South Fork Republican Restoration Coalition: Stream Management and Restoration Planning

Submitted on behalf of the Coalition by:

Republican River Water Conservation District
410 Main Street #8
Wray, CO 80758
Deb.Daniel@rrwcd.com

Submitted to:

Colorado Water Conservation Board
ATTN: Chris Sturm
1313 Sherman St., Room 721
Denver, CO 80203
chris.sturm@state.co.us

1.0 PROJECT PROPOSAL SUMMARY SHEET

Project Title:	*South Fork Republican Restoration Coalition: Stream Management and Restoration Planning*
Project Location:	South Fork of the Republican River, Flagler to the State Line
Grant Type:	Watershed Restoration Program: Stream Management Planning
Grant Request Amount:	$99,000
Cash Match Funding:	$120,000
In-kind Match Funding:	$63,500
Project Sponsor:	Republican River Water Conservation District
Contact:	Nancy Smith

The Nature Conservancy
2424 Spruce Street
Boulder, CO 80302
Phone: (303) 859 - 9082
Email: nsmith@tnc.org

Project Summary:

The South Fork Restoration Coalition ("the Coalition") consists of: Yuma County, Republican River Water Conservation District ("RRWCD"), Colorado Parks and Wildlife ("CPW"), Three River Alliance, and The Nature Conservancy ("the Conservancy"). The Coalition is founded on a shared desire to sustain vibrant natural and agricultural communities in the South Fork Republican River watershed. We seek to create a plan for restoring the river channel, improving instream surface flows and wildlife habitat, and creating future recreation-based economic opportunities on the South Fork Republican from Flagler to the state line, with a focus area consisting of the river reach from Highway 385 to the Bonny Dam. We intend to produce a Stream Management and Restoration Plan that will address wildlife habitat needs, invasive woody vegetation, reestablishment of a functioning stream channel and floodplain in the focus area, appropriate prairie restoration, and maintaining surface water resources above the Bonny Dam – all within the parameters of the legal requirements of the Republican River Compact between Colorado, Kansas, and Nebraska ("the Compact"). The Coalition has secured the support and participation of the Bureau of Reclamation ("BOR") (which manages Bonny Dam) and the Yuma County Pest Control District. Additionally, we will engage local stakeholders such as the Natural Resource Conservation Service ("NRCS"), Partners for Wildlife, Rocky Mountain Bird Observatory ("RMBO"), Pheasants Forever, Audubon Society, and surrounding landowners in Wray, Burlington, Saint Francis, and Goodland. The planning process will address harmonizing state, local, and federal goals for the planning area through six primary tasks:

1. Assessment, feasibility analysis, and preferred engineering concept design for channel and floodplain restoration for the portion of the South Fork Republican from Highway 385 to Bonny Dam.
2. Assessment of hydrology to determine stream flow needs to sustain a restored channel and native fishery, within the parameters of the Compact and the flood control structure (Bonny Dam).
3. Riparian and riverine habitat restoration planning.
4. Native fish population restoration plan by CPW.
5. Recreational economy opportunities assessment.
6. Stakeholder engagement process.

2.0 PROJECT BACKGROUND AND STATEMENT OF NEED

2.1 Target Basin, Water Uses, and Key Issues

The Republican River Basin spans Colorado, Kansas, and Nebraska. The Colorado portion of the basin comprises 31% of the Republican River Basin and contains three major tributaries: North and South Forks of the Republican River, and the Arikaree River. This planning effort will cover generally the South Fork Republican River from Flagler to the state line, with a detailed focus on the section from Highway 385 to the Bonny Dam (see maps in Appendix A). The basin consists primarily of grassland and cultivated agriculture. The key water management challenges in the basin include 1) compliance with the Republican River Compact between Kansas, Colorado, and Nebraska; 2) continued depletion of the Ogallala Aquifer resulting in diminished surface flows and water for agriculture; and 3) increased pressure on already stressed native fish populations from diminishing flows.

The economy of the Republican River basin is centered on agriculture. The planning area falls in Yuma and Kit Carson counties which are, respectively, the second and fifth highest agricultural producing counties in Colorado. Irrigators and surface flows in the planning area are dependent on the Ogallala Aquifer. Ongoing depletion of the aquifer threatens agricultural producers who depend on groundwater, as well as native plants and wildlife dependent on surface flows hydrologically connected to the underground aquifer.

In the 1980s and 90s, groundwater depletions and diminished flows in the Republican River led to litigation related to the Republican River Compact of 1942. The Compact allocates Colorado 25,400 acre feet from the South Fork Republican basin. In 1998, Kansas filed a lawsuit against Nebraska and Colorado, arguing that groundwater should also be regulated under the Compact. In 2000, a U.S. Supreme Court Special Master ruled that consumption of groundwater must be included in Compact accounting to the extent that it depletes streamflow. In 2002, Colorado, Kansas, and Nebraska entered into a negotiated settlement that placed a moratorium on new wells (though Colorado had stopped issuing permits in 1978) and the states agreed to develop a groundwater model to determine the amount, location, and timing of streamflow depletions caused by well pumping.

Subsequently, the RRWCD was created by the Colorado State Legislature to facilitate the State's efforts to comply with the Compact. The District includes seven counties and all three tributaries of the Republican River. To settle its outstanding water account with Kansas, Colorado drained Bonny Reservoir on the South Fork Republican in 2011, delivering about 4 billion gallons of water downstream. Currently, the RRWCD promotes conservation and pursues Compact compliance through voluntary well retirement programs that reduce consumptive use and increase stream flows. Through federal programs, the RRWCD has brought millions of federal dollars to offer financial incentives to producers who voluntarily retire water rights.

Ecologically, the Conservancy's 2017 Healthy Rivers Assessment indicates that habitat restoration and flow interventions will help recover ecosystem function and increase overall aquatic and riparian resiliency in the Republican basin. The Assessment investigated anthropogenic stressors and flow alterations that have consequences for the ecological integrity and resilience of freshwater ecosystems in Colorado. The analysis offers an index of resilience scores for Colorado watersheds, defining resilient stream systems as those that will support a full spectrum of biodiversity and maintain functional integrity even as species compositions and hydrologic properties change over time. The Republican River has resilience scores that range between moderate to high, with most impacts to the system surfacing due to habitat and flow alterations.

2.2 Statement of Need for Stream Management and Restoration Planning

South Republican State Wildlife Area and the former Bonny Reservoir

Bonny Dam, on the South Fork Republican River, was built in 1951 as a BOR flood control structure. Bonny Reservoir covered approximately 1,900 surface acres and became a popular fishing and

boating destination. However, in the 1990s water levels in the reservoir began to drop, primarily due to increased pumping of the Ogallala aquifer, retention of more water on the land, and high evaporation rates from the shallow body of water. In September 2011, Colorado State Engineer Dick Wolfe ordered Bonny Reservoir drained to help Colorado meet its legal obligations under the Compact.

Beyond complicating Compact compliance, the Reservoir and its subsequent draining had ecological consequences for the South Fork Republican River; altering streamflow patterns which led to significant sediment deposition in the river channel near Highway 385. Local stakeholders report that there are reaches of the river channel where there used to be more than eight feet of clearance between the bottom of the river channel and existing infrastructure, but today there remains only three to four feet of clearance. (See photos in Appendix B.) Today, the South Fork channel disappears into over four feet of deposited sediments in the cattail marshes and muddy areas that inhabit the former reservoir bed. (See photos and satellite images in Appendices A and B.) To remedy existing conditions, the Coalition seeks to engage local stakeholders to best restore and re-establish the stream channel within the site constraints for the purpose of restoring native fish and wildlife habitat and increase surface flow Compact deliveries to Kansas.

Finally, the Coalition also seeks to explore alternatives for restoring recreational activities at the former reservoir site and along the river. Yuma County reports that Bonny Reservoir hosted an average of 50,000 visitors annually from 2000-2011, and was an important local economic resource. The planning effort will build upon the extensive planning work conducted by the Yuma County Economic Development office and explore the economic potential of small water activities as well as non-water activities such as horse riding.

Compact compliance and enhancing streamflows in the South Fork Republican River

Colorado has been out of compliance with the Republican River Compact since 2003 because its beneficial use of Republican River water has exceeded its compact allocations. From 2003-2007, Colorado's use exceeded its compact allocation by an average of about 10,000 acre feet per year. Since then the gap has decreased due to the draining of Bonny Reservoir, RRWCD's lease of surface water rights in the North Fork drainage basin, and the retirement of approximately 30,000 irrigated acres through federal programs. Even with these advances, projections of stream depletions from past well pumping indicate that stream depletions may increase in the future. The Coalition believes a hydrology assessment will allow us to explore if restoring the South Fork channel, in concert with the RRWCD's ongoing well retirement program, will increase surface flow Compact deliveries to Kansas.

Groundwater depletion, surface flows, and native fish restoration

To successfully restore the South Fork, the planning team will consider the interaction of groundwater and surface water in the South Fork Republican, with the goal of identifying actions that will increase surface flows and native fish habitat. Groundwater decline and associated surface flow depletions have resulted in less available habitat for native plains fishes in the Republican Basin. In its 2016 Republican River Basin Study Final Report, the Bureau of Reclamation reported: "*In-stream diversions, groundwater pumping, on-farm soil and water conservation practices, upstream irrigation development, and extended drought in the Basin have significantly decreased stream flows . . . These activities and conditions have transformed pre-settlement riverine habitats to highly-variable, inhospitable habitats in which long-term persistence of native stream fishes is questionable."* The biggest threat to native fish is the reduction in the reach of streams that have surface flows. If connectivity between wet portions of stream is reduced the flow of genetic information between populations will also be reduced, and can negatively impact isolated populations. Furthermore, when stream flows are reduced, water temperatures increase, and could potentially increase beyond the capacity of native fish tolerate.

Altered stream flow has additionally led to significantly reduced peak flow magnitudes, which in turn has reduced the ability of the river to scour sediment and caused additional simplification and degradation of aquatic habitat conditions. Peak flow changes can also affect riparian vegetation and wildlife habitat. For example, reduction in peak flows can alter fluvial processes such as the timing, frequency, extent, and duration of floodplain inundation. This alteration in inundation patterns can result in changes in riparian plant species composition and age-class structure, which can alter habitat suitability for native birds and thus result in a shift in bird community species composition (Orr et al. 2017). In turn, riparian vegetation can feed back to hydraulic and geomorphic processes. For example, increased hydraulic roughness provided by newly established vegetation can increase sediment deposition and lead to encroachment of vegetation into the active channel following flow regulation—as evidenced in the South Fork Republican River by encroachment of cattails in and upstream of the former Bonny Reservoir site.

The Conservancy has invested significant resources in the Arikaree River, retiring wells in an attempt to preserve native fish habitat by improving instream surface flows and hydrology profiles. Nonetheless, the Arikaree River has become more ephemeral. Flows in the South Fork appear to be more stable, and accordingly, the Coalition is initiating this planning effort in pursuit of native fish habitat restoration. We seek a plan for restoring degraded portions of stream channel and increasing the length and connectivity of wet portions of the South Fork Republican to increase habitat for native plains fish populations and improve their resilience, long-term viability, and survival.

3.0 GOALS AND OBJECTIVES

3.1 Plan Goal

The overall goal of the proposed South Fork Republican Stream Management and Restoration Plan is to work collaboratively with the Coalition and local stakeholders to create implementable actions in the project area that will contribute to sustaining the vibrant natural and agricultural communities of watershed. We seek to create a plan for restoring the river channel at the site of the former Bonny Reservoir, improving instream surface flows and wildlife habitat, and creating future recreation-based economic opportunities at the South Republican State Wildlife Area -- all within the parameters of the legal requirements of the Republican River Compact.

3.2 Objectives

3.2.1. Re-establish the South Fork Republican River channel and enhance surface flows:

As described above, no restoration activities accompanied the draining of Bonny Reservoir in 2011. With capture of surface flows within the four (plus) feet of deposited sediments upstream of the dam, the South Fork Republican has not been able to reestablish is channel and floodplain (from Highway 385 to the Bonny Dam) after Bonny Reservoir was drained in 2011. We seek to complete hydrologic, hydraulic, geomorphic, and ecologic assessments to support feasibility analysis of alternative solutions, ultimately identifying a preferred engineering concept design for channel and floodplain restoration for the portion of the South Fork Republican impacted by the construction and subsequent draining of Bonny Reservoir. We also seek to analyze and define surface flow needs in the South Fork Republican River to determine the magnitude and timing of surface flows required to maintain the newly restored river channel – and what degree of flow restoration is possible within the legal constraints of Compact compliance. Additionally, we will explore the connection between surface flows and groundwater in the project area, according to the state's approved groundwater model, in order to plan actions that will ensure increasing surface flows will not simply result in additional groundwater pumping. The hydrology analysis will rely on the existing Republican River Compact Groundwater Model.

Finally, we will evaluate riparian and fish habitat restoration alternatives that work with the current and projected future flow regime, with the goal of identifying a preferred alternative that will be

feasible given the physical characteristics of the focal reach (channel and floodplain geometry, flow regime) and will be effective in restoring/enhancing ecological integrity of the river corridor to support native fish and riparian vegetation communities. We will analyze whether these flows achievable within legal, flood control, and infrastructure constraints of the site, and how to optimize ecological benefits within existing constraints.

3.2.2. Create a riparian and riverine habitat restoration plan to improve wildlife and fish habitat

The Coalition plans to work with local stakeholders to create a viable and implementable riparian and riverine restoration plan that will build on the ongoing efforts of the Three Rivers Alliance and Yuma County Pest Control District ("Pest District"). In an effort to restore the watershed and enhance stream flow, the Pest District seeks to eradicate woody invasive phreatophytes, including tamarisk and Russian-olive, and revegetate treated areas with native vegetation. In 2016, the Pest District received a North American Wetlands Conservation Agreement ("NAWCA") grant to work with private land owners along the South Fork Republican from Bonny Reservoir to the Colorado-Kansas state line to remove phreatophytes and restoring native vegetation and wildlife habitat. The planning effort will help the Pest District to continue and expand its work on the river corridor to west of Highway 385.

The riparian/riverine habitat restoration plan will involve a course filter analysis of the broader planning area to identify "hot spots" for nonnative vegetation removal, and recommend more intensive actions for the focus area. Invasive species removal will be accompanied by plans for restoration of native systems.

3.2.3 Determine opportunities for restoring native fish

Based on CPW's historic sampling, there are robust and healthy populations of native fishes both above and below Bonny Dam. CPW and the Conservancy believe that if we can provide more functional stream reaches, native fish will colonize these areas on their own. The planning effort will also consider the need for active repopulation.

3.2.4 Assess recreational economic opportunities and identify action steps.

As part of the planning process, the Coalition will assess how the State Wildlife Area can ultimately be leveraged to attract visitors and generate economic benefits for the County once restoration is complete. This process will address harmonizing state, local, and federal goals for the property.

3.2.5 Engage key stakeholders to ensure the plan reflects local concerns and needs

MaryLou Smith, Policy and Collaborator Specialist with the Colorado Water Institute, will facilitate public meetings throughout the South Fork Republican area and educate the public on the project. She will organize meetings with landowners to discuss the project and address their concerns. Ms. Smith will also organize meetings of participants ensuring the project is managed as presented.

4.0 GEOGRAPHIC SCOPE AND EXISTING INFORMATION

This planning effort will cover generally the South Fork Republican River from Flagler to the state line, with a detailed focus on the section from Highway 385 to the Bonny Dam. The planning effort will build upon existing efforts and utilize existing plans conducted for the area, including:

- Republican River Basin Study – Bureau of Reclamation
- Invasive species mapping (covering 2,938 acres on the South Fork Republican) and ongoing eradication efforts (totally 1,700 acres thus far) – Yuma County Pest Control District
- Repurposing of Bonny State Park, Idalia, CO – Yuma County Economic Development Committee
- Republican River Compact Administration Groundwater Model

- Colorado Republican River Conservation Reserve Enhancement Program ("CREP") (designed to reduce water use and increase streamflows in the Republican River basin)
- South Republican State Wildlife Area Management Plan and CPW historic fish sampling data from Hale Ponds and the South Fork Republican River
- Republican River Conservation Action Plan – The Nature Conservancy

5.0 ORGANIZATIONAL CAPACITY

The planning effort is a Coalition effort, but the lead sponsor for the project is the RRWCD. The Coalition consists of: Yuma County, RRWCD, CPW, Three River Alliance, and the Conservancy. The mission of Three Rivers Alliance is "to sustain vibrant natural and human communities of the Republican River Basin by promoting good stewardship of its land, water and wildlife." The mission of CPW is to perpetuate the wildlife resources of the state, to provide a quality state parks system, and to provide enjoyable and sustainable outdoor recreation opportunities. The Conservancy's mission is to conserve the lands and waters on which all life depends. The RRWCD was created by the State Legislature to assure local involvement in compliance with the Republican River Compact. It promotes conservation through voluntary participation in conservation programs. From February – July 2017, these entities joined forces to form a shared vision for the South Fork Republican River as represented in the objectives of the proposed management and restoration plan. Please find attached commitment letters from the Coalition partners.

The grantee, RRWCD, has extensive experience managing large-scale resource management and planning projects. Working with USDA/FSA-NRCS, it utilizes federal programs such as CREP and the Environmental Quality Incentives Program ("EQIP"), to leverage local dollars to provide financial incentives to well owners who voluntarily retire irrigation wells. These programs provide for conserving water formerly used to irrigate approximately 20,500 acres of land. The RRWCD has also purchased surface water rights for compact compliance deliveries, and received a low-interest loan from CWCB to finance the purchase of water rights and to build the compact compliance pipeline.

The other Coalition members also bring capacity and experience: Three Rivers Alliance helped garner $533,000 for Pest District activities along the river. During its 51 years in Colorado, the Conservancy has managed dozens of complex community-based planning initiatives. CPW has an annual grant program for wetland enhancement which could be used to enhance wetlands in the project area. Funds are also available from the BOR as cost share for projects on their property that benefit wildlife. The planning effort will be staffed by Deb Daniel, RRWCD; Frank McGee, CPW; Nancy Smith, The Nature Conservancy; and MaryLou Smith, Colorado State University. Together, these staff will contribute approximately .3FTE to managing and directing the contractors conducting the individual assessments.

6.0 MONITORING AND IMPLEMENTATION PLAN

To set up for future monitoring efforts, the site assessment for this project will establish photo points to document existing conditions and enable before and after comparisons for future monitoring efforts. Implementation and monitoring for the preferred concept design will be part of future phase(s) of the long-term effort to return healthy and functional conditions to this reach of the South Fork Republican River. The coalition is committed to continuing work to bring a restoration project to construction and to support long-term monitoring to ensure the success.

7.0 BUDGET, MATCH, AND SCHEDULE

The Coalition and consulting partners have structured the project so it can be completed from June 2018 – June 2020. The Conservancy is providing $120,000 in cash match, and Coalition partners are providing $63,500 in in-kind match in the form of hydrologist support (RRWCD), fish monitoring (CPW), and project management (RRWCD, the Conservancy, CPW). See budget for details.

SCOPE OF WORK

GRANTEE: Republican River Water Conservation District

PRIMARY CONTACT: Deb Daniel

ADDRESS: 410 Main Street #8
Wray, CO 80758

EMAIL: Deb.Daniel@rrwcd.com

PHONE: 970-332-3552

PROJECT NAME: South Fork Republican Management and Restoration Plan

GRANT AMOUNT: $99,000 *(Total Project Cost -- $282,500)*

INTRODUCTION AND BACKGROUND

OBJECTIVES

The objective is to create an implementable management and restoration plan for:

1. re-establishing a functioning South Fork Republican River channel and connected floodplain from Highway 385 to Bonny Dam;
2. improving instream surface flows in the planning area, within the parameters of the legal requirements of the Republican River Compact between Colorado, Kansas, and Nebraska;
3. restoring riparian and riverine habitat to address wildlife and native fish habitat needs, and reduce invasive vegetation; and
4. creating future recreation-based economic opportunities in the project planning area.

TASKS

TASK 1 - Stakeholder Engagement Process

Description of Task

This task will be managed by MaryLou Smith, Policy and Collaborator Specialist with the Colorado Water Institute. Stakeholder engagement is key to successful watershed management. It starts from the beginning of the assessment and planning process, and continues throughout. This task runs concurrent with other tasks because stakeholder input is sought for all aspects of the project, from data gathering to planning to implementation. The primary objectives of this task are twofold: to identify key stakeholders who represent key substantive interests in the project area, and to constructively engage them in the creation of the South Fork Management and Restoration Plan. The Coalition has already secured participation from the Bureau of Reclamation ("BOR") (which manages Bonny Dam) and the Yuma County Pest Control District. Additionally, we will engage local stakeholders such as the Natural Resource Conservation Service ("NRCS"), Partners for Wildlife, Rocky Mountain Bird Observatory ("RMBO"), Pheasants Forever, Audubon Society, and surrounding residents in Wray, Burlington, Saint Francis, and Goodland.

Method/Procedure

A multi-faceted process will be developed to identify our key stakeholders and engagement strategies so that their values and ideas are heard and acted upon, and that they have a sense of

ownership in the assessment, planning and implementation process. The engagement process will involve the following steps:
1) The Coalition will employ MaryLou Smith to create an initial stakeholder engagement strategy.

2) MaryLou Smith will work with the core working group and partners to prepare a preliminary list of stakeholders and initiate contact by sending out general notices to this list informing them of the assessment and planning endeavor and encouraging their involvement.

3) We will identify key stakeholders who represent key substantive interests in the project area. Preliminary targeted list includes: BOR, the Pest Control District, NRCS, Partners for Wildlife, Rocky Mountain Bird Observatory, Pheasants Forever, Audubon Society, and surrounding residents in Wray, Burlington, Saint Francis, and Goodland.

4) We will engage stakeholders through at least five public meetings to provide information about progress of the planning effort and to solicit their input/feedback. Their contributions will be shared with the core working group and partners for consideration to improve the planning process and insure it has high likelihood of maintaining stakeholder support. The stakeholders will be actively involved in helping formulate implementable actions that the community can support.

Deliverables
Throughout the process, the community engagement consultant will provide to the core team and partners written reports of stakeholder contributions, culminating in an "implementation vision" to communicate to the involved communities.

TASK 2 – South Fork Republican River Channel and Floodplain Restoration Assessment, Feasibility Analysis, and Preferred Engineering Concept Design

Description of Task
The project focus area from Highway 385 to the Bonny dam represent an extensively altered ecosystem. The extensive footprint of the remaining dam structure creates a substantial disruption to water and sediment load conveyance. Surface water patterns are disrupted by the Dam, with flows routed to the north to a piped outfall that drains to the dam spillway. Aerial imagery indicates flow passing through the Dam in its approximate midpoint, either via secondary pipe or possibly seepage through/under the Dam. This pathway may have been a historical channel location for the South Fork Republican. While surface water flows remain disrupted by the dam, sediment transport processes are completely blocked by it, as evidenced by the extensive deposition of sediments above the Dam. Additionally, interactions of surface water and groundwater are complex and changing, which additionally complicates system understanding in this area.

Because the dam is still in place, restoration of channel and floodplain health and function will require solutions that are informed by natural form and function. Due to its water storage capacity and flood control intent, removal of the Dam is not a feasible solution and therefore optimal improvements that work with the Dam must be pursued.

Subtask 2.1 Hydraulic and Geomorphic Assessment
Site assessments will be conducted to understand the hydraulic and geomorphic conditions. We will collect data integrate these results with ecohydrologic and hydrologic assessment data from Tasks 3 and 4, respectively, to gain comprehensive understanding of the riverine system.

The primary challenge in most river restoration projects is to develop and construct designs that work with the prevailing processes that shape the channel and floodplain. The dominant processes (e.g., sediment transport, discharge, large wood supply) at any particular site are a product of larger

watershed- and reach-scale variables and interactions. Therefore, sustainable restoration projects must begin by developing an understanding of the dominant controls working to shape the channel. In general, our restoration strategy will be to work within the available project boundaries to mimic the geomorphic characteristics appropriate to the reach and restore a complex channel cross section (i.e., low flow channel with connected floodplain benching).

Site knowledge and engineering analyses will support development of scientifically defensible, risk-based and consensus-driven conceptual alternatives for restoration that take into consideration stakeholder concerns, protect property and utilities, stabilize the channel and bank slopes, provide fish habitat, and ensure that existing and constructed floodplains function by providing the essential lateral connection to the channel in order to convey flood flows and facilitate hyporheic (i.e., shallow groundwater) exchange.

Subtask 2.2 Develop Channel and Floodplain Restoration Alternatives Analysis

The complex challenges in the former reservoir bed require innovative restoration solutions that will work with fluvial processes and continue to function in the long-term. Significant investment in alternatives analysis is important to identify restoration solutions that are technically feasible, meet anticipated budgets, are supported by project stakeholders, and are on the path to approval by regulatory agencies and compliance with Compact and funding requirements.

In addition to site assessment data, a combination of hydraulic modeling, bed stability analyses, and reach-scale geomorphic stability and trajectory analyses will support feasibility investigations. The stability of a channel is fundamentally linked to the sediment regime or the combination of sediment delivery, transport, and storage processes at work in the watershed. The stable form of a channel is a product of the relationship between sediment supply and transport capacity. In order to assess the stability of the restored reaches, an understanding of the prevailing sediment regime of the system is necessary.

Conceptual designs, developed using information from the site assessments, will be serve as the foundation for discussion between the Coalition and the Otak-Stillwater Sciences team. These designs will guide expectations of the work that can be accomplished for future achievable budgets and to aid in exploration of alternative solutions in a timely fashion. The evaluation of the alternatives and prioritization of the proposed alternatives will be well-documented and considerable effort will be made to maintain cohesion and continuity between stakeholders as the conceptual plans are developed and alternatives are evaluated.

The Otak-Stillwater Sciences team will develop associated preliminary cost estimates for final design and construction of conceptual alternatives. Construction cost estimates will be based on best available information on work areas, grading volumes, construction of specialized design features (where applicable), soil amendments, revegetation and bank stabilization. Cost estimates will be high-level given preliminary information, but produced on a line-item basis to allow evaluation of specific cost components, including cost drivers. The cost estimates will include a range of expected costs (low/high/median) to best accommodate the preliminary state of design information.

Subtask 2.3 Engineering Concept Planset for Preferred Alternative

Upon selection of a preferred restoration alternative, our team will prepare a conceptual restoration design. The heavy investment in alternatives analysis described in Subtask 3.2 above.

In general, the Otak utilizes two approaches to channel design, referred to as threshold and alluvial channels. Our team has experience optimizing the design of both channel types, as dictated by the site and reach conditions. Threshold channels are more appropriate when it is important for the bed to be in a particular location, for example in locations with critical infrastructure and a limited sediment supply. Alluvial channels are more appropriate when the designed channel needs to be able to adjust, in response to discharge and sediment supply. To accommodate sometimes extensive and

often conflicting site constraints, in many cases our approach is to design an alluvial channel with various threshold features (e.g., hardened riffles).

The concepts developed for 2 to 3 alternative restoration solutions will include sufficient detail to convey proposed restoration components and will include preliminary engineer's opinion of probable cost (OPC) for necessary comparison of major cost drivers, to best set up for next phases of funding procurement, and, ultimately to support Coalition and stakeholder selection of the preferred engineering concept design for channel and floodplain restoration

Method/Procedure

Subtask 2.1 Hydraulic and Geomorphic Assessment

This task will start with review of the available data from applicable documents (geology, ecology, hydrology, geomorphology, soils, water quality conditions). Available existing information, including watershed characteristics, potential natural plant communities and wildlife, historical aerial imagery (including pre-dam construction, if readily available), geomorphic assessment, hydrology and hydraulics data, and any other applicable documents, will be utilized to identify data gaps and guide collection of new data necessary to conduct engineering analysis and design. A basemap will be developed to support field assessment using Geographic Information System (GIS) and Computer Aided Design (CAD) with data provided by the Coalition and developed by the Otak-Stillwater Sciences team.

In order to understand the effectiveness of any proposed channel construction, topographic survey information will need to be collected for the site. The project team will identify and evaluate existing sources of information (previously collected survey, as-builts, etc.) and leverage those in order to optimize project funds. If LiDAR (Light Detection and Ranging) data is available, the project team will use those data for the overbank and floodplain areas, and only collect survey along the channel bottom and banks. Topographic survey collected for this project is anticipated to include strategic cross-sectional survey data for hydraulic modeling use, and some localized topographic survey to capture the geometry of prominent hydrogeomorphic features and slope breaks. Survey data will help to develop hydraulic models and design the channel slope and geometry. Utility location information will be collected or requested prior to the supplemental survey for collection.

The assessment will include collection of geomorphic data (characterization of bed, bank and floodplain conditions, including stream substrate sampling) in project reaches, as well as the reaches upstream of the project sites to support Subtask 2.2 sediment supply and bed stability assessments and to ensure that designs maintain connection upstream with the river. Field data will augment desktop analysis to develop an understanding of the channel's geomorphic trajectory, which along with infrastructure constraints present in the project site, will provide the basis of design.

Photo points will be established and documented during the site visit to document existing conditions, and will be revisited during construction and post-construction to best set up for future monitoring efforts. All spatial data will be organized in a project GIS before transferring the necessary information into CAD for analysis and design.

Subtask 2.2 Develop Channel and Floodplain Restoration Alternatives Analysis

In general, the design approach will seek to develop an understanding of river behavior so that treatments can be designed to incorporate the prevailing process regimes, resulting in more sustainable channels. Common project elements include compound channels that dissipate flood energy and store sediment through the construction of floodplain benches, the use of large wood to stabilize banks and enhance in-channel habitat, and revegetation of riparian areas with native species to both stabilize the floodplain and provide valuable habitat.

The Otak team will obtain regulatory or other existing conditions hydraulic model(s), as available. Models will be reviewed and updated to incorporate physical features identified during the assessment subtask. The team will update the existing conditions model with salient assessment and survey data. In addition, we will prepare two proposed conditions hydraulic models to be used for design and no-rise analyses. The design analysis model will include low and high flows and provide critical output (water surface elevations, stream velocity, shear stress, stream power for various design flows) to the team to aid in design of a stable channel. The no-rise model will be used to preliminarily investigate the ability of design alternatives to cause no adverse impact to the floodplain for the primary purpose of preliminary cost estimating for proposed alternatives. While no-rise should not be a requirement for the preferred alternative, the costs associated with the Conditional Letter of Map Revision and Letter of Map Revision (C/LOMR) processes with FEMA are substantial and therefore a driving component in alternatives analysis.

Bed stability analysis will be quantified using the results from the hydraulic modeling, using appropriate transport formula(s) based on the grain size distributions from the field-collected data. A sediment competency analysis will be conducted at the reach scale to assess what particles would be transported at what flows under existing and proposed conditions. Additionally, we will use our hydraulic model to examine the longitudinal change in stream power, a measure of a flow's ability to do work. In this manner, areas of lower (or higher) energy can be matched with the appropriate restoration strategy. For example, if an area of the channel shows a dramatic decrease in stream power, we can expect deposition to occur and will thus need to design accordingly.

A full sediment budget may be determined to be required for this fine-grained system. Available budget can be stretched however, if stream power analysis, combined with the geomorphic characterization and trajectory, are found to suffice for informing the long-term stability of proposed channel and floodplain work. The Otak team will evaluate the pros and cons of each approach. Results of the transport calculations will be used to evaluate various design features. For example, in order for pools to maintain depth, bankfull flows should provide sufficient energy to mobilize fine sediments from the pools, without compromising stability of adjacent riffles. Otak will evaluate the ability of key features to withstand or resist transport during the range of modeled flows.

Subtask 2.3 Engineering Concept Planset for Preferred Alternative

The concept planset will present proposed work for the preferred alternative in planview, profile, and cross-sectional format to clearly depict design components with respect to water surface elevations from the hydraulic models including low flow, bankfull, and a range of return interval flows. Proposed channel alignment will be shown to illustrate and support qualitative identification of needed areas of fill or excavation. Plans will include existing site features, proposed features, as well as natural features of value for preservation and incorporation into current designs.

The planset will represent specialized design components such as in-stream grade control and habitat structures, floodplain benches, or bank stabilization treatments with simplistic representation in planview and supporting typical details. Details will be drafted to convey relevant technical design information, but also in a manner that is readily understandable by all project stakeholders in order to facilitate project communication and discussion.

We will incorporate final design and construction cost estimate ranges in a Next Steps Report that the Coalition can distribute to stakeholders and use as a planning tool to move into future phases of funding procurement and design and construction. We understand the importance of education-based reporting and outreach materials, so the Next Steps Report will be a concise and readily understandable summary of the preferred conceptual alternative, its cost potential ranges, and recommendations for advancing the project reach to construction implementation.

Otak will produce the final conceptual design planset for the preferred alternative. The planset will

combine channel/floodplain and habitat restoration concepts from Task 3. The planset will be supported by a Channel and Floodplain Design Basis Report that documents the site assessment, design approach, technical analysis methods and procedures, and results.

Deliverables

Subtask 2.1 Hydraulic and Geomorphic Assessment

The methods and results of the site assessment, as well as all mapping products and GIS files for all key layers used in the assessment, will be included in the Conceptual Design Report provided under Subtask 2.2.

Subtask 2.2 Develop Channel and Floodplain Restoration Alternatives Analysis

- Draft and final Conceptual Design Report. This report will include the conceptual design drawings for 2-3 restoration alternatives, the feasibility assessment based on results of the site assessment and other information, and a description and comparison of each alternative. The draft report will be revised based on stakeholder input received at stakeholder meetings and workshops to produce a final report that identifies and describes the preferred restoration alternative. A summary of the alternative evaluation and selection process, including stakeholder comments, will also be included in the report.
- Deliverables will also include GIS files for all key layers developed for the feasibility assessment and conceptual design report.

Subtask 2.3 Engineering Concept Planset for Preferred Alternative

- Final conceptual designs. The team will provide a final conceptual restoration planset combining channel/floodplain and habitat restoration concepts from Task 3.
- Draft and final Channel and Floodplain Design Basis Report. The document will undergo one round of review by the management team before being finalized.
- Next Steps Report.
- GIS files for all key layers used in developing the final conceptual design.

TASK 3 – Riparian Corridor and Riverine Habitat Restoration Plan

Description of Task

Subtask 3.1 Ecohydrological Assessment

The ecohydrological assessment will identify and map areas within the project area that are most suitable for restoration, based on existing biophysical conditions and ecohydrological requirements of native plants. We will conduct a coarser ('broad-brush') assessment for the river-riparian corridor from Flagler downstream to the State line to identify potential 'hot spots' of riparian habitat that might warrant future attention for active removal of non-native riparian vegetation or other natural resource conservation and management actions. In addition, we will zoom in on the focus reach to conduct a more detailed, finer scale ecohydrological assessment. Working within a GIS framework, the available spatial datasets ("data layers") will be prepared and synthesized to identify areas having the greatest potential for active restoration success throughout the focal reach, and used to develop restoration alternatives and, after selection of a preferred alternative, to inform development of a River Corridor Habitat Restoration Plan.

Subtask 3.2 Develop Restoration Alternatives

Based on results of the ecohydrological assessment, as well as evaluation of opportunities and constraints driven by physical and hydrological site conditions (identified in coordination with engineering design and hydrology team members), we will develop 2-3 restoration alternatives for detailed evaluation and ultimate selection of a preferred restoration alternative to be carried forward to the design and planning phase (Subtask 3.3). Alternative development and selection will

incorporate input by key stakeholders, including landowners, water users, resource agencies, the Pest Control District, and academic or agency scientists conducting related research and monitoring in the basin.

Subtask 3.3 Restoration Design and Planning

Upon selection of a preferred restoration alternative, our team will prepare a conceptual restoration design for the broader project reach and a more detailed conceptual design for the focal reach that incorporates removal of invasive riparian vegetation, active and/or passive revegetation, and enhancement of aquatic habitat and connectivity. The final conceptual restoration designs will be included in a River Corridor Habitat Restoration Plan that includes a biological site assessment.

Method/Procedure

Subtask 3.1: The following categories of data will be evaluated and included, as available and appropriate, as part of the ecohydrological assessment:

- Vegetation—characterization of dominant vegetation types and distribution patterns along the planning reach is a key component of the ecohydrological assessment, chiefly because it identifies those areas dominated by native versus nonnative, invasive species, provides an understanding of the physical conditions upon which different vegetation types may persist, and serves as a proxy for wildlife habitat types. Two primary data sources will be evaluated and incorporated for this analysis:reach-scale wetland mapping and vegetation-classification data produced by the National Wetlands Inventory and Colorado Natural Heritage program, and satellite-derived Normalized Difference Vegetation Index (NDVI) data (for example, using data from Sentinel-2 or NAIP imagery). This information is important as it helps us characterize existing vegetation structure and identify areas likely to have higher vegetation productivity potential. If other factors (such as groundwater depth and soil salinity) are suitable more productive vegetation stands, even if dominated by Russian olive or tamarisk, may be used as an indicator of areas likely to be suitable for revegetation by native woody species.

- Groundwater—survival of native riparian trees, whether naturally recruiting or planted, depends on having root systems that remain in contact with groundwater or perennially moist soils. Plants on floodplains with rapidly declining groundwater tables, or that experience high diurnal fluctuations in groundwater depth (e.g., from groundwater extraction through pumping or evapotranspiration) often undergo severe water deficits. These conditions result in low plant productivity, canopy dieback and/or mortality, and ultimately reduce the prospects for successful native plant revegetation. Examination of groundwater levels and processes within the planning reach is therefore needed to refine the identification of appropriate management actions. We will estimate shallow groundwater levels throughout the focal reach by creating a relative-elevation map based on the best available topography data and relating the relative elevation surface to available data on groundwater elevations near the river channel and its floodplain. The relative elevation surface will indicate height of ground surface above the low-flow channel. Based on our work in Arizona and elsewhere in the western U.S., this approach should provide a reliable means to estimate depth to shallow groundwater below the floodway ground surface throughout the focal reach.

- Soils—equally important to revegetation success are soil conditions, such as texture and salinity. For efficiency, we will utilize available soil mapping as published by the Natural Resources Conservation Service (NRCS) to assess soil suitability for vegetation-related actions. We will generate soil salinity maps using the NRCS data.

- Hydro-geomorphology—characterization of the river's hydrology and geomorphology is equally critical in any assessment of restoration suitability, We will review existing publications (such as Katz et al. 2005. Ecological Applications 15:1019-1035), available historical aerial photographs, and the Task 4 hydrology analysis to understand changes in

the river since the 1935 flood, the construction of Bonny Dam in 1951, and the draining of the dam in 2011, with more detailed examination of changes in the focal reach.

- Riparian wildlife habitat—A key challenge facing the management and conservation of riparian birds and other wildlife is that riparian areas are dynamic, with individual habitat patches subject to cycles of creation, growth, and loss due to drought, flooding, fire, and other disturbances. Therefore, measuring and predicting habitat—either to identify areas that may develop into appropriate habitat for certain species or that, with intervention by active restoration could support future habitat needs—requires knowledge of recent/current/future habitat conditions and an understanding of the dynamic processes and ecological factors that determine habitat use bv species of interest (e.g., riparian breeding sites for neotropical migrant birds). We will utilize available published and unpublished information on wildlife riparian habitat suitability and, to the extent possible, we will also draw upon available field data collected by CPW, USFWS, or others in the South Fork Republican River or nearby basins.

- Water sources—Mapping of agricultural return flow locations, tributaries, and other water sources will be conducted. Locations will be digitized based on aerial photograph interpretation and other available information sources. This would also include, if possible, phone or email interviews with local growers and other water users and stakeholders to assess location of water sources, recent levels of water use and return flows, and likely future levels.

The spatial data layers will be synthesized in a GIS framework to identify areas of the riparian corridor that appear most suitable for active removal of non-native riparian vegetation and/or native vegetation plantings. A two-day field reconnaissance of the focal reach will be conducted to ground-truth key components of the office-based assessment and conduct the biological site assessment that will be incorporated into the River Corridor Habitat Restoration Plan prepared under Subtask 3.3. The field reconnaissance will also allow us to meet with the Coalition's project manager and other key stakeholders in the field to learn about local site conditions and other information that cannot be gained through office-based analysis.

Subtask 3.2: Restoration alternatives will be developed and evaluated using the following approach, resulting in selection of a preferred alternative:

- Identify feasibility—Feasible locations and methods for restoration will be identified based on the results of the ecohydrological analysis completed in Subtask 3.1, as well as opportunities and constraints posed by physical and hydrological site conditions that will be identified in coordination with the engineering and hydrology team members. Also included in the assessment of feasibility will be available information on prior removal of invasive phreatophytes in the focal reach, existing infrastructure, recreational uses, land ownership, and existing high-quality riparian habitat. This information will be obtained by review of available reports, mapping products, datasets, and input from project partners, agencies, and stakeholders.

- Alternative development—Based on the feasibility assessment, conceptual designs will be prepared to illustrate the proposed restoration elements for 2-3 project alternatives. The conceptual designs will illustrate and describe locations where existing native habitat should be preserved/protected, the most suitable locations for removal of non-native riparian vegetation and subsequent active or passive revegetation, opportunities for enhancement of riverine aquatic habitat, and locations where aquatic habitat connectivity can be improved (e.g., through culvert replacement or weir upgrades). The alternatives will be described in a Conceptual Design Report that includes the conceptual design drawings and narrative descriptions of each alternative, including a table or matrix comparing key aspects and highlighting differences in outcomes among the alternatives.

- Alternative selection—A preferred alternative will be selected through a series of meetings and workshops involving the project technical team and stakeholders. Conceptual designs for the 2-3 project alternatives will be presented and discussed, soliciting input from landowners, water users, regulatory agencies, and other key stakeholders. A field workshop will be held to provide an on-the-ground perspective to help stakeholders evaluate the site-specific implications of each alternative. Alternatives will be ranked according to benefits and drawbacks in a range of categories (e.g., Ecological, Socioeconomic, Regulatory, Recreation, Water Rights) and scores will be used to select a preferred alternative.

Subtask 3.3: Final conceptual designs for the preferred alternative will be included in a River and Riparian Corridor Habitat Restoration Plan, which will be developed and finalized through the following procedure:

- Finalize conceptual restoration designs—The project team will finalize conceptual designs for the preferred restoration alternative. The conceptual designs will include a broad-brush design for the full river corridor and a more detailed design for the focal reach. Proposed habitat restoration treatments for the focal reach will be incorporated into the channel and floodplain engineering concept design.

- Restoration Plan—We will prepare a River Corridor Habitat Restoration Plan that includes the conceptual habitat restoration designs and a biological site assessment, building on the GIS vegetation/wetland and other data from the ecohydrological assessment (subtask 3.1) The biological site assessment will include available data on fish and wildlife habitat, species of concern, habitat use, existing plans and programs addressing biological resources, and other pertinent data to describe biological resources that could affect or be affected by restoration. Site conditions will be evaluated during a 2-day field assessment (conducted under Subtask 3.1), which will include validation of habitat data and site-specific assessment of ecological conditions as needed to supplement existing data.

Deliverables

Subtask 3.1:

- The methods and results of the ecohydrological assessment, as well as all mapping products and GIS files for all key layers used in the assessment, will be included in the Conceptual Design Report provided under Subtask 3.2.

Subtask 3.2:

- Draft and final Conceptual Design Report. This report will include the conceptual design drawings for 2-3 restoration alternatives, the feasibility assessment based on results of the ecohydrological assessment and other information, and a description and comparison of each alternative. The draft report will be revised based on stakeholder input received at stakeholder meetings and workshops to produce a final report that identifies and describes the preferred restoration alternative. A summary of the alternative evaluation and selection process, including stakeholder comments, will also be included in the report.
- Deliverables will also include GIS files for all key layers developed for the feasibility assessment and conceptual design report.

Subtask 3.3:

- Final conceptual designs. The team will provide a final conceptual restoration planset for the focal reach (one planset for channel/floodplain and habitat restoration) and conceptual designs for the full river corridor.
- Draft and final River Corridor Habitat Restoration Plan Report. The report for the River Corridor Habitat Restoration Plan will include a biological site assessment for the focal reach. The document will undergo one round of review by the management team before being finalized.

- Deliverables will also include GIS files for all key layers used in developing the final conceptual design and the River Corridor Habitat Restoration Plan.

TASK 4 – Hydrology Assessment to Determine Surface Flow Needs

Description of Task

An understanding and analysis of the hydrologic regime (i.e., timing, duration, frequency, and magnitude of flows) present in the watershed is critical for determining what ecological restoration and functional gains are possible at the site. Hydrodynamics set the foundation and define the linkages that create the higher level stream functions (e.g., trophic structures, biochemical processes, biological community structure) necessary to support native fish populations. Changes in land management, climate patterns, water demands, and ground to surface water interactions all create much uncertainty surrounding the seemingly simple question of what streamflow exists at the project site.

The hydrologic regime of the South Fork of the Republican River is ephemeral, flashy, and rainfall-driven, with dry periods occupying the time between storms. Precipitation events have the potential to deliver large volumes of water to the channel in short timeframes resulting in flows capable of transporting a considerable bed and wash sediment loads. In locations where the stream power decreases (e.g., the Highway 385 bridge and the former reservoir bed) sediment drops out in sheets that span the entire width of the channel. The success of a new channel will depend upon understanding these dynamics.

The RRWCD, and others associated with the Compact and creation of Bonny Reservoir, have already put forth considerable effort to understand the hydrology at the site. The technical team has been in contact with Jim Slatterly (hydrologist with the RRWCD) who has agreed to provide hydrologic support for the project, in order to gain a better understanding with previous existing data, models, and analyses. Additionally, he will help advise the project in regard to water right and Compact issues. A groundwater model, used to understand the groundwater contribution to water delivery in accordance with the Compact, will be used to understand how large of an increase in streamflow can be expected from Compact compliance, removal of invasive species from the riparian corridor, and the construction of a stream channel. While some gauge data exists in the area from the 70s, it is not considered reliable as changes in land management and agricultural practices have changed the duration and magnitude of peak flows.

Method/Procedure

The existing groundwater model, combined with inflow calculations into Bonny Reservoir and existing rainfall-runoff models, will be used as a basis for developing the design hydrology. Given the support offered by the RRWCD, the scope for this task is primarily coordination between the project technical team and RRWCD. The need for some additional calculations is anticipated in order to support additional magnitude frequency analysis (if necessary), hydraulic modeling, sediment transport calculations, and channel sizing. Ultimately, a flow duration curve will be produced for the site.

Deliverables

The deliverables for this task include a hydrology report that communicates the basis (methods, analysis, and results) for the selected design metrics.

TASK 5 – Native Fish Population and Habitat Research

Description of Task
In 2018, CPW will sample Hale ponds and the South Fork Republican River for native fish. It will also conduct habitat evaluation surveys on the river to determine possible restoration work that can benefit the stream and fish.

Method/Procedure
Sampling procedures will include gill nets, trap nets, and electrofishing. CPW will spend two days sampling the Hale Ponds, four days conducting habitat surveys, and six days sampling fish on the river. CPW anticipates that the cost of this work will be approximately $15,000. CPW will conduct the necessary planning meetings with a variety of staff , resulting in at least another $10,000 in staff time.

Deliverables
The deliverable will be a written report from CPW documenting the native fish population survey results and habitat restoration recommendations.

TASK 6 – Recreational economy opportunities assessment

Description of Task
Through this task, the Coalition seeks to explore alternatives for restoring recreational activities at the former reservoir site and along the river. Yuma County reports that Bonny Reservoir hosted an average of 50,000 visitors annually from 2000-2011, and was an important local economic resource. The planning effort will build upon the extensive planning work conducted by the Yuma County Economic Development office and explore the economic potential of small water activities as well as non-water activities such as horse riding.

Method/Procedure
The Coalition will identify an economics consulting firm with expertise in outdoor recreation-based economic activities to develop the methodology. The Conservancy will approach Summit Economics, with whom it has partnered on other natural resource related economic analyses.

Deliverables
Prioritized recommendations for fostering the economic potential of small water activities as well as non-water activities such as horse riding in the project planning area.

TASK 7 – Project Coordination, Administration, and Reporting

Description of Task
As part of project coordination and administration, RRWCD, CPW, and the Conservancy will all review and manage the activities and deliverables of the consultants. This task also involves the coordination of consultant activities by the Coalition. It includes fulfillment of reporting requirements in collaboration with our stakeholder engagement consultant, MaryLou Smith. Finally, it captures efficient and timely financial reports by RRWCD.

Method/Procedure
1) Completion of CWCB contract (RRWCD)
2) Consultant contracting, scheduling, and deliverable review (RRWCD, the Conservancy, Three Rivers Alliance, and CPW)
3) Stakeholder outreach coordination and scheduling (MaryLou Smith)
4) Project reports submitted semi-annually and one final project report (RRWCD, MaryLou Smith)
5) Prepare quarterly reimbursement requests (or as needed) (RRWCD)
6) Collect and make available all data, summaries, assessment results and project reports to the general public through establishment of a repository at RRWCD. (RRWCD and MaryLou

Smith)

Deliverables

Deliverables include: timely and effective reports and financials, which include five semi- annual reports and one final report. Reimbursement requests will be made quarterly, or more frequently during times of high expenditures, if necessary.

LIST OF APPENDICES

Appendix A: Maps
- Stream Management and Restoration Planning Area
- Planning and Restoration Focus Area Satellite Imagery

Appendix B: Photos

Appendix C: Project Leads Resumes

Appendix D: Letters of Financial Commitment & Support

1. Three Rivers Alliance
2. Yuma County Commissioners
3. Yuma County Water Authority
4. Republican Water Conservation District
5. The Nature Conservancy
6. Yuma Pest Control District
7. Boy and Cub Scout Troop 38
8. Bureau of Reclamation
9. South Platte Basin Roundtable (pending presentation at 11/14/2017 Roundtable meeting)
10. Senator Cory Gardner (pending)

Appendix A: Project Area Maps

South Fork Restoration Coalition:
Stream Management and Restoration Planning Area

Focus Area

Planning Area

Cope
Joes
Idalia
County Road 9
County Road 6
Kirk
County Road M
County Road V
County Road 40
South Republican SWA
South Republican SWA
South Republican SWA
South Republican SWA
South Republican SWA
Yuma
Kit Carson
Bonny Reservoir Dam
US Highway 385
KANSAS
COLORADO
South Fork Republican River
Flagler
Flagler Reservoir SWA
Seibert
Vona
Stratton
Bethune
Burlington

0 2.5 5 10 15 20 Miles

Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

11/3/2017,SouthForkRestorationCoalition_StreamMngmntRestorationPlanningArea_20171101.mxd


South Fork Republican Planning Focus Area
South Fork Republican River Planning & Restoration Focus Area
Highway 385
Bonny Dam
Former Bonny Reservoir Site
S. Fork Republican River

Appendix B: Photos

Photo 1: Cattail Damage West of Highway 385

Photo 2: Cattail Damage West of Highway 385

Photo 3:Cattails East of Bridge on Highway 385 – looking toward former Bonny Reservoir site

Photo 4:Highway 385 Bridge – silt and cattails have reduced clearance from 8+ feet to 3-4 feet

Photo 5: Highway 385 Bridge – silt and cattails have reduced clearance from 8+ feet to 3-4 feet

Appendix C: Project Coordinator Resumes

Bruce Orr, Ph.D., Entomology
Principal/Senior Ecologist

Dr. Bruce Orr (Ph.D., Entomology/Ecology) has over 25 years of experience leading complex projects involving natural resource inventories, integrated natural resource management plan development, and federal and state regulatory processes. He has led numerous multi-disciplinary restoration feasibility and planning studies that incorporate hydrologic and water resource management planning, instream flow needs, and groundwater inputs in major watersheds throughout California (San Joaquin, Merced, and Santa Clara rivers), and is currently leading restoration planning projects on the Virgin and Gila rivers (Nevada and Arizona). Dr. Orr provides senior strategic support on many of Stillwater's large-scale regulatory, watershed management, and restoration projects.

AREAS OF EXPERTISE

- Riparian and Wetland Ecology
- Restoration Ecology
- Integrated Natural Resource Analysis and Management Planning
- Watershed Analysis
- Benthic Macroinvertebrate and Stream Ecology
- TMDLs

YEARS OF EXPERIENCE

At Stillwater: 21 years
In Total: 38 years

EDUCATION

Ph.D., Entomology (Aquatic Entomology/Aquatic and Wetland Ecology), University of California at Berkeley, 1991

BA, Biological Sciences and Environmental Studies (High Honors), University of California at Santa Barbara, 1979

PROFESSIONAL AFFILIATIONS

- American Institute of Biological Sciences
- California Native Plant Society
- Ecological Society of America
- Society for Freshwater Science
- Society for Ecological Restoration
- Society of Wetland Scientists
- California Native Plant Society Vegetation Committee

SELECTED PROJECT EXPERIENCE

Ecohydrologic Assessment, Virgin River, UT, AZ, and NV *(Clients: Walton Family Foundation and The Nature Conservancy):* Dr. Orr is the project director for an ecohydrologic assessment to help identify and prioritize suitable riparian restoration locations along the flood prone, ecologically sensitive Virgin River—a major tributary to the Colorado River. The assessment supports the initial phases of the much greater Virgin River Restoration Framework involving numerous resource agencies, academic researchers, and local stakeholders all working towards the removal of the invasive tamarisk plant and restoration of critical habitat for listed species, including Southwestern Willow Flycatcher. Dr. Orr is leading the riparian vegetation analysis and modeling to identify hydrologically and ecologically suitable locations for restoration implementation. He continues to be engaged in reach-scale restoration feasibility assessments and site-specific restoration design and implementation on the lower Virgin River.

Restoration Framework for the Upper Gila River, AZ *(Clients: The Gila Watershed Partnership of Arizona and Walton Family Foundation)*: Restoration planning effort along the upper Gila River to restore wildlife habitat and native riparian corridor, which has become densely choked by an invasive tamarisk forest. The comprehensive effort involves generation of baseline ecological and hydro-geomorphological factors, followed by synthesis of these data with others, including wildlife potential, soils and groundwater, and land use, to ultimately identify and prioritize restoration sites best suited for sustainable, cost-effective treatment. Dr. Orr continues to work with the Partnership in implementing and monitoring the riparian restoration at high priority sties.

Restoration Feasibility Study and Riparian Vegetation Dynamics, Classification and Mapping Study, Santa Clara River Parkway, CA *(Client: California Coastal Conservancy)*: Dr. Orr led a team that sampled, classified, and mapped over 25,000 areas of riparian vegetation and floodplain habitats along the Santa Clara River in Ventura County. Additional studies explored the physical process drivers and human land and water use impacts on riparian-floodplain dynamics. The final

PERMITS

- U.S. Fish and Wildlife Service 10(a)1(A) recovery permit (#TE237086-0) for California freshwater shrimp (*Syncaris pacifica*)
- California Department of Fish and Wildlife Scientific Collecting Permit (SC #6032) for freshwater fishes, anadromous fishes, freshwater invertebrates, reptiles, amphibians.
- California Department of Fish and Wildlife California ESA Plant Voucher Collecting Permit No. 2081(a)-13-133-V

SELECTED CONFERENCE PRESENTATIONS AND PUBLICATIONS

Orr, B.K., A.M. Merrill, Z.E. Diggory, and J.C. Stella. 2017. **Use of the biophysical template concept for riparian restoration and revegetation in the Southwest.** In: B.E. Ralston and D.A. Sarr (eds.), *Case Studies of Riparian and Watershed Restoration Areas in the Southwestern United States—Principles, Challenges, and Successes.* U.S. Geological Open File Report 2017-1091, 116 p., https://doi.org/10.3133/ofr20171091.

Orr, B., M. Johnson, G. Leverich, T. Dudley, J. Hatten, Z. Diggory, K. Hultine, D. Orr, and S. Stone. 2017. **Multi-scale riparian restoration planning and implementation on the Virgin and Gila Rivers.** In: B.E. Ralston and D.A. Sarr (eds.), *Case Studies of Riparian and Watershed Restoration Areas in the Southwestern United States—Principles, Challenges, and Successes.* U.S. Geological Open File Report 2017-1091, 116 p., https://doi.org/10.3133/ofr20171091.

Feasibility Report integrated these and other studies to present strategies for habitat conservation, levee setback and removal, passive and active native plant revegetation, non-native species removal, fish passage improvement, and water quality treatment to improve ecosystem functions and increase the resiliency of the lower Santa Clara River to climate change impacts. Dr. Orr is currently directing studies supporting riparian and aquatic invasive species control and river and riparian and floodplain restoration implementation and monitoring efforts being implemented by local stakeholders under Prop 84 funding.

Wetland and Riparian Assessment and Restoration Planning, San Joaquin River Restoration Plan, CA *(Client: Friant Water Users Authority and NRDC; U.S. Bureau of Reclamation)*: Dr. Orr co-managed a unique effort to develop a plan for restoring the San Joaquin River ecosystem in balance with beneficial uses of San Joaquin River water supplies. Stillwater developed restoration objectives and strategies pre-settlement agreement and SJRRP initiation to restore the San Joaquin River below Friant Dam to support self-sustaining, naturally reproducing populations of aquatic species, including Chinook salmon. Dr. Orr was the technical team lead for riparian and floodplain wetland assessment and restoration planning, as well as macroinvertebrate drift studies. He is currently a member of the consultant team hired by the U.S. Bureau of Reclamation to provide technical support to the multi-agency team charged with implementing the restoration along 150 miles of the San Joaquin River.

Ecosystem Linkages and Ecological Flows Studies, Sacramento River, CA *(Clients: CALFED and The Nature Conservancy):* Dr. Orr led the Ecosystem Linkages Study and other studies as part of the Sacramento River Ecological Flows Study initiated by The Nature Conservancy in collaboration with ESSA Technologies, Stillwater Sciences, UC Davis, and UC Berkeley. The purpose of this study was to define how flow characteristics (e.g., the magnitude, timing, duration, and frequency) and associated management actions (such as gravel augmentation and changes in bank armoring) influence the creation and maintenance of habitats for a number of native species that occur in the Sacramento River corridor. Dr. Orr was the technical lead for studies focused on riparian and floodplain habitats and ecosystem linkages between river processes and species of interest. He led several expert workshops on key focal species, including bank swallow, western pond turtle, and Fremont cottonwood. Stillwater's technical studies provided the scientific foundation for ESSA's development of the Sacramento River Ecological Flows Tool (Sac EFT), which TNC and the agencies are using to assess ecological benefits and impacts of various water management and river restoration actions.

MaryLou Smith
Colorado Water Institute
128 Student Services Building
Colorado State University
Fort Collins, CO 80523-1033
MaryLou.Smith@colostate.edu

Education

2004	Mediation/Conflict Management Training, CDR Associates
1973	M.A. New Mexico State University, Educational Psychology
1972	B.A. New Mexico State University, Social Welfare, Highest Honors

Experience

MaryLou is policy and collaboration specialist for the Colorado Water Institute at Colorado State University. Prior, she was a cofounder and vice president of Aqua Engineering, Inc., a Fort Collins, Colorado based water resources engineering firm with projects worldwide. She served 25 years as the firm's financial and human resources officer before launching a division of the firm to conduct water policy and water conflict resolution work.

MaryLou began her work in western water policy with a twelve year tenure on the City of Fort Collins Water Board. She has facilitated panels and presented papers on water policy and conflict for the U.S. Committee on Irrigation and Drainage, the International Committee on Irrigation and Drainage, Irrigation Association, Colorado Water Congress, Western State University Water Workshop, Arkansas Basin Forum, Ditch and Reservoir Companies Alliance and others

Projects

Exemplary project experience includes:

- **Colorado Agricultural Water Summit.** Designed and facilitated full day gathering of 150 Colorado agricultural producers convened by the Ag Council and Colorado State University Extension Service, "How Can Colorado Agriculture Speak with One Voice to Protect Colorado Ag Water?" Resulted in formation of Colorado Ag Water Alliance.
- Center for Native Ecosystems/Rocky Mountain Farmers' Union. Designed and facilitated full day gathering of 30 agricultural producers and representatives of environmental groups to negotiate a joint position on 2008 Farm Bill to meet shared needs of farmers and environmentalists.
- **Colorado Department of Natural Resources.** Served as facilitator/coordinator of the Interbasin Compact Committee's Public Education, Participation and Outreach Work Group during its startup period.
- **Arkansas Basin Roundtable.** Facilitated Water Transfer Guidelines Committee of agriculturalists and urban water managers, resulting in the report "Consider*ations for Agriculture to Urban Water* Transfers."
- **Lower Arkansas Valley Water Conservancy District.** Facilitated meetings of ditch company shareholders attempting to resolve issues in order to form the Super Ditch—a cooperative rotational fallowing leasing arrangement for transfer of water from agriculture for non-agricultural uses.

- **El Paso County Water Authority.** Designed and facilitated *Legal and Institutional Opportunities for Aquifer Recharge and Storage in Colorado—an Interactive Forum,* including conference report reviewed by Colorado Department of Natural Resources.
- **Ag/Urban Environmental Water Sharing Work Group.** Convened and facilitated a diverse group of ag/urban/environmental representatives from several western states to undertake an initiative funded by the Walton Family Foundation. Purpose was to pull into a focused action forum those who have pioneered and are pioneering creative water sharing strategies in the west, to pinpoint obstacles and promote strategies to overcome them. Resulted in recommendations to the Western Governors' Association and the Western States Water Council.
- **Colorado Watershed Assembly.** Designed and facilitated panel of state and regional leaders resulting in the report "How Can We Better Integrate Land Use Planning and *Water Supply* Planning in Colorado?"
- **Groundwater/Surface Water Conjunctive Use Work Group.** Convening and facilitation of a think tank of highly respected Colorado water leaders attempting to develop a framework and a political approach for addressing unintended consequences of Colorado's current legal/administrative approach to conjunctive use.
- **Environmental Protection Agency, Region 8.** Nutrients and Water Quality: A Region 8 Collaborative Workshop. Designed and facilitated a hands-on workshop to bring together ag producers, water treatment operators and others faced with nutrient restrictions and controls to work out practical strategies with agency personnel, both from EPA and state water quality organizations. Resulted in actionable recommendations and significantly improved producer/agency communication.
- **Agricultural/Environmental Water Project Field Trips.** Organized and facilitated field trips to the Pacific Northwest so that agricultural and environmental stakeholders from Arizona and Colorado could observe successful multi-sector water sharing projects in Oregon and break down ag/environmental polarization. Funded by the Walton Family Foundation.
- **Addressing Agricultural Water in the Colorado River Basin**. Served as collaboration specialist for this USDA funded project which brought together land grant universities in the seven Colorado River Basin states to interview and survey ag producers in those states who irrigate with water from the Colorado River. The project resulted in an understanding from the farmer/rancher point of view what the pressures are on ag water in the region, and what farmers would like to do to meet the challenge and led to a second project specific to ag water conservation strategies.
- **Montezuma Valley Irrigation Company.** Facilitated meetings of stockholders convened by the company's board of directors to uncover concerns leading to stockholders' turning down a board recommendation to lease 6000 acre feet of water for $1.4 million three out of five years for instream flow. Revenues would have provided much needed funds for infrastructure improvements. Intent was to determine concerns in order to better meet the desires of stockholders and determine alternative means of income generation.
- **Poudre Runs Through It Study/Action Work Group.** Conceptualized, convened and currently facilitates stakeholder group of agricultural, urban and environmental leaders to build relationships and study issues in order to cooperatively take actions to improve the health of the Poudre River while respecting the water rights of those for whom it is a working river.
- **Poudre River Forum.** Works with committee to plan and implement this annual forum for community education and networking regarding the Poudre River.
- **Nutrients and Water Quality: A Region 8 Collaborative Workshop.** For the Environmental Protection Agency, designed and facilitated a hands-on workshop to bring together ag producers, water treatment operators, and others faced with nutrient restrictions and controls to work out practical strategies with agency personnel, both from EPA and state water quality organizations.

Resulted in actionable recommendations and significantly improved producer/agency communication.

- **Arkansas Basin Conduit Water Conservation Plan.** Worked with Southeast Colorado Water Conservancy District to engage small rural communities along the Arkansas River to develop a joint water conservation plan to assist in securing federal funding for a pipeline to bring Frying Pan-Arkansas project water to these communities to bolster their domestic water supplies and remove the need for them to use contaminated well water. Project funded by Colorado Water Conservation Board.
- Colorado Cattlemen's Association Ag/Environmental Collaborative Statement for Colorado **Water Plan.** Convened and facilitated over a one year period a dozen stakeholders from agriculture and conservation groups to result in a statement of what they could agree on in regard to Colorado's plans to meet a project water supply gap. Project funded by the Walton Family Foundation.
- **South Platte River and its Alluvial Aquifer Report to the Colorado Legislature.** Designed and conducted stakeholder engagement process as part of the Colorado Water Institute's assignment by the state legislature to determine how the river and alluvial aquifer might be better managed in tandem to create better solutions for surface water/well water conflicts.
- **Moving Forward in Agricultural Water Conservation in the Colorado River Basin.** Project manager of USDA funded project to work with agricultural producers to identify and address legal, social, and economic obstacles to agricultural water conservation in light of technological opportunities.
- **National Western Center Youth Water Project.** Planned and implemented a CSU Water Sustainability Fellows program to engage undocumented college students to work with high school students of color in the low income neighborhoods surrounding the to-be-expanded National Western Center in Denver to learn about water issues and to stage an annual youth water summit.

Published Work

Exemplary published work includes:

MaryLou Smith, James Pritchett, Reagan Waskom. "Environmentalists and Urban Water Managers Join with Agriculture in the Colorado River Basin to Find Innovative Ways to Share Water."

MaryLou Smith, Peter Leigh Taylor, Reagan Waskom, Julie Kallenberger, Faith Sternlieb. "Water for Agriculture in the Colorado River Basin: What Do Farmers Think about its Future?" *Colorado Water* (2013).

MaryLou Smith, Stephen Smith. "Agricultural/Urban/Environmental Water Sharing in the Western United States: Can Engineering Engage Social Science for Successful Solutions?" *Irrigation and Drainage* (March 2012).

Smith, MaryLou. "2011 Water Conference Report. Water for the Future: The Role of Efficient Agriculture. July 21 - 22, Omni Interlocken Resort, Broomfield, Colorado." *Irrigation Association* (2011).

James W. Bauder, MaryLou Smith. "Nutrients and Water Quality, A Region 8 Collaborative Workshop: Feb. 15-17, 2011, Salt Lake City, Utah. Workshop Summary and Recommendations." *Colorado State University Colorado Water Institute Information Series*, No. 111 (2011).

Smith, MaryLou. "2010 Water Conference Report: Water, Irrigation and the Future. July 13-14, 2010, Williamsburg, Va., Kingsmill Resort & Spa." *Irrigation Association* (2010).

MaryLou Smith, James Pritchett. "Agricultural/Urban/Environmental Water Sharing: Innovative Strategies for the Colorado River Basin and the West." *Colorado State University Colorado Water Institute Special Report,* Series No. 22 (2010).

Smith, MaryLou. "Can Agricultural Water Conservation and Efficiency Provide the Water Needed for Colorado's Future?" *Colorado Agricultural Water Alliance* (November 2009).

Smith, MaryLou. "2009 Water Conference Report: How Can the Irrigation Industry Take a Leadership Role in Addressing Our Challenges?" *Irrigation Association* (2009).

Smith, MaryLou. "Integrating Land and Water Planning—Groundbreaking Symposium Staged in Denver." *The Water Report* (November 15, 2009).

Smith, MaryLou. "Agricultural to Urban Water Transfers: Panel of State Water Leaders Responds to Arkansas Basin Roundtable Report at Colorado Water Congress 51st Annual Convention." *Colorado Water* (March 2009).

Smith, MaryLou. "The Future of Colorado Agricultural Water: A Panel's Perspective, Responses to the Arkansas Basin Roundtable's Report, Considerations for Agriculture to Urban Water Transfers. *Arkansas Basin Roundtable* (January 2009).

Smith, MaryLou. "Considerations for Agriculture to Urban Water Transfers." *Arkansas Basin Roundtable* (2008).

Smith, MaryLou. "Farmers and Urban Water Managers Working Together to Seek Solutions: If Water is Going to be Transferred from Ag to Urban, How Can We Get It Right?" *United States Committee on Irrigation and Drainage* (2008).

Smith, MaryLou. "Colorado's "Super Ditch": Can Farmers Cooperate to Make Lemonade Out of Lemons?" *United States Committee on Irrigation and Drainage* (2008).

Smith, MaryLou. "Resolving Urban Conflict on an Agricultural Ditch—A Demonstration of Interest Based Negotiation." *United States Committee on Irrigation and Drainage* (2008).

Smith, MaryLou. "Conflict is Not a Four Letter Word—Some Advice for Ditch and Reservoir Companies." *Ditch and Reservoir Companies Alliance Member Handbook* (2007).

Smith, MaryLou. "Legal and Institutional Opportunities for Aquifer Recharge and Storage in Colorado—an Interactive Forum." *Colorado Water Conservation Board* (2007).

Smith, MaryLou. "Consensus Building as a Primary Tool to Resolve Water Supply Conflicts." *United States Committee on Irrigation and Drainage* (2004).

MaryLou Smith and Stephen Smith. "Agricultural/Urban/Environmental Water Sharing in the Western United States: Can Engineers Engage Social Science for Successful Solutions?" *Irrigation and Drainage, vol. 62. Published online 25 March 2013 Wiley Online Library*. Winner of the Wiley-Blackwell 2014 Best Paper Award for papers published in Irrigation and Drainage during 2013. This paper was the basis for a presentation MaryLou Smith gave in Tehran, Iran, at an International Council on Irrigation and Drainage (ICID) conference.

Reagan Waskom, Kevin Rein, Dick Wolfe, MaryLou Smith .How Diversion and Beneficial Use of Water Affect the Value and Measure of a Water Right Is "Use It or Lose It" an Absolute? February 2016 Colorado Water Institute Special Report No. 25

Masih Akhbari, MaryLou Smith. Case Studies Outlining Challenges and Opportunities for Agricultural Water Conservation in the Colorado River Basin June 2016 Colorado Water Institute Special Report No. 27

Anne Castle, MaryLou Smith, John Stulp, Brad Udall, Reagan Waskom Where Now with Alternative Transfer Methods—ATMs—in Colorado? Colorado Water Institute April 2017 Special Report No. 31

Julie Ash, PE

Senior Project Manager/Water Resource Engineer

Julie is a senior project manager, water resource engineer, and a registered professional engineer in Colorado. She has 20 years experience in restoration and engineering to support ecological, development, and redevelopment projects. Julie is the Otak Colorado Water and Natural Resources Group manager, leading a multidisciplinary Boulder-based team that specializes in river corridor restoration, specifically, and water resources, generally. She has worked on a broad range of restoration projects, including stable channel design, streambed and bank stabilization, bioengineering treatments, instream structures, wetland and riparian habitat improvement, floodplain analyses and permitting, wetland mitigation design, surface water control, and erosion and sedimentation control. Julie focuses on restoring health and resiliency to natural systems challenged by today's reality of myriad and unavoidable constraints. She believes that intact natural systems, with their inherent resiliency, are the key to successfully meeting the diverse and often competing goals that we place on these areas and that protecting them is the best way to protect ourselves.

Education

- Bachelor of Science, Civil Engineering (Michigan State University)
- Graduate Coursework, Applied Hydrology, Open Channel Hydraulics, Sediment Transport (University of Colorado)

Registration

- Professional Engineer (Colorado)

Affiliations

- Colorado Riparian Association
- Sustaining Colorado Watersheds Annual Conference
- Colorado Association of Stormwater and Floodplain Managers
- Association of State Floodplain Managers
- Wildlands Restoration Volunteers

Selected Project Experience

Left Hand Creek Flood Recovery & Restoration Project – Foothills Reach; Boulder County, Colorado

Water Resource Engineer—This flood recovery project on Left Hand Creek was funded by the NRCS Emergency Watershed Protection Program to address extensive damage to homes, businesses, and road infrastructure incurred during Colorado's 2013 flood. Working closely with Lefthand Watershed Oversight Group (LWOG) and property owners within the reach, Otak led the analysis and design for this high-priority project and is currently providing construction support services to guide the riverine construction team on successful implementation of improvements. High sediment loading during the flood quickly plugged undersized culverts at road crossings and caused substantial deposition, channel avulsion, and bank erosion that threatened life and property. Primary restoration treatments include floodplain reconnection, restored riffle-pool and step-pool sequencing, offset protection at critical assets, bank stabilization, and native revegetation. Otak supported LWOG with public stakeholder meetings and facilitated discussions with private property owners and completed 1D and 2D hydraulic modeling, as well as sediment transport analyses, to meet technical design and floodplain permitting requirements. This project applied resiliency strategies for multiple benefits, risk reduction, and stream health improvement to enable the river and adjacent assets to perform better during future floods with reduced damage and faster recovery time.

Fall River Hydroplant & Upper Fish Hatchery Reaches Stabilization Project; Estes Park, Colorado

Water Resource Engineer—Otak worked with the Town of Estes Park to return the Fall River Hydroplant and Upper Fish Hatchery sites to more resilient and sustainable conditions to increase stream health and hydraulic capacity to convey and withstand future flood events. This design-build project was on an expedited timeline to ensure CDBG-DR Infrastructure Program grant funds were fully expended by March 2016. Our team surveyed post-flood conditions, analyzed hydrology and hydraulics, designed channel improvements, secured a Floodplain Development Permit with the Town, notified the community of the project, and began construction. The winning partnership between the Town, our design

team, and construction personnel successfully worked within the requirements of the grant to restore the beauty and ecological function of this reach of channel. Work in the Hydroplant Museum Reach includes removal of historical hydroplant piping, repair of eroded vertical bank sections, grading of the channel to reestablish a low flow channel and floodplain benching, re-creation of a stable step-pool channel, stabilization of banks using natural materials found onsite, and planting native riparian revegetation. The designed step-pool channel was constructed to increase aquatic habitat, promote fish passage, and protect the adjacent Hydroplant Museum structure. Work in the Upper Fish Hatchery Reach includes removal of sediment deposition, channel grading to reconnect the channel to the floodplain, including a low flow channel and floodplain benching, re-establishment of a step-pool channel, incorporating aquatic habitat features throughout, and removal of two fish barriers located in the reach.

Left Hand Creek Reach 3B Restoration; Boulder County, Colorado
Water Resource Engineer—Otak is the design lead for this design-build construction project on Reach 3B of Lefthand Creek for the Lefthand Watershed Oversight Group. The project involves reestablishing conveyance and aquatic and riparian habitat to a flood-damaged reach of Lefthand Creek between Longmont and Boulder. Otak will lead the channel and floodplain restoration design, hydraulic modeling, geomorphic and sediment transport analyses, stakeholder engagement, and construction oversight.

St. Vrain Creek Channel Flood Recovery Design-Build and Expanded Area Analyses; Lyons, Colorado - Otak was part of the Naranjo Team that completed the design-build project on the St. Vrain Creek, addressing the extensive 2013 flood damage through the Town of Lyons. The project had two main components—a design-build piece within the Town limits and a larger hydraulic and sediment transport modeling study. Otak staff led the diverse team of technical and construction consultants alongside representatives of the Town through an accelerated design/build process. The project involved the rehabilitation of North St. Vrain and main stem St. Vrain creeks through the Town of Lyons including channel repairs/sizing, floodplain reconnection, and habitat improvements. Otak completed 1D and 2D hydraulic modeling of existing and proposed conditions to support the technical design analysis and floodplain permitting requirements. Otak also led public stakeholder meetings and facilitated discussions with private property owners. The extended modeling component of the project involved several miles of hydraulic and sediment transport modeling and geomorphic assessments on North St. Vrain, South St. Vrain and mainstem St. Vrain creeks. Conclusions and recommendations resulting from the modeling and analyses will provide resource managers and design teams with reach-scale hydraulic, geomorphic and restoration guidance to help inform the planning of future projects.ng.

Luke Swan

Senior Project Manager and Geomorphologist

Luke is a project manager and senior fluvial geomorphologist with 11 years of experience in watershed and river assessment and restoration. He found geomorphology through a background in mathematics and a fascination with wild places. Having been trained in the Pacific Northwest in the morphologic approach to geomorphology, Luke relies on a quantitative, process- and evidence-based approach to geomorphic analyses and restoration. He is experienced in all phases of river assessment and rehabilitation projects, having recently led watershed-scale geomorphic hazard assessments, large-scale channel rehabilitation design-build projects, and development and application of sediment transport models for restoration projects. Luke serves as a technical reviewer for Colorado Phase 2 Emergency Watershed Protection (EWP) projects. He relies on skills developed through his training and project experience that include channel design; field sampling and assessment, data collection and interpretation; construction oversight; hydrologic and hydraulic (1 and 2D) modeling; sediment transport modeling; remote sensing (satellite and aerial); GPS, DGPS, and total station survey; softcopy photogrammetry, terrain modeling; GIS and spatial data modeling.

Education

- Master of Science, Natural Resource Management, focus in Fluvial Geomorphology (Central Washington University)
- Bachelor of Science, Geography (Ohio University)

Affiliations

- Member, River Restoration Northwest
- Member, Colorado Riparian Association
- Instructor of fluvial geomorphology at the Urban Drainage and Flood Control District's Urban Streams Academy

Selected Project Experience

Emergency Watershed Protection, Phase 2 Program Management and Implementation; Front Range Flood Recovery Areas, Colorado
Technical Reviewer/Senior Geomorphologist— Otak is part of the Resilient Watershed Partners (RWP) team that is overseeing this three-year program administration contract for the Colorado Water Conservation Board (CWCB) and the Natural Resources Conservation Service (NRCS). The geographic scope of this project includes all stream corridors affected by the 2013 Front Range flood. Otak is serving as design lead for projects in Left Hand Creek, St. Vrain Creek, and Big Thompson watersheds. Luke's responsibilities include geomorphic assessment and analysis, including sediment transport and stability; design team oversight, direction, and quality control for Otak design teams; design review and QA/QC for all designs produced by the RWP team and outside consultants. He also developed 2D hydraulic models (SRH-2D) to support the design process.

Middle Yampa River/Morgan Bottom Irrigation Delivery and Habitat Improvements, Phase 1; Hayden, Colorado
Project Manager/Design Lead—Otak, as part of the FlyWater-Otak design-build team, is leading design on a channel restoration and diversion stabilization project on the Yampa River near the Carpenter Ranch east of Hayden. The primary goals of the project include stabilizing the channel, designing a fish- and aquatic organism-passable diversion structure, enhancing a globally-rare riparian forest, and increasing aquatic and riparian habitat quality for a reach of the Yampa River. Luke's responsibilities include project management, analysis, modeling, and design. This project is anticipated to go to construction in spring 2017. To date, Luke has overseen and performed field assessment, terrestrial survey, ADCP survey, and LiDAR data collection. The ADCP data will be used to train a SRH-2D hydraulic model to design and verify the performance of the diversion structure and perform sediment transport calculations.

James Creek Restoration; Jamestown, Colorado
Design Lead—The Lynker-Otak-Amec team is designing this restoration of James Creek. This includes a 30 percent channel restoration design for roughly

one mile of James Creek, located in a steep mountain canyon below the Town of Jamestown. This reach was devastated by the 2013 flood, having been heavily impacted by debris flow. The primary project goal is to build resiliency, restore geomorphic function, and mitigate sediment loading in the watershed. Luke's responsibilities included geomorphic field and desktop assessments and analyses, channel design method determination, guidance, and oversight.

Fish Passage and Ditch Diversion Resiliency Design Services; Big Thompson River near Loveland, Colorado
Project Manager/Design Lead—AloTerra, representing Colorado Trout Unlimited and the US Fish and Wildlife Service, selected Otak for this project, to build upon the Front Range flood recovery work. Luke led the 30 percent design of fish passable diversion structures meant to replace four impassable structures on the Big Thompson River. Structure replacements were designed and tested with the use of a 1D (HEC-RAS) model and consisted of rock ramps and Newbury Riffles.

South Platte River Sediment Transport Modeling and Feasibility Study; Evans, Colorado
Geomorphology Lead—The CDM-Smith/Otak team was awarded this project that covers the South Platte River from the confluence with the Saint Vrain Creek to the confluence with the Cache la Poudre River. The study will quantify the sediment transport regime through the study reach by identifying sediment sources, building a reach-scale sediment budget, and modeling sediment transport. Otak's role includes leading the fieldwork and providing support for the sediment transport modeling and feasibility study. Luke led the field assessment, interpretation, and sampling of approximately 20 miles of the South Platte River, a highly dynamic, sand-bed channel. A channel evolution model, specific to the project reach was developed in order to communicate complex sediment transport modeling results to project stakeholders and landowners. Luke also helped develop a suite of practical, coordinated treatments that address system-scale instabilities, as verified in the bed evolution model (HEC-6T).

Colorado Water Conservation Board Pilot Channel Migration Zone Delineation; Collbran, Colorado
Geomorphology Lead—Otak geomorphologists worked with the Colorado Water Conservation Board (CWCB) and the Town of Collbran to test the implementation of Washington State's Preliminary Channel Migration Zone (pCMZ) methodology and Vermont's Riverine Erosion Hazard methodology in Colorado. A large landslide in the Salt Creek drainage basin delivered massive amounts of sediment and debris to the headwaters of the creek. This landslide created considerable risk for the Town. As a result, the Plateau Creek basin was chosen as the focus area for testing two riverine erosion hazard determination methods. Luke's responsibilities included experimental design; application of both methods to the watershed; evaluation of the merits of both for application in Colorado; and creation of a riverine erosion hazard map for the Town that identified probable and high risk areas where the channel could be active in the future.

Nancy A. Smith
Water Program Director
The Nature Conservancy, Colorado Office
2424 Spruce Street
Boulder, CO 80304
NSmith@tnc.org

PROFESSIONAL SUMMARY

A natural resource conservation professional with over 20 years of experience in natural resource conservation project strategic development and management. In-depth experience in analyzing and strategically pursuing conservation policy opportunities and managing long-term projects that deliver results. Extensive experience leading teams to deliver on complex conservation projects at multiple scales. Served as project manager for the team that conserved 27,000 acres of critical shortgrass prairie habitat as part of the $5.5 million, award-winning Shortgrass Prairie Initiative that provided in-lieu mitigation services to the Colorado Department of Transportation. Led water policy and conservation initiatives in Northern California to address the environmental impacts of marijuana cultivation and agricultural diversions in coastal watersheds. Subject matter expertise in water law and freshwater conservation in California and Colorado. Served as the Public Partnerships Program Director in Colorado, and had direct responsibility for cultivating agency and private coalition relationships necessary to reach Conservancy goals.

PROFESSIONAL EXPERIENCE

The Nature Conservancy, Colorado Field Office **June 2016 – Present**
Water Program Director, Colorado

The Nature Conservancy, California Field Office **October 2013 – June 2016**
Project Director, Water Program

- Develop and implement water policy strategies to enhance streamflows for salmon in north and central California.
- Lead the Marijuana Policy Working Group which successfully positioned TNC to lead the public debate on the environmental impacts of marijuana cultivation, influenced key state legislation regulating medical marijuana, and secured protective environmental provisions in the leading legalization ballot initiative filed for the 2016 election.
- Manage over $500,000 in contracts.
- Developed water policy framework for TNC California's Environmental Flows Strategy.

Colorado Court of Appeals **August 2012 – August 2013**
Legal Clerk – Chief Judge Alan Loeb

- Conducted legal research and analysis, drafting appellate opinions on all areas of civil and criminal law.

Environmental Protection Agency, Region 8 **August 2011 – May 2012**
Legal Clerk – Office of Regional Counsel and Enforcement

- Conducted legal research and wrote legal memos on oil and gas drilling regulation, "fracking", state compliance with the Clean Air Act, tribal jurisdictional and land use issues, and Clean Water Act compliance.

CO Attorney General - Natural Resources & Environment Section **May 2011 - August 2011**

Legal Clerk – Water Branch

- Conducted legal research and drafted surreply for water rights case which formed the basis for argument at Colorado Supreme Court.

- Conducted legal research, wrote legal memos, and responded to motions regarding Colorado water law, state participation in the Colorado River multi-national treaty, and state jurisdiction over Clean Water Act compliance.

Veterans Green Jobs Alliance **April 2009 – September 2010**

Strategic Partnerships Director

- Developed public and private partnership strategy and conducted policy analyses of public sector funding opportunities for green jobs development for military veterans.
- Developed and implemented private major donor fundraising strategies.

Falletti Weber Consulting Group **June 2007 – April 2009**

Senior Consultant

- Conducted site visits for Conservation International in Brazil, Bolivia, Colombia, Madagascar, and Washington, D.C., to ensure legal and best practice compliance with private and public funding regulations and guidelines.

The Nature Conservancy – Colorado Field Office **March 1995 – January 2008**

Public Partnerships Program Director (August 2005 – January 2008)

- Developed and implemented public funding strategies for conservation land transactions, resulting in over $47 million in federal and state funds for TNC conservation transactions.
- Managed public sector partnerships with state agencies, including transaction structuring and funding.
- Developed and implemented project-management systems for handling over $100 million of public-funding efforts, including managing two grants and contracts administrators.

Agency Relations Program Manager (August 2000 – August 2005)

- Negotiated, secured, and managed $5.5-million contract from Colorado Department of Transportation to conserve 27,000 acres of land through the Shortgrass Prairie Initiative, an EPA national award-winning project.
- Managed state and federal agency funding relationships and partnership initiatives.

Special Projects Coordinator – Conservation Programs (March 1995 – August 2000)

- Managed TNC involvement in multi-partner public funding efforts.
- Wrote and edited Conservation Plans and outreach materials for conservation landscapes.

EDUCATION

University of Colorado – Law School **May 2012**

Juris Doctor

- Graduated in top 11% of class
- Environmental Law Society Fellow 2011

University of Colorado – Leeds School of Business **December 2011**

MBA

- Graduated in top 5% of class

University of Colorado, Boulder **May 1989**

Bachelor of Arts

- *summa cum laude,* Department of English; s*umma cum laude,* General Honors
- Valedictorian, College of Arts and Sciences

MARGARET WHITE

The Nature Conservancy

2424 Spruce Street
Boulder, CO 80302

Tel. (303) 541-0376
meg_white@tnc.org

EDUCATION

Ph.D.	Arizona State University	2011	Plant Biology
M.S.	University of California, Berkeley	2004	Environmental Planning
B.A.	University of Michigan	1998	Political/Environmental Science

RESEARCH EXPERTISE

Dr. White is an interdisciplinary scientist with expertise in riparian ecosystems, primarily in arid and semi-arid regions of western U.S.A. She has focused on understanding fluvial processes and flow ecology relationships across multiple spatial scales. She also specializes in water transactions, environmental flows, reuse, effluent-dominated and urban waterways, and environmental policy. Her research is often conducted in the applied context of riparian ecosystem restoration and management.

RECENT WORK EXPERIENCE

Freshwater Scientist
The Nature Conservancy of Colorado, Boulder, CO 80302 — 2/2012 – Present

Biology/Science Instructor
Metropolitan State University of Denver — 8/2012 – Present

PUBLICATIONS

White, M.S., C. Rasmussen, B. Tavernia, P. Shafroth, T. Chapman, and J. Sanderson (*in review*) Investigating Habitat Complexity at Tributary **J**unctions on the Colorado and Dolores Rivers. *Landscape Ecology*.

White, M.S. and J.C. Stromberg. (*in review*) Nutrients and nitrophiles: effects of treated wastewater on dryland riparian plant communities. *River Research and Applications*.

White, M.S., D. White and J.C. Stromberg. (*in prep*) Integrating water resources: opportunities and constraints in using effluent for environmental flows. *Society & Natural Resources*.

White, M.S. and J.C. Stromberg. (*in prep)* Spatial and temporal patterns of effluent discharge into waterways in the southwest. *Landscape Ecology.*

White, M.S. and J.C. Stromberg. (*in prep*) Environmental flows and the emergence of effluent-dominated riparian ecosystems in the southwestern United States. *Ecohydrology*.

Stromberg J.C., **M.S. White**, A.F. Hazelton, J.M. White, R.A. Fischer. March 2009. Ephemeral wetlands along a spatially intermittent river: temporal patterns of vegetation development. *Wetlands*. 29(1): 330-342.

Stromberg J.C., A.F. Hazelton and **M.S. White**. March 2009. Plant species richness in ephemeral and perennial reaches of a dryland river. *Biodiversity and Conservation*. 18(3): 663 – 677.

White, D. D., E.A. Corley, and **M.S. White**. 2008. Water managers' perceptions of the science-policy interface in Phoenix, Arizona: Implications for an emerging boundary organization. *Society & Natural Resources 21*(3), 1-14.

Stromberg J.C., S.J. Lite, R. Marler, C. Paradzick, P.B. Shafroth, D. Shorrock, **M.S. White**. 2007. Altered stream flow regimes and invasive plant species: the *Tamarix* case. *Global Ecology and Biogeography* 16: 381-393

Anthony Keith
Senior Aquatic Ecologist

A.J. Keith (*M.A., Ecology and Systematic Biology*) has over 20 years of experience in aquatic and riparian ecology and resource management, analyzing the effects of water and land management on aquatic and riparian communities and sensitive native species. He manages and provides technical expertise for projects that integrate multidisciplinary conservation and management strategies for listed and sensitive species, emphasizing solutions based on ecological linkages between physical processes and biological response. His recent work has focused on the ecology, restoration, and management of at-risk native fish populations and habitat in rivers throughout the desert Southwest, Colorado, and California.

AREAS OF EXPERTISE

- Fisheries and aquatic ecology
- Aquatic and riparian habitat restoration
- Environmental impact assessment
- Regulatory compliance and permitting (NEPA, CEQA, ESA Section 7, 401/404)
- Hydropower licensing/relicensing
- Natural resource management planning
- Habitat conservation plans
- Limiting factors analysis
- Mitigation and monitoring plans

YEARS OF EXPERIENCE

At Stillwater: 21 years
In Total: 25 years

EDUCATION

M.A., *Ecology and Systematic Biology*, San Francisco State University, 1995

B.S., *Environmental, Population, and Organismal Biology*, University of Colorado at Boulder, 1989

PERMITS AND TRAINING

- U.S. Fish and Wildlife Service 10(a)1(A) recovery permit (#TE198917-1) for tidewater goby (*Eucyclogobius newberryi*)
- California Department of Fish and Game Scientific Collecting Permit (SCP #4100) for freshwater fishes, anadromous fishes, freshwater invertebrates

SELECTED PROJECT EXPERIENCE

Evaluating Watershed Restoration in the Colorado River Basin (*Client: The Walton Family Foundation*): Serving as project manager and lead scientist, Mr. Keith is assisting the Walton Family Foundation in its efforts to evaluate the progress and success of riparian corridor and river flow restoration efforts in the Dolores, Escalante, Verde, Gila, Gunnison, and San Pedro rivers, as well as the Colorado River Delta. Mr. Keith is working collaboratively with restoration project grantees as well as the Tamarisk Coalition and the University of Utah to analyze, evaluate, and summarize riparian restoration data and to provide technical assistance to the Nature Conservancy to support groundwater and surface water monitoring efforts in Arizona's Verde River and San Pedro River.

Riparian Restoration and Monitoring Assistance, Escalante River, Utah and Upper Gila River, Arizona (*Clients: Escalante River Watershed Partnership and Gila Watershed Partnership*): Mr. Keith is working collaboratively with the Escalante River Watershed Partnership (ERWP) and Gila Watershed Partnership (GWP) to develop science-based field survey and analysis protocols to monitor and evaluate riparian restoration progress throughout the Escalante River and upper Gila River watersheds. Managing a small, multidisciplinary team of scientists, Mr. Keith is helping the ERWP and GWP develop a goal-driven data collection and reporting approach and quantitative evaluation metrics to effectively meet the needs of watershed stakeholders and funders.

Central Arroyo Seco Native Fish Habitat and Restoration Priorities Assessment, CA (*Client: Arroyo Seco Foundation*): Mr. Keith is the lead ecologist for an ongoing assessment of aquatic habitat conditions and limiting factors related to native fish conservation and restoration in the central portion of the Arroyo Seco near Pasadena, California. This project includes an evaluation of environmental flow requirements, water temperature, sediment dynamics, habitat connectivity, and key aquatic and riparian habitat conditions as they relate to the abundance, distribution, and potential restoration of arroyo chub, rainbow trout, and other native fishes in Arroyo Seco.

- Whitewater Rescue Technician (WRT #3103), Rescue 3 International, 2006

PROFESSIONAL AFFILIATIONS

- American Fisheries Society
- Salmonid Restoration Federation

SELECTED PUBLICATIONS AND PRESENTATIONS

Lando, J.B., A.J. Keith, and A.F. Brumo. 2013. **Modeling to predict habitat capacity and population dynamics of spring-run Chinook and steelhead: A Case Study for Reintroduction Planning in the Upper Yuba Basin, CA.** Presented at the 2013 Annual Meeting of the Western Division of the American Fisheries Society, Boise, Idaho. 17 April.

Keith, A.J. and J.B. Lando. 2011. **Modeling spring Chinook and steelhead habitat capacity to evaluate reintroduction potential in the upper Yuba River, California.** Presented at the 45th Annual Conference of the California-Nevada Chapter of the American Fisheries Society, Folsom, California. 2 April.

Ligon, F. K., M. R. Sloat, A. J. Keith, B. C. Harvey, and N. S. Lassettre. 2009. **A regional perspective on the ecology and management of steelhead in San Francisco Bay Area streams.** Poster. Presented at the National Conference on Ecosystem Restoration, Los Angeles, California, 20–24 July.

Liebig, R., A. J. Keith, M. Singer, and B. Orr. 2008. **Fish community composition on the Merced River: spatial and seasonal patterns at multiple scales and between high-flow and low-flow years (2006-2008).** Poster. Presented at the 5th Biennial CALFED Bay-Delta Science Conference, Sacramento, California, 22-24 October.

River Flow Restoration and Accounting, Verde River, AZ *(Client: The Nature Conservancy)*: Mr. Keith recently led a multidisciplinary team to help The Nature Conservancy track and document the outcomes of current and future water conservation and flow restoration actions in the Verde River, Arizona. The Nature Conservancy is working with surface water users in the Verde Valley to implement a suite of "flow restoration" projects to reduce consumptive water use and improve river flow while maintaining local economies. Under Mr. Keith's direction, Stillwater Sciences developed a quantitative flow accounting method to demonstrate measurable instream flow gains to downstream beneficiaries and to help prioritize and guide future flow restoration improvements.

San Joaquin River Restoration Program, CA *(Client: Bureau of Reclamation):* Mr. Keith was project manager and lead aquatic ecologist for the restoration of flows, habitat, and native fish in a 52-mile reach of the San Joaquin River in California's Central Valley. As a member of the agency-led Fisheries Management Workgroup, he helped develop project alternatives, identify biological opportunities and constraints, and evaluate the ecological benefits of restoration flows. Mr. Keith was lead author of the fisheries section of the SJRRP Program Environmental Impact Statement and Environmental Impact Report, evaluating ecological linkages between planned physical habitat and infrastructure improvements and potential impacts on native fishes and sportfish, including salmonids, lamprey, sturgeon, and striped bass.

Cache Slough Complex Conservation Assessment, Sacramento-San Joaquin Delta, CA *(Client: Department of Water Resources [DWR]):* Mr. Keith is lead fisheries biologist for the consultant team providing support to DWR in the implementation of the Fish Restoration Program (FRP) in order to fulfill requirements contained within Biological Opinions of the USFWS (2008) and NMFS (2009) for continued federal and state water export operations. For the Cache Slough Complex Conservation Assessment, Mr. Keith is working with DWR staff to identify and prioritize tidal marsh restoration opportunities in the northwestern portion of the Delta. The assessment relies on existing conceptual models to synthesize historical ecology of the Delta, current landscape and waterscape patterns, ecological linkages and requirements of native fish and aquatic species, and effects of climate change.

Trabuco Creek Fishway Restoration at Interstate 5/Camino-Capistrano, Orange County, CA *(Client: Trout Unlimited, as a subconsultant to Northwest Hydraulic Consultants):* Mr. Keith is the lead fisheries biologist and provides technical assistance for permitting and regulatory compliance for the design and implementation of a southern steelhead trout passage and habitat improvement project in a previously obstructed portion of Trabuco Creek in Orange County, CA.

Appendix D: Letters of Financial Commitment and Support

1. Three Rivers Alliance
2. Yuma County Commissioners
3. Yuma County Water Authority
4. Republican Water Conservation District
5. The Nature Conservancy
6. Yuma Pest Control District
7. Boy and Cub Scout Troop 38
8. Bureau of Reclamation (forthcoming – electronic file received but corrupted)
9. South Platte Basin Roundtable (pending)
10. Senator Cory Gardner (pending)

THREE RIVERS ALLIANCE

12572 CR U
Kirk, CO 80824
(970)354-7487

OUR MISSION

To sustain vibrant natural and human communities of the Republican River Basin by promoting good stewardship of its water, land, and wildlife.

October 26, 2017

Colorado Water Conservation Board
Ms. Becky Mitchell
1313 Sherman Street, Room 721
Denver, CO 80203

Dear Ms. Mitchell,

Three Rivers Alliance (TRA) is a Colorado non-profit landowner conservation group formed in 2008 by land owners in the Republican River Basin. The main objective of this organization is the conservation and restoration of riparian areas in the Basin for the benefit of land owners, communities, and the wildlife in this area. TRA and its partners are involved in several ongoing projects which include Russian olive and other invasive species removal, dead wood removal, education, and noxious weed management.

TRA is excited and proud to be part of the South Fork Republican Restoration Coalition. The members of this coalition have a common interest in restoring the channel of the South Fork Republican River to its historic form since Bonny Reservoir has been drained. This will have a very positive impact for wildlife and recreation in this area, which will be of great benefit to the county and local communities.

Three Rivers Alliance whole heartedly supports the South Fork Republican Restoration Coalition's application for funding to develop a Stream Management Plan. TRA will continue to participate in this project as the restoration of the channel of the South Fork Republican is important for the wildlife and communities in this area. We recommend funding of this project through the Colorado Water Plan Grant Fund.

Sincerely,

Dana Shaw

Dana Shaw, Three Rivers Alliance Chairman

BOARD OF COUNTY COMMISSIONERS

Dean Wingfield, District 2 | Robin Wiley, District 3 | Trent Bushner, District 1

Andrea Calhoon
Administrator

October 23, 2017

Republican River Water Conservation District Stream Management Plan

Dear Sir or Madam:

The Yuma County Board of County Commissioners would like to formally express their support for the South Fork Restoration Coalition's application for the Colorado's Water Plan Grant Fund sponsored by The Republican River Water Conservation District. The Coalition is founded upon common interests in our area related to the South Fork Republican River and the South Republican State Wildlife Area.

The project vision, among other things, focuses on restoration and improvement of surface flows in the South Fork of the Republican including both a specific restoration plan and a Stream Management Plan. The Stream Management Plan is intended to work with local stakeholder groups to focus on shared goals to sustain both natural and human communities on the South Republican.

The Yuma County Board of County Commissioners recommend this project for funding through the Colorado's Water Plan Grant Fund.

Sincerely,

Robin Wiley Trent Bushner

Chairman

Phone (970) 332-5796 310 Ash Street, Suite A • Wray, Colorado 80758-1800 Fax (970) 332-3411

BOARD OF COUNJ11(COMMISSION£RSS

Dean Wingfield
District 2

Robin Wiley
District 3

Trent Bushner
District I

Andrea Calhoon
Administrator

October 23, 2017

Republican River Water Conservation District Stream Management Plan

Dear Sir or Madam:

The Yuma County Water Authority extends their support for the South Fork Restoration Coalition's application for the Colorado's Water Plan Grant Fund sponsored by The Republican River Water Conservation District. The Coalition is founded upon common interests in our area related to the South Fork Republican River and the South Republican State Wildlife Area.

The Coalition is focused on restoration and improvement of surface flows in the South Fork of the Republican specifically including a Stream Management Plan. The Stream Management Plan is intended to work with local stakeholder groups to focus on shared goals to sustain both natural and human communities on the South Republican.

The Yuma County Water Authority recommends this project for funding through the Colorado's Water Plan Grant Fund.

Sincerely,

Chairman

Phone (970) 332-5796 310 Ash Street, Suite A • Wray, Colorado 80758-1800 Fax (970) 332-3411

Republican River Water Conservation District
Water Activity Enterprise
410 Main Street, Ste 8, Wray, Colorado 80758
Phone 970-332-3552 Fax 970-332-3553

October 25, 2017

Colorado Water Conservation Board
Ms. Becky Mitchell
1313 Sherman Street, Room 721
Denver, CO 80203

Dear Ms. Mitchell,

The Colorado General Assembly created the Republican River Water Conservation District (RRWCD) in 2004 to assist the State of Colorado in carrying out its duties under the Republican River Compact. Since its inception, the RRWCD has created and funded conservation programs, purchased surface water rights and with the assistance of a low interest loan from Colorado Water Conservation Board, built a 12-mile pipeline to deliver water to the North Fork, all in support of the State of Colorado. Due to these efforts of the RRWCD, the State of Colorado is in compliance with the Republican River Compact. The Republican River Water Conservation District strives to encourage efficient irrigation practices and water conservation to further assist with compact compliance, while endeavoring to sustain the local agriculture based economy.

The Board of Yuma County Commissioners, the RRWCD, the Colorado Division of Parks and Wildlife, Three Rivers Alliance and The Nature Conservancy came together to create the South Fork Republican Restoration Coalition (SFRRC). The focus of the SFRRC is the common interest that exists between individual missions, as it relates to restoring the channel of the South Fork Republican River.

The Republican River Water Conservation District would like to formally express its support of the South Fork Republican Restoration Coalition's application for stream management funding. The RRWCD will be the fiscal agent for this project and the RRWCD will continue to participate in this project as we strive to restore the channel of the South Fork Republican. We recommend funding of this project through the Colorado Water Plan Grant Fund.

Sincerely yours,

Rodney L Lenz

Rod Lenz,
President of the Board

The Nature Conservancy
Colorado

The Nature Conservancy in Colorado
2424 Spruce Street
Boulder, CO 80302

tel (303) 444-2950
fax (303) 444-2985

nature.org/colorado

November 1, 2017

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

Dear Board Members,

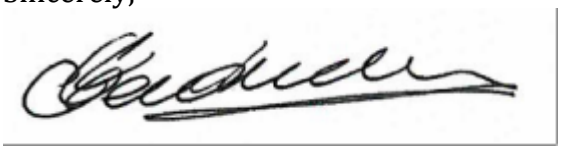
As the State Director for The Nature Conservancy in Colorado, I appreciate this opportunity to express my support for the South Fork Republican Restoration Coalition's Stream Management and Restoration Planning application to the Colorado Water Conservation Board's Colorado Watershed Restoration Program.

The Republican River is an important region for the State of Colorado that includes productive agriculture, wildlife habitat, and established communities that rely on the water that sustains them. It is a high conservation priority for The Nature Conservancy because its ecological and societal values. Working collaboratively, we hope to create an actionable plan for the project area that will sustain the vibrant natural and agricultural communities of the South Fork Republican Watershed.

The mission of The Nature Conservancy is to conserve the lands and waters upon which all life depends. Because the proposed project directly contributes to the core of our mission, The Nature Conservancy has determined the project warrants our financial commitment. If funded by CWCB, the Conservancy commits to contributing to the project, up to $120,000.

I urge the CWCB to fund this application to the Colorado Watershed Restoration Program Grant Opportunity. I am confident this project will materially contribute to the agriculture, ecology, and communities of the South Fork Republican.

Sincerely,



Carlos Fernandez
State Director, Colorado
The Nature Conservancy

Yuma County Pest Control District
420 West Hoag
P.O.Box311
Yuma, CO 80759
970-848-2509

October 31, 2017

From:Mike Foor
Supervisor | Yuma County Pest ControlDistrict | 420 West Hoag Ave | Yuma | CO | 80759

To:Ms.Becky Mitchell
Colorado Water Conservation Board 11313 Sherman Street,Room 721 | Denver | CO | 80203

Dear Ms. Mitchell:

Since 2006 Yuma County Pest ControlDistrict (YCPCD} and many of the partners of the South Fork Republican Restoration Coalition (SFRRC) have formed a partnership to remove invasive phreatophyte tree,mainly Russian-olive and Tamarisk, from the main channel of the South Fork of the Republican River and the tributaries of the said river. The invasive phreatophyte removal project is progressing, and the majority of the invasive phreatophytes have been removed from private property along the main channel of the South Fork of the Republican River.

The next phase of restoring the South Fork of the Republican River should be the control and removal of the large cattailmat that has grown from the Highway 385 bridge east to what was formally the high-water mark of Bonny Reservoir. In 2011YCPCD started a cattail controlproject using a helicopter and an aquatic approved herbicide to control the cattails on the west side of the Highway 385 bridge on private property,with success.

YCPCD supports all efforts of the SFRRC in the restoration of the river channel in the South Fork of the Republican River from Flagler,CO to the Colorado/Kansas state line. YCPCD will support this project as needed and outlined by the SFRRC.

Mike Foor
Supervisor

October 31, 2017

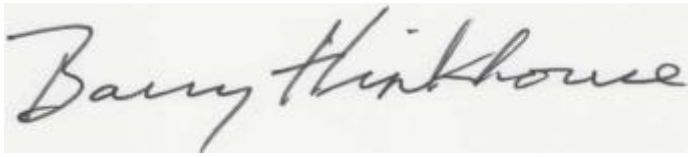
Burlington Boy and Cub Scout Pack 38

Dear Sir or Madam:

The Boy and Cub Scout Pack 38 extends it's support for the South Fork Restoration Coalition's application for the Colorado's Water Plan Grant Fund sponsored by the Republican River Water Conservation District. The Scouts annually have a Camporee along the South Fork Republican River that up to 700 scouts and leaders attend. We feel the Coalition has many of the same interests we have in the matters that effect the South Fork as well as the South Republican State Wildlife Area.

Burlington Boy and Cub Scout Pack 38 recommend this project for funding through the Colorado's Water Plan Grant Fund.

Sincerely,



Barry Hinkhouse

Chairman

United States Department of the Interior

BUREAU OF RECLAMATION
Great Plains Region
Nebraska-Kansas Area Office
1106 West 3rd Street

McCook, NE 69001-2159

REPLY REFER TO

NK-Hla
2.2.3.18 FRC

October 31, 2017

VIA ELECTRONIC MAIL ONLY

Ms. Deb Daniel
General Manager
Republican River Water Conservation District
410 Main Street #8,
Wray, CO 80758
Email: deb.daniel@rrwcd.com

Subject: Letter of support for the Republican River Water Conservation District (RRWCD)

Dear Ms. Daniel:

In response to your request, the Bureau of Reclamation supports (RRWCD) application, on behalf of the South Fork Republican River Restoration Coalition for a Stream Management funding through the Water Plan Grant of the Colorado Water Conservation Board.

The proposed project fits with Reclamation's mission to manage, develop, and protect water and related resources. With increasing demands for water, specifically within the Republican River basin, this River Restoration project is an essential component to sustain our limited water resources.

Sincerely,

Aaron M. Thompson
Area Manager