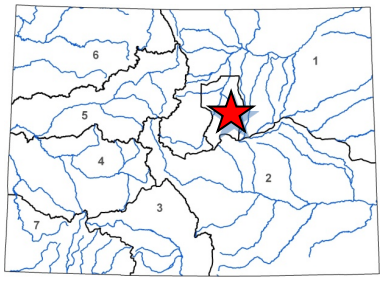
COLORADO
Colorado Water Conservation Board
Department of Natural Resources

West Plum Creek Stream Management Plan, Phase 1
River Network

January 2022 Board Meeting

Colorado Watershed Restoration Program Application



LOCATION	
County/Counties:	Douglas
Drainage Basin:	Metro/South Platte

DETAILS	
Total Project Cost:	$296,786
Colorado Watershed Restoration Program Request:	$220,787
Recommended amount:	$220,787
Other CWCB Funding:	$0
Other Funding Amount:	$70,999
Applicant Match:	$5,000
Project Type(s): Planning	
Project Category(Categories): Stream Management Plan	
Measurable Result: Stream Health Assessment, Landowner Engagement Plan, Identified projects, e.g. fish passage projects	

West Plum Creek is the last relatively unaltered transition zone stream in the South Platte Basin and is perhaps the best example of a nearly intact fish assemblage along Colorado's Front Range.

1 Northern Redbelly Dace

It is home to important plains fish species including Northern Redbelly Dace (State Endangered), Common Shiner (State Threatened), and Iowa Darter (Species of Special Concern), as well as the Northern Leopard Frog (Species of Special Concern) and the Preble's meadow jumping mouse (federally Threatened Species). West Plum Creek has long been identified as an important conservation priority; as early as 1996 the Colorado Natural Heritage Program identified "an extraordinary number of rare or imperiled species, demonstrating that this (West Plum Creek) macrosite represents a significant proportion of Douglas County's biological diversity." Land along the creek corridor is predominantly privately owned and consists of rural ranchettes and small-acreage agriculture.

Colorado Parks and Wildlife (CPW), alongside partners including River Network, US Fish and Wildlife Service (USFWS), Douglas County's Division of Open Space and Natural Resources, Chatfield Watershed Authority, and others see a need for a Stream Management Plan (SMP) to assess native fish habitat, improve water quality, and better understand hydrology and opportunities in water management with the water users. This project aims to build on years of aquatic data collection by CPW and others to fully document existing conditions and identify risks to fish populations that may threaten the persistence of these State-listed species in the watershed. Of primary importance is documenting fish passage barriers and understanding the hydrologic regime of the watershed, and how to maintain its integrity into the future.

Phase 1 of this SMP will focus on stream condition assessment and characterization, development of objectives to reduce risk to native fish populations, identification of priority projects for fish passage, and landowner engagement. A subsequent phase will identify and prioritize opportunities in water management, water quality, and river/riparian restoration alongside water users.

COLORADO WATERSHED RESTORATION PROGRAM GRANT APPLICATION
September 2021

West Plum Creek Stream Management Plan, Phase 1

PROJECT PROPOSAL SUMMARY SHEET

Project Title: West Plum Creek Stream Management Plan, Phase 1
Project Location: West Plum Creek is a small stream located in Douglas County, CO within the South Platte River Basin. It flows from the Palmer Divide south into Chatfield Reservoir. The project area includes the mainstem of West Plum Creek and its tributaries (Gove Creek, Bear Creek, Spring Creek, Jackson Creek and Garber Creek) from the National Forest boundary to the confluence with East Plum Creek. (39.218613 N -104.987933 W, south to 39.430231 N -104.969756 W). These boundaries align with the Riparian Conservation Zone for Preble's Meadow Jumping Mouse habitat. The project area encompasses 21 miles of the mainstem and 30 miles of tributaries within six HUC-12s: the entirety of 101900020606 and portions of 101900020601, 101900020602, 101900020603, 101900020604, and 101900020605. See Attachment A for location maps.

Grant Type: Stream Management Plan
Grant Request/Amount $220,787
Cash Match Funding: $44,999
In-kind Match Funding: $31,000

Project Sponsor(s) : River Network (Fiscal Agent), Colorado Parks and Wildlife
Contact person name, email address, and phone number: Nicole Seltzer, nseltzer@rivernetwork.org, 970-744-0324

Brief description of the project:

West Plum Creek is the last relatively unaltered transition zone stream in the South Platte Basin and is perhaps the best example of a nearly intact fish assemblage along Colorado's Front Range. It is home to important plains fish species including Northern Redbelly Dace (State Endangered), Common Shiner (State Threatened), and Iowa Darter (Species of Special Concern), as well as the Northern Leopard Frog (Species of Special Concern) and the Preble's meadow jumping mouse (federally Threatened Species). West Plum Creek has long been identified as an important conservation priority; as early as 1996 the Colorado Natural Heritage Program identified "an extraordinary number of rare or imperiled species, demonstrating that this (West Plum Creek) macrosite represents a significant proportion of Douglas County's biological diversity." Land along the creek corridor is predominantly privately owned and consists of rural ranchettes and small-acreage agriculture.

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1) Qualifications Evaluation

Identify the lead project sponsor and describe the other stakeholders' level of participation and involvement

In early discussions among key stakeholders, including CPW, **River Network** was identified as a lead project sponsor and fiscal agent for this SMP. River Network will oversee day-to-day management of the project tasks, hire all contractors, oversee an Advisory Committee and manage project finances and reporting.

CPW will contribute towards the strategic vision for the project, conduct field work to support the project, chair the project Advisory Committee, and work to coordinate agency staff involvement.

Douglas County's Division of Open Space and Natural Resources will coordinate the stream health assessment field work through the Site Conservation Team for the Preble's Meadow Jumping Mouse.

Chatfield Watershed Authority will assist with wastewater plant operator outreach, landowner engagement, limited water quality sampling and data analysis, and participation in the Advisory Committee.

Douglas County Conservation District will assist with developing a landowner engagement plan to understand how residents use the creek and what they value in West Plum Creek and their ideas for long-term protection opportunities.

Specify in-kind services and cash contributions (match) amount for the proposed activities. See section B.2 of the grant program guidance to determine match funding requirements. Discuss whether other funding sources are secured or pending.

During this time of transition of the Watershed Restoration Program grants being rolled into Colorado Water Plan grants, CWCB's Chris Sturm verbally communicated to River Network that we should use the CWP match requirements of 25% for studies, rather than the Watershed Restoration program requirements of 50%. This budget reflects that conversation.

Colorado Parks & Wildlife: cash ($25,000, secured)

US Fish & Wildlife Service: cash ($9,999, secured)

Chatfield Watershed Authority: cash ($5,000, secured), in-kind ($5,000, secured)

River Network: cash ($5,000 secured)

Douglas County's Division of Open Space and Natural Resources: in-kind ($21,000, secured)

Douglas County Conservation District: in-kind ($5,000, secured)

2) Organizational Capability

What is the applicant organization's history of accomplishments in the watershed? Provide several past project or planning examples. List partner organizations and agencies with whom applicant worked to implement past projects or planning efforts.

River Network has initiated over ten SMPs in Colorado since 2017, including in the St. Vrain, Big Thompson, and Purgatoire watersheds on the Front Range. Our knowledge of the SMP process will result in an efficient and effective SMP in West Plum Creek. We will rely on our partners with longstanding history in the watershed, including

CPW, Douglas County's Division of Open Space and Natural Resources and the Douglas County Conservation District, to bring the local knowledge and relationships that are required for a successful SMP. There is no locally based non-profit watershed group or coalition with experience in SMPs to do the heavy lifting of coordinating this effort, which is why CPW asked River Network to step forward.

CPW staff involved in this SMP have assisted with other SMPs in a technical advisor capacity, including the St.Vrain and Lefthand SMP, S. Boulder Creek SMP, and Cache La Poudre River Health Assessment (State of the Poudre). Within the West Plum Creek watershed, CPW has a long history of aquatic monitoring and is deeply vested in the long-term conservation of the watershed. CPW also brings a local presence and longstanding landowner relationships.

Douglas County's Division of Open Space and Natural Resources brings unparalleled local knowledge, particularly on the history of land and water management in the watershed. They also coordinate the Preble's Meadow Jumping Mouse Site Conservation Team which supports US Forest Service efforts to assess habitat for this endangered species.

Chatfield Watershed Authority was established in 1984 to promote protection of water quality in the Chatfield Watershed for recreation, fisheries, drinking water supplies, and other beneficial uses. Through its members, it has monitored water quality in the reservoir and is charged with implementing point source, nonpoint source and stormwater controls pursuant to the Chatfield Reservoir Control Regulation #73.

What level of staffing will be directed toward the implementation of the proposed project/planning effort? Discuss the number of staff and amount of time dedicated for the project. Will volunteers be utilized, and if so, how? Include brief resumes for each member of the active project team.

This project will be staffed through a mix of paid and in-kind staff, interns and consultants. Project coordination and management of all tasks will be provided by River Network staff (totaling 0.45 FTE). Douglas County's Division of Open Space and Natural Resources staff, through their efforts to coordinate the Site Conservation Team as well as paid summer field interns, will oversee and conduct field data collection (two half-time FTEs during the field season). A part-time coordinator will assist the project team with understanding landowner needs and conduct outreach activities (0.3 FTE). Chatfield Watershed Authority, through their Technical Consultant RESPEC, will assist with water quality sampling and analysis and outreach to landowner and wastewater providers. CPW staff will conduct fisheries field work and lead the Advisory Committee.

Contractors will be hired as needed to conduct specific assessments that may be outside the skillset of summer field interns (hydrology and water rights, habitat quality, etc).

Key project personnel include:

Nicole Seltzer, River Network: Nicole leads a small team of watershed planning and capacity building professionals and has been involved in a number of Stream Management Plans in Colorado.

Mikhaela Mullins, River Network: Mikhaela will utilize her experience in sustainable agriculture education and supporting Colorado coalitions' efforts to

engage agricultural stakeholders in river health initiatives for the project.

Boyd Wright, Colorado Parks & Wildlife: Boyd spearheads conservation efforts for native fish and amphibians in the South Platte River Basin for CPW. Boyd has participated in multiple SMPs in a technical advisory role and has been monitoring aquatic communities in West Plum Creek for ten years.

Andy Hough, Douglas County's Division of Open Space and Natural Resources: Andy, as the environmental resources coordinator, has decades of experience in wildlife management, habitat assessment and improvement, T & E species management, wildlife & aquatic inventory, water quality, land management, landowner relations and coordination of environmental initiatives with diverse resource agencies and stakeholder groups.

Alan Leak, Chatfield Watershed Authority Technical Advisory Committee / RESPEC: Alan has 39 years of experience in Stormwater, Water Resources, and Water Rights Engineering and has been involved with all aspects of Stormwater Management. He is the Technical Advisor to Chatfield Watershed Authority.

Demonstrate that the project budget and schedule are realistic. Please use the budget/timeline spreadsheet attached to the application. Please note that the start date will take place after funding awards are announced and grants are contracted.

The project will combine the skills, financial resources and staff capacity of several organizations so as to not overwhelm any one agency. River Network is well-versed in the staffing and knowledge needed to successfully complete a Stream Management Plan, and is confident that the combined talents of their staff, Colorado Parks & Wildlife, Douglas County's Division of Open Space and Natural Resources, Chatfield Watershed Authority and paid consultants will achieve the project goals on time and within budget. The project schedule allows for two field seasons if needed, and the overall project is phased. Phase 1 will focus on stream condition assessment and characterization, development of objectives to reduce risk to native fish populations, identification of priority projects for fish passage, and land and water rights owner engagement. A subsequent phase will identify and prioritize opportunities that may require more in-depth technical and legal conversations such as water management, water quality and river/riparian restoration.

3) Proposal Effectiveness

What information is the project sponsor using to develop the proposed plan or project? Include any relevant information regarding existing watershed plans, stream management plans, geomorphic assessments, flood studies, fire protection plans, riparian conditions assessments, aquatic/terrestrial habitat conditions, wildlife studies, and/or river restoration reports.

The project area has long been identified as a conservation priority by Colorado Parks and Wildlife (2015 State Wildlife Action Plan, pg. 148) and the Colorado Natural Heritage Program (1996 Natural Heritage Resources of Douglas County and Their Conservation). It is also within the nonpoint source reduction area of the Chatfield Watershed Authority for Total Phosphorus and chlorophyll-*a* (2015 Chatfield Watershed Plan).

An inventory of existing data was completed to support this project (Attachment B).

Data reviewed includes: USGS stream gauge data, CPW R2CROSS data, historical and current CPW fish monitoring data, State of Colorado CDSS data including locations and status of existing and historical in-stream structures, Colorado Geological Survey surficial geology maps, NRCS soil maps, historical and current water quality data from various sources (CDPHE, EPA, River Watch, Chatfield Watershed Authority, Colorado School of Mines), benthic macroinvertebrate community data from CDPHE and EPA, LiDAR topography data, digital elevation model and relative elevation model data, active and potential floodplain extent data, National Land Cover Database data, National Wetlands Inventory wetland mapping, and Douglas County riparian mapping.

In addition, several reports and surveys were reviewed including: 2021 Chatfield watershed modeling of future scenarios including additional development, stream restoration, and wildfire; 2020 Sandstone Ranch botanical survey; 2019 Sandstone Ranch baseline documentation report; 2018 Sandstone Ranch Open Space natural resource inventory and analysis; 2015 Chatfield Watershed Plan; 2016 Master Plan completed for Mile High Flood District; and 2013 Chatfield Reservoir Reallocation Project Mitigation Plan.

More information about existing data sources, as well as identification of data gaps, is provided in the West Plum Creek Existing Data Summary memorandum (Attachment B).

Discuss the multiple objective aspects of the project and how they relate to each other. Describe similar activities in the watershed and how this project or plan complements but does not duplicate those activities. Multiple objectives may include (but are not limited to) channel stabilization, riparian re-vegetation, habitat improvement, recreation opportunity enhancement, natural hazard reduction, flood mitigation, water supply delivery improvement, fish migration improvement, ephemeral/intermittent channel stabilization, and upland erosion mitigation.

This project's primary objective is to eliminate threats to native fish populations in West Plum Creek. Within that overarching objective are multiple other objectives, including: infrastructure upgrades to alleviate fish passage barriers, actions to improve water quality (especially N, P and TSS), riparian corridor restoration, fish habitat quality, opportunities to restore flows or protect them from future degradation, and increasing local understanding of the conservation value of the creek.

Ongoing efforts in the project area that will complement this SMP include Douglas County's Division of Open Space and Natural Resources' Preble's Meadow Jumping Mouse Site Conservation Team and Sandstone Ranch Master Plan; Chatfield Watershed Authority's non-point source watershed plan; Mile High Flood District's Plum Creek, West Plum Creek, and East Plum Creek Major Drainageway Plan; and the Chatfield Reservoir Reallocation Project Fish Wildlife, and Recreation Mitigation Plan. While all of these data gathering and planning efforts will provide information relevant to this SMP, they are focused on different goals and will not recommend actions to protect native fish populations in West Plum Creek.

Describe the proposed monitoring or implementation plan. How will the project or plan measure success of its objectives?

Success of this planning effort will be measured in a few ways:

- Completion of all tasks on-time and on-budget
- Increased understanding by land and water rights owners of the conservation value of West Plum Creek
- Identification of priority fish passage projects that have landowner support and a clear implementation plan
- Agreement amongst the partners to continue on to Phase 2 to further identify and refine recommendations related to water quality, flow restoration/protection, riparian and river restoration actions, etc.

Scope of Work

GRANTEE: River Network & Colorado Parks & Wildlife
FISCAL AGENT: River Network
PRIMARY CONTACT: Nicole Seltzer
ADDRESS: P.O. Box 21387, Boulder, CO 80308
PHONE: 970-744-0324
PROJECT NAME: West Plum Creek Stream Management Plan, Phase 1
GRANT AMOUNT: $220,787

INTRODUCTION AND BACKGROUND

West Plum Creek is the last relatively unaltered transition zone stream in the South Platte Basin and is perhaps the best example of a nearly intact fish assemblage in Colorado. It is home to important plains fish species including Northern Redbelly Dace (State Endangered), Common Shiner (State Threatened), and Iowa Darter (Species of Special Concern), as well as the Northern Leopard Frog (Species of Special Concern) and the Preble's meadow jumping mouse (federally Threatened Species). West Plum Creek has long been identified as an important conservation priority; as early as 1996 the Colorado Natural Heritage Program identified "an extraordinary number of rare or imperiled species, demonstrating that this (West Plum Creek) macrosite represents a significant proportion of Douglas County's biological diversity."

Colorado Parks and Wildlife (CPW), alongside partners including River Network, US Fish and Wildlife Service (USFWS), Douglas County's Division of Open Space and Natural Resources, and others see a need for a Stream Management Plan (SMP) to assess native fish habitat, improve water quality, and better understand hydrology and opportunities in water management with water users. This project aims to build on years of aquatic data collection by CPW and other researchers to fully document existing conditions and identify risks to fish populations that may threaten the persistence of these state listed species in the watershed. Of primary importance is documenting fish passage barriers and understanding the hydrologic regime of the watershed, and how to maintain its integrity into the future.

Phase 1 of this SMP will focus on stream condition assessment and characterization, development of objectives to reduce risk to native fish populations, identification of priority projects for fish passage, and landowner engagement. A subsequent phase will identify and prioritize opportunities in water management, water quality and river/riparian restoration alongside landowners and water users.

OBJECTIVES

1. Improve knowledge about creek characteristics, including:
    a. Fish habitat quality
    b. Fish populations and locations
    c. Fish passage barriers
    d. Hydrology: existing peak/base flows, dry-up points, longitudinal connectivity, lateral connectivity to the floodplain, on- and off-channel ponds, and threats to the hydrologic regime
    e. Riparian corridor quality and stream bank conditions
2. Establish trust and partnership between resource management agencies and landowners to

help all parties appreciate the conservation value of the creek, know what a healthy stream looks like, understand how land management practices impact creek health, and be aware of what opportunities exist to improve practices

3. Identify opportunities to improve stream conditions for native fish spawning/life cycles in terms of longitudinal connectivity, stream flow and velocity, substrate, cover, water depth, etc.
4. Improve water quality in the creek and its contributions to Chatfield Reservoir (especially N, P, sediment)
5. Improve riparian habitat quality, including floodplain connectivity and reduction in noxious weeds
6. Create a replicable model for other area tributaries, including East Plum Creek

TASKS

TASK 1 – STREAM HEALTH ASSESSMENT

Description of Task

This project will conduct a Stream Health Assessment to characterize native fish habitat quality, native fish populations and locations, fish passage barriers, hydrology, water quality and riparian corridor/bank conditions in the project area. The assessment will identify the primary stressors to native fish spawning and life cycles with the goal of ultimately developing recommendations for land management practices, creek restoration and fish passage barriers, and flow protection to reduce risk to native fish populations.

Method/Procedure

River Network and Alba Watershed Consulting completed a review of existing data sources for the project area in 2021 (Attachment B). We will utilize existing information for the assessment where possible. Known field data collection needs include: hydrology patterns including understanding or mapping spring contributions and "flow permanence" in the headwaters, water rights information, in-stream structure inventory, roadway crossings evaluation, macroinvertebrate monitoring, additional fish monitoring to understand the upper and lower distribution limits of State-listed species and species diversity along the entire longitudinal gradient of West Plum Creek, fieldwork measuring basic physical habitat metrics (pebble counts, maximum residual pool depth, width-to-depth ratio, entrenchment ratio, etc.), and an assessment of off-channel ponds.

The Stream Health Assessment will utilize the Colorado Stream Health Assessment Framework (CoSHAF) to organize and manage environmental datasets. The CoSHAF "grading scale" will be customized to assess ecological conditions against the needed habitat elements for existing native fish populations. The preferred habitat conditions that would inform the grading scale have already been identified by CPW (see species profile for Redbelly Dace as an example).

The Preble's Meadow Jumping Mouse Site Conservation Team, led by Douglas County's Division of Open Space and Natural Resources and utilizing summer field interns, will conduct field data collection on the terrestrial variables (riparian habitat, wetland complexes, bank condition, in-stream structure inventory). Colorado Parks and Wildlife staff will assist by providing all aquatic data and in the interpretation of fishery data analysis. Additionally, staff will assist in the collection of hydrology and water quality data as needed, and may conduct fishery surveys to fill any identified fish data gaps. Chatfield Watershed Authority will assist with water quality

data collection and analysis. Even with these combined efforts, the use of contractors will be necessary due to staff capacity limitations. Contractors will be used for hydrology/water rights assessments and CoSHAF grading at a minimum. River Network staff will coordinate all data collection and analysis work, assist with field work as needed and write up findings.

Deliverable

A Stream Health Assessment Technical Report will present all findings and identify primary stressors to native fish populations.

TASK 2 – LAND & WATER RIGHTS OWNER NEEDS ASSESSMENT & ENGAGEMENT

Description of Task

The upper watershed consists of US Forest Service or Douglas County's Division of Open Space and Natural Resources property, and the entire lower watershed is privately-owned land. Tract size ranges from 35 acres to large ranches greater than 1,000 acres, and many properties are held in conservation easement. In addition, there are water supply and water treatment facilities within the project area that influence creek flows and water quality both today and in the future. This task will be split into two parts: a landowner needs assessment and a water user needs assessment.

The goal of the landowner needs assessment and engagement will be to: 1) better understand the critical issues and priorities of private landowners in the project area, 2) create two-way communications between the resource management agencies (primarily Douglas County, Colorado Parks & Wildlife and Chatfield Watershed Authority) and landowners in the project area to help all parties appreciate the conservation value of the creek, and 3) begin to identify the opportunities that exist to improve native fish habitat that also meet landowner needs (full identification and prioritization would happen in Phase 2).

The goal of the water user needs assessment is to: 1) summarize existing water use and infrastructure that influences flow and water quality in the project area (agricultural and municipal supplies), 2) summarize any future plans for infrastructure expansion or development of conditional rights, or change of use in water rights, and how they may influence flows in the project area, and 3) begin to identify the opportunities that exist to improve native fish habitat and water quality that also meet water right owner needs (full identification and prioritization would happen in Phase 2).

Method/Procedure

- Landowner Needs Assessment
    - River Network will develop a landowner engagement plan, in coordination with Douglas County Conservation District, Chatfield Watershed Authority, and other organizations that regularly work with area residents
    - Engage a part-time coordinator to meet with and interview landowners on their priorities, current practices, and ideas for conservation actions using a questionnaire focused on: in-stream structures and infrastructure needs and their creek-related values

    - Present on the project at local meetings and write articles for local information sources such as the Douglas County News Press and the Douglas Conservation District newsletter.
    - Conduct at least one community field day to share back assessment findings and showcase the creek's habitat
    - Develop a summary report of interview findings
- Water User Needs Assessment
    - Engage the Coordinator to identify and conduct interviews with major agricultural water users that are not already captured in the Landowner Needs Assessment
    - Engage the Chatfield Watershed Authority Technical Advisory Committee to identify and conduct interviews with major municipal water suppliers or wastewater facilities in the project area
    - River Network staff will compile and summarize existing information on water use and future plans and their possible influence on native fish habitat into a summary report

Deliverables

- Landowner engagement plan
- Summary report of landowner interview findings
- Summary report of water right owner findings

TASK 3 – OBJECTIVES DEVELOPMENT & FINAL REPORT

Description of Task

The project partners will utilize the physical data from Task 1 and consultant support to develop objectives that reduce threats to native fish populations within the watershed. Objectives may include quantified numeric flow ranges, substrate or water velocity requirements, water chemistry targets, physical habitat improvements such as beaver dam analogs, or modifications to improve habitat suitability in-stream or off-channel, etc.

The partners will also use the land/water rights owner needs and values from Task 2 to develop a range of multi-purpose project options that could improve physical conditions while also meeting their needs and values, such as additional measurement devices, flow protection, riparian restoration, floodplain connectivity, water management changes, etc.

Identification of specific projects and prioritization of action items will occur in Phase 2, except for fish passage (Task 4)

Method/Procedure

The project partners will develop objectives (measurable conservation targets) through an iterative process, with consultant support, that will rely upon the assessment data in Task 1 and the land/water rights owner needs from Task 2. These objectives will be the standards by which we will develop and prioritize actions and strategies in Phase 2. River Network staff will write all final report materials, utilizing contractors for maps and graphic design.

Deliverable

Final report documenting objectives and possible project options

TASK 4 – FISH PASSAGE PROJECT PRIORITIZATION

Description of Task

In Task 1, all physical structures for which permission to access is granted will be assessed for fish passage. All structures will be rapidly assessed in a qualitative manner to determine if they represent a fish passage concern. Physical measurements (depths, velocity, channel cross-sections, and longitudinal profile) will be collected at those structures deemed to pose a fish passage threat. As part of Task 2, outreach will be conducted to structure owners to better understand their needs, constraints, and factors considered when contemplating incorporating fish passage. In this task, that information will be used to develop a prioritization matrix to prioritize structures that pose a threat to fish passage for future action. Project identification and prioritization for other kinds of (non-passage related) actions will happen in Phase 2.

Method/Procedure

Parameters for prioritization have not been determined, but may include distribution of sensitive fish species, miles of connectivity restored, property owner willingness to cooperate, etc. Consultant support will be utilized to develop the prioritization matrix and write up findings.

Deliverable

Prioritized list of fish passage projects

TASK 5 – PROJECT COORDINATION

Description of Task

River Network will coordinate the project's day to day activities, including ensuring timely and accurate completion of the Scope of Work tasks, facilitating regular meetings of the Advisory Committee, and keeping the lines of communication open amongst all involved.

River Network will administer the project's contracts and finances. This includes completing contracts with the CWCB, project partners, and contractors; managing invoices, budgets, and reimbursement requests; and completing reports.

Method/Procedure

- All appropriate contracts, external and internal reports, and project activities completed within planned period and anticipated costs
- Regular meetings of an Advisory Committee made up of Colorado Parks & Wildlife, Chatfield Watershed Authority, Douglas County's Division of Open Space and Natural Resources, USFWS and Douglas County Conservation District.

Deliverables

- Advisory Committee agendas and minutes posted publicly
- Six month progress reports, including financials, to CWCB

Budget and Schedule

Prepared Date: 11/01/2021

Name of Applicant: River Network

Name of Water Project: West Plum Creek SMP, Phase 1

Project Start Date: 06/1/2022

Project End Date: 11/30/2023

Task No.	Task Description	Task Start Date	Task End Date	Grant Funding Request	Match Funding						Total
					CPW	*USFWS*	*CWA*	*River Network*	*Douglas Conserv District*	*Douglas Co*	
1	Stream Health Assessment	6/1/2022	7/30/2022	$ 101,871	$ 20,000	$ 9,999				$ 21,000	$ 152,870
2	Landowner Engagement	6/1/2022	11/30/2023	$ 45,602			$ 5,000	$ 5,000	$ 5,000		$ 60,602
3	Objectives & Final Report	10/1/2022	11/30/2023	$ 25,178							$ 25,178
4	Fish Passage Prioritization	8/1/2022	10/31/2023	$ 10,563	$ 5,000						$ 15,563
5	Project Coordination	6/1/2022	11/30/2023	$ 26,023			$ 5,000				$ 31,023
	Direct Costs	6/1/2022	11/30/2023	$ 11,550							$ 11,550
			Total	$ 220,787	$ 25,000	$ 9,999	$ 10,000	$ 5,000	$ 5,000	$ 21,000	$ 296,786

	Hours/ Miles	$/hour or trip	Total Budget	Grant Request	Direct Expenses (Grant)	Match: Cash	Match: IK
Task 1: Stream Health Assessment							
Field data collection & structure inventory (2 interns (each .5 FTE for 5 months in '22 and '23)	1440	$ 20	$ 28,800	$ 28,800			
Field data collection oversight (Douglas Co Open Space)			$ 21,000				$ 21,000
Mileage to/from site (3 trips/week of 65 miles in shared vehicle)	7800	$ 0.55	$ 4,290		$ 4,290		
Other Consultant fees							
Hydrology			$ 15,000	$ 15,000			
RHAF Scoring			$ 55,000	$ 35,000		$ 20,000	
Data review and GIS development			$ 14,999	$ 5,000		$ 9,999	
River Network coordination			$ 18,071	$ 18,071			
Task Total			*$ 157,160*	*$ 101,871*	*$ 4,290*	*$ 29,999*	*$ 21,000*
Task 2: Land & Water Rights Owner Engagement							
Landowner Outreach (.3 FTE for 20 months)	0.3	$ 55,000	$ 30,195	$ 20,195		$ 5,000	$ 5,000
Printing, meeting supplies	250	5	$ 1,250		$ 1,250		
Mileage to/from visits (4 trips/mo of 65 mi)	5200	$ 0.55	$ 2,860		$ 2,860		
Water rights analysis / interviews	100	$ 165	$ 10,000	$ 10,000			
Water/Wastewater provider outreach	50	$ 100	$ 5,000				$ 5,000
River Network coordination			$ 15,407	$ 15,407			
Task Total			*$ 64,712*	$ 45,602	$ 4,110	$ 5,000	$ 10,000
Task 3: Objectives Setting/Final Report							
Maps and graphic design			$ 6,500	$ 6,500			
River Network facilitation			$ 10,951	$ 10,951			
Writing (River Network)			$ 7,727	$ 7,727			
RN travel(mileage & hotels for 3 mtgs for 3 staff)	350	9	$ 3,150		$ 3,150		
Task Total			*$ 28,328*	$ 25,178	$ 3,150		
Task 4: Fish Passage Assessment							
Project prioritization/consultant			$ 6,500	$ 1,500		$ 5,000	
River Network coordination			$ 9,063	$ 9,063			
Task Total			*$ 15,563*	$ 10,563		$ 5,000	
Task 5: Project Admin							
River Network coordination			$ 10,951	$ 5,951		$ 5,000	
Task Total			*$ 10,951*	$ 5,951	$ -	$ 5,000	$ -
Total			$ 276,714	$ 189,165	$ 11,550	$ 44,999	$ 31,000
RN admin fee (10% of grant)			$ 20,072	$ 20,072			
TOTAL			**$ 296,786**	**$ 209,237**	**$ 11,550**	**$ 44,999**	**$ 31,000**

Attachment A: Location Maps

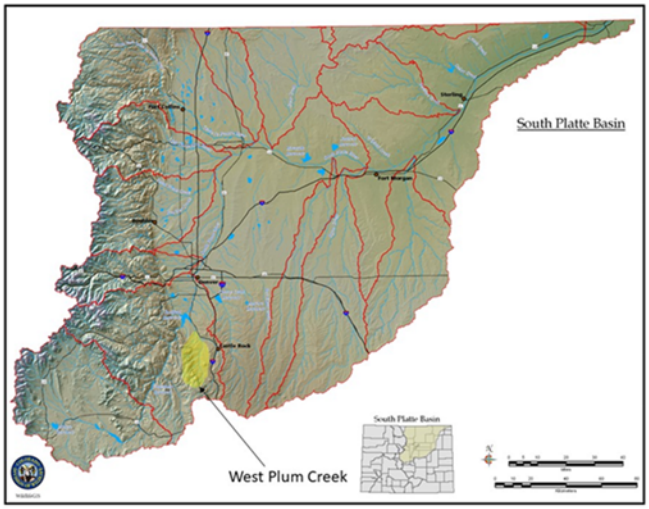

Fig 1: General location map

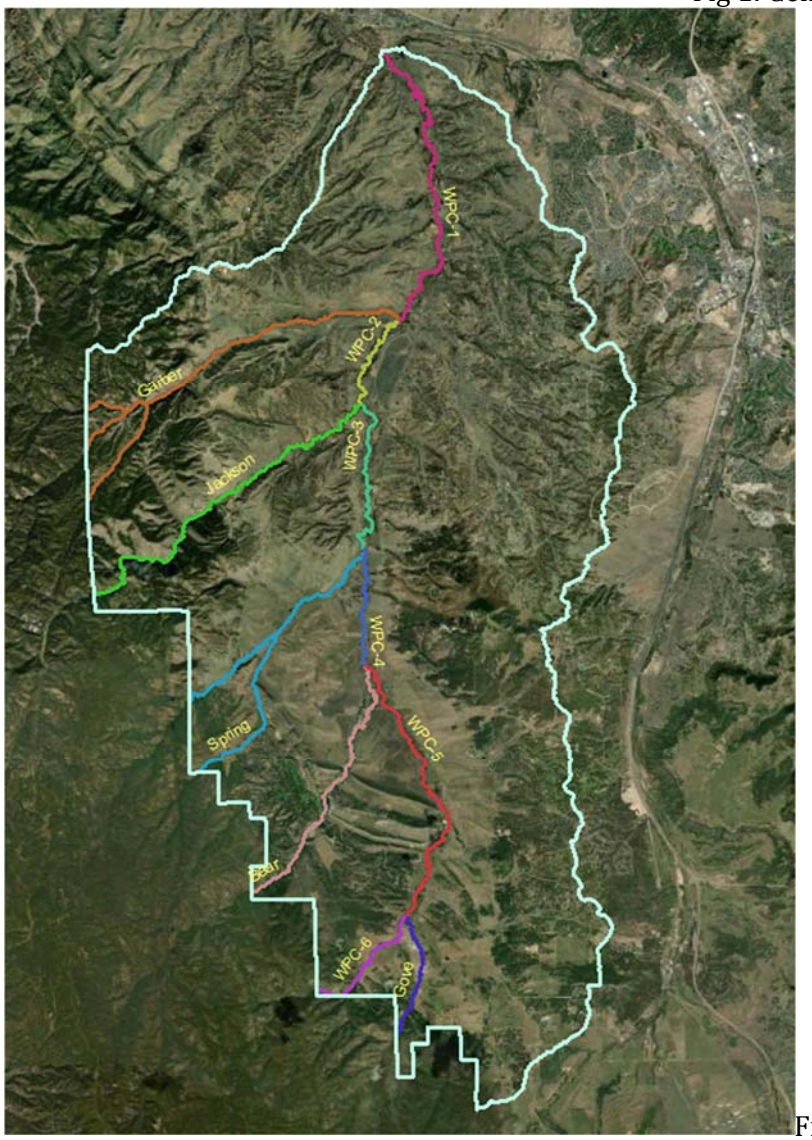

Fig 2: Reach delineations map

TECHNICAL MEMORANDUM

TO: Nicole Seltzer (River Network)

FROM: Kim Lennberg (Alba Watershed Consulting)

SUBJECT: West Plum Creek Existing Data Summary

DATE: October 28, 2021

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1 INTRODUCTION AND BACKGROUND

West Plum Creek (WPC) is the last relatively unaltered transition zone stream in the area and is home to several important plains fish species. The resident fish in West Plum Creek are the only surviving relicts of declining plains species native to the South Platte and Arkansas basins. Colorado Parks and Wildlife (CPW), alongside partners including US Fish and Wildlife Service (USFWS), Douglas County Open Space, Chatfield Watershed Authority (CWA), and River Network, support an effort to study and assess aquatic and riparian habitat, as well as better understand hydrology and opportunities in water management with the water users. The end goal is to implement conservation actions that a diverse stakeholder group can support to help protect these fish (e.g., improving fish passage, enhancing water quality, and supporting healthy riparian conditions, as well as exploring potential opportunities for water management and flow protection).

Proposed Study Area

A planning group consisting of representatives from CPW, Chatfield Watershed Authority CWA, Douglas County, USFWS, Denver Water, and River Network defined the spatial extent of a future West Plum Creek SMP as follows: from the WPC headwaters to the confluence with East Plum Creek, including major tributaries (Gove, Bear, Spring, Jackson, and Garber Creeks) and using the National Forest boundary as the upper elevation limit to bound the extent on the west side of the drainage. These boundaries align with the extents of Douglas County Open Space's Preble's Meadow Jumping Mouse (PMJM) riparian conservation zone (RCZ). These study area extents amount to approximately 20.7 miles of the WPC main stem and 29.3 miles of tributaries. The main stem of West Plum Creek was split into 6 reaches at the tributary confluences to better understand the spatial distribution of different data types (Figure 1). **The purpose of this technical memorandum is to provide a summary of existing data available within the West Plum Creek SMP spatial boundaries.**

Data Summary Organizational Framework

Existing data within the study area are summarized in this document, with data types broken out into biological, hydrological, geomorphological/physical categories. The information is classified in this way to inform a river health assessment to be conducted as part of the SMP. Many SMPs across the state use an adaptation of FACStream 1.0, the Functional Assessment of Colorado Streams (FACStream). This is a reach-scale assessment tool that rates stream health according to the degree of impairment of several ecological variables. The Colorado Stream Health Assessment Framework (COSHAF) is a recent iteration

of FACStream that can be customized to a particular stream or watershed and has been used as a river health assessment organizational framework for several SMPs. Core drivers of river health, represented by ~10 variables, are studied for each sub-reach within the project extent. Each reach, and each variable within each reach, is graded using an academic (A-F) grading scale that indicates the degree of impairment from a desired condition. Possible stressors and likely causes of impairment are also explored.

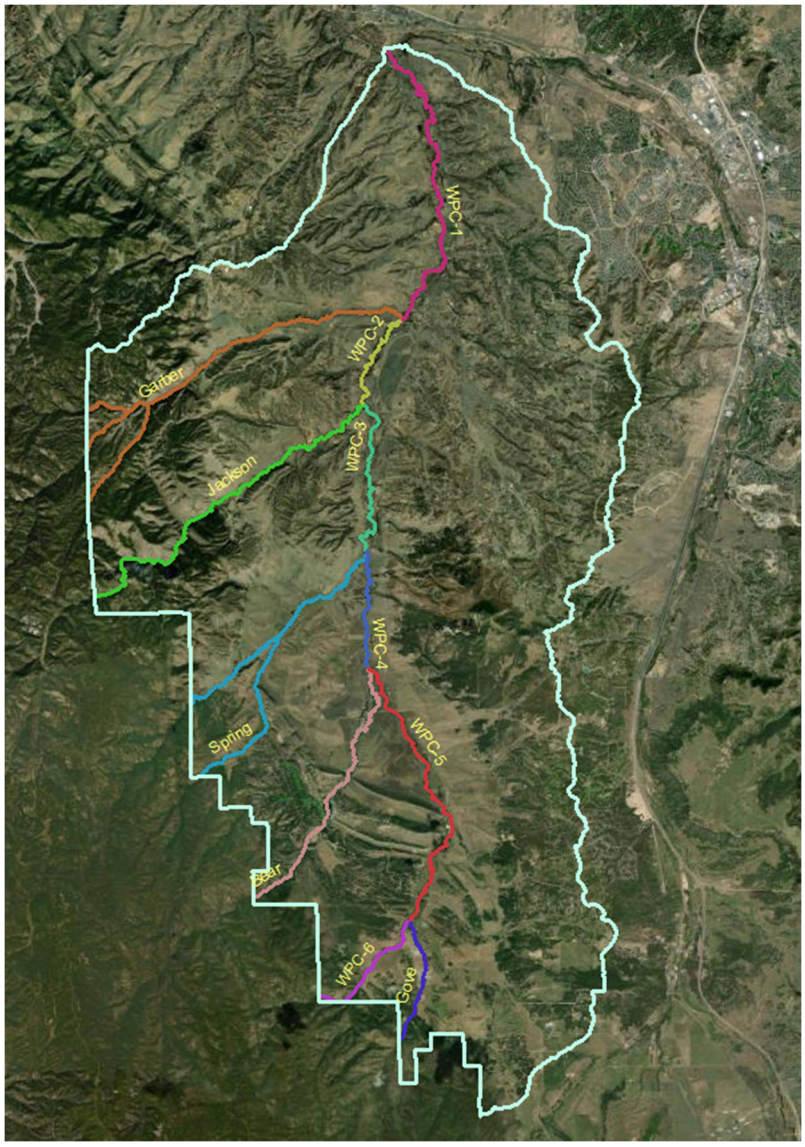

Figure 1. West Plum Creek Proposed Stream Management Plan Extent

This data summary lists and describes relevant data for the following river health indicators or variables:

- flow regime,
- sediment regime,
- water quality,
- habitat connectivity,
- riverscape/hydrologic connectivity,
- riparian vegetation,
- channel morphology,
- structural complexity, and
- aquatic biota.

A working definition is provided for each variable, existing data that may provide information about that variable is described, and potential data gaps and/or areas for further data collection are identified. Data included in this summary were collected from numerous publicly available data sources, as well as targeted requests from both public and private entities. Several additional data sources are listed and summarized at the end of this memorandum.

The COSHAF organizational framework may be customized to fit the purpose and scope of the WPC SMP by customizing the grading scale to indicate degree of departure from desired fish habitat conditions. The scoring criteria used to grade each of the variables can be tailored to include information about preferred habitat conditions of existing native fish populations. For example, the State-endangered northern redbelly dace prefers slow-moving pool habitat and overhanging banks and/or large wood for cover, so the presence of these habitat features will be evaluated and included in the structural complexity scoring guidelines.

The comprehensiveness of the data used to score each variable ranges from coarse-level information designed to provide a general estimation of ecological integrity (e.g., windshield surveys, desktop assessments, anecdotal evidence) to fine-scale data-driven quantitative metrics (e.g., hydraulic modeling, R2CROSS, riparian transects). Moderate scale information could include rapid field assessments. For the WPC SMP, more precise data can be pursued for the flow regime, water quality, aquatic habitat (connectivity and complexity), and aquatic biota variables, while less precise data may suffice for the sediment regime, riverscape/hydrologic connectivity, riparian vegetation, and channel morphology variables.

2 Summary of Recommendations

Based on a detailed review of available data in the WPC drainage, **the most important data gaps related to SMP objectives of understanding creek characteristics related to native fish habitat availability and quality are associated with the flow regime, water quality, habitat connectivity, structural complexity, and aquatic biota indicators.** Recommendations are summarized in the following paragraphs.

Two seasonal stream gauges with relatively short periods of record currently operate in the WPC drainage. More flow data are necessary, both on the main stem of West Plum Creek and along its tributaries. Measuring flows during different times of year, deploying continuous pressure transducers at key points through the watershed and establishing a stage-discharge relationship to track flows at those locations, quantifying tributary contributions to main stem flows, documenting dry-up points and natural spring contributions, and understanding the distribution and characteristics of on- and off-channel ponds are important data gaps to fill for this analysis. In addition, the State's structures database and associated GIS layers should be obtained and reviewed to understand historical and current status of diversions and associated water rights information. A field assessment of in-channel structures, including information about structure dimensions, integrity, fish passage feasibility, maintenance needs, and ownership, should be completed across the study area. In addition to an infrastructure assessment, mapping of bridge/culvert crossings would also be useful to identify impediments to fish passage.

Macroinvertebrate monitoring is recommended for an understanding of water quality and health of aquatic biota in the drainage. Much of the study area is on a provisional CDPHE 303(d) list for macroinvertebrates, but monitoring has not occurred since 2010 to support this listing. Adding continuous temperature gauges (or possibly joint pressure/temperature HOBO data loggers) in select locations may also be worthwhile to understand the temperature regime across the watershed, as spring-fed tributaries such as Garber Creek lower main stem temperatures and provide suitable conditions for some of the native cool water species. Additional water quality monitoring may be warranted based on review of existing data.

While fish monitoring data are both spatially and temporally well-distributed across the watershed, better understanding of the upper and lower distribution limits of State-listed species, as well as increased understanding of species diversity along the entire longitudinal gradient of West Plum Creek, are needed. CPW recommends clustering additional fish monitoring sites at locations in the vicinity of where existing data suggest may be the upper and lower bounds of high diversity and State-listed species. These sites could initially be monitored in the fall season (2022) and then repeated in the late spring/early summer timeframe (2023).

Fieldwork measuring basic physical habitat metrics and substrate size and distribution is recommended at points spread out along the length of WPC and tributaries to better characterize available habitat and

understand habitat suitability for various species. Quantitative measurements such as pebble counts, maximum residual pool depth, width-to-depth ratio, entrenchment ratio, channel slope, availability of resting locations and cover, etc. are recommended at approximately 20 main stem and tributary locations in the drainage, coincident with recent or future fish monitoring reaches. Information about these aquatic habitat features and details will inform the structural complexity, channel morphology, and sediment regime variables. Particular to northern redbelly dace, information about the locations and persistence of off-channel ponds (historical versus current locations, water source, reasons for dry-up) should be collected as well using historical aerial imagery coupled with field verification.

3 SUMMARY OF EXISTING DATA

3.1 Flow Regime

Working Definition: Flow regime is defined as the characteristic pattern by which water is supplied to a river segment from its contributing watershed. It is often represented by a hydrograph, and is dictated by precipitation, inter- and intra-annual weather patterns, watershed characteristics, and human influences. Flow regime is a primary determinant of a river's structure and function. In particular, the magnitude, duration, frequency, timing, and rate of change of river flow interact with the landscape to determine the functions that the river performs.

Existing Data: The USGS maintains two seasonal (April-September) stream gauges within the project area: one in the Perry Park area (WPC-5 reach upstream of the Bear Creek confluence), and one at the downstream end of the study area near Sedalia, just upstream of the confluence with East Plum Creek in the WPC-1 reach. The period of record reported on the USGS website is relatively short for both gauges, dating back to spring 2015. However, Chatfield Watershed Authority reports show that the upstream gauge may have data dating back to 2009. Modeled hydrology data may also be available.

In addition, CPW has recently collected some flow data. For this work, R2CROSS data including cross-sectional channel survey, flow, pebble counts, and channel characteristics were collected and documented at 13 riffle transects on the main stem of West Plum Creek in spring 2019 and 2020. These transects are located at the upstream reach (WPC-6), sometimes referred to as Stark Creek, and also bracket Bear Creek (in reaches WPC-5 and WPC-4) and Jackson Creek (in reaches WPC-3 and WPC-2).

The State's CDSS map viewer includes a GIS layer for administered and decreed structures (mainly diversions, ditches, and headgates) (Figure 2, pink squares). Metadata includes information on adjudication date, associated structures, and structure status (active or historical). For active structures, the metadata indicates whether contemporary diversion records are maintained, and whether historical diversion records exist. Another layer includes groundwater well and pond structures (Figure 2, blue triangles). Data can be accessed at https://maps.dnrgis.state.co.us/dwr/Index.html?viewer=mapviewer.

Potential Data Gaps: The drainage currently has two seasonal stream gauges with a relatively short period of record. To meet the objectives of improving native fish habitat and understanding the basin's hydrologic regime, more flow data are necessary, both on the main stem of West Plum Creek and in the tributaries. Measuring flows during different times of year, deploying continuous pressure transducers at key points through the watershed and establishing a stage-discharge relationship to track flows at those locations, quantifying tributary contributions to main stem flows, documenting dry-up points and natural spring contributions, and understanding the distribution and characteristics of on- and off-channel ponds are important data gaps to fill for this analysis. Discussions with USGS and Douglas County should be

initiated to extend the existing seasonal stream gauges to record year-round flow conditions, and more flow data should be collected at intermediate locations. Another suggestion that could engage the community is to use a straightforward citizen science application such as Stream Tracker to document the presence or absence of flow at target locations in the watershed.

The State's structures database and associated GIS layers should be obtained and reviewed to understand historical and current status of diversions and associated water rights information. This layer can also be used as a starting point for structure assessments throughout the study area.

Finally, another data gap related to flow is information about historical flow conditions. WRC Engineering and CH2M Hill modeled baseline hydrology for Plum Creek within the MHFD boundary in 2001 and 2007, respectively, but should be contacted to see if modeling included WPC.

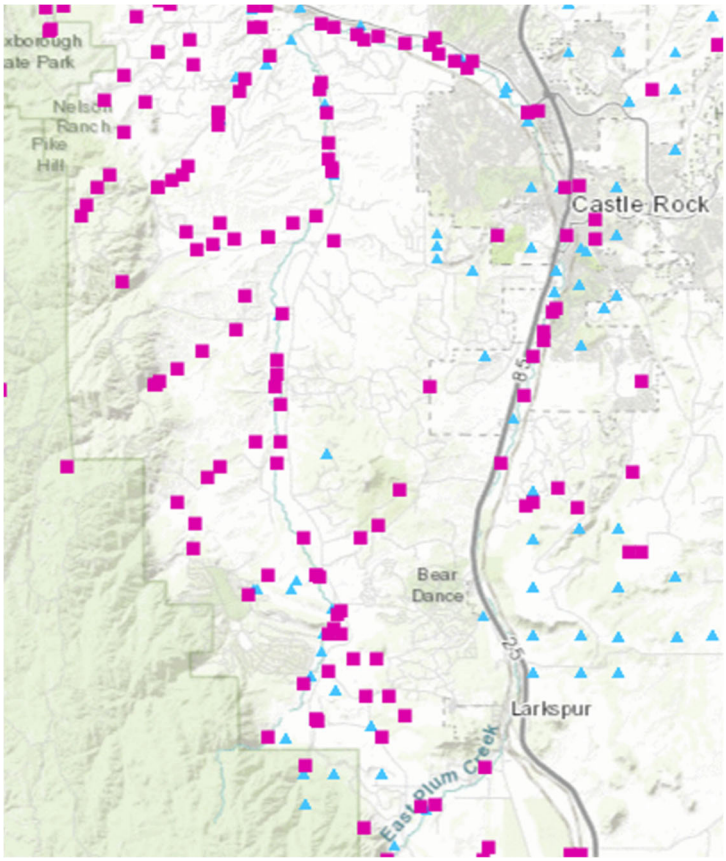

Figure 2. Example Screenshot from Colorado CDSS Showing Structures on WPC and Tributaries

3.2 Sediment Regime

Working Definition: Sediment regime is defined as the amount and timing of sediment that all sources, including land erosion in the contributing watershed and upstream channel erosion, supply to a reach, as well as patterns of sediment transport along and out of a reach. The production, transport, and deposition of sediment largely determines channel form and dynamics. Like changes to flow regime, an altered sediment regime can cause significant impacts to stream form and function, including aquatic habitat quality and long-term channel stability, and can damage infrastructure.

Existing Data: Colorado Geological Survey (CGS) digitized surficial geology maps, NRCS soil type data layer, limited pebble count data from CPW R2CROSS surveys.

Potential Data Gaps: Much of the corridor in the downstream reach (WPC-1) is defined by steep eroding bluffs that are scattered with pines and some bushes. The meandering channel is somewhat stable for portions and then cuts into large bluffs around outside meanders. Similar characteristics were found on a recent site visit in areas further upstream in the watershed. Evidence of historical and current beaver activity can be found in the drainage, and some sections visited on a recent site visit are characterized by an incised channel and heavily eroded banks, possibly resulting from beaver dams being blown out and not reestablishing. Some areas appear to be recovering. More information about historical and current

beaver activity on tributaries as well as the main stem of WPC could be important for understanding sediment transport in the system, as well as providing useful flow information. Information about grazing practices in different areas across the drainage would also be helpful. Finally, refer to the Aquatic Biota variable discussion below for recommendations about additional pebble count locations.

3.3 Water Quality

Working Definition: Water quality is defined as the physico-chemical characteristics of water in a river segment, and it is influenced by natural geological weathering, biogeochemical processes, and human activities (upstream land and water uses). Suitable water quality in streams supports recreational uses, ensures public health, and supports wildlife and fish habitat.

Existing Data: Historical and current data are available from a number of sources: Colorado Department of Public Health and Environment (CDPHE), Environmental Protection Agency (EPA), River Watch, Chatfield Watershed Authority (CWA), and Colorado School of Mines (CSM). In general, the monitoring locations are well-distributed throughout the watershed and cover major constituents. Table 1 shows water quality monitoring locations by source and reach, including some information about sampling dates and parameters analyzed.

Table 1. WPC Water Quality Monitoring Locations by Source and Reach

Source	**CDPHE**	**Chatfield Watershed Authority**	**RiverWatch**	**EPA**	**Colorado School of Mines**
Dates	2002-2021 (most yrs)	2000, 2012-2014	1991-2011 (most yrs) + 1930	2002-2003	May 2020
Parameters	Physical, Nutrients, E. Coli, Some Metals	Physical, Nutrients, E. Coli	Physical, Nutrients, Some Metals	Physical, Nutrients, Some Metals	Physical, Nutrients, E. Coli, Some Metals
WPC-1			1	1	1
WPC-2			1		2
WPC-3	1	2			1
WPC-4				1	1
WPC-5	1	2	2	2	1
WPC-6 (Stark Ck)	1				1
Garber Ck	2		1		
Jackson Ck	1			1	1
Spring Ck	1				
Bear Ck	2			1	5
Gove Ck					

Current CDPHE listings are minimal for the study area, with three Monitoring and Evaluation (M&E) listings and two provisional 303(d) listings. Garber Creek, Jackson Creek, and Bear Creek below the Perry Park Reservoir outlet are M&E listed for arsenic, and Bear Creek from the National Forest boundary to the Perry Park Reservoir inlet is listed for dissolved oxygen. Arsenic listings are pervasive across the State due to detection limits that are higher than the regulatory standard. Interim nitrogen and phosphorus standards (Regulation No. 31) may also be exceeded at some locations, so nutrient data should be reviewed for this analysis.

The main stem of West Plum Creek from the National Forest boundary to Chatfield Reservoir, as well as the Spring Creek and its tributaries, are provisionally 303(d) listed for macroinvertebrates based on samples collected by CDPHE and EPA between 2002 and 2010. CDPHE samples are well-distributed across the study area, with samples collected in the WPC-2, WPC-3, WPC-5, WPC-6, Garber, Jackson, and Bear reaches, and EPA samples were collected in reaches WPC-3 and WPC-5. Most of the available data are raw data that include taxonomy and counts, but some of the CDPHE data also include the analytical results of the Multimetric Index (MMI), Hilsenhoff Biotic Index (HBI), and Shannon Diversity Index (SDI).

Potential Data Gaps: It does not appear that water quality data have been collected at the downstream end of the watershed (near the confluence with East Plum Creek, in reaches WPC-1 and WPC-2) since 2011, with the exception of a few discrete samples collected by CSM students in 2020. Sample collection on Gove Creek at the headwaters is also a potential data gap. Data on suspended sediment and nutrients should continue to be collected within the watershed due to the large number of individual septic systems and livestock grazing throughout the watershed.

In addition, macroinvertebrate monitoring is recommended as part of the WPC SMP. Much of the study area is on a provisional CDPHE 303(d) list for macroinvertebrates, but monitoring has not occurred since 2010 to support this listing. Information about the composition of the benthic macroinvertebrate community would also inform the objective of supporting a healthy native plains-species fishery.

Adding continuous temperature gauges (or possibly joint pressure/temperature HOBO data loggers) in select locations may also be worthwhile to understand the temperature regime across the watershed, as spring-fed tributaries such as Garber Creek lower main stem temperatures and provide suitable conditions for some of the native cool water species.

3.4 Habitat Connectivity

Working Definition: Habitat connectivity is defined as the interaction and interconnectedness between a river segment and its surrounding landscape, including pathways for movement of biological organisms and organic matter through the riparian corridor. This category includes connectivity of both terrestrial and aquatic communities and considers both longitudinal (upstream/downstream) and lateral (channel/floodplain/upland) directions.

Existing Data: Data related to longitudinal connectivity includes information about diversions and roadway crossings. Diversion data provided in the CDSS map viewer can be applied to this variable (Figure 2).

Potential Data Gaps: In addition to an infrastructure inventory, mapping of bridge/culvert crossings would be useful as well to identify any fish passage barriers resulting from roadway crossings.

3.5 Riverscape/Hydrologic Connectivity

Working Definition: Riverscape connectivity is defined as the degree to which water can access and hydrate the surrounding riverscape (channel and floodplain). In particular, riverscape connectivity reflects the ability of the valley bottom to be actively and routinely engaged by fluvial processes. Connectivity varies naturally based on geology, topography, and hydrology. It also reflects impediments due to hydromodifications, channel modifications (e.g., enlargement, entrenchment, channelization/ stabilization), and/or anthropogenic land uses within the floodplain (e.g., levees, drainage ditches,

development, fill), which limit hydrogeomorphic processes and biological interactions between the channel and its floodplain.

Existing Data: Active and potential floodplain layers, digital elevation model (DEM), relative elevation model (REM), LiDAR topography data.

Potential Data Gaps: Active and potential floodplain layers may be available via remote assessment methods, but field verification is needed to confirm the extents of hydrologic connectivity across the riverscapes.

3.6 Riparian Vegetation

Working Definition: Riparian areas, or lands that occur along and are influenced by watercourses, are a critical part of a healthy and resilient stream ecosystems, providing physical roughness that slows water velocities and mitigates the impacts of flood flows; bank stability through root system cohesiveness; habitat for a diversity of riparian plants, animals, and microbes; water quality improvement; shade for the stream corridor to maintain a healthy thermal regime; large wood to stream channels, which creates beneficial habitat complexity; organic matter to the water column; and off-channel habitats like backwaters, wetlands, and side channels that act as refugia for fish and other aquatic species. Well-established and connected riparian areas also link stream corridor and upland ecological processes.

Existing Data: Moderate resolution land cover data are available from the National Land Cover database (NLCD), and wetland mapping is available from the National Wetlands Inventory (NWI). Douglas County also has mapped riparian polygons that will prove useful, and Sandstone Ranch in the upper watershed has very detailed current information about riparian vegetation.

The Denver Regional Council of Governments (DRCOG) has embarked on a project to develop a detailed high-resolution regional land cover dataset in 2021 following a successful pilot study in 2020. The WPC drainage is part of the target area to be mapped by spring 2022. The mapping is planned to include structures, impervious surfaces, roads, open water, grassland, shrubland, tree canopy, turf, barren, and cropland classifications. More information is provided here:
https://drcog.org/services-and-resources/data-maps-and-modeling/regional-land-use-land-cover-project

Potential Data Gaps: Higher resolution vegetation data downstream of the Sandstone Ranch boundary would be desirable to better understand riparian corridor conditions. The DRCOG dataset may prove useful to fill this gap, but should be supplemented by field verification.

3.7 Channel Morphology

Working Definition: Channel morphology is defined as the river channel shape and geometry. It is directly influenced by the physical attributes of the watershed (e.g., geology, topography, hydrology), channel hydraulics, sediment transport, and local hillslope and floodplain uses (e.g., adjacent roadways, grazing). Biological drivers (e.g., riparian vegetation, large woody material, beaver activity, aquatic vegetation) influence river form as well by altering hydraulics and erosional patterns.

Existing Data: CPW R2CROSS data at select riffle transects.

Potential Data Gaps: It is typically useful to do a rapid field assessment to assess this variable. Also refer to the Aquatic Biota variable discussion below for recommendations about additional data collection to support an understanding of channel morphology in the drainage.

3.8 Structural Complexity

Working Definition: Structural complexity is defined as the degree of heterogeneity and physical composition of a stream that results from interactions between flow regime, sediment dynamics, and other factors. The more complex and heterogeneous the physical structure of a stream, the more enhanced the habitat for resident aquatic species. Structural complexity considers hydraulic characteristics (water depth and velocity patterns), bed and bank features, and substrate material, and is often considered at both a coarse- and fine-scale.

Existing Data: No specific information.

Potential Data Gaps: It is typically useful to do a rapid field assessment to assess this variable. Also refer to the Aquatic Biota variable discussion below for recommendations about additional data collection to support an understanding of structural complexity in the drainage.

3.9 Aquatic Biota

Working Definition: Aquatic biota is defined as the health of resident aquatic biota including microbes, periphyton (attached algae), macrophytes (aquatic plants), macroinvertebrates (aquatic insects), fish, amphibians, and any other organism that is part of the aquatic biological community for all or part of its life history.

Existing Data: Fish and macroinvertebrate data are available for the WPC study area. Macroinvertebrate data are described in the Water Quality section above.

A data request for fish monitoring data in the CPW database yielded 210 location-date combinations for fish presence/absence and relative abundance by species. These data span both public and private property, and were collected between the years of 1912 and 2020, with most of the data collected in the last 50 years. The data are spatially well-distributed across the entire study area, with a total of 67 discrete locations (Table 2). While most of the monitoring was completed within the stream reaches, some occurred in nearby ponds or ditches.

Table 2. Number of Fish Monitoring Locations by Reach

Reach	Number of Monitoring Sites
WPC-1	5
WPC-2	4
WPC-3	9
WPC-4	3
WPC-5	5
WPC-6 (Stark Ck)	1
Garber Ck	19
Jackson Ck	5
Spring Ck	3
Bear Ck	11
Gove Ck	2

Potential Data Gaps: Conversations with CPW indicate that lacking from the existing fish monitoring data is a solid understanding of upper and lower distribution of State-listed species, and a better understanding of species diversity along the entire longitudinal gradient of West Plum Creek. Time of year may be important; for example, tributaries that may not provide suitable habitat in the fall may be desirable for some of the State-listed species in the spring. Thus, CPW recommends clustering additional fish monitoring sites at locations in the vicinity of where existing data suggest may be the upper and lower

bounds of high diversity and State-listed species. These sites would initially be monitored in the fall season and then monitoring would be repeated in the late spring/early summer timeframe.

Fieldwork measuring basic physical habitat metrics and substrate size and distribution is recommended at points spread out along the length of WPC and tributaries to better characterize available habitat and understand habitat suitability for various species. Quantitative measurements such as pebble counts, maximum residual pool depth, width-to-depth ratio, entrenchment ratio, channel slope, availability of resting locations and cover, etc. are recommended at approximately 20 main stem and tributary locations in the drainage, coincident with recent or future fish monitoring reaches. Information about these aquatic habitat features and details will inform the structural complexity, channel morphology, and sediment regime variables. Particular to northern redbelly dace, information about the locations and persistence of off-channel ponds (historical versus current locations, water source, reasons for dry-up) should be collected as well using historical aerial imagery coupled with field verification.

3.10 Additional Data Sources and Ancillary Information

Several additional data sources that were catalogued and reviewed are summarized below. The list is ordered from most recently completed to oldest data source.

Chatfield Watershed Model Scenario Results Memorandum (2021): A memorandum prepared by Lynker Technologies for the Chatfield Watershed Authority technical advisory committee that describes results of Chatfield watershed model results. The model was used to simulate and analyze best management practices that could potentially be implemented in the watershed or used to represent future conditions in the watershed for the following scenarios: additional development, stream restoration, and wildfire.

Sandstone Ranch Botanical Survey (2020): A botanical survey of Douglas County Open Space's recently acquired Sandstone Ranch property was completed by the Denver Botanic Gardens in April 2020. A vision for the future of Sandstone Ranch is being developed by stakeholders and the public, with an aim to balance historical and ecological preservation of the Ranch with public access and educational opportunities. The goal of the botanical survey and report is to inform this process with relevant data about the botanical and ecological character of the property. The study was based on intensive field sampling, and includes information about taxonomic distribution, species richness, biogeographic origin (native vs non-native), listing status (for noxious weeds), wetland dependence, and plant community descriptions.

Sandstone Ranch Baseline Documentation Report (2019): In 2019, Great Ecology produced a baseline documentation report to record the current ecological values and use of the portion of the property being permanently protected by Douglas County, Chatfield Reservoir Mitigation Company (CRMC), and Colorado DNR in order to provide offsite mitigation for the Chatfield Storage Reallocation Project (CSRP). The report describes the ecological, socio-cultural, geological, and hydrologic conditions of the property, addresses environmental concerns and notes current development, and provides other relevant information, maps, and photographs.

Sandstone Ranch Open Space Natural Resource Inventory and Analysis (2018): Inventory of insects, mammals, birds, and other wildlife observed or known to be present at Sandstone Ranch using data collected by Douglas County Open Space volunteer naturalists. The document includes a short biography and list of credentials for each observer.

Birds of Sandstone Ranch (2018): A brochure for bird watchers was completed for Sandstone Ranch. The bird checklist includes field sheets to document observations and inventory observed.

Plum Creek, West Plum Creek, and East Plum Creek Major Drainageway Plan (2016): A Master Plan was completed by Enginuity for the Urban Drainage and Flood Control District (UDFCD), now the Mile High Flood District (MHFD), in September 2016. This Plan, titled the *Plum Creek, West Plum Creek, and East Plum Creek Major Drainageway Plan*, includes detailed hydraulic modeling and mapping, a comprehensive stream stability assessment, erosion and channel migration zone analysis, and floodplain analysis for approximately 3 miles of West Plum Creek from the confluence with East Plum Creek to the MHFD boundary. GIS layers for the historical and current channel migration zones, avulsion and erosion hazard zones, floodplain structures, and 100- and 500-year floodplains are available for this stream segment (about half of reach WPC-1). Plan recommendations for this reach included upgrading the SH 67 bridge crossing and protecting Highway 105 by constructing a series of drop structures and stabilizing eroding banks in two areas. The large report is available for review or download at: http://enginuity-es.com/plumcreek/PlumCreekMDP_09-01-2016.pdf.

Chatfield Watershed Plan (2015): A comprehensive Watershed Plan for the entire Plum Creek drainage was completed by CWA in 2015. It includes basic descriptive background information about the watershed, as well as details about water quality and recommended management strategies. A complementary matrix identifies issues and interests important to a variety of stakeholders. Interests include stream stabilization, agricultural BMPs, individual sewage disposal systems (ISDS), habitat, fire/flood, and funding. Stakeholders include Audubon, Coalition for the Upper South Platte, Colorado Agricultural Leadership Foundation, CPW, Denver Botanic Gardens, Denver Water, Ducks Unlimited, HOAs, Rocky Mountain Land Library, Thorne Nature Experience, Town of Castle Rock, Tri-County Health, West Jefferson Conservation District, and Wildlife Habitat Council.

Chatfield Reservoir Reallocation Project: Fish, Wildlife, and Recreation Mitigation Plan (2013): This mitigation plan for the Chatfield Reallocation Project identifies stakeholders in potential issues that the Chatfield reallocation project could create. Most recreation areas will need to be moved. Reallocation of Chatfield allows for 8,500 AF per year yield of surface water. Reallocation could increase food supply to birds, increase shoreline habitat, and increase downstream fisheries. However, unexpected or unknown adverse factors could affect the plan.

Chatfield Summit Matrix of Follow-Up Projects and Potential Next Steps (2010): A word document containing the results of a Chatfield Watershed Authority board member discussion of potential projects is available. The matrix includes ideas for projects related to water quality improvements, stream enhancements and restoration projects, managing septic systems in the watershed, and grazing management.

COLORADO
Parks and Wildlife
Department of Natural Resources

Aquatics, Terrestrial, & Natural Resources Branch
6060 Broadway
Denver, CO 80216-1029
P 303-291-7637

ATTACHMENT C

October 28, 2021

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

RE: CPW Letter of Support, including Cash Match for the West Plum Creek SMP

To Mr. Sturm,

Colorado Parks & Wildlife (CPW) would like to provide this letter of support to River Network for completion of the first phase of a Stream Management Plan (SMP) for West Plum Creek (WPC). Central to the focus of this unique SMP is the long term conservation of aquatic habitat that supports several State Listed species, a few of which now persist only in the WPC watershed. To that end, CPW is also pleased to commit our financial support in the form of a $25,000 cash match for the project.

With financial support from the U.S. Fish and Wildlife Service, River Network has already worked with a sub-contractor to coalesce disparate data sources and build a geodatabase related to biota and watershed health. The proposed initial and critical phase of the SMP will leverage these data to document existing conditions and identify risks to fish populations. A primary focus will be the identification of fish barriers and prioritization for fish passage, as well as understanding the hydrologic regime of the watershed and how to maintain its future integrity. River Network will manage the project and work with sub-contractors to implement a Scope of Work that includes the following tasks: (1) Stream health assessment, (2) Land and water rights owner needs assessment and engagement, (3) Objectives development and final report, (4) Fish passage project prioritization, and (5) Project Coordination. This work will culminate in a report to CWCB and other partners that documents how the above tasks were completed.

Upon notification that River Network's CWRP grant is successful, but no later than May 1, 2022, CPW is prepared to issue a non-competitive grant in the amount of $25,000 to River Network (Purchase Order Grants Given, POGG1, constituting the cash match referenced above), to begin work on all tasks outlined above. This project directly supports CPW's mission to perpetuate the aquatic wildlife resources of the state by setting the stage for the long-term conservation of state listed species in a priority watershed. Thus, we are compelled to provide financial support and technical assistance on this timely project.

Thank you in advance for your consideration of this support.

Sincerely,

Reid DeWalt,
Assistant Director, Aquatics, Terrestrial, and Natural Resources
303-291-7637

November 3, 2021

Chris Sturm, Watershed Protection Director
Watershed & Flood Protection Section
Colorado Water Conservation Board
1313 Sherman Street, Room 718
Denver, CO 80203

Re: West Plum Creek Stream Management Plan

Dear Mr. Sturm:

On behalf of the Chatfield Watershed Authority ("Authority") as its Technical Consultant, the Authority is pleased to support the grant application for the West Plum Creek (WPC) Stream Management Plan (SMP). The Authority believes that this plan will provide opportunities to maintain and improve water quality in West Plum Creek and ultimately Chatfield Reservoir. On November 2, 2021, the Authority's Technical Advisory Committee (TAC) approved providing $5,000 in cash support in 2022 for the SMP. In addition, the Authority TAC authorized the Authority's technical consultant, RESPEC Company, LLC., to provide up to $5,000 in in-kind services for the SMP. The Authority looks forward to this plan moving forward and is pleased to support the WPC SMP grant application. Please give me a call if you have any questions.

Sincerely,

Alan J. Leak, P.E.
Chatfield Watershed Authority Technical Consultant
RESPEC Company, LLC.

cc: CWA Board of Directors

NOTICE OF AWARD

1. DATE ISSUED *MM/DD/YYYY*
08/11/2021

1a. SUPERSEDES AWARD NOTICE dated
except that any additions or restrictions previously imposed remain in effect unless specifically rescinded

2. CFDA NO.
15.608 - Fish and Wildlife Management Assistance

3. ASSISTANCE TYPE Cooperative Agreement

4. GRANT NO. F21AC02870-00
Originating MCA #

5. TYPE OF AWARD
Other

4a. FAIN F21AC02870

5a. ACTION TYPE New

6. PROJECT PERIOD *MM/DD/YYYY*
From 08/01/2021 **Through** *MM/DD/YYYY* 08/01/2023

7. BUDGET PERIOD *MM/DD/YYYY*
From 08/01/2021 **Through** *MM/DD/YYYY* 08/01/2023

AUTHORIZATION (Legislation/Regulations)

Fish and Wildlife Coordination Act—Cooperation of agencies (16 U.S.C. §661)

8. TITLE OF PROJECT (OR PROGRAM)
West Plum Creek Stream Management Plan

9a. GRANTEE NAME AND ADDRESS
River Network
737 29th St Ste 201
Boulder, CO 80303-2317

9b. GRANTEE PROJECT DIRECTOR
Ms. Nicole Seltzer
737 29th St Ste 201
Boulder, CO 80303-2317
Phone: 970-744-0324

10a. GRANTEE AUTHORIZING OFFICIAL
Erika Chasia
737 29th St Ste 201
Boulder, CO 80303-2317
Phone: 720-465-6962

10b. FEDERAL PROJECT OFFICER
Ms. Pam Sponholtz
134 Union Blvd, Ste 675
Lakewood, CO 80228
Phone: 303-236-4216

ALL AMOUNTS ARE SHOWN IN USD

11. APPROVED BUDGET (Excludes Direct Assistance)

		II
I Financial Assistance from the Federal Awarding Agency Only		
II Total project costs including grant funds and all other financial participation		
a. Salaries and Wages	$	25,206.25
b. Fringe Benefits	$	0.00
c. Total Personnel Costs	$	25,206.25
d. Equipment	$	0.00
e. Supplies	$	0.00
f. Travel	$	3,093.09
g. Construction	$	0.00
h. Other	$	0.00
i. Contractual	$	6,700.00
j. TOTAL DIRECT COSTS →	$	34,999.34
k. INDIRECT COSTS	$	0.00
l. **TOTAL APPROVED BUDGET**	$	34,999.34
m. Federal Share	$	9,999.00
n. Non-Federal Share	$	25,000.34

12. AWARD COMPUTATION

a. Amount of Federal Financial Assistance (from item 11m)	$	9,999.00
b. Less Unobligated Balance From Prior Budget Periods	$	0.00
c. Less Cumulative Prior Award(s) This Budget Period	$	0.00
d. **AMOUNT OF FINANCIAL ASSISTANCE THIS ACTION**	$	9,999.00
13. Total Federal Funds Awarded to Date for Project Period	$	9,999.00

14. RECOMMENDED FUTURE SUPPORT
(Subject to the availability of funds and satisfactory progress of the project):

YEAR	TOTAL DIRECT COSTS	YEAR	TOTAL DIRECT COSTS
a. 2	$	d. 5	$
b. 3	$	e. 6	$
c. 4	$	f. 7	$

15. PROGRAM INCOME SHALL BE USED IN ACCORD WITH ONE OF THE FOLLOWING ALTERNATIVES:
a. DEDUCTION
b. ADDITIONAL COSTS
c. MATCHING
d. OTHER RESEARCH (Add / Deduct Option)
e. OTHER *(See REMARKS)*

e

16. THIS AWARD IS BASED ON AN APPLICATION SUBMITTED TO, AND AS APPROVED BY, THE FEDERAL AWARDING AGENCY ON THE ABOVE TITLED PROJECT AND IS SUBJECT TO THE TERMS AND CONDITIONS INCORPORATED EITHER DIRECTLY OR BY REFERENCE IN THE FOLLOWING:
a. The grant program legislation
b. The grant program regulations.
c. This award notice including terms and conditions, if any, noted below under REMARKS.
d. Federal administrative requirements, cost principles and audit requirements applicable to this grant.

In the event there are conflicting or otherwise inconsistent policies applicable to the grant, the above order of precedence shall prevail. Acceptance of the grant terms and conditions is acknowledged by the grantee when funds are drawn or otherwise obtained from the grant payment system.

REMARKS (Other Terms and Conditions Attached - ● Yes ○ No)
No Program Income.

GRANTS MANAGEMENT OFFICIAL:
Grayson Rentz, GRANTS MANAGEMENT SPECIALIST
5275 Leesburg Pike
Falls Church, VA 22041
Phone: 612-403-8088

17. VENDOR CODE 0070043347 **18. DUNS** 805110202 **19. CONG. DIST.** 02

LINE#	FINANCIAL ACCT	AMT OF FIN ASST	START DATE	END DATE	TAS ACCT	PO LINE DESCRIPTION
1	0051012909-00010	$9,999.00	08/01/2021	08/01/2023	1611	FISH PASSAGE ASSESSMENT

DOUGLAS COUNTY
COLORADO

Office of the County Manager

www.douglas.co.us

Open Space & Natural Resources Division

November 2, 2021

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

Dear Mr. Sturm:

Douglas County Government is supportive of the application of the River Network and Colorado Parks and Wildlife for a Colorado Watershed Restoration Program grant. Douglas County Government (Douglas County) is partnering with these organizations on the West Plum Creek Stream Management Plan, Phase 1.

West Plum Creek was identified by the Colorado Natural Heritage Program (CNHP) as the last, best example of an in-tact piedmont stream on the Front Range. Douglas County highly values this watershed as well. It supports a plethora of rare native fish, the threatened Preble's meadow jumping mouse (PMJM), and myriad other wildlife species. Douglas County is participating in the US Fish and Wildlife Service (Service) sponsored PMJM Site Conservation Team (SCT) process. The Plum Creek watershed is one of only two watersheds within the entire PMJM range that is believed to support a large PMJM population segment. The SCT process is analyzing its habitat and will make a recommendation to the Service on the population's status. Designation of this large population segment is a critical part of the PMJM recovery plan, which is anticipated to ultimately lead to species recovery and delisting. West Plum Creek is a gem within Douglas County and crucial for so many species.

The establishment of a plan for the West Plum Creek watershed is critical for its long-term protection and management. If the watershed is conserved, all the species that depend on the habitat it provides will be conserved as well. This planning process is very timely in helping to ensure the longevity of the large PMJM population segment anticipated to be designated through the SCT process; it will add credibility and assurance to the SCT recommendation.

Water quality will also benefit from this plan. West Plum Creek runs through a largely undeveloped refuge right in the center of the most densely populated portion of Colorado. While stream flows support aquatic species and the habitat that supports so many terrestrial species as well, a significant portion of this water is put to beneficial use downstream in support of the human population. Water quality is critical for both wildlife and people.

Andy Hough, Douglas County's Environmental Resources Coordinator, will coordinate and supervise the field teams for which funding is requested in this grant. These field teams will survey the West Plum Creek watershed for both the PMJM SCT habitat analysis and the aquatic, hydrologic and water quality sampling required for the West Plum Creek planning process. The PMJM SCT will analyze the findings and feed these into their recommendation to the Service. The SCT is comprised of many natural

resource professionals. Their analysis and assistance will also feed into the West Plum Creek planning reports. Douglas County values this combination of in-kind services at $21,000.

Douglas County appreciates the efforts of the West Plum Creek planning team and the possible support of the Colorado Water Conservation Board through this grant. We see great opportunities for synergy in the combining of efforts between these various initiatives, not to mention the robust conservation efforts Douglas County has undertaken over the last quarter century. We are fully supportive of this application and the work it will support. Thank you for the opportunity to participate in this process.

Respectfully,

Cheryl Matthews
Director

DOUGLAS COUNTY CONSERVATION DISTRICT
PO Box 688 / 7519 E. Hwy 86, Franktown, CO 80116 / Phone 303-218-2622

October 29, 2021

River Network
P.O. Box 21387
Boulder, CO 80308

Attention: Nicole Seltzer, Colorado Basin Program Director

Regarding: Letter of Interest for the West Plum Creek Stream Management Plan

Dear Nicole,

Thank you for inviting the District to participate in the West Plum Creek Stream Management Plan. The District sees the potential for conservation along this important fish and wildlife corridor. We look forward to working with you on the Landowner Engagement Plan described in the Colorado Watershed Restoration Program grant.

Best Regards,

DocuSigned by:
Kevin Shanks
0506940D472D4C6...

Kevin Shanks
Vice President of the Board of Supervisors
Douglas County Conservation District