

Lower San Rafael River and Riparian Corridor Habitat

Project ID: 3718

Status: Current

Fiscal Year: 2017

Submitted By: N/A

Total Acres: 205

Project Manager: Brian Laub

PM Agency: Utah State University

PM Office: Logan

Lead: Bureau of Land Management

WRI Region: Southeastern

Description:

Continue riparian and river channel habitat restoration improvement and monitoring on 6 river miles and 205 acres as part of a long-term restoration plan. Activities will include beaver dam construction and maintenance, tamarisk resprout treatments, and monitoring of channel and habitat changes around beaver dam structures.

Location:

The project is located on two sections of the lower San Rafael River, between the San Rafael Reef and the Green River confluence.

PROJECT NEED

Need For Project:

The ecological condition of the lower San Rafael River has been severely degraded over time through a combination of impacts including altered flow regimes and non-native vegetation encroachment. Currently, the river is not functioning to provide sufficient habitat to support sustainable populations of native fish species. Riparian habitat has also been degraded. Much of the riparian corridor is occupied by thick stands of tamarisk and native vegetation recruitment is low, particularly for cottonwood trees.

The lack of sufficient habitat in the lower San Rafael River threatens the persistence of native vegetation and fish within the San Rafael River. In particular, the San Rafael River is home to the flannelmouth sucker (*Catostomus latipinnis*), bluehead sucker (*Catostomus discobolus*), and roundtail chub (*Gila robusta*), collectively referred to as the three species. All three species are considered sensitive species throughout their range, and a rangewide conservation agreement was signed by BLM, UDWR, and other interested parties to manage the three species in 2004. The three species maintain self-sustaining populations in the upper San Rafael River (above the San Rafael Reef), but the lower San Rafael River is considered a sink for populations of these species, meaning that the lower river population is only maintained by immigration of fish from the upper San Rafael River and from the Green River. In addition, survival of fish immigrating to the lower river is very low due to a lack of available habitat, altered flow regimes, and the presence of predatory non-native fish. Improvement of habitat conditions in the lower river would likely improve survival of immigrating fish, help increase populations of the three species in the lower river, and therefore help ensure the continued persistence of the three species throughout the San Rafael River.

The focus of the restoration project will be to improve populations of the three species and native vegetation. However, endangered fishes of the Colorado River Basin, including Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), and bonytail chub (*Gila elegans*) have also been observed to use the San Rafael River seasonally, such that restoration activities are likely to benefit these endangered species as well.

Restoration aimed at improving riparian habitat conditions will likely benefit native vegetation and instream fish habitat as well. The presence of thick tamarisk stands has likely contributed to reduced establishment of native vegetation across large areas of the riparian corridor, due to shading effects and competition for soil moisture. Replacement of native vegetation, particularly large cottonwoods, by tamarisk has likely further degraded habitat for native fish on the San Rafael River by reducing the amount of large wood and wood accumulations in the river. Analyses of aerial imagery and on-the-ground observations have found that wood accumulations and large pieces of wood, primarily large cottonwood trees, increase channel complexity and provide important fish habitat including scour pools, backwaters, and overhead cover. In addition, improving riparian conditions will likely improve habitat for terrestrial species of wildlife including mammals and birds.

Without restoration, it is unlikely that degradation of the lower San Rafael River will be reversed, and therefore, actions that aim to improve habitat conditions are needed to ensure persistence of native fish and vegetation in the lower river.

Objectives:

The project proposed here is a continuation and refinement of the first phase of a comprehensive restoration plan developed for the lower San Rafael River (provided as an attachment). The goals of the overall plan are: 1) to recover self-sustaining populations of the three species and other native fish in the San Rafael River, 2)

ensure persistence of native riparian vegetation, 3) to provide necessary and sufficient habitat to ensure persistence of native fish, and 4) to conduct sufficient monitoring of restoration impacts to quantitatively assess whether the restoration actions are accomplishing the restoration goals and objectives and to determine the causes of success or failure.

The project proposed here (continuation of the first phase of the overall restoration plan) is intended to help meet the goals of the overall restoration plan by improving fish and riparian habitat conditions at two specific locations on the lower San Rafael River. The specific objectives for phase I of the restoration project are:

1. Increase instream habitat complexity (defined as the amount of pools, riffles, and backwater habitats in the channel) over 6 river miles.
2. Reduce abundance of tamarisk and other non-native vegetation and increase establishment of native vegetation (particularly cottonwood trees) on 64 acres of the riparian corridor.

In the initial habitat improvement project (Project ID: 2879), tamarisk was removed on 64 acres of riparian land and 6 river miles of river were treated with a combination of beaver-dam analog devices and addition of gravel bars. Monitoring has indicated positive responses of channel habitat and riparian vegetation to these treatments, but additional work is now needed to rebuild and maintain beaver-dam analog structures, control tamarisk resprouting, burn removed tamarisk piles, and monitor channel and riparian vegetation changes. Additional monitoring in particular is needed, to ensure that beaver dam analog structures and other habitat improvement projects are working as intended and promoting beneficial habitat responses before applying these treatments to additional sections of the river.

The main objectives for the extended work under phase I of the overall project are to:

1. Maintain habitat complexity created by initial treatments and increase habitat complexity further with additional treatments over 6 river miles.
2. Control tamarisk resprouting and prevent reestablishment of tamarisk trees in removal areas.
3. Monitor channel, habitat, and fish community responses in treatment areas to determine whether habitat treatments improve channel complexity and whether native fish use created habitats.

Threats / Risks:

The proposed project addresses the current degraded instream and riparian habitat that threatens the persistence of native fish and vegetation in the San Rafael River. Working to ensure persistence of native fish in the San Rafael River is critical, because the San Rafael River is one of the few rivers in Utah that harbors populations of bluehead sucker, flannelmouth sucker, and roundtail chub together. In particular, the roundtail chub has been extirpated from many nearby rivers (including the Price and Muddy) and is currently being petitioned for endangered species listing the lower Colorado River Basin. Thus, ensuring persistence of the roundtail chub in the San Rafael River could help prevent listing of the species in the upper Colorado River Basin.

Over the long-term, the threats to native fish and vegetation are likely to continue and worsen without management and restoration of the river system. For example, a study of the water resources available in the San Rafael River watershed identified areas where additional water storage can be implemented (San Rafael River and Muddy Creek Watersheds Study, Utah Division of Water Resources, 2012), so the flow regime and river habitat is likely to be impacted further unless environmental flows can be incorporated into basin management plans. Thus, undertaking a restoration project will not only help ensure robust populations of native fish in the near-future by addressing immediate threats, but will also help ensure robust populations over the long term by ensuring native fish species are considered in long-term development planning within the watershed.

Some of the gains in habitat improvement obtained during the initial phase of restoration on the lower San Rafael are at risk of being lost without further action. In particular, the complex habitat created around beaver-dam analog structures could be lost without additional construction and maintenance of some structures. Tamarisk removal efforts could also be negated if resprouts are allowed to grow and recolonize cleared areas. In addition, there is a substantial opportunity to understand whether and why applied treatments are effective at improving habitat complexity that would be lost without additional monitoring efforts. Understanding the effects of applied treatments will help guide future restoration efforts on the San Rafael and nearby rivers, so that loss of an opportunity to gain this understanding could make future restoration efforts less efficient and effective.

Relation To Management Plan:

San Rafael River Restoration Project

The project proposed here is part of a larger restoration effort planned for the lower San Rafael River (see Table 2, pg. 51 of attachment: FinalPlan_7-15-2013), and will help meet the goals of this restoration effort (see attachment: Mgmnt_Plan_Goals). The project is an extension of a habitat restoration effort initiated in 2015 (WRI project ID 2879). The Utah Division of Wildlife Resources has also undertaken habitat restoration efforts on much of the land they own along the lower San Rafael River (WRI project IDs 2260, 1963, 867). The project proposed here extends these habitat restoration efforts, will be undertaken in close coordination with the UDWR, and thus helps achieve stated UDWR goals for restoration (see attachment: Mgmnt_Plan_Goals).

Three Species Rangewide Conservation Agreement/Utah Three Species Plan

The three species are currently managed under a range-wide and state conservation agreement to which the BLM and UDWR are signatories. The proposed restoration specifically targets improvement of three species populations in the San Rafael River through habitat improvement and implementation of a monitoring plan, and thus will help accomplish the goals of this conservation agreement (see attachment: Mgmt_Plan_Goals).

Upper Colorado River Endangered Fish Recovery Program

The Colorado pikeminnow, razorback sucker, and bonytail chub have all been observed in the San Rafael River on a seasonal basis, suggesting potential use of the river for spawning and rearing. Many of the habitat requirements for the three species are closely aligned with habitat requirements of these endangered species, particularly young life stages, such that habitat restoration on the San Rafael will likely benefit these endangered species as well and contribute toward the goal of recovering populations of each species toward delisting.

Watershed/TMDL Plans

Both the Upper and Lower San Rafael River Assessment Units were included on the 2000 UDEQ-DWQ 303(d) List of Impaired Waters for not supporting the Beneficial Use Class 4-Agriculture for total dissolved solids (TDS) of 1,200 mg/L. This listing required development of a Total Daily Maximum Load (TMDL) report, which was developed for the Price River, San Rafael River, and Muddy Creek and approved by the EPA in 2004. The project may increase loads of TDS in the short-term (5-10 years) due to destabilization and erosion of bank materials, a known, albeit minor, component of TDS loading in the San Rafael River. However, over the long term (>10 years), loads are expected to decline through the project reach due to increases in river-floodplain connectivity and retention of water and sediments in beaver ponds, oxbows, and floodplain depressions. Reductions are predicted to be small in magnitude, the major sources of TDS loading to the San Rafael River being irrigation return flows and natural loading from groundwater and monsoon-derived sediment inputs, but nonetheless significant.

BLM Price Field Office Resource Management Plan

The resource management plan is a broad framework for managing BLM lands in the jurisdiction of the Price Field Office, including the San Rafael River. The proposed project will comply with and enhance the objectives of this management plan including objectives to restore riparian functioning and provide quality habitat to support native fish and wildlife (see attachment: Mgmt_Plan_Goals).

Fire / Fuels:

The overall project will reduce risks of fire and fuel loading by reducing the extent of thick tamarisk stands within the riparian corridor. This will help protect valuable wildlife habitat within the riparian corridor. In this phase of the project specifically, piles of removed tamarisk trees will be burned to reduce fuel loading in areas recently treated with tamarisk removal.

Water Quality/Quantity:

As discussed within the Relation to Management Plans section, the project may increase loads of TDS in the short-term (5-10 years) due to destabilization and erosion of bank materials, a known, albeit minor, component of TDS loading in the San Rafael River.

However, over the long term (>10 years), loads are expected to decline through the project reach due to increases in river-floodplain connectivity and retention of water and sediments in beaver ponds, oxbows, and floodplain depressions. Reductions are predicted to be small in magnitude, the major sources of TDS loading to the San Rafael River being irrigation return flows and natural loading from groundwater and monsoon-derived sediment inputs, but nonetheless significant.

Compliance:

The proposed project is in compliance with all NEPA and permitting requirements. The NEPA process was completed under the initial phase of restoration, including a Biological Opinion from the US Fish and Wildlife Service (approved NEPA document and BO are attached). State and Army Corps permits were also obtained during the first phase of restoration and will cover project activities proposed under this extension (stream alteration permits attached).

Methods:

A number of activities have been identified that will be used to restore river and riparian habitat.

Partnering with beaver: Installation of beaver-dam analog structures will be used as a restoration tool. Beaver-dam analogs consist of willow branches weaved in between wooden posts hammered into the streambed. Beaver-dam analogs should help beaver maintain additional dams, but even if beaver do not use the structures, the structures alone can provide similar benefits as natural beaver dams.

Beaver-dam analogs will be installed and maintained by Utah Conservation Corps crews over a two week period in the fall.

Tamarisk resprout control: Removal of 64 acres of tamarisk was accomplished in 2015, and resprout control

will be conducted in this and some additional removal areas.

Tamarisk resprout control will be conducted in the fall using a hand-applied herbicide spray. 205 acres will be treated in total. A contractor will be hired to complete the work.

Tamarisk pile burning: Piles of tamarisk that were removed on 64 acres in 2015 will be burned in order to clear the debris from the riparian corridor and reduce fuel loading.

Burning will be conducted by BLM fire crews, likely in the late fall or winter.

Monitoring:

Detailed monitoring of channel responses to installation of beaver-dam analogs will be conducted to understand whether the structures are altering channel properties such as width, depth, and substrate composition and whether any changes benefit fish habitat. If changes are observed, monitoring will also be conducted to understand how the beaver-dam analogs achieve channel changes through alteration of geomorphic processes of erosion, scour, and deposition. Monitoring of fish use of habitat around beaver-dam analogs will also be conducted to determine whether native fish actually use habitat created by beaver-dam analogs. Below are details on the methodology and timing of anticipated monitoring:

* Channel morphology: Impacts of restoration on the shape of the channel, including degree of channel confinement and channel width will be monitored by comparing on-the-ground surveys (RTK-GPS) of channel and floodplain topography conducted in the fall, after the spring and monsoon flood season, to data which will be acquired prior to installation of beaver-dam analogs which will occur this spring. In addition to before-after surveys, control sites will be monitored before and after installation to compare to areas treated with beaver-dam analogs. Detailed surveys will be conducted in the fall by an experienced contractor over a period of 2-3 weeks. Fish habitat monitoring and topographic change detection will be conducted following the Columbia Habitat Monitoring Program (CHaMP) survey protocol (Bouwes et al. 2011. Scientific protocol for salmonid habitat surveys within the Columbia Habitat Monitoring Program. Terraqua, Inc., Wauconda, WA). The CHaMP program has built-in analytical tools and data hosting capabilities in a queryable database that will be leveraged for analysis of the survey data.

* Habitat complexity: Amount of pools, riffles, and backwaters in restored sections of the channel will be surveyed in restored areas and control areas and compared to pre-restoration complexity data that will be collected in spring 2016. Surveys will constitute a combination of high-resolution CHaMP surveys (laid out strategically within the restoration treatment reaches centered around the beaver-dam complexes), and a visual, field-based geomorphic mapping of discrete channel units, including pools, riffles, and backwaters (carried out between the beaver-dam complexes within the longer treatment reaches). Surveys will be conducted in fall 2016 by an experienced field crew over a 1-week period.

* Native fish habitat use: Electrofishing and seining surveys will be conducted in control and restored reaches of the river in the fall to determine whether native fish or non-native fish are occupying any habitat created by beaver-dam analog structures. Fish surveys will be conducted by experienced field crews during a 1-week period in the fall.

The achievement or failure to achieve the objective to improve habitat complexity will be reported in the final report associated with this project. Monitoring data will also be presented in local and regional scientific and management meetings. Monitoring data is also expected to lead to 1 or 2 scientific publications.

Partners:

The project lead agency is the BLM, and several partners have been identified, including:

1. Utah Division of Wildlife Resources
2. Utah State University
3. U.S. Geological Survey

The Utah Division of Wildlife Resources has been involved in planning, implementation, and monitoring of all phases of the San Rafael Restoration project, and some work proposed in this plan will be conducted on UDWR lands.

Utah State University has been involved in development of the overall San Rafael restoration plan and is fully involved in the implementation and monitoring of the project. Student seasonals have assisted with plan implementation, and monitoring of channel and habitat changes and groundwater impacts have been conducted by Utah State personnel. Utah State personnel will continue to be involved in restoration implementation and will lead monitoring efforts of channel and habitat changes.

The U.S. Geological Survey currently operates a flow gage within the project reach, and this gaging will continue through the proposed project period.

Future Management:

One activity that will be ongoing as part of the broad restoration plan (see Table 3, pg. 55 in attachment) and that will help ensure the long-term success of the current project is to coordinate with stakeholders in the watershed to provide ecological flows. Providing both low flows and flood flows (after needs of water users are met) will help maintain habitat and create new habitat through natural river processes. Non-native fish control and fish passage improvement are also planned as part of the broad restoration plan and will help ensure native fish populations will be around to use restored habitat. Any future cottonwood establishment sites will be protected from cattle grazing until trees are large enough to resist browsing and trampling. The proposed project is the first phase of a larger habitat restoration effort that will extend successful activities to other sections of the river to help ensure that habitat is improved throughout the lower San Rafael River corridor.

Domestic Livestock Benefit:

The proposed project has a high potential to improve forage for domestic livestock. Tamarisk removal will allow native grasses to establish in areas where dense tamarisk stands previously shaded out any forage plant species - some growth of grasses in tamarisk removal areas has already been observed. This project will help maintain improvements in forage by preventing tamarisk from recolonizing removal areas and by opening up further space for forage plant establishment through burning of tamarisk slash piles.

BUDGET	WRI/DWR	Other	Budget Total	In-Kind Total	Grand Total
	\$51,000.00	\$39,670.00	\$90,670.00	\$35,000.00	\$125,670.00

Item	Description	WRI	Other	In-Kind	Year
Personal Services (seasonal employee)	Wages for seasonal employees working to collect and process vegetation, channel morphology, fish habitat use, and fish habitat data at monitoring sites.	\$7,500.00	\$0.00	\$0.00	2017
Personal Services (permanent employee)	Cost for permanent employees to develop and oversee project implementation and monitoring plans and to analyze monitoring data and produce monitoring reports.	\$5,000.00	\$0.00	\$0.00	2017
Contractual Services	Herbicide and cut-stump treatments on 205 acres of tamarisk removal treated area at \$100/acre.	\$20,500.0	\$0.00	\$0.00	2017
Contractual Services	Hiring of Utah Conservation Corps crew to work for two weeks constructing and maintaining beaver-dam analog structures	\$6,000.00	\$0.00	\$0.00	2017
Personal Services (permanent employee)	Contributions to building and maintenance of beaver-dam assist structures and vegetation management.	\$0.00	\$0.00	\$5,000.00	2016
Contractual Services	Burning of tamarisk piles in tamarisk removal areas.	\$12,000.0	\$0.00	\$0.00	2017
Contractual Services	Monitoring of groundwater levels and channel change around beaver-dam analog structures	\$0.00	\$20,000.0	\$0.00	2016
Personal Services (seasonal employee)	Seasonal labor for building and maintenance of beaver-dam analogs	\$0.00	\$0.00	\$20,000.0	2016
Contractual Services	Installation and operation of a flow gauge at the restoration site	\$0.00	\$19,670.0	\$0.00	2016
Personal Services (permanent employee)	Cost for BLM and DWR employees to assist in development and supervision of implementation and monitoring plans.	\$0.00	\$0.00	\$10,000.0	2017

FUNDING	WRI/DWR	Other	Funding Total	In-Kind Total	Grand Total
	\$51,000.00	\$39,670.00	\$90,670.00	\$35,000.00	\$125,670.00

Source	Phase	Description	Amount	Other	In-Kind	Year
ESMF	IE093		\$24,000.0	\$0.00	\$0.00	2017
BLM HLI (Riparian 1040)			\$13,524.0	\$0.00	\$0.00	2017

Source	Phase	Description	Amount	Other	In-Kind	Year
DNR Watershed	N362		\$13,476.0	\$0.00	\$0.00	2017
DWR			\$0.00	\$39,670.0	\$0.00	2016
DWR			\$0.00	\$0.00	\$20,000.0	2016
BLM			\$0.00	\$0.00	\$5,000.00	2016
BLM		Permanent employee involvement in project.	\$0.00	\$0.00	\$5,000.00	2017
DWR		Permanent employee involvement in project.	\$0.00	\$0.00	\$5,000.00	2017

EXPENSE	WRI/DWR	Other	Expense Total	In-Kind Total	Grand Total
	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Source	Phase	Description	Amount	Other	In-Kind	Year
ESMF	IE093	N/A	\$0.00	\$0.00	\$0.00	
BLM HLI (Riparian 1040)		N/A	\$0.00	\$0.00	\$0.00	
DNR Watershed	N362	N/A	\$0.00	\$0.00	\$0.00	
DWR		N/A	\$0.00	\$0.00	\$0.00	
DWR		N/A	\$0.00	\$0.00	\$0.00	
BLM		N/A	\$0.00	\$0.00	\$0.00	
BLM		N/A	\$0.00	\$0.00	\$0.00	
DWR		N/A	\$0.00	\$0.00	\$0.00	

SPECIES

Species	"N" Rank	HIG/F Rank
Bluehead Sucker	N4	N/A
Threat		Impact
Channel Downcutting (indirect, unintentional)		Low
Invasive Plant Species – Non-native		Medium
Sediment Transport Imbalance		Medium
Colorado Pikeminnow	N1	N/A
Threat		Impact
Channel Downcutting (indirect, unintentional)		Low
Invasive Plant Species – Non-native		Medium
Sediment Transport Imbalance		Medium
Roundtail Chub	N3	N/A
Threat		Impact
Channel Downcutting (indirect, unintentional)		Low
Invasive Plant Species – Non-native		Medium
Sediment Transport Imbalance		Medium
Bonytail	N1	N/A
Threat		Impact
Channelization / Bank Alteration (direct, intentional)		Medium

Species	"N" Rank	HIG/F Rank
Threat		Impact
Invasive Plant Species – Non-native		Medium
Sediment Transport Imbalance		Medium
Domestic Livestock		N/A
Threat		Impact
No Threat		NA
American Beaver		N/A
Threat		Impact
No Threat		NA
Yellow-billed Cuckoo	N3	N/A
Threat		Impact
Channel Downcutting (indirect, unintentional)		High
Habitat Shifting and Alteration		Medium
Flannelmouth Sucker	N3	N/A
Threat		Impact
Channel Downcutting (indirect, unintentional)		Low
Invasive Plant Species – Non-native		Medium
Sediment Transport Imbalance		Medium
Razorback Sucker	N1	N/A
Threat		Impact
Channelization / Bank Alteration (direct, intentional)		Medium
Invasive Plant Species – Non-native		Medium
Sediment Transport Imbalance		Medium

HABITATS

Habitat

Aquatic-Scrub/Shrub

Threat	Impact
Invasive Plant Species – Non-native	Medium
Sediment Transport Imbalance	Medium

Riverine

Threat	Impact
Channel Downcutting (indirect, unintentional)	High
Channelization / Bank Alteration (direct, intentional)	High
Invasive Plant Species – Non-native	Medium
Sediment Transport Imbalance	Medium

PROJECT COMMENTS

Comment	01/25/2016	Type: Project	Commenter Clint Wirick
Great collaborative project			
Comment	01/25/2016	Type: Project	Commenter Alan Clark
Brian, you list permanent employees being funded through WRI to manage project and analyze data. Whose employees?			
Comment	01/25/2016	Type: Project	Commenter Brian Laub
The employees will be a combination of BLM, UDWR, and personnel from Utah State University. Should this be specified in the budget description?			
Comment	01/27/2016	Type: Project	Commenter Nicole Nielson
Brian, I think you should also claim Aquatic Scrub/Shrub in habitats.			
Comment	01/27/2016	Type: Project	Commenter Brian Laub
Thanks, I have added that habitat - I guess I was looking for riparian habitat, so I missed this before.			
Comment	01/27/2016	Type: Project	Commenter Wade Paskett
support			
Comment	01/29/2016	Type: Project	Commenter Makeda Hanson
Remove dam/reservoir threat from Colorado pikeminnow and remove natural rarity threat from bonytail since your project isn't directly addressing these threats. Remove brush eradication from habitat threats. Also separate your employee funding to better describe what is needed for monitoring staff. Permanent employee funds should be considered in-kind. Please make changes by COB 01/01/2015.			

COMPLETION

Start Date:

End Date:

FY Implemented:

2017

FY Completed:

Final Methods:

N/A

Project Narrative:

N/A

Future Management:

N/A

Map Features

ID	Feature Category	Action	Treatment/Type
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ID	Feature Category	Action	Treatment/Type
5012	Aquatic/Riparian Treatment	Herbicide application	Spot treatment