



# Integrating Water Data to Enhance Ecological Flows in the Upper Clark Fork River Basin

*Application submitted October 2023 by:*

**The Clark Fork Coalition**

*to:*

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**Project Manager: Alex Leone, CFC Restoration Policy Manager**

140 South 4<sup>th</sup> St. West • Missoula, MT 59801

alex@clarkfork.org • 406-396-5284

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# List of Common Abbreviations

<b>ARCO</b>	Atlantic Richfield Company
<b>CFC</b>	Clark Fork Coalition
<b>cfs</b>	Cubic feet per second
<b>CSKT</b>	Confederated Salish and Kootenai Tribes
<b>DEQ</b>	Montana Department of Environmental Quality
<b>DNRC</b>	Montana Department of Natural Resources and Conservation
<b>EPA</b>	U.S. Environmental Protection Agency
<b>ESA</b>	Endangered Species Act
<b>FWP</b>	Montana Fish, Wildlife and Parks
<b>MCA</b>	Montana Climate Assessment
<b>MBMG</b>	Montana Bureau of Mines and Geology
<b>NRDP</b>	Montana Natural Resource Damage Program
<b>Streamflow Group</b>	Upper Clark Fork Streamflow Group
<b>TU</b>	Trout Unlimited
<b>UCF</b>	Upper Clark Fork River
<b>UCFWG</b>	Upper Clark Fork Working Group
<b>UM</b>	University of Montana
<b>USFS</b>	United States Forest Service
<b>USFWS</b>	United States Fish and Wildlife Service
<b>WFS</b>	Web Feature Service
<b>WMS</b>	Web Map Service
<b>WRC</b>	Watershed Restoration Coalition of the Upper Clark Fork

## 1. Executive Summary

This FY 2023 WaterSMART Applied Science Grant Program proposal requests funding for a project by the Clark Fork Coalition (CFC), a nonprofit organization based in the City of Missoula in Missoula County, Montana, whose mission is to protect and restore the Clark Fork River watershed. Through this project, CFC and its project partners seek to improve ecological conditions in the Upper Clark Fork River watershed (UCF) by developing a web-based decision-support tool for water managers and conservation project planners that integrates the abundance of water data on key variables influencing instream flow and water quality in this ecologically vital but chronically dewatered basin. Due in part to its location at the heart of the largest Superfund site in the United States, more data has been collected on the UCF than any other watershed in Montana. This extensive body of information has been, and continues to be, independently procured from government, private, and nonprofit entities through research and restoration projects, monitoring, engineering studies, surveys, daily resource management, and other means. But it is housed in myriad locations and formats and managed by unaffiliated agencies and entities following independent protocols. While discrete portions of it have been compiled in the past, a broadly accessible, customizable, and continuously updated tool does not yet exist to integrate and expand access to this wealth of information. This project will fill that need, identify data gaps, and inform and expedite water management and conservation decisions to help natural resource agencies, key stakeholders, and cooperative watershed groups address critical instream flow and ecological restoration needs in the UCF basin in a timely way. The project will run from April 2024 through March 2026. The geographic scope of this project – the Upper Clark Fork watershed from Butte to Rock Creek – includes areas located on Lolo National Forest and Beaverhead-Deerlodge National Forest.

## 2. Technical Project Description

### Applicant Category & Eligibility

As a nonprofit organization located in the United States, the Clark Fork Coalition is an eligible Category B applicant. CFC is working in partnership with, and with the agreement of, the Montana Department of Natural Resources and Conservation (DNRC), a Category A partner located in the State of Montana. (See Appendix D for the October 17, 2023 Letter of Partnership from Anna Pakenham Stevenson, Water Resources Division Administrator of DNRC.) Through its Water Resources Division, Montana DNRC has water delivery authority in the State of Montana.

As noted in its letter, DNRC is very supportive of the project and will be actively involved in the design and testing of the water management decision-support tool. DNRC intends to use the tool as a basis to develop an integrated hydrologic modeling framework to improve water management and drought planning and mitigation throughout the state, as recommended in the forthcoming Montana Drought Management Plan. DNRC is also contributing in-kind services staff time valued at \$8,300, and, as a sub-awardee of the grant, will also contribute data from a return flow pilot study and feedback from testing of the tool.

## Detailed Project Description

Through its project, *Integrating Water Data to Enhance Ecological Flows in the Upper Clark Fork River Basin* (Project), the Clark Fork Coalition will work with its partners, Montana Department of Natural Resources and Conservation (DNRC), Montana Natural Resource Damage Program (NRDP), Trout Unlimited (TU), and other stakeholders to create a web-based water management decision-support tool that will integrate an abundance of independently procured, but currently unconsolidated (and difficult to access) data from government, private, and nonprofit entities on key variables influencing instream flow and water quality in the UCF.

**Background:** The Clark Fork is Montana’s largest river by volume, comprised of a vast network of nearly 30,000 miles of tributaries and feeder streams spanning 14 million acres of western Montana. The Clark Fork sustains some of the largest, most intact, and biologically rich ecosystems in the Lower 48, and is a major economic, ecological, cultural, and recreational driver in the state.

One of the most complex and exhaustively-studied reaches of this large river system is its headwaters: the 3,710 square-mile Upper Clark Fork basin, stretching from its origins near Butte, to Missoula, 120 river miles downstream – a reach that constitutes the country’s largest Superfund site. Flowing through the epicenter of Montana’s mining boom of the mid to late 1800s and early 1900s, the Upper Clark Fork bore the brunt of the degradation and contamination associated with massive mining enterprises, along with the damaging impacts of the road, rail, irrigation, logging, and agricultural systems that accompanied them.

Because of severe and widespread mining-related impacts, the Upper Clark Fork was formally declared a Superfund Site in 1986. The U.S. Environmental Protection Agency (EPA) subsequently worked with the State of Montana to win legal claims against Atlantic Richfield Company (ARCO) in 1999 and 2008 to restore and remediate mining-related damages in the basin. The State also won separate civil settlements with ARCO in 1999, 2005, and 2008 to restore or replace aquatic, terrestrial, and groundwater resources damaged by mining activities. The Montana Department of Justice administers restoration funds and activities through CFC’s project partner, the Montana NRDP. The Montana Department of Environmental Quality (DEQ), with oversight from EPA, is the lead agency for cleanup and remediation activities (CFC 2011).

Superfund designation and related remediation and restoration settlement claims were driven by – and subsequently triggered – extensive research, surveys, analysis, sampling, and monitoring on ecological, geophysical, biological, hydrologic, and other conditions in the basin. Over the past several decades, the pace and volume of studies by agencies, conservation nonprofits, universities, and researchers have only accelerated, so that currently, more data has been collected on the UCF basin than any other watershed in Montana. In fact, it is likely now among the most studied watersheds in the country.

**Project Need:** A common insight found throughout these studies is that chronic dewatering is a significant factor hindering restoration of the aquatic ecosystems in the basin. Montana Fish Wildlife & Parks estimates that in the UCF nearly 90 miles of the mainstem river and 42

tributaries are chronically dewatered (FWP 2015). Annual stream monitoring, fisheries research, tributary assessments, synoptic flow studies, and myriad other studies continue to confirm the problem. A rapidly-warming climate and increasing demand are further exacerbating the impacts of drought (Whitlock et al 2017).

The severity of dewatering and its far-reaching implications led NRDP to create an instream flow restoration fund. Restoring flow to improve water reliability and to ensure aquatic habitats have sufficient water at the right time, in the right place, and at the right temperature, is also a high priority for the Clark Fork Coalition, Trout Unlimited, and the Upper Clark Fork Streamflow Group (hereafter, Streamflow Group – a collaboration of diverse stakeholders working to support and balance local agricultural and ecological water needs).

Although NRDP, natural resource agencies, and others have implemented dozens of flow restoration projects over the last 15-20 years and have made some progress, these efforts have not been based on a shared, in-depth understanding of aquatic, climatic, geophysical, and other conditions in the UCF, or coordinated in a way that effectively addresses the breadth or severity of dewatering in the basin. Uncertainty, complexity, and the cost, lag time, and difficulty of obtaining high-quality, comprehensive data on a given reach or drainage has delayed decision-making and project implementation. In the case of the NRDP flow fund these factors have effectively frozen resources dedicated to improve instream flow, as without sufficient data, decision-makers cannot be confident that scarce restoration dollars will be applied most strategically. At the same time, volumes of high-quality datasets that could inform water management and water conservation decisions sit unused.

CFC and its partners (including the UCF Streamflow Group) have determined that a common denominator to the unacceptably slow progress in addressing dewatering is the lack of a unified, easily accessible, real-time dataset that integrates the best available information about the main variables influencing instream flow. This wealth of data on the UCF basin is currently housed in myriad locations and formats and managed by unaffiliated agencies and entities following independent protocols. Accessing it requires knowing it exists, knowing where to find it and/or obtaining permission to use it, standardizing data formats, and other expensive and time-consuming logistical hurdles.

**Table 1**, which includes only a *partial* inventory of existing ecological flow data, illustrates this challenge. The datasets in this table are only related to flow, are from a limited number of sources, and cover less than a decade of research. Yet the data are housed in numerous locations and formats and must be accessed independently.

Discrete portions of UCF data have been compiled by engineering firms and agencies in the past, but they have not been widely used, nor do they offer a comprehensive integration of available data.



**Table 1: Partial Inventory of Available UCF Ecological Flow Data**

Database Description	Type	Owner	Years	# of locations*	Notes
<b>Seasonal monitoring</b>					
Racetrack Creek	Flow/temp	CFC	2016-pres	5	Four sites on creek; one at lake
Modesty Creek	Flow/temp	CFC	2016-21	1	Spring dominated system
Lost Creek	Flow/temp	CFC	2016-pres	1	Near mouth of Lost Creek (downstream of USGS gage)
CF Mainstem	Flow/temp	CFC	2016-pres	3	Between USGS gages at Galen and Deer Lodge
CF Mainstem	Temp	FWP	2014-pres	45	FWP manages several long-term sites
Cottonwood Creek	Flow/temp	CFC	2016-pres	3	Near major diversions and at mouth
Warm Springs Creek	Flow/temp	TU	2019-pres	2	Near major diversions
Little Modesty Creek	Flow/temp	CFC	2017-18	1	Only 2 years of monitoring
Dry Cottonwood Creek	Flow/temp	CFC	2016-pres	2	Ephemeral stream in lower reaches
<b>Synoptic flow studies</b>					
Racetrack Creek	Flow	CFC	2022		
CF Mainstem	Flow	CFC	2015 & 17		
Lost Creek	Flow	CFC	2016		
Warm Springs Creek	Flow	CFC/TU	2019 & 21		
<b>Specific Models or Reports</b>					
Groundwater return flow model for Westside Ditch	Flow	NRDP	2016		Completed by Newfields consulting and WGM group. Format: MODFLOW 2000/GW Vistas
Surface water inundation model, mainstem UCF	Flow/inundation	NRDP/DEQ	2022		Being used for UCF mainstem Superfund cleanup;; completed by River Design Group & Applied Geomorphology. Format not known
Seasonal data on irrigation withdrawals (spot coverage)	Flow	CFC / NRDP / TU	Various		CFC/TU have records of irrigation withdrawals for most of the largest diversions in the UCF
Synoptic ditch measurements (spot coverage)	Flow	CFC / NRDP	Various		CFC has synoptic data on Westside, Whalen, and Valiton Ditches
Silver Lake instream flow report	Flow	TU / NRDP	2018 & 2020		TU completed detailed report-outs of impacts of instream flow releases from Silver Lake
Split season leasing study	Flow	NRDP / Geum	2022-2023		NRDP & Geum are studying the impact of split season leasing and have detailed water use data
Silver Bow Creek & Warm Springs Ponds feasibility study	Flow	NRDP / Respec	2019		NRDP & Respec studied potential impacts of changes to water mgmt. regimes between Silver Bow Creek and Warm Springs Ponds
UCF diversions study	Flow	TU	2015		TU completed a survey of the major irrigation diversions in the UCF

\* If known or relevant

**Project Description:** This project will result in a broadly accessible, customizable, and continuously updated decision-support tool that will integrate, standardize, facilitate use of, and expand access to this vital information. Information will be housed on a web-based Clark Fork-specific geoserver that will be accessible to the public 24/7, and allow for 2D mapping, 3D visualizations, graphic and statistical analysis of time-series stream data, modeling, forecasting, reporting, and more. Importantly, this water management decision-support tool will be designed in close collaboration with NRDP and DNRC to ensure the data and final tool design meet these natural resource agencies' needs and data protocols.

Project Activities: CFC will hire a consulting firm with demonstrated expertise in data consolidation, analytics, and visualization to integrate existing global and local datasets related to ecological flows in the UCF. These data will be processed to create a web-based Clark Fork “geoserver” that will allow for 2D mapping, 3D visualizations, charts and time series, groundwater modeling, and other functions to aid in planning, development, and analysis for aquatic restoration projects. A key advantage of this tool is that it will be continuously updated with new data as they are generated. Specific project activities include:

**A. Secure web tool development contractor**

- i. Draft Scope of Work (*The area of focus will be the portion of the UCF basin from Butte to the confluence with Rock Creek, roughly 25 miles east of Missoula*)
- ii. Solicit bids, select contractor, finalize contracts

**B. Procure datasets**

- i. Reach out to agencies, conservation nonprofits, stream restoration engineering firms, universities, researchers, and others to obtain datasets pertaining to UCF stream conditions (including geomorphology, flow and temperature data, monitoring results, water quality and sediment data, and groundwater and surface water inputs and outputs)
- ii. CFC work with contractor to obtain UCF-specific land surface and sub-surface datasets (e.g., climate, topography, terrain, land use, watershed boundaries, streams, lakes, aquifers, soil types, surface and bedrock geology, and more)
- iii. Procure data from current-year stream monitoring and new groundwater recharge research:
  - i. Collect data via UCF mainstem and tributary stream monitoring
  - ii. Conduct *Gold Creek Return Flow Pilot Study* (carried out by DNRC as sub-awardee - see Appendix A for more information); provide data to decision-support tool; use tool to design future tests for this project.

**C. Process, integrate, and test datasets**

- i. Review original file formats, data structures, and metadata; filter/process any bad or incomplete data; convert units, reformat to enable time series analysis
- ii. Publish station/site locations to Clark Fork-specific geoserver as Web Map Service (WMS - image) layers for 2D mapping; publish stations/sites as Web Feature Service (WFS - vector) layers
- iii. Link WMS data services and metadata (abstract, keywords, etc.) to data layer and 2D map explorer; conduct intensive testing
- iv. Link WFS data services to 3D visualization and styling tools based on attribute / parameter values; conduct intensive testing
- v. Link WFS data services to real-time visual analytics tools for graphical and statistical analysis of time-series stream data; conduct intensive testing

**D. Integrate additional datasets from specific research on mainstem and tributaries**

- i. Review original file formats of original data and reports



- ii. Extract and process relevant study data (may include streamflows, water levels, inundation maps, groundwater, and/or aquifer data)
- iii. Publish data to Clark Fork-specific geoserver as WMS layers for 2D mapping; and WFS for 3D visualization, styling, and visual analytics
- iv. Link WMS data services and metadata; conduct intensive testing

**E. Create documentation and provide training**

- i. Develop tutorials and illustrative examples
- ii. Develop technical report of data processing procedures
- iii. Provide webinars for various user types *(during the project period this is expected to be limited to natural resource agencies, conservation nonprofits, remediation/restoration contractors; and stream restoration engineers. In future years we anticipate further refinement of the tool to accommodate users such as private landowners and the UCF Streamflow Group)*

Please see Appendix B for a visual representation of the Project activities and methodology described above, along with expected outcomes and applications.

### Project Goal

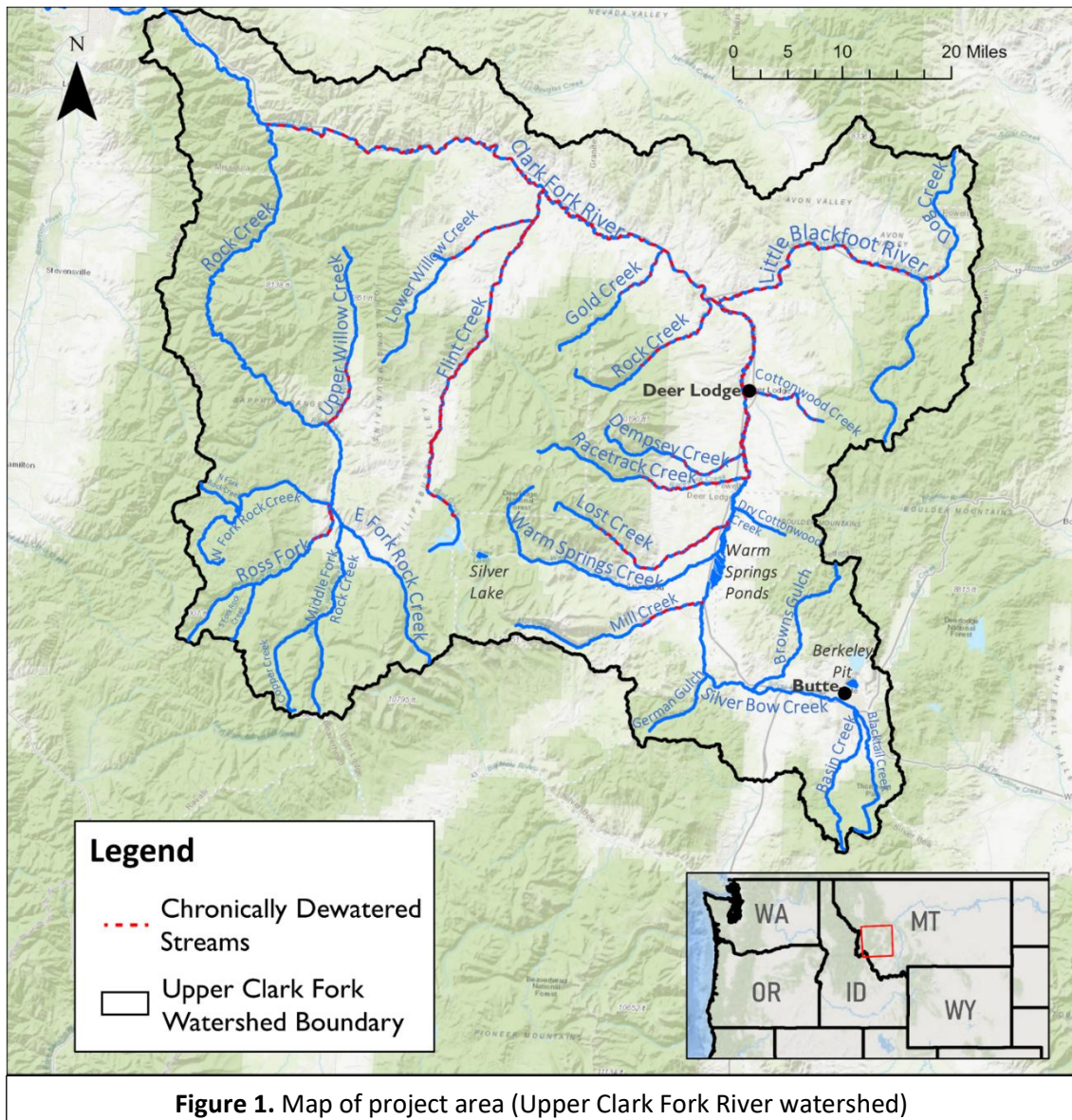
The goal of this project is to improve ecological conditions in the Upper Clark Fork River basin by improving, broadening, simplifying, and facilitating timely access to key datasets on the myriad variables that influence ecological flow. Our desired outcomes are to: 1) increase understanding of the impact and potential benefits of conservation projects across the basin; 2) reduce the time and resources required to develop, design, and implement projects; and 3) foster more coordinated, strategic, timely, and successful flow restoration efforts to address chronic dewatering and other limiting factors in the watershed.

### Objectives:

- Compile and integrate independently procured, but currently unpooled data from government, private, and nonprofit entities on key variables influencing instream flow and water quality in the UCF.
- Create a user-friendly, web-based water management decision-support tool that will standardize and synthesize this data so that it can be accessed and fully utilized for project planning, analysis, and water management by natural resource agencies, conservation organizations, and others.
- Share the tool and provide training for water managers and others in the Upper Clark Fork basin and, through our partners, other basins in Montana.

## 3. Project Location

The geographic focus of this project is the UCF River basin in western Montana, including portions of Missoula, Powell, Granite, Deer Lodge, and Silver Bow Counties. See map, Figure 1.



#### 4. Data Management Practices

The Clark Fork Coalition confirms that the data integration and decision support tool and any related products created through this project will be developed in industry standard formats that are compatible with GIS platforms.

#### 5. Evaluation Criteria

##### Criterion A—Water Management Challenge(s)

##### 1. Water management challenges

The Clark Fork River, Montana’s largest river by volume, originates high in the Continental Divide in the western half of the state, flowing 330 miles through ancestral Tribal lands,

agricultural areas, cities, towns, and industrial sites to its mouth at Idaho's Lake Pend Oreille. This vast river system also constitutes the most distant headwaters of the Columbia River, the fourth-largest river in the U.S. The approximately 3,500 square-mile UCF watershed that is the geographic scope of this project extends from the river's headwaters near Butte to its confluence with Rock Creek, 25 miles east of Missoula, Montana (see map, Figure 1).

The UCF flows through some of the wildest habitat in the continental United States, including designated wilderness areas such as the Anaconda-Pintler, large roadless areas in the Sapphire Mountains-Rock Creek area, and significant blocks of rugged uplands in other ranges. The Clark Fork provides food, shelter, breeding and rearing grounds, spawning areas, and migratory corridors for myriad native species, including grizzly and black bears, lynx, wolves, elk, raptors, songbirds, native fish, and many other endemic species. Because of its location and abundant natural resources, the UCF supports a robust and growing recreational and fishing economy.

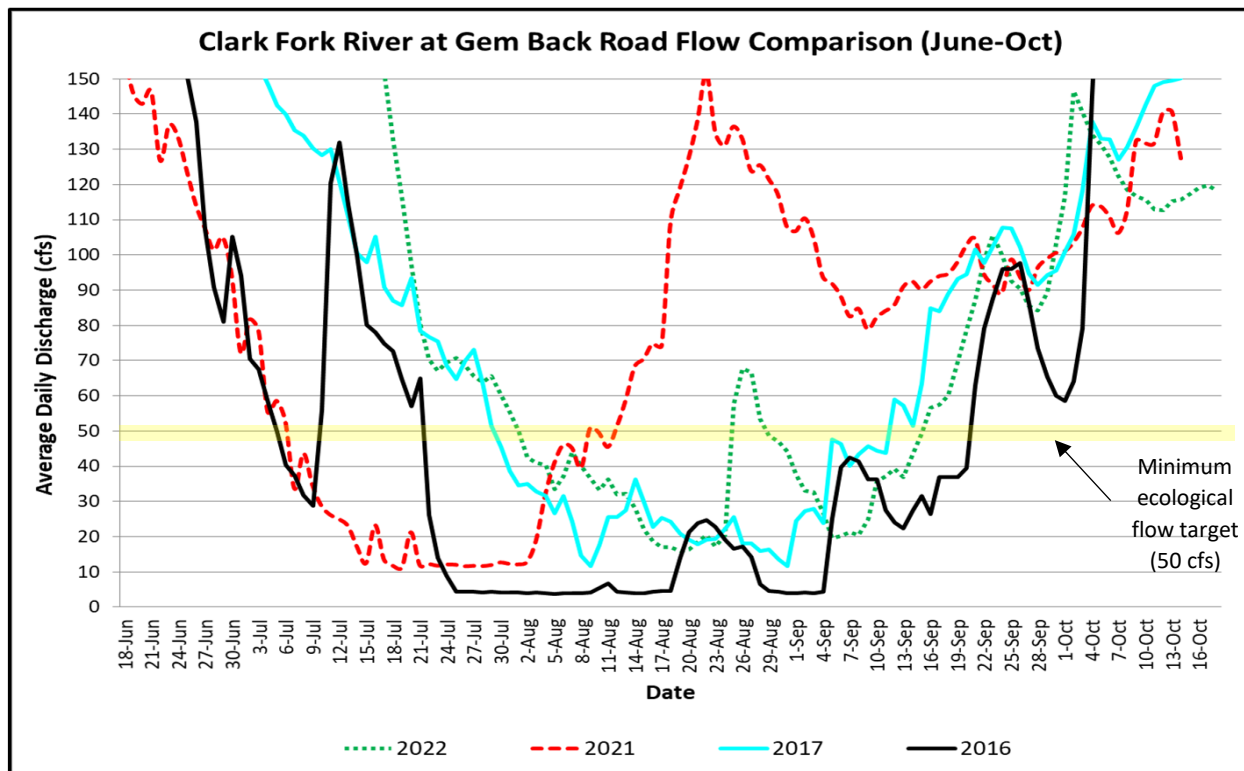
The UCF basin is also one of the most heavily impacted river systems in North America. Over 120 miles of the Clark Fork mainstem, from the headwaters near Butte downstream to the former site of Milltown Dam near Missoula, has been designated as a part of the largest Superfund complex in the United States. A century of mining impacts at the Clark Fork River headwaters and a catastrophic flood in 1908 distributed millions of cubic yards of contaminated mine tailings across the floodplain of the UCF (NRDP, 2019). As a result of the heavy metals contamination in the basin, water quality and associated aquatic ecosystems are severely impacted. The Superfund cleanup of the UCF began in earnest in the early 2000s and with over 20 years of work completed, decades of work remain to protect human health and improve water quality and aquatic ecosystem health in the UCF.

In addition to the complex Superfund and related water quality management challenges, the UCF also faces severe water supply challenges. As with many intermontane mountain basins in southwest Montana, the geography of the UCF results in frequent and persistent periods of chronic drought. Data from the Montana Climate Assessment shows that southwest Montana will likely see an increase in the severity and intensity of drought periods in the future due to the impacts of climate change (Whitlock et al 2017).

Precipitation patterns in the region vary depending on elevation and location and are a significant driver of land use. Higher elevations receive the greatest average annual precipitation in the UCF and accumulate a winter snowpack that is critical to the annual water balance of the basin. In contrast, the valley bottom locations are considered semi-arid with precipitation totals varying between 10 and 14 inches annually. This, coupled with the lack of major reservoir storage, means that the UCF water system is largely snowmelt driven, making water scarcity and frequent drought one of the area's biggest natural resource challenges.

Chronic drought and associated high-water temperatures are another challenge and a critical factor limiting the recovery of the aquatic ecosystem in the UCF (NRDP, 2019). Over 87 miles of the UCF mainstem has been classified as severely dewatered by MT FWP with dozens of UCF tributaries also identified as facing chronic water supply challenges (FWP, 2015). Streamflow in the most dewatered reaches of the UCF often falls well below established target flows and

water temperatures, frequently exceeding biological thresholds for both native and non-native aquatic species. As recently as 2022, streamflows on the UCF mainstem upstream of Deer Lodge have dropped as low as 20 cfs, well below what is needed to sustain aquatic ecosystems (see Figure 2).



**Figure 2.** Comparison of streamflow on the upper Clark Fork River during recent periods of drought. The Gem Back Road monitoring location is located approximately 15 miles upstream of Deer Lodge. The minimum ecological flow target for this reach of river is 50 cfs.

The UCF supports populations of native and wild trout and other native and endemic aquatic species that are sensitive to elevated water temperatures. For example, the entire UCF mainstem is listed as critical habitat for bull trout, which are U.S. Endangered Species Act-listed cold water dependent salmonids that, according to MT FWP, need water temperatures generally below 15 °C to survive and thrive (FWP 2000). According to monitoring by FWP and CFC, water temperatures in the Clark Fork in mid-summer regularly exceed 20°C, and during extreme droughts may exceed 23°C, which can be lethal for native trout.

The ecological impacts of drought and elevated water temperatures on cold water-dependent species are well documented (NRDP, 2019). To protect Montana’s fisheries, MT FWP implements “hoot owl” fishing restrictions when water temperatures reach a level that impacts fish health (typically when maximum water temperatures exceed 73° F for more than three consecutive days). Due to the increased severity and duration of drought, MT FWP has had to initiate restrictions in six out of the last 10 summers. Recent trout population estimates from MT FWP show that current fish numbers are at record lows upstream of Deer Lodge, with the

uppermost section of the Clark Fork holding only 30 trout per mile in 2023\* . Fish numbers exceeded 1,200 trout per mile in that section as recently as 2014.

In addition to these water supply and management challenges:

- Superfund-related responsibilities are complex, as multiple state and federal agencies are involved in cleanup activities with overlapping roles and management obligations;
- at the UCF headwaters near Butte the massive Berkeley Pit contains billions of gallons of highly acid-contaminated water that is actively being treated and released into Silver Bow Creek (one of the UCF's primary headwaters tributaries);
- active mining operations in Butte at Montana Resource's Continental Pit consume significant quantities of water from two of the UCF's two main headwaters streams, (Silver Bow Creek and Warm Springs Creek);
- Just downstream of Butte and situated squarely at the headwaters of the Clark Fork River, the Warm Springs Settling Ponds cover over 2,500 acres and are still being operated to treat contaminated water entering the system from Silver Bow Creek;
- water supplies from UCF and its tributaries sustain well over 10,000 acres of irrigated agriculture lands, creating frequent conflicts over limited water supplies, including decades of water right litigation on some of the most over-appropriated tributaries;
- western Montana is one of the fastest growing regions in the United States (more than 200,000 people rely on surface and groundwater resources in the project area) and development pressure is impacting water resources throughout the basin;
- the Confederated Salish and Kootenai Tribes (CSKT) Water Compact and associated Milltown Water Right will become enforceable in 2025 (see Evaluation Criteria E, Subcriterion E3), at which time, CSKT and MT FWP will be co-managing a potentially controversial instream flow water right for ecological and fisheries benefit.

## **2. Concerns or outcomes if water management challenges are not addressed**

The Upper Clark Fork River is arguably one of the most critical headwaters systems in the entire Northern Rockies ecoregion. Improving aquatic and ecological conditions in the UCF has been a major goal of the Clark Fork Coalition since the mid-1980s, and a high conservation and restoration priority for numerous state and federal natural resources agencies, stakeholder groups, local communities, and nonprofit organizations. Over the last 20-30 years these entities, collectively and independently, have pursued countless restoration, flow, habitat improvement, and research projects to address the challenges detailed above.

While those efforts have resulted in some significant ecological improvements, many parts of the mainstem and its tributaries remain critically impaired, and the pace and scope of response has not matched the urgency of the basin's needs. Not only does this prolong and likely exacerbate the accumulated impacts on aquatic species from dewatering, habitat degradation, and continued heavy metals contamination, it also risks losing a rare window of opportunity to take corrective action. The state has remediation and restoration dollars in place now, but the funding is limited. Those limited dollars can do less over time as costs for construction,

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\* *Personal communication between CFC staff and FWP biologist Caleb Uerling. Data not yet fully reported.*



equipment, and personnel continue to rise each year. In addition, positive political will, key collaborative partnerships, inter-agency cooperation and the structures to facilitate their interaction are in place now – a condition that has been hard-won and did not exist in the past. Conflicts over water do still happen, but are likely to be strained further if we fail to make progress, especially in light of the upcoming implementation of the CSKT Water Compact.

Finally, local communities that have lived with extensive mining contamination and its associated environmental challenges have waited a very long time for conditions to improve. Ecological restoration in the Upper Clark Fork is entirely dependent upon the cooperation and buy-in of those who own and/or make a living on the land encompassed by the UCF watershed. CFC and its partners share a strong sense of urgency to do right by these communities through tangible progress toward a more ecologically healthy, safe, and clean Upper Clark Fork

This project will not solve every UCF challenge on its own. But it gets to the heart of a persistent obstacle to timely progress: lack of a clear, comprehensive picture of current conditions; lack of confidence in applying restoration funds due to insufficient data to ensure dollars are spent as effectively as possible; ongoing data collection that is going unused especially in places where it is needed most; and an inability for many to access critical data to help make decisions, build trust with project partners, and respond in a timely, cost-effective way to the most urgent ecological issues facing the UCF.

### **3. How project addresses water management issues**

Previous attempts to warehouse and catalogue water-related datasets in the UCF have not succeeded to the desired extent, or have remained largely unused. The sheer volume of existing data has been one of the largest impediments to creating a truly integrated and accessible database (see Table 1). One of the most beneficial aspects of this proposed project is its tight focus on ecological flows, which provides both sideboards and clear purpose for creating the decision-management tool, as well as a clear understanding of how it can be used.

To address the urgent need for more comprehensive and collaborative approaches to streamflow restoration in the UCF, agencies, NGOs, and others must all be working on the same playing field and with the same data. The first step in that process will be to amalgamate all the existing data related to ecological flows in the project area (e.g., surface water, groundwater, temperature, as partially illustrated in Table 1), standardize data formats, and make it accessible to all user groups. This will help break down data siloes; improve transparency; accelerate project identification, analysis, and implementation; democratize data increase trust by creating a common, central dataset that pulls from diverse sources; remove blind spots in project development; identify data gaps; and get the most of the abundant research and data that has been, and continues to be, gleaned about the UCF.

#### **Criterion B—Project Benefits**

##### **How the need for the project was identified**

In fall 2021, the NRDP contracted with a professional facilitator (Chaffin 2021, 2022) to convene a diverse group of stakeholders to discuss potential pathways for improved use and management of water resources in the Upper Clark Fork River Basin. Initially, the group



consisted of staff from NRDP, FWP, DNRC, the Confederated Salish and Kootenai Tribes, CFC, WRC, Trout Unlimited, and the Atlantic Richfield Corporation, as well as individual producers and irrigators working in the UCF basin. The Streamflow Group has subsequently met every other month since that first meeting, and has added interested stakeholder groups, including the Montana Bureau of Mines and Geology, University of Montana (UM), Montana Tech, and various consulting firms working on watershed restoration projects in the basin.

In 2021, through a facilitated visioning exercise to determine the potential for a collaborative path forward toward flow restoration in the UCF, the group agreed in principal that: (1) there is a clear need to augment flow in the UCF mainstem river to restore aquatic habitat; (2) legal water rights should be respected, and water rights holders should be clearly represented in any plan to augment streamflow; and (3) there are likely better ways of addressing water use and streamflow challenges than have been pursued in the past, including opportunities to act on mutual goals and achieve shared benefits.

As an outcome of Objective (3) the Streamflow Group collaboratively prioritized three potential projects to address streamflow and water use challenges: a) water user compensation programs; b) an investigation of headwaters storage opportunities and feasibility; and c) a basin-wide water budget and water modeling. This proposal is specifically focused on building a basin-wide water budget and conceptual water model. After several conversations with the Streamflow Group and other partners, CFC recognized that the first, and most important step in the process of building a water budget, is synthesizing, and amalgamating the vast quantity of existing datasets.

## **2. How and when the tool will be applied; and**

### **3. Extent of benefits**

One of the most exciting aspects of the proposed project is the potential for natural resource agencies and conservation entities to improve decision-making around water management and restoration project implementation in the near term, including:

- FWP fisheries managers will have access to a much more comprehensive dataset on streamflows and water temperatures when making decisions on drought related fishing closures, allowing them to fine-tune restrictions. FWP will also be able to prioritize habitat and flow improvement and restoration projects.
- DNRC is currently in the process of implementing a statewide drought management plan in which synthesizing and integrating local data is a primary goal. A more comprehensive understanding of the hydrology in the basin will help the DNRC's water management bureau work through data-intensive administrative tasks (like changes in water rights). The DNRC is also launching a statewide water management modeling tool and has identified this project as an integral pilot portion of that broader effort. The DNRC will also be helping CFC work with the Montana State Library to digitally warehouse and host this effort for the long term.
- NRDP will benefit from this tool first, by having much more usable access to the vast trove of ecological flow data they invested in collecting over the last decade – from

seasonal flow and temperature data to annual flow reports, synoptic flow studies, and water modeling. And second, by the tool providing a valuable starting point to prioritize how NRDP spends restoration dollars from their aquatic flow fund.

- CFC will use this tool to improve internal water management decision-making capacity to prioritize flow and restoration projects. CFC holds and manages dozens of individual instream flow water rights in the UCF and manages over 300 acre-feet of stored water at Racetrack Lake. This project will improve the ability for CFC to manage those water rights for ecological flow benefits.
- TU, as noted in its Letter of Support for this project, foresees using the tool to more efficiently identify streamflow, temperature, and other geospatial data to support its stream restoration efforts; prioritize project development in locations with a high likelihood of success; and improve communication with education partners, local communities, landowners, and project funders.

#### **4. How the project complements other similar efforts**

Several previous attempts have been made to catalogue and warehouse water-related datasets in the UCF. Most recently, in 2018 NRDP and Upper Clark Fork Working Group (UCFWG) collaborated in hosting a limited amount of data through an online mapping tool accessible through the UCFWG's website (<https://ucfwg.org/>). (The UCFWG is an independent collaborative comprised of university researchers, resource managers, consultants, and NGOs working to generate knowledge related to the UCF Superfund cleanup.)

The UCFWG mapping tool includes data related to streamflow, water quality, and fish habitat and incorporated datasets from the University of Montana, CFC, TU, and others. Since the mapping tool was first rolled out, it has seen limited use and hasn't been updated for several years. Still, the UCFWG tool was effective in building a case for the much more comprehensive and focused approach we are proposing. Instead of attempting to corral all the data that is available, we are proposing to build out a stepwise framework and focus only on data that will help improve ecological flow conditions. We have built this proposal to incorporate lessons learned from previous attempts and have been working in close collaboration with both the NRDP and DNRC to complement their goals and ongoing flow restoration efforts in the basin.

### **Criterion C—Project Implementation**

#### **1. Approach and methodology**

As part of the collaborative approach to developing this project, CFC communicated with a wide range of stakeholders (primarily through network of partners in the UCF Streamflow Group and in response to the group's identification of the need for a basin-wide water budget and water modeling). Our selected approach is based on CFC and our partners' experience with other database amalgamation efforts, as well as knowledge of web-based modeling and visualization tools used in other locations and other applications. The vast quantity of data that has been collected in the UCF, and the recurring themes we heard from our partners, helped shape the scope of this proposal. The goal of the first phase of this project (the subject of this proposal) is to centralize, normalize and synthesize existing ecological flow data compiled by our project

partners. This was a major need identified by those we consulted, and is an important building block for future phases of the project.

Once the data has been integrated and centralized in one digital location it will facilitate applying it other ways. For example, 3D aquifer system visualizations have been created for other watersheds using big data visualization techniques, which allow for interactive mapping, charting, and graphical representations of complex data. Given the complexities of the UCF basin, big data visualization is an excellent tool to help synthesize enormous volumes of data in a way that water managers and others can use for everyday applications.

**2. Work plan; and**

**3. Anticipated products**

Work product	Tasks	Estimated timing	Estimated Costs	
			Grant-funded	Cash match / in-kind
Compiled datasets	-Compile existing data from agencies, NGOs, others -Incorporate UCF land and sub-surface data -Add data from new/current research (UCF stream monitoring; DNRC sub-award)	April-Oct 2024 <small>(New data: 2024 &amp; 2025 field seasons)</small>	\$30,000 \$7,824	\$5,000 \$9,000
Integrated data	-Review file formats; determine standardized format -Convert and reformat datasets as needed -Consult with partners on formats and QC	Oct – Nov 2024	\$31,000	\$5,000 \$9,250
Web-based data	-Prepare data for web-based use (image, vector, raster) -Prepare/publish data on Clark Fork-specific server -Link to visualization and styling tools to enable interactive use	Nov 2024 – April 2025	\$19,500*	\$2,500 \$9,000
Training, documentation, tutorials	-Develop online tutorials -Create online technical documentation for tool -Prepare and deliver webinars and training sessions	April 2025- Dec 2025	\$14,500	\$2,500
CFC Project oversight & implementation	-Participate in project design -Assist in collecting data -Participate in testing and dissemination	Ongoing throughout project	\$31,060	\$2,600
<b>TOTAL COST</b>			<b>\$133,884</b>	<b>\$44,850</b>

\* Includes \$2,000 for web hosting fees during project period

**4. Project partners and roles**

**CFC (Applicant):** CFC will serve as the project lead and ensure that the project’s goals and deliverables are met.

**DNRC (Category A Partner):** DNRC will be involved as a primary project partner and technical liaison. The DNRC will be involved in all the major phases of the project from the selection of the contractor to the formatting of the database and ultimate utilization of the database.

**NRDP:** NRDP will also be involved as a primary project partner. The NRDP has spearheaded over a decade of data collection efforts in the UCF and is the ultimate source of much of the data

that needs to be synthesized. NRDP will play an important role in the data compilation phase and the creation of the web-based database.

TU: TU will be involved as a primary project partner, bringing a broad level of watershed knowledge and expertise to the group. TU has collected a significant amount of data in the basin and has experience building out data visualization tools (like fish trackers). TU will be involved in all phases of the project.

## **5. Applicant qualifications**

Alex Leone, CFC Restoration Policy Manager and Project Lead: Alex has worked for the Clark Fork Coalition since 2016. He received his undergraduate degree in forestry from the University of Montana and a Master's degree in Earth Sciences from Montana State University. As part of his graduate research, Alex worked with a downscaled climate model to run climate and hydrological projections for the Jefferson River Basin in southwest Montana. Alex was a co-author of the 2017 MT Climate Assessment and has broad scale knowledge related to climate change, hydrology, and watershed modeling.

John Lunzer, Hydrologist, DNRC Water Resources Division: John will be the technical lead for the DNRC (Category A partner). John received his Bachelor's degree in Geological Engineering from Colorado School of Mines and his Master's Degree in Hydrogeological Engineering from Montana Technological University. Currently he works as a hydrologist for the Montana Dept. of Natural Resources and Conservation – Water Sciences Bureau where he focuses on adaptive irrigation practices, canal seepage, and groundwater & surface water modeling. He also serves as the co-project manager on a previously-awarded BOR WaterSMART Applied Science Grant: “Enhancing Hydrologic Modeling and Water Supply Forecasting in Montana’s Upper Yellowstone Basin.”

### Criterion D—Dissemination of Results

One of the primary goals of this project is to ensure that the data that is produced is useable, appropriately formatted for, and made available to all the primary water resources managers in the basin. We will disseminate and communicate the data through three primary channels: 1) Monthly meetings with the contractor and project partners (DNRC, NRDP, CFC, TU) and FWP to ensure they are engaged in data management decision-making from the onset; 2) UCF Streamflow Group bimonthly meetings to help disseminate project information to a wide and diverse set of UCF stakeholders; and 3) UCFWG's network and website, which is focused heavily on water quality data collection (see [www.mtnsfepscor.org/projects/crews](http://www.mtnsfepscor.org/projects/crews)) and reaches university, agency, NGO, and private industry stakeholders.

### Criterion E—Presidential and Department of the Interior Priorities

#### Subcriterion E1: Climate Change

The 2017 Montana Climate Assessment (MCA) showed that affects from climate change are anticipated to drastically alter Montana's hydrologic cycle in the coming decades (Whitlock et al 2017). These impacts are already evident, and predictions are that current patterns of lessening snowpack, earlier runoff, and reductions in summer streamflows will continue and increase in

magnitude and impact. This is expected to significantly increase average stream temperatures in the northern Rockies and exacerbate drought severity.

This project will directly support efforts to address these climate challenges and build drought resilience by providing greater access to flow-related data to better predict and understand drought conditions and their impacts on aquatic ecosystems. It will also help reveal data gaps in the relationship between water use and management, drought, and ecosystem function, which will help managers and others pursue more coordinated water conservation efforts. Because the decision-support tool will be populated with both historical data and continually updated with new data, and because ultimately it will be housed in a publicly-owned location with broad access, we expect it to provide these benefits for many years, and possibly decades, to come.

#### Subcriterion E2: Disadvantaged or Underserved Communities

Benefits from this project are expected to accrue to local residents and communities of Deer Lodge, Granite, and Powell Counties. While not formally considered historically underserved, these communities are considered economically disadvantaged relative to the wealth of surrounding counties (Montana Department of Commerce 2021). Census data show that Montana has recently experienced a significant rise in high-income households, mostly in urban centers of the state, which has exacerbated the rural-urban income gap (Erickson 2022). This socioeconomic trend in Montana, combined with record-high inflation and low economic development and employment opportunities in rural agricultural counties, render places such as the project area economically challenged.

The impacted residents and communities the UCF have also been severely impacted by contamination from historic mining and smelting operations upstream in Butte and Anaconda, MT (McQuillan 2015; MT DEQ and USEPA 2015). In addition, climate change has increased the potential for severe droughts, especially those that occur quickly and without significant indicators, i.e., “flash droughts” (Jencso et al. 2019), to which the region’s agriculturally-dependent communities are particularly vulnerable. This project will help increase the reliability of water supplies for these communities, contribute to addressing historic environmental challenges, and provide a measure of adaptation to uncertain future climate impacts.

#### Subcriterion E3: Tribal Benefits

The proposed project will benefit habitat of potential use by bull trout in the Upper Clark Fork River Basin and its tributaries, a culturally significant species to people of the Confederated Salish and Kootenai Tribes (Smith 2022). Bull trout once flourished in the basin and were harvested by the Tribes, as evidenced by the place names given to the UCF and its tributaries (Séliš u Qlispé Culture Committee 2019). The CSKT have treaty rights that protect their ability to harvest culturally significant species such as bull trout in usual and accustomed places, including the entirety of the UCF basin. The CSKT have taken an active role in water management in the UCF as Natural Resource Trustees in the Superfund reclamation and restoration processes, as co-owners of a large instream flow right in the mainstem Clark Fork River along with MT FWP, and as active participants in the UCF Streamflow Group (see attached letter of support).

Importantly, the CSKT instream flow right on the Clark Fork River (often referred to as the “Milltown right” after the former Milltown Dam at the confluence of the Clark Fork and Blackfoot Rivers) is part of a Congressionally-approved (2021) Tribal water rights settlement between the CSKT, State of Montana, and the United States (MCA 85-20-1901). As part of this decades-in-the-making settlement, the CSKT compromised their right to legally challenge extensive potential water rights in the UCF in exchange for co-management of this instream flow right on both the Blackfoot and Clark Fork Rivers. The project will allow CSKT water resources professionals to work alongside the UCF Streamflow Group and in other venues to pursue data-driven projects that enhance ecological flow and habitat benefits across the UCF. For these reasons we believe this project will greatly advance collaborative and holistic approaches to meeting the Milltown right and protecting CSKT treaty resources.

## 6. Project Budget

**Budget Table 1 – Summary of Non-Federal and Federal Funding Sources**

<b>FUNDING SOURCES</b>	<b>AMOUNT</b>
<b>Non-Federal entities:</b>	
1. MT Natural Resource Damage Program – Cash contribution	\$15,000
*2. MT Natural Resource Damage Program – In-kind	\$18,950
*3. MT Dept. of Natural Resources & Conservation – In-kind	\$8,300
4. Clark Fork Coalition – Cash contribution	\$2,600
<b>Non-Federal subtotal:</b>	<b>\$44,850</b>
<b>REQUESTED Reclamation funding</b>	<b>\$133,884</b>

### Budget Narrative

Please see the *Budget Detail and Narrative* spreadsheet, submitted with this application.

## 7. Environmental and Cultural Resources Compliance

This project does not entail any ground-disturbing activities, and therefore will not be out of compliance with the National Environmental Policy Act; any State, Federal, or local environmental cultural, and paleontological resource protection laws and regulations; or the Clean Water Act, Endangered Species Act, or the National Historic Preservation Act. No wetlands or surface waters or endangered species will be impacted, no irrigation systems or historic structures will be modified or affected, no disadvantaged populations or Indian sacred sites will be impacted, and the project will not contribute to the spread of invasive weeds. The Clark Fork Coalition has consulted about this project with the Confederated Salish and Kootenai Tribes, who support its implementation (see CSKT Letter of Support in Appendix C).

## 8. Required Permits or Approvals

No permits or approvals are required for this project.



## 9. Overlap or Duplication of Effort Statement

No activities, costs, or time commitment of key personnel related to this project overlap with other active or anticipated proposals. Further, this proposal does not duplicate any other project or proposal: and no other applications for funding (federal or non-federal) are being submitted for this project, now or in the future.

## 10. Conflict of Interest Disclosure Statement

The applicant and its project partners have no actual or anticipated conflicts of interest related to this potential federal award. In addition, the Clark Fork Coalition has in place internal controls to identify, disclose, and mitigate or eliminate any potential or identified conflicts of interest. CFC acknowledges that, should it receive this federal award, it is responsible for notifying in writing the Financial Assistance Officer of any conflicts of interest that may arise by CFC or subrecipients under this potential award. CFC also certifies that no lobbying activities will be carried out using federal grant funds. See the *Disclosure of Lobbying Activities* (SF-LLL) and *Certification Regarding Lobbying* forms included with this application.

## 11. Uniform Audit Reporting Statement

CFC was not required to submit a Single Audit Report for 2022 (most recent fiscal year).

## 12. Disclosure of Lobbying Activities

See attached SF-LLL, *Disclosure of Lobbying Activities*.

## 13. Letters of Support

Please see Letters of Support included in Appendix C, submitted by CSKT, TU, the Watershed Restoration Coalition of the Upper Clark Fork, and the Streamflow Group. **Please note:** *Letters from WRC and CSKT refer to a working title of this proposal, not the final title.*

## 14. Letter of Partnership

Please see Appendix D for a Letter of Partnership from the Category A partner for this project, the Montana Department of Natural Resources and Conservation. Note that this letter also confirms Montana DNRC's commitment to contribute \$8,300 in in-kind services to this project.

## 15. Official Resolution

See Appendix E for the CFC Board Resolution of October 16, 2023. Note that this resolution also confirms CFC's commitment to contribute \$2,600 in cash match to this project.

## 16. Letters of Funding Commitment

Please see Appendix F for a Letter of Funding Commitment from the Montana Natural Resource Damage Program (cash and in-kind). (As noted above, the applicant will also contribute \$2,600 to the project, and the Category A Partner, Montana DNRC, will contribute \$8,300 in in-kind services, as confirmed in their October 17, 2023 Letter of Partnership.

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## **Appendices**

- A. DNRC Gold Creek Return Flow Pilot Study – project description
- B. Visual Representation of the Project and Methodology Flow Chart
- C. Letters of Support
- D. Category A Letter of Partnership
- E. CFC Board Resolution
- F. Letter of Funding Commitment

# Appendix A

## Gold Creek Return Flow Pilot Study

### Background and Purpose for the Project

*Information provided by DNRC*

The widespread shift in irrigation methodology, from the gravity-supported flooding of fields to mechanized sprinkler systems, across the western U.S. has created an irrigation efficiency “paradox” throughout the western U.S. While sprinkler systems are considerably more efficient in the volume of water diverted and labor invested, water that previously deemed “waste” or “seepage” under flood irrigation is no longer part of the local hydrology.

Under flood irrigation, this unconsumed water would either infiltrate into the aquifer or percolate through the shallow groundwater, returning to the stream later in the season (return flows) to augment aquatic habitat and be available to downstream irrigators. Thus, the paradox is that despite increasing the efficiency of water use, converting to sprinkler irrigation often reduces return flows, meaning that less water is available downstream in late summer, when it is most needed, especially during dry years.

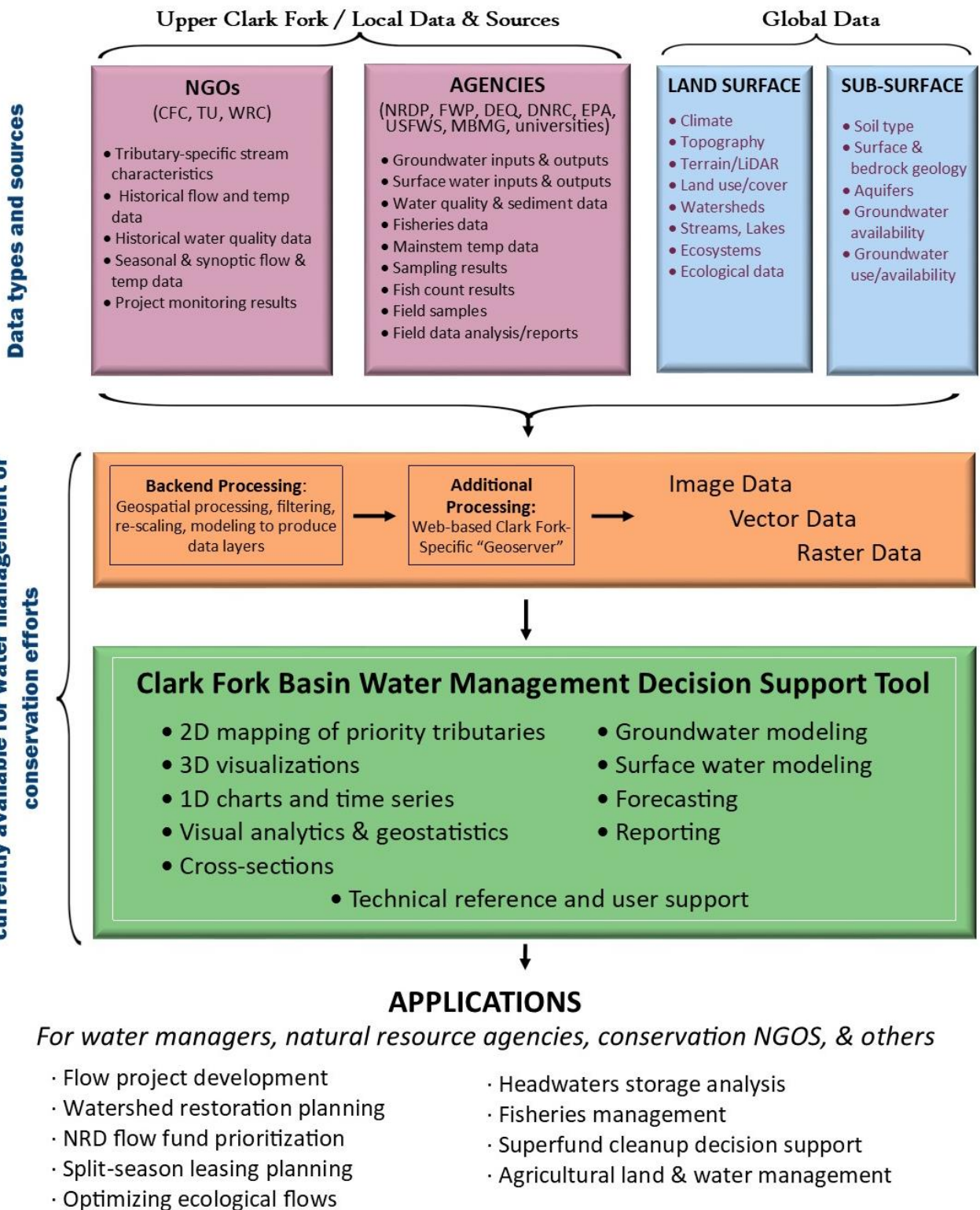
Sprinkler methods also have implications for soil health and production because water is not held at depth in the soil profile, which means that root systems are shallower than they were under flood and that re-growth after the first hay cutting is slower, especially if ranchers delay re-starting irrigation (commonly practiced in western Montana).

Many producers are concerned about the impacts of widespread sprinkler use on previously flood irrigated fields. However, converting back to flood irrigation is not practical because it is labor-intensive and flood infrastructure (mainly ditches) was destroyed when pipes and pivots were installed. The paradox of irrigation efficiency has been widely researched and discussed, yet no experiments have been conducted using sprinkler application rate and volume to see if it can offer similar benefits as flood irrigation.

Through the **Gold Creek Return Flow Pilot Study**, DNRC will establish a remote soil moisture monitoring network to test if utilizing pivots to hold onto water higher in the Gold Creek basin during spring runoff could be an effective means of recharging groundwater and increasing soil moisture. (Gold Creek is a tributary of the Upper Clark Fork River that enters the mainstem roughly 30 miles northwest of Deer Lodge.) If this technique proves successful, DNRC believes it could be replicated elsewhere in the Upper Clark Fork basin and other watersheds in Montana

# Appendix B

## Integrating Water Data to Enhance Ecological Flows in the Upper Clark Fork River Basin: *Methodology Flow Chart*

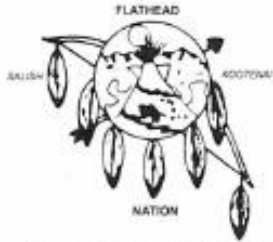


*Data sources:* CFC: Clark Fork Coalition; TU: Trout Unlimited; WRC: Watershed Restoration Coalition of the Upper Clark Fork; NRDP: MT Natural Resource Damage Program; FWP: MT Fish, Wildlife & Parks; DEQ: MT Dept. of Environmental Quality; DNRC: MT Dept. of Natural Resources & Conservation; EPA: US Environmental Protection Agency; USFWS: US Fish & Wildlife Service; MBMG: MT Bureau of Mines & Geology



# Appendix C:

## Letters of Support



A Confederation of the Salish,  
Pend d' Oreille  
and Kootenai Tribes

THE CONFEDERATED SALISH AND KOOTENAI TRIBES  
OF THE FLATHEAD NATION  
P.O. BOX 278  
Pablo, Montana 59855  
(406) 275-2700  
FAX (406) 275-2806  
www.cskt.org



A People of Vision

#### TRIBAL COUNCIL MEMBERS:

Tom McDonald - Chairman  
Len Twoteeth - Vice Chair  
Martin Charlo - Secretary  
Ellie Bundy - Treasurer  
Carole Lankford  
James "Bing" Matt  
Jim Malatare  
Mike Dolson  
Jennifer Finley  
Terry Pitts

October 12, 2023

**To:** Department of the Interior, Bureau of Reclamation, Water Resources and  
Planning Office  
Attention: WaterSMART Grant Application Review Committee

**Re:** WaterSMART Environmental Water Resources Projects for Fiscal Year 2023  
Funding Opportunity Number: R23AS00446  
Letter of Partnership for the Clark Fork Coalition project application, *Water Management Decision Support  
Tool for the Upper Clark Fork River Basin*

Dear Review Committee Member

This letter is written to demonstrate the Confederated Salish and Kootenai Tribes (CSKT) support for the Clark Fork Coalition (CFC) WaterSMART grant application under the program noted above. The CFC application will be applied to create a web-based water management decision-support tool that will synthesize existing, but currently dispersed data from government, private, and nonprofit entities on key variables influencing instream flow and water quality in the UCF.

The CSKT have a strong connection to the Upper Clark Fork Basin, well established in the anthropological and historical record, as well as contemporaneously through their role as trustee in the upper basin superfund sites, their role on the Upper Clark Fork Advisory Board, their participation in the Upper Clark Fork Basin Streamflow Group, and significantly their Stevens-Treaty based water rights in the mainstem Clark Fork River and tributaries. The mainstem water right, often termed the Milltown Right, has a deferral period for implementation, and the Tribes and the water right co-owner, Montana Fish, Wildlife and Parks are working on an implementation plan to effectuate the water right. For the Tribes this proposal, and the outcome from the proposed work are very timely, given the need to prepare and execute on an implementation plan in a basin with a complex pattern of water use.

The proposed workproduct and tools will help improve ecological conditions in the basin by providing a more comprehensive understanding of the impact and potential benefits of conservation projects and water management decisions, reducing the time required to develop, design, and implement these projects.

We are excited to support the CFC's WaterSMART Applied Science Grant proposal and will work collaboratively with CFC and our partners in the UCF Streamflow Group to ensure that our goals are aligned with the goals of the grant proposal.

Sincerely,

Seth Makepeace

CSKT Compact Project Officer and Hydrologist

Seth.Makepeace@cskt.org



October 16, 2023

Department of the Interior  
US Bureau of Reclamation  
Water Resources and Planning Office  
Attn: WaterSMART Applied Science Grant Application Review Committee

RE: WaterSMART Applied Science Projects for Fiscal Year 2023  
Funding Opportunity Number: R23AS00446  
Letter of Partnership for the Clark Fork Coalition project application  
Integrating Water Data to Enhance Ecological Flows in the Upper Clark Fork  
River Basin

Dear Committee:

Trout Unlimited (TU) supports the Clark Fork Coalition's WaterSMART Applied Science proposal "Integrating Water Data to Enhance Ecological Flows in the Upper Clark Fork River Basin".

Development of the web-based water management decision-support tool to synthesize existing independently procured data from government, private, and nonprofit entities on key variables influencing instream flow and water quality in the Upper Clark Fork River (UCF) aligns well with TU's designation of the Clark Fork River Basin as a Priority Water. Priority Water status means that TU is taking strategic action to care for and recover the native and wild trout fisheries; inspiring people and communities to care for and recover their local waters; and investing in staff, volunteers and partners so we have the right tools, technology, training, and resources necessary to achieve shared goals. The Clark Fork River Basin plan specifically calls for improving instream flow and water temperatures in mainstem habitat and key tributaries of the UCF to address chronic dewatering and concerning declines in native and wild trout populations in the basin.

Trout Unlimited has been working with the Clark Fork Coalition, the Montana Natural Resource Damage Program, local landowners, and many other project partners to improve streamflow and habitat in the UCF for over a decade. After initial success implementing several instream flow projects in the basin, progress has stalled, in part

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*Trout Unlimited: America's Leading Coldwater Fisheries Conservation Organization*  
321 East Main Street, Suite 411, Bozeman, MT 59715  
email: [morgan.case@tu.org](mailto:morgan.case@tu.org) • [www.tu.org](http://www.tu.org)

due to the complexity of water right administration; poorly-understood surface-groundwater interactions; and shifting precipitation patterns, increased temperatures, and changes in snowpack due to climate change. Having a web-based water management decision-support tool that incorporates disparate datasets to forecast, model, and visualize spatial and temporal hydrologic, geologic, and administrative data will improve project development in the UCF. Some examples include the following:

- Efficiently identify streamflow, and temperature, and other geospatial data currently available on multiple websites or housed in spreadsheets or standalone databases across project partners. In the past, TU staff has spent considerable time trying to locate and validate data that could be used to evaluate streamflow projects;
- Prioritize project development in locations with a high likelihood of success (e.g. identification of sites where natural groundwater storage will contribute to late season baseflow in flow-limited tributaries); and
- Improve communication with and education of partners, community members, landowners, and project funders. Data visualization and mapping interfaces improve shared understanding and are useful for demonstration of project impacts. Having the relevant data available for review when meeting with project partners will save time and increase transparency during project development.

Trout Unlimited will collaborate with the project sponsors to collect streamflow and temperature data, compile datasets, review and test the water management decision-support tool, and help ensure the final product will be a practical and utilized tool to address water management challenges facing the community and ecosystem in the UCF.

Thank you for your consideration. Please contact me if you have any specific questions regarding our support of this proposal.

Respectfully,



Morgan Case  
Trout Unlimited

Watershed Restoration Coalition of the Upper Clark Fork  
1109 Main Street Deer Lodge, Montana 59722

October 12, 2023

Department of the Interior, Bureau of Reclamation, Water Resources and Planning Office  
Attention: WaterSMART Applied Science Grant Application Review Committee

Re: WaterSMART Applied Science Projects for Fiscal Year 2023  
Funding Opportunity Number: R23AS00446  
Letter of Partnership for the Clark Fork Coalition project application, A Water Management  
Decision Support Tool for the Upper Clark Fork River Basin

To whom it may concern:

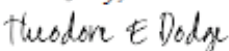
This letter is written in support of the "A Water Management Decision Support Tool for the Upper Clark Fork River Basin Upper Clark Fork Basin" grant application submitted to the Bureau of Reclamation WaterSMART Applied Science Projects for Fiscal Year 2023 by The Clark Fork Coalition (CFC).

The Watershed Restoration Coalition (WRC) is a landowner, conservation district and local government-based nonprofit. WRC has partnered with CFC since the WRC's start up in 1999. The project proposed by CFC is important to the continued restoration efforts in the upper Clark Fork.

Abundant data has, and continues to be, compiled on myriad ecological and hydrological conditions in the Upper Clark Fork basin. While some data have been synthesized, a broadly accessible, customizable, and continuously updated pooled data source does not yet exist to consolidate this information.

The WRC supports CFC's WaterSMART Applied Science Projects for Fiscal Year 2023 grant proposal and will work collaboratively with CFC and our other partners in the Upper Clark Fork Stream Flow Group to support the objectives identified in the application. The WRC believes that the proposed project will identify data gaps and facilitate and expedite water management and restoration planning decisions in the UCF basin.

Sincerely,

Theodore E. Dodge

BA02250E1411742F

Ted Dodge  
Executive Director  
WRC

Contact information

Ted.dodge516@gmail.com  
406-579-3762





October 16th, 2023

To: Department of the Interior, Bureau of Reclamation, Water Resources and Planning Office  
Attention: WaterSMART Grant Application Review Committee

RE: WaterSMART Environmental Water Resources Projects for Fiscal Year 2023  
Funding Opportunity Number: R23AS00446

Letter of Partnership for the Clark Fork Coalition project application, *Integrating Water Data to Enhance Ecological Flows in the Upper Clark Fork River Basin*

To whom it may concern:

This letter is written in support of the "Integrating Water Data to Enhance Ecological Flows in the Upper Clark Fork River Basin" grant application submitted to the Bureau of Reclamation WaterSMART Applied Science Grant program by the Clark Fork Coalition (CFC) to create a web-based water management decision-support tool that will synthesize existing independently procured, but currently unpooled data from government, private, and nonprofit entities on key variables influencing instream flow and water quality in the UCF. Ultimately this tool will help improve ecological conditions in the basin by providing a more comprehensive understanding of the impact and potential benefits of conservation projects and water management decisions, reducing the time required to develop, design, and implement these projects.

As part of my research and service work as a professor at the University of Montana, I am contracted by the MT Natural Resources Damage Program to coordinate the **Upper Clark Fork Basin Streamflow Group** (Streamflow Group), a coalition of state agencies, conservation organizations, Tribal water resource managers, and irrigators working collaboratively to pursue solutions that support and balance the water needs of Upper Clark Fork River watershed communities. The Streamflow Group initially convened in 2021 and has met every other month since with strong representation from both water management and conservation stakeholders in the basin. I write today in my capacity as Streamflow Group coordinator to express the group's unanimous support of CFC's Applied Science Grant proposal. The project clearly supports the Group's explicit and co-developed goals which include (1) building a clear, collective understanding of the water use and streamflow challenges in the Upper Clark Fork River, (2) sharing information about ongoing activities pursued by participants to address water use and streamflow challenges, and (3) determining a suite of additional actions that could be initiated by Streamflow Group participants to augment flow during critical times.

The Streamflow Group is excited to support the CFC's WaterSMART Applied Science Grant proposal and will continue to work collaboratively with CFC and all of our partners in the Group to ensure that the proposed project will significantly increase the potential for long-term benefits of enhancing flexibility in water management for ecological benefits in the Upper Clark Fork Basin.

Sincerely,

A handwritten signature in black ink that reads "B. Chaffin".

Brian C. Chaffin, Ph.D.  
Coordinator, UCF Streamflow Group  
Associate Professor, University of Montana

W.A. FRANKE COLLEGE OF  
**FORESTRY & CONSERVATION**  
UNIVERSITY OF MONTANA

32 Campus Dr., Forestry 109 | Missoula, Montana 59812 | 406.243.6575 | [brian.chaffin@umontana.edu](mailto:brian.chaffin@umontana.edu)

# Appendix D:

## Category A Letter of Partnership

### DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

Water Resources Division

1424 9th Ave, Helena, MT 59620-1601 Phone: (406) 444-6601 Fax: (406) 444-0533



GREGGIANFORTE, GOVERNOR

1539 ELEVENTH AVENUE

## STATE OF MONTANA

DIRECTOR'S OFFICE: (406) 444-2074  
FAX: (406) 444-2684

PO BOX 201601  
HELENA, MONTANA 59620-1601

October 17, 2023

To: Department of the Interior, Bureau of Reclamation, Water Resources and Planning Office  
Attention: WaterSMART Applied Science Grant Application Review Committee

Re: WaterSMART Applied Science Projects for Fiscal Year 2023  
Funding Opportunity Number: R23AS00446  
Letter of Partnership for the Clark Fork Coalition project application, *Integrating Water Data to Enhance Ecological Flows in the Upper Clark Fork River Basin*

Dear Members of Review Committee,

I am writing to express support for and confirm partnership in the proposed project, "Integrating Water Data to Enhance Ecological Flows in the Upper Clark Fork River Basin," from the Montana Department of Natural Resources and Conservation (DNRC, Category A Partner). The Clark Fork Coalition (CRC, Category B Applicant) is proposing this project with the support of the Upper Clark Fork Streamflow Group (Streamflow Group), a group of diverse, collaborative stakeholders in the Upper Clark Fork (UCF) Basin, whose mission is to support and balance the water needs of communities in the Basin. DNRC helped initiate the Streamflow Group in 2021, and we are pleased to continue supporting this partnership through cooperative water management activities.

This project supports the mission of DNRC Water Resources Division by promoting the sound utilization of the State's waters and protection of existing uses. Specifically, the Division is currently developing an integrated hydrologic modeling framework to improve water management throughout the state. Applying the framework to all the basins in Montana is a substantial undertaking for a small state agency, so this project will significantly lessen staff workloads by providing usable, accessible data for the UCF Basin. In addition, it will inform DNRC's approach to expanding the framework across the state. This project will also help implement several key statewide recommendations from the forthcoming Montana Drought Management Plan, including the expansion of water use measurement and investment in hydrologic modeling. Ultimately, it will provide decision makers, water users, and other stakeholders with valuable data to support drought planning and mitigation and the enhancement of ecological flow conditions of the UCF Basin.

DNRC is acting in partnership with CFC and other UCF stakeholders to implement this important water management project. We agree to the submittal and content of this application, and we intend to participate in this project by providing review and input throughout project development. DNRC's staff time support will constitute \$8,300 in in-kind contributions.

Thank you for considering this important project.

Sincerely,

A handwritten signature in blue ink, appearing to read "Anna Pakenham Stevenson".

Anna Pakenham Stevenson  
Water Resources Division Administrator



# Appendix E:

## CFC Board Resolution



### **PROPOSED RESOLUTION**

#### **Board of Directors**

#### **Approval of Application for Grant Funds from the Bureau of Reclamation WaterSMART Applied Science Grant Program**

RESOLVED, that the Board of Directors of the Clark Fork Coalition has reviewed and approved the grant application for the Bureau of Reclamation's WaterSMART Applied Science Program as it furthers the Coalition's mission to protect and restore the Clark Fork River watershed.

RESOLVED FURTHER, that the Board of Directors of the Clark Fork Coalition identifies Karen Knudsen, Executive Director of the Coalition, as possessing the legal authority to enter the Coalition into contractual agreements and financial and legal obligations associated with the receipt of a BOR Applied Science Grant.

RESOLVED FURTHER, that if the Coalition is selected to receive funds through the Program it will work with the Bureau of Reclamation to meet established deadlines for entering into a financial assistance agreement.

RESOLVED FURTHER, that the Board of Directors verifies the capability of the Coalition to allocate over two years the sum of \$2,600.00 from private funding sources to the proposed project, *Integrating Water Data to Enhance Ecological Flows in the Upper Clark Fork River Basin*.

I, Jenni Chaffin, certify that I am the duly elected and acting President of the Clark Fork Coalition, a not-for-profit corporation organized under the laws of the state of Montana. I further certify that the resolution set forth above was adopted by the Board of Directors of the Clark Fork Coalition by unanimous vote on October 16, 2023, and that said resolution has not been modified or rescinded.

Executed in Missoula, Montana the 16<sup>th</sup> day of October 2023.

A handwritten signature in cursive script that reads "Jenni L. Chaffin".

Jenni Chaffin, Board President

# Appendix F:

## Letter of Funding Commitment

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October 16, 2023

Department of the Interior, Bureau of Reclamation, Water Resources and Planning Office

Attention: WaterSMART Applied Science Grant Application Review Committee

Re: WaterSMART Applied Science Projects for Fiscal Year 2023  
Funding Opportunity Number: R23AS00446  
Letter of Partnership for the Clark Fork Coalition project application, *Integrating Water Data to Enhance Ecological Flows in the Upper Clark Fork River Basin*

To whom it may concern:

This letter is written in support of the "Integrating Water Data to Enhance Ecological Flows in the Upper Clark Fork River Basin" project application submitted to the WaterSMART Applied Science program by the Clark Fork Coalition.

Aquatic and riparian resources of the Upper Clark Fork River Basin (UCFRB) have been injured by hazardous substances, released from mining and mineral-processing operations in the Butte and Anaconda areas. In 1983, the State of Montana (State) filed a lawsuit against the Atlantic Richfield Co., for injuries to the State's natural resources in the UCFRB. The State settled this lawsuit which established the UCFRB Restoration Fund. The UCFRB Restoration Fund are State of Montana funds and administered by the Natural Resource Damage Program (NRDP). These funds must be used to restore, rehabilitate, replace, or acquire the equivalent of the injured natural resources and meet the goals of the UCFRB Aquatic and Terrestrial Resources Restoration Plans.

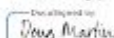
Restoring the fishery of the Clark Fork River is one of the goals of the UCFRB Aquatic and Terrestrial Resources Restoration Plans. Some areas of the UCFRB are chronically dewatered and suitable flow conditions have been shown to be critical to restoring and supporting viable fish populations in both the mainstem and tributaries. Thus, flow enhancement is a top priority restoration action for NRDP. To achieve the State's flow-related restoration goals, we partner with state and federal agencies, NGOs, and the agriculture community to identify potential projects, conduct hydrologic assessments, and review water rights. Given the limited resources for restoration and the complexity of developing flow augmentation projects, there is a need for a tool that will consolidate and synthesize diverse datasets. This project will develop such a tool and help NRDP and partners more efficiently prioritize, design, and implement flow projects.

NRDP is committed to support the Clark Fork Coalition's WaterSMART Applied Science Grant proposal by providing up to \$15,000 in cash match to the project and an additional \$18,950 in in-kind services. NRDP's in-kind support includes staff time and travel for project management (\$9,950) and two seasons of flow monitoring (\$9,000 total).

These funds will be available to the applicant at the outset of proposed project, specifically by April 1<sup>st</sup>, 2024. There are no time constraints on the availability of the funds during the duration of the project. There are no other contingencies on these committed funds.

Thank you for considering the Clark Fork Coalition's proposal. We look forward to continuing to work with the Clark Fork Coalition and the diverse set of stakeholders involved with this project to enhance flows in the UCFRB.

Sincerely,



Douglas Martin  
Acting NRDP Program Manager  
Natural Resource Damage Program

Natural Resource Damage Program  
State of Montana

P.O. Box 201425  
1720 9<sup>th</sup> Avenue  
Helena, MT 59620-1425

Phone: 406-444-0205  
Fax: 406-444-0236  
nrpd@mt.gov