Projects Committee Meeting
Thursday, November 30, 2023 7:30 AM
Lower Platte North NRD Office
P.O. Box 126
Wahoo, NE 68066

1. UNFINISHED BUSINESS

2. JOINT WATER MANAGEMENT ADVISORY BOARD (JWMAB)

2.A. East Fremont/Elkhorn Township Drainage - FEMA HMPG

Final deliverables for both Phase 1 and Phase 2 of alternatives planning project were delivered to NEMA and forwarded onto FEMA.

2.B. West Fremont - FEMA BRIC

The partners have directed JEO to amend their agreement with the County to maximize available grant funding of $250,000. This is not anticipated to increase the NRD's commitment of $20,000 representing approximately one-third of required local costs. As the project progresses, it will focus on advancing ordinance adoption and non-structural programming including:

- City Council/County Board education on need for non-structural and ordinance updates
- Public Education/Information gathering on need for non-structural and ordinance updates
- Develop the ordinances and non-structural program framework
- Assist City with the adoption of ordinances
- Prepare for FY24 Application for any remaining non-structural items or possibly Farmland Levee (eligibility is still a question, but we won't know for sure until application)

2.C. Rawhide Creek Watershed - NRCS WFPO

JEO is working on the plan writing now trying to get the 90% package ready. Getting the field work done and results back are going to be the main drivers on delivery date. Once JEO gets that info, we can have the full 90% plan drafted up in 2-3 weeks.

Both geotech and wetlands folks have this on their to-do list and hoping can get their field work done by 12/1. Geotech will probably have a longer turnaround time on getting their findings and report back to the plan writers but they shouldn't have much impact on the actual plan writing.

Economics are in process. Things are still looking good from that regard. The economist was updated so he'll be prepared to turnaround his final report pretty quickly once JEO sends him final cost estimates.

90% plan documents are expected to be submitted to NRCS by 1/5. A 90% plan

review meeting will be scheduled for the week of 1/22.

The next regular monthly partners meeting will be on Monday December 18th, 1:00pm at Dodge County Emergency Managers office and/or Microsoft Teams.

3. SHELL CREEK WATERSHED

The next SCWIG meeting is scheduled for Tuesday, December 5th, 10:00am at Columbus NRCS office.

3.A. Shell Creek Implementation - 319 & NET

An onsite waste water treatment system was upgraded for Randy Brabec at a total cost of $5,443.01. 60% of that is reimbursable by NDEE 319 funds.

4. WAHOO CREEK WATERSHED

4.A. Dam Site Planning Update

4.A.1. Design - Olsson

Sites 26 & 27: Tree removal bids plan to be advertised 12/6, hold a pre-bid meeting 12/19, and have bids due 1/4/24 to be awarded at 1/8/24 Board meeting.

Site 77: Olsson has analyzed several scenarios to deal issue regarding 72" principal spillway; NRCS has no standard design drawings to cover a 72" concrete pipe principal spillway, therefore, would require an extensive review from National. There is also concerns about challenges faced with installing pipe of that size to design specs.
The recommended alternative for further analysis is a dual 48" pipe spillway with a small increase in auxiliary spillway width. NRCS will need to approve.

Site 55: Olsson will request further geotech analysis from NRCS to best determine path forward to deal with Todd Valley sands at
site. Engineering/design costs are covered through WFPO program.

4.A.2. Real Estate - Olsson & Great Plains Appraisal

Offer letters were mailed 11/27, Danielle Allen made contact with all landowners and has begun to set up meetings. Danielle will be available for the Board meeting.

Olsson invoice for $2,873.63 attached.
Great Plains invoice for $23,100.00 attached.

4.A.3. Funding - NRCS WFPO & NeDNR JEDI

4.B. Water Quality - NWQI & 319

Drew and Ryan are meeting with NDEE on December 4th to outline a 319 grant workplan. NRCS is planning to have an in-person NWQI (National Water Quality Initiative) meeting at the NRD the week of December 18th.

5. LOWER PLATTE RIVER CORRIDOR ALLIANCE

Bi-Annual meeting occurred on November 29th at LPSNRD. Our next meeting will occur in May, 2024. By the next meeting, the NRD's plan to have some work done on updating the Alliacne Watershed Management Plan. This is what makes our Skull &

Bone watersheds eligible for NDEE 319 grant funds (similar to SCWIG). Staff plan to begin working on a 319 project plan for Skull and Bone once our Wahoo Creek 319 plan is complete, spring/summer of 2024.

The Alliance has engaged USGS to look at a trend analysis on continuous water quality collected at four sites: Platte River at Louisville, Elkhorn River at Waterloo, Platte River at Leshara, and Salt Creek near Ashland. There is a document attached describing the proposed study in more detail. Staff are recommending a presentation from USGS at a future committee or board meeting. Direction is requested before the next Alliance meeting in May. All Alliance members have shown some degree of interest. Total cost of the project is estimate at $148,100. USGS will contribute $48,300 with interested Alliance members responsible for the remaining $99,800. This would be a two year project spread between two to three fiscal years.

2024 membership bill of $1,000 and our share of the Leshara stream gauge of $5,320 will arrive soon. There are 8 members of the alliance: LPS, PMR, LPN, National Guard, Game & Parks, UNL, NeDNR, and NDEE. Three are 5 entities splitting Leshara gauge costs: LPS, PMR, LPN, LWS, and MUD.

The Lower Platte South facilitated an airboat tour to view and discuss projects downstream of the highway 6 bridge. They had 11 of their 21 directors, several staff, and one senator attend. Is this an interest to LPN?

Elbert with NDEE is planning on retiring in March.

An agenda for this meeting is attached along with approved minutes from the previous bi-annual meeting on May 31st, 2023.

6. MORSE BLUFF LEVEE

Director Saalfeld coordinated a meeting on November 11th. Lots of discussion occurred regarding potential funding and technical assistance. The bottom line, is an entity is needed to lead projects and hold easements.

Our legal council, Jovan, gave us some guidance:
- The Village of Morse Bluff could as long as the project is within their one mile zoning jurisdiction (the project does not appear to be within their jurisdiction),
- A Township could as long as it is not defunct,
- A drainage district could (if one exists) and/or a SID. A SID gets complicated as it has to go through a similar process of setting up an IPA (Improvement Project Area) by landowner petitioning and future burdens of elections, insurance, budgets, and auditing.
- Another option could be a rural fire district as they are political subdivisions and could argue that it falls under the scope of their emergency response services.

Attendees included: Directors Saalfeld and Tonnies, Staff Chapman, Greg Johnson with the US ACE, and four landowners.

7. OTHER

Keep Fremont Beautiful's Scrap Tire Collection Event occurred on November

11th. Director Saeger and Staff Chapman helped at the event along with thirteen other volunteers. Approximately 375 participated and 365.83 tons of tires were collected in 5 hours.

8. ADJOURNMENT

Progress Report for Wahoo Creek Watershed Dams Sites

Lower Platte North NRD

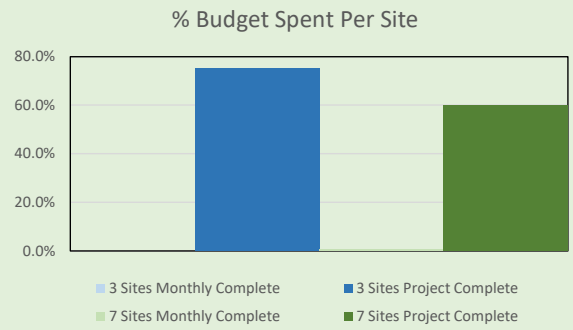
olsson

For Work Compled During The Month Of : October, 2023
(through 11/4/23)

Project # 018-3423 Dam Site 26A, 26B, &27 Project Phase	Phase Budget	Billings for Month Current Earned/Billings	 % Completed This Month	Project Total Billings to Date JTD Earned/Billings	 % Completed Overall
010 - Project Management/Meetings	$ 23,213		0.0%	$ 14,067.55	60.6%
020 - Geotechnical Engineering	$ 224,493		0.0%	$ 226,775.48	101.0%
030 - Dam Design	$ 184,885		0.0%	$ 199,168.83	107.7%
040 - Permitting	$ 86,634		0.0%	$ 60,884.18	70.3%
050 - Survey and Legal Descriptions	$ 11,142		0.0%	$ 23,636.47	212.1%
060 - Community/Public Participation	$ -			$ -	
070 - Construction Services	$ 171,962			$ 1,590.75	0.9%
				$ -	
3 Sites Totals	$ 702,329	$ -	0.0%	$ 526,123.26	74.9%

Project # A18-3423 (separate invoice) Sites 55, 66, 77, 82, 84, 85, &86 Project Phase	Phase Totals	Billings for Month Current Earned/Billings	 % Completed This Month	Project Total Billings to Date JTD Earned/Billings	 % Completed Overall
100 - Project Management/Meetings	$ 60,813		0.0%	$ 33,240.14	54.7%
110 - Geotechnical Engineering	$ 592,047	$ 2,771.05	0.5%	$ 566,187.05	95.6%
120 - Dam Design	$ 425,202		0.0%	$ 399,831.35	94.0%
130 - Permitting	$ 244,810	$ 11,150.13	4.6%	$ 151,697.59	62.0%
140 - Survey and Legal Descriptions	$ 28,165		0.0%	$ 33,529.76	119.0%
150 - Community/Public Participation	$ 30,000		0.0%	$ 5,899.20	19.7%
160 - Other	$ -			$ -	
170- Construction Services	$ 603,992			$ -	0.0%
7 Sites Totals	$ 1,985,029	$ 13,921.18	0.7%	$ 1,190,385.09	60.0%

Billings For Month	**$ 13,921.18**
Total Billings To Date	$ 1,716,508.35
Project Budget	$ 2,687,358.00
Budget Remaining	$ 970,849.65



Summary Of Work Completed This Month	
Sites 26A, 26B, & 27	Sites 55,66,77,82,84,85, & 86
-Awaiting comments from State for submittal of 26a, 26b and 27 -Finalized the legal descriptions for 1st three sites	-Submitted 60% plans for Sites 84, 85, 86 -Finished draft geotechncial analysis for 84, 85, 86 -Project management -Environmental: Coordination with USACE and NRCS, wetland mitigation calculations, permit preparation updating plans based on comments -Met with NRCS and NRD to discuss pipe size changes for 77

Planned Work For Next Month	
Site 26A, 26B, & 27	Sites 55, 66, 77, 82, 84, 85, & 86
-Anticipating comments from the State of Nebraska in November and December	-Finish NRCS comments and submit 90% for Site 66 -Finish Tree bid package and bid early December -Updating USACE permit for nationwide permit and individual permits -Finalize on approach for Site 77 and begin updating 60% plans

For questions regarding billings, please contact Andrew Phillips at (402) 440-8807 or aphillips@olsson.com

Invoice

olsson

601 P St Suite 200
PO Box 84608
Lincoln, NE 68501-4608
Tel 402.474.6311, Fax 402.474.5063

November 22, 2023
Invoice No: 479083

Invoice Total $13,921.18

Ryan Chapman
Lower Platte North NRD
PO Box 126
Wahoo, NE 68066-0126

Olsson Project # A18-34230 Lower Platte North NRD Wahoo Creek Watershed & 7 Dam Sites Phase II

Professional services rendered October 8, 2023 through November 4, 2023 for work completed in accordance with agreement.

Phase 110 Geotechnical Engineering

Labor

	Hours	Amount	
Assistant Engineer	.75	73.42	
Project Professional	16.50	2,300.43	
Administrative/Clerical	5.00	397.20	
Totals	22.25	2,771.05	
Total Labor			**2,771.05**
		Total this Phase	**$2,771.05**

Phase 130 Permitting

Labor

	Hours	Amount	
Principal	36.25	6,486.82	
Assistant Professional	39.00	4,286.77	
Administrative/Clerical	1.00	74.04	
Totals	76.25	10,847.63	
Total Labor			**10,847.63**

Reimbursable Expenses

Filing Fees		302.50	
Total Reimbursables		**302.50**	**302.50**
		Total this Phase	**$11,150.13**
		AMOUNT DUE THIS INVOICE	**$13,921.18**

Authorized By: Andrew Phillips

INVOICE PAYMENT IS REQUESTED WITHIN 30 DAYS

Invoice

601 P St Suite 200
PO Box 84608
Lincoln, NE 68501-4608
Tel 402.474.6311, Fax 402.474.5063

November 21, 2023
Invoice No: 478817

Invoice Total $2,873.63

Ryan Chapman
Lower Platte North NRD
PO Box 126
Wahoo, NE 68066-0126

Olsson Project # 023-00443 LPNNRD Wahoo Creek Watershed Flood Reduction Project Real Estate Services

Professional services rendered through November 4, 2023 for work completed in accordance with our Agreement dated February 17, 2023.

Phase 100 Real Estate Acquisitions

Labor

		Hours	Amount	
Principal		12.50	2,873.63	
	Totals	12.50	2,873.63	
	Total Labor			**2,873.63**
			Total this Phase	**$2,873.63**

Billing Limits	**Current**	**Prior**	**To-Date**	
Total Billings	2,873.63	25,064.70	27,938.33	
Limit			210,000.00	
Balance Remaining			182,061.67	
		AMOUNT DUE THIS INVOICE		**$2,873.63**

Billings to Date

	Current	Prior	Total
Labor	2,873.63	22,478.21	25,351.84
Expense	0.00	2,586.49	2,586.49
Totals	**2,873.63**	**25,064.70**	**27,938.33**

Email invoices to: rchapman@lpnnrd.org; selliott@lpnnrd.org and CC: jbreunig@lpnnrd.org

Authorized By: Danielle Allen

INVOICE PAYMENT IS REQUESTED WITHIN 30 DAYS

Trend Analysis on Continuous Water Quality in the Lower Platte River

USGS Nebraska Water Science Center
Matt Moser, Brenda Densmore, and Dave Rus

In partnership with the Lower Platte River Corridor Alliance

Introduction:
With continuous water quality data being collected in cooperation with the Lower Platte River Corridor Alliance (LPRCA) over the past 15 years, datasets are now sufficient to begin looking for potential water quality trends that are occurring in the lower Platte River. These data sets can be examined using modeling techniques to account for wet and dry years or missing data and detect water quality trends or facilitate comparisons between sites to better understand how the water quality in the Lower Platte River has changed over the monitoring. This short proposal describes the type of modeling that the USGS could complete in cooperation with the LPRCA to gain more information about the water quality of the Lower Platte River as represented by this monitoring data.

The Lower Platte River Corridor Alliance has cooperated with the USGS Nebraska Water Science Center since 2007 to collect continuous water quality data at four stream locations strategically placed in the lower Platte River basin to target specific watersheds. These include:

- Platte River at Louisville has had seasonal collection of water temperature, specific conductance, dissolved oxygen, and turbidity since the fall of 2007. Beginning in 2012, continuous nitrate data were also collected seasonally.
- Elkhorn River at Waterloo has had seasonal collection of water temperature, specific conductance, dissolved oxygen, and turbidity since the fall of 2007. Beginning in 2016, continuous nitrate data were also collected seasonally.
- Platte River at Leshara has had seasonal collection of water temperature, specific conductance, dissolved oxygen, turbidity, and nitrate since 2016.
- Salt Creek near Ashland has had seasonal collection of water temperature, specific conductance, dissolved oxygen, and turbidity since the fall of 2007.

The USGS has provided the Lower Platte River Corridor Alliance and the Natural Resources Districts (NRD with bi-yearly updates on the collected data with graphs, data summaries, and observations on how these continuous water quality variables were changing from year to year. These continuous data sets have also supported other water management operations and studies in these streams by documenting current water quality conditions.
The continuous water quality monitors can provide data for trend analysis over several years, river conditions, and multiple parameters. Continuous water quality monitors provide the ability to look at short term fluctuations in the river that traditional sampling can miss, as well as data that can be collected and analyzed over a variety of flow conditions. Continuous data such as this, provide the ability to look at a more complete picture of river conditions.
To date (2023), statistical analysis of the continuous water quality data being collected has not been completed to better understand how water temperature, specific conductance, dissolved oxygen, turbidity, and nitrate are changed seasonally, during wet and dry years, and year to year over the period of data collection. Therefore, the full value of this continuous data record is not well understood.

Objectives:
The LPRCA and the USGS NEWSC are interested in completing statistical trend analysis on the continuous water quality data from the beginning of each record up to and including the 2023 monitoring season to better understand how these monitored parameters are changing over time. This project will also include an analysis of discharge trends during the same time period.

Conceptual approach:
The high-frequency data from continuous water quality monitoring provides many benefits but also provide challenges to the statistical analysis of trends because of the serial correlation (dependence upon previous data values) inherent in the measurements. Since many wide-spread, readily available continuous water quality data sets are just recently reaching length thresholds that make trend analysis practical (generally around 10 years), trend analysis using these types of data are an active research topic.

Using order statistics of daily values from continuous water quality data in Virginia streams, Porter and others (2020) were able to perform a trend analysis on high frequency data. The USGS Nebraska WSC would follow a similar method to analyze data and look for trends on data collected in Nebraska. Daily values would be utilized for data to run linear regressions on continuous water quality data in the lower Platte. This approach would look at overall trends occurring throughout the time frame and not analyze every single point.

The linear regressions would only focus on the extremes and averages observed within each selected time frame, and then compare those extremes and averages against similar time frames throughout the 15-year period where data have been collected. The USGS NEWSC would utilize previous R packages already established by the USGS and available in R to analyze the data.

Temporal changes in daily discharge statistics will be explored using methods available in the EGRET software (Hirsch and De Cicco, 2015). Daily discharge records can be used to perform Mann-Kendall trend tests, and the associated Thiel-Sen slope estimates, to create Quantile-Kendall plots (Hirsch, 2018) to evaluate discharge trends across the range of discharge values at each of the sites for a specified timeframe. These statistics will be explored as a possible method for trend analysis at the four sites in the lower Platte River. In addition to these trend analyses at each site, sites will be compared to better understand how the full system is changing over the years contributions to the system from the tributaries vs from the Central Platte.

The USGS also previously produced concentration predictions using surrogate relations in the Lower Platte River. These relations were published through a USGS Scientific Investigations Report (Schaepe et al, 2014) and were funded in part by a NET grant. These surrogate equations were developed using continuous water quality data collected from 2007 to 2011 and comparing those data to a USGS sample dataset. When these two data sets are combined, their relations were able to compute additional concentrations of analytes of concern that were occurring in the stream throughout that period. The USGS is proposing to add in data collected from 2011 to 2023 to these equations to update the data to better reflect stream concentrations

over the entire monitoring period. This will help represent the concentrations of additional constituents more accurately in the rivers. By updating these equations, better calculations would be made of real time concentrations of concern such as atrazine, *E.coli*, phosphorus, suspended sediment, and ammonia.

Potential outcome of the study:

The Lower Platte River Corridor Alliance and member NRDs have water quality management plans in place on the Platte River and its tributaries. Part of these water quality management plans are to look at impaired watersheds and water flowing into the river. The trend analysis being proposed can look at the collected continuous water quality data to help determine if long term management changes are impacting the water quality of the lower Platte River. The trends analysis will be able to account for wet vs dry years and see a clearer picture of how the water quality of the system is changing independent of discharge. Often during dry years, the amount of runoff into the channel is diminished which also decreases the quantity of contaminants and likewise during very wet years extremes in water quality are observed.

Long term changes can also possibly identify changes occurring in regard to climatic effects. The temperature in the lower Platte River can be analyzed throughout the previous 15+ years to see if any changes have occurred or are occurring.

The outcomes of this study will also provide a better understanding of how continuous water quality parameters in the Lower Platte River watersheds are changing over time since data collection started. The R scripts used to complete the data analysis will be created in a way that future years of collected data can be further analyzed through these same scripts. The statistical methods used will be described in a USGS scientific investigations report and the R script and resulting trends data will be published as a USGS data release in ScienceBase.

Study duration: 2 years

Data analysis will primarily occur during Federal Fiscal Year (FY) 2024, with report writing beginning at the same time. The final scientific investigations report and data release will be published in FY 2025.

Cost estimate:

The anticipated cost for the data analysis and report production are expected to be $148,100. This cost will be split between the USGS and Lower Platte Corridor Alliance members electing to participate in the trend analysis. Of the total cost, the USGS will be contributing $48,300 and the LPRCA members contributing $99,800.

References:

Helsel, D.R., Hirsch, R.M., Ryberg, K.R., Archfield, S.A., and Gilroy, E.J., 2020, Statistical methods in water resources: U.S. Geological Survey Techniques and Methods, book 4, chap. A3, 458 p., https://doi.org/10.3133/tm4a3. [Supersedes USGS Techniques of Water-Resources Investigations, book 4, chap. A3, version 1.1.]

Hirsch, R.M., and De Cicco, L.A., 2015, User guide to Exploration and Graphics for RivEr Trends (EGRET) and dataRetrieval: R packages for hydrologic data (version 2.0, February 2015): U.S. Geological Survey Techniques and Methods book 4, chap. A10, 93 p., https://dx.doi.org/10.3133/tm4A10.

Hirsch, R.M., 2018, Daily Streamflow Trend Analysis, U.S. Geological Survey Office of Water Information Blog, https://owi.usgs.gov/blog/Quantile-Kendall/

Kendall, M.G., 1975, Rank correlation methods (4th ed.): London, Charles Griffin.

Porter, A.J., Webber, J.S., Witt, J.W., and Jastram, J.D., 2020, Spatial and temporal patterns in streamflow, water chemistry, and aquatic macroinvertebrates of selected streams in Fairfax County, Virginia, 2007–18: U.S. Geological Survey Scientific Investigations Report 2020–5061, 106 p., https://doi.org/10.3133/sir20205061.

Schaepe, N.J., Soenksen, P.J., and Rus, D.L., 2014, Relations of water-quality constituent concentrations to surrogate measurements in the lower Platte River corridor, Nebraska, 2007 through 2011

Sen, P.K., 1968, Estimates of the regression coefficient based on Kendall's tau: Journal of the American Statistical Association, v. 63 p. 1379–1389

Yang, G., and Moyer, D.L., 2020, Estimation of nonlinear water-quality trends in high-frequency monitoring data: The Science of the Total Environment, v. 715, p. 136686, accessed February 2020 at https://doi.org/10.1016/ j.scitotenv.2020.136686.

For any additional questions or comments, please reach out to:

Matt Moser
Physical Scientist
USGS Nebraska Water Science Center
402-328-4184
mmoser@usgs.gov

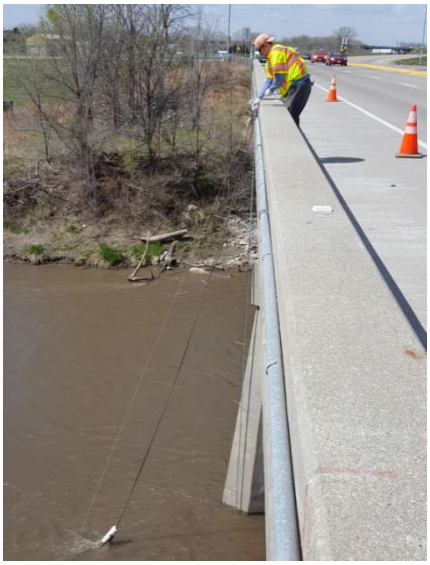
USGS – LPRCA Water Quality Gages in the Lower Platte River

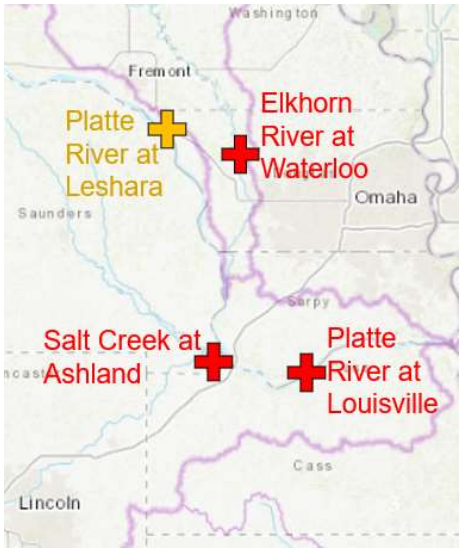
The USGS Nebraska Water Science Center has been cooperating with the Lower Platte Corridor Alliance to collect continuous water quality data in the lower Platte River. Four gages have recorded continuous water-quality data seasonally since 2007. Readings of water temperature, specific conductance, dissolved oxygen, turbidity, and nitrate are taken every 15 minutes and the data are transmitted hourly to the USGS webpages. These water quality measurements provide information for a variety of goals in the Lower Platte River, some of which include:

- Monitoring in support of the Lower Platte River's Water Quality Management Plan
- Potential to identify the water-quality impacts from management and land use changes in the contributing basin and to provide a baseline for future comparisons.
- Assessing the stream health for fisheries
- Better characterization of nitrate concentration in the drinking water source of many Nebraskans.
- Inform those who use the river for recreating of potential water quality risks.
- Development of surrogate estimates to help better quantify loads of non-monitored parameters.

This data collection effort has been funded by multiple agencies that are a part of the LPRCA. The Platte River at Leshara site is funded as a joint agreement between the USGS, Lower Platte South, Lower Platte North, Papio-Missouri, Lincoln Water System and Metropolitan Utilities District.

The remaining three sites; Louisville, Waterloo, and Salt Creek, are funded through USGS, Lower Platte South NRD, and Papio-Missouri NRDs. Data collection will continue under the current agreement through the 2024 calendar year.



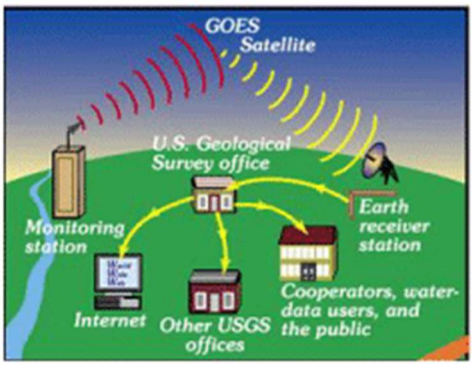


What is continuous real-time water quality?

Real-time water quality refers to in-stream water-quality measurements made available on the web in real-time. Water-quality measurements are recorded in time intervals as small as 5 minutes to hourly and are often referred to as continuous. These time-dense (continuous) stream data are made available on the Web in near real-time (available at http://waterdata.usgs.gov/nwis). Providing these data in real-time informs the user of stream conditions for various uses and public safety.

Real-time water quality information is made possible because of improvements in sensor and data recording technology since the first in-stream sensors were developed in the 1950-60s to directly measure or compute concentrations of many water-quality constituents. Sensors that measure water-quality properties or constituent concentrations are available for specific conductance, pH, water temperature, turbidity, dissolved oxygen, and nitrate. Sensors also are available that measure portions of the electromagnetic spectrum (light) that indicate adsorption or scatter (turbidity, chlorophyll, nitrate, and fluorescence) or sound (acoustic Doppler technology,). In-stream chemical analyzers and portable field laboratories for nitrate and phosphorus also are available. Many additional new sensors are being developed as the need for these data increase.

Increasingly, the USGS, in cooperation with other Federal, Tribal, State, and local agencies and non-governmental organizations, are using these innovative real-time monitoring approaches to collect continuous and immediate water-quality information that is then used as surrogates for many other constituents in water including, sediment, indicator bacteria and nutrients. In recent years, selected field measurements are available in real-time from more than 3,000 USGS sites available at https://waterdata.usgs.gov/nwis.



Continuous real-time information on water quality is a vital asset that helps safeguard lives and property and ensures adequate water resources for a healthy State economy. Increased data-collection frequency provides an improved understanding of factors affecting water quality. Continuous real-time water-quality data are needed for decisions regarding drinking water, water treatment, regulatory programs, recreation, and public safety.

USGS science for a changing world

Matt Moser mmoser@usgs.gov

Why continuous and real time?

Continuous real-time information is a vital asset that helps safeguard lives and property and ensures adequate water resources for a healthy economy. Continuous real-time water-quality data are needed for decisions regarding drinking water, water treatment, regulatory programs, recreation, and public safety. Additionally, increased data-collection frequency provides an improved understanding of factors that affect water quality.

Advances related to monitoring technology are enhancing our understanding of water-quality issues. These advancements include, for example, innovation and new water-quality sensors, monitors (multiple sensors in a single probe), data recorders, and transmission equipment. In-stream water-quality sensors provide continuous measurements (typically, every 5-60 minutes) of water-quality conditions that may vary widely over short periods of time, such as before, during, and after storms or during tidal fluctuations. When these data are available in real time, water management officials can be notified of these changes and are able to respond by altering treatment or collecting additional data. Additionally, real-time measurements for temperature, conductance, and turbidity can be statistically related to other important properties, such as indicator bacteria that are more costly and difficult to monitor and analyze. Continued development, testing, and deployment of a new generation of real-time sensors for water quality have the potential to greatly increase the level of information available.

Advantages of continuous and real-time data:

- USGS real-time water-quality data are available to everyone on the Internet.
- The time-density of continuous data improves our knowledge and understanding of relations between water quality and changes in hydrology, geology, and land use.
- Increased data-collection frequency provides an improved understanding of factors that affect water quality.
- Continuous data provide richer data sets for developing tools and models for extending observed water quality to unmeasured streams and enables development of better management tools for ensuring stream quality protection.
- Notification of water resource managers in real time, eliminating delay between sample collection and lab analysis may be critical for warning the public for recreation or for water treatment.
- Real-time data can decrease time and costs associated with manual sampling.
- Continuous data provide better measures of water quality relative to water-quality criteria compared to a few samples collected during a year.
- Continuous data measure water quality changes at night and during storms when samples are seldom collected and when storm events can have major effects on concentrations and loads.

USGS
science for a changing world

Matt Moser mmoser@usgs.gov