Henson Creek and Lake Fork Confluence Channel Improvement Project

FINAL Report
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Submitted to:

Colorado Water Conservation Board
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Executive Summary

The Lake Fork Valley Conservancy completed river improvements along approximately 3300 linear feet of lower Henson Creek and its confluence with the Lake Fork of the Gunnison, in and near the Town of Lake City. This is Phase I of a three phase project to improve the river through Town (Figure 1). In the Phase I project area, 2740 feet of the original proposed project reach along Henson flows through the Town and 560 feet of river is under BLM jurisdiction, but the Town leases the property along the river from the BLM for their trail system. The lower Henson has been impacted from historic mine tailing impoundment failures, creating a braided and unstable channel with high bed load movement.

The purpose of this project is to realign areas of the channel where the river is threatening the Town irrigation head-gate and ditch, stabilize banks to reduce erosion that are undermining public trails, repair riparian areas, enhance fisheries and increase public access to the river, providing an overall quality recreational experience along this reach. The project involves construction of several in-channel structures, repair of the Town ditch intake, revegetation of the riparian corridor, and a new trail constructed at the confluence.

In September 2013, LFVC hired Webco, Inc. through a competitive bidding process, to complete the design/build specifications and in-channel construction for the CWCB-funded portion of the project. The Town, LFVC's Executive Director, and Webco, Inc. have worked together to oversee construction since it began in the Fall of 2013. Swift progress and relatively smooth implementation speak to the efficiency of this partnership and to each party's aptitude for managing large projects.

Phase I of the Lake Fork River Enhancement Project is now complete. Webco has constructed all in-channel structures on Henson, its confluence with the Lake Fork, and on the Lake Fork just above and below the confluence. We were able to complete all construction with additional funds secured from Upper Gunnison River Water Conservancy District ($37,400), CPW Fishing is Fun Program ($25,000), and from local donations (over $35,000). This additional funding also covered riparian revegetation, and educational programs along the river. LFVC received an additional grant from CWCB Watershed Restoration Program to complete Phase II design work for the remaining 4250 linear feet of the river project downstream through town, which is now almost complete. This design will be used for grant proposals for construction work in 2016.

PROJECT OBJECTIVES

The overall goal of the Project is to enhance and protect the ecological health and recreational quality of the Lake Fork of the Gunnison and its main tributary, Henson Creek, in the vicinity of Lake City.

There are 5 main objectives of the project:

1) Improve bank stability along the lower Henson and at the confluence with the Lake Fork of the Gunnison;
2) Enhance fisheries by increasing over-wintering and drought habitat;
3) Improve public recreation opportunities through safer access, better fisheries and boating, and extension of usable space at Memorial Park.
4) Facilitate full utilization of the Town of Lake City's Irrigation Ditch water right;
5) Improve organizational performance and accountability to manage restoration projects.

SCOPE OF WORK AND OUTCOMES

TASK 1 – Project Design and HECRAS Flood Plain Analysis

Description of Task

A 30% design plan for river channel and riparian improvement was completed for the entire river project, including the Phase I area and continuing down through Town to below the sewage treatment facility north of Town. This design utilized survey data already collected during the feasibility and planning phase (2009-2012). This included hydraulic analysis and floodplain modeling that conforms to both FEMA's Guidelines and Specifications for Flood Hazard Mapping and the CWCB Rules and Regulations for Regulatory Floodplains in Colorado. This was done by Black Creek Hydrology out of Northglenn, CO and Baker Engineering in Denver.

Project Outcomes

1) In-channel Schematic Design (30% Design) is complete, and is described in full in Appendix A, final report, submitted with the March 2014 semi-annual WSRA report submitted to CWCB. All data was provided to CWCB and to the Design Engineer to complete 60% design.

TASK 2 - Construction Preparation

Description of Task

Prior to construction, we required land owner approval, completion of NEPA, completion of 60% design, and US Army Corps of Engineers and Hinsdale County flood plain development permits.

Project Outcomes

1) All seven land owners along the project stretch signed agreements to participate in the project. These land owners contributed $16,350 toward construction costs.
2) BLM completed the NEPA in the spring of 2013.
3) A nationwide permit application was submitted to the USACE in late August using the 30% conceptual design. We experienced delays in receiving approval due to the federal government shutdown, but finally received to green light on October 21, 2013.
4) We received approval from the County to proceed in last week of October, 2013.
5) In late August, 2013, LFVC released an RFP for design build services to complete in-channel construction. We received three proposals. In early September, LFVC hired Webco, Inc., a local construction firm, to complete the design/build specifications and in-channel construction for the CWCB-funded portion of the project. They have 30 years of experience with heavy equipment and a decade of experience in river enhancement work. Webco, Inc. collaborated with Brett Jordan (PhD, PE, CPESC), the Principle Hydraulic Engineer of HydroGeo Designs, LLC, to complete the 60% design (report and drawings available upon request). Mr. Jordan has worked on more than 30 different river systems, and has 10 years of experience in hydrology, fluvial geomorphology, open channel hydraulics, erosion control, sediment transport, and stream restoration design in the academic and private consulting sectors.
6) Engineered design drawings were completed in October, with construction starting soon thereafter. A final design report was submitted in January of 2014 for the entire Phase I area. The 60% design resulted in a change in the original structure estimates that were submitted with the original WSRA proposal.
7) We secured additional funds ($34,800) to prepare channel design for the remaining 4250 linear feet of river from the confluence down to the north end of Lake City, the lower portion of which was significantly altered from flooding these past two seasons. Design work is almost complete with a final report to be prepared December of 2015. We are now ready to apply for permits and continue construction downstream as funds become available.

The March 2014 Semi-Annual Report contains all supporting documents for conceptual and engineered designs, contracting, landowner agreements, NEPA report, etc.

TASK 3 - Public outreach, monitoring and maintenance plan

Description of Task

Public outreach has been done to get feedback on final design and update the public on progress. We also worked with individual landowners to make sure design work is in tandem with their desires and to garner financial support for the work on their property. In addition, LFVC has secured funds to complete an interpretive river trail along Henson Creek and the Lake Fork through Town. This project will be installed in the summer of 2016.

A monitoring and maintenance plan is being prepared for the project, as part of the Town Master Recreation Plan. This will detail monitoring methods to be used to measure project success and document estimated maintenance schedules for river structures and bed load removal, post-construction. Costs for maintenance will be paid for via the LFVC's annual Frozen River Film Festival fundraiser, which will be matched by the Town of Lake City, for an annual total of $2000.

Periodic maintenance (average every five years) is expected to be needed just below the confluence of the Lake Fork and Henson to remove bed load that will accumulate during years of high flow (greater than bank full). This has been incorporated into the engineered design. In-channel structural maintenance will be dealt with as needed (e.g. after larger flood events).

Project Outcomes

1) Since inception of this project, we have conducted three public meetings to present our design and construction progress, with over 100 participants attending.
2) All seven landowners have signed agreements to participate (see Task 2).
3) Our outreach work is showing great results. At a Town prioritization meeting for the master planning effort, the river project ranked within the top five projects for the Town to focus its resources on. The project has also been featured in the local paper six times this past year, highlighting progress.
4) We also exceeded our local match requirement by almost $17,000, for a total contribution of $36, 983, thanks to our successful outreach efforts. Our ability to raise funds and complete construction for Phase I is helping us to leverage the local support needed for the rest of the project through Town (Phase II). We have raised $7500 so far with a fundraising campaign that began Fall of 2014.
5) LFVC has held three Frozen River Film Festivals, in 2013 through 2015, raising over $3,500 for river maintenance costs and Phase II construction.
6) We conducted a public tour of the river improvements in June of 2014 to see channel construction that had been completed up to that time. Several river front land owners joined the tour and some are interested to have work done on their property downstream in the Phase II area.

7) The Town of Lake City and Hinsdale County hired a consultant to produce a Master Recreation Plan for the area. This plan will include river recreation activities and trails. A draft plan is expected early 2016.

TASK 4 - In-Channel Construction

Description of Task

The following work was originally proposed as part of the CWCB WSRA work plan:

1) Repair of irrigation ditch intake channel and replacement of head-gate.
2) Bank stabilization along Henson Creek Trail
3) Repair of Henson Creek channel from head gate down to the confluence
4) Confluence Channel Improvements – construct a boulder terrace at the confluence and replace the cross vane at the fishing pier just upstream of the terrace on the Lake Fork.

Project Outcomes

1) Hired contractor (see Task 2) who mobilized equipment and transported 1,500 cubic yards of boulders to the construction site.
2) 100% of all construction work directly funded by WSRA has been completed, down to just above the confluence.
3) Funding was also secured and a change order initiated to finish all of Phase I construction. This work was completed as of October 2014 (See Table 1 for details of design and construction costs paid to WEBCO).
4) We have realized significant savings in channel construction costs compared to the original estimates submitted in the WSRA proposal in 2012. Total design and construction cash cost was $319,280, compared to $464,566 originally estimated in the proposal. The savings were primarily due to the construction requiring less rock than originally planned. WEBCO delivered 1,500 CY of rock to the site and there is about 100 CY remaining after construction for Phase II construction. This compares to the original volume estimate of 2,100 CY.
5) WEBCO originally proposed replacing the head gate structure for the Town ditch. Once we surveyed the site we determined that the problem was not the head gate itself, but the ditch. WEBCO used the $3,500 originally budgeted for a new head gate to clean out the ditch and remove a dysfunctional dam that was placed on the ditch. In addition, a j-hook structure constructed at the head gate increased base flow intake at the gate by 0.6 feet, increasing the flow into the ditch.
6) Some repair work was done in October 2014 at the head gate to repair erosion that occurred behind the steel plate during the 5 year flood in June 2014. Webco also repaired a structure below the CDOT Highway bridge that was not properly constructed and is being impacted by the bridge abutments. LFVC will work with CDOT in the future to see if we can get permitted to work the channel underneath

the bridge.

TASK 5 - Riparian Habitat Restoration and Trails

Description of Task

Areas previously denuded and those impacted from construction were revegetated with native willows, poplars, alder and spruce, to bring back the natural riparian community that previously existed here and that is of high biodiversity significance in the state. In addition to revegetation, a 500 foot trail extension was built on the extended rock terrace to facilitate visitor's enjoyment of the river front.

Project Outcomes

Revegetation efforts began shortly after completion of construction in November 2013, when we recruited volunteers to revegetate a small section of lower Henson Creek near the Town ditch with 80 willow cuttings. The effort was part of the nation-wide Collaborative Groasis Waterboxx Pilot Program, a three-year research effort to study the effectiveness and value of the Groasis rainwater catchment box in the mountainous regions of the United States. Our volunteers not only learned about the importance of native plant communities in creating and maintaining a healthy river system, and how to cut and plant willows for future revegetation efforts, they also got hands-on experience implementing cutting-edge revegetation technology. The 40 matched pairs of willows—half sheltered by Waterboxxes, half without—are monitored for growth on a monthly basis, and will be revisited in the spring for fencing by our volunteers. Out of the 40 pairs, 36 sprouted during the summer of 2014. Most of these have survived into 2015.

The runoff during both 2014 and 2015 reached 5 year flood levels and brought significant sediment to deposit along the flood plain. All along the constructed river reach on Henson there was significant natural seeding of willows and poplars, negating the need for a targeted revegetation effort. We did plant some willow and poplar seedlings near the confluence and will monitor their success in coming growing seasons.

In areas where existing shrubs and trees had to be removed, these living clumps were lifted by excavator and transplanted to newly constructed flood plain along Henson. Those transplanted last year have 100% survival rate. Some willows removed at the confluence this fall were cut into 3 foot sticks and are currently being planted. Four large clumps from the confluence were transplanted upstream on Henson. We preserved one large cottonwood clump that is now surrounded by rock as part of the confluence terrace. It is perfectly situated to provide shade on the upper terrace.

The public trail near the Town ditch head gate was repaired and new gravel placed. A 500 foot extension trail was constructed on the terrace at Memorial Park. The Town of Lake City also constructed a gazebo on the terrace extension and landscaped the area, making a

highly enticing recreational space for visitors and residents. Use if this area has increased dramatically and has brought about significant awareness of LFVC's restoration work.

TASK 6 – Pre and Post Construction Monitoring

Description of Task

This task involves the completion of the necessary pre-construction and post-construction monitoring necessary to evaluate success of the project.

Project Outcomes

LFVC and Hydro-Geo Designs (Webco's contracted design engineer) selected and surveyed seven cross sections from the Town ditch down to the confluence, that best represent sites that will undergo the most significant changes in channel morphology. These sites correspond with cross-sections previously inventoried by Black Creek Hydrology. At each cross section we have detailed morphology, pebble counts, surrounding flood plain topography, and photo points. Standard Operating Procedures were used from CDPHE's Measurable Results Project, also used by CWCB. Pre-existing vegetation was determined from aerial photos and on the ground rapid surveys.

In June 2014, LFVC staff took photos at various photo points of the completed structures as flows reached their peak. We experienced a five year flood level this year with flows approaching 1000 cfs on Henson. The structures were designed to withstand 1200 cfs flows. All structures did well through the high flows. Several photos were taken during 2014 construction to document construction progress at the terrace. In addition we took monitoring photos in the Fall of 2015. Appendices A and B contain before and after photos and pre-and post-construction ditch flows.

We have identified two cross-vanes that need to be adjusted to accommodate better bedload movement. Both experienced some sedimentation during past high flows and need to have boulder elevations adjusted and pools excavated. This work will be done in spring of 2016 using maintenance funds collected during fundraising events.

LFVC has reengaged the River Watch Program and selected water quality sites on lower Henson, and the Lake Fork above and below the confluence. River Watch volunteers will be also monitoring macro-invertebrate sites in addition to water chemistry.

After completion of channel construction and revegetation activities in the Phase II area, the above methods will be repeated at the same locations in addition to sites located in Phase II area. Also, an assessment of structures will be conducted using CDPHE's Structural Assessment SOP. In addition, sapling survival rate will be assessed via counts, and macro-invertebrate sampling will be conducted using BLM's Utah BugLab protocols (so we can compare to data collected in 2009-2010). These sampling protocols are compatible with

Colorado Water Quality Control Division protocols. Macro sampling protocols can be found at http://www.usu.edu/buglab/MonitoringResources/MonitoringProtocols/#item=26

LFVC and the Town will continue to monitor structures annually for three years following completion of the project (summer/fall 2017-2019). This will include annual documentation of condition of treatments and identify any problems that may develop.

TASK 7 - Project oversight and administration

Description of Task

This task involves the coordination of project activities and administration of grants. It includes fulfillment of reporting requirements and efficient and timely financial reports.

Progress to Date

1) LFVC staffed successfully completed the contracting process with CWCB.
2) LFVC successfully completed a fair bidding process that resulted in selection of a highly qualified design build team.
3) The timely and successful completion of in-channel construction is testament to the smooth working relationship between LFVC, the Town and our contractor, Webco.
4) Nine reimbursement requests have been submitted to CWCB in a timely fashion.
5) LFVC has successfully procured an additional $86,700 toward confluence construction, Phase II design, and education programming.

PROJECT EXPENDITURES

Expenditures

Final project cost was $449,320.76, of which the WSRA grant covered $289,084.70. This has been matched with $160,236.06, from both cash and in-kind sources, 36% of total cost. Table 2 shows total expenditures broken down by Task and Table 3 breaks this down further by sources of match.

Changes in Match Requirement

In our initial work plan budget to CWCB we had projected an unfunded portion of $142,000 to complete the construction at the Lake Fork confluence, based on conceptual design estimates. LFVC and the Town twice applied for GOCO Local Government Parks and Outdoor Recreation grants to cover this portion, but were turned down both times on grounds that we were not shovel ready. With completion of the 60% design, we have realized significant cost savings for construction at the confluence. LFVC has procured all funds necessary to complete construction of the entire Phase I design area. Also, we

originally proposed a match of $50,000 from the CWP Fishing is Fun Program, but they only awarded $25,000. With change in construction costs and funding opportunities, we requested approval for change in our match requirements in March of 2014.

Table 1. WEBCO's 60% Engineered design estimates compared to final construction costs. LFVC added additional design for Phase II to the change order. We initially estimated an additional $10,000 for rock to complete the terrace at the confluence but this was not needed and will be used for Phase II.

	TOTAL PROPOSED in Phase I 60% DESIGN			***Completed:***	
Item	***Unit cost***	***number***	***Total***	***number***	***Final Invoiced***
Design (HGD) - Phase I			$24,000.00		$24,000.00
Construction Oversight (HGD)			$38,000.00		$36,000.00
Rock Cost	$100.00	1500	$150,000.00		$144,000.00
cross vanes (equipment)	$3,400	7	$23,800.00	7	$23,800.00
j hooks (equipment)	$2,750	6	$16,500.00	6	$16,500.00
sills (equipment)	$400.00	6	$2,400.00	6	$2,400.00
vanes (equipment)	$750.00	15	$11,250.00	14	$10,500.00
clusters (equipment)	$315.00	14	$4,410.00	17	$5,355.00
confluence terrace	$24,000.00	1	$24,000.00	1	$24,000.00
headgate/ ditch work		LS	$3,500.00		$3,500.00
gravel removal and reshaping		LS	$24,000.00		$24,000.00
reslope banks/ repair trails		LS	$1,250.00		$935.75
transplants		LS	$2,500.00		$2,500.00
safety and erosion control		LS	$2,000.00		$2,000.00
bonds and insurance		LS	$6,425.00		$6,516.00
Webco In-kind			-$10,000.00		-$10,000.00
TOTAL			**$324,035.00**		**$319,280.00**
Additional In-kind design work by HGD					**$7,400.00**

Table 2. Summary of all expenditures by Task, from September 1, 2012 through November 18, 2015.

TASK	Task Description	WSRA Budget	Cumulative WSRA Expenditure	Remaining WSRA Funds	Total Projected Cost (Including Match)	Projected Match	Cumulative Match	Remaining Match	Total Expenditure (Including Match)
1	Conceptual Project Design	$0.00	$0.00	$0.00	$22,320.37	$22,320.37	$22,320.37	$0.00	$22,320.37
2	Pre-Construction Preparation/60% Design	$29,100.00	$30,032.60	-$932.60	$43,760.00	$14,660.00	$25,600.00	-$10,940.00	$55,632.60
3	Outreach, Monitoring and Maintenance Plan	$2,750.00	$3,380.00	-$630.00	$13,050.00	$10,300.00	$15,699.47	-$5,399.47	$19,079.47
4	In-Channel Construction	$238,316.00	$238,316.00	$0.00	$331,424.00	$93,108.00	$72,595.00	$20,513.00	$310,911.00
5	Revegetation and Trails	$4,920.00	$3,371.22	$1,548.78	$15,140.00	$10,220.00	$3,675.25	$6,544.75	$7,046.47
6	Post-Construction Monitoring	$2,250.00	$2,260.00	-$10.00	$5,250.00	$3,000.00	$1,981.86	$1,018.14	$4,241.86
7	Project Management	$11,750.00	$11,724.88	$25.12	$15,590.00	$3,840.00	$18,364.11	-$14,524.11	$30,088.99
	TOTAL	**$289,086.00**	**$289,084.70**	**$1.30**	**$446,534.37**	**$157,448.37**	**$160,236.06**	**-$2,787.69**	**$449,320.76**

Table 3. Expenditures broken down by Task and sources of match.

				Cash and in-kind Contribution by Partners*:									
Task	**Task Description**	**WSRA**	**Total Revised Match**	**CWCB CWRP**	**EPA 319**	**UGRWCD**	**CPW FiF**	**LFVC**	**Webco/ HGD (in-kind)**	**OSM/ VISTA (in-kind)**	**BLM (in-kind)**	**Town LC (in-kind)**	**Cumulative Match**
1	Conceptual Project Design	$0.00	$22,320.37	$13,584.62	$8,360.75	$0.00	$0.00	$60.00	$0.00	$0.00	$0.00	$315.00	$22,320.37
2	Pre-Construction Preparation/60% Design (Phase I)	$30,032.60	$14,660.00	$0.00	$2,180.00	$0.00	$0.00	$5,060.00	$7,400.00	$0.00	$10,450.00	$510.00	$25,600.00
3	Outreach, Monitoring and Maintenance Plan	$3,380.00	$10,300.00	$0.00	$2,170.00	$1,766.00	$0.00	$2,763.47	$0.00	$5,600.00	$0.00	$3,400.00	$15,699.47
4	In-Channel Construction	$238,316.00	$93,108.00	$0.00	$0.00	$23,641.00	$24,000.00	$10,954.00	$10,000.00	$0.00	$4,000.00	$0.00	$72,595.00
5	Revegetation and Trails	$3,371.22	$10,220.00	$0.00	$0.00	$1,253.75	$1,000.00	$21.50	$0.00	$0.00	$0.00	$1,400.00	$3,675.25
6	Post-Construction Monitoring	$2,260.00	$3,000.00	$0.00	$1,588.86	$371.50	$0.00	$21.50	$0.00	$0.00	$0.00	$0.00	$1,981.86
7	Project Management	$11,724.88	$3,840.00	$0.00	$1,540.00	$4,672.00	$0.00	$11,912.11	$0.00	$0.00	$0.00	$240.00	$18,364.11
	TOTAL	**$289,084.70**	**$157,448.37**	**$13,584.62**	**$15,839.61**	**$31,704.25**	**$25,000.00**	**$30,792.58**	**$17,400.00**	**$5,600.00**	**$14,450.00**	**$5,865.00**	**$160,236.06**

* EPA 319 - 319 grant funds; CWRP - CWCB Watershed Restoration Program; UGRWCD - Upper Gunnison RIver Water Conservancy DIstrict; CPW FiF - Fishing is Fun; LFVC - Lake Fork Valley Conservancy; Town of Lake City; OSM/VISTA - Office of Surface Mining VISTA Program