

**South Platte Rivers Urban Waters Partnership (SPRUWP)**  
**November 16, 2021, from 1:00 pm to 3:00 pm**  
**Virtual Meeting**  
**Meeting Summary – FINAL**

**ATTENDANCE:**

*Participants:* Bill Battaglin, Chelsea Campbell, Amy Conklin, Casey Davenhill, Dan DeLaughter, Jim Dorsch, Stacey Eriksen, Kristen Hughes, Rachel Hutchens, Peter Ismert, Jeff Lee, Mike McHugh, Jeff Medaugh, Dave Moon, Jon Novick, Jordan Parman, David Rausch, Gene Reetz, Donny Roush, Taylor Ruffin, Nona Shipman, Steph Sipprell, Erickson Smith, Travis Warziniack, Scott Williamson, and Alison Witheridge

*Facilitation:* Samuel Wallace and Izzy Sofio

**ACTION ITEMS**

<b>All SPRUWP partners</b>	<ul style="list-style-type: none"><li>• For any interested partners, email Steve Lundt to join the Phosphorus Free Fertilizer Coalition.</li><li>• For any interested partners, email Travis Warziniack to collaborate with the Spur Campus' living lab.</li></ul>
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**PARTNER INTRODUCTIONS AND UPDATES**

SPRUWP partners introduced themselves and provided relevant updates. Below are highlights from the partner updates.

***Denver Trout Unlimited (DTU)***

Over the last four months, DTU created and published the *Universal Angling Access Design Guide*. The publication includes updated best practices around angling access and a design guide for improving access to the river. It is available for purchase on Amazon at this [link](#).

***Bluff Lake Nature Center***

The Bluff Lake Nature Center recently welcomed Erickson Smith as its new Land Manager. Erickson will attend SPRUWP meetings going forward in place of Rachel Hutchens. Erickson has a background in wildlife through his time at the National Park Service and Colorado Parks and Wildlife (CPW). Most of his water-related work has been with beavers and native fish species.

***Colorado State University's Spur Campus***

Colorado State University's (CSU) Spur Campus is a development around the National Western Complex. CSU is interested in establishing a living lab, using geography to study what happens in the surrounding neighborhood, and finding a way to incorporate the landscape around the Spur Campus into various experimental designs. The studies and research associated with the living lab will require stakeholder engagement. If any SPRUWP partners are interested in the area around CSU's Spur Campus or the National Western Complex, they should reach out to Travis Warziniack.

***Barr Lake and Milton Watershed Association***

- Barr Milton Lake and Milton Watershed Association is leading the Phosphorus-Free Fertilizer Coalition. If SPRUWP partners and their organizations are interested in joining the Coalition, they should reach out to Steve Lundt at [slundt@mwrddst.co.us](mailto:slundt@mwrddst.co.us).
- Organizations who join will have their logo added to the page of other organizations supporting the movement.

- As part of the outreach efforts around the Phosphorus-Free Fertilizer Coalition, a billboard will be installed on Highway I-76, near the Mile High Flea Market, in April. There will also be associated advertisements on Colorado Public Radio.

### ***One World One Water Center (OWOW)***

Nona Shipman was promoted to Co-Director of OWOW, a position she will fill at the end of the year when Tom Cech retires.

### **SPRUWP 10-YEAR CELEBRATION**

Amy Conklin, Stacey Eriksen, and Donny Roush, long-time members of SPRUWP, shared their perspectives and experiences from the last ten years of SPRUWP. Below are key highlights from their words of reflection.

- The first full partnership meeting was on December 9, 2011. Ten years ago, as SPRUWP formed and met for the first time, Next Generation Science Standards and the Common Core State Standards were released. The City of Denver had just released sustainability goals for swimmable and fishable urban waters.
- Because of the Urban Waters Small Grants Program, Keep It Clean – Neighborhood Environmental Trios (KIC-NET) is a permanent feature of the Denver Department of Public Work's Wastewater Management department. Over the years, KIC-NET has reached 12,000 students, almost 400 teachers, and supported 141 environmental action-related projects.
- Donny Roush shared that the work is still largely the same after ten years, but he gets to spend more time with students. For example, ten years ago, he might spend one-afternoon teaching students about macroinvertebrates in the South Platte River. Now he gets to spend longer periods of time with students, like the third-grade classroom who visited with him once a week for two months recently. Now, there are opportunities to combine watershed and literacy education through programs like the Joe Shoemaker School's summer literacy program, where kids spent three weeks studying Cherry Creek and writing books about what they learned. Students are spending more time in these programs, which means they are learning more.
- Barr Lake and Milton Reservoir Watershed Association received an Urban Waters Small Grant to develop a series of messages about water quality from 2012 – 2014. As mentioned above, some of the messages developed through the Grant will now be included on radio advertisements and a billboard off Highway I-76 to promote the Phosphorus Free Fertilizer Coalition.
- Sometimes, communities do not expect federal initiatives like this one to become long-term programs. However, the Urban Waters Federal Partnership is now a dedicated program with the Environmental Protection Agency (EPA) and other federal agencies. The program is looking for congressional funding to ensure that there is funding available through the Urban Waters Small Grants to help support programs and organizations like KIC-NET and the Barr Lake and Milton Reservoir Watershed Association.
- The EPA appreciates the support of the U.S. Forest Service (USFS), which co-leads this partnership and provides financial contributions. Long-term members and new members expressed gratitude for the last ten years and excitement for the next ten years.

### **ROCKY MOUNTAIN LAND LIBRARY PRESENTATION**

Jeff Lee from the Rocky Mountain Land Library (Land Library) presented information about the Land Library's Headwaters to Plains program and its other programs and initiatives. Below are key points from his presentation.

### ***Background***

- The Land Library began with a book collection of over 50,000 books about the land, water, nature, and people's relationship to each of those elements. Rivers and water have always been important to the collection.
- The Land Library hopes that people will come to their locations and find inspiration through the landscape and the books.

### ***Buffalo Peaks Ranch Location***

- Located in South Park, Colorado, the Buffalo Peaks location, which is on the middle fork of the South Platte River, serves as the "Headwaters" location of the Land Library. The Land Library leases most of the ranch land, buildings, and everything on the property up to the river.
- In addition to the diversity of wetlands and the active beaver population surrounding the ranch, the Land Library has books on topics from Native American literature to poetry to science. The Land Library offers day-long stream ecology classes and other wetland-related classes taught by educators like Ashley Rust or Denise Culver. Moreover, groups like Colorado College, the University of Colorado at Denver, and the Colorado School of Mines, can use the space at Buffalo Peaks Ranch to run environmental leadership classes and other educational programs. Programs are very important to the Land Library, and they want people and groups to come to experience the ranch through its books and landscape.

### ***Globeville Location***

- One of the Land Library's "Plains" location is on Washington Street in Denver's Globeville neighborhood, which is one of the Land Library's two Metro Denver locations along the South Platte River. The Globeville location offers more books for adults. In contrast, Metro Waste Recovery's Kassler building, the second "Plains" location, has the Waterton Canyon Kids and Educators Library and offers more books for children.
- CSU's Spur Campus is across the river from the Globeville location.
- Before COVID-19, the Globeville location offered some programs, like a foraging class along the South Platte River Trail. However, COVID-19 caused the Globeville location to close regular hours and suspend programs.

### ***Plans and Projects for the Future***

- The Land Library's long-term project at their Buffalo Peaks Ranch location is to create a river hut library out of an old building on the ranch closest to the river. The river hut library would have books about rivers, water, and fishing, and it would have room for programs, gathering spaces for the water community, and fly-fishing classes.
- For the Globeville location, the Land Library hopes to establish regular hours again, offer programs, and host volunteer days.
- Lastly, the Land Library plans to digitize their collection.

### ***Clarifying Questions***

SPRUWP partners had the opportunity to ask several clarifying questions about the Land Library presentation. Questions are below in italics, and corresponding answers are in plain text.

*How many books are typically checked out at one time at the Globeville location?*

Due to the COVID-19 pandemic, the Globeville location has operated without regular hours. This winter, they plan to establish regular hours again.

*How many books does the Land Library have?*

The Land Library stopped counting how many books they have after 50,000. However, the collection likely totals approximately 55,000 books.

## **SOURCES AND SINKS OF NUTRIENTS DURING LOW-FLOW CONDITIONS FOR THE SOUTH PLATTE RIVER AND CHERRY CREEK IN DENVER, COLORADO IN 2019 – 2020**

Bill Battaglin, US Geological Survey, presented his study on sources and sinks of nutrients during low-flow conditions for the South Platte River and Cherry Creek in Denver, Colorado, in 2019 – 2020. Below are key points and the findings of his study.

### ***Identified Problem and Background***

- In 2017, the City of Denver considered adding orthophosphate (OP) to drinking water to reduce concerning lead levels. Originally, the study was meant to determine if the addition of OP would affect water quality. The City of Denver ultimately did not add OP to the water. However, the study findings provided a better understanding of how ongoing regulatory actions can or will impact the water quality in the South Platte River and Cherry Creek in Denver, Colorado.
- Elevated nutrients in the South Platte River and Cherry Creek have been decreasing over the last twenty years; although, the levels are still high. The high levels of nutrients in the water can lead to increased algae production, reduced dissolved oxygen concentration, eutrophication, impacts on aquatic food webs, and fewer recreational opportunities.
- In 2012, the Water Quality Control Commission created Regulation 85, which established regulations for nitrogen and phosphorus originating from wastewater treatment plants. Since then, wastewater treatment plants have been working to reach the 2022 goal of 1.0 milligrams/liter (mg/L) of total phosphorus (TP) and 15 mg/L of total nitrogen (TN). Regulation 31 establishes lower surface water nutrient standards, like 0.17 mg/L of TP and 2.01 mg/L of TN by 2027 for warm rivers and streams.
- The research's purpose was to identify changes in streamflow and nutrient concentrations and loads in the South Platte River and Cherry Creek as they go through Denver, Colorado. The study employed the Lagrangian approach, in which the researchers selected a parcel upstream and sampled the same water as it moves downstream to monitor any changes to nutrient conditions and loads during low-flow conditions. The study collected data from 45 sites in 2019 and 42 in 2020. The samples were analyzed for OP, TP, nitrate, nitrite, and TN.
- The study area was the South Platte River between the Chatfield Reservoir and Henderson, Colorado, and Cherry Creek between Cherry Creek Reservoir and the confluence with the South Platte River.
- The visual representations of the results are organized on a graph where the reservoirs are at the bottom. Green triangles represent sampling sites, blue flags represent golf courses, and red circles represent wastewater treatment plants. The graphs also indicate tributaries coming into the South Platte River and Cherry Creek. The graphs are approximately scaled to river miles. The width of the shaded part of the river is scaled to the value of each parameter (i.e., streamflow, OP concentration, OP load, TP load, Nitrate concentration, Nitrate load, and TN load).

### ***Streamflow***

- In 2019 on Cherry Creek, the streamflow was moderate from the Cherry Creek Reservoir. There was a decrease in streamflow after the drain at Downing. Increases in the streamflow were associated with wastewater treatment plants and some of the tributaries.

- In 2020 on Cherry Creek, the streamflow was lower from the Cherry Creek Reservoir, and there were larger inputs of streamflow from the tributaries downstream.
- In 2019, the South Platte River saw similar inputs from Marcy Gulch (11.7 cubic feet per second (cfs)) and the Chatfield Reservoir (15.5 cfs). The maximum streamflow occurred at 88<sup>th</sup> Avenue. At the Burlington Ditch, a significant amount of water is removed from the South Platte for Barr Lake and Milton Reservoir, decreasing streamflow. Lastly, the downstream wastewater treatment plant input remains constant throughout. In 2020, the South Platte River saw very similar patterns to 2019.

### ***OP Concentration***

- In 2019 on the South Platte River, there were low concentrations of OP coming from Chatfield Reservoir but a significant concentration from Marcy Gulch. After Marcy Gulch, the water is diluted until after the South Platte Renew wastewater treatment plant, where concentration increases. Again, the water gets diluted until the next wastewater treatment plant. This pattern occurs again before and after the last wastewater treatment plant. The study found that there were not high levels of OP concentrations from any of the drains or ditches flowing into the South Platte River. There were similar findings in 2020 on the South Platte River.
- In 2019 on Cherry Creek, there were low concentrations of OP from the Cherry Creek Reservoir. However, there was a high concentration of OP coming from the drain at Downing. In 2020, there were higher concentrations of OP from the Cherry Creek Reservoir. OP concentrations throughout the rest of Cherry Creek hovered around 1.00 mg/L of OP.

### ***OP Load***

- The loads resemble the streamflow graphs more than the OP concentration graphs for the South Platte River. The OP loads on the South Platte River in 2019 were high in some of the tributaries. There was not an observed increase in the load until the first wastewater treatment plant. After the first wastewater treatment plant, the load dissipates, and the Burlington Ditch removes water and decreases the OP loads. The loads increase after the second, third, and fourth wastewater treatment plant, then dissipate slightly downstream. The loads resembled a similar pattern in 2020 on the South Platte River.
- In 2019, Cherry Creek showed a steady pattern of increasing loads of OP.

### ***TP Load***

The TP load findings are quite similar to the OP loads because a large portion of the TP is OP.

### ***Nitrate Concentration***

- In 2019 and 2020, nitrate concentrations are relatively consistent throughout the South Platte River, generally hovering at about 2 to 3 mg/L. Tributaries along the South Platte River show larger inputs of nitrate concentration.
- In 2019 and 2020, nitrate concentrations in Cherry Creek are much lower than on the South Platte River, staying below 1 mg/L. Cherry Creek also shows higher inputs from tributaries.

### ***Nitrate Load***

- In 2019 and 2020, the nitrate load is small coming from the Chatfield Reservoir into the South Platte River. There are substantial increases in the nitrate load after the wastewater treatment plants. The Burlington Ditch is a distributary along the South Platte River, leading to a decrease in load downstream of the ditch.
- For Cherry Creek in 2019 and 2020, nitrate loads follow a slowly increasing pattern.

### ***TN Load***

The TN load graphs and findings are about the same as the Nitrate load graphs and findings.

### ***Ratio of OP/TP and Nitrate/TN***

- In natural rivers, the ratio of OP to TP should be around five percent, meaning five percent of the TP load would be OP. Cherry Creek and the South Platte River start with a five percent ratio in both years. However, the rates of OP quickly increase to 70 percent in Cherry Creek and over 90 percent in the South Platte River by the end of the study area, meaning the bulk of TP is being transferred as OP, which is the more biologically available form.
- In natural rivers, the ratio of Nitrate to TN should be around 45 percent. In Cherry Creek and the South Platte River, the ratio begins at about 45 percent but increases downstream.

### ***Conclusions***

- Wastewater treatment plants were the largest sources of nutrients within the study system. The wastewater treatment plant's size relative to the river's size at the outflow is a critical factor to determine which plants influenced the river most. The details on this will be in the study's paper.
- Tributaries were mostly small sources of nitrogen, which is not surprising based on the low-flow conditions of the study areas.
- Golf courses are a likely source of nutrients. Golf course input was more noticeable in Cherry Creek, where there are fewer nutrients overall. However, golf courses have noticeable impacts on the South Platte River, too, depending on the season.
- The Burlington Ditch is a major sink likely responsible for removing nitrogen from the river downstream of the ditch. The study found other small sinks throughout the system, mostly where the river loses water. The river may be losing water to a groundwater source, like Oglala Aquifer. There are other sinks along the South Platte River, specifically between Florida and 7<sup>th</sup> Avenue, where hyporheic zone processes are removing nitrogen and phosphorus from the system.

### ***Clarifying Questions***

SPRUWP partners had the opportunity to ask several clarifying questions about the presentation. Questions are below in italics, and corresponding answers are in plain text.

*What are the next steps, solution-wise, for the issues this research uncovered?*

The study provides baseline information, providing a picture of water quality for 2019 and 2020. It is already outdated information. For example, MWR recently upgraded its wastewater treatment plant. However, this data can measure how regulatory changes and upgrades impact water quality. This study should be administered again to gather additional data during different times of the year, as this study captures the winter low-flow period. Groups like South Platte CURE could conduct Lagrangian sampling when they do their sampling to gather more information.

*What was most surprising from the study?*

The most surprising finding from the study was how much signal there was from the golf courses on Cherry Creek.

### *Are there plans for a follow-up study?*

The US Geological Survey (USGS) is attempting to get more Urban Waters Partnership Small Grants to install supergages along the South Platte River to continually monitor nutrients like OP and nitrogen on one or two locations. The SPRUWP Science and Data Committee is discussing this proposal. The USGS submitted pre-proposals for Urban Waters funding to establish a supergage to monitor various metrics on the South Platte River.

### *How healthy is the South Platte River? Should someone swim in the river?*

- The levels of nutrients in the South Platte River should not interfere with someone's decision to swim in the river.
- During certain times of the year, E. coli levels can be concerning high. The Denver Department of Public Health and Environment does not recommend swimming in the areas of the South Platte River in Denver.

### **Group Discussion**

- In the last five years, MWR started utilizing the full biological treatment for phosphorus removal. They also recently started pelletizing the phosphorus and will provide it as composting products for A1 Organics. Additionally, they have reduced their ammonia outputs.
- A few years ago, graduate students researched golf course outputs into the South Platte River. It would be interesting to measure the summer versus winter results from the golf courses. There is an urban myth that golf courses are responsible for a lot of runoff. However, observing a signal from the golf courses may have more to do with the base flow coming in from that part of the aquifer, where the nitrogen is high; it may not be from direct runoff from the golf courses. The shallow aquifer under a golf course may be saturating the ground in the soil zone with high nitrogen levels that may be going back into the river.
- For about half of the year, the wastewater treatment plant's output comprises almost 80 percent of the South Platte River's flow. During low-flow periods, the output from the wastewater treatment plants comprises a higher percentage of the South Platte River flow. Under those conditions, some wastewater treatment plants have modeled significant input from the groundwater. There is also outflow during high-flow conditions, which indicates there is an interaction between groundwater and the river.
- During the times of the year when the Burlington Ditch is pulling water out of the South Platte River, compared to when it is not, the total maximum daily load (TMDL) for cadmium varies greatly along Segment 15 of the South Platte River.
- E. coli is a major problem on the South Platte River. Wastewater treatment plants meet E. coli requirements, so it appears that the E. coli rates come from stormwater and natural input.

### **ASSESSMENT OF IN-STREAM CHANNEL IMPROVEMENTS ON THERMAL MIXING AND NATIVE FISH HABITAT IN AN EFFLUENT-DOMINATED SEGMENT OF THE SOUTH PLATTE RIVER**

Jordan Parman, MWR, presented findings for MWR's assessment of in-stream channel improvements on thermal mixing and native fish habitat in an effluent-dominated segment of the South Platte River. Below are key points from his presentation.

### **Background Information**

- MWR serves approximately two million people in the Metro Denver area. At the Robert W. Hite Treatment Facility (RWHTF), MWR treats approximately 130 million gallons per day (MGD). The RWHTF discharges treated water into Segment 15, which is an effluent-

dominated segment of the South Platte River. In addition to being effluent-dominated, it is also channelized and has several ditch withdrawals. As the river flows through Denver, there is more urban land use, but downstream in Segment 15, there is a transition to agricultural land use. Segment 15 is home to warm-water fish species.

- For over half of the year, 85 percent of Segment 15 is water from RWHTF. When MWR upgrades its treatments, there is often an immediate in-stream impact. For example, in January, MWR transitioned to full-scale biological phosphorus removal.
- Upstream of the RWHTF outfalls, the South Platte River flows at about 2.0 cfs. The RWHTF's outfall contributes water throughout the day at 200 cfs. The project study area at the South Platte River and Clear Creek confluence is about a mile downstream of the outfall. In this location, water flows at about 240 cfs.
- Long-term temperature monitoring indicates that the effluent temperature is higher than the average temperature of the river during the winter. Water temperatures as far as seven miles downstream of RWHTF indicate higher temperatures. The heat from residential water use, such as showers and laundry machines, is retained throughout the process of traveling to the treatment facility, undergoing treatment, and entering the South Platte River as effluent water. On average, the effluent temperature is four degrees Celsius warmer than what the water temperature should be during the winter.

#### ***Instream Mixing Project and the Sewer Heat Project***

- There are several ways to address this problem; however, quite a few solutions are not sustainable. For example, cooling towers are one solution to this problem, but they are associated with high greenhouse gas emissions. MWR is utilizing a “portfolio approach” of sustainable tactics to decrease the temperature of effluent water.
- MWR employs instream mixing tactics, where habitat alteration creates the opportunity to mix cooler water from Clear Creek into the South Platte River. The idea behind the “Instream Mixing Project” is to mix Clear Creek’s cool water with the mainstem of the South Platte River and improve thermal mixing and heat dissipation in Segment 15. The goal of improving thermal mixing is to reduce wintertime temperatures and create more consistent thermal conditions for aquatic life. The project also incorporated aquatic life habitat enhancements into its design.
- MWR also has a large sewer heat construction project under construction at the National Western Complex. As water travels to the wastewater treatment facility, this project will utilize retained heat from the sewer pipes to warm buildings within the National Western Complex. This project provides the National Western Complex with a sustainable source for heat while also reducing the temperature of wastewater when it arrives and undergoes treatment at the wastewater facility. Ultimately, this project will reduce the effluent temperature that will go into the South Platte River. When the project is complete, it will likely be one of the largest sewer heat recovery projects in North America.
- MWR is working on some smaller-scale projects at the RWHTF as well to reduce wintertime temperatures.

#### ***Instream Mixing Project Components***

- Before MWR’s project, water coming from Clear Creek was not mixing into the South Platte River until several miles downstream of the confluence, leaving the main stem of the South Platte warm while the banks cooled. To improve thermal mixing conditions, reduce winter temperatures, and improve aquatic life in this area, MWR engineered a constructed riffle to channel the water from Clear Creek to increase mixing.



- Additionally, MWR used spur dikes, which are rock piles along the riverbanks that direct water into the middle of the channel, to increase thermal mixing. Spur dikes also improve fish habitat because they create pools for fish to reside within. Riffles also create fish habitat.
- MWR installed a second riffle downstream of the first riffle and another spur dike. They also repaired the drop structure below 74<sup>th</sup> Avenue with the hopes of helping assist with fish migration.
- In one part of Segment 15, there was a natural backwater area, an important habitat feature for fish. MWR installed temperature gauges in the backwater area and found that it stays cool throughout the winter. MWR ensured the backwater area was maintained as a nursery-type area for fish.

### ***Temperature Monitoring***

- Another major component of the project was conducting cross-channel thermal gradient assessments, which identify temperature differences in the right and left banks of the river. Before the habitat improvements, there could be a four-to-five-degree temperature difference across the channel.
- MWR installed temperature sensors on both sides of the bank to determine the effectiveness of the thermal mixing. Before the improvements, in 2019, there was about a four-degree Celsius difference. By the next winter season, there was a significantly lower difference of about less than one-degree Celsius; downstream at the drop structure, the river seemed to be fully mixed. MWR saw immediate improvements in thermal mixing after the project.
- It is yet to be determined if the project's other goal, to establish overall temperature reductions downstream of the facility, was achieved. MWR measures the temperature at 88<sup>th</sup> Avenue to determine whether there is a reduction in the overall temperature. So far, MWR has not seen a reduction. One reason for this may be that there is not a strong enough flow coming from Clear Creek to reduce the temperature of the South Platte River.
- The two seasons after the habitat improvements, Clear Creek had lower flows coming into the South Platte River. There may not be enough cooler water in the winter months to influence the temperature of the South Platte River. In higher-flow years, like 2013, 2014, and 2015, the overall temperatures at 88<sup>th</sup> Avenue were lower.
- Climate change model projections indicate that streamflows will be lower and air temperature will be warmer. Even with habitat improvements, some of the benefits may not be seen because of the impacts of climate change.

### ***Target Fish Species***

- The White Sucker, Green Sunfish, Sand Shiner, and Longnose Dace were the target fish species for habitat improvement. All of the species like riffles, submerged sandy bars, and deep pools. Improving the fish habitat should improve the number of fish and fish species in the area.
- Every fall, MWR conducts electrofishing surveys. Based on survey results, native minnows dominate the area. Habitat improvements, like pools, provide habitat for the target fish species; however, introduced fish species also enjoy those habitat features.
- The site has good fish species diversity. One indication of that is the presence of Iowa Darters and Johnny Darters. The Johnny Darter is an especially good indicator as it is a thermally sensitive fish.

### ***Clarifying Questions***

SPRUWP partners had the opportunity to ask several clarifying questions about the presentation. Questions are indicated in italics below, and corresponding answers are in plain text.

*Are there any existing public outreach campaigns regarding water temperature?*

It does not appear that any existing public outreach campaigns are addressing this topic. However, MWR has a pamphlet about the sewer heat project and uses the pamphlet to reach out to developers.

*Is shading a viable option on the South Platte River to help keep the water temperatures lower?*

Usually, shading is a viable option when the temperature-related issue is in the summer because, during the winter, the trees will not provide much shade. Additionally, the South Platte River is quite wide, meaning that any shading trees would not cover the entire width of the river.

*How much of the heat from wastewater comes from the residential sector versus the industrial sector?*

MWR has conducted studies to determine an answer to this question. The study found that contributions from residential areas are significantly warmer.

*Is there an opportunity upstream of the diversion point to increase the water coming into the South Platte River from Clear Creek? Does the amount of diverted water upstream change from winter to summer?*

There is a significant ditch diversion downstream of Golden. However, whether there is a difference between winter and summer diversion rates is unknown. MWR could potentially investigate that.

*Do the gravel pits along the sides of the river help or hinder the efforts MWR is making to restore fish habitat?*

The gravel pits hinder fish habitat restoration efforts. Gravel pits are used for drinking water storage, which means that the pits are lined so that water does not flow out. Some studies show groundwater interruption due to the number of gravel pits along the South Platte River.

### ***Group Discussion***

- South Platte Renew noticed that effluent temperature data has a seasonal component. The effluent temperature is closely related to the ambient air temperature but is delayed by approximately one month. They hypothesize that ground or soil temperatures influence the collection lines. MWR's seven-day temperature average graphs also express about a month delay. Mid-January is the coolest time for ambient air temperatures; however, data expresses that the lowest effluent temperature is in mid-February. These observations are not to say that the air temperature drives the effluent temperature; it simply appears that the air temperature acts as a baseline in which the effluent temperature can present higher or lower depending on the season.
- The approximate month-long delay can interfere with standards and regulations.
- In 2023, there may be an opportunity for partners to produce outreach materials targeting the reduction of residential hot water use. Some opportunities to promote reductions to water temperatures in residential areas include partnering with Xcel Energy to promote setting hot water heaters at 120 degrees Fahrenheit or including a "bill stuffer" or educational pamphlet with utility bills.
- One way to determine the effectiveness of marketing and outreach efforts could be measured through a pilot study where water from targeted residential areas would be directed into a sub-basin equipped with temperature sensors.

**NEXT STEPS**

The next SPRUWP meeting will be on Tuesday, February 15, from 1:00 pm to 3:00 pm.