

Fish Habitat Enhancement at the Paonia River Park Final Report

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Submitted by the



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Introduction

The Fish Habitat Enhancement at the Paonia River Park improved fish habitat over 500 feet of river channel and restored approximately 2 acres of aquatic habitat within the floodplain of the North Fork of the Gunnison River at the Paonia River Park. The project is part of a substantial river restoration program that, in total, has rehabilitated over 1,600 feet of river channel and restored approximately 8 acres of aquatic habitat within the floodplain of the North Fork of the Gunnison River at the Paonia River Park. The Paonia River Park was once an in-stream gravel pit and is currently the only public river access point along 30 miles of the North Fork of the Gunnison River.

The Fish Habitat Enhancement component of the project was coordinated by the Western Slope Conservation Center, designed and implemented by Crane Associates, and made possible by funding from the Colorado Water Conservation Board's Colorado Healthy Rivers Fund, the Colorado Department of Parks and Wildlife Fishing is Fun Program, the Jared Polis Gift Fund, and Patagonia Environmental Grants Program.

Project Background

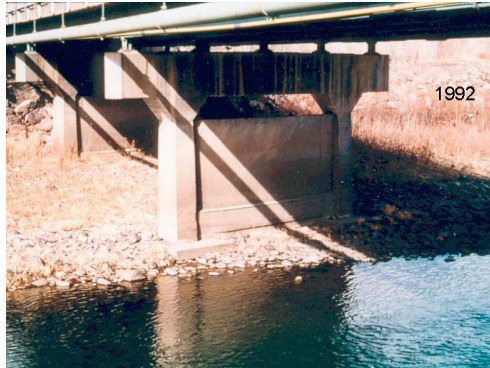
The headwaters of the North Fork begin in the Gunnison National Forest at the confluence of Anthracite and Muddy Creeks and flows 33 miles southwest through the Towns of Paonia and Hotchkiss in Delta County before meeting the mainstem of the Gunnison River near the Black Canyon of the Gunnison National Park and the Gunnison Gorge National Conservation Area. The project site is located on the northern boundary of the Town of Paonia.

Throughout much of the 70's, 80's and 90's this 19-acre site was used as an in-stream gravel mine. The in-stream gravel mining contributed substantially to the destabilization of the channel and created extensive down-cutting of the river bed both up and downstream of the actual mining boundaries. This excessive scouring resulted in the abandonment and relocation of several irrigation diversions, the lowering of the local groundwater table, accelerated bank erosion, and threatened the integrity of two bridge structures.

Gravel mining at River Park in 1997



In 1997 the North Fork River Improvement Association (NFRIA) documented five vertical feet of



channel down-cutting in five years and called attention to an unsafe highway bridge abutment as a result of the scour. The local watershed group formed just a year earlier to develop local collaborative efforts to restore morphological integrity and riparian health to a battered 16-mile stretch of the river. Since 1996 the organization contributed to the restoration of a single-thread meandering channel along 6 miles of the river, the

reconstruction of 8 irrigation diversions for fish migration and recreational boating, the removal of one dam and the relocation of 2 in-stream gravel mines. At the Paonia River Park site NFRIA negotiated with the gravel company for the donation of the 19-acre site as a community river park and worked to support the relocation of the gravel mining operation away from the river.



In 2006 NFRIA took ownership of the site with the intent of restoring riverine health and



creating the first river park in the North Fork Valley where 95% of the land along the river is privately owned and river access is extremely limited. On hot summer days adults and children alike can be found swimming in a small pool in the river. A primitive boat ramp was constructed by local boating enthusiasts and the community raised money to fence the site, build a small trail and construct a parking lot with a beautiful entrance feature. However, the

river was still in desperate need for restoration. The channel was badly braided and could not move sediment bedload through the system or adequately hold fish.

The full river rehabilitation area consisted of an approximate 1,500 foot reach of the river that was the primary gravel mining area. A large pit was excavated in the river and was never required to be reclaimed. That area had 4 channels running through it with no primary watercourse. Erosion rates were high and aquatic habitat was severely compromised. The design concept of the project was to rehabilitate the floodplain and construct a single-thread



meandering channel that properly integrates the single-thread channel immediately above and below this area. The project was designed to balance the bedload transport capabilities of the channel and enhance the morphological integrity of the ecosystem.

The **targeted fish enhancement project** area consisted of an approximately 500 foot reach of the river near the confluence of the North Fork and Minnesota Creek at the downstream edge of the rehabilitation project.

This project was implemented by reconstructing one of the braided channels into the primary channel and securing logs and woody debris in the secondary channels. The secured debris slows the velocity of water overtopping the bankfull elevation of the floodplain and allows the river to deposit sediment and its natural seed base onto the floodplain. This floodplain rehabilitation project utilizes the natural riverine processes to sustainably revegetate the floodplain.

Rock structures and root wad revetments (bank stabilization structures) were installed along the outside bends of the primary channel to stabilize the riverbank. Similar structures were also employed at the head of the secondary channels but not constructed any higher than bankfull elevation. The design encourages overtopping of the floodplain during high runoff events. Willow cuttings and cottonwood tree transplants supplement the revetment structures and add native riparian vegetation to the exposed banks. Volunteers were utilized for installation of vegetative enhancements and the removal of invasive Russian olive and Tamarisk species.

This project received a NWP 27 for Aquatic Habitat Restoration, Establishment, and Enhancement Activities from the Army Corps of Engineers on Nov. 13, 2012.

Project Implementation

Primary construction on the **Fish Habitat Enhancement** component of the project occurred in from March 3, 2014 through March 14, 2014. The project consisted of re-grading the channel and stabilizing the channel using large boulders, root wads, willow cuttings and transplanted cottonwood trees. We revisited the project from December 6, 2014 through December 14, 2014 to make adjustments after observing the project's response to spring runoff.



March 2014, before construction



March 2014, after construction



June 2014, after spring runoff



January 2015, after construction

Rock structures and root wad revetments (bank stabilization structures) were installed along the outside bends of the primary channel to stabilize the riverbank. Grade control logs were built into the side channels horizontally level to spread out overbank flows and prevent gully-washing. The grade control logs were secured by diagonally placed posts excavated into the floodplain and overhanging the horizontal grade beams. Approximately fifty bundles of cut willows were installed with the grade control logs to act as a live willow silt fence thereby catching debris, reducing overbank flow velocities and depositing sediment and its riparian seed base.





Project Monitoring

Permanent cross sections were established throughout the project. These cross sections have measured the pre-construction (9/2012), post-construction (2/2013) and post-runoff (7/2013) morphological conditions of the channel and floodplain. Photos were taken at each cross section in specific locations. Each cross section has photos taken at each endpoint looking toward the channel and photos looking at the center of the cross section from both upstream and downstream. Four of the eight cross sections also had midpoints that were used as endpoints for photos because some of the existing vegetation did not allow for a clear view all the way across the cross section and it is important to gage success at both the reconstructed side channels as well as the new primary channel. Additional photos were also taken at key revetment structures.

Post-Construction Observations

A pre-construction survey was performed on February 25, 2013 and a post-runoff survey was performed on July 17, 2013. The average peak flow in mid-May was approximately 1,600 cfs. Bankfull flow is statistically about 2,500 cfs but overtopping throughout the floodplain was achieved and sediment deposition occurred as designed.

Photo points were taken on September 19, 2012 prior to any construction, December 8, 2012 immediately following Phase I construction and prior to construction of the **Fish Habitat Enhancement** project, May 28, 2013 during runoff at approximately 1,200 cfs and on August

19, 2013 after the initial establishment of new riparian vegetation. A survey of the success rate of planted willows was performed on August 25, 2013.

Results (for only the cross sections related to the Fish Habitat Enhancement project)

Cross sections – (See Appendix for location and plots of each cross section)

3+00 – This cross section was located downstream of the project boundaries across the popular “swimming hole” at the confluence of Minnesota Creek. The purpose of this plot was to identify any changes in the pool due to the project. The horizontal dimensions of the pool remained primarily unchanged but the depth of the pool increased by close to 3 feet. It is speculated that the concentration of flow from one channel instead of three improved the scouring capability of the river at the pool.



5+80 – This cross section traverses the previous south side channel where it met the current main channel upstream of Minnesota Creek. The side channel was filled at the confluence and stabilized with large rock. A series of wetlands were developed in the side channel for aquatic and terrestrial habitat. Willows, bulrush and cattails were planted around the perimeter of the wetlands. Two piezometers were installed along this cross section to measure the depth of groundwater relative to the surface water of the river. The main channel at this location deposited a new gravel bar on the north side of the river and is forming a new point bar. The main low flow channel was narrowed substantially and the depth decreased by about one foot. The floodplain is thriving with new riparian vegetation and the revetments along the south side of the bank remained unchanged. It is expected that the new point bar will grow over time and generate new vegetation as well. This would be a good location for additional adaptive management to stabilize the point bar and create additional fish holding structures above the bar.



New gravel point bar with main channel on left



Looking upstream at new pool

8+04 – This cross section traverses the entire floodplain with an angle point near the north side designed to measure the lower third of the meander bend in the new channel.

The cross section indicates no appreciable change in the south side channel but a substantial filling of the middle side channel from flood deposits. The floodplain through this section is growing rapidly. The

primary channel on river right widened approximately 25 feet along the inside point bar naturally adjusting to the increased flow. All of the rock and root wad revetments are intact as installed but the rock weir on the left side of the channel needs to be extended to accommodate the widened channel.

Willow Planting Success Rate

Three hundred bundles of willows (in total), each approximately 12" in diameter, were cut from nearby sources close to the river and installed throughout the reconstructed floodplain. They were used for different purposes. Some were planted along the riverbank of the new channel, some were planted along the bank of previous side channels, some were planted in single individual locations throughout the previous side channels and others were planted thick in trenches across the side channels in front of log flow inhibitors.

The ones planted in trenches across the side channels were primarily used as live willow silt fences. Their purpose was to filter out sediment and debris while allowing water to pass and slow flow velocities. These silt fences worked very well for their intended purpose but few of them established new vegetative starts. There are no definitive reasons for why most of these did not grow but possible reasons include too much water and too thick of a bundle. These silt fences were placed in locations of varying depth to groundwater with varying densities of sediment around the bundles but only about 20% of the willows in these trenches actually survived.



Debris and sediment captured & some growth



Sediment upstream, gravel downstream & no growth

The best success rate of the willows planted occurred along the new primary riverbank and along the previous side channel riverbanks. The success rate in these locations was 90%. Most areas along the previous side channels had good soil coverage but the areas along the riverbank had little soil. Nevertheless both locations had strong success rates.



Willows thriving along previous side channel



Willows along river doing well

The individual willow plantings come with a mixed review. Some did well where others did not survive at all. There did not seem to be any definitive reason for the varied success. Overall the success rate was measured at 59%.



Unsuccessful willows in gravel bed



Willows thriving in side channel

The overall success rate of all willows planted was 68%. More study will take place in subsequent years to help determine best management practices that work well in this particular environment.

Photo Points

The Paonia Ditch diversion is located approximately 1,200 feet upstream of the project. During the late irrigation season the ditch typically dries up the river below the diversion to maintain its senior water rights. Both the preconstruction and the post runoff photos were taken during the late summer when the ditch was drying up the river. All of the water in the river shown in the photos is a result of groundwater seeping back to the river channel. It is this reason that the project was designed to consolidate low flows and attempt to create aquatic habitat from groundwater sources. See Appendix for compared photo points and other additional photos.

Summary

The project was designed to reconstruct a floodplain from several braided channels and to consolidate river flows into a single meandering channel that will enhance both aquatic and terrestrial habitat. The project accomplished that. Vegetation throughout the project is growing rapidly with a standard diversity of cottonwoods and willows making up the predominance of the species.

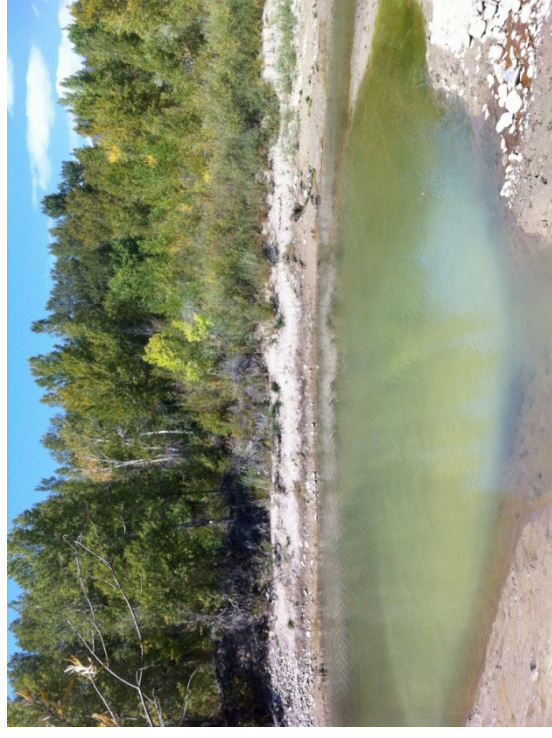
APPENDIX

Cross Section 3+00

Pre-construction September 20, 2012



Looking
Downstream



Right
Bank

Post-construction August 19, 2013



Looking
Downstream



Right
Bank

Cross Section 3+00

Pre-construction September 20, 2012



Left
Bank



Looking
Upstream

Post-construction August 19, 2013



Left
Bank



Looking
Upstream

Cross Section 5+80

Pre-construction September 20, 2012



Left
Bank



Looking
Upstream

Post-construction August 19, 2013



Left
Bank



Looking
Upstream

Cross Section 5+80

Pre-construction September 20, 2012



Looking
Downstream



Right
Bank

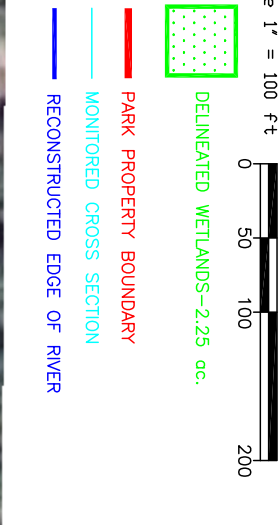
Post-construction August 19, 2013



Looking
Downstream



Right
Bank



Designed by: JEFF CRANE		Date: Feb, 2013	Rev.
Dwn by: JPC	Ckd by:	Design file no:	
Reviewed by:		Drawing Code:	
Submitted by:		File name: Plot date: Plot scale:	

NORTH FORK GUNNISON RIVER
PAONIA RIVER PARK
DELTA COUNTY, COLORADO
FLOODPLAIN and
AQUATIC RESTORATION
ASBUILT PLAN VIEW

Sheet
reference
number:

Sheet 1 of 5



Horizontal scale 1" = 50 ft
Vertical scale 1" = 5 ft