Needle Rock Diversion Fish Passage Project

Final Report

Prepared for:
Colorado Water Conservation Board
Colorado Water Plan Grants- Environment and Recreation
Attn: Chris Sturm

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Introduction

This fish passage project is the result of a collaborative effort including numerous stakeholders and partners to address fish entrainment and loss impacts on the Smith Fork of the Gunnison. The project which was led by Trout Unlimited (TU) who worked directly with Needle Rock Ditch Company (NRDC) and other partners to develop and implement the project. Numerous snags hindered the progress of the project but in the end the project resulted in a real benefit to the fishery and stands as an example of how consumptive and non-consumptive water needs can be improved through joint efforts. The construction of the project at the cost it was completed for was made possible by its connection to a larger diversion modification funded in large part through the Lower Gunnison NRCS RCPP project. TU led this project because we are a nationwide conservation organization with experience in fisheries improvements. Additionally, the project lead for TU has years of experience with the Smith Fork and the fishery that were useful for building relationships and completing the project.

Background

The Needle Rock Ditch diversion structure is a concrete and grouted boulder dam that extends across the Smith Fork with a the headgate located on river-right adjacent to a small steel bypass gate that passed water downstream. The concrete dam creates the head necessary for the water users to divert water out of the stream into the ditch. A water surface elevation difference of nearly 3 feet is created by the dam which prevented fish from moving from the downstream side to the upstream side at nearly all flow regimes as a result of high velocities or the height of the structure. During low summer flows, fish often swim into the ditch, which at times diverts the bulk of the available water in the stream leaving inadequate habitat below the diversion.

This project was identified through a watershed study[1] by the Western Slope Conservation Center which was completed with funding from the US Bureau of Reclamation. In August of 2016 TU along with other WSCC and others toured the diversions from the Smith Fork. Four of the major diversion structures on Smith Fork including the Needle Rock Diversion were identified as barriers during that effort. The Needle Rock Diversion is the highest of the

[1] Smith Fork of the Gunnison River Watershed Assessment, December 30, 2016

significant permanent barrier structures identified in the watershed. It is common for the Smith Fork to be dry near the town of Crawford as a result of irrigation diversions. Fish that are trapped below any of these diversions are likely to perish from lack of water, high water temperatures, or from entrainment in irrigation ditches. Without the ability for fish to seek refuge above the Needle Rock diversion, the fishery would be negatively affected which would reduce recreational opportunities in the Smith Fork watershed. Upstream of the Needle Rock diversion is approximately 4 miles stream access on public lands and about 3 miles of stream on private property that supports an outfitting business.

In 2016 the Colorado River Water Conservation District (CRD) along with partners including Trout Unlimited (TU) were awarded $8 million for irrigation infrastructure and water supply improvement projects in the Lower Gunnison Basin. The first phase of this project was the completion of the Watershed Plan[2] completed by the Natural Resources Conservation Service. The Plan identified impacts from irrigation and projects that could address those impacts. The status of the fishery on Smith Fork was acknowledged in the Plan as was the Needle Rock Diversion and piping project. However, because the plan did not specifically call out the need for fish passage improvement at the site the Colorado River District, who was the primary Lower Gunnison RCPP partner, would not allocate funds toward the fish passage project even though the RCPP funds were meant to address "inadequate habitat for fish and wildlife".

As CRD began the planning process for the modification of the diversion structure and pipeline with the Needle Rock Ditch Company Board, TU approached the board about the need for fish passage and proposed some conceptual designs. TU also contacted the landowner where the Needle Rock Diversion is located and gained access to investigate the diversion and the health of the fishery. In July of 2017 a fish population assessment was completed by the Lower Gunnison Fisheries Biologist from Colorado Parks and Wildlife (CPW) with assistance from TU staff. In this process the stream immediately above and below the diversion structure was shocked and the fish were measured and recorded by species or sub-species. The results of the survey showed healthy populations and numerous age classes of trout- primarily Brown and Rainbows but also some Brook, Cutthroat, and hybridized Cutthroat/Rainbows as well as native Sculpin and Dace. Fish were found immediately below the diversion structure as well as in the ditch just downstream of the diversion. After fish population assessment TU consulted with CPW biologists on the which diversion on the creek would be the best location to initiate a fish passage project.

[2] *Final Watershed Plan and Environmental Assessment for the Lower Gunnison Project. NRCS March 2018*

It was determined that because the Needle Rock was near the upper end of the watershed and there were several miles of unaffected stream above the diversion, the Needle Rock diversion was a good location to focus passage efforts.

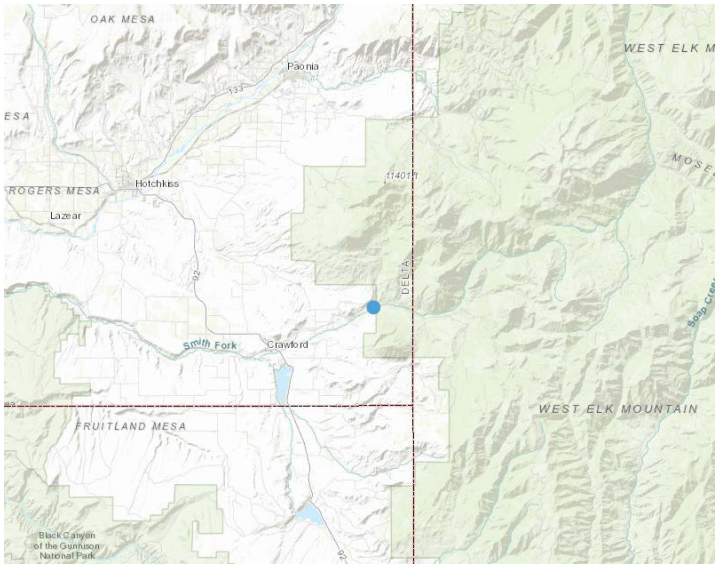
TU began looking for funding from numerous sources in July of 2017 and applied for CWCB Water Plan funds in August of the same year. The CWCB awarded $20,000 to TU on March 16, 2018.

Initially, TU planned to work with the NRDC and CRD to address the need for a stream gauging and automation at the diversion. However due to lack of matching funds for the gauge and changes to the fish passage design TU decided it would be best to direct all the CWCB funds toward the fish passage structure.

TU approached the NRDC Board members and described the impacts of the barrier to the fishery and discussed how the opportunity to improve diversion using RCPP funds would provide a good opportunity to address needs of the fishery while improving irrigation infrastructure.

The project objectives were refined to provide passage for trout past the diversion at most flow regimes.

Needle Rock Diversion Location:

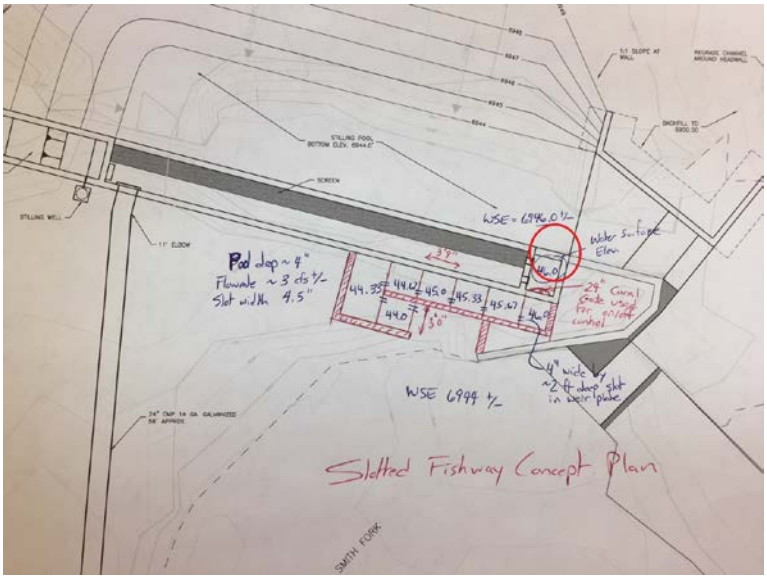


Methods

Once funding was secured TU began working with NRDC board members, staff from the CRD, and Craig Ullman from Applegate engineering, who'd been hired to engineer the new diversion structure and piping, to develop a plan to pass fish at the diversion that also complimented the proposed changes to the diversion.

There were two design alternatives proposed to the NRDC board. One would be to enlarge and change the sluice gate in the diversion wall. This alternative would require cutting into the wall and creating a grouted concrete stream that fish could use to navigate past the diversion. The other alternative was construction of a small stream on the far side of the creek from the diversion that would have a low grade and velocity and would allow for fish passage. Both alternatives were rejected by NRDC. TU offered a variation to the notch in the dam which was also rejected. At this time NRDC told TU that they were not interested in a fish passage structure at all because of maintenance concerns. TU continued to work with the project partners and received assistance from Quinn Donnelly an engineer with River Restoration LLC. Quinn visited the site and propose we us a vertical slot fish passage similar to one that River Restoration designed for TU project on the Weber River in Utah. Applegate Engineers worked the vertical slot fish passage structure into a draft design and TU proposed the alternative to the NRDC board. The NRDC board agreed to allow the fish passage to be installed as long as the passage had its own control gate.

Third alternative concept:



Applegate Engineers with assistance from River Restoration evaluated the proposed design to make sure project objectives would be met. TU investigated how the passage worked on the Weber River project and contacted CPW who thought the alternative was suitable.

It was determined that the passage design would meet the objectives and that it would complement the proposed diversion modification process. Applegate Engineers proceeded with incorporating the passage design into the irrigation infrastructure drawings. Applegate Engineers also prepared cost estimates and bid release documents.

Engineering support from Applegate was paid for by CWCB Financial Assistance funds for Salinity and RCPP projects and River Restoration provided Engineering assistance free of charge.

The project was released for bids from contractors in August of 2018. Pitt Construction from Hotchkiss was selected for the project. However due to the government shutdown in December of 2018 the NRCS could not guarantee that the contractor would be paid, and Pitt canceled the contract. Once the Government shutdown was clearly going to be reversed a new contactor was sought and Rundle Construction was selected to construct the diversion, fish ladder, and pipeline.

Unfortunately, construction could not progress until disagreements over access to the diversion with the owner of the land where the diversion is located could be settled. Through the planning phases of the project the landowner was amenable to the project moving forward. But when construction was imminent the landowner insisted that the ditch company did not have the right to access the diversion and instructed NRDC that they could not proceed with construction. NRDC, who has a deeded easement on the property around the diversion and the proposed construction site, tried to negotiate with the landowner. During these negotiations TU became involved because the landowner insisted the fish passage structure would be a burden on his property and asked for the funds for the passage to be spent on landscaping on his property. The landowner threatened legal action against the ditch company to resolve the access issue. It seemed apparent to TU that the landowner could not prohibit the diversion modification project but could protest the addition of the fish passage as a burden on his property, even though the landowner had granted TU and the ditch company access and his verbal support for the project. TU was eventually able to help with moving the project forward by paying the landowner $1000 in exchange for access and space for fish passage. Time was of the essence and if construction didn't begin as soon as possible it was likely that the project would be delayed another year.

Construction began on February 2019 when Rundle Construction began cutting in the new access road and mobilizing equipment and supplies. Through February construction crews set pipe, coffered off the river, formed and poured concrete for the diversion and fish passage works.

In March Stan May fabricated the steel plates for the fish passage structure. The plates were installed in the first week of April. The diversion and fish passage were finished by April 22nd almost just in time for the irrigation season. The higher than normal snowpack and significant runoff created delays and concerns about the job-site washing out. Fortunately, the spring temperatures were low, and snowmelt stabilized.

Project nearing completion:

The larger than average spring runoff resulted in considerable sediment and floating debris at the diversion which resulted in issues for the ditch company staff and water users who were learning how use the new diversion works and screen. This resulted in modifications being made to the intake of the diversion and the fish screen being turned off approximately twice during from the period of June to September. The fish passage control gate was off in September which was noticed by TU staff during a site visit. After discussing the issue with the president of the board of NRDC, TU and NRDC agreed that a sign at the passage gate reminding users to leave the passage on, would prevent the passage from being adjusted or turned off unnecessarily. The NRDC board president also communicated to the users and ditch rider that the passage was to be left on unless necessary.

Greg Powers, the area Water Commissioner, was contacted to make sure there would be no issue with delivering water to senior users downstream of the diversion through the fish passage. He said that it would not be an issue.

Sign on passage control:

CWCB funds were used for the following expenses related to the construction of the fish passage:

- $500 to the Needle Rock Ditch Company for payment to the landowner for site use.
- $1,112.62 to Stan May Welding for steel plates for the fish passage structure.
- $15,696.80 to Rundle Construction for excavation, concrete, installation and control gates for the fish passage structure.
- $45.71 for signage and related materials.

TU contacted CPW about monitoring the fish passage structure. Unfortunately, CPW staff was not able to assist or implement such a study. Fish were present below the diversion structure when the fish passage was off that were not present when the passage was on. TU staff also used a AA flowmeter to check velocities within the passage. Water velocities were lower than expected and well within the swimming capabilities of the trout species the project was constructed to pass.

Results

Because of a lack of resources related to monitoring the results of this effort it is difficult to determine precise results. However, TU can confirm that relationships between non-consumptive water users and irrigators in the Smith Fork drainage were strengthened through this project. Additionally, the design and conceptual designs used in this project for the fish passage and diversion works infrastructure can be used to inform future projects.

Conclusions and Discussion

The primary objective of the project, to provide passage for trout at most flow regimes at the Needle Rock Ditch, was met. The objectives of the project from the time of the CWCB application to when actual implementation took place, changed considerably. Initially, TU had envisioned a more "natural" fish passage structure, similar to a roughened ramp, that would be incorporated into the diversion rebuild. TU has also hoped that the fish passage addition would allow for flow monitoring at the diversion that would assist water management through the Smith Fork Watershed. Due to design and funding changes the objectives were narrowed to fish passage at the structure. TU believes that the fish passage is seen as a benefit to the watershed by the water users on the Needle Rock Ditch and those users are of the opinion that operation of the passage does not affect their ability to divert water or maintain their diversion. TU does plan to perform a follow-up fish population survey with CPW. TU will stay in contact with the NRDC to monitor the use and performance of the structure and to address issues should they arise.

The difficulties experienced in the implementation of the project are discussed in the first section of this report. In short, the project had minor setbacks with design that met the standards of the ditch company and considerable setback from pushback from the owner of the land where the diversion is located. The former was addressed by being persistent and flexible which allowed for a design that was acceptable to all parties. Listening to the ditch company's concerns and adjusting to accommodate was important for building support and finding solutions. The issue with the landowner was one that truly surprised not just TU but also the NRDC and other partners. From the conceptual design period up until the point the NRDC and partners intended to move forward with construction the landowner was very helpful and supportive of the project. In hindsight it would have been helped to get a written agreement from the landowner that clarified access and support of the project.

TU plans to continue working with water users and landowners in the Smith Fork to improve flows and water quality. Specifically, TU is supporting a plan to install a stream gauge 2 miles upstream of the Needle Rock Diversion which will assist water users with making water management decisions. TU is also working with two water users on plans to monitor ditch spills and automate diversions to improve flows and reduce water waste.

Actual Expense Budget

Colorado Water Conservation Board						
Water Plan Grant - Exhibit A						
Budget and Schedule						
Date: 1/2/2020						
Name of Applicant: Trout Unlimited						
Name of Water Project: Needle Rock Diversion Modification						
Task No.	**Task Description**	**Start Date[(1)]**	**End Date**	**CWCB**	**Match Funding**	**Total**
1	Fish passage channel design review	1-Feb-18	15-Jun-18	$0	In-kind RR	
2	Stream gauge design and engineering	1-Feb-18	15-Jun-18	$0	$3,500	$3,500
3	Construction	1-Sept-18	1-Jan-19	$17,345	$276,192	$293,537
4	Stream gauge instrumentation purchase and installation	1-Sept-18		$0	$7,500	$0
5	Project Outreach and Education	January 15, 201	1-Apr-19	$46	$900	$946
6	Project Management and Administration	January 15, 201	1-Apr-19	$2,609	$1,500	$4,109
			Total	$20,000	$289,592	$302,091

Appendix

The design criteria and notes were provided in: Introduction to Fishway Design, Chris Katopodis, P. Eng. January 1992

CPW Aquatic Biologist at site of future fish passage structure

Passage at end of construction: