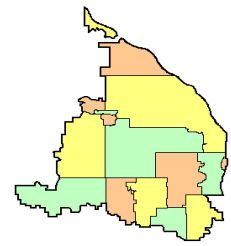
XIII. Other Business.

XIV. Adjournment. There being no further business before the Commissions, the joint meeting was adjourned at 2:40 p.m.

Respectfully submitted,

Handwritten signature of Judie A. Anderson.

Judie A. Anderson
Recording Secretary
JAA:tim



Real-time streamflow for all USGS gages in Minnesota

- [USGS Current Conditions for Minnesota Streamflow](#)

Current web page for Shingle Creek

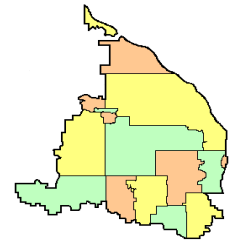
- [USGS Current Conditions for USGS 05288705 SHINGLE CREEK AT QUEEN AVE IN MINNEAPOLIS, MN](#)
- Stage (water level), discharge, water temperature, and specific conductance.
- In box to right of graph, can compare Shingle data to other sites, like Minnehaha (05289800) or Rice Cr (05288580)
- This web page also has links at the top header that will take other data and information collected at the gage, including
 - **Link to WaterWatch gage dashboard** which contains context-added information regarding gage
 - [USGS WaterWatch's "Site Dashboard"](#) where you'll graphs of
 - ◇ Cumulative flow hydrograph
 - ◇ Duration Hydrograph give current flow in context of range of flows that have occurred in period of record
 - ◇ Flood Tracking chart AND table of annual peaks
 - ◇ Rating curve with recent Qms and link to table of our current rating curve (You can add any station ID to this link to get current rating curve for that site)
 - ◇ Raster hydrographThis site may undergo changes in the next year or so also
- **Link:** gage is also part of the USGS National WQ network [USGS National Water Quality Network](#)
 - ◇ [Factsheet https://pubs.usgs.gov/fs/2021/3019/fs20213019.pdf](https://pubs.usgs.gov/fs/2021/3019/fs20213019.pdf)
 - ◇ [NWQN Real-time WQ web site https://nrtwq.usgs.gov/nwqn/#/](https://nrtwq.usgs.gov/nwqn/#/)
 - ◇ <https://nrtwq.usgs.gov/nwqn/#/site/05288705>
 - ◇ [Graphs of annual loads and trends \(WRTDS\)](#)
 - ◇ [Graphs of observed concentrations and trends \(WRTDS\)](#)

Link: Next Generation Monitoring pages [SHINGLE CREEK AT QUEEN AVE IN MINNEAPOLIS, MN - USGS Water Data for the Nation](#). Features still being added (I don't use it yet). Slider bars. Simplified selection buttons. Map is better. Available data and meta data. Still in progress: Historical data, data retrievals route to classic pages (or use Water Services)

New WaterDashboard National Map of Streamgages [USGS | National Water Dashboard](#)

Under gaging stations:

- ◇ Discharge (default) Zoom into metro. Summaries of stations in map view
- ◇ SW Levels – can see which are in NWS flood status, rising falling, etc.
- ◇ WQ turn on ALL, see stations with water temp, or SC
- ◇ Atmospheric
- ◇ Weather Conditions> recent radar-indicated precip or NWS QPF:1,2,3 days
- ◇ Hydrology
- ◇ Rivers
- ◇ Watershed boundaries
- ◇ Aquifers (uppermost bedrock)



New HIVIS Webcams [USGS HIVIS \(Hydrologic Imagery Visualization and Information System\)](#)

USGS reasons for cameras are (1) winter discharge estimates, knowing conditions before/instead of trip, stage verification, outreach, future LSPIV; NWS ice jams; cooperators: water transparency, conditions, etc.

- ◇ Show Hastings for visuals
- ◇ Elm Cr for useful ice estimates & stage verification, dune movement
- ◇ Show Minnehaha Cr outflow: gate setting changes
- ◇ Bad River Reservation site Denominie site, stage data AI

Large Scale Photometric Image Velocimetry [Streamflow Estimation from Advanced Imaging \(LSPIV\) in Pennsylvania | U.S. Geological Survey \(usgs.gov\)](#)

Currently 2 in flashy parts of Minnesota. We plan to pilot a site with Coon Cr WD to help them rate some of their channels