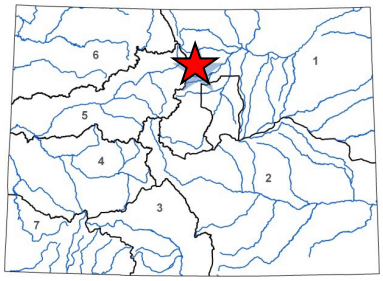
COLORADO
Colorado Water Conservation Board

Recovery and Resilience of the Cache la Poudre Colorado State University

September 2022 Board Meeting

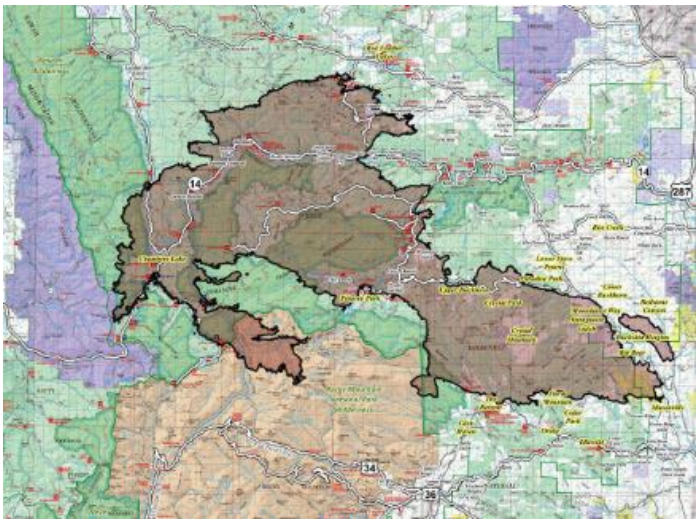
Water Plan Grant Program Application



LOCATION	
County/Counties:	Larimer
Drainage Basin:	South Platte

DETAILS	
Total Project Cost:	$796,179
Colorado Water Plan Grant:	$472,520
Recommended amount:	$315,171
Other CWCB Funding:	$0
Other Funding Amount:	$323,659
Applicant Match:	$237,333
Project Type(s): Planning	
Project Category: Watershed Health and Recreation	
Measurable Result: Study will provide information on damage to aquatic ecosystems in the Poudre River watershed, and strategies to mitigate against further damage from wildfire related ash and sediment flows. The river reach being studied is 55 miles long.	

The extensive Cameron Peak wildfire in 2020 and monsoonal rain in summer 2021 resulted in an ash and sediment flow that caused destruction of life and property and destroyed recreational and native fish communities and altered habitat in the Cache la Poudre River. This study will assess the level of fish community and habitat destruction, compared with recently collected historical information, and will measure the recovery and resilience of fish populations and habitat in the watershed. Fish population abundances and sediment mapping and monitoring will guide managers interested in restoring aquatic resources, and improving habitat and water quality. This information will be useful to formulate strategies to mitigate against future debris flows that may alter fish communities, habitat, and water quality in the Poudre River watershed and will be shared at intervals with the many stakeholders and interested parties via written materials and oral presentations, which will aid restoration managers in the Poudre River basin, the State of Colorado, and the western United States, where wildfire impacts increasingly alter aquatic communities and habitat.



Upon CWCB staff request, the applicant reached out to its stakeholders to request more cash contributions to offset the total need from the CWCB Colorado Water Plan grant program. Colorado Parks and Wildlife acquiesced to the applicant's request, and they will be providing cash match to fully fund the application. This is not reflected in the details above because CWCB staff received a last minute email regarding the additional funds and is awaiting formal notification.

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Colorado Water Conservation Board

Water Plan

Water Project Summary

Name of Applicant	Colorado State University
Name of Water Project	Recovery and resilience of the Cache la Poudre River fish community and habitat following a wildfire-related fish kill
Grant Request Amount	**$472,520.00**
Primary Category	$472,520.00
Watershed Health & Recreation	
Total Applicant Match	**$0.00**
Applicant Cash Match	
Applicant In-Kind Match	
Total Other Sources of Funding	**$323,659.00**
Colorado Parks and Wildlife	$52,500.00
Colorado Parks and Wildlife	$33,826.00
Colorado State University	$68,800.00
Colorado State University	$168,533.00
Total Project Cost	**$796,179.00**

Applicant & Grantee Information

Name of Grantee: Colorado State University
Mailing Address: 2002 Campus Delivery Fort Collins CO 80523
FEIN: 846,000,545

Organization Contact: Kevin Bestgen
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Grant Management Contact: Kevin Bestgen
Position/Title:
Phone: (970) 491-1848
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Description of Grantee/Applicant

No description provided

Type of Eligible Entity

- [x] Public (Government)
- [ ] Public (District)
- [ ]

- [ ] Public (Municipality)
- [ ] Ditch Company
- [ ] Private Incorporated
- [ ] Private Individual, Partnership, or Sole Proprietor
- [ ] Non-governmental Organization
- [ ] Covered Entity
- [ ] Other

Category of Water Project

- [ ] Agricultural Projects
  Developing communications materials that specifically work with and educate the agricultural community on headwater restoration, identifying the state of the science of this type of work to assist agricultural users among others.
- [ ] Conservation & Land Use Planning
  Activities and projects that implement long-term strategies for conservation, land use, and drought planning.
- [ ] Engagement & Innovation Activities
  Activities and projects that support water education, outreach, and innovation efforts. Please fill out the Supplemental Application on the website.
- [x] Watershed Restoration & Recreation
  Projects that promote watershed health, environmental health, and recreation.
- [ ] Water Storage & Supply
  Projects that facilitate the development of additional storage, artificial aquifer recharge, and dredging existing reservoirs to restore the reservoirs' full decreed capacity and Multi-beneficial projects and those projects identified in basin implementation plans to address the water supply and demand gap.

Location of Water Project

Latitude	40.000000
Longitude	105.000000
Lat Long Flag	Stream location: Coordinates based on general location on stream
Water Source	Cache la Poudre River
Basins	South Platte
Counties	Weld; Larimer
Districts	3-Cache La Poudre River

Water Project Overview

Major Water Use Type	Environmental
Type of Water Project	Planning (e.g. watershed)
Scheduled Start Date - Design	10/1/2022
Scheduled Start Date - Construction	

Description

The extensive Cameron Peak wildfire in 2020 and monsoonal rain in summer 2021 resulted in an ash and sediment flow that caused destruction of life and property and destroyed recreational and native fish communities and altered habitat in the Cache la Poudre River. Our study will assess the level of fish community and habitat destruction, compared with recently collected historical information, and will measure the recovery and resilience of fish populations and habitat in the watershed. Fish population abundances and sediment mapping and monitoring will guide managers interested in restoring aquatic resources, and improving habitat and water quality. Our information will be useful to formulate strategies to mitigate against future debris flows that may alter fish

communities, habitat, and water quality in the Poudre River watershed. We will share our information at intervals with our many stakeholders and interested parties via written materials and oral presentations, which will aid restoration managers in the Poudre River basin, the State of Colorado, and the western United States, where wildfire impacts increasingly alter aquatic communities and habitat.

Measurable Results

	New Storage Created (acre-feet)
	New Annual Water Supplies Developed or Conserved (acre-feet), Consumptive or Nonconsumptive
	Existing Storage Preserved or Enhanced (acre-feet)
	New Storage Created (acre-feet)
290,400	Length of Stream Restored or Protected (linear feet)
	Efficiency Savings (dollars/year)
	Efficiency Savings (acre-feet/year)
	Area of Restored or Preserved Habitat (acres)
	Quantity of Water Shared through Alternative Transfer Mechanisms or water sharing agreement (acre-feet)
	Number of Coloradans Impacted by Incorporating Water-Saving Actions into Land Use Planning
500,000	Number of Coloradans Impacted by Engagement Activity

Other

Study will provide information on damage to aquatic ecosystems in the Poudre River watershed, and strategies to mitigate against further damage from wildfire related ash and sediment flows. The river reach under study is 55 miles long.

Water Project Justification

The extensive Cameron Peak wildfire in 2020 and monsoonal rain in summer 2021 resulted in an ash and sediment flow that caused destruction of life and property and destroyed recreational and native fish communities and altered habitat in the Cache la Poudre River watershed. Our study will assess the level of fish community and habitat destruction, compared with recently collected historical information, and will measure the recovery and resilience of fish populations and habitat in the watershed. Fish population abundances and sediment mapping and monitoring will guide managers interested in restoring aquatic resources, and improving habitat and water quality. This information will inform post-wildfire mitigation planning to protect and enhance the Poudre River watershed, including the health and resilience of aquatic communities, aquatic habitat, recreation and angler interests, water quality, and sediment transport and deposition dynamics, especially as ongoing climate change affects precipitation patterns and water supply characteristics. We will share our information at intervals with our many stakeholders and interested parties via written materials and oral presentations, which will aid restoration managers in the Poudre River basin, the State of Colorado, and the western United States, where wildfire impacts increasingly alter aquatic communities and habitat.

Related Studies

Our project proposal follows up on the prior study referenced below, which was funded by CWCB and the City of Fort Collins. The proposed work is relevant to the watershed and other programs of CWCB by illuminating fire effects in watersheds, future risks from same, and how they may be mitigated.

Haworth, M. R., and K. R. Bestgen. 2022 report. Fish community composition and movement in the Cache la Poudre River in Fort Collins, Colorado. Final report to the City of Fort Collins Natural Areas Department, Fort Collins, CO, and the Colorado Water Conservation Board, Denver, CO. Larval Fish Laboratory Contribution 226.

Taxpayer Bill of Rights
NA

Statement of Work

Project Title: Recovery and resilience of the Cache la Poudre River fish community and habitat following a wildfire-related fish kill
Project Location: Cache la Poudre River, from the Poudre River State Fish Hatchery to Interstate 25
Grant Type: Water Plan Grant-Watershed Health and Recreation Project
Grant Amount: $472,520 (total grant amount [$743,679] includes secure cash and in-kind contributions)
Project Sponsor: Colorado Water Conservation Board
Contact: Kevin Bestgen, Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO 80523 kbestgen@colostate.edu; 970 491-1848

Synopsis

The extensive Cameron Peak wildfire in 2020 and monsoonal rain in summer 2021 resulted in an ash and sediment flow that caused destruction of life and property and destroyed recreational and native fish communities and altered habitat in the Cache la Poudre River. Our study will assess the level of fish community and habitat destruction, compared with recently collected historical information, and will measure the recovery and resilience of fish populations and habitat in the watershed. Fish population abundances and sediment mapping and monitoring will guide managers interested in restoring aquatic resources, and improving habitat and water quality. Our information will be useful to formulate strategies to mitigate against future debris flows that may alter fish communities, habitat, and water quality in the Poudre River watershed. We will share our information at intervals with our many stakeholders and interested parties via written materials and oral presentations, which will aid restoration managers in the Poudre River basin, the State of Colorado, and the western United States, where wildfire impacts increasingly alter aquatic communities and habitat.

Stakeholders

We commit that this project will be a collaborative effort, and we invite participation by all interested persons in the Poudre River watershed and beyond. Specific stakeholders we have already communicated with regarding this project and their interests and uses of data collected include:

- **South Platte Basin Round Table**. Data will be used to inform means to improve watershed health, enhance environmental and recreational attributes, and manage risks associated with climate change.
- **Colorado Parks and Wildlife**. Data will guide management to restore recreational fishery resources and conserve and restore native fishes. For example, rates of recovery for fish communities will inform the need to restore recreational fisheries and also enhance recovery efforts for rare or endangered native fishes. The interplay of habitat and streamflow is especially important, in the face of future water development that may reduce river flows.
- **City of Fort Collins**. Data will be used to assist with refinement of the Poudre River report card, guide stream health assessments, and inform the Poudre River Master Plan, of which native and recreational fishes and water and habitat quality are an important component. The health assessment will also benefit from additional habitat information, specifically, remediation of ash and sediment deposits by Poudre River stream flows. Study results will also guide City and regional efforts to protect and improve ecological flows, to manage large wood in channels, and improve water quality in the watershed. Further assessments of river reach connectedness will

benefit from comminuted monitoring of fish use of passage devices that are in place in the basin, especially in the City boundaries.

- **Coalition for the Poudre River Watershed**. Data will be used to refine the Poudre River report card and refine the Poudre Stream Health Assessment, of which native and recreational fishes and their habitat are an important component. Will also assist to protect the physical, chemical, and biological components of our watershed and restore those that have already been degraded. Information is also crucial to inform future post-fire mitigation planning for the river, and to track the health and resilience of the aquatic community, water quality, future recreation, and sediment transport, with an overall goal to improve watershed resilience, and reduce wildfire risk.
- **City of Greeley**. Data will be used to refine stream health assessments, of which native and recreational fishes are an important component, and inform strategies to improve water quality in the watershed. Results will also guide planning for improved watershed health in the months and years ahead, where the future likely contains more arid forests and more prolific wildfires.

Most of these stakeholders provided, or plan to provide, letters of support for this research, and others will be invited to participate as needed or requested.

Project overview

Disturbances play an integral role in the structuring of stream systems (Resh et al. 1988, Lake 2000). Pickett and White (1985) presented a commonly used definition of disturbance as, "any relatively discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment". A number of processes can constitute disturbance in streams, and may be physical (flooding, drought, fire) or biological (disease, invasive species) in nature (Meffe and Minckley 1987, Walker and Nehring 1995, Dunham et al. 2003, Adams and Warren, Jr. 2005, Johnson et al. 2008). However, defining what constitutes a disturbance event and understanding the response of the biological communities present remains challenging, as effects can vary over time and space and by species (Poff 1992, Detenbeck et al. 1992, Matthews et al. 2013). In a review of case studies on disturbance to temperate stream fish communities, Detenbeck and others (1992) found rate of recovery differed based on disturbances being classified as "press" or "pulse", referring to the duration of disturbance relative to the life span of affected organisms. Furthermore, some studies provided evidence that recovery was faster when the disturbed sites were closer to source populations for recolonization, and when barriers to movement were absent.

Wildfire disturbances affect stream habitat and fish communities both directly, via changes in water quality, sediment deposition and transport, and temperature during and immediately following a fire, and indirectly, through secondary effects on hydrology and erosion processes (summarized in Gresswell 1999). The western US is projected to experience continued frequent, intense, and widespread wildfires during the 21st century (Brown et al. 2021), meaning stream ecosystems will experience more wildfire-related disturbances. Streams of the western Great Plains often undergo frequent and extreme changes in streamflow, temperature, and turbidity, and fishes inhabiting them persist through their capability to withstand or recover from these environmental fluctuations (Dodds et al. 2004, Lytle and Poff 2004, Bestgen et al. 2017, Bestgen et al. 2020). Native species evolved in these systems over millennia in the presence of large disturbances such as wildfire, and a central mechanism to weather their effects would have included numerous populations segments across large interconnected stream networks that facilitated resilience to large disturbances (Rieman et al. 2003). However, when stream fish populations

are subjected to persistent anthropogenic disruptions including habitat degradation, fragmentation, and invasive species, risks to populations from natural disturbances are compounded (Dunham et al. 2003), leading to limited understanding of how streamflow and sediment dynamics, water quality, and fish and invertebrate populations will respond to increasingly common wildfire disturbances in altered stream systems of the western US.

The Cameron Peak fire burned over 200,000 acres from August-December 2020 in the Cache la Poudre (Poudre) River basin, the largest wildfire in Colorado history (Figure 1). The following summer on 20 July 2021 a rainstorm moved over portions of the watershed that generated a large debris flow that moved down the Black Hollow Creek drainage into the Poudre River. The debris flow introduced large amounts of sediment and ash into the Poudre River that produced zero-clarity water conditions and deposited fine sediment throughout the river (Figure 2). Observations during and immediately after these sediment-laden flows by Colorado Parks and Wildlife (CPW) and Colorado State University Larval Fish Laboratory (CSU) suggested a widespread fish kill occurred that extended at least 50 miles downstream from Black Hollow, an area designated as both National Wild and Scenic River and National Heritage Area.

Detailing the effects of stochastic disturbances on aquatic communities is often not possible as it requires repeated sampling at appropriate space and time scales *prior* to the disturbance event followed by comparison with post-disturbance sampling results. Rapid assessment of the 2021 fish kill was made possible by annual sampling completed by CPW in canyon-bound reaches of the river both up and downstream of the Black Hollow debris flow, as well as recent completion of a fish community and movement study by CSU (Haworth and Bestgen 2022) during 2018-2021. CPW annually sampled several canyon-reach sites, and the CSU effort included repeated sampling of fish, substrate, and habitat characteristics at 13 locations over 15 miles of the Poudre River transition zone between the town of Bellvue, CO, and Interstate 25 (Figure 1). Additional sampling completed by CPW and CSU in autumn 2021 confirmed the magnitude and extent of the fish kill, which was deemed catastrophic with complete fish eradication in some canyon-bound reaches (news release 13 June 2022; https://cpw.state.co.us/aboutus/Pages/News-Release-Details.aspx?NewsID=3528). Effects also extended more than 50 miles downstream, with provisional data showing an average fish abundance reduction of 73% (range 42-87%, preliminary data Haworth and Bestgen) in the transition zone (Figure 3); those effects were verified in sampling conducted in spring 2022. These combined efforts of pre and post disturbance sampling allow a rare opportunity to quantify the direct effects of a wildfire related flash flood event on the fish community over a large continuous reach of river that encompasses both a valuable sport fishery and important native fish habitat.

To that end, this project seeks to use this opportunity to answer a set of questions related to the resilience and recovery of portions of the Poudre River fish community and habitat affected by the Cameron Peak Fire. Objectives include: 1) monitoring of fish community composition throughout canyon and transition zone reaches to assess recovery; 2) monitoring fish movement to assess the role of existing fish passage structures in facilitating recolonization; 3) possible repatriation of rare and endangered native fish species following a large and widespread fish kill; and 4) sediment mapping, monitoring and entrainment (Table 1, Task descriptions are below). Thus, Objectives 1-3 study biological processes, which will be linked to information obtained in Objective 4, which will study aquatic habitat resilience and effects and usefully detail processes that may drive biotic communities. Objective 4 will also be useful to understand prospects for additional ash and sediment transport from other tributaries to the Poudre River during future rain events.

Project findings will be relevant to identify the status and recovery of fishery and aquatic resources and habitat in the affected reach of the Poudre River. This information will inform post-wildfire mitigation planning to protect and enhance the Poudre River watershed, including the health and resilience of aquatic communities, aquatic habitat, recreation and angler interests, water quality, and sediment transport and deposition dynamics, especially as ongoing climate change affects precipitation patterns and water supply characteristics. Information generated by this project aligns with the mission, goals, and ongoing efforts of multiple stakeholders including the South Platte Basin Roundtable, Colorado Parks and Wildlife, the City of Fort Collins, the Coalition for the Poudre River Watershed, and the City of Greeley. In addition to these and other local stakeholders, we anticipate project findings will benefit communities throughout the Basin, state, and western region that face similar threats related to increased risk of wildfire.

Specific opportunities to share information gathered will be at the inception of the study, where stakeholders and other interested parties can review and learn about the study proposal. Feedback from stakeholders about the utility of the study has already been considered and how it might be useful to them into the future will also be considered. We will provide opportunities to share data and study results at interim (year 2 or 3) and final phases of the project, in the form of written and oral presentations with relevant local, state, and federal government entities. An effort will be made to engage the public and present information in an easy-to-understand format; the City of Fort Collins, for example, has several means to accomplish this. This will enhance our ability to convey a commitment to restore and protect ecological processes that connect the land with water. Information collected will benefit restoration managers in the Poudre River basin, the State of Colorado, and the western United States, where wildfire impacts are widespread and increasingly alter aquatic communities and habitat.

This project is proposed as a five-year research and monitoring program, with field work beginning Autumn 2022 and continuing through November 2027, plus a portion of a year devoted to prepare a report to be delivered by December 31st, 2027. It is important to note that the scope of the project and emphasis on various objectives should be flexible to accommodate variable environmental conditions including flow rates and timing, and the known potential for future flood events, which may alter the project schedule and objectives. Any changes desired by CSU/CPW will be discussed with CWCB. The total project budget commitment for CWCB is $472,520, with a total grant amount of $743,679 reflecting secure cash and in-kind contributions, and additional secure cash requests have also been made (Colorado Parks and Wildlife). Our project is fiscally and technically feasible, which is assured by inclusion of the expertise of several seasoned scientists with greater than 100 years of combined experience in conducting studies relevant to the topic area and the Poudre River basin in particular.

Task descriptions

Task 1 – Monitoring fish community composition to inform recovery rates.

Description of Task

The objective for the first phase is to monitor fish community composition throughout reaches previously monitored by CPW and CSU to assess recovery from the 2021 fish kill. This will allow managers to understand differences in recovery rates based on proximity to the source of the debris flow, proximity to potential source populations of fish, and relate water quality and habitat conditions to rate and extent of recovery across monitoring sites.

Method/Procedure

We envision monitoring to occur as a joint effort between CPW and CSU over an approximately 55 mile reach of river from just upstream of the Poudre State Fish Hatchery, located in the upstream reaches of Poudre Canyon, downstream to Interstate 25. CPW monitors fish populations and habitat at 12 locations in Poudre Canyon, including three sites 0.5-7 miles upstream of the Black Hollow debris flow, sites which will serve as a partial control for comparison to downstream sites directly affected by ash flow. An additional nine sites affected by the debris flow are located at interval between Black Hollow and the canyon mouth. Monitoring in the transition zone near Fort Collins would occur at the 13 sites established during the recently completed fish movement study conducted by CSU from 2018-2021. Sampling at each site will consist of electrofishing, or electrofishing and seining, to obtain the most robust assessment of fish community composition and size structure possible. Electrofishing will target all habitat types but especially deep pools and areas with complex cover, locations where seines are less efficient. Seines will target open water and shallower habitat, which is less efficiently sampled with electrofishing. Early life stages of fishes will also be sampled with appropriate gear to determine where reproduction is occurring in the river. Species will be identified for each sampling gear effort, and fish lengths taken to calculate length frequency histograms. Habitat sampling at each site will assess degree of complexity and include measurements of stream widths, depths, velocities, and substrate types along transects, presence and abundance of cover, maximum depths of pools, and area of each main habitat type: riffles, runs, backwaters, and pools. Findings from this task will be linked to processes studied in Task 4 to inform how the degree of sediment deposition across a longitudinal gradient from the debris flow source, as well as changes in sediment composition through time, especially following spring runoff in each year, influence fish community structure and recovery throughout the study area.

Task 2 – Monitoring passage rates of fish over diversion dams with completed fish passage structures.

Description of Task

The objective for this portion of the study is to understand the role of existing passage structures in facilitating fish recolonization in fragmented river reaches. Results from Task 1 will inform the degree of species reductions in reaches fragmented by diversion dams, especially in the transition zone. Results from the previously completed movement study indicated fish passed over diversions at a much higher rate when passage structures were available, and that diversions without passage available blocked upstream movement and caused reduced species richness and abundance upstream of them (Haworth and Bestgen 2022). We expect to see more rapid upstream recolonization in reaches connected by fish passage structures and in upstream reaches closer to control sites that were unaffected by the ash flow. Results from this task will allow us to disentangle the influences of local severity of the fish kill, water quality and habitat characteristics, and the capability to move into a given reach on local fish community recovery rates.

Method/Procedure

This task will build upon previously successful methods utilized to monitor fish movement in the heavily fragmented transition zone. Prior to the fish kill, approximately 6,500 fish were implanted with passive integrated transponder (PIT) tags that allowed us to track movement of tagged fish with a variety of techniques including: 1) antennas fixed to existing fish passage structures; 2) submersible antennas placed on the streambed in places of interest such as known travel corridors or congregation areas; and 3) a mobile antenna used to actively search for tagged fish throughout the study area during low flow conditions. Continuing to PIT tag fish at sites in the transition zone would build on the substantial, albeit

somewhat ash-flow depleted, number of tagged fish available to understand species-specific and seasonal movement. Tagging would also allow direct estimation of fish survival rates based on tag-recaptures over time.

Tagging efforts may also be expanded into sites in canyon reaches to inform recolonization in reaches where the fish community was completely depleted by the debris flow. This may include tagging fish in unaffected upstream reaches or tributaries (e.g., North Fork Poudre River) to measure the number of moving fish and distance traveled to recolonize depleted reaches.

Task 3 – Monitoring success of rare fish recovery efforts.

Description of Task

The objective for this portion of the study is to monitor repatriation efforts for rare and endangered fishes formerly found in the Poudre River transition zone. Large adult Brown Trout and Rainbow Trout had expanded their distribution and increased in abundance over the past decade into downstream reaches of the transition zone that historically supported a diverse suite of cool and warmwater species, including several rare and endangered taxa (Haworth and Bestgen 2022). Sampling completed by CSU in autumn 2021 and again in spring 2022 indicated trout were almost completely eliminated from these reaches by the ash and debris flow. This creates an opportunity for a natural experiment aimed to increase abundance of rare taxa and reestablish populations of extirpated species following the removal of nonnative predators. We envision the opportunity to enhance or repatriate populations of one or more Colorado Species of Greatest Conservation Need including; Common Shiner (Tier 1, State Threatened), Northern Redbelly Dace (Tier 1, State Endangered), Brassy Minnow (Tier 1, State Threatened), Orangespotted Sunfish (Tier 1), and Plains Topminnow (Tier 1), species that are either cultured in the hatchery, or are available from wild stocks.

Method/Procedure

Stocking of rare and endangered taxa would be directed by CPW, and based upon species availability and suitability of habitat. Persistence of stocked fish in the river would be assessed through sampling completed in Task 1, as well as other targeted post-stocking monitoring in stocking locations over time. Release location of fish also offers an opportunity to build upon Task 2 to monitor movement and upstream recolonization potential of released fish. Stocking may take place at varying distances upstream and downstream of the Fossil Creek Reservoir Inlet Diversion (FCRID), which was fitted with a fish passage structure designed to allow passage of small-bodied warmwater species. Additionally, these efforts would coincide with the City of Fort Collins Natural Areas Department Poudre River Native Fish Project. This project will improve habitat complexity and winter refuge pools in a relict channel of the river at the CSU Environmental Learning Center just downstream of the FCRID, with construction beginning in 2022/2023. This creates an opportunity to release fish in and near newly created habitat to assess the potential of this project to increase populations of presently absent rare and endangered native fishes.

Task 4 – Sediment mapping, monitoring, and entrainment.

Description of Task

Wildfires in the Poudre River watershed commonly increase sediment yields to the river network via widespread sheetwash and rilling, bank erosion along rivers in which the riparian corridor burned, and episodic debris flows. These processes can introduce a wide range of sediment grain sizes to rivers, but the finer sediment (sand, silt, clay) can be particularly abundant and can create persistent changes in the river corridor. Although downstream transport of fine sediment can require relatively little flow energy, three factors can allow post-fire fine sediment deposits to persist. The first factor is the depositional site. If the fine sediment is initially deposited in zones of flow separation (marginal eddies, secondary channels, overbank areas) during a high discharge, subsequent lower flows may not access the depositional sites or may not create sufficient shear stress to re-mobilize the sediment. The second factor related to deposition is that fine sediment commonly infiltrates and fills the spaces between cobble or boulder particles in streambeds. This sediment is extraordinarily difficult to re-mobilize unless the discharge is large enough to mobilize the entire coarse bed-surface. The third factor that can limit remobilization is the cohesion of silt and clay, which may only be overcome at very high flows. Consequently, it is useful to understand locations and quantities of fine sediment deposition along a river corridor following wildfire to identify flow levels that must be met or exceeded to remobilize fine sediment. Understanding these processes will be especially useful to understand effects of ash and sediment on channel margin and backwater habitat that are important for main channel as well as early life stages of fish, and rare species such as Plains Topminnow.

Method/Procedure

The geomorphic component of this project will focus on three primary subtasks:

1) Assessing the mainstem Poudre River and the mouths of larger tributaries for sites where fine sediment is currently retained.
   By mapping the locations and approximate quantities of fine sediment stored along the Poudre River in the 55-mile-long reach from just upstream of the Poudre State Fish Hatchery, downstream to Interstate 25, we can assess how much and where aquatic habitat is compromised and potential continuing sources of fine sediment to downstream sites. As part of this assessment, we would identify the reach-scale channel characteristics (cross-sectional and planform geometry, geomorphic spatial heterogeneity, valley geometry, channel bed substrate) that facilitate fine sediment retention. We would also determine whether downstream trends (e.g., toward progressively less sediment retention with increasing distance from the 2020 Cameron Peak burned areas) exist or whether fine sediment deposition predominantly reflects local controls. Our focus will be on channel margin sites (e.g., lateral eddies, secondary channels), riffles and pool exit-slopes that might be used as spawning habitat for large-bodied native suckers and trout, and floodplain wetlands that are hydrologically connected to the active channel(s) and provide important rearing and slackwater habitat for young fish and backwater dependent taxa.
2) Select a subset of 10 sites for detailed assessment and monitoring.
   At these sites, which will be distributed along the length of the study area including sites upstream of the impacted area, we will use drone-based mapping of the areal extent of the deposits and ground measurements of deposit thickness and grain-size distribution to quantify sediment retention. These sites will at least partially overlap with sites at which fish monitoring is ongoing. Each site will be at least 300 m in length along the river and will include the active channel(s) and floodplain.
3) At 5 of the 10 detailed sites, we will use the HEC-RAS 2D model to quantitatively evaluate thresholds for fine sediment entrainment and relate these thresholds to actual flows as measured

at USGS and other gauging stations on the Poudre River and to flows hypothetically necessary for sediment mobilization.

Task 5 – Final report.

Description of Task

The final report will integrate findings from investigations described under Tasks 1-4. Briefly, the report will detail the recovery of the Poudre River fish community over the duration of the study in both canyon and transition zone reaches, describe the role of fish passages in facilitating that recovery, and progress toward reestablishment of elements of the native fish community. All those biological investigations will integrate results from Task 4, which will describe results of sediment mapping, monitoring and entrainment, and the role that sediments played in structuring recovery of the fish community. Recommendations will feature management actions needed for additional recovery of the fish community and aquatic habitat of the Poudre River, which will necessarily incorporate effects of additional sediment and ash flows that are expected into the future.

Budget and Schedule

Task	Description	Target start date	Target end date	Grant request	Cash Match, secure	In-kind match	Total funding
1	Monitor fish community composition throughout reaches previously monitored by CPW and CSU to assess recovery from the 2021 fish kill.	**Spring 2023**	**Spring 2027**	**171300**	**24942**	**73360**	**269602**
2	Study the role of existing fish passage structures in facilitating recolonization in fragmented river reaches.	**Spring 2023**	**Summer 2027**	**100660**	**14656**	**43108**	**158424**
3	Monitor efforts to enhance or repatriate populations of rare and endangered fishes historically found in the Poudre River transition zone.	**Spring 2023**	**Spring 2027**	**32400**	**4718**	**13875**	**50993**
4.1	Assessing current sediment storage in the mainstem Poudre River and the mouths of larger tributaries.	**Spring 2023**	**Autumn 2025**	**35220**	**5128**	**15083**	**55431**
4.2	Complete detailed assessment and monitoring of sediment characteristics and retention at a subset of 10 locations.	**Spring 2023**	**Autumn 2025**	**35220**	**5128**	**15083**	**55431**
4.3	Quantitatively evaluate thresholds for fine sediment entrainment and mobilization.	**Spring 2023**	**Autumn 2025**	**35220**	**5128**	**15083**	**55431**
5	Final Report		**Winter 2027**	**62500**	**9100**	**26766**	**98366**
	Budget total			**$472,520**	**$68,800**	**$202,359**	**$743,679**

The secure cash match in the budget is verified by Dr. Kathryn Stoner, Head, Department of Fish, Wildlife, and Conservation Biology, Colorado State University, in an attached letter.

Deliverables

1. Performance monitoring to include progress reports every 6 months following the execution of a contract detailing status updates on tasks identified in the work statement, and description of any major issues that have occurred and any corrective actions taken to address said issues.
2. A final report that summarizes the project and how it was completed. This will include:
    - Description of any obstacles encountered, and how they were overcome
    - Confirmation that all matching commitments have been fulfilled
    - Photographs and summaries of meetings and engineer reports/designs.

Budget detail

The budget presented just below assumes the standard CWCB 15% overhead rate on all items. Salary is mainly that for M. Haworth, technicians, and a graduate student to be named to assist Dr. Wohl with Task 4 investigations, with a small amount for report preparation conducted by Bestgen; all other supervisory and administrative salary required is an in-kind contribution from Bestgen and Wohl.

	Period					
	2022-2023	2023-2024	2024-2025	2025-2026	2026-2027	Total
Personnel						
Salary[1]	$67,999.11	$69,175.09	$70,386.34	$42,833.93	$44,118.94	$294,513.41
Fringe	$13,250.16	$13,561.27	$13,881.70	$11,331.76	$11,671.70	$63,696.59
Calculated Direct Costs	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Personnel Subtotal	$81,249.27	$82,736.36	$84,268.04	$54,165.69	$55,790.64	$358,210.00
Non-personnel						
Equipment[2]	$18,710.00	$0.00	$0.00	$0.00	$0.00	$18,710.00
Travel	$1,050.00	$1,081.50	$1,113.95	$1,147.37	$1,181.79	$5,574.61
Other Direct[3]	$11,155.00	$4,800.00	$4,896.00	$4,994.00	$2,547.00	$28,392.00
Calculated Direct Costs	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Non-personnel Subtotal	$30,915.00	$5,881.50	$6,009.95	$6,141.37	$3,728.79	$52,676.61
Totals						
Total Direct Cost	$112,164.27	$88,617.86	$90,277.99	$60,307.06	$59,519.43	$410,886.61
Total F&A Costs	$16,824.64	$13,292.69	$13,541.70	$9,046.06	$8,927.92	$61,633.01
Totals Subtotal	$128,988.91	$101,910.55	$103,819.69	$69,353.12	$68,447.35	$472,519.62

[1]Includes graduate student stipend, $2400/month for 36 mos (9% fringe rate), 2023-2025; salary for Haworth at $5,000/mos, and technician salaries $15-17.50/hr (27% fringe).
[2]Includes a backpack electrofisher and two submersible antennas
[3]Includes PIT tags, PIT tag detectors, sampling gear, antennas, tuners, batteries

The in-kind or cash matching contributions required by CWCB are identified below, and include services and equipment donated or purchased by CSU and CPW (equipment only, no salary), and a portion of cash from CSU. We also submitted a proposal to CPW for assistance with matching funds, and need to confirm if that has been funded.

In-kind or secure cash matching funds summary.

Category	2023	2024	2025	2026	2027	totals
In-kind, equipment (Parks and Wildlife)	6500	6630	6763	6898	7036	33826
In-kind CSU salaries + fringe (1+ mos. each, Bestgen, Wohl)	32385	33033	33693	34367	35055	168533
subtotal	38885	39663	40456	41265	42090	202359
Cash, secure, purchased equipment (CSU)	8800					8800
Cash, secure, CSU discretionary fund	12000	12000	12000	12000	12000	60000
subtotal	20800	12000	12000	12000	12000	68800
total	59685	51663	52456	53265	54090	271159

The secure cash match in the budget is verified by Dr. Kathryn Stoner, Head, Department of Fish, Wildlife, and Conservation Biology, Colorado State University, in an attached letter.

Qualifications and Roles

Dr. Kevin Bestgen- Director, Larval Fish Laboratory, Senior Research Scientist, Dept. of Fish, Wildlife and Conservation Biology, Colorado State University
As a fish ecologist working in arid-land streams of the West, including Colorado, Dr. Bestgen has focused on understanding habitat needs of native fishes and means to restore them in regulated systems where water demands are high. He has worked on Front Range rivers for 40 years, collecting extensive data on distribution and status of native fishes in the Cache la Poudre and Big Thompson rivers. He also assisted with development of an Ecological Response Model for native fishes, trout, and other ecosystem attributes for the Poudre River.

Dr. Bestgen will serve as co-principal investigator for the project, taking a lead role in study design, field work planning, some field work, data analysis and reporting, and grant administration.

Matt Haworth- Research Associate III, Larval Fish Laboratory, Dept. of Fish, Wildlife and Conservation Biology, Colorado State University
Mr. Haworth has extensive field and laboratory research experience studying the ecology of fishes of the Central and Western Great Plains, including those native to Colorado's Front Range streams. His areas of interest and expertise include ecology and conservation of native fishes, field sampling, taxonomy, age and growth analysis, and effects of altered hydrology on reproduction and survival of stream fishes.

Mr. Haworth will serve as co-principal investigator, taking lead role in field research activities, and study design, fieldwork planning, and data analysis and reporting.

Dr. Ellen Wohl- Professor, Department of Geosciences, Colorado State University
Dr. Wohl's work is prominent and globally known across fluvial sciences and beyond, with contributions that include interactions between river profiles and tectonism, the influences of large wood on river flow and geomorphology, historic benchmarking of flooding in rivers, debris flows, carbon cycling and biogeochemistry, ecological river restoration, and the historical role of beavers in post-glacial floodplain development. She has worked extensively in the Poudre River basin and other Front Range streams.

Dr. Wohl assisted with proposal preparation and will supervise a graduate student (to be named) who will map, monitor, and study entrainment of sediment and ash in the Poudre River basin. A M.S. thesis is expected as a result of these studies. Dr. Wohl's time will be contributed as in-kind service.

Mr. Kyle Battige- Biologist, Colorado Parks and Wildlife, Fort Collins, Colorado
Mr. Battige has worked for more than a decade in Colorado streams, understanding native and sportfish interaction with invasive predators, and documenting native fish and stream salmonid response to flow and watershed disturbance.

Mr. Battige will continue collection of salmonid distribution and abundance data in the canyon and transition zone sections of the Poudre River, adding to an extensive historical record that will be used to document recovery of that resource post ash flow. He assisted in proposal development and will provide data analysis and report writing contributions when data are summarized. His time will be contributed as in-kind service, along with equipment and travel.

Mr. F. Boyd Wright- Biologist, Colorado Parks and Wildlife, Fort Collins, Colorado
Mr. Wright has worked for more than a decade in Colorado streams, understanding native and sportfish response to invasive predators, and documenting native fish and habitat relationships while conserving this resource.

Mr. Wright will continue collection of native fish distribution and abundance data in the Poudre River drainage, including tributaries, adding to an extensive historical record that will be used to support native fish conservation efforts in this study. He assisted in proposal development and will provide data analysis and report writing contributions when data are summarized. His time will be contributed as in-kind service, along with equipment and travel.

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Table 1. Proposal tasks, their principle objectives, and the projected benefit of each to the Cache la Poudre River and other Colorado watersheds.

Task	Objective	Benefit
1	Monitor fish community composition throughout reaches previously monitored by CPW and CSU to assess recovery from the 2021 fish kill.	Provide an example of fish community response to an historic wildfire disturbance in a large Colorado watershed.
2	Study the role of existing fish passage structures in facilitating recolonization in fragmented river reaches.	Improve understanding of how investment into passage infrastructure benefits fish populations in fragmented river networks as part of post-wildfire mitigation strategies.
3	Monitor efforts to enhance or repatriate populations of rare and endangered fishes historically found in the Poudre River transition zone.	Provide managers a case study of how large disturbance events may be utilized as an opportunity to benefit rare and endangered species as part of post-wildfire mitigation strategies.
4	Measurement and mapping of sediment deposition, retention, and transport associated with the 2021 Black Hollow debris flow.	Provide context to the effects of wildfires on sediment transport dynamics and associated influence on riverine and riparian habitat, water quality, recovery of fish populations, and continued risks from additional sediment flows in a large Colorado watershed.

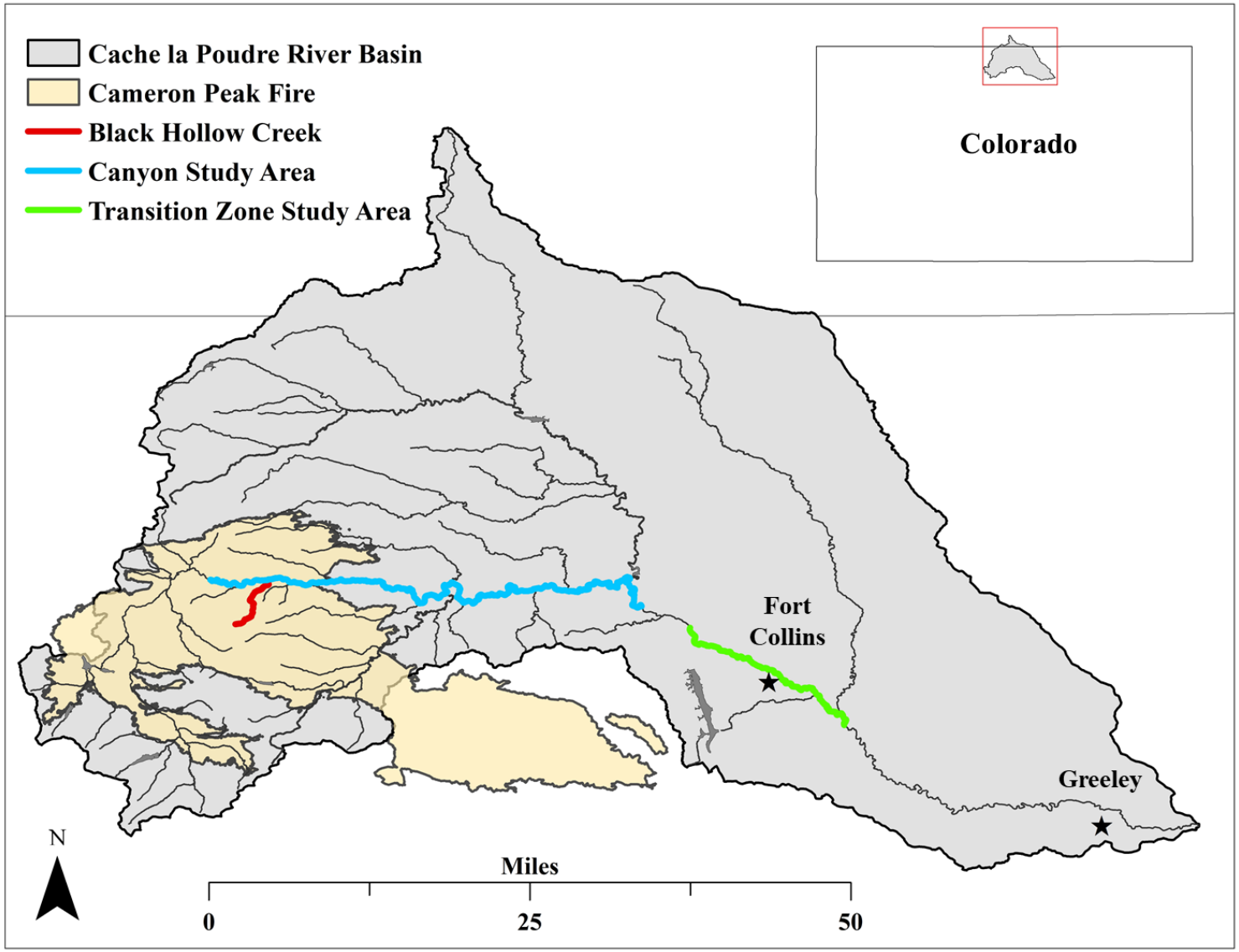


Figure 1. Extent of the Cameron Peak Fire, source of the Black Hollow debris flow, and proposed study area within the Cache la Poudre River basin in north-central Colorado.

A.

B.

Figure 2. Sediment and ash deposition in channel-margin habitat following the summer 2021 ash flow in the Poudre River (image A, upper, image credit M. Haworth), and suffocated trout (image B, lower, image credit Jason Clay, Colorado Parks and Wildlife).

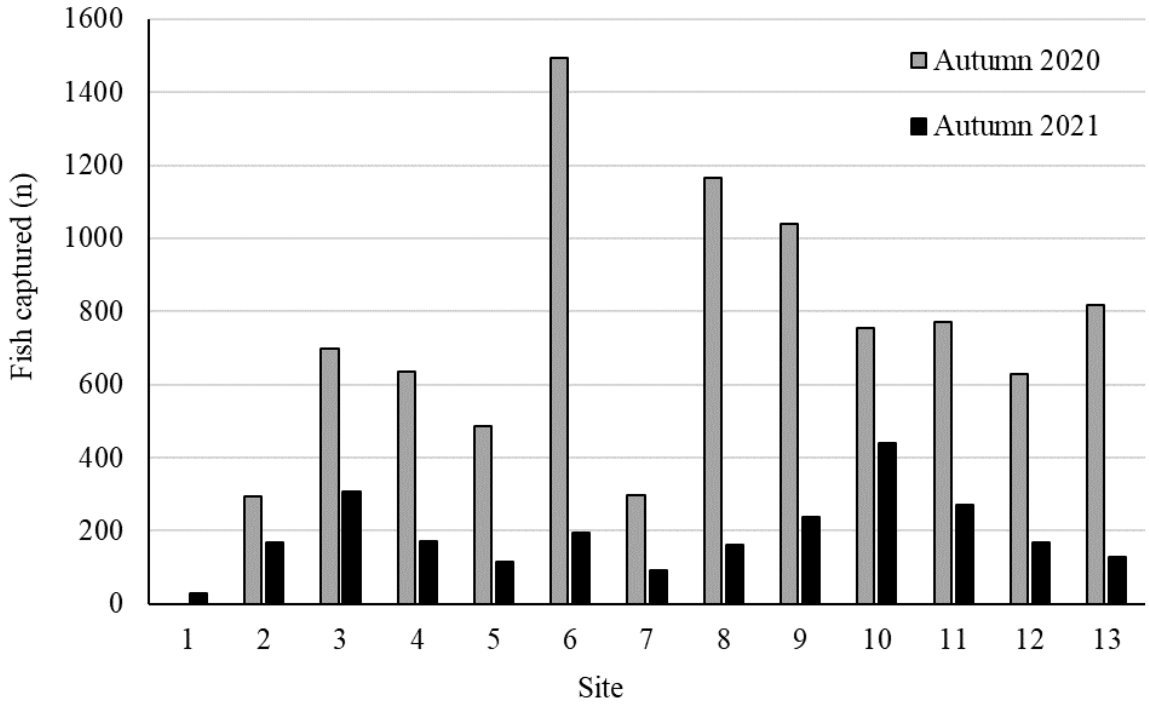


Figure 3: Total number of fish captured at thirteen sampling sites in the Cache la Poudre River transition zone in autumn 2020 (pre ash flow) and 2021 (post ash flow). No sampling occurred at the most upstream Site 1 (Watson Lake State Wildlife Area) in autumn 2020.

Task	Description	Target start date	Target end date	Grant request	Cash Match, secure	In-kind match	Total funding$
1	Monitor fish community composition throughout reaches previously monitored by CPW and CSU to assess recovery from the 2021 fish kill.	**Spring 2023**	**Spring 2027**	**171300**	**24942**	**73360**	**269602**
2	Study the role of existing fish passage structures in facilitating recolonization in fragmented river reaches.	**Spring 2023**	**Summer 2027**	**100660**	**14656**	**43108**	**158424**
3	Monitor efforts to enhance or repatriate populations of rare and endangered fishes historically found in the Poudre River transition zone.	**Spring 2023**	**Spring 2027**	**32400**	**4718**	**13875**	**50993**
4.1	Assessing current sediment storage in the mainstem Poudre River and the mouths of larger tributaries.	**Spring 2023**	**Autumn 2025**	**35220**	**5128**	**15083**	**55431**
4.2	Complete detailed assessment and monitoring of sediment characteristics and retention at a subset of 10 locations.	**Spring 2023**	**Autumn 2025**	**35220**	**5128**	**15083**	**55431**
4.3	Quantitatively evaluate thresholds for fine sediment entrainment and mobilization.	**Spring 2023**	**Autumn 2025**	**35220**	**5128**	**15083**	**55431**
5	Final Report		**Winter 2027**	**62500**	**9100**	**26766**	**98366**
	Budget total			**$472,520**	**$68,800**	**$202,359**	**$743,679**

Total secure cash contributions (68,800) are an electrofisher (8800 once and 12,000 annual discretionary),

total in-kind costs of $271,159 allocated as a % of total budget

City of Fort Collins Natural Areas

1745 Hoffman Mill Road
PO Box 580, Fort Collins, CO 80522-0580

JEN SHANAHAN / SENIOR WATERSHED PLANNER
NATURAL AREAS DEPARTMENT

970-218-8858 /C
jshanahan@fcgov.com /E

June 26, 2022

Chris Sturm, Colorado Water Conservation Board
2829 W. Howard Pl.
Denver, CO 80204

To Chris Sturm and the Colorado Water Conservation Board,

The City of Fort Collins Natural Areas Department would like to express its support for the proposed study: *Recovery and resilience of the Cache la Poudre River fish community and habitat following a wildfire-related fish kill.* The City is excited to see this proposal come to fruition because it accomplishes two valued goals. First it will carry forward the data collection and reporting on several existing data sets. Second, it will provide new analysis on existing and new data to weave together a more complete story of fishery health in the context of changing land use, development, river and floodplain management, climate change and the extreme stressor of post-fire sediment.

The joint proposal from Colorado State University and Colorado Parks and Wildlife aquatic biologists represents an important new collaboration between the Poudre Basin's leading aquatic biologists. Collectively they hold over a century's worth of experience and first-hand knowledge of the Poudre's fish communities. The addition of Dr. Ellen Wohl to compliment the biological findings with critical new understanding of sediment dynamics is fortunate and much appreciated in the wake of the wildfire and fish kills.

The Natural Areas Department is invested in taking a data- informed approach to management. While there are a lot of local efforts and initiatives aimed at supporting and improving the health and resilience of the Poudre River there is still a paucity of river-wide ecologically integrated data sets. The City envisions the findings of this study may support:

- the next Poudre River Health Assessment and Report Card (led by the Coalition for the Poudre River Watershed),
- the City and regional efforts aimed at protecting and improving ecological flows,
- the City's approach to managing large wood in the channel for public safety and habitat,
- and techniques applied to major river restoration initiatives.

Overall, the City perceives that the integration of study objectives and data sets across these agencies will lead to a much stronger conversation and ability by local natural resource management agencies to more effectively support the health of the fish populations. Lastly and perhaps most importantly, many stakeholders and community members are interested to know more about the fish populations and know that managers are taking actions to support the fishery in the wake of the fires. Lessons learned here will surely be of interest to anglers and public who recreate on the Poudre River and across Colorado.

Thank you for your consideration.

Jen Shanahan

Jen Shanahan, Senior Watershed Planner

City of Greeley Colorado

June 29, 2022

Mr. Chris Sturm
Watershed Protection Director
1313 Sherman Street, Rm. 718
Denver 80203

Dear Mr. Sturm,

Greeley Water hereby pledges its formal support for the river health research proposal by Colorado State University's Drs. Bestgen and Wohl, and M. Haworth, and from Colorado Parks and Wildlife (K. Battige and F. B. Wright). We appreciate the science-based approach to understanding river health and the resilience of the Cache la Poudre River fish community and habitat following the Cameron Peak Fire and Black Hollow flash flood-related fish kill. Studying the recovery and resilience of the aquatic community in the Poudre River and identifying future impacts of additional sediment and ash flows associated with fires will be extremely valuable in the months and years ahead. The results of this research will be important when navigating a new and uncertain future that likely contains more arid forests, more prolific wildfires, and more regular flood events, washing sediment and debris into the water supply.

Water users and managers in the Cache la Poudre Basin face many challenges in meeting the municipal, industrial, recreational, and agricultural water needs while protecting environmental resources. These challenges can lead to conflicts that force water users to make difficult choices in meeting their existing and future needs. Project findings will be relevant in quantifying the status and recovery of aquatic resources and habitat health in the affected reach of the Poudre River. This research will inform post-wildfire mitigation planning to preserve and enhance the Poudre River watershed, protecting the health and resilience of aquatic habitat and communities, supporting recreation and angler interests, maintaining water quality, and understanding sediment transport and deposition dynamics.

Lastly, we support the project because we know Colorado's future will unfortunately include more severe fires in critical watersheds, and therefore, we anticipate project findings will benefit communities in other basins throughout the state that face similar threats related to increased risk of wildfire. We find the collaboration of Colorado State University and Colorado Parks and Wildlife particularly well suited to this valuable watershed health work.

In closing, we support the research described above and encourage you to fully fund the CWP grant request for this project. Please contact us if you have questions about our letter of support.

Sincerely,

Michaela Jackson
Water Quality and Regulatory Compliance Manager

cc: Sean Chambers, Director of Water & Sewer Utilities

Coalition for the Poudre River Watershed
320 East Vine Drive Suite 317
Fort Collins, CO 80524
(970) 222-5754
www.poudrewatershed.org

Chris Sturm
Colorado Water Conservation Board
1313 Sherman St. Room 721
Denver, CO 80203

June 24, 2022

RE: Support for the *Recovery and resilience of the Cache la Poudre River fish community and habitat following a wildfire related fish kill* Proposal to the Colorado Water Plan Grant

Dear Mr. Sturm,

On behalf of the Coalition for the Poudre River Watershed (CPRW), I am writing in support of Colorado State University's application to the Colorado Water Plan-Environmental and Recreation Project grant to study the impacts of the 2021 Black Hollow debris flow on fish and aquatic habitat in the river. CPRW's mission is to improve and maintain the ecological health of the Poudre River Watershed through community collaboration. Since the onset of the Cameron Peak Fire, we have coordinated with stakeholders, partners, and researchers to help prioritize, plan, and implement critical post-fire needs. The largest concern following the fire has been the post-fire hillslope erosion and subsequent sedimentation, debris flows, nutrient loading etc. Unfortunately, the monsoon season last year caused massive amounts of ash and sediment to enter the river throughout the summer, and on July 21st, the Black Hollow debris flow occurred resulting in the loss of human life and massive amounts of sediment that resulted in a complete kill of the fish in the Poudre downstream of the flood.

CSU's proposal will provide valuable data to help answer questions related to the resilience and recovery of the fish community impacted by the Fire and subsequent Black Hollow flood in the Poudre. The findings from this project will be crucial to inform future post-fire mitigation planning for the river, and the data collected will be used to track the health and resilience of the aquatic community, water quality, future recreation, and sediment transport. As one of the key organizations in the basin that has been working for over 10 years with stakeholders and partners to improve watershed resilience, reduce wildfire risk, and recover from the 2012 and now 2020 CPF, I encourage you to fully fund CSU's request. If you have any questions about my support of their proposal, please don't hesitate to contact me.

Sincerely,

Hally Strevey

Hally Strevey
Executive Director

COLORADO
Parks and Wildlife
Department of Natural Resources

317 W. Prospect St.
Fort Collins, CO 80526
970.472.4339 | F 970.472.4458

June 30, 2022

Mr. Chris Sturm
Watershed Protection Director
Colorado Water Conservation Board
1313 Sherman St., Rm 718
Denver, CO 80203

RE: CPW Letter of Support for the Cache la Poudre River post-fire resilience study

Dear Mr. Sturm,

Colorado Parks & Wildlife (CPW) is supportive of the study, "Recovery and resilience of the Cache la Poudre River fish community and habitat following a wildfire-related fish kill," proposed by Colorado State University's Larval Fish Lab, in collaboration with other Colorado State University faculty and CPW Aquatic Biologists. The proposed five-year study would provide a thorough understanding of the impacts of ash and sediment flows resulting from a rainstorm event in July 2021 over a burn scar in the Black Hollow Creek drainage of the Cache la Poudre (Poudre) River. The rain event, occurring over a portion of the area burned by the Cameron Peak fire in 2020, mobilized massive amounts of ash, sediment and debris into the Poudre River. This resulted in a complete fish kill extending at least 16 miles downstream, and a major kill extending more than another 30 miles, well downstream of the City of Fort Collins. The event impacted not only the high-value trout fishery within the Poudre Canyon, but also the transition zone and warmer-water native fish community further downstream, which includes several species identified as Species of Greatest Conservation Need in Colorado's State Wildlife Action Plan (2015).

As large wildfires become more prevalent in Colorado and throughout the West, very often followed by ash and sediment flow events, it is increasingly important to understand the response of different biotic communities and their habitats. This knowledge will not only facilitate assessment of risk to aquatic communities, but will assist with post-wildfire mitigation planning throughout the Poudre watershed and elsewhere.

The proponents of this study are very well-positioned to carry it out and maximize the knowledge gained. The faculty study leaders include nationally and internationally-recognized leaders in stream fish ecology and fluvial geomorphology, and have decades of experience studying Front Range fishes and ecosystems. Additionally, the collaborators have an extensive historical data set collected at as many as 25 sites in the study area over a period of up to 30 years for some sites. This record, in conjunction with the field insights gained over the course of

collecting these data, make the proponents particularly well-equipped to understand impacts and track the recovery of fish populations. Biological data will be paired with sediment mapping, monitoring, and entrainment data to determine aquatic habitat resilience and understand the mechanisms driving fish community response.

This project supports CPW's mission to perpetuate the aquatic wildlife resources of the state, by expanding and updating our knowledge of fish community status in the Poudre River, and by potentially improving our ability to understand post-wildfire runoff events. CPW Aquatic Biologists will continue to monitor and manage the fishery throughout the duration of the project.

Thank you for your consideration of this project.

Sincerely,

Harry Crockett
Native Aquatic Species Coordinator

George J. Schisler, Ph.D.
Aquatic Research Chief

South Plate Basin Roundtable

July 20, 2022

Colorado Water Conservation Board
1313 Sherman Street, Room 718
Denver, CO 80203

Dear Colorado Water Conservation Board,

At our recent South Platte River Basin Roundtable meeting on July 12, 2022, we reviewed a CWP grant request and presentation by scientists from Colorado State University (Drs. Bestgen and Wohl, and M. Haworth) and from Colorado Parks and Wildlife (K. Battige and F. B. Wright) entitled "Recovery and resilience of the Cache la Poudre River fish community and habitat following a wildfire-related fish kill". The research aims to examine effects of a recent sediment and ash flow in the Poudre River from the Black Hollow Creek drainage, which experienced a post fire flash flood in 2021 that caused a large fish kill and alterations to habitat. The ash flow was a direct result of rain on the burn scar of the large Cameron Peak wildfire that burned through the latter half of 2020. The Roundtable views this as an important study on the recovery and resilience of the aquatic community in the Poudre River. We are hopeful that the work will identify future watershed risks of additional sediment and ash flows associated with fires in the months and years ahead. This will be important when navigating an uncertain future that likely contains more arid forests and more prolific wildfires. Roundtable participants supported the project and recommended grant funding without opposition.

Water users and managers in the South Platte Basin currently face many challenges meeting municipal, industrial, recreational, and agricultural water needs while maintaining or enhancing environmental resources. These challenges can lead to conflicts that force water users to make difficult choices in meeting their existing and future needs. We feel this project will enhance our ability to meet our strategic goals particularly to "Protect and enhance watersheds". Coloradans and tourists regularly enjoy the recreational opportunities and environmental features of the Poudre Basin, including high-value native and recreational fisheries and whitewater recreation.

Project findings will be relevant to identify the status and recovery of fishery and aquatic resources and habitat in the affected reach of the Poudre River. This information will inform ongoing post-wildfire mitigation planning to protect and enhance the Poudre River watershed, including the health and resilience of aquatic communities, aquatic habitat, recreation and angler interests, water quality, and sediment transport and deposition dynamics, especially as ongoing climate change affects precipitation patterns and water supply characteristics. Information generated by this project aligns well with the South Platte Basin Implementation Plan and the vision to protect and enhance watershed, environmental, and recreational attributes, as well as manage risks of climate change. In addition, we anticipate the project findings will benefit communities in other basins that face similar threats related to wildfire.

In closing, we support the research described above and encourage you to fully fund this project. Please contact us if you have questions about our letter of support.

Sincerely,

Sean P. Chambers
Chair, South Platte Basin Round Table

Colorado State University

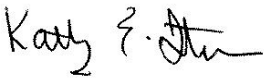
Department of Fish, Wildlife, and Conservation Biology
1474 Campus Delivery
Fort Collins, CO 80523-1474
Dept. Office: 970-491-5020
Fax: 970-491-5091

June 28, 2022

Dear Colorado Water Conservation Board,

I am writing to verify partial match cash funding support for a proposal submitted to your agency by Dr. Kevin Bestgen of my staff that is entitled "Recovery and resilience of the Cache la Poudre River fish community and habitat following a wildfire-related fish kill". Dr. Bestgen has annual discretionary funding available to him and he will minimally be able to provide up to $12,000 annually over this five-year project, and possibly more. We are also searching for additional matching fund support and have submitted a proposal to Colorado Parks and Wildlife for that, which is pending approval. Please contact me if you have questions about this letter of support verification.

Sincerely,



Kathryn E. Stoner, Head and Professor
Department of Fish, Wildlife and Conservation Biology
Colorado State University

http://warnercnr.colostate.edu/fwcb