

R23AS000446 WaterSMART Applied Science

QUANTIFYING WATER CONSERVATION AND WATER QUALITY IMPROVEMENTS FOR MUDDY CREEK



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EXECUTIVE SUMMARY

Project: Quantifying Water Conservation and Water Quality Improvements for Muddy Creek
Date: October 16, 2023
Applicant: Sun River Watershed Group (Category B, watershed group)
Supported by Greenfields Irrigation District (Category A, irrigation district)
See section D.2.2.16 Letter of Partnership
Location: Teton, Cascade, and Lewis & Clark Counties, Montana

The Sun River Watershed Group (SRWG) works collaboratively to protect and restore the resources of the Sun River watershed and its communities in Central Montana. SRWG recently completed a Master Plan for Muddy Creek (a major tributary to the Sun River), which was funded by a WaterSMART CWMP grant. This Master Plan suggests nature-based strategies to restore natural processes on Muddy Creek and describes anticipated benefits to implementation of those strategies. SRWG seeks Applied Science funding through this Proposal for the next planning step – quantifying anticipated benefits through modeling and forecasting – so SRWG and partners can use that quantification to further prioritize strategies suggested in the Muddy Creek Master Plan. Once SRWG has prioritized strategies for Muddy Creek based on quantified benefits, we can use that information to apply for larger-scale planning and construction grants.

This project will begin upon award and be complete within 2 years (est. completion December 31, 2025, based on anticipated award date of April 1, 2024 listed in the NOFO).

The project is a planning effort so will not include on-the-ground activities. Planning will include private, state, and federal lands.

TECHNICAL PROJECT DESCRIPTION

SRWG is a Category B applicant, applying in partnership with Greenfields Irrigation District (Category A). Greenfields Irrigation District will participate in this project by contributing funds, attending outreach meetings, and providing technical support.

Detailed Project Description

This project will quantify the anticipated benefits strategies suggested in the Muddy Creek Master Plan (MCMP) could have on ecological benefits including water availability, water quality, and habitat. SRWG will use the results of this Project to prioritize future work on Muddy Creek. SRWG could potentially extrapolate this project to quantify and prioritize work throughout the Sun River watershed. The basis of need for this project is described in E.1.1. Evaluation Criterion A—Water Management Challenge(s).

The MCMP was developed with support of a Technical Advisory Team, which included experts in water quality, water management and conservation, and aquatic habitat.

Strategies suggested in the Plan aim to restore these ecosystem services, often through nature-based strategies (Figure 1).

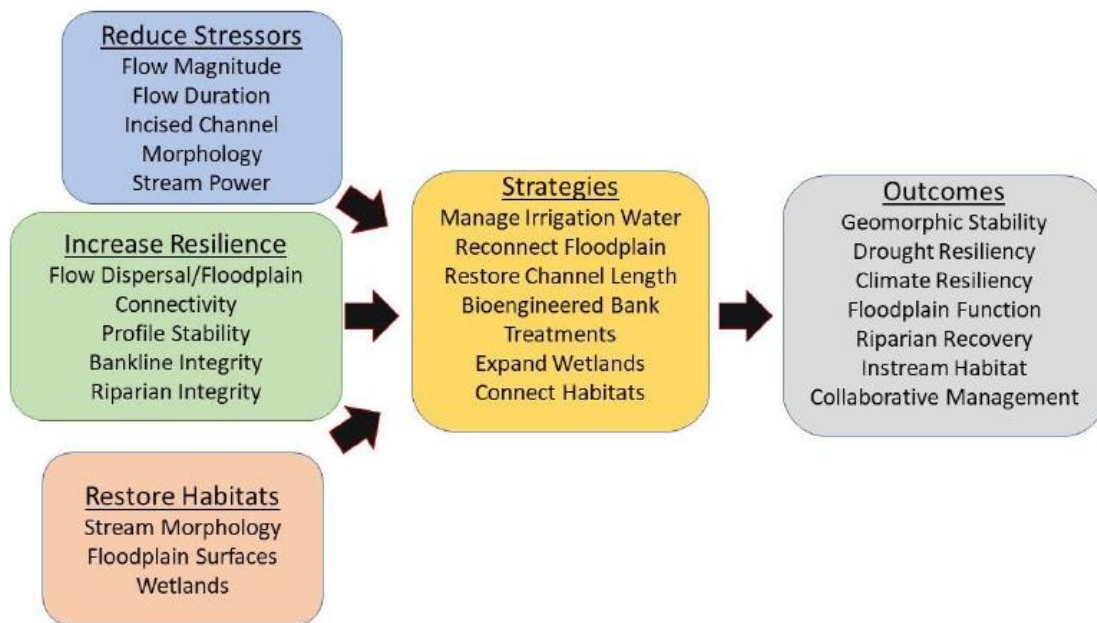


Figure 1. From the Muddy Creek Master Plan, Page 29. Flow chart of ecosystem issues along Muddy Creek, strategies, and expected outcomes.

The MCMP provides an excellent guideline for future work on Muddy Creek and SRWG is pleased to have documentation of strategies to restore ecosystem services. SRWG's next step is to develop a tool for prioritizing future projects. This Project will provide that tool by quantifying anticipated benefits of various suggested restoration strategies.

Goals

This project will analyze the suggested strategies from the MCMP and quantify the anticipated benefits to water availability, water quality, and habitat. Questions to be answered for the various strategies include:

- How much water will be saved or conserved through this strategy?
- How much will this strategy reduce erosion?
- How much less sediment/nutrients will be contributed to the stream through this strategy?
- How much habitat will this strategy create?

By quantifying potential improvements to ecosystem resources, SRWG can prioritize strategies to be implemented through future work. SRWG anticipates using this tool throughout the watershed where similar conditions exist. SRWG is open to including other goals as recommended by Reclamation or other partners.

Work Plan

To accomplish these goals, SRWG will form a Technical Advisory Committee (TAC) made up of, at a minimum, water quality, stream flow, and aquatic habitat advisors. The TAC will advise a consulting team, guide and inform the development of the Report, and review the final Report.

SRWG will hire an engineering consultant to perform spatial analysis and modeling of current conditions and anticipated conditions induced by each strategy. SRWG will follow federal procurement policies in the hire of this consultant. The consultant will be advised of the project goals and will be asked to make a recommendation for the best actions and measurements for achieving these goals, within the project budget.

SRWG has been collecting water quality data (publicly available on [DataHub](#)) for 19 years, including water quality above, below, and in Muddy Creek. Data collected has included stream flows, Total Suspended Solids (TSS), Total Nitrogen (TN), Total Phosphorus (TP), Nitrate + Nitrite (NO₃+NO₂), pH, water temperature, Specific Conductance (SC), Turbidity, and site photos. In addition, there is a network of stream gages, including several on Muddy Creek, which relay real-time stream flows. The stream gage at the mouth of Muddy Creek provides over 82 years of flow data. These data will provide essential background to inform the consulting team's modeling projections. Stream gage data are available on [USGS](#), [Reclamation](#), and [DNRC](#) websites.

The final deliverable of this project will be a report, created by the consultant, reviewed and informed by the TAC, SRWG, and available data. This report will be publicly available on the SRWG website and will be presented at a stakeholder meeting. Also included in this project is the upgrade of SRWG's seasonal stream gage hardware, which will enable the continued monitoring of stream flows on some of the Sun River tributaries.

Next Steps

The final Report will be a tool SRWG can use to inform future work. SRWG will use the results of this tool to prioritize which strategies and projects to include in future WaterSMART watershed-scale planning and construction grants, such as the AERP program. Another SRWG goal is to be selected as a DEQ Priority Watershed. This would mean half of DEQ's 319 funding each year (for a period of 2-3 years) would be reserved for SRWG projects. For this, SRWG must have projects that will provide a significant improvement to water quality ready to design and build. The Report will show SRWG has projects identified that will have quantifiable improvements to water quality and a strategy for implementation. These steps will help SRWG stand out as a candidate for the DEQ Priority Watershed program. [This link](#) describes 319 funding and shows that ½ of funds are reserved for the priority watershed (currently the Lower Gallatin River).

This Report will enable SRWG to present a strategic plan to grantors that will provide the maximum benefits to natural resources on Muddy Creek and across the Sun River watershed.

PROJECT LOCATION

The Sun River watershed is in Central Montana between Gibson Dam and Great Falls. The Muddy Creek sub-watershed is a 256-square-mile drainage at the western edge of the Sun River watershed. Muddy Creek is approximately 44 miles long that flows into the Sun River at the town of Vaughn, crossing Teton and Cascade Counties. The Muddy Creek basin includes a mixture of Federal, State, and private property.

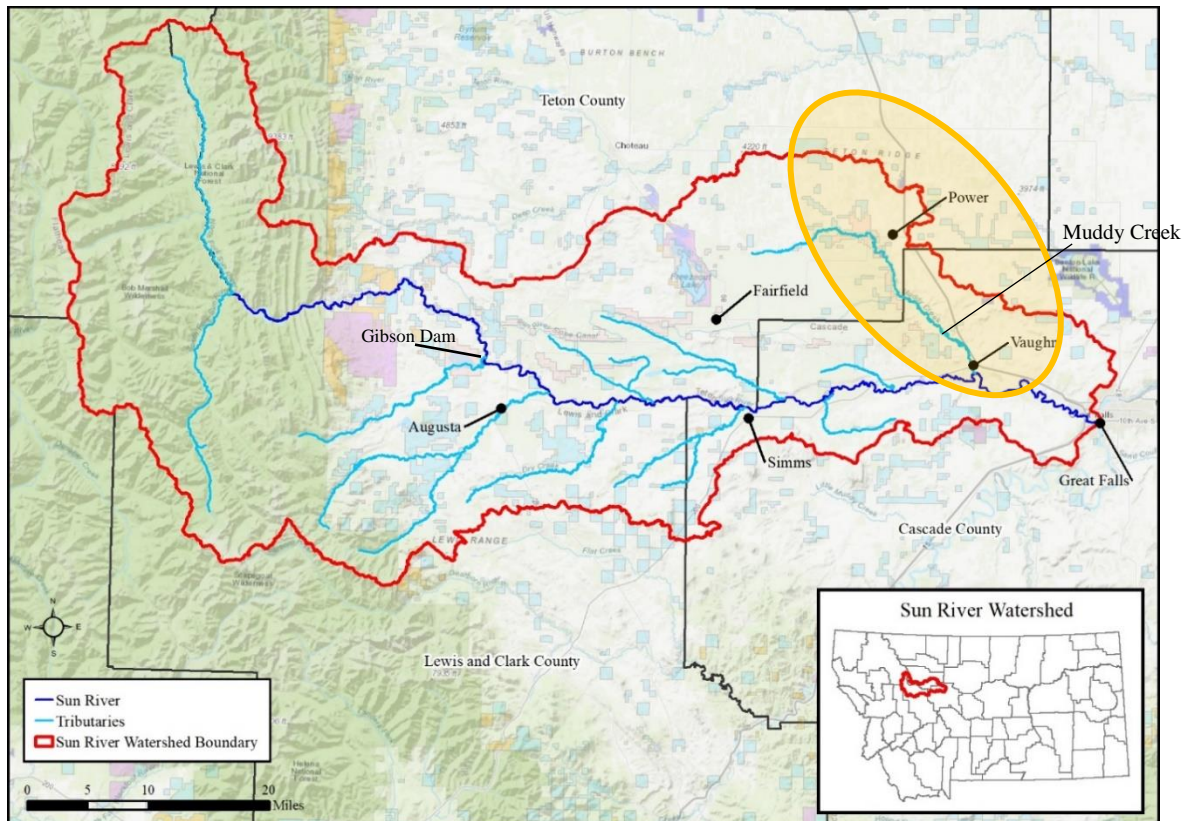


Figure 2. Map of the Sun River watershed with Muddy Creek sub-watershed in yellow. Inset: location of watershed in Montana.

DATA MANAGEMENT PRACTICES

Any spatially explicit data or tools developed in the performance of an award made under this NOFO will be developed in industry standard formats that are compatible with Geographic Information System (GIS) platforms.

EVALUATION CRITERIA

E.1.1. Evaluation Criterion A—Water Management Challenge(s)

While in the main Sun River, seasonal dewatering is an issue, many of the problems in *Muddy Creek* stem from excess water. The Muddy Creek basin includes the Greenfields Bench, which is a region of mostly agriculture served by Greenfields Irrigation District (Figure 3. GID is shown in orange).

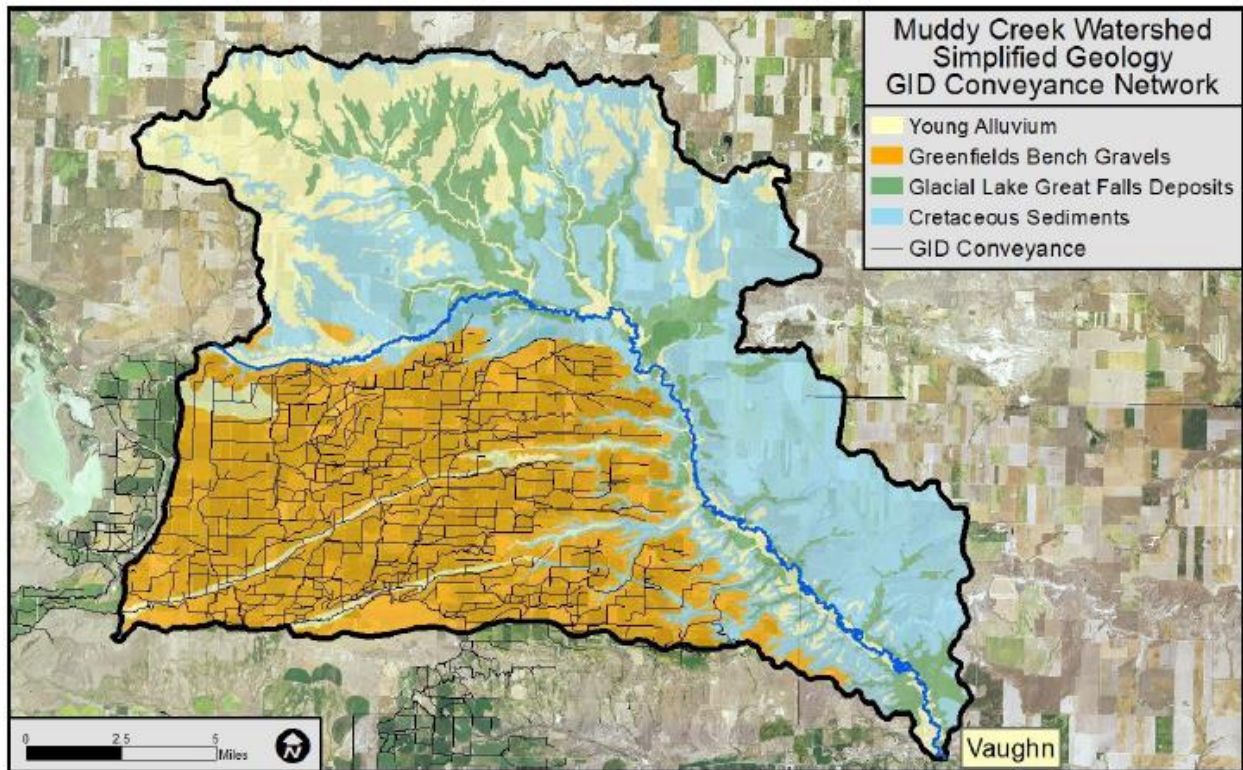


Figure 3: Map of the Muddy Creek sub-watershed.

With the establishment of Reclamation’s Sun River Project, Muddy Creek has gone from a 3’ wide seasonal creek (based on historic landowner descriptions) to year-round flows that fluctuate heavily, especially during the irrigation season (May – September) due to irrigation excess water ending up in the Creek. This leads to degradation of many ecosystem values, described below, and fully described in the [2004 Total Maximum Daily Load Report](#) and [2022 Sun River Watershed Restoration Plan](#).

Water Quality

During the irrigation season, Muddy Creek functions more like a ditch than a creek, carrying excess irrigation flows into the Sun River. These excessive seasonal flows come from farms and ranches, as well as from smaller creeks and ditches. Additionally, the seasonally fluctuating flows cause the banks of Muddy Creek to erode, adding additional sediment and nutrients (from fertilizer, other farm chemicals, and naturally occurring nutrients) to the creek. Where creeks and ditches feeding Muddy Creek run through ranch and grazing lands, they frequently pick up animal waste and carry that into Muddy Creek as well. Muddy Creek is currently listed as “impaired” for nutrients, salinity, suspended solids, pH and more, due to agriculture, flow modification, irrigated crop production, range land, and other factors. These factors not only degrade Muddy Creek water quality, but also the quality of the Sun and Missouri Rivers (Figure 4).



Figure 4. Muddy Creek flowing into the Sun River (top) and the Sun River flowing into the Missouri River (Photo: Google).

The 2004 TMDL describes which beneficial uses are likely to be impacted by impairments, including Aquatic Life, Cold-water Fisheries, Drinking Water, Swimming/Recreation, Agriculture, and Industry. The TMDL assessed key water bodies in the Sun River watershed, including Muddy Creek and found:

- Muddy Creek is *not likely to support* aquatic life, cold-water fisheries, or recreation, and *only partially supports* agriculture and drinking water (the town of Power gets their water from Muddy Creek).
- The Sun River from Muddy Creek to mouth (confluence with the Missouri at Great Falls) is *not likely to support* aquatic life or cold-water fisheries and *only partially supports* recreation, agriculture, or industry.

Water Availability

In addition to degrading water quality, unnaturally high flows and excessive flow fluctuation eroding the creek banks have caused Muddy Creek to become extremely incised – meaning the stream bed is much lower than the banks and groundwater is not

connected to surface water (Figure 5). This reduces aquifer recharge, naturally occurring processes key to late season streamflow supply and groundwater storage (water supply reliability). Replenishing groundwater storage would be a key tool for combating drought – which is very important locally as Montana has been experiencing prolonged drought.



Figure 5. Muddy Creek. To the right, dry vegetation and collapsing banks (contributing to poor water quality) are characteristic of an incised channel and disconnected floodplain. On the left where floodplain is connected, vegetation is healthy and banks are stable.

Habitat

Degraded water quality and reduced water availability negatively affect aquatic habitat in Muddy Creek and the Sun & Missouri Rivers. Excessive nutrients and sediment directly impair fish health and fitness, and can smother fish eggs in redds (trout egg nests in the creek) cutting off oxygen developing trout need to develop and survive. Nutrients and sediment can also increase water temperatures to levels that are harmful to coldwater fishes, like trout, especially in the main Sun River during summer when temperatures are already increased due to low flows.

Groundwater storage is also important for aquatic habitat. As visible in Figure 5, a disconnected floodplain where groundwater is not stored tends to have less vegetation. Vegetation is important for aquatic species because it provides habitat: insects that live

in the vegetation fall into the creek for fish to eat, plants provide shade that helps cool water temperatures (thermal refugia for fish), and provide cover so fish can hide from avian predators. Groundwater connectivity to surface water is also important for late-season flows, which provide cool water and habitat connectivity for fish. See attachment B for data correlating fish populations to stream flows. Fish require different types of habitat throughout the year, and it's important they can get from one habitat type for another. Many parts of Muddy Creek that have become disconnected from the floodplain are old oxbows. In a healthy stream, these old river bends function as wetlands or shallows that provide habitat for aquatic organisms. Young trout, for example, use the protected waters of wetlands or shallows to forage for abundant food and to hide from larger fish that prey upon them.

Potential Outcomes

Some potential outcomes likely if these issues are not addressed are fairly obvious – continued erosion equates to more land lost and no longer available for farming or ranching, and continued degradation will have continued negative effects on aquatic life. Less apparent are issues likely across the full watershed if conditions on Muddy Creek persist. “Wasting” water, or excess irrigation water, in Muddy Creek often equates to less water stored in reservoirs. This means less water is available to supplement irrigation or river flows later in the irrigation season (July – September), when precipitation is less frequent and water is at its most scarce. This has potential impacts to Montana’s economy through negative impacts on food production, and negative effects on fish and other aquatic life:

Less water in storage for irrigation impacts food production. The Sun River provides irrigation for 116,000 acres, and food production (ranching and farms) makes up 63% of land use. Montana’s, specifically the Sun River watershed’s, agriculture is key to food production for our nation:

- In 2015, Montana [farmers harvested 44,200,000 bushels of barley](#), 73% of which were harvested in the Great Falls region.
- The Golden Triangle (fertile region in Central Montana that includes the Sun River Watershed) is [Montana’s top producer of winter wheat](#), worth about \$400M annually.
- Cascade County (one of the counties overlapping the Sun River Watershed) [ranks 9th in beef production in Montana](#) and generates \$78M. [Teton County \(also in SR watershed\) ranks 18th](#) – cattle outnumber people in Teton County 8:1.
- [Thirty-five percent of the barley used to produce Coors beer](#) (the best beer) comes from Montana producers. The average farmer in Montana produces enough barley for 1 million cases of beer.

Storage water is also important for the fishery, especially late in the summer, and affects more than the Sun River. Reduced river flows in the Sun River leads to areas of dewatering, which reduces fish habitat. Low flows are a problem because they reduce the size of habitat and impair connectivity between types of habitat. Low flows lead to increased temperatures, which stress fish and reduce their fitness, also reducing productivity (spawning fitness and number/fitness of offspring). Through “wetted perimeter” analysis on the Sun River, FWP found low flows (below 100 cfs) cause

dramatic reductions in habitat and food production (insects and aquatic organisms that fish eat) for fish and aquatic invertebrates (Attachment A). Reduced fish populations represent an intrinsic loss to an important ecological value and equate to reduced fishing opportunities, impacting recreational values and ultimately negatively impacting Montana's tourism economy.

Low flows in the Sun and poor water quality in Muddy Creek has effects beyond our watershed. SRWG has attended many presentations of fish studies in the Smith River (a tributary that meets the Missouri River about 15 miles upstream of where the Sun meets the Missouri) and studies of Missouri River fish. In multiple studies, researchers mention the Smith and Missouri River fisheries and Sun River fishery are connected. In one case, a Smith River Whitefish was tracked all the way to the Sun River near the town of Fort Shaw – a distance of over 45 miles. Therefore, improvements to fish habitat in the Sun River and its tributaries will benefit fishes that move between the Sun and the Smith & Missouri Rivers.

Project Approach to Water Management Issues

This Project will address the water management issues identified above by quantifying the potential for strategies described in the MCMP to improve water quality, water availability, and habitat. This will enable SRWG to prioritize strategies that will have the most positive impacts.

The strategies suggested in the MCMP, and to be analyzed and qualified in this Report, are aimed at improving ecological conditions in the watershed. This includes:

- water supply reliability for agricultural, environmental or recreational water uses;
- management of water deliveries;
- drought mitigation;
- restoring connection between ground and surface water;
- general watershed health;
- restoration of natural features through nature-based strategies to reduce water supply reliability for ecological and economical values, impacts of drought and flood;
- conservation and efficiency; and,
- improvements to water quality.

The MCMP describes several restoration strategies and the anticipated benefits. Some highlights, as applicable to the list above, include nature-based strategies, which will be quantified by this Report:

- Low-Tech, Process-Based Restoration (LT-PBR). This technique uses natural materials to replicate absent or reduced natural processes. This includes mimicking beaver dams, log jams, and woody debris to encourage groundwater storage, reduce erosion, repair stream incision, and boost revegetation. These projects conserve water, mitigate drought, improve water quality, and often provide other ecosystem services such as cool-water refugia, food, and cover for aquatic species.



Figure 6. This Low-Tech Process Based restoration structure recently installed by SRWG on Arnold Coulee will reduce sediment from entering the stream while the bank builds back up and vegetation fills back in. Similar strategies are suggested for the Muddy Creek basin.

- Improve floodplain connectivity. This can include reconnecting oxbows, which often function as wetlands, habitat for young fishes, and areas of groundwater recharge. Across the watershed, stream channels are incised, meaning the stream bed is much lower than its banks (see Figure 5) so the river looks like a canyon. Often vegetation on the banks is minimal because roots can't reach water. This also means water in the stream is so low the surrounding banks are not connected to groundwater, thus groundwater storage is minimally connected to surface water. By raising the stream bed, lowering/sloping banks, or both, the stream can be reconnected. This

reconnection means more groundwater storage, which is a key component of water availability/security.

- Revegetation / bioengineered bank stabilization. Revegetation on its own or in conjunction with other actions can help stabilize banks, reducing erosion, filter nutrients and reduce the amounts entering the creek, and provide habitat for aquatic life. Bioengineered bank stabilization refers to using natural materials, such as logs, combined with vegetation, to stabilize banks. This helps reduce erosion so sediment and nutrients don't enter the stream.
- No action. It's important to note that there are places where it's recommended to let the stream heal itself or behave like a creek. This Report will quantify the effects of doing nothing versus implementing various strategies.

The Report will also include quantification of improvements anticipated through mechanized or other strategies. Though these solutions aren't natural, the outcomes will have ecological benefits. This could include re-regulation or pump-backs so instead of excess water being "wasted" into Muddy Creek, it can be re-used or managed more efficiently, reducing the need to remove more water from storage. Re-regulation or re-circulation of excess water also provides opportunity for this water to percolate into the aquifer and add to groundwater recharge benefiting fish and aquatic life as described above.

E.1.2. Project Benefits

The need for this project was identified upon review of the Muddy Creek Master Plan. The MCMP was developed by a diverse suite of stakeholders. This report provides an excellent overview of the history and issues along Muddy Creek and describes potential strategies SRWG and partners could employ to improve conditions. Upon review and as SRWG began seeking funding to develop project designs and implement work, we experienced issues deciding which projects would have the largest impact to improving ecosystem services – where will we get the most bang for our effort and funds? How do we decide which projects to do, in what order? As SRWG participated in workshops and webinars by Reclamation's WaterSMART team, the Applied Science program seemed to be a perfect opportunity to create a decision-making tool for future work based in fact and quantification of resource improvements.

Once complete, SRWG's Project Committee can use the new tool and the MCMP, combined with the Strategic Project Planning Tool we anticipate creating, to do long-range planning for watershed-scale projects. Having quantification for project benefits will provide justification we can show to potential funding entities and stakeholders to explain our prioritization process. It will help SRWG plan out work years in advance, which will be important for staff management. SRWG will use this tool when applying for long-range, watershed-scale planning and construction grants.

Quantifying anticipated water savings will help water management decisions. SRWG will share the Report with stakeholders, including water managers, through our website and by providing print copies if desired. Knowing which projects SRWG is implementing and

how much water these projects are expected to save will help water managers with forecasting. Water managers, in the case of GID and Fort Shaw Irrigation District, for example, are often people making decisions about upcoming projects for their entity. This report will help water managers decide which strategies they may want to implement in addition to SRWG's work.

SRWG anticipates this tool being adaptable to other parts of the watershed that have similar characteristics and similar issues. There are many tributaries to the Sun River that function as a "ditch" during the irrigation season, much like Muddy Creek.

Synergetic Efforts

SRWG and partners have many planning efforts in progress that will be complementary to this Report. For example:

- SRWG has a project underway on Muddy Creek, funded by a WaterSMART CWMP, that will implement several of the strategies suggested in the MCMP. This could provide a great opportunity to study project outcomes. This project includes expanding J-Wasteway, a reservoir that spills into Muddy Creek when full. Expanding this wasteway will reduce the amount of excess water 'wasted' down Muddy Creek – an important first step to conserving water through improved management.
- SRWG is applying for WaterSMART and DNRC funding this fall/winter to develop a watershed Project Prioritization Strategy Plan that would prioritize future work across the watershed and to develop new resource conservation and outreach programs to further our mission.
- SRWG continues water quality monitoring each year and will be upgrading the seasonal stream gage network so stream flows can continue to be monitored.
- GID is working with Farmers Conservation Alliance and NRCS to develop a plan to improve irrigation efficiencies through replacement of aging infrastructure.
- GID is also implementing hydropower in applicable locations across their infrastructure, with the intention of using income from power to fund upgrades and replacement to inefficient, aging infrastructure.
- Fort Shaw Irrigation District has applied for funding to replace an aging irrigation siphon and once replaced, will work on improving efficiencies across their water delivery infrastructure.
- The MCMP highlights many other projects completed and underway, led by SRWG and others, implemented in recent years to improve water quality and availability.

The cumulative effect of this Report and other work by SRWG and partners will be watershed-scale drought resiliency, improved water reliability, and restored ecosystem services.

E.1.3. Evaluation Criterion C—Project Implementation

As described in Section D.2.2.4., SRWG will hire a consulting engineer to perform the modeling and other data analysis and to compile the report. SRWG does not have expertise in this area and will rely on the hired team to determine the most appropriate methodology and specific modeling tools to be used.

Tasks, Milestones, Schedule, and Costs

Figure 6 describes the tasks, milestones, and dates for this project. Estimated costs are included in the project budget, section D.2.2.8.

Task 1 - Consultant Selection

SRWG will invite a panel of experts including water managers, water quality and conservation professionals, and aquatic habitat & fisheries biologists (at a minimum) to participate as a Technical Advisory Committee (TAC). SRWG will create a Request for Proposals for hiring an engineering consultant, with the TAC providing input for the RFP. This RFP will follow federal procurement standards and processes. SRWG and the TAC will select a consultant and SRWG will contract with the selected consultant.

Task 2 - Data Analyses and Preparation

SRWG, TAC, and Consultant will hold a project kickoff meeting to discuss the Scope of Work (SOW) and goals for the final tool. SRWG and TAC will provide Consultant with access to existing data and will acquire access permission if Consultant needs to do any field surveys for additional data. This task also includes updating SRWG's stream gage hardware for seasonal (irrigation season) gages.

Task 3 - Development of Tool

Consultant will create a report that quantifies improvements to water quality, water availability, and habitat, describing the factors that determine these quantities, and the methods used to arrive at figures. Report will address the goals listed on page 7 of this Proposal, or the modified goals arrived at through Task 2 above. The TAC and SRWG will review a draft of the report, provide comments to the consultant, then the consultant will create a final report that incorporates comments.

Task 4 - Dissemination of Tool

The final tool (report) will be shared publicly on the SRWG website at www.sunriverwatershed.org/resources and will be distributed via email. SRWG will hold a stakeholder meeting to share the final plan and provide hard copies upon request.

| <u>Task</u> | <u>Milestone</u> | <u>Start Date</u> | <u>End Date</u> |
|-------------------------------|----------------------------------|--------------------------|------------------------|
| Consultant Selection | - Assemble TAC | 9/24/24 | 9/30/2024 |
| | - Release RFP | 11/1/2024 | 12/1/2024 |
| | - Select consultant | 12/1/2024 | 12/15/2024 |
| Data Analyses and Preparation | - Kickoff meeting/SOW | 1/6/2025 | 1/6/2025 |
| | - Compilation and review of data | 1/6/2025 | 6/30/2025 |
| | - Data analysis & modeling | 7/1/2025 | 12/1/2025 |
| | - Update gages | 7/1/2024 | 10/1/2024 |
| Development of Tool | - Draft of Report/Tool | 12/1/2025 | 5/30/2025 |
| | - Review draft | 6/1/2025 | 6/30/2025 |
| | - Final Report/Tool complete | 7/1/2025 | 7/31/2025 |

Dissemination of Tool - Report shared publicly 8/15/2025 On-going

This schedule has a buffer built in, as SRWG hasn't completed a project that included this level of data analysis and modeling and we want to ensure project can be completed by December 31, 2025. In discussions with engineers who perform similar work, SRWG believes a one-year schedule is appropriate. Funding for stream gage updates will come from a state funding source which will likely become available between award announcement and contract execution for this WaterSMART NOFO, so that work may occur earlier than the work funded directly by this NOFO.

SRWG has consulted with an engineer who performs similar work and the total budget proposed is adequate, but we are unsure how the budget will break out per task. Please see Section D.2.2.8 for the budget and narrative.

SRWG's Executive Director will be responsible for management of this project, though some actual tasks may be performed by Board or staff. SRWG's Executive Director previously managed development of SRWG's Strategic Plan, Watershed Management Plan, Muddy Creek Master Plan, and Channel Migration Zone Report. The Executive Director has managed many Federal grants, including three WaterSMART grants, and has experience with competitive hiring and contracting processes for consultants. We do not anticipate any delay in beginning the project immediately upon award.

Most tasks involved with the compilation and finalization of the report will be performed by an engineering consultant not yet selected. SRWG will follow federal procurement guidelines to hire the most responsive and responsible candidate. Stream gage updates will be performed by Larry Dolan – retired from DNRC, now contracted to SRWG for annual stream gage maintenance.

E.1.4. Evaluation Criterion D—Dissemination of Results

SRWG will disseminate project results as follows:

- Final Report/Tool will be shared in a public meeting
- Final Report/Tool will be shared on SRWG's website on the "Resources" page
- SRWG will distribute a press release to local and state-wide media outlets describing the Final Report/Tool and where it can be found
- SRWG will send an email to our stakeholders with a link to the Final Report/Plan and share it on social media as well
- SRWG will make print copies of the plan available upon request
- SRWG will participate in any Reclamation WaterSMART webinars or other requested venues.

SRWG will provide hard copies of the Report to local water managers. SRWG will discuss the Report at water managers meetings including, but not limited to: Greenfields Irrigation District, Fort Shaw Irrigation District, Sun River Water Management Working Group and

the Sun River Water Quality Working Group. These last two groups are made up of federal, state, and public stakeholders who meet regularly to discuss watershed issues.

E.1.5. Evaluation Criterion E—Presidential and Department of the Interior Priorities (10 points)

Climate Change

Though SRWG has not identified “climate change” as a key resource concern to be addressed in this project, water availability is a direct result of the climate crisis and will be addressed in the project. Therefore, by quantifying improvements to water availability so SRWG and partners can prioritize projects with the biggest anticipated impacts, this project will improve the watershed’s resilience to climate change. This includes impacts to water storage and drought mitigation through prioritizing projects with the biggest potential to improve water availability. In addition, projects with quantifiable improvements to water storage will likely include reconnecting floodplains and restoring oxbow connectivity, which will further improve water availability and aquatic habitat, mitigating effects of climate change and making the watershed more resilient to impacts. Furthermore, reconnected floodplains help the landscape’s ability to mitigate and recover from floods, and the restored vegetation that comes with these improvements helps sequester carbon, reducing greenhouse gasses.

Disadvantaged or Underserved Communities

According to the Interactive Climate and Economic Justice Screening Tool, portions of the watershed located in Teton and Lewis & Clark County is considered “disadvantaged”, as is the city of Great Falls, also in the Sun River watershed. This project will help SRWG prioritize projects that will increase reliability of water supplies and improve water quality to avoid additional economic hardship (though loss of food production capability which would be impaired by lack of water, for example). By considering ecosystem services a key resource in our prioritization process, it may be possible to prioritize projects that improve the fishery and other resources that improve tourism and therefore the economy of the region.

Tribal Benefits

This project does not directly benefit a Tribe.

Nexus to Reclamation

This Project is adjacent to a Reclamation Project: [The Sun River Project](#). Greenfields Irrigation District, which drains into Muddy Creek, was formed through the Sun River Project. The Project will result in a tool that can benefit watershed health across this Reclamation basin.

SRWG does not hold a water service, repayment, or O&M contract with Reclamation or receive Reclamation water. However, project partners Greenfields Irrigation District and Fort Shaw Irrigation District do.

D.2.2.8 Project Budget

The total project cost is the sum of all allowable items of costs, including all required cost sharing and voluntary committed cost sharing, including third-party contributions, that are necessary to complete the project. Please include the following chart (Table 1) to summarize all funding sources. Denote in-kind contributions with an asterisk (*).

Table 1.—Summary of Non-Federal and Federal Funding Sources

| FUNDING SOURCES | AMOUNT |
|--|------------------|
| Non-Federal Entities | |
| 1.DNRC stream gage funds | \$ 25,000 |
| 2.GID Contribution | \$ 5,422 |
| 3.In-kind: non-federal stakeholder participation | \$ 5,985 |
| Non-Federal Subtotal | \$ 36,404 |
| REQUESTED RECLAMATION FUNDING | \$110,000 |

Budget Details

The Budget Narrative spreadsheet provided in the NOFO is included with this Proposal. Some clarifications:

- Funding from DNRC is based on our successful applications to the Irrigation Development / Drought Planning Grant program in the past. SRWG plans to apply for these funds in fall of 2023 and will have the letter of commitment by the time this NOFO is awarded.
- GID contributes \$9,000 to SRWG annually and we will use as much of this funding as needed to make up any short-falls that may occur in match (if any). So the total GID contribution will vary from what is shown above if necessary.
- SRWG is careful not to include the time, miles, or supplies contributed by federally funded employees as in-kind match to our Federal Grants.
- SRWG reimburses mileage, travel, and per diem at the Federal rate.

D.2.2.9 Environmental and Cultural Resources Compliance (as applicable to the project)

Please answer the questions from *Section H.1. Environmental and Cultural Resource Considerations* in this section.

D.2.2.10 Required Permits or Approvals

This project does not include any on-the-ground activity. SRWG will seek permission from landowners prior to visiting any sites to gather information.

D.2.2.11 Overlap or Duplication of Effort Statement

This proposed project does not overlap or duplicate any other active or proposed projects by SRWG. SRWG has other work that is complementary to this project and we are careful to track expenses and staff time such that it is completely separate. We are able to provide proof of such separation and lack of duplication.

D.2.2.12 Conflict of Interest Disclosure Statement

SRWG is not aware of any actual or potential conflicts of interest at this time.

D.2.2.12.3 Restrictions on Lobbying

SRWG does not participate in lobbying activities to any degree.

D.2.2.13 Uniform Audit Reporting Statement

SRWG has not required an audit due to receipt of over \$750,000 in federal award funds within one year, but we are aware of the requirement to do so if this occurs.

LETTERS OF SUPPORT



US Bureau of Reclamation
Water Resources and Planning Office
Attn: Ms. Avra Morgan
PO Box 25007
Denver, CO 80225-0007

RE: 2023 Sun River Watershed Water Strategy Proposal – NOFO R23AS00109

Dear Ms. Morgan and Committee:

Montana Department of Environmental Quality (DEQ) supports the Sun River Watershed Group's (SRWG) WaterSMART Applied Science Proposal for "Quantifying Water Conservation and Water Quality Improvements for Muddy Creek".

DEQ has been a partner with SRWG since their inception, developing watershed plans to improve water quality and supporting projects as a grantor and partner. Over the past 29 years, SRWG has worked hard to improve water reliability and management in the Sun River watershed and has a track record of collaborative solutions to watershed improvements. DEQ recognizes SRWG's ability to work with stakeholders to implement projects and programs that benefit water resources. SRWG is an essential voice for resource conservation, looking to improve ecosystem health while satisfying water requirements for agriculture.

We strongly support SRWG's plan to take a strategic approach to project planning and implementation on Muddy Creek. We are keenly aware of the limited financial resources available for addressing water quality, and we support SRWG's efforts to identify and target projects and practices that will have a lasting impact on water quality.

DEQ is anxious to see the SRWG move forward with the recommendations developed through the Muddy Creek Master Planning Process. We feel that the proposed Quantifying Water Conservation and Water Quality Improvements for Muddy Creek project will result in future on-the-ground projects and efficient use of restoration funds. DEQ has worked closely with the Sun River Watershed Group in the past and is confident the organization has the ability and capacity to carry out this project.

Please contact me if you have any specific questions regarding our support of the SWRG and this proposal. Thank you.

Respectfully,

A handwritten signature in blue ink, appearing to read "Mark Ockey", is written over a light blue horizontal line.

Mark Ockey, Water Quality Specialist
DEQ Nonpoint Source and Wetlands Section
Phone: 406-465-0039
Email: mockey@mt.gov



4600 Giant Springs Road
Great Falls, MT 59405
September 28, 2023

Re: Sun River Watershed Group Grant Proposals R23AS00362, R23AS00226, R23AS00109

To whom it may concern,

Montana, Fish Wildlife and Parks (FWP) supports the Sun River Watershed Group's (SRWG) proposals that aim to improve the Sun River. The Sun River ecosystem is impaired by chronic dewatering, thermal stress, and sediment pollution. SRWG has been working on solutions to these problems for past 25 years and Montana Fish, Wildlife and Parks appreciates the strategic planning process SRWG has followed to identify and prioritize projects that may address these issues.

Projects identified within SRWG's 2019 Strategic Plan and the Muddy Creek Restoration and Resiliency Project aim to address and repair the continual degradation of the Sun River. FWP looks forward to SRWG implementing projects that will result in improved in-stream flows including cooperative, actionable drought resiliency plans. We encourage SRWG to conduct monitoring to evaluate and report on the success of these projects. Specifically, monitoring should be completed to evaluate if the projects are successful in improving habitat quality, water quality, and water quantity.

Regional FWP fishery biologists benefit from SRWG's assistance in removing communication barriers among water users across the Sun River watershed. Their work has generated new avenues for collaboration among private landowners, state agencies, water managers, and conservation districts across multiple counties. FWP has worked closely with the Sun River Watershed Group in the past and is confident the organization will continue to implement projects that have long-term, watershed-scale benefits to the natural resources and communities in the watershed.

Thank you,

Jason Rhoten
Regional Supervisor
Montana Fish, Wildlife and Parks

United States Bureau of Reclamation
WaterSMART Cooperative Watershed Management Program (CWMP)
Phase I Grant Program
RE: 2020 Sun River Watershed Cooperative Watershed Management Phase I Grant

Dear Grant Administrator,


As landowners affected by the ever-changing Muddy Creek, we strongly support the Sun River Watershed Group's (SRWG) application for a CWMP Watershed Management Project Design for the Muddy Creek.


Muddy Creek landowners are suffering from the erosion caused by the fluctuating water flows seen on the creek. Several projects were completed along the Muddy Creek over the past few decades, but multiple issues still remain. Some issues currently facing landowners: fence lines and large areas of shoreline falling into the creek, structures and septic systems in jeopardy, land being divided by the flows and creek crossings being washed away by the changing water levels. A long-term commitment to proper management and continuous improvement of the entire watershed are key ingredients to improving water quality and protecting landowners property.


We understand this is the first phase of a project to identify solutions, prioritize project areas, and prepare designs for future construction. As landowners, we will work with the SRWG to provide information about our properties and identify our concerns while allowing access to the project team for the purpose of furthering this effort. Our commitment is to assist the SRWG in achieving the overall improvement of the watershed while protecting our properties.


It is our belief, the SRWG is a consensus-based organization that looks to resolve watershed issues. We look forward to being active members of the group and providing a positive impact to the watershed. We appreciate your time and the opportunity to voice our concerns and look forward to your support of this very important issue.

Respectfully,


SKIP NEUMAN
1490 2nd Road NE
Vaughn, MT 59487


WAYNE TONNE
224 North Vaughn Frontage Road
Vaughn, MT 59487

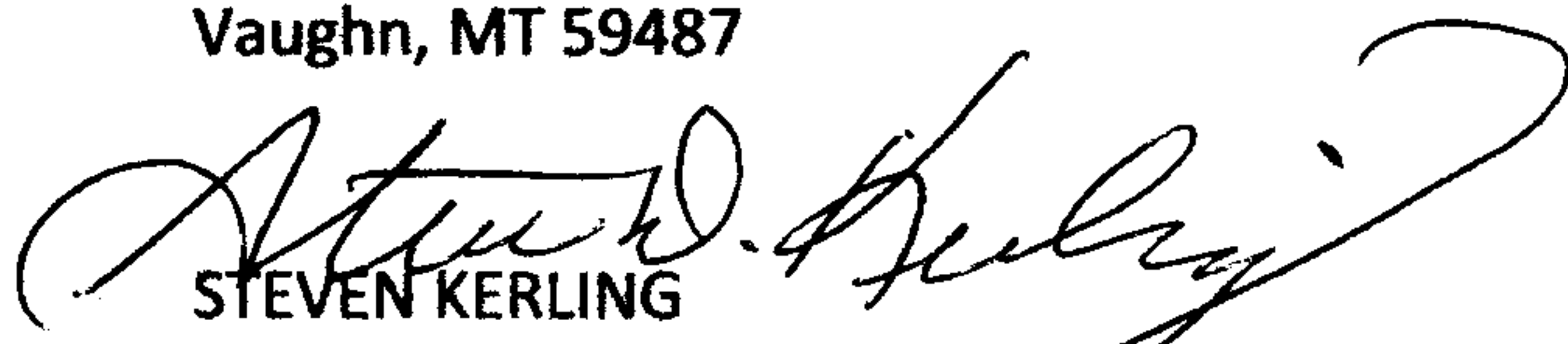

MICHAEL REID
100 North Vaughn Frontage Road
Vaughn, MT 59487


JOHN SCOTT
68 Wibaux Road
Vaughn, MT 59487

NOT AVAILABLE FOR SIGNATURE.
JENNIFER HENNING
34 Wibaux Road
Vaughn, MT 59487

SEE ATTACHED EMAIL
SUSAN OVERFIELD
251 Gordon Road
Vaughn, MT 59487

RUSSELL LEITHEISER
440 North Vaughn Frontage Road
Vaughn, MT 59487


STEVEN KERLING
150 North Vaughn Frontage Road
Vaughn, MT 59487



See Additional Signatures Page:

Additional LAND OWNERS:

~~Linda Berger~~

Linda Berger

1 Second St

Vaughn MT 59487

Daniel Rhodes

Daniel Rhodes

1 Second St

Vaughn MT 59487

~~Steven Feist~~

Steven Feist

446 N Vaughn Frontage Rd

Vaughn, MT 59487

Support Letter for the SRWG

Steve Kerling <kerling70@gmail.com>
To: Kelley <kerlingk@gmail.com>

Fri, Nov 8, 2019 at 2:40 PM

----- Forwarded message -----

From: **Susan Overfield** <stockdog@3rivers.net>
Date: Fri, Nov 8, 2019, 6:37 AM
Subject: Re: Support Letter for the SRWG
To: Steve Kerling <kerling70@gmail.com>

The letter, with my name attached, is fine.

Thanks, Steve.

Susan

On Thu, Nov 7, 2019 at 12:12 PM Steve Kerling <kerling70@gmail.com> wrote:
How about this..

----- Forwarded message -----

From: **Steve Kerling** <kerling70@gmail.com>
Date: Tue, Nov 5, 2019, 12:48 PM
Subject: Support Letter for the SRWG
To: <neumanfarms@hotmail.com>, <hhbar@hotmail.com>, <gopheranch@yahoo.com>, <jenhenning@ymail.com>, <stockdog@3rivers.net>, <russelleitheiser@gmail.com>, Kelley <kerlingk@gmail.com>

All,

Please take a moment to review the attached letter. If you want something changed or added please let me know. I am gonna try and get it signed as soon as everyone gets back to me. Tracy Wendt from the water

shed needs it by COB Friday, but I might be able to get it to her on Saturday. Please check to make sure your address is right and I didn't misspell your name.

There is a meeting at the Sun River Valley Community Center this Thursday at 6:30; it will be a good time to raise our concerns.

We are trying to have a meeting of landowners on Saturday at 1000 at our house.
150 north Vaughn frontage road....the tan and green place by the underpass for Neuman school road.

Thanks and as also if you have a neighbor or know someone effected by this please get them involved.

steve

LETTER OF PARTNERSHIP

September 18, 2023

US Bureau of Reclamation
Water Resources and Planning Office
Attn: Ms. Avra Morgan
PO Box 25007
Denver, CO 80225-0007

RE: 2023 Sun River Watershed Water Applied Science – NOFO R23AS00226

Dear Grant Administrator:

The staff and management of Greenfields Irrigation District (GID) are pleased to offer this letter of support towards the Sun River Watershed Group's (SRWG) application for an Applied Science Grant. As the Category A applicant type supporting this project, GID agrees to:

- Act in partnership with SRWG (applicant);
- Support the submittal and content of this application; and,
- And will participate in the project in multiple ways, including providing feedback and support for the project.

GID has a long-standing relationship with SRWG and participates in the Sun River Water Management and Water Quality Working Groups, which will be strong resources in developing the deliverables and meeting objectives for this grant. GID is also a partner to SRWG in the Muddy Creek Master Plan.

GID supports SRWG's proposal for "Quantifying Water Conservation and Water Quality Improvements for Muddy Creek" because we believe this will lead to a strategic approach to project planning and implementation. By quantifying anticipated water conservation and potential improvements to water quality, this project will help SRWG prioritize work in the Muddy Creek sub-basin for the largest impact and focus on natural techniques that will have the greatest benefits to ecological processes. The outcome from this project will be a decision-making tool for SRWG, GID and partners that can illustrate the nature-based techniques we should concentrate on applying across Muddy Creek – with potential implications for the entire Sun River watershed – resulting in a more resilient ecosystem that is resistant to drought and supports multiple resource uses.

SRWG is a consensus-based group comprised of a diverse array of stakeholders, including agencies, private property owners, state and local governments, and other entities concerned with the resources of the Sun River basin. Over the past 29 years, SRWG has worked hard to improve water reliability and management in the watershed and has a track record of collaborative solutions to watershed improvements. GID has

USBR - NOFO R23AS00226

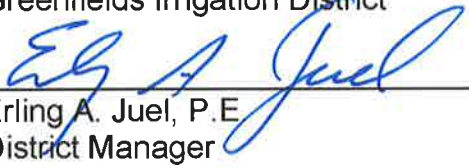
September 18, 2023

worked closely with the Sun River Watershed Group in the past and is confident the organization has the ability and capacity to carry out this project and that the project will have long-term, environmental and resource benefits to the Muddy Creek drainage.

Please contact me if you have any specific questions regarding the District's support of the SWRG and this proposal. Thank you.

Respectfully,

Respectfully,
Greenfields Irrigation District



Erling A. Juel, P.E.
District Manager

C: GID Board of Commissioners

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OFFICIAL RESOLUTION



RESOLUTION of the SRWG BOARD OF DIRECTORS
September 5, 2023

In regards to a project funding proposal by the Sun River Watershed Group (SRWG) to the Bureau of Reclamation in response to Notice of Funding Opportunity No. R23AS00446:

WHEREAS the mission of SRWG is to collaboratively restore and protect the resources of the Sun River watershed and its communities;

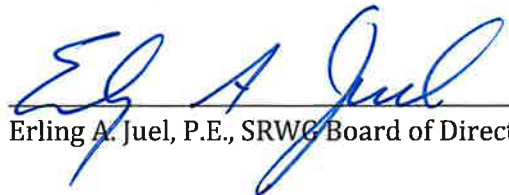
WHEREAS the proposed activities in the prepared proposal support the mission of SRWG;

WHEREAS the Board of SRWG has reviewed the above-mentioned application;


WHEREAS SRWG has the staff capacity and broad support from members and partners to carryout the direct and indirect tasks proposed in this proposal;

Be it resolved:

1. SRWG is in full support of the proposal entitled "Quantifying Water Conservation and Water Quality Improvements for Muddy Creek" to the WaterSMART Applied Science Grant, a program of the US Bureau of Reclamation;
2. SRWG Executive Director Tracy Wendt is authorized to submit this Proposal and act as (or appoint) Project Manager on behalf of SRWG; and,
3. SRWG board and staff will work with Reclamation to meet all established deadlines for entering into a grant or cooperative agreement and necessary for the completion of proposed activities.



Erling A. Juel, P.E., SRWG Board of Directors



Date

LETTERS OF FUNDING COMMITMENT

Funding commitments mentioned in this Proposal as “matching funds” have not been awarded yet. SRWG is applying for funds this fall/winter and will have proof of awards upon award of this NOFO. These are grants SRWG has applied for successfully in the past and anticipates being awarded again.



Montana Fish, Wildlife & Parks

4600 Giant Springs Road
Great Falls, MT 59405

May 8, 2001

Maryanne C. Bach
Regional Director, Great Plains Region
U.S. Bureau of Reclamation
Box 36900 (GP-1000)
Billings, MT 59107

Dear Director Bach:

I would like to express our Department's appreciation for the efforts of your agency in working to maintain a minimum instream flow of 100 cubic feet per second (cfs) in the Sun River below Diversion Dam during the summer and fall of 2000. We feel that without your efforts, it is very likely the Sun River would have had substantially lower flows.

Unfortunately, flows could not be maintained at the recommended 100 cfs minimum level through the winter. Although runoff forecasts have improved recently, we are still facing another drought in the coming year. According to the May 1 forecast provided by your agency, runoff is expected to be 68% of average, which is an improvement from the 54% estimate predicted on March 1. The May 1 forecast predicts that river flows will increase above 100 cfs in May and June but could return to 50 cfs during July through October. One of my staff members, Steve Leathe, discussed this with Tim Felchle today and Tim was fairly optimistic that a minimum of 100 cfs can be maintained this summer and fall. Fortunately, it now appears Gibson will fill this year, or very nearly so.

We have participated in Sun River Watershed group meetings for several years and have funded numerous fish habitat improvement projects on the river and its tributaries through our Future Fisheries Program. Like others in the group, we have long hoped that the substantial investments of public funds over many years to improve irrigation efficiency on the Fairfield Bench would "free-up" water to provide minimum flows for fish, wildlife and recreation in the Sun River.

We have continually advocated for improved flow conditions in the Sun River because we firmly believe that trout populations in the river are depressed, and this is primarily due to inadequate stream flows and associated impacts of irrigation (high water temperature and turbidity in irrigation return waters). Angling use on Montana's "blue-ribbon" trout rivers has increased dramatically, particularly by non-residents, in recent years. This reflects a strong national interest in these unique resources. We feel that in

its natural state, the Sun River was a high quality trout stream and it retains that potential. Improvement of depressed fisheries in rivers like the Sun is important because it will help accommodate increasing public demand and will also help diversify Montana's economy by promoting tourism.

We have conducted fish population surveys in several sections of the Sun River below Diversion Dam periodically and typically have found very low trout densities. The most recent work was done in the spring of 2000 when we found trout densities of roughly 50-150 per mile. For comparison, trout populations in the forks of the Sun River upstream from Gibson Dam are excellent and range from 400-1000 fish per mile. The few trout that do exist in the river below Diversion have good growth rates, indicating the river is capable of supporting a healthy trout population. Rainbows up to 20 inches and brown trout up to 23 inches long were captured in our surveys below Diversion.

We conducted "wetter perimeter" analysis during the late 1980's as part of the Missouri River Water Reservation proceeding to determine minimum flow requirements of the Sun River to protect and maintain fisheries resources. We divided the lower 90 miles of the Sun River below Diversion Dam into two reaches for that proceeding. The wetted perimeter analysis indicated preferred flows of 220-360 cfs (upper inflection point) and absolute minimum flows of 100-130 cfs (lower inflection point) for these two reaches. The wetted perimeter curves show there are dramatic reductions in wetted surface area (and habitat for fish and aquatic invertebrates) as flows dip below the lower inflection points. It should be emphasized that the lower inflection point flows should be viewed as absolute minimums, and not as "preferred" minimums.

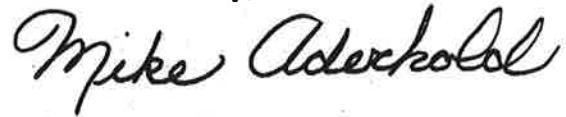
It is our understanding that from time to time the Bureau revises the standard operating procedures for its reservoir systems. When this occurs, we recommend establishment of the following flow targets. For non-drought years, we recommend a summer flow of at least 220 cfs and a range of 220-360 cfs. During drought years, we recommend an absolute minimum flow of 100 cfs. Provision of adequate minimum flows in the Sun will also augment minimum flows downstream in the Wild and Scenic Missouri River where a number of sensitive fish species reside, including the endangered pallid sturgeon.

We very much appreciate the Bureau's active involvement in water management on the Sun River in recent years and we look forward to working with you and other interests to improve the compatibility of fisheries and irrigation in the drainage. We recognize that the BOR is only one of several major players in the Sun River drainage and it will require commitments from other major irrigators to maintain minimum flows initiated by releases from Gibson/Diversion. We hope this cooperative relationship will be refined and consolidated through the efforts of the Sun River Watershed group.

We believe the Sun River has excellent fisheries potential. Improved river flow and screening of major irrigation diversions are critical to fisheries restoration. We are encouraged by the steady progress being made, and some very large challenges (particularly screening major diversions) lie ahead. We recommend that flows in the river below Diversion be returned to at least 100 cfs as soon as possible and that

operational adjustments be made to ensure a minimum of 100 cfs henceforth. Thanks for considering these recommendations.

Sincerely,

A handwritten signature in black ink that reads "Mike Aderhold". The signature is written in a cursive, flowing style.

Mike Aderhold
Region 4 Supervisor

cc: Susan Kelly, Montana Area Manager, BOR
Tim Felchle, BOR, Reservoir Operations
Dick Long, BOR, Water and Facilities Management
Sue Camp, BOR, Fisheries Biologist
Laura Ziemer, MT Director, Western Water Project, Trout Unlimited
Rob Hazlewood, Senior Staff Biologist, US Fish & Wildlife Service, Helena
Alan Rollo, Sun River Watershed Project Coordinator
Steve Leathe, MDFWP, Region 4 Fisheries Manager
Kathleen Williams, MDFWP, Water Resources Supervisor