2023-2025 Teton County Montana

Spring Coulee Irrigation Efficiency Project

Targeted Implementation Plan (TIP)

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TIP Summary

The Primary Goal of this TIP is to reduce inefficient irrigation water use by converting flood and wheel line irrigation to more efficient sprinkler irrigation systems. The secondary resource concerns are nutrients and pesticides transported to surface water.

Reducing inefficient irrigation water use and monitoring soil moisture is so important because the timing, location and quantity of water also affects the movement and availability of nutrients and pesticides through the soil.

Modernizing irrigation systems and implementing management practices allows producers to better time and regulate water applications to match the needs of their crop, thus reducing water and nutrient loss, minimizing the impact on the environment.

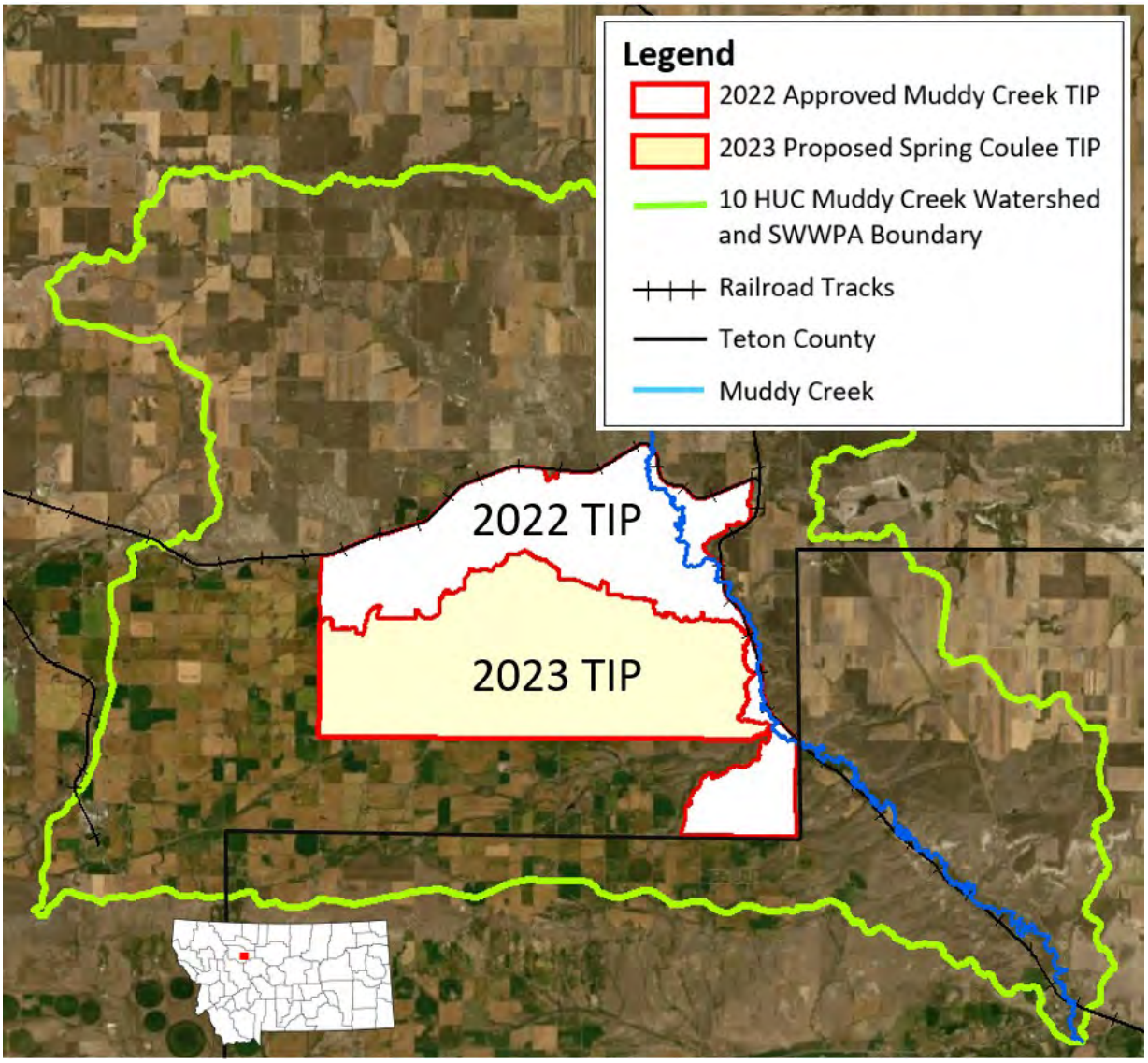

Figure 1. Map of TIP Project 1

Geographic Focus

This TIP is in southeastern Teton County between the towns of Fairfield and Power. All acres are within the Source Water Priority Protection Area (SWPPA) in Teton County and within Greenfields Irrigation District (GID). GID irrigates 82,230 acres and the irrigation water comes from Gibson reservoir and the Sun River. Muddy Creek drainage is downstream from the majority of acres in the Greenfields Irrigation District.

There has been continual interest by producers in Teton County to improve irrigation efficiencies. During the summer of 2019, the NRCS Choteau field office partnered with Teton Conservation District (TCD) and the Sun River Watershed Group (SRWG) to hold community "town hall" style meetings to discuss natural resource concerns facing Teton County landowners. One of the most prevalent concerns was irrigation water management and water use efficiency. Irrigation water management has been one of the TCD's Local Working Group priority resource concerns since 2015. This Irrigation Efficiency TIP proposal is in direct response to these landowner concerns. The practices in this TIP proposal address those concerns. *(Teton County's Long-Range Plan (LRP) (pages 39, 41, 42), Nutrient and Pest Management is referenced in the TMDL (page 26)).*

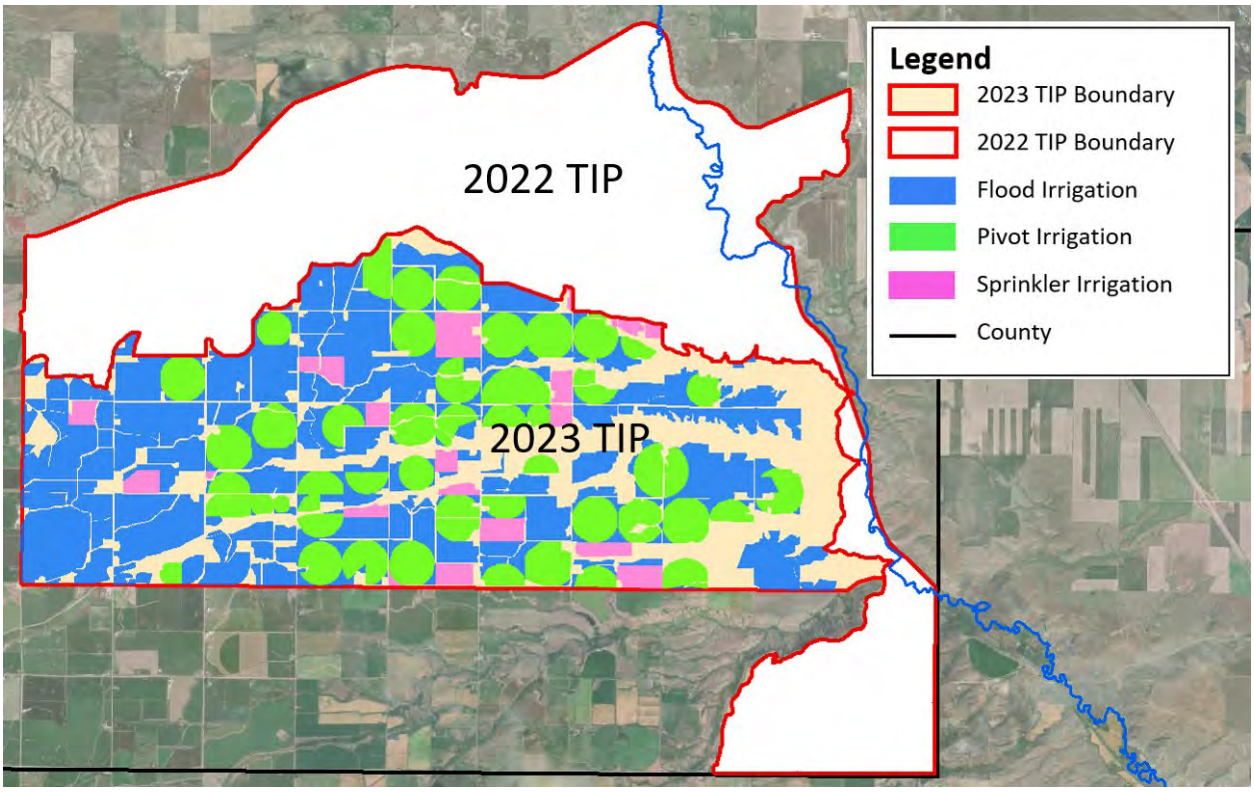

Figure 2. Map of TIP Project

Project Area

This TIP is in the Source Water Priority Protection Area (SWPPA) designated by the Montana NRCS (Figure 1). The original intent was to cover all irrigated acres in the SWPPA but realized, due to financial and capacity limitations, it would be beneficial if the proposal was broken into different TIP's and each area prioritized. The NRCS field office worked with GID, SRWG and NRCS's resource soil scientist to identify the area south and west, contiguous to the 2022 TIP. (Figure 2). This TIP ties into other conservation projects that are underway by SRWG and GID. Partner collaboration with other agencies enables shared responsibility and commitment to local resource concerns. With continued combined partnership efforts, this TIP can help these agencies and groups achieve their conservation goals, with each producer having a bigger impact on the resource concerns in the project area.

The boundary of this TIP proposal encompasses 11,495 irrigated acres, including flood, wheel line, and pivot acres. (Table 1) The primary focus of this TIP will be converting the 6,310 flood acres to sprinkler irrigation. Not all flood acres are suited for sprinkler irrigation, some are limited by field shape or the ability to get power to that field. Irrigation Water Management, Nutrient Management, and Integrated Pest Management practices are available to producers on all irrigated acres included in this TIP.

Table 1. Total irrigated acres in this TIP Project area

Irrigation delivery method	**Flood**	Wheel Line	Pivot	Total Acres
2023 TIP Project area irrigated acres	**6,310**	1,035	4,150	11,495

Resource Concern

<u>Primary Resource Concern:</u> Inefficient Irrigation Water Use

As per Teton County's Long-Range Plan (page 39, 42), water use efficiency and irrigation management are identified priority resource concerns. This TIP will target irrigated fields that do not follow an Irrigation Water Management plan, especially those currently under flood irrigation. By increasing irrigation efficiency and monitoring the soil moisture throughout the growing season, the producer will have better on-farm management that can improve scheduling and uniformity of applied water, minimize runoff, and optimize crop productivity.

Sprinkler irrigation allows for increased control of water application to field crops compared to flood irrigation. Established sprinkler infrastructure while following an irrigation water management plan allows for greater control of the amount of water being applied during irrigation, as well as a more uniform application of irrigation water to crops.

<u>Secondary Resource Concern</u>: Nutrients and Pesticides Transported to Surface Water.

Flood irrigation can leach out nutrients from the soil when the water level rises and falls, which can lead to nutrient transport to ground and surface water and decreased crop yield. Sprinkler irrigation and the increased control of water application reduces the possibility of nutrients and fertilizers being removed from the soil and the crops.

Following an Integrated Pest Management plan, producers can reduce pesticide environmental risks, reduce pesticide transport to ground and surface water, reduce pesticide drift, reduce the overall amount of pesticide applied, can increase efficacy, and allow lower application rates. *(NRCS Agronomy Technical Note No. 5 (page 9)).*

NRCS lists Nutrient Management as a practice for greenhouse gas emission reduction and carbon sequestration. Precisely managing the amount, source, timing, placement, and form of nutrient and soil amendments to ensure ample nitrogen availability and avoid excess nitrogen application reduces N2O emissions to the atmosphere.
(Green House Gas and Carbon Sequestration Tool - NRCS)

An ancillary benefit to increasing irrigation efficiency is likely to be improved water quality in Muddy Creek by reducing the amount of runoff and leaching during the irrigation season. Muddy Creek is identified on the Montana DEQ's 303(d) list of impaired streams for a wide range of impairments including nutrients (DEQ 2004). Agriculture is cited as a probable source for much of this impairment. The DEQ Total Maximum Daily Load (TMDL) recommends increasing on-farm and delivery efficiency. *(Water Quality Restoration Plan - DEQ 2004 (section 9.4.5 page 173)).* This is stated, in part, "Restoration approaches that address inefficient irrigation water delivery are vital. Increasing on-farm irrigation and delivery system efficiency will be useful to reduce summer irrigation water return flow to tributaries."

On Muddy Creek, excess water during the irrigation season also contributes to erosion due to greater flows and increased stream energy. Bank erosion is increased along Muddy Creek as return flows increase *(DEQ 2004).*

Goals and Objectives

When more irrigation water is applied than the soil can hold, the excess can runoff or leach through the soil profile and below the root zone. This can transport pesticides, fertilizers, salts, and sediments to other producer field's downslope, GID drains, Muddy Creek, and the Sun River. Although many producers realize the need for improved irrigation efficiency and management practices, without the technical and financial contributions of NRCS, most are unable to implement these conservation practices on their own or in a timely manner.

The soils in the proposed TIP area include a mix of gravelly, coarse textured soils and soils with higher clay content as well. The gravelly soils have low available water holding capacity and are better suited to sprinkler irrigation for the most efficient use of water. These soils are prone to leaching of nitrates which can end up in surface and ground water. The clayey textured soils have higher water holding capacity, but due to high clay content on the surface, they are prone to ponding and runoff under flood irrigation. The combination of these different soil types would suggest that a conversion to sprinkler irrigation would help reduce the potential for leaching and runoff into Muddy Creek.

Nitrogen is an essential nutrient for plant and animal growth and is one of the most important nutrients necessary for crop production. However, nitrogen is easily moved by water and is often associated with the impairment of the quality of groundwater and surface water. Sprinkler systems with an Irrigation Water Management plan (IWM) have a low potential for nitrogen leaching with a low probability of an adverse impact to ground and surface resources. Flood irrigation without IWM has a very high potential for nitrogen leaching with a very high probability of an adverse impact to groundwater. Remedial action should be taken when flood irrigating without IWM to reduce the risk of nitrogen movement. Soil and water conservation practices and a nutrient management plan are needed to reduce the potential of water quality degradation. *(NRCS Agronomy Technical Note MT-91)*

The SRWG and Department of Environmental Quality (DEQ) developed the Sun River Watershed Restoration Plan. The plan lists irrigation water management, using efficient irrigation methods, switching from flood to pivot irrigation, preventing on-farm surface irrigation water runoff, and implementing farm-specific nutrient management plans for irrigated lands, as management measures needed to address impairments in Muddy Creek. *(Sun River Watershed Restoration Plan (pages 17, 18, 111, 173)).*

The Montana Department of Environmental Quality 303d TMDL restoration strategy for Muddy Creek includes increasing on-farm nutrient management plans and irrigation water management (page 111) and on-farm irrigation efficiency (pages 156, 173).

The 2018 Farm Bill added a provision for the protection of drinking/source water through conservation practices in local priority areas. Montana NRCS has designated six Source Water Priority Protection Areas (SWPPA) in the state. This TIP area has two of those priority areas. The practices proposed in this TIP have been identified as ways to protect the source water and help prevent contaminants from entering the water source in the Fairfield-Teton County, and Muddy Creek-Sun River Source Water Priority Protection Areas. (Figure 3)

The best way to protect drinking/source water is to keep contaminants from entering the water source. Agricultural activities that cause non-point source (NPS) pollution include improper, excessive, or poorly timed application of pesticides, irrigation water, and fertilizer. Impacts from agricultural activities on surface water and ground water can be minimized by using management practices that are adapted to local conditions. *(EPA Protecting Water Quality from Agricultural Runoff).*

<u>Fairfield-Teton County SWPPA</u> - Nitrates

Significant potential contaminant sources for Fairfield, MT public water supply are agricultural chemicals, nitrates, and pathogens on cultivated cropland; over-application or improper handling of agricultural chemicals; excessive irrigation causing transport of contaminants or sediments to groundwater/surface water through runoff. *(Montana DEQ - Fairfield Public Water System #MT0000212 (pages 22, 27)).*

<u>Muddy Creek-Sun River SWPPA</u> - Sedimentation

Significant potential contaminant sources for Power, MT public water supply include fertilizers, pesticides, nitrates, pathogens, and contaminants in surface water runoff or irrigation return flows on cropped agricultural land. *(Montana DEQ - Power Teton County Water District Public Water Supply System PWSID #MT0000311 (pages 14, 20)).*

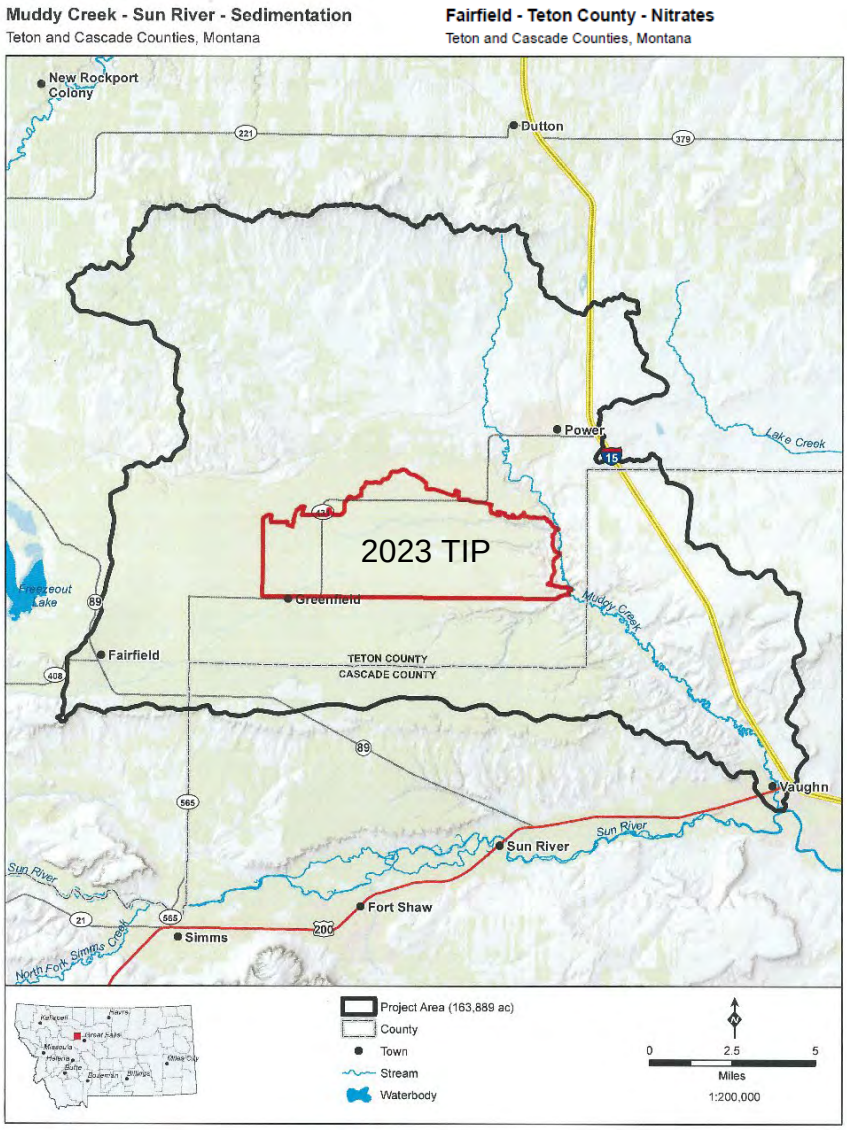

Figure 3. Fairfield-Teton County SWPPA and Muddy Creek-Sun River SWPPA project watershed boundary (Montana NRCS).

Alternatives

Alternative 1:

Producers will install a Flow Meter (587), implement, and follow an Irrigation Water Management Plan (449), Nutrient Management Plan (590), and Integrated Pest Management Plan (595) on existing sprinkler irrigated acres included in this TIP.

Preferred Alternative 2:

Producers will convert from flood or wheel line sprinkler irrigation to more efficient sprinkler irrigation systems. (Sprinkler System (442) practices funded through this TIP project must provide for a net water savings of 10% or more). Producers will install a Flow Meter (587), implement, and follow an Irrigation Water Management Plan (449), Nutrient Management Plan (590), and Integrated Pest Management Plan (595) on all irrigated acres included in this TIP.

(Note: NRCS conservation practice numbers are shown in parentheses above).

Practices offered by NRCS for this TIP include:

Primary Practices:

(442) Sprinkler System
(587) Structure for Water Control - Flow Meter
(449) Irrigation Water Management (IWM)
(590) Nutrient Management
(595) Integrated Pest Management

Supporting Practices:

(553) Pumping Plant
(430) Irrigation Pipeline
(587) Structure for Water Control - Intake Structures, Sumps

Technical assistance and engineering designs will be provided primarily by NRCS staff in the Helena work units and Missoula Area with the option to use Technical Service Providers (TSPs) as needed.

Implementation

Through outreach during 2021, NRCS staff has identified six producers interested in converting from flood to sprinkler irrigation within this TIP boundary. Initial field assessments have been completed on these fields. The primary focus of this TIP is flood to sprinkler conversions as that will have the greatest impact on the resource.

NRCS and its partners will be holding outreach events throughout the summer to reach out to the producers in the TIP area, including producers currently using sprinkler irrigation to target management practices. We want the producers to realize that implementing more efficient irrigation practices and minimizing off-farm flows of nutrients and pesticides will not only have a positive impact on their operation but the environment as well. SRWG will hold a workshop to demonstrate the practices, goals, and benefits to producers, partners, and the public. The workshop will focus on practices featured in this TIP which will facilitate applications for new projects under this TIP.

The proposed solution addressing the resource concerns described in this TIP is by providing technical and financial support to producers. By implementing irrigation efficiency and management practices, individual producers can make a positive difference to help address resource concerns in Teton County and in the Fairfield-Teton County and Muddy Creek-Sun River Source Water Priority Protection Areas.

National Environmental Policy Act (NEPA) concerns will be addressed through environmental evaluations. Projects will comply with all other required local, state, and federal permits and permissions.

Table 2 lists the payment estimate for a typical center pivot irrigation system and management practices in Teton County. Actual payment may vary based on practices contracted, and the size of irrigation system installed.

Table 2. Payment Schedule Estimate (based on NRCS EQIP Source Water Protection payment rates for fiscal year 2022)

Typical Center Pivot Irrigation System and Management Practices				
Practice	Unit	Amount	Rate	Total Payment
(442) Sprinkler System (Lifespan: 15 Years)				
Center Pivot, >/=1,200 feet,	AC	140	$568.96	$79,654.40
(430) Irrigation Pipeline (Lifespan: 20 Years)				
(PVC) Pipe, >/= 10-inch	LB	7002	$2.47	$17,294.94
(533) Pumping Plant (Lifespan: 15 Years)				
Electric-Powered Pump, > 30-74 HP	HP	40	$319.51	$12,780.4
(587) Structure for Water Control (Lifespan: 20 Years)				
Miscellaneous Structure, Extra Small	EA	1	$4,088.91	$ 4,088.91
Flow Meter with Electronic Index	IN	10	$266.99	$2,669.90

(449) Irrigation Water Management - Contracted (Lifespan 1 Year)				
Intermediate IWM, year 1	EA	1	$1622.99	$1,622.99
Intermediate IWM, Years 2 and 3	EA	2	$1028.95	$2,057.9
(590) Basic NM (Non-Organic)				
Nutrient Management	AC	140	$8.02	$1122.80
(595) Pest Management				
Integrated Pest Management	AC	140	$13.21	$1849.40
				$123,141.64

Funding for this project is being requested for FY23-25. Contract development for the TIP will be completed within this timeframe. Implementation of contracts will begin in FY23 with all contracts obligated by the end of FY25.

Applicants will be financially responsible for costs not covered by the NRCS payment schedule to implement the irrigation efficiency measures.

Budget projections are based on the NRCS EQIP Source Water Protection payment rates. (Table 3). Actual payments may vary from year to year based on changes to the payment schedule and individual practices selected. Future budget projections have been conservatively estimated using anticipated producer interest, average property sizes and engagement with landowners.

Table 3. Estimated Annual NRCS budget projections

Year	Contracts	Acres	NRCS Payment
2023	3	400	$300,000
2024	4	500	$400,000
2025	3	400	$300,000

Screening and Ranking

Screening tools and ranking questions will be used to prioritize applicants in the project area.

Ranking Questions:

1. Will the application improve irrigation efficiency using the Farm Irrigation Rating Index (FIRI) by 25% or greater?

2. Will applicants **only** be installing a (587) Flow Meter, and implementing management practices (449) Irrigation Water Management, (590) Nutrient Management and (595) Integrated Pest Management?

3. Will (449) Irrigation Water Management be contracted for three years?

4. Will the application improve irrigation efficiency (FIRI) by 10% to <25%?

Outcomes

The practices proposed in this tip include, converting flood and wheel line irrigation to more efficient sprinkler irrigation systems, Irrigation Water Management, Pest Management and Nutrient Management. All are listed as conservation practices needed to address resource concerns identified in:

- The Teton County Long Range Plan
- The Sun River Watershed Restoration Plan
- The Teton County Local Working Group priorities
- The Montana Department of Environmental Quality 303d TMDL for Muddy Creek

By providing technical and financial assistance from NRCS, producers can implement conservation practices that will not only help them optimize their farm productivity and improve their bottom line, but it can also make them better stewards of land and water resources.

Producers can use a number of conservation practices and combinations of practices to build healthy soils. Two of these are nutrient and pest management. Chemical soil disturbances such as over application of fertilizer and pesticide applications, can have negative effects on microbial action in the soil, decreasing soil health. Following nutrient and pest management plans, producers will be applying the right source, right place, right rate, and at the right time.

Each project will be overseen by field office staff. NRCS will conduct field checks after installation of sprinkler systems and check all management practices prior to payment to ensure standards and specifications were met.

Producers will be required to install flow meters, soil moisture sensors, and follow an Irrigation Water Management (IWM) plan for a minimum of one year. The producers will monitor the soil moisture throughout the irrigation season so adjustments can be made to keep soil moisture between Field Capacity and the Management Allowed Depletion (MAD) level. NRCS or TSPs will assist producers with determining the water holding capacity of the soil and protocols for IWM practices. *(NRCS Montana Conservation Practice Standard - Irrigation Water Management (449)).*

Producers will submit IWM records and crop acres to NRCS at the end of the irrigation season. The producer will participate in a year-end feedback session with NRCS staff to review the effective management of soil moisture throughout the growing season.

Producers will submit district irrigation records from the prior year for that individual field. This will allow NRCS to compute irrigation amounts applied to the field pre-project. NRCS will do a comparison of the water applied to the field before and after the practices were installed to show a positive change in irrigation efficiency.

Producers will work with NRCS on evaluating a nutrient budget to minimize nutrient leaching and runoff. Producers will submit prior year crop yield and fertilization records to compare with the crop yield and fertilization rates after implementation. Positive changes in nutrient application will be tracked at the field level by comparing old records with fertilization taking place after the irrigation efficiency improvements are installed. With irrigation infrastructure in place, the opportunity to manage nutrient runoff and leaching will be greatly increased. *(NRCS Montana Conservation Practice Standard - Nutrient Management (590)).*

Producers will turn in herbicide and pesticide monitoring records to NRCS so that environmentally sensitive areas can be addressed. Producers will work with NRCS to run WinPst, evaluate and monitor environmental and human risks associated with their custom management programs and mitigate management where necessary. With improved irrigation infrastructure in place, Pest Management will be further customized to reduce the potential for non-point pesticide leaching and runoff. *(NRCS Montana Conservation Practice Standard - Integrated Pest Management (595)).*

The local NRCS field office and the NRCS area office will be coordinating to make sure the project practices meet NRCS specifications and the applicant's needs.

Partnerships

Teton Conservation District (TCD)

TCD assisted in the preparation of this TIP and will assist producers with their financial needs related to this project within the scope of their respective District Board direction. The Conservation District can provide assistance to applicants with acquiring applicable permits if any are required. This project will also use the Conservation District to engage landowners who may be interested in applying for this program and support NRCS staff as needed.

Greenfields Irrigation District (GID)

GID was instrumental in identifying critical areas where the proposed practices would have the greatest impact in the watershed. GID made a formal motion at their February 2022 board meeting to support this 2023 TIP proposal. GID is an important partner for promoting this project and reaching out to potential applicants.

This TIP ties directly into the irrigation efficiency projects in progress or already completed by GID. GID is working with a software developer to increase district irrigation efficiency in water delivery. Ditch riders will move from paper copies to tablets that will automatically upload water delivery information into a system that producers will be able to access. This will help producers working with NRCS when integrating IWM into their irrigation systems to have a total water consumption picture. GID received a US Bureau of Reclamation's WaterSMART Grant to automate manual flow and control gates, so they can use water more efficiently. GID is in the process of upgrading control structures on several canals. In 2020, GID completed the J-Lake reregulation pond. This project converted the "constant-level" J-Lake into a reregulation pond, allowing GID to capture the water in J-Lake before it leaves GID. The installation of a new "smart-gate" regulates releases from the reregulation pond to Spring Coulee to reduce water losses to Muddy Creek. GID is planning more reregulation ponds and "smart gates" in the future to enhance water management within their water delivery system for producers. The improvements that GID is making will enable them to increase water efficiency and reduce waste flows that currently enter Muddy Creek.

Sun River Watershed Group (SRWG)

The SRWG works collaboratively with other agencies and groups to protect and restore the resources of the Sun River watershed and its communities. SRWG assisted in the preparation of this TIP and will be helping engage applicants. They will also provide public education and outreach associated with this project. SRWG is working with partners on other grant applications that will incorporate elements of this TIP. They are working with GID to expand the J-Lake reregulation project. The first phase, partially funded with a WaterSMART grant, is complete. Construction has started on the second phase and is being funded by the Montana Department of Natural Resources and Conservation (DNRC) Renewable Resource Grant and Loan Program (RRGL).

References

EPA Protecting Water Quality from Agricultural Runoff (Revised March 2005)

GID Interview, December 2020, May 2021, December 2021 Erling Juel General Manager

Green House Gas and Carbon Sequestration Ranking Tool | NRCS (usda.gov)

Montana Department of Environmental Quality Interview March 2022, Mark Okey Water Quality Specialist, Water Quality Planning Bureau

Montana Department of Environmental Quality - Fairfield Public Water System PWSID #MT0000212 - Source Water Delineation and Assessment Report. (Report Date: 06/03/04)

Montana Department of Environmental Quality - Power Teton County Water District Public Water Supply System PWSID #MT0000311 - Source Water Delineation and Assessment Report. (Report Date: 12/12/02)

Montana Department of Environmental Quality - Water Quality Restoration Plan (DEQ 2004)

Nitrogen Risk Assessment - NRCS Agronomy Technical Note MT-91

NRCS Montana Conservation Practice Standard - Integrated Pest Management (595)

NRCS Montana Conservation Practice Standard - Irrigation Water Management (449)

NRCS Montana Conservation Practice Standard -Nutrient Management (590)

Pest Management in the Conservation Planning Process – NRCS Agronomy Tech Note No. 5

SRWG Interview, May 2021, December 2021, Tracy Wendt Project Manager

Sun River Watershed Restoration Plan – January 2012

USDA NRCS Choteau Field Office - 2020 Teton County Long Range Plan