

SUN RIVER WATERSHED WATERSHED RESTORATION PLAN

Revised March 2022 - DRAFT



ACKNOWLEDGEMENTS

This updated Watershed Restoration Plan was developed through partnership and collaboration between people, agencies, and organizations invested in the use, restoration, and conservation of the resources of the Sun River Watershed. This effort was led by a special committee of the Sun River Watershed Water Quality Working Group which included representatives from the Sun River Watershed Group Board of Directors; Montana Trout Unlimited; Greenfields Irrigation District; US Bureau of Land Management; Montana Salinity Control Association; and the Montana Department of Natural Resources and Conservation. SRWG would also like to thank Katie Vivian and Jason Mullen from Montana Fish, Wildlife, and Parks, for their in-depth review and insightful comments on this plan; Emma Kelsick, Connor Mertz, and Rai Hahn for their diligent collection of water quality samples; Adam Sigler and Meghan Robinson at Montana State University Extension Water Quality Division for assistance with water quality data organization, input, and analysis; and, finally, SRWG's Board of Directors for providing valuable input, including extra efforts from Project Committee chairs, Dave Martin and Steve Leathe, and GIS work by Tanner Tompkins.

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ACRONYMS AND ABBREVIATIONS

BLM	US Bureau of Land Management
CD	Conservation District
DEQ	Montana Department of Environmental Quality
DNRC	Montana Department of Natural Resource Conservation
DO	Dissolved Oxygen
EPA	Environmental Protection Agency
FSID	Fort Shaw Irrigation District
FWP	Montana Fish, Wildlife, and Parks
GID	Greenfields Irrigation District
MSUEWQ	Montana State University Extension, Water Quality Division
NRCS	Natural Resources and Conservation Service
Reclamation	US Bureau of Reclamation
SAP	Water Quality Sampling and Analysis Plan
SOP	Volunteer Water Quality Monitoring Standard Operating Procedures
SRWG	Sun River Watershed Group
TDS	Total Dissolved Solids
TN	Total Nitrogen
TP	Total Phosphorous
TMDL	Total Maximum Daily Load
TPN	Total Persulfate Nitrogen
TSS	Total Suspended Solids
USGS	US Geological Survey
WRP	Watershed Restoration Plan

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INTRODUCTION

Statement of Need for Updated WRP

The Sun River Watershed Group [SRWG] and Montana Department of Environmental Quality [DEQ] developed a Sun River Watershed Restoration Plan [WRP] in 2012 to provide an approach for addressing water quality and quantity concerns in the Sun River watershed. These concerns were related to findings of the 2004 Total Maximum Daily Loads Report [TMDL], which identified six reaches and waterbodies as impaired and indicated 14 probable causes [pollutants]. SRWG and partners have implemented many projects over the past 20 years, largely aimed at improving water quality. In 2019, Montana State University Extension, Water Quality Division [MSUEWQ] prepared an analysis of existing water quality data, providing an updated look at nutrient trends in the Sun River and key tributaries. Finally, SRWG has discovered that projects designed to improve one aspect of watershed health [e.g. water quality] often have a significant impact on another aspect of watershed health [e.g. wildlife habitat].

This updated WRP builds on and replaces the original 2012 WRP, broadening the scope to address a larger spectrum of resource concerns, reflecting what we now know about water quality trends, acknowledging the interrelatedness of resource issues, and taking a wider stance in setting goals for watershed health. The 2022 WRP is intended to be a workplan for SRWG and includes both static and dynamic elements to allow for long-term planning and flexible watershed management, guiding our work to improve not just water quality, but a full suite of natural resource values.

The updated WRP is based on SRWG's mission to *collaboratively restore and protect the resources of the Sun River watershed and its communities* and includes objectives corresponding to the Strategic Values of SRWG, which are:

- *Improved water quality* through reduction of sediment, nutrients, and temperature;
- *Adequate stream flows* in all seasons that support multiple uses including agriculture, recreation, fish, and wildlife;
- *Restored hydrologic processes*, such as floodplain connectivity and river migration;
- *Enriched natural resources*, such as soils, fish, and wildlife;
- *Noxious weeds control*;
- *Community education* about watershed resources and stewardship; and
- *Monitoring and follow-up actions to ensure project success.*

Key Information for WRP Users

The following are key sources of information used to inform this WRP:

- DEQ and Clean Water Act [CWA]
In 2002, DEQ released the TMDL for the Sun River watershed, “listing” segments of the river and tributaries that do not fully support designated uses or are threatened [likely to violate water quality standards in the future], including a plan to bring these waters into compliance with appropriate standards, as required under Section 303(d) of the CWA. The DEQ recommends the development of locally-led WRPs and provides guidance for creating Watershed Restoration Plans, including the EPA's nine elements of a WRP. More information about this process can be found on the [DEQ Water Quality Planning Bureau](#) website.

- Montana Fish, Wildlife, and Parks, Region 4
Current and past fisheries biologists from FWP, FWP reports, and other documents, provided information used in this WRP. In addition, the local fisheries biologists participate in the Water Management Working Group and meet periodically with SRWG’s Executive Director to discuss issues and potential projects to improve fish habitat in the watershed. FWP has historically provided fisheries data, input about water management and Gibson Dam operations, and scientific-based recommendations for incorporating fish and wildlife health considerations on the topics of water quality and stream flows, among other natural resource considerations.
- MSUEWQ and Data Hub
SRWG’s water quality monitoring program was developed with assistance from MSUEWQ. MSUEWQ has reviewed and quality-checked data collected by SRWG. Data are shared publicly through MSUEWQ’s [Data Hub website](#), including lab results, photo points, and field data. MSUEWQ has also performed data trend analysis, conducted water quality research, and compiled several reports, which are available on the SRWG website or by contacting SRWG. These analyses and reports helped inform this WRP.
- Natural Resources Conservation Service:
SRWG works periodically with local NRCS representatives to develop NRCS Long Range Plans and Targeted Implementation Plans for the Sun River Watershed. This WRP considers the goals and objectives outlined in those Plans, which enables collaboration between SRWG, NRCS, and other stakeholders where our values are in sync. Long Range Plans for the [Great Falls](#) and [Choteau](#) NRCS offices are available online.
- Private Landowners and Other Stakeholders
In 2017-18, SRWG surveyed landowners and stakeholders as part of the process to develop a new mission, strategic values, and plan for the Sun River Watershed. This survey sought to understand public perception of key resource concerns and potential projects for SRWG. SRWG’s mission and strategic values were updated in 2019 to reflect findings from this survey. This WRP included updates to these values based on further discussion with stakeholders. In addition, SRWG and partners hold landowner meetings as part of the inclusive process to develop documents like the [Channel Migration Zone Report \[CMZ\]](#) and Muddy Creek Master Plan [to be completed June 2022], and to get feedback about current watershed issues, like the current Adobe Creek avulsion.
- Sun River Water Management Working Group
Distribution of water in the Sun River is primarily managed by Greenfields Irrigation District [GID] in coordination with other water users, including: Fort Shaw Irrigation District [FSID], Broken O Ranch, and the Sun River Valley Ditch Company [SRVDC]. The GID [website](#) describes water management and distribution across the watershed. The Bureau of Reclamation’s [website](#) also provides useful information on the history and operations of the Sun River Project. Stream flows are monitored by SRWG, DNRC, and USGS via multiple stream gages in the Sun River and tributaries, which help provide information used in management decisions. Representatives from the organizations mentioned here, as well as other parties with an

interest in water management in the Sun River Watershed, participate in the [Water Management Working Group](#) and provided information used in developing this WRP.

- Sun River Water Quality Working Group
The Sun River [Water Quality Working Group](#) meets annually or as needed and is made up of representatives from agencies and organizations with an interest in Sun River Watershed water quality. A sub-committee from this working group helped direct and inform this WRP.
- Additional Watershed Reports
 - 2001 FWP Sun River minimum instream flow letter to Reclamation
 - 2012 Sun River Watershed Special Study
 - 2019 Sun River Watershed Trend Analysis
 - 2019 SRWG Strategic Plan
 - 2021 Sun River Watershed Channel Migration Zone Report
 - Gibson Operations guide
 - Sun River Water Quality SOP/SAP

Copies of reports and documents are available on the [SRWG website](#) or can be obtained by contacting [SRWG](#). A full list of references can be found in Appendix A of this document.

Information Gaps

While much is already known about the condition of this watershed, information gaps still exist. SRWG's working groups and committees should consider and prioritize the suggestions below and develop a plan to close these information gaps:

- Water Quality Project Prioritization:
In 2004, the Sun River TMDL characterized pollution from tributaries identified as major sources. Since that time, changes across the watershed may have affected relative contributions from various tributaries, including those SRWG has not been monitoring for water quality. Those changes include land management practices; irrigation updates, such as from flood to sprinkler or to higher-efficiency sprinklers; irrigation infrastructure and management updates; and implementation of restoration projects. In addition, the 2019 MSUEWQ water quality trend analysis report identifies several opportunities for improving water quality through land management practices on tributaries. SRWG needs to work with partners to devise a plan to identify which tributaries should be high priority: where would projects to improve water quality have the greatest impact?
- Unintended Effects of Irrigation Efficiencies:
Though irrigation efficiencies, such as changing from flood to sprinkler irrigation or from canals to pipes can reduce seepage and “wasted” water, SRWG should study the effects of these practices on groundwater recharge. In addition, in some parts of the watershed it's assumed that irrigation returns or seepage may act like natural springs, contributing water to creeks and potentially providing enhanced flows and temperature refugia for fish. As more water efficiencies are implemented for the sake of water conservation or water quality, it is important to understand the unanticipated effects of these practices on other natural resource values. Water efficiency

projects should be monitored to ensure saved water results in increased stream flows as a benefit.

- **Identify Other Watershed Resources to Restore and Protect:**
In creating this WRP, SRWG worked closely with multiple stakeholders and reviewed results from the 2017-18 survey of stakeholders to re-define the natural resource values this document should address. Though the WRP process intended to include only values that had direct or indirect connections to water quality, such as stream flows or fish habitat, discussions revealed that stakeholders are looking for support on more natural resource values and SRWG was reminded that the watershed includes more than the river. SRWG was encouraged to consider supporting stakeholders with predator deterrent; habitat for elk, pheasants and other wildlife; soil health; and range health. Whether SRWG takes a lead role in addressing these concerns or provides support by connecting landowners to the appropriate entity for help, SRWG should consider taking a more holistic view of watershed resource health and think outside the river.
- **Fish Movement and Habitat Use:**
FWP has long-standing survey reaches in the Sun River where they conduct annual fish sampling, and has done multiple focused studies of fish in the watershed. However, FWP and SRWG note a need to learn more about trout habitat use, connectivity, and quality across the watershed. It is important to find a way to understand how factors such as low stream flows, structural barriers, water temperatures, and pollutants are affecting fish behavior, fitness, and population dynamics. SRWG needs to work with FWP to create a strategy for identifying degraded habitat and connectivity, and to prioritize locations for restoration and improvement projects and activities.
- **More Accurate Information:**
Though data are collected across the Sun River watershed, there are areas where either more data or improved accuracy would better inform management decisions. In addition to the suggestions above, SRWG and partners should consider adding flow gages to points of diversion along the Sun River, calibrating or upgrading gages or flumes that are inaccurate, additional weather stations or SNOTEL sites, and wells to monitor seepage from ditches to create a more accurate picture of flow management, distribution, and seepage/loss. The TMDL suggests several locations for continuous temperature monitoring that are not being monitored, and DEQ suggests the watershed may benefit in places from finer-scale water quality data. Several other opportunities for improving data are likely to exist. SRWG needs to create a dialog with partners to identify data gaps and inaccuracies, prioritize them, and take steps to remedy these gaps.
- **Progress Monitoring:**
Since the 2012 WRP was developed, SRWG has implemented many projects to improve water quality and stream flows. The reasons for creating an updated WRP was to revisit the 2012 goals with consideration of the improvements that have been made so far, to update watershed resource goals, and to consider broadening SRWG's reach to include additional resource concerns. In undertaking this WRP update, it has become clear that data do not exist to determine progress towards many of the stated goals. Though the current WRP suggests many activities that would help make positive progress towards stated goals, there is not a mechanism for tracking that progress and many of the activities are not time-bound. With this new WRP, SRWG

seeks to set measurable objectives that are time-bound and include a mechanism for tracking progress.

WRP Format

The WRP is centered around the SRWG’s Strategic Values. Each Value is highlighted in a section that includes a description of past issues and projects, current and desired conditions, *general* future project suggestions, and descriptions of how SRWG will monitor improvements for each Strategic Value.

Specific projects SRWG has planned or in progress to help achieve desired conditions are included in the Project Prioritization Matrix [Appendix D], which doubles as a SRWG work plan. The SRWG Project Committee uses the Project Screening Tool [Appendix C] to periodically review, approve, and prioritize projects. Approved projects are added to the Project Prioritization Matrix. The Matrix shows specific projects, strategic values affected by the projects, collaboration partners, and project status. The Matrix is a flexible document, updated quarterly to reflect project progress and new projects as identified and prioritized by the Project Committee. In this way, we are able to keep our WRP relevant and tied to the work plan.

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WATERSHED BACKGROUND

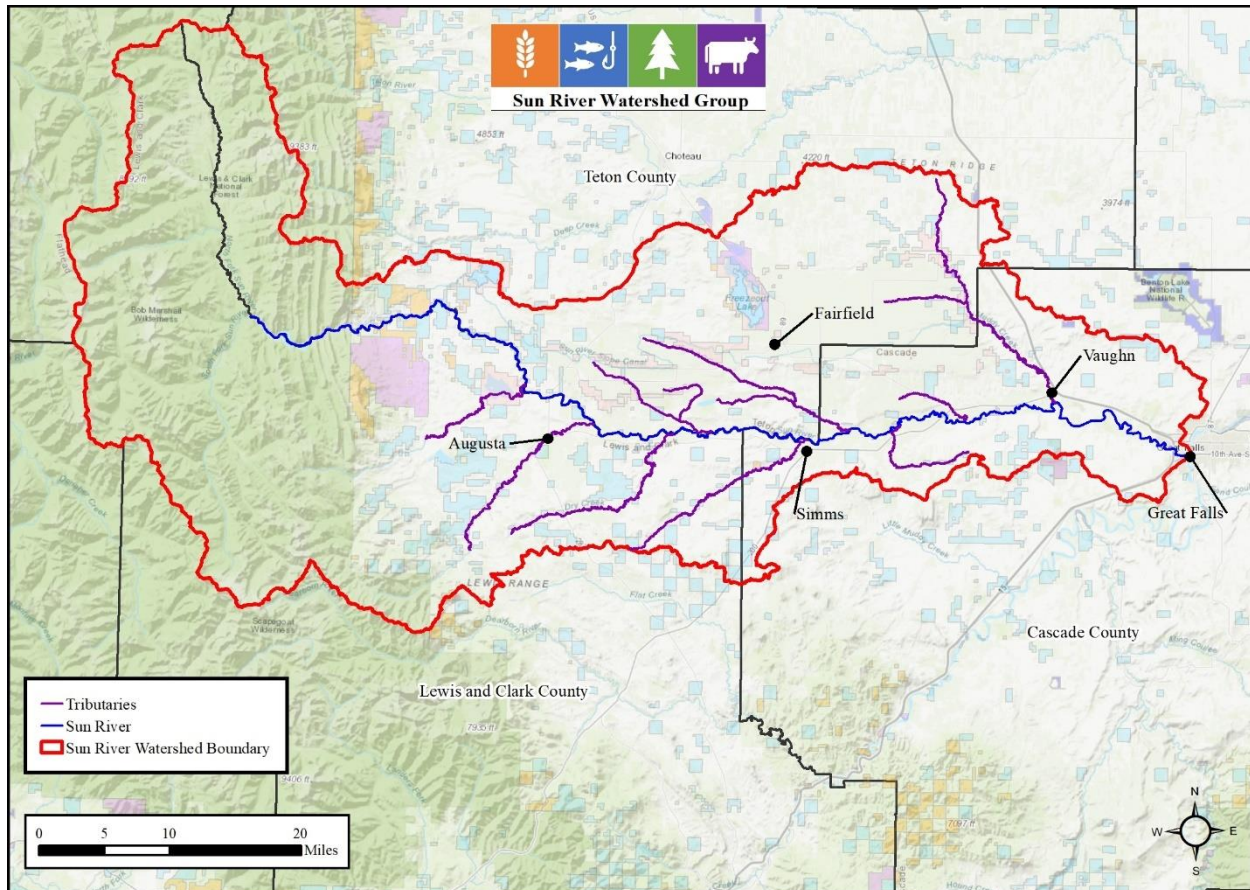


Figure 1. Map of the Sun River Watershed by Montana MapWorks

The Sun River watershed is approximately 2,200 square miles and spans Cascade, Lewis & Clark, and Teton Counties. The river flows approximately 97.4 miles east, with elevation ranging from 9,000 at the Continental Divide to 3,350 feet at its confluence with the Missouri.

The geology of the watershed includes Precambrian-age sedimentary rocks to Quaternary-age alluvial deposits and exposed Precambrian to Paleozoic-age rock with tightly folded and faulted fine-grained mudstones, sandstones, and impure carbonates. Cretaceous Colorado group marine shale in the eastern and lower portion of the watershed likely contributes to the estimated annual dissolved TDS loads in and around Freezeout Lake.

Land use includes forest at the western edge, becoming range and agricultural lands to the east. The towns of Augusta, Simms, Fort Shaw, Sun River, Vaughn, Power, Fairfield, Sun Prairie, and Great Falls are all within the Sun River watershed and rely on the Sun River for municipal, residential, agricultural, and industrial water supplies, and for groundwater recharge. The Sun River provides irrigation for over 116,000 acres, served by two irrigation districts and multiple private ditch companies.

The Sun River supports fish and wildlife, as well as recreational uses. Montana FWP annual sampling reveals Westslope Cutthroat Trout, Rainbow and Brown Trout, Mountain Whitefish, White and

Mountain Sucker, and many other fish species. The Sun River Wildlife Management Area at the west end of the watershed provides important winter range for the Sun River elk herd and habitat for deer, antelope, grizzly bears, and other wildlife. Freezeout Lake on the watershed's northern boundary provides important habitat for migrating waterfowl, the snow goose migration being a particular attraction. The Sun River is popular with kayakers, campers, and anglers, facilitated by many camping, picnicking, and fishing access sites.

The Sun River was called the "Medicine" River and was important to early Native American people who hunted there. Pictographs and tepee rings can still be found throughout the watershed. Captain Lewis of the Lewis & Clark Expedition followed the Sun River to the Missouri on his return trip from the Pacific Coast, camping along "Shishequaw Creek", now known as Elk Creek. Lewis' party noted an abundance of game including deer, antelope, buffalo, and wolves.

The modern watershed is largely shaped by irrigation. Fort Shaw was established in 1867, and Sun River water was used to irrigate the Fort's land. In 1906, the US Bureau of Reclamation authorized the Sun River Project, which established the Greenfields and Fort Shaw Irrigation Districts and led to the construction of the Gibson Reservoir and Dam, Diversion Dam, Pishkun Dikes and Reservoir, Willow Creek Dam and Reservoir, and associated canal systems.

The Sun River is fed by the North and South forks of the Sun River, which originate in the Lewis and Clark National Forest and flow into Gibson Reservoir. Gibson Dam regulates reservoir water levels and Sun River flows. Below the dam, the Sun River flows for 3.4 miles to the Diversion Dam, which sends a portion of flows to Greenfields Irrigation District. The remaining flows make up the main Sun River that runs east across the landscape towards Great Falls, with portions diverted for irrigation and excess irrigation water returning to the river farther downstream.

Sun River Watershed Group

The SRWG grew from the Muddy Creek Task Force, a grass roots group of local landowners who set out to improve water quality and reduce erosion on Muddy Creek, a major tributary to the Sun River. Through the 1990s, this group initiated many important partnerships and implemented several projects before becoming the SRWG, a 501(c)3 addressing a variety of natural resource concerns on the Sun River and its tributaries. The mission of the SRWG is to *collaboratively protect and restore the resources of the Sun River watershed and its communities.*

Today, the SRWG includes a board of directors, paid staff, volunteers, and a suite of partners. SRWG's board meets quarterly. Strategic Values are addressed largely through committees of the board and through focused working groups. The Water Management Working Group meets in April and October, and the Water Quality Working Group meets once per year or as needed.

More information about SRWG can be found at www.sunriverwatershed.org.

WATERSHED RESTORATION PLAN

The SRWG worked with partners and stakeholders to identify key values to guide SRWG's work and further our mission to *collaboratively protect and restore the resources of the Sun River watershed and its communities*. The WRP is formatted around SRWG's list of Strategic Values:

- *Improved water quality* through reduction of sediment, nutrients, and temperature;
- *Adequate stream flows* in all seasons that support multiple uses including agriculture, recreation, fish, and wildlife;
- *Restored hydrologic processes*, such as floodplain connectivity and river migration;
- *Enriched natural resources*, such as soils, fish, and wildlife;
- *Noxious weeds control*;
- *Community education* about watershed resources and stewardship; and
- *Monitoring and follow-up* actions to ensure project success.

The WRP includes a section for each Strategic Value that includes that Value's history, current status, management actions, and monitoring. Following the Strategic Values section, the WRP includes a Projects and Milestones section, describing the objectives, timeline for activities, and which Strategic Value will be affected by each activity. Specific project information is detailed in the Project Prioritization Matrix [Appendix D], which is updated quarterly. This enables SRWG to use the WRP for guidance and long-term goal-setting, with the flexibility of the Matrix, which is regularly updated and used for SRWG's work plan. The Project Screening Tool, which is used by the Project Committee to review, approve, and prioritize projects included in the Matrix is also included as Appendix C.

WATER QUALITY

SRWG seeks to improve water quality through reduction of sediment, nutrients, and temperature.



History

Addressing water quality issues has been the backbone of the SRWG's work, as the organization's founding purpose was to improve water quality in Muddy Creek. Water quality assessments by DEQ, the 2004 TMDL document and the 2012 WRP helped describe and prioritize areas for future water quality projects, identifying key water bodies as impaired or threatened and not supporting their identified beneficial uses. Sun River waterbodies on Montana's List of Impaired Waters are described in the table below.

Waterbody	Probable Cause of Impairment	Probable Sources	TMDL?
FORD CREEK, from two miles above Smith Creek [T20N R8W S25] to mouth [Smith Creek]	Alteration in Stream-side or Littoral Vegetative Covers; Other Anthropogenic Substrate Alterations	Grazing in Riparian or Shoreline Zones; Channel Erosion-Incision from Upstream Hydromodifications; Streambank Modifications-destabilization	Not Applicable
	Sedimentation-Siltation	Grazing in Riparian or Shoreline Zones; Channel Erosion-Incision from Upstream Hydromodifications; Streambank Modifications-destabilization	Yes
HUBER COULEE, headwaters to mouth [Sun River Valley Ditch]	Escherichia coli [E. Coli]	Leaking Underground Storage Tanks; Manure Runoff	No
MUDDY CREEK, headwaters to mouth [Sun River]	Total Nitrogen; Total Phosphorus; Salinity; Sedimentation-Siltation; Sulfate; Temperature; Total Dissolved Solids [TDS]	Habitat Modification – other than Hydromodification; Streambank Modifications-destabilization; Channel Erosion-Incision from Upstream Hydromodifications; Agriculture	Yes
	Selenium	Crop Production [Crop Land or Dry Land]	Yes
SUN RIVER, Gibson Dam to Muddy Creek	Alteration in Stream-side or Littoral Vegetative Covers; Flow Regime Modification	Impacts from Hydrostructure Flow Regulation-modification; Channelization	Not Applicable
	Sedimentation-Siltation	Grazing in Riparian or Shoreline Zones; Agriculture	Yes
	Temperature	Impacts from Hydrostructure Flow Regulation-modification; Channelization	Yes
SUN RIVER, Muddy Creek to	Flow Regime Modification	Crop Production [Irrigated]	Not Applicable

mouth [Missouri River]	Total Nitrogen; Total Phosphorus	Agriculture; Rangeland Grazing; Crop Production [Irrigated]	Yes
	Sedimentation-Siltation; Total Suspended Solids [TSS]	Channelization; Crop Production [Irrigated]; Rangeland Grazing	Yes
FREEZEOUT LAKE	Metals; Organic Enrichment, DO, Salinity, TDS, Chlorides	Agriculture, Crop Production [Irrigated and non-irrigated]	Yes

Though water from Freezeout Lake flows into the Teton River, Freezeout Lake is included in the Sun River watershed TMDL because its water quality is largely influenced by irrigation drainage from Greenfields Irrigation District and activities in the Sun River watershed.

Though not identified on the List of Impaired Waters, the following streams were identified in the TMDL as being probable sources of impairment:

- Duck Creek
- Big Coulee
- Adobe Creek
- Mill Coulee
- Willow Creek

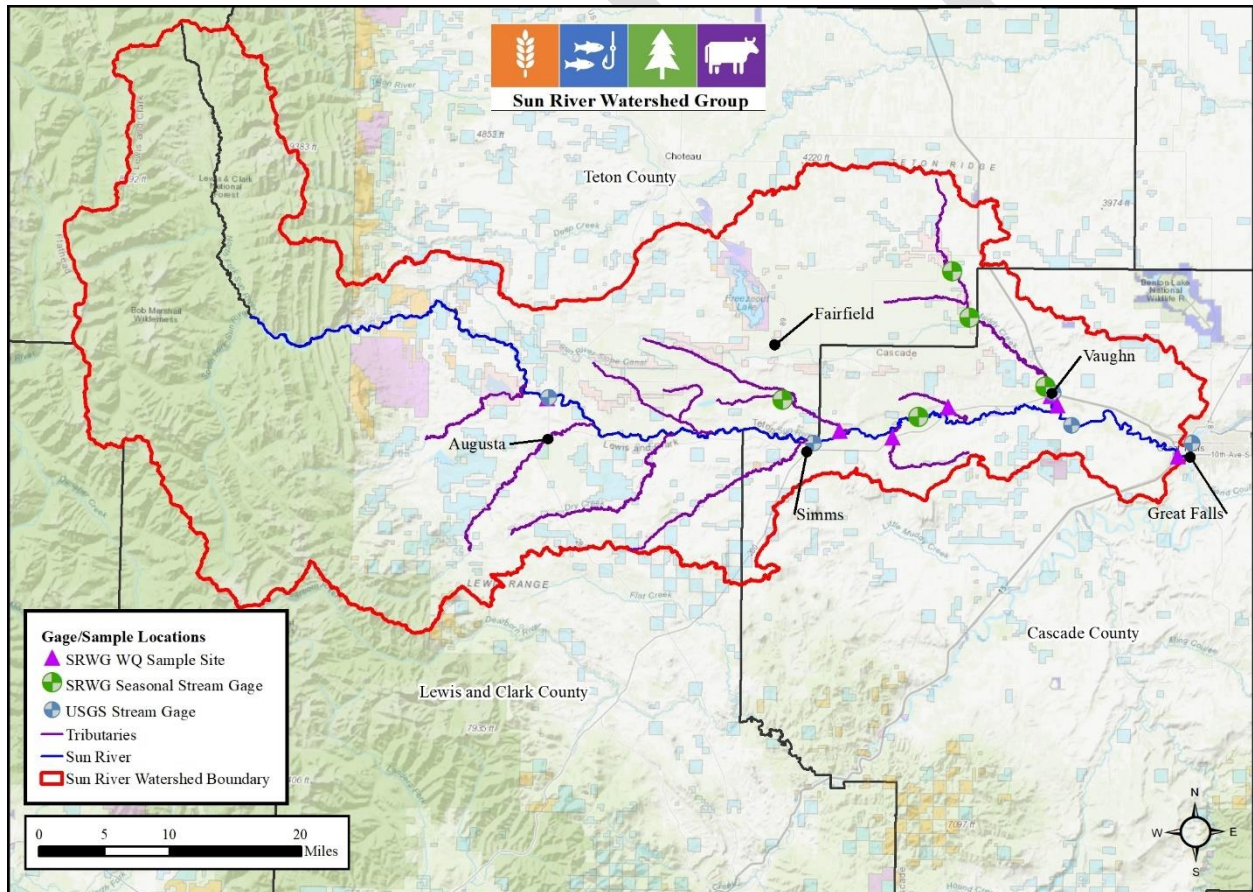


Figure 2: Map of SRWG water quality monitoring and stream gage sites by Montana MapWorks

To address concerns identified in the TMDL, SRWG created a monitoring plan and began implementing projects to improve water quality. Water quality data are collected at established, long-term sites [Figure 2: Map of SRWG water quality monitoring and stream gage sites] from April

through October in order to capture samples at base flow, growing season, and high flows each year. Water quality monitoring sites were chosen based on their proximity to reaches identified in the TMDL, or because they are identified in the TMDL as key streams to restore for maximum benefit to the full watershed. Water quality monitoring includes taking photos at established points; in situ measurements, such as pH, flow, temperature, and turbidity; and collection of water samples to be analyzed at the lab for Total Nitrogen [TN], Total Phosphorus [TP], Nitrate + Nitrite [NO₃+NO₂], and Total Suspended Solids [TSS]. SRWG's data collection protocols are fully described in the Sun River Watershed Volunteer Water Quality Monitoring Standard Operation Procedures [SOP] and annual Sampling and Analysis Plan [SAP] documents. The data collected can be found on the MSUEWQ [Data Hub](#). In addition, as recommended in the TMDL, water temperature is monitored continuously at the Simms USGS stream gage.

Salinity and selenium are significant pollutants, especially for Freezeout Lake, Lower Sun River, and Muddy Creek, and targets are set in the TMDL for salinity and selenium in these three waterbodies. SRWG's annual monitoring program includes measuring specific conductivity and turbidity in the field and analysis of lab samples for TSS, however, Freezeout Lake is not included in annual monitoring. To date, SRWG has sought to improve salinity and selenium through irrigation efficiencies, such as converting from flood to sprinkler irrigation and by reducing leakage in conveyance systems in key areas. SRWG has worked with Montana Salinity Control Association to identify areas and techniques for reducing salinity to improve water quality.

To learn how water quality parameters change over time, SRWG has periodically commissioned Adam Sigler from MSUEWQ to perform data analysis, most recently in 2019. The full 2019 analysis report is available at SRWG's [website](#). Some results include:

- Total Nitrogen and Total Phosphorus concentrations are higher on some tributaries of the Sun River and exceed MT DEQ nutrient standards in some cases.
- The data show no signs of increasing concentrations of nitrate, total nitrogen, or total phosphorus over the 15-year data period.
- There are significant decreases in at least one nutrient for at least one season at the Sun River at Great Falls, Adobe Creek, and Big Coulee sites. Overall, six of the 18 nutrient site combinations have a significant decreasing trend.
- When nitrogen concentrations are highest in a stream during baseflow, it suggests a groundwater source. This is the case for all sample sites except the Augusta site on the Sun River.

These analyses suggest there are opportunities for nitrogen-related projects on Mill Coulee and Muddy Creek, and projects to encourage healthy riparian vegetation facilitate the removal of nitrogen before it enters the stream. The report also mentions that in areas with cultivated agriculture, elevated nitrogen in groundwater suggests opportunities for increasing nitrogen use efficiency to increase crop yields and protein to improve farm revenues while protecting water quality.

Impacts of Sun River impairments extend beyond the watershed. The City of Great Falls and Montana FWP both monitor water quality on the Missouri River and have noted that the Sun River is a major contributor of sediment to the Missouri. This affects fish habitat, water temperatures, sediment

loading at dams, and many other aspects of Missouri River health. Sediment also routinely fouls the water intake for Wadsworth Pond in Great Falls, which is filled from the Sun River.

In the past, SRWG has implemented many projects to address water quality, prioritizing key reaches and tributaries described above. These projects have included bank stabilization, riparian grazing management, riparian plantings, and irrigation water management projects [irrigation efficiencies]. A full list of SRWG past projects can be found in Appendix B. In addition, SRWG’s Water Quality Working Group meets 1-2 times per year, or as needed, to discuss water quality goals, progress, and strategies.

Current Status

SRWG is continuing its long-standing focus on Muddy Creek. Each year, approximately 15,635 tons of sediment flow out of the Muddy Creek subbasin and into the Sun River, a short distance upstream from the confluence of the Sun and the Missouri. In addition to sediment, Muddy Creek also contributes elevated levels of nutrients, salts to the Sun and Missouri Rivers. SRWG is currently developing a Muddy Creek Master Plan to guide long-term and short-term efforts to improve water quality [to be completed in June 2022]. The plan will include on-the-ground projects that can be implemented in the next 3-5 years, as well as larger-scale solutions that will take multiple partners and many years to complete, and Best Management Practices to help stream-side landowners manage their land to reduce negative impacts on water quality. The plan will also include a list of recommended best management practices for landowners on the creek who seek to be good stewards of the resource and help improve water quality.



Photo 1: Muddy Creek flows add substantial sediment and nutrients to the Sun River, from Google Maps



Photo 2: Sun River flows add substantial sediment to the Missouri River at Great Falls, from Google Maps

As suggested in the TMDL, SRWG has implemented riparian buffer and grazing management projects to help improve water quality, and continues to look for more opportunities to implement similar projects. SRWG also recently replaced undersized culverts with a bridge on Lower Muddy Creek, reducing erosion. Other components of this project, to be complete in 2022, include riparian fencing to keep livestock off stream banks planting of a riparian buffer, which will be excluded from livestock via the new fencing.

Throughout the rest of the Sun River watershed, water quality improvement projects are incorporated into projects to improve stream flows and restore hydrologic processes. One example is near the town of Fort Shaw, where the Sun River has avulsed into Adobe Creek and an unnamed historic channel. SRWG is working with Cascade Conservation District, landowners, and water managers to address the avulsion while maintaining natural processes and reducing bank erosion. Another example is SRWG's work through the Water Management Working Group to document the process for managing Gibson Reservoir and improve stream flows in the river. By increasing river flows, we will lower water temperatures and improve fish habitat, connectivity, and food production. These and other actions are described later in this document under their primary resource values, but also have positive impacts on water quality.

SRWG works with partners such as Montana Salinity Control Association, DEQ, MSUEWQ, and NRCS to identify areas and actions to improve water quality through projects. These are important partners for helping SRWG identify impairment sources, collect and analyze data, provide cost-sharing for projects, and monitor changing water quality conditions.

SRWG will use this WRP and past reports and analyses to continue implementing projects to improve water quality across the watershed.

Water Quality Management Actions

SRWG will continue to seek out, develop and implement water quality improvement activities throughout the Sun River watershed. Projects and activities will be identified and prioritized according to SRWG's Project Prioritization Matrix [Appendix D] for the following management actions:

- Reduce animal waste and other livestock impacts through grazing management, such as fencing and vegetative buffers on key tributaries identified in TMDL
- Improve vegetation on banks for stabilization, shade, and nutrient filtering, especially where identified in 2019 Nutrient Trend Analysis
- Continue annual water quality monitoring and regular data analyses
- Coordinate with City of Great Falls and FWP to better learn how Sun River impairments are affecting the Missouri River
- Implement projects addressing other SRWG Strategic Values that improve water quality as an ancillary benefit. For example, water efficiency projects may reduce irrigation return flows to surface water, reducing impairment inputs.
- Work with MSCA to identify opportunities to reduce salinity and selenium
- Revisit TMDL recommendations about Freezeout Lake monitoring and actions and work with DEQ to prioritize
- Promote water quality and nonpoint source pollution education through partnerships and communication
- Seek designation as a future DEQ focus watershed for 319 funding to enable more projects

SRWG's TMDL cites septic tanks as a potential source of nutrients, though not likely to be significant compared to agricultural inputs. At this time, SRWG is not prioritizing work or monitoring of septic systems, as this work is ably led by Montana Rural Water Systems.

Please visit the PROJECTS AND MILESTONES section of this WRP for a list of SRWG's water quality milestones, timeline, and resource value objectives. Specific projects are listed in the Project Prioritization Matrix [Appendix D], which is updated quarterly.

Monitoring Project Success

SRWG has an established water quality monitoring program in place that will continue. SRWG will work with MT DEQ and MSUEWQ to determine locations and methodology for additional monitoring sites that may be added to better describe progress towards goals, and to continue periodic analysis of data. For example, as the Muddy Creek Master Plan projects are implemented, it may be desirable to increase monitoring efforts to gauge which projects are having the most impact and to identify and prioritize areas for future work.

One useful tool that is part of SRWG's water quality monitoring is establishing photo points. Where projects are anticipated to reduce erosion or improve riparian vegetation, SRWG should also establish photo points and take photos at regular intervals to record changes.

STREAM FLOWS

SRWG will work with partners to ensure adequate stream flows in all seasons that support multiple uses including agriculture, recreation, fish, and wildlife.



History

In most years, as much as 90% of Sun River flows comes from precipitation above Gibson Dam. Responsibility for managing the storage and distribution of that water falls to Greenfields Irrigation District [GID], as the operator of Gibson Dam, with support from the US Bureau of Reclamation. GID must balance this limited water supply with the demand from irrigators, other water managers who divert flows from the Sun River, and the needs of fish, wildlife, domestic & municipal uses, and recreation. Changes in water orders, precipitation levels, and poor communication can lead to extreme fluctuations in the river and tributaries. These fluctuations directly affect fish habitat, erode river banks, and affect hydrologic processes in other ways. The 2002 TMDL states that “[l]ow in-stream flow is the biggest obstacle for meeting all uses and achieving sediment and temperature targets in the upper Sun River.” In short, stream flows and flow fluctuations are closely tied to many other strategic values identified by SRWG.

With water being a limited resource, and management of that resource falling to other entities, SRWG’s role is largely to facilitate communication to set and meet target stream flows that support multiple water uses and to implement projects that help keep more water in the river. SRWG created the Sun River Water Management Working Group, a collaborative of water users, managers, and stakeholders in Sun River that meet bi-annually. The Working Group relies on a network of stream gages and SNOTEL sites to understand and forecast water availability and distribution.

The 2012 WRP outlined specific goals for water quantity: 1] meeting FWP’s wetted perimeter discharge requirements for survival of aquatic communities (drought minimum – 100 cfs above Elk Creek, drought minimum 130 cfs below Elk Creek, and non-drought minimum 220 cfs for all; 2] reducing Muddy Creek flows to 150 cfs to reduce erosion; and 3] reducing Big Coulee flows to 50 cfs to reduce erosion. Early SRWG projects to address these goals and improve stream flows in general focused largely on communication, information, and improved irrigation efficiency. Communication has been improved through regular meetings of the Water Management Working Group, SRWG attendance at meetings of the local irrigation districts, and outreach to water managers and stakeholders. SRWG has improved information about stream flows by facilitating payment for USGS stream gage sites, working with DNRC to set up additional monitoring sites, and operating and maintaining several seasonal stream gages on tributaries of the Sun River. Irrigation efficiency projects have included ditch lining or converting open ditches to pipe and switching to automated head gates. A full list of past projects can be found in Appendix B.



Figure 3: Sun River watershed stream gages and SNOTEL sites, image from www.sunriverwatershed.org/river-conditions

Current Status

SRWG continues to focus on communication, information, and irrigation efficiency as means to ensure adequate stream flows for multiple uses in all seasons. SRWG and partners have made progress towards the goals stated in the 2012 WRP:

Sun River Minimum Flows

Achieve FWP's wetted perimeter discharge requirements for survival of aquatic communities (drought minimum – 100 cfs above Elk Creek, drought minimum 130 cfs below Elk Creek, and non-drought minimum 220 cfs for all).

Over the past two years, SRWG facilitated collaboration between GID and Reclamation to document operations of the Gibson Reservoir, setting minimum low flows and addressing the desire for higher

target flows. The minimum flow objective stated in the 2002 TMDL to meet “...FWP Sun River minimum instream flow of 130 cfs between Elk Creek and Muddy Creek...” has led to some misunderstanding that 130 cfs is the goal, rather than the absolute minimum. Recent communication and operations improvements have resulted in an absolute minimum flow of 100 cfs over Diversion Dam and 130 cfs at the Simms gage, however FWP states the preferred flow for fish food production in this reach is 220-360 cfs. SRWG and partners continue to pursue irrigation efficiency and water savings opportunities that would result in more progress towards this goal.

Muddy Creek Flow Reduction

Reduce Muddy Creek flows to 150 cfs to reduce erosion.

Muddy Creek flows remain greater than 150 cfs during the irrigation season. Muddy Creek flows are impacted by irrigation return flows across the Greenfields Irrigation District and from the Sun River Valley Ditch Company, as well as other agricultural operations around the creek. Though it’s difficult to track every source of Muddy Creek flows, major work is being done on Spring Coulee Creek, one of the larger flow sources. GID and SRWG have several projects in progress and planned to expand GID’s ability to mitigate and manage flows. SRWG’s Muddy Creek Master Plan will identify additional strategies for reducing flows in Muddy Creek.

Big Coulee Flow Reduction

Reduce Big Coulee flows to 50 cfs to reduce erosion.

Significant progress has not been made towards the goal of reducing Big Coulee flows to 50 and SRWG will continue working on this issue.

The TMDL notes that irrigation efficiency projects are important for reducing pollutants in the Sun River and tributaries. SRWG should consider multiple benefits a project is expected to deliver when prioritizing water efficiency projects. This means assessing the benefits the project is expected to bring not just for stream flows, but also for water quality and fish habitat connectivity, for example.

The Sun River Water Management Working Group continues to meet before and after the irrigation season each year, typically in April and October. To further improve communication between stakeholders, SRWG was recently awarded a DNRC Irrigation Development Grant for 2022-23. This grant will also help SRWG and partners identify water savings projects and drought preparedness planning.

Stream Flow Management Actions

SRWG will continue to seek out, develop and implement stream flow improvement activities throughout the Sun River watershed. Projects and activities will be identified and prioritized according to SRWG’s Project Prioritization Matrix [Appendix D] for the following management actions:

- Frequently revisit target flows set for Sun River, adapting targets as water efficiency projects improve seasonal flows
- Reduce Muddy Creek flows to 150 cfs
- Reduce Big Coulee Creek flows to 50 cfs
- Work with MSCA to identify water efficiency projects that will also positively impact salinity and selenium in water quality
- Improve accuracy of water measurements to enable better management decisions

- Sustain and improve snow and streamflow data, reliability, and incorporation into water management decisions
- Continue to improve communications among water users and water managers to fine-tune river operations and irrigation water management and improve flow in the Sun River
- Plan for extended or more frequent drought
- Implement projects addressing other SRWG Values that improve stream flow as an ancillary benefit [i.e. habitat improvement or irrigation efficiency projects]

Please visit the **PROJECTS AND MILESTONES** section of this WRP for a list of SRWG’s stream flow milestones, timeline, and resource value objectives. Specific projects are listed in the Project Prioritization Matrix [Appendix D], which is updated quarterly.

Monitoring Project Success

To monitor improvements to river flows and irrigations efficiencies, SRWG will rely on the stream gage network. SRWG will continue to manage and operate seasonal stream gages on tributaries of the Sun River. This includes reinstallation of the Upper Muddy Creek gage, and collaboration with DNRC and Lewis & Clark Conservation District to gage Elk Creek. SRWG will also work with USGS and partners to ensure long-term funding of USGS gages. SRWG will work with the Water Management Working group to periodically assess whether additional gages are needed.

HYDROLOGIC PROCESSES

SRWG works to restore hydrologic processes such as floodplain connectivity and river migration.



History

The Sun River has a history of migrating across the floodplain, flooding, and eroding banks. All of these are natural processes, important for transport of nutrients, sediment movement and sorting, development of riparian vegetation, and groundwater recharge. Along the Sun River, humans are constantly fighting these natural processes, installing riprap and levees to protect farms, irrigation infrastructure, towns, and roads. For a healthy watershed, a balance must be struck between restoring natural processes and protecting human needs and safety.

Sun River characteristics vary as it crosses the landscape – from a steep, mountain river confined by the canyon in the west, to a highly dynamic system with a wide floodplain as it flows east. The Sun River below the canyon is highly migratory, a process thoroughly described in the Sun River Channel Migration Zone report completed in 2021.

Historic photos show that the Sun River has avulsed multiple times – rapidly migrating into new channels or reactivating old channels. A combination of drought years and irrigation infrastructure reduced channel avulsions through the late 1900s and early 2000s, but currently there are two reaches identified as high-risk of avulsion, one of which is actively avulsing. In addition, these low-water years also allowed vegetation to encroach on the river, narrowing the channel and making it more susceptible to dramatic change in the next flood.

Many studies have been commissioned to help understand the nature of the Sun River, identify problem areas, and prioritize projects. The most recent reports have included a 2014 study by Warren Kellogg and the Sun River Channel Migration Zone [CMZ] Report, completed by Applied Geomorphology Inc. in 2021.

Current Status

The avulsion of the Sun River at Adobe Creek is an issue SRWG and Cascade Conservation District are currently addressing. Though avulsions and river migration are natural processes, this particular avulsion is flooding and eroding agricultural lands and threatening water supply to 60+ water users on the Sun River Valley Ditch. Cascade CD has acquired funding to hire a consultant to design a project to reduce flood risk and damage to agricultural land infrastructure while maintaining healthy hydrologic processes. This project will consider the full range of the affected reach, including causal and effect factors. The design will balance important hydrologic processes and agricultural land and water use.

Other projects SRWG is currently pursuing across the watershed include those on Muddy Creek, described in the Water Quality section, which will restore floodplain connectivity and other hydrologic function, and flood recovery and mitigation projects around Elk Creek. SRWG is working with Lewis & Clark Conservation District and local landowners to understand how to reduce impacts of future floods on town and agricultural infrastructure while maintaining important hydrologic processes associated with high water.

The CMZ report was just completed in August 2021. SRWG’s board and partners are in the process of reviewing that report and identifying high-priority projects to pursue in the coming years. The Muddy Creek Master Plan, to be completed in June 2022, will identify additional opportunities for restoring hydrologic processes, as will Warren Kellogg’s 2014 Sun River watershed Assessment.

In addition to natural channel migration, flooding, and drought, the watershed is also impacted by changes to irrigation management. SRWG and partners pursue projects to improve irrigation efficiencies, such as changing from flood to sprinkler irrigation or improving irrigation efficiency through piping or lining ditches. However, the impacts these “water efficiency” actions have on other hydrologic processes are not well understood. As water efficiency is improved, there may be unintended effects to groundwater recharge, timing of recharge, “spring” fed creek temperatures, or other hydrologic processes. While these processes may not be entirely natural in origin, the basin has been modified by irrigation for over 100 years and some of these processes could be quasi-natural, replicating or replacing natural processes.

Hydrologic Processes Management Actions

SRWG will continue to seek out, develop and implement hydrologic process improvement activities throughout the Sun River watershed. Projects and activities will be identified and prioritized according to SRWG’s Project Prioritization Matrix [Appendix D] for the following management actions:

- Identify long-term watershed-scale approaches to restoring hydrologic processes
- Identify, assess, and prioritize reach-scale projects to re-establish hydrologic processes
- Study effects of irrigation method changes on groundwater recharge
- Educate the public about channel migration and natural hydrologic processes
- Implement projects addressing other SRWG Values that improve hydrologic processes as an ancillary benefit [i.e. habitat improvement or irrigation efficiency projects]

Please visit the PROJECTS AND MILESTONES section of this WRP for a list of SRWG’s hydrologic process milestones, timeline, and resource value objectives. Specific projects are listed in the Project Prioritization Matrix [Appendix D], which is updated quarterly.

Monitoring Project Success

Most monitoring of hydrologic process improvements will be project-specific and related to project goals. SRWG will, at a minimum, set up photo points at key locations to assess efficacy of future projects. At a watershed-scale, water quality monitoring and stream gages may provide some insight to long-term trends and improvements to hydrologic processes. SRWG will work with the developers of the Channel Migration Study to determine the methods and frequency of monitoring to assess long-term, watershed-scale improvements to hydrologic processes.

WATERSHED NATURAL RESOURCES

SRWG supports healthy natural resources, including, but not limited to soil, fish, and wildlife.



History

SRWG's focus has historically included stream flows, water quality, and weeds, with ancillary benefits to other resources such as soil and fish habitat. When SRWG conducted stakeholder surveys in 2017-18 to learn what resource concerns and project ideas our partners and local landowners had, we learned that there was a need to address more issues – from baling twine hazards for raptors to encouraging the US Forest Service to include the watershed in their planning process. Watershed Natural Resources is a new Strategic Value added to this WRP to allow SRWG to address fish and wildlife habitat, soil health, and other resource concerns not addressed elsewhere in this plan.

Sun River Fishery

The Sun River above Gibson Dam was historically fishless due to the significant waterfall that Diversion Dam is now built upon. Fish introductions have occurred throughout this drainage since colonization by pioneers. These historic introductions, including efforts by Montana FWP, have moved White Suckers, Brook Trout, Rainbow Trout, Brown Trout, Westslope Cutthroat Trout, and Arctic Grayling into the upper portion of the Sun River watershed. Rainbow Trout were annually stocked in Gibson Reservoir to create recreational opportunities, however, due to extreme reservoir fluctuations, these populations did not thrive and stocking was ceased.

The North and South Forks of the Sun River [above Gibson Dam] contain Rainbow Trout, Westslope Cutthroat Trout, and Westslope Cutthroat x Rainbow Trout hybrids. These populations originate from historical hatchery stocking events that have since established fluvial populations. A very small Arctic Grayling population is present in the lower section of the South Fork Sun River as a remnant of an attempt to establish a conservation population, though this population is not considered a viable conservation population. The mainstem of the Sun River was stocked with Rainbow Trout, Brown Trout, Brook Trout, and Cutthroat Trout beginning in the 1930s. With the exception of the Arctic Grayling efforts, FWP ended river stocking in 1973. The Sun River below Diversion Dam currently supports Brown Trout, Rainbow Trout, and Mountain Whitefish populations.

The Upper Sun drainage fishery population has been sampled by snorkel surveys since 1995. These surveys estimate the total number of trout [8 inches and greater] per mile. Recent estimates place the South Fork Sun River trout population approximately at 641 [6-year average] to 670 [12-year average] trout/mile with an average length of 11.5 inches. The North Fork Sun River population averages 583 [12-year average] to 716 [6-year average] trout /mile.

The mainstem of the Sun River is sampled annually by mobile anode electroshocking at three locations. The total number of trout [8 inches and greater] per mile were 183, 168, and 85 trout per mile in 2021, compared to long-term averages of 190, 86, and 95 trout/mile at the Highway 287, Simms, and Sun River sites, respectively. Population estimates at the two upstream sites have generally been greater in recent years than during the late 1990s and early 2000s, however are still well below population densities upstream of Gibson Reservoir. Monitoring of these locations has demonstrated how suppressed the fisheries are due to the effects of chronic dewatering and associated habitat loss and higher water temperatures. Irrigation diversions also likely play a role in

suppressing fish passage and migration throughout the Sun River watershed and result in direct loss through entrainment into canals.

Fish survey results for 1997-2021 can be found in Appendix E.

Sun River Wildlife

The Sun River watershed supports a wide range of wildlife including grizzly bears, antelope, deer, big horn sheep, waterfowl, raptors, and other birds and small animals. The Sun River Wildlife Refuge at the western extent of the watershed provides important protected winter range for elk. Freezeout Lake is an important stopover for migrating snow geese twice a year. The wildlife of the Sun River watershed is important for intrinsic values, as well as for recreation and hunting opportunities and the associated economic values.

The Upper Sun River Wildlife Team meets multiple times throughout the year to discuss wildlife concerns in the watershed. This working group supports local and state wildlife initiatives and research, such as the Montana Statewide Bighorn Research Initiative, and annual mule deer and moose reports. Wildlife is managed by FWP and the US Fish and Wildlife Service, and other organizations such as Pheasants Forever and Ducks Unlimited support habitat improvement projects.

SRWG is well-poised to support wildlife habitat projects and support outreach efforts by our partner organizations. Some examples include supporting weed control efforts by the USFS and FWP to improve natural vegetation desired by wildlife, organizing an ammunition pick up after hunting season at Freezeout Lake, or coordinating larger habitat improvement projects with FWP, Ducks Unlimited, Pheasants Forever and other partners to benefit a range of wildlife species.

In recent years, grizzly interactions with humans have increased. SRWG has been approached by multiple organizations about helping landowners acquire cost-share funding to implement predator-deterrent resources on farms and ranches, assisting with public outreach about food and other attractant storage, educating boaters and anglers to be “bear aware”, and about initiating a carcass pick-up program to reduce on-farm attractants. SRWG is not likely to take the lead on these activities, but could play an important role in fundraising, outreach, and directing landowners and citizens towards the appropriate resources.

Soils and Other Resources

SRWG’s strategic values to improve water quality and stream flow and to control weeds go hand-in-hand with other resource concerns, such as soil conservation and restoration of native plant species. SRWG projects to improve water efficiency, riparian health, and wildlife habitat are likely to benefit many other natural resources as well. SRWG has partners, such as local conservation districts, FWP, and NRCS who have vast experience and skill in addressing these resource concerns. SRWG can serve the resource well by connecting landowners to the appropriate support agency.

The TMDL notes that groundwater discharge from fallow cropland or bare, grazed lands is a major source of salinity and selenium in Muddy Creek and Freezeout Lake. By working with partners such as MSCA and NRCS, SRWG can identify key areas and actions to reduce salinity and selenium, such as

restoring vegetation, reducing grazing impacts, and altering cropping practices, and to help provide cost-share to farmers willing to implement these practices.

The NRCS Long Range Plans for Teton, Cascade, and Lewis & Clark Counties describe natural resource concerns, as informed by watershed stakeholders. SRWG will work with NRCS, landowners, conservation districts, and other entities to help address these resource concerns as possible.

Natural Resource Management Actions

SRWG will continue to seek out, develop and implement natural resource improvement activities throughout the Sun River watershed. Projects and activities will be identified and prioritized according to SRWG's Project Prioritization Matrix [Appendix D] for the following management actions:

- Improve fish habitat and connectivity, including removal of fish passage barriers
- Protect and improve habitat for key wildlife species
- Promote practices and projects to improve soil health
- Support responsible interactions between people and wildlife, including predators
- Increase public awareness and support for fish, wildlife, and other resources
- Identify opportunities to change grazing and crop practices to reduce saline seeps
- Identify and improve other natural resources in the watershed
- Support partner projects and connect landowners to partner resources
- Implement projects addressing other SRWG Values that improve natural resources as an ancillary benefit [i.e. improving Sun River flows to achieve target flows will improve fish habitat]

Please visit the PROJECTS AND MILESTONES section of this WRP for a list of SRWG's natural resource milestones, timeline, and resource value objectives. Specific projects are listed in the Project Prioritization Matrix [Appendix D], which is updated quarterly.

Monitoring Project Success

Monitoring of fish and wildlife is done by FWP. If SRWG instigates a habitat improvement project, it will include a monitoring plan that will be approved, if not executed, by FWP or an appropriate resource management agency.

WEEDS

SRWG works with partners to control noxious weeds.



History

Weed control in the watershed has mostly focused on reducing weeds in the upper watershed – though projects have included parts of the lower watershed as well. Annual weed spray days are organized by the US Forest Service on Elk Creek and Ford Creek, west of Augusta, and in the Sun Canyon. Since 1998, the SRWG has organized a Weed Whacker Rodeo weed pull each year, which focuses on public use areas and drainages in the Sun Canyon. These main events are complemented by weed pulls and spray events organized by the Rocky Mountain Front Weed Roundtable, Pull Your Share student knapweed pulls, and efforts to control weeds on private properties. SRWG has also worked with the Rocky Mountain Front Weed Roundtable to collect and release biocontrols.

The largest weed control event is the SRWG Weed Whacker Rodeo, held annually since 1998. Over the years, volunteers have logged over 4,000 hours pulling more than 17,000 lbs of knapweed in the Sun Canyon. This event is endorsed by local businesses and individuals who donate funds to support the event and prizes that are awarded to volunteers. Controlling weeds in the canyon is SRWG's strategy to reduce their spread downstream.

While knapweed and houndstongue are the primary weeds SRWG and partners focus on, there are several other noxious weeds in the watershed, including whitetop, cheatgrass, and leafy spurge. SRWG follows the lead of the RMFWR and local weed districts to prioritize weed control efforts.

Current Status

SRWG currently works with the USFS each year to set weed spray days for Elk Creek, Ford Creek, Sun Canyon, and Gibson Reservoir. SRWG will continue to hold the Weed Whacker Rodeo on the second Saturday in July, with the 25th annual Rodeo to be held in 2023. In recent years, SRWG has organized annual social media campaigns, such as “Weed Wednesday,” to spread awareness about weeds, control measures, and sources of support for landowners seeking to control weeds. SRWG plays an important role in weed education, workshops, and sources for information, as well as connecting volunteers to weed control opportunities. Budget limitations have prevented SRWG from expanding the weed program, but as funding allows, SRWG should grow the program to help address more weeds across the watershed.

Weed Control Management Actions

SRWG will continue to seek out, develop and implement weed control throughout the Sun River watershed. Projects and activities will be identified and prioritized according to SRWG's Project Prioritization Matrix [Appendix D] for the following management actions:

- Suppress or control noxious weeds throughout the watershed
- Support partners' weed control efforts in the watershed
- Help landowners connect with resources that can help with weed control
- Grow awareness about noxious weeds and efforts to control them

Please visit the PROJECTS AND MILESTONES section of this WRP for a list of SRWG's weed control milestones, timeline, and resource value objectives. Specific projects are listed in the Project Prioritization Matrix [Appendix D], which is updated quarterly.

Monitoring Project Success

SRWG does not currently have a formal weed monitoring program. Each spring, SRWG staff does visual surveys of weed “hot spots” in the Sun Canyon. These are areas that volunteers focus on during the Weed Whacker Rodeo. SRWG also coordinates with Pull Your Share, USFS, and RMFWR, who also do visual surveys, and works with individual landowners to get an idea of where weeds are improving or spreading.

OUTREACH AND EDUCATION

SRWG helps educate local communities about watershed resources and stewardship.



History

Community outreach and education have been core values of SRWG since the beginning. SRWG created and distributed brochures about SRWG collaboration and watershed issues and held workshops on topics that include water quality monitoring, grazing management practices, and irrigation water management. SRWG has also hosted many tours to show stakeholders firsthand the issues and implemented projects across the watershed. SRWG's long-time water quality monitoring volunteer, Rai Hahn, also had a Sun River Science Club that exposed students to natural resource issues and supported multiple student research projects. SRWG has long been involved with local landowners, conservation districts, NRCS partnership projects, community commissioners, and Montana Watershed Coordination Council events.

Current Status

The Sun River Watershed Group strives to include community outreach and education across all our other values and in our projects. This includes in-person events, such as workshops and tours, as well as on-line through social media, the SRWG website, and list-serve. SRWG is currently developing a Fundraising and Outreach Plan that describes specific objectives and milestones for Outreach and Education.

The overarching objectives of Outreach and Education are for *SRWG to provide information to stakeholders* and for *SRWG to gather information from stakeholders*. Providing information to stakeholders includes facilitating educational opportunities, such as workshops for landowners, or tours of watershed projects and issues. It also includes sharing information, such as recently completed reports or news about upcoming projects. SRWG gathers information from stakeholders, such as natural resource issues or news and events, by attending meetings of other organizations or by holding exploratory meetings, such as an open house, where two-way communication is encouraged. SRWG outreach and education efforts may be specific to a project or natural resource value, or may be intended to grow SRWG's profile in general.

Key Audiences for SRWG's outreach and education efforts include current and potential stakeholders: project partners, landowners, funding entities, and the general public. Outreach to current partners is achieved through our email list-serve and our mailing list for hard-copy correspondence. SRWG tries to engage the general public, as well as current stakeholders, through our website, social media, press releases, and events. SRWG also attends meetings and events held by watershed stakeholders, in order to learn more about others' issues, objectives, news, and to engage new stakeholders.

Events are an important way for SRWG to reach current and potential stakeholders. They are also opportunities for SRWG to strengthen relationships by co-hosting or co-sponsoring events. Events SRWG has hosted or co-hosted recently include:

- 25th Anniversary Watershed Tour and Celebration
- Annual Weed Whacker Rodeo
- Bashin' Trash River Clean Up
- Rain Barrel Workshop

- Suds for the Sun Pint Night
- Night Out at the Ball Park

SRWG also participates in events hosted by other organizations with shared interests or goals, which helps expand our audience and learn more about resource values.

Objectives and Future Projects

Objectives for SRWG’s outreach and education efforts include:

- Grow community knowledge, involvement, and support for watershed issues
- Promote SRWG Strategic Plan as a vehicle to address watershed issues
- Enhance SRWG’s understanding of natural resource concerns, potential projects, and partnership opportunities

This will be accomplished through SRWG execution of:

- Meetings / open houses
- Workshops
- Events
- Tours
- Newsletters
- Social Media
- Annual reports

And through SRWG participation in the above when held by other stakeholders.

SRWG’s specific outreach and education goals, including milestones and timeline will be described in SRWG’s Fundraising and Outreach Plan [in development].

PROJECTS AND MILESTONES

In 2017-18, SRWG conducted a survey of stakeholders and partners to determine what they saw as the main resource concerns and project needs throughout the Sun River watershed. In addition, SRWG and partners have completed many reports about watershed health, most recently the 2014 Special Report by Warren Kellogg and the 2020 Channel Migration Zone Report. The results from these surveys and reports helped inform SRWG’s mission statement and Strategic Values, and helped set the objectives and milestones described in this WRP.

SRWG’s Project Committee also uses these surveys and reports, as well as regular communications with stakeholders, to inform the Project Prioritization Matrix, which lays out the specific projects that will be implemented to support the objectives and milestones in this WRP. The Project Committee meets regularly to review, approve, and prioritize projects proposed by SRWG staff and partners, using the Project Screening Tool [Appendix C]. Once projects have been approved by the Committee and prioritized, SRWG staff lists them on the Project Prioritization Matrix [Appendix D] and begins pursuing funding sources. The Matrix is reviewed and updated quarterly and shared with the SRWG board at each quarterly board meeting.

This table describes projects and milestones to be implemented as part of this WRP. For specific project information, please refer to the Project Prioritization Matrix [Appendix D].

MILESTONE	VALUES*					
	WQ	SF	HP	NR	W	M
Within two years [2024]						
Reinstall upper Muddy Creek gage station at new location.						X
Work with FWP to add fish sampling sites on Muddy Creek.				X		X
Establish photo points and, if possible, water quality monitoring stations at key points along Muddy Creek to record current [pre-construction] conditions. Continue monitoring through and after construction of Muddy Creek Master Plan projects.	X					X
Develop monitoring plan for upper Muddy Creek to quantify flow savings associated with water efficiency improvements, i.e. pump backs, TIPS, J-waste way and head gate replacements.						X
Work with FSID to have flume and gage at Sun River head gate accuracy improved		X	X			X
Grow weed program by increasing outreach and volunteer recruitment for 25 th WWR anniversary.					X	
Construct three or more small-scale, low-cost restoration projects, such as in-channel structures, targeted bank protection, etc. (Low-tech, process-based restoration, on streams identified in the TMDL.	X		X	X		
Within five years [2027]						

Complete design and implement Phase I of Muddy Creek Master Plan stream restoration project	X	X	X	X		X
Improve Broken O Ranch diversions with automated head gate.	X	X	X	X		
Construct three or more small-scale, low-cost restoration projects, such as in-channel structures, targeted bank protection, etc. (Low-tech, process-based restoration, on streams identified in the TMDL.	X	X	X	X		
Develop 2-3 projects with FWP biologists or other partners to improve upland habitat	X	X				
Develop 2-3 projects with FWP biologists or other partners to improve wetland/waterfowl habitat	X	X	X			
Work with DNRC and others to get Elk Creek gaged again						X
Seek better forecasting methodology – i.e. SNOTEL sites or weather stations			X			X
Implement at least two projects addressing potential avulsions or hazards described in the CMZ Report	X	X	X	X		
Develop a watershed-scale drought-management plan.		X	X	X		
Partner with FWP to identify fish passage barriers on the Sun River and develop a plan for removal				X		X
Identify and implement at least three projects to improve riparian vegetation or other nutrient-reducing techniques on key streams as identified in the 2019 Water Quality Trend Analysis report.	X		X	X		X
Contract with MSUEWQ or other entity to perform follow up water quality data analyses.						X
With MSCA, map priority areas for salinity and selenium reduction projects	X			X		X
5-10 years [by 2032]						
Water efficiency study to assess unintended effects of changing from flood to pivot and other irrigation efficiency projects.		X	X	X		X
Develop a monitoring or analyses plan to help determine relative contributions of impairments for Sun River tributaries	X					X
Create weed map or add to RMFWR weed maps; keep updated					X	X
Work with partners such as Greenfields Irrigation District to implement large-scale water efficiency projects, such as pump-backs	X	X	X	X		

or other techniques suggested in the Muddy Creek Master Plan and other reports.						
Construct three or more small-scale, low-cost restoration projects, such as in-channel structures, targeted bank protection, etc. (Low-tech, process-based restoration, on streams identified in the TMDL.	X	X	X	X		
Implement 2-3 projects to reduce salinity / selenium inputs to key waterways	X			X		
Ongoing						
Support NRCS water efficiency cost-share projects [TIPS] and encourage landowner participation	X	X	X			X
Make sure funding is maintained long-term for seasonal and USGS gages						X
Work with water managers and FWP to maintain target flows in the Sun River and to update those targets as more water efficiency projects are implemented.		X	X	X		
Support large carnivore and predator education and help landowners with deterrent actions			X			
Continue annual outreach and education events including Bashin' Trash River Clean Up, Weed Whacker Rodeo, and occasional Rain Barrel Workshops.	X				X	

*WQ: Water Quality; SF: Stream Flow; HP: Hydrologic Processes; NR: Natural Resources; W: Weeds; M: Monitoring.

SRWG Values of Outreach & Education are not included in the table because they are a part of all of SRWG's projects and programs. SRWG showcases our work and educates the public about watershed issues through social media, emails, events, and workshops in accordance with our annual Fundraising and Outreach Plan [*in development*]. Milestones for Outreach and Education are described in that Plan.

CONCLUSION

This WRP is made up of static and dynamic elements. The Strategic Values, objectives, and milestones in the WRP will be reviewed periodically and the document will be updated or revised at such time that it is determined to be outdated. By describing specific projects in the Project Prioritization Matrix, a flexible and frequently updated document, and tying those projects back to the Values and objectives in this WRP, SRWG hopes to increase the relevance and livelihood of this WRP.

SRWG will annually review the Projects and Milestones section of this WRP and compare to the Project Prioritization Matrix to ensure projects are being planned and implemented to meet the objectives set out in this WRP. SRWG staff will work continually with the Project Committee and with partners to “feed” the Project Prioritization Matrix with projects that will help accomplish the objectives described in this WRP.

SRWG will assess project efficacy and on-the-ground progress towards objectives through monitoring. Project efficacy will be measured through project-specific monitoring plans and that data will be available by contacting SRWG. Overall watershed improvements, and impacts of projects to the greater watershed will be assessed through monitoring is performed annually by SRWG and our partners, such as long-term water quality monitoring and stream gage data selection. Data associated with that monitoring can be found through the SRWG River Conditions web page. SRWG will continue to perform trend analyses on a regular basis, and such reports will be available on the SRWG website Resources page.

Please direct questions and requests for more information to:

Sun River Watershed Group
Tracy Wendt, Executive Director
(406) 214 2868
tracy@sunriverwatershed.org



APPENDIX

APPENDIX A: REFERENCES

- Many of these documents are available on the SRWG website, www.sunriverwatershed.org/resources. Contact tracy@sunriverwatershed.org for further assistance.
- Applied Geomorphology, Inc. 2021. *Channel Migration Mapping Sun River (Phase 1) Elk Creek (Phase 2)*. www.sunriverwatershed.org/resources.
- Juel, Erling. 2020-2022. *Personal Communications*. Greenfields Irrigation District.
- Kellogg, Warren. 2014. *Sun River Assessment*. www.sunriverwatershed.org/resources.
- Montana Department of Environmental Quality. 2004. *Water Quality Restoration Plan and Total Maximum Daily Loads for the Sun River Planning Area*. www.sunriverwatershed.org/resources.
- Montana Department of Environmental Quality and Sun River Watershed Group. 2012. *Sun River Watershed Restoration Plan*. www.sunriverwatershed.org/resources.
- Montana Department of Natural Resources and Conservation. 2022. *StAGE – Stream And Gage Explorer*. <https://gis.dnrc.mt.gov/apps/StAGE/>.
- Montana Fish, Wildlife and Parks. 2001. *Letter to US Bureau of Reclamation regarding Sun River minimum flows*.
- Montana State University Extension Water Quality. 2019. *Sun River Watershed Group Volunteer Monitoring Program Nutrient Data Summary*. www.sunriverwatershed.org/resources.
- Mullen, Jason. 2021. *2021 Sun River Fisheries Survey Data*. Montana Fish, Wildlife and Parks.
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- Ockey, Mark. 2020-2022. *Personal Communications*. Montana Department of Environmental Quality.
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- Sun River Watershed Group. 2019. *SRWG Strategic Plan*. www.sunriverwatershed.org/resources.
- Sun River Watershed Water Management Working Group. 2021. *Sun River Project Operating Guide for Greenfields Irrigation District*. Greenfields Irrigation District and US Bureau of Reclamation.
- Upper Sun River Wildlife Team. 2019-2022. *Misc. Working Group Meeting Notes*. USRW.
- US Geological Survey. 2022. *USGS Current Water Data for Montana*. <https://waterdata.usgs.gov/mt/nwis/rt>.

US Bureau of Reclamation. 2022. *Sun River Project*.
<https://www.usbr.gov/projects/index.php?id=420>.

US Department of Agriculture Natural Resources Conservation Service, Montana. 2020. *Cascade County Long Range Plan*. USDA NRCS Great Falls Field Office.

US Department of Agriculture Natural Resources Conservation Service, Montana. 2020. *Lewis and Clark County Long Range Plan*. USDA NRCS Helena Field Office.

US Department of Agriculture Natural Resources Conservation Service, Montana. 2020. *Teton County Long Range Plan*. USDA NRCS Choteau Field Office.

Vivian, Katie. 2021. *Personal Communications*. Montana Fish, Wildlife and Parks.

GIS Resources

Hydrography: Sun River, Tributaries
Montana Hydrography Framework (National Hydrography Dataset); Data Provider: U.S. Geological Survey, Montana State Library Geographic Information Clearinghouse. <https://ftpgeoinfo.msl.mt.gov/Data/Spatial/MSDI/Hydrography/>

Watershed Boundary: Sun River Watershed
Watershed Boundary Dataset; Data Provider: U.S. Department of Agriculture, Natural Resources Conservation Service, National Geospatial Center of Excellence, Montana State Library Geographic Information Clearinghouse. <https://ftpgeoinfo.msl.mt.gov/Data/Spatial/MSDI/HydrologicUnits>

Public Lands:
Montana Public Lands Dataset; Data Provider: Montana Department of Revenue, Montana State Library Geographic Information Clearinghouse. <http://ftpgeoinfo.msl.mt.gov/Data/Spatial/MSDI/Cadastral/PublicLands/>

County Boundaries:
Administrative Boundaries Framework; Data Provider: Montana Department of Revenue, Montana State Library Geographic Information Clearinghouse. <https://ftpgeoinfo.msl.mt.gov/Data/Spatial/MSDI/AdministrativeBoundaries/>

USGS Stream Gages:
USGS Streamflow Gauges in Montana, 2017; Data Provider: U.S. Geological Survey, National Water Information System, Montana State Library Geographic Information Clearinghouse. https://ftpgeoinfo.msl.mt.gov/Data/Spatial/NonMSDI/Shapefiles/USGS_Gauges_2017

SNOTEL:



Montana SNOTEL Locations, 2010; Data Provider: U.S. Natural Resources Conservation Service, National Water and Climate Center, Montana State Library Geographic Information Clearinghouse. <https://ftpgeoinfo.msl.mt.gov/Data/Spatial/NonMSDI/Shapefiles/Snotel2010>

All of the above GIS data was retrieved from the Montana State Library GIS Clearinghouse

Point of Contact:

Montana State Library

PO Box 201800

Helena, MT 59620-1800

ESRI Topographic Map Baselayer:

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community.

APPENDIX B: SRWG RECENT PROJECTS AND ACHIEVEMENTS

Recent [2018 – 2022]

- Muddy Creek Master Plan. *In progress*
- Adobe Creek Avulsion Plan. *In progress*
- Muddy Creek crossing and habitat improvement project. *In progress*
- Winter RiverFest: A celebration of the Missouri and Sun Rivers. *February 2022*
- Channel Migration Zone Report – Elk Creek. *August 2021*
- AIS Awareness Boat Ramp Painting. *August 2021*
- Upper Muddy Creek Animal Waste Management [riparian fencing]. *September 2020*
- Rain Barrel Workshop. *July 2020*
- Channel Migration Zone Report – Sun River. *June 2020*
- Sun River Water Quality 15-Year Trend Analysis. *December 2019*
- 25th Anniversary Celebration and Outreach Event. *August 2019*
- SRWG Strategic 10-Year Plan. *August 2019*
- Bashin’ Trash River Cleanup. *Annually*
- Weed Whacker Rodeo. *Annually*
- Water Quality Monitoring. *Annually*
- Arctic Grayling rescue. *Annually*

Historic [1994 – 2017]

- Implemented water quality and stream flow monitoring through numerous stream gages and a volunteer water quality monitoring program.
- Sun River mainstem projects
 - Improved over 22,000 feet of river banks
 - Removed 500 car bodies and 40 tons of trash from lower Sun River
- Sun River mainstem projects
 - Improved over 22,000 feet of river banks
 - Removed 500 car bodies and 40 tons of trash from lower Sun River
- Mill Coulee projects
 - Improved 4 miles of river banks in collaboration with landowners
- Big Coulee projects
 - Improved 10 miles of stream through collaboration with landowners
- Elk Creek projects
 - Improved 10 miles of stream through collaboration with landowners
- Sun River and major tributaries
 - Conducted an assessment on over 180 miles by professionals to identify conditions, needs and options to improve conditions, if needed. The waterbodies included the mainstem of the Sun, Muddy Creek, tributaries of Muddy Creek, Mill Coulee, Adobe Creek, Simms Creek, Big Coulee, Duck Creek, and Elk Creek.
- Fort Shaw Irrigation projects
 - Converted 75,000 feet of open ditch to lined canals or pipelines
 - Conducted canal measurements

- Upgraded to automated head gates
- Greenfields Irrigation District projects
 - Converted 7,000 feet of open ditch to lined canals and pipelines
 - Installed wastewater pump-back systems
 - Automated canal head gates
- Sun River Valley Ditch Company projects
 - Lined 3,000 feet of canal
 - Automated headworks
- Nilan Water User projects
 - Lined 1,500 feet of canal
- Weed control projects
 - Treated over 30,000 acres for weed control
 - 400 volunteers released 5 million bio-control
 - Initiated annual Weed Whacker Rodeo in 1998. Through 2017, over 1000 volunteers had removed 17,000 lbs of knapweed.
 - Initiated partnerships that contributed to the now eight annual weed events that occur in the upper Sun River watershed
- Studies by students
 - Predicting West Nile Virus in Cascade County, 2016
 - Comparison of Lower Sun River Water to Fort Shaw Irrigation Return Water, 2015
 - Sun River Conservation: a water quality study, 2014
 - Spring Creek Algae and Water Quality, 2014
 - Spring Creek Fishery Conditions, 2014
 - Biodiversity of Big Coulee Creek, 2013
 - Baseline Water Quality Data from Rocky Mountain Front, Montana, and Implications for Native Trout, 2011
 - Turbidity of Muddy Creek and Tributaries, 2007
 - Salinity and pH in Big Coulee, 2007

APPENDIX C: SRWG PROJECT SCREENING TOOL

I. PROJECT INFORMATION

Date of Review:

Project Name:

Role of SRWG

Project Lead

Project Partner

Project Support

If SRWG will be a Partner or Supporter of the project, please describe the estimated level of involvement and tasks SRWG will be responsible for:

Location (Address, Description, Lat/Long, GPS):

SRWG Strategic Resource Concern (check all appropriate, circle MAIN concern):

Water Quality

Hydrologic Processes

Stream Flows

Outreach/Education

Weeds

Building Capacity

Fish & Wildlife Habitat

Other: _____

Project Overview (one paragraph):

Project Goals (specific, include priorities):

Stakeholders (include private, government, other NGO, etc):

Other Information Related to Project (related documents, studies, referenced in CMZ, etc.):

Timeline (describe estimated timeline, including est. start date, any restrictions or constraints, any time sensitivity):

If SRWG is the Project Lead, providing financial support, or significant staff time, complete financial information) below

Estimated Cost (if known):

Potential Funding Sources:

II. DECISION

Project committee will meet to discuss projects where SRWG's role is Lead or includes financial support or significant SRWG staff time. Projects where support is minimal may be decided by Coordinator.

Accepted

Hold

Denied

Comments from Committee:

For projects that are Accepted, also complete Section III. PRIORITIZATION and complete project matrix.

For projects On Hold or Denied, provide more detail and add to project matrix. *Describe why committee put project on hold – is more information needed? Is project pending a change in conditions? Is there a legal or legislative constraint? Add any relevant comments here.*

III. PRIORITIZATION

Complete this section for any project deemed “Accepted” in Section II.

SRWG Resources to Complete Project *(Including internal and external resources. Capacity – if SRWG does not have capacity to complete project in the proposed timeline, consider building capacity, reprioritizing other projects, or another approach to fit the project in if it is deemed priority.*

Internal (anticipated)

Coordinator Time:

Other Staff Time:

Board Time:

Other SRWG inputs (internal funds, mileage, supplies):

External

Contractor/Consultants:

Partners:

Other:

Has landowner access been granted? Or are there any anticipated issues that may prevent landowner from granting access?

Have partners committed to providing support, in-kind contributions, and/or funding? Describe:

Does SRWG have capacity to approach this work within the describe timeline? When would this project fit into SRWG’s capacity?

What are the anticipated impacts to the local community? This would be benefits or other affects not highlighted as a Resource Concern in Section I of this form.

Will this project help raise SRWG’s profile in the community, expand our outreach and influence, or provide other “PR” benefits?

What does SRWG know or project in regards to likelihood of funding?

What is the prioritization of this project?

- HIGH – must do. Big impact, big return on investment, important optics.
- MEDIUM – beneficial but not priority, low investment/risk.
- LOW – nice to do. Opportunistic, “low-hanging-fruit”.

Comments from the committee:

APPENDIX D: SRWG PRIORITIZATION MATRIX

APPENDIX E: SUN RIVER FISH SURVEY DATA

SUN RIVER FISHERIES SURVEY RESULTS

