# Gunnison River and Riparian Habitat Restoration Project

Final Report


Prepared for:
Colorado Healthy Rivers Fund Grants
Attn: Chris Sturm

January 18, 2019

City of Gunnison and Colorado Department of Parks and Wildlife
Grant Amount: $440,589
Prepared by: Andie Ruggera

## Introduction

The Upper Gunnison River Basin encompasses an area of approximately 4,300 square miles and discharges over 2.4 million acre-feet of water annually. The basin for the most part is uncontrolled, with Taylor Reservoir being the only major control structure above Blue Mesa Reservoir. Additionally, there are no trans-mountain diversions within the basin. While the basin's functions are not significantly impacted by dams and/or diversions, human impacts to the river and riparian system have occurred in the past. Conservation efforts were taken to improve river and riparian habitat system functions.

## Background

This project's history dates to 1993 when the Trust for Public Lands purchased the VanTuyl Ranch and subsequently brokered deals with the City of Gunnison and the Bureau of Reclamation (BOR) to transfer title of this real property. The City purchased the Ranch to protect the alluvial gravel aquifer and recharge area that serves as its domestic water source. The BOR purchased the 1.5-mile river corridor to help fulfill an obligation to replace approximately 18 miles of public river access lost by the construction of Blue Mesa Reservoir. The BOR deeded the river corridor to the Colorado Parks and Wildlife (CPW) with restrictions requiring that this river reach shall be used "to conserve wildlife…, provide for public access and enjoyment… and mitigate losses of, and improve conditions for the propagation of fish and wildlife". The CPW property is now known as the *Gunnison River State Wildlife Area*.

In 2001, CPW developed a *Fluvial Geomorphological Assessment and River Restoration Considerations Report for the Gunnison River near Gunnison, Colorado*. The report addressed concerns about large concrete-rubble levees in the river channel reach adjacent to the VanTuyl Ranch. These human alterations significantly affected the river/riparian system functions.

In 2012, the City and CPW agreed to collaborate on a strategy to implement actions to improve the river channel function while also protecting the City's interests in managing the Ranch open space. The following are the project goals set forth at the onset of the project:

- Improve diversion points
- Reconnect floodplains
- Improve channel habitat
- Increase trout biomass
- Improve trout size
- Improve riparian habitat
- Improve public river access

The CPW and the City applied for a Water Supply Reserve Account grant with the Colorado Water Conservation Board (CWCB). The grant application was approved in September 2014. For the next three years, the CPW and city staff implemented wetland and habitat investigations, river survey work and river system improvement designs. Final design was completed in 2017, and permitting with the US Fish and Wildlife Service and Army Corps of Engineers was completed in August 2017. Construction work was initiated in November 2017 and the majority of the project was completed in March 2018 with additional work being completed in November 2018. A few maintenance items will occur in the Spring of 2019.

## Methods / Results / Conclusion

Please see attached PowerPoint and documentation.

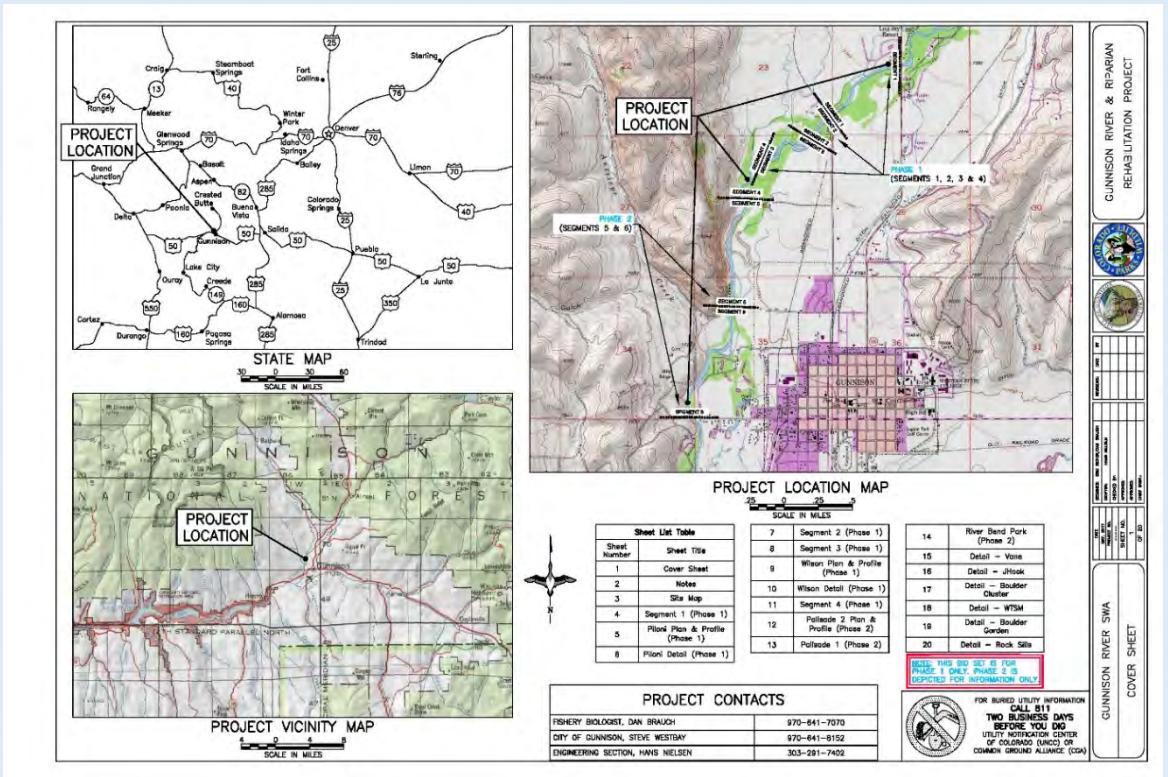
## Actual Expense Budget

Please see attached actual budget separated by scope of work.

# *The Gunnison River and Riparian Habitat Rehabilitation Project*

*Local Partnerships at Work*

*Dan Brauch – CPW Aquatic Biologist*
*Steve Westbay – City of Gunnison*



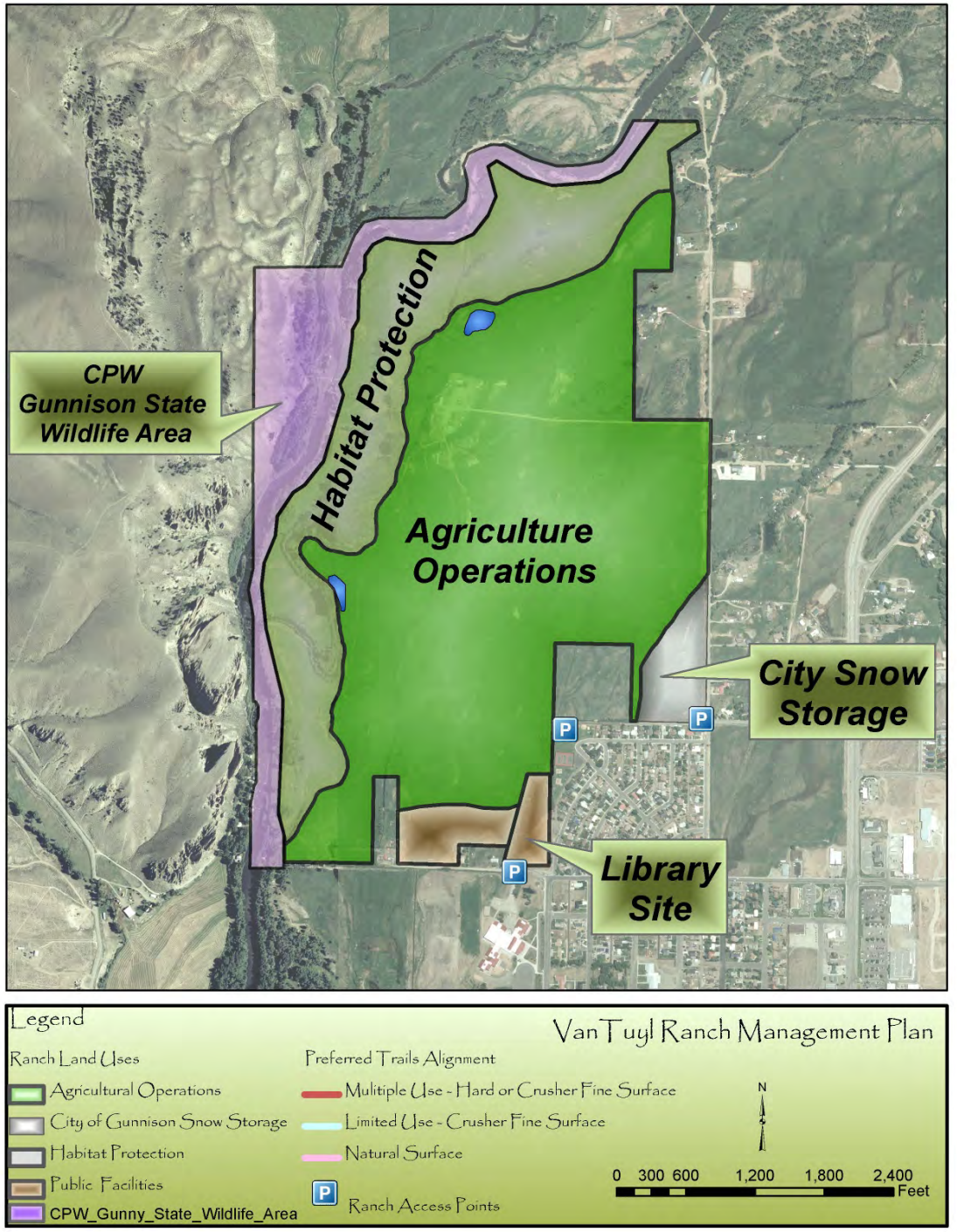

## Goddard Ranch

## *Background*
## *VanTuyl Ranch & Gunnison River State Wildlife Area*

A Project 25 Years in the Making

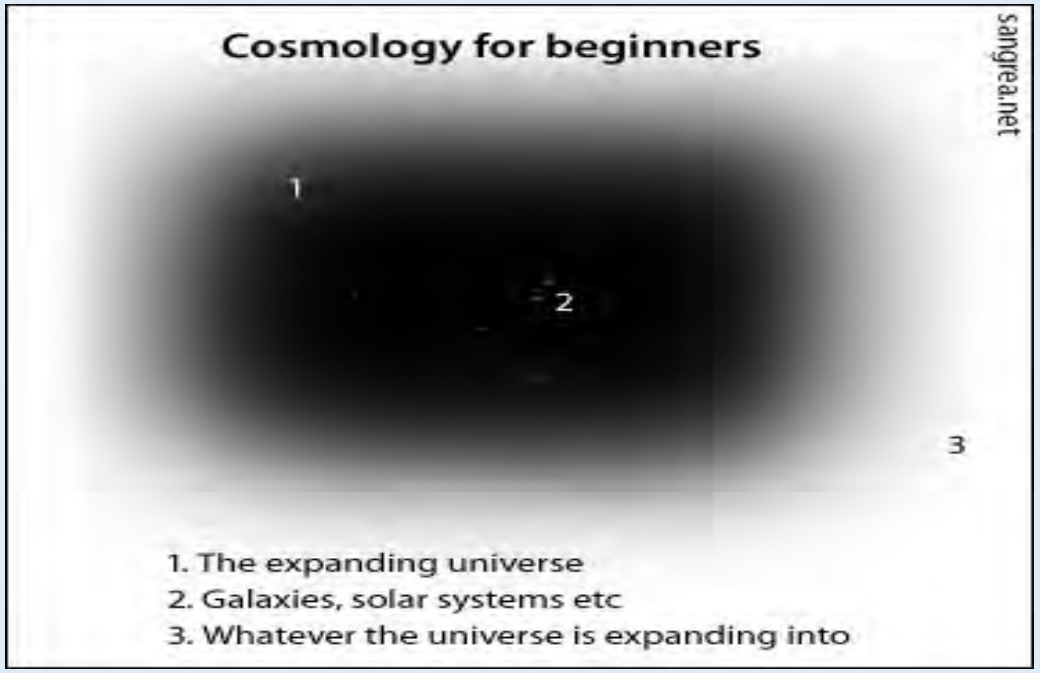
- Property purchased 1993 by the Trust for Public Lands
- Titles conveyed to Bureau of Reclamation (BOR) & the City
- State Wildlife Area deed transfer from BOR to CPW in 1994
- City took over ranch operations in 2008 after lifetime resident Ray VanTuyl passed away

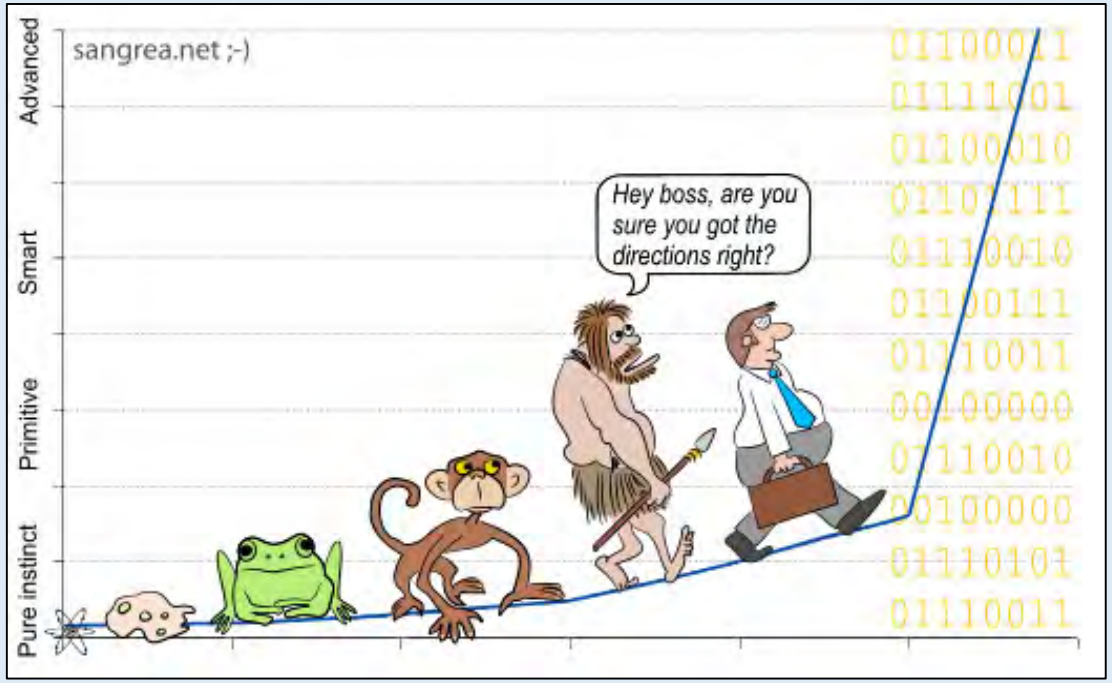
- Ranch Annexed in 2011
  - Regulated by an *Adaptive Resource Management Plan*
  - Alluvial Aquifer Recharge – City domestic water source
  - Watershed Protection – Septic system proliferation
  - Prescribed Agricultural Operations & community garden
  - Public Open Space – 5K trail system
  - Flood Control
  - Habitat Protection



## *Rehabilitation Project - It Starts with an IDEA in 2001*

- *Fluvial Morphology & River Restoration Assessment*,2001
- Partners: CWCB, Trout Unlimited, UGRWCD, CPW, City, 2012
- Championing the Cause: CPW & City, 2012
- Funding: 2014 CWCB Grant ($440K); Private Donations ($150K)
- Design Programming 2014 through 2017
- Scope Modification 2016 – Project Cost Overruns
- Permitting: ACOE 404; Fish & Wildlife Service 2017
- Project Bid Award September 2017 & Construction through May 2018



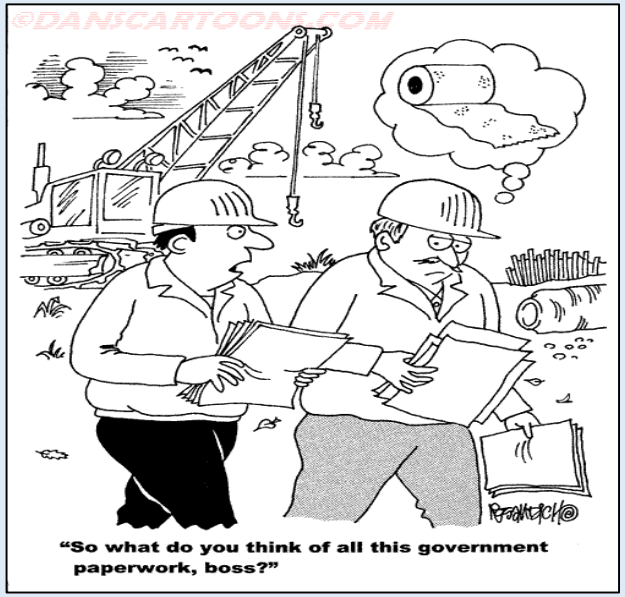



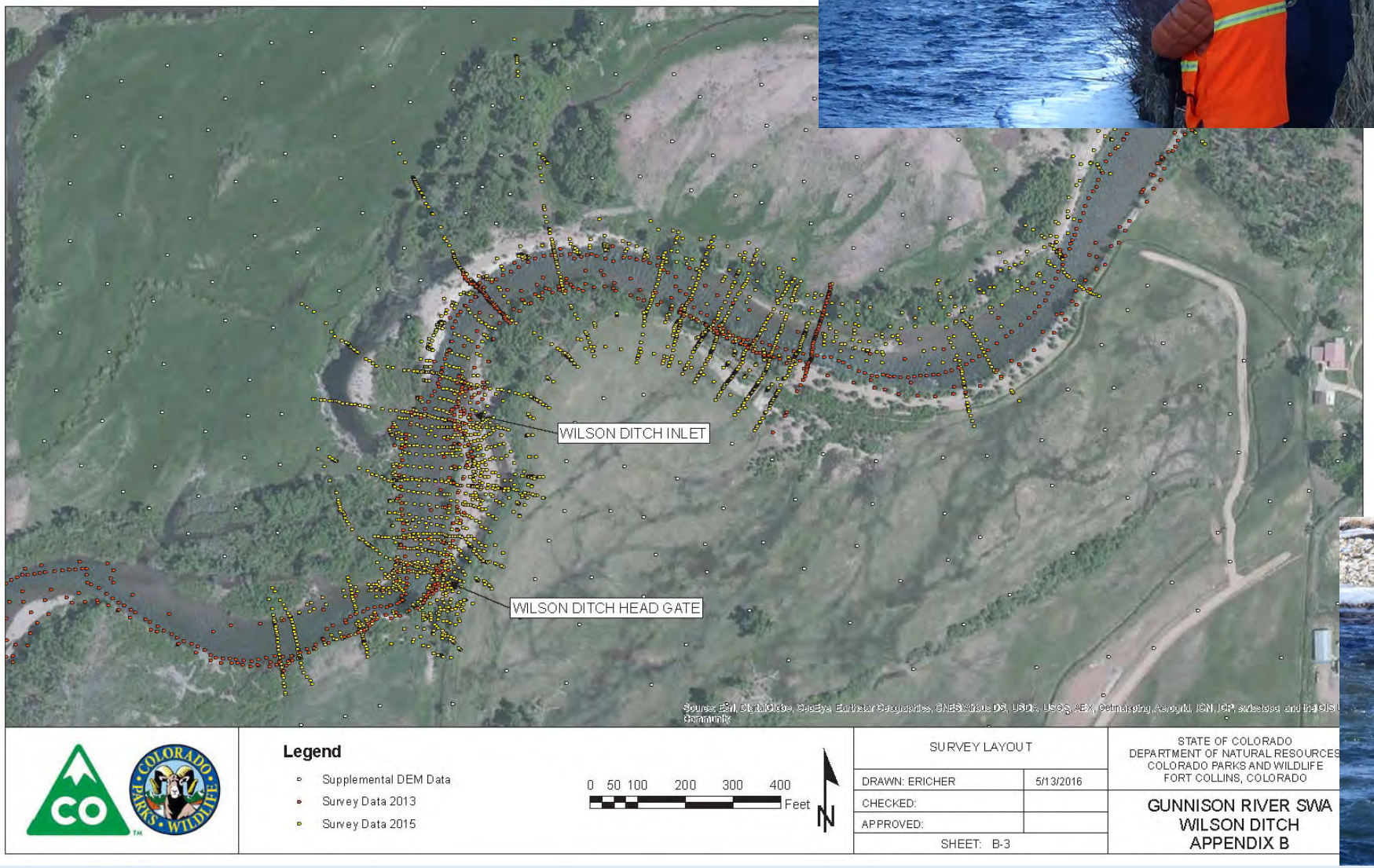
## *PROJECT GOALS*

- Improve diversions- H2O rights due diligence
- Reconnect floodplains
- Improve channel habitat
- Increase trout biomass
- Improve trout size
- Improve riparian habitat
- Improve public river access

## *Permitting Overview*

- Gunnison Sage-grouse Listing Decision November 12, 2014 - US Fish and Wildlife Service
- ACOE Nationwide Permit 33:*Temporary Access Construction and Dewatering – agricultural diversions*
- ACOE Regional General Permit 12: *Aquatic Habitat Improvement for Stream Channels in Colorado*
- Endangered Species Act, Section 7 Consultation, ACOE/FWS
  - *Cultural Resource Inventory*
  - *Wetland Inventory*
  - *ESA Gunnison Sage-grouse Critical Habitat Biological Assessment*
  - *Special Conditions for season of operations, equipment access, et AL*
- Coordination & Approvals from the Bureau of Reclamation
- County Flood Hazard Application



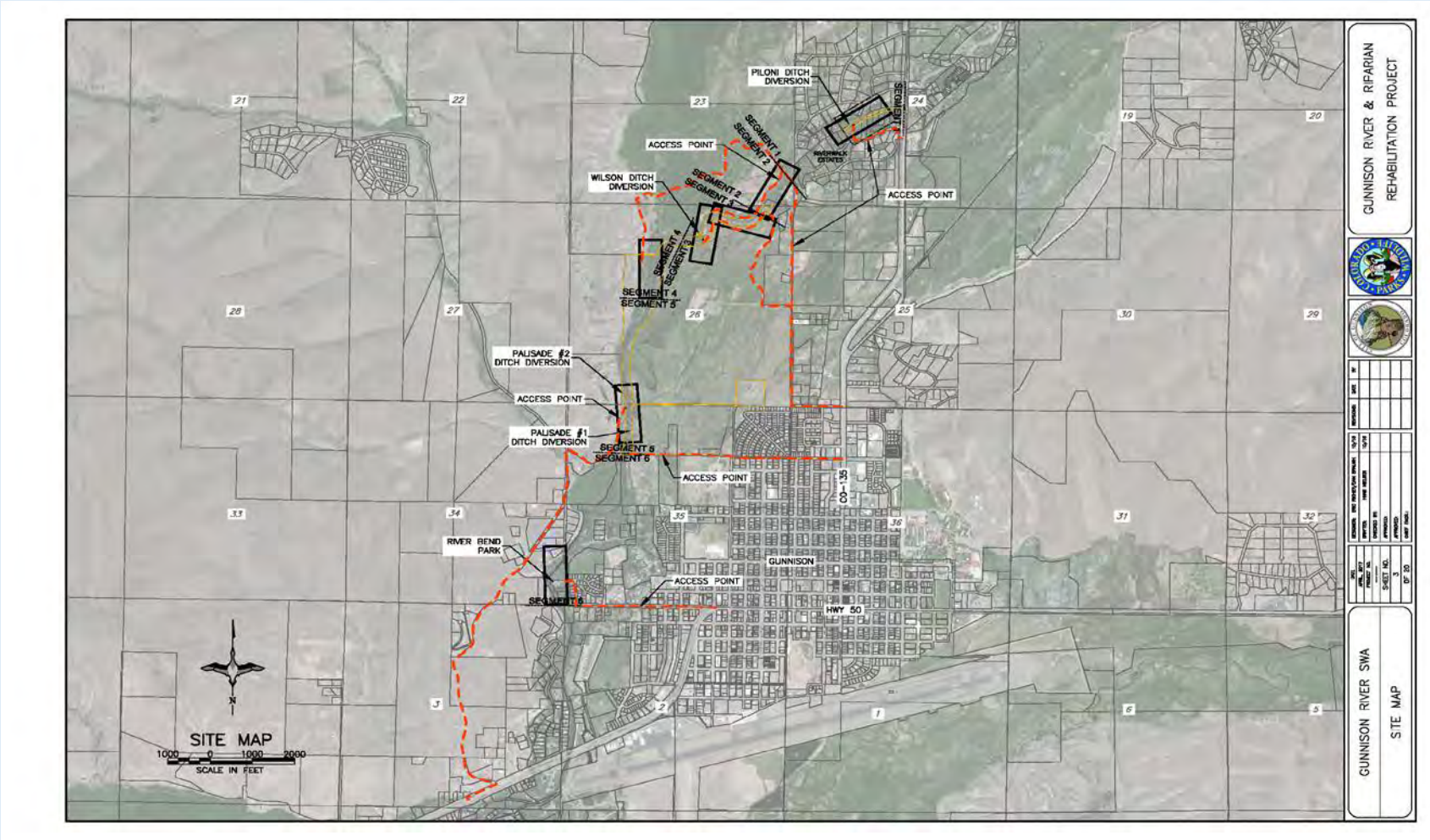




Project engineering and design was done by the CPW's engineering staff. These in kind design services, along with permit administration by local agencies added significant project value.

# *KEY DESIGN CONSIDERATIONS*

## Design Improvements on 7 Channel Segments along a 3.75 mile reach

- Abate historic channelization where practical
- Reestablish morphological function
- Improving fish habitat
- Emphasize low profile channel features
- Improve Riparian Function w/ vegetation treatment
- Reconnect floodplains where possible
- Use native vegetation: willow transplants; sod mat

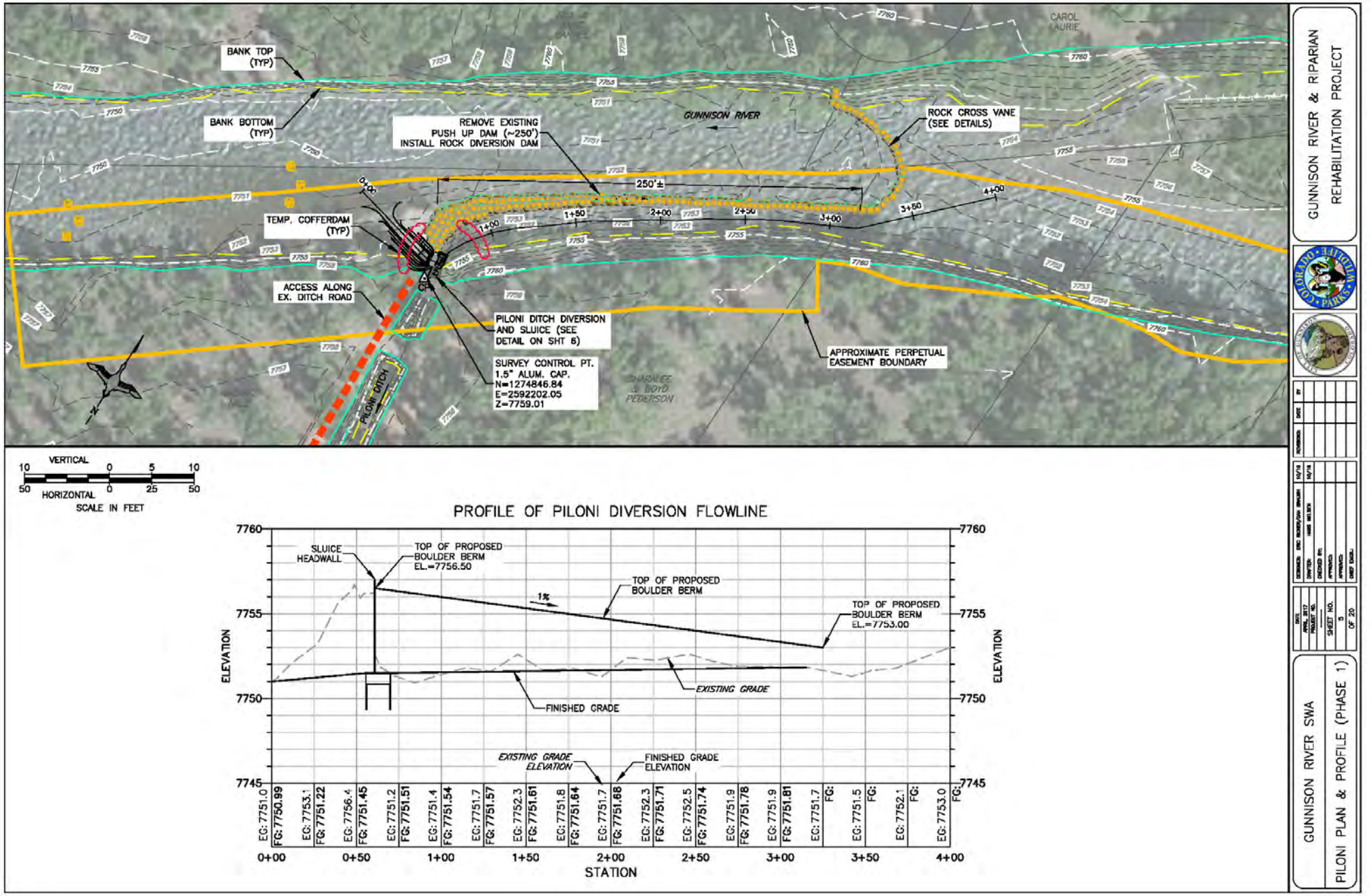


## *Pre-Construction Conditions – Hydraulic Modelling*

Hydraulic modeling indicated that the initial designs of one channel feature would cause flood elevation rise & final design alterations were made to ensure no-rise would occur.

Elevation grade change between the head gates and diversion points were critical functions of the final design to ensure adequate water delivery and sediment control.

# *Piloni Ditch Diversion*



## *Piloni Ditch – Major Diversion & Habitat Improvements*

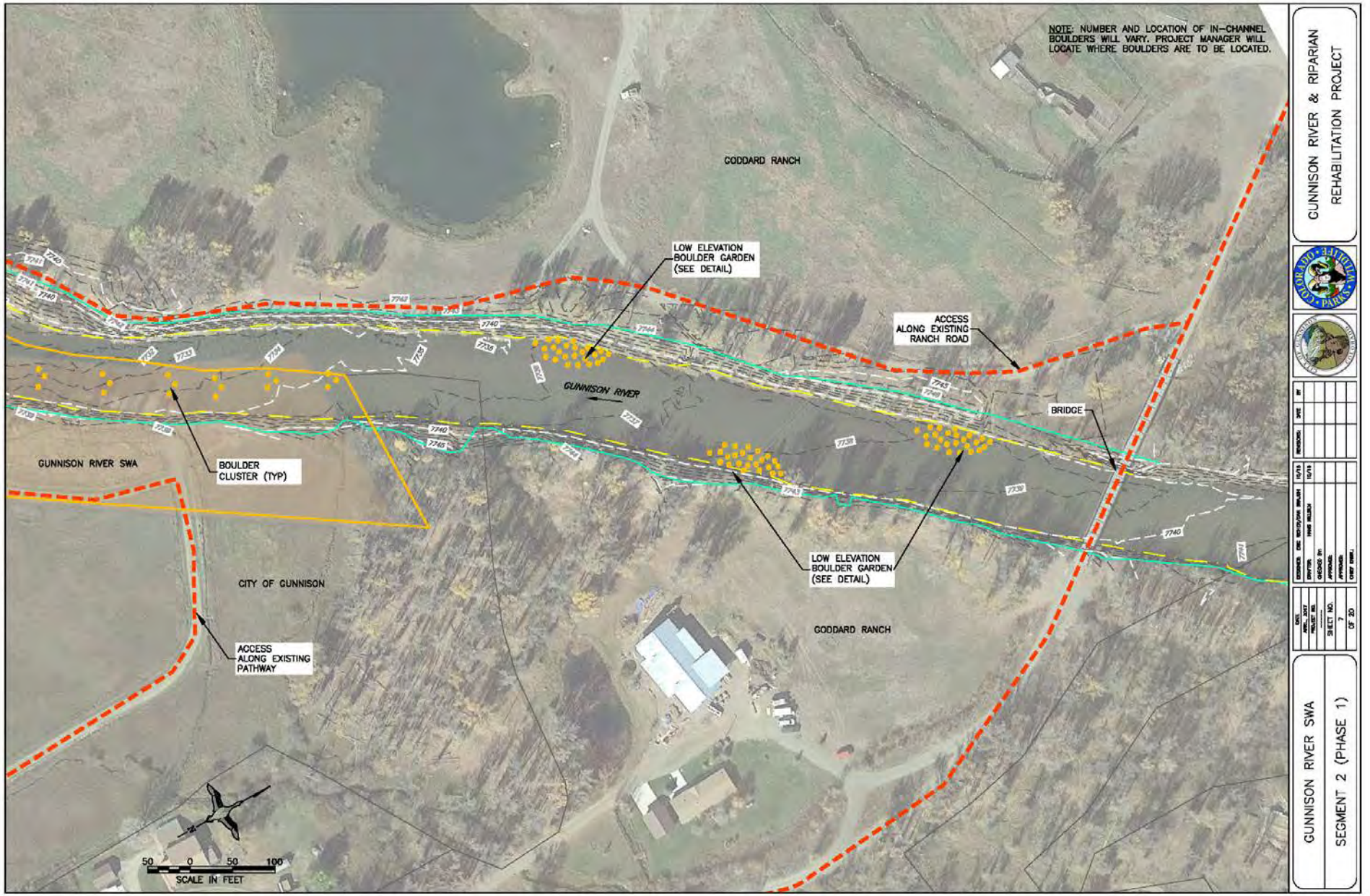
Frozen soil conditions experienced in early January 2018 finally chased the crew off for the season. Construction began again the past week – estimated completion date May 2018.

A $100,000 grant from the LOR Foundation allowed for constructing a new headworks on the Piloni Ditch & the construction of additional fish habitat structures in all reaches of the river project area.

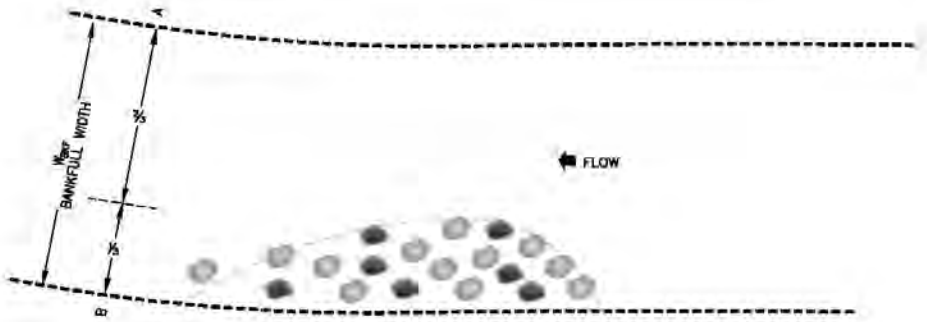
***Piloni Ditch – March 27, 2018***
**Ongoing Construction**


what's wrong
with this picture?

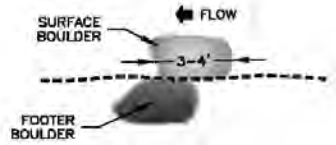
# *Typical Fish Habit Channel Features*



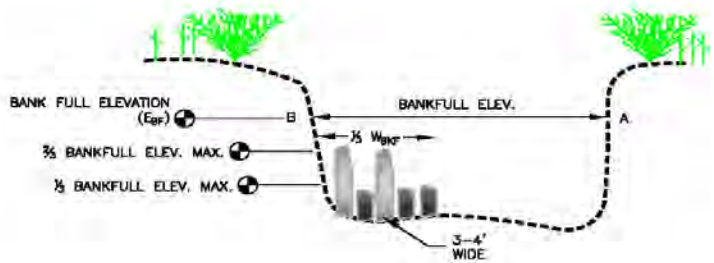
# *Boulder Garden Details*




PLAN VIEW
NTS




BOULDER PROFILE VIEW
NTS




CROSS–SECTION VIEW
NTS

**CONSTRUCTION NOTES:**

1. STRUCTURE SHALL BE FIELD LOCATED BY CPW PROJECT MANAGER OR DESIGNATED REPRESENTATIVE.
2. SURFACE BOULDERS ARE THE TOP COURSE OF BOULDERS. SURFACE BOULDERS SHALL VARY IN DEPTH BETWEEN 1/3 BANK FULL DEPTH AND 2/3 BANK FULL DEPTH.
3. FOOTING BOULDERS ARE PLACED TO PROVIDE A FOUNDATION FOR THE SURFACE BOULDERS. TYPICALLY FOOTER BOULDERS SHALL BE BURIED IN THE CHANNEL BOTTOM AND NOT SEEN WHEN THE STRUCTURE IS COMPLETED. ALL SURFACE BOULDERS SHALL REQUIRED FOOTERS AND SHALL BE OMITTED ONLY AT THE DISCRETION OF CPW PROJECT MANAGER, OR DESIGNATED REPRESENTATIVE, ON A STRUCTURE BY STRUCTURE BASIS.
4. BOULDERS SHALL BE PLACED AT AN IRREGULAR SPACING.
5. BOULDERS SHALL BE PLACED APPROXIMATELY 2–4 x BOULDER DIAMETER APART.
6. CONTRACTOR SHALL USE AN EXCAVATOR OF SUITABLE CAPACITY WITH HYDRAULIC THUMB TO CONSTRUCT THE STRUCTURE.
7. CONTRACTOR SHALL ANTICIPATE THAT HANDLING OF INDIVIDUAL ROCK (ESPECIALLY BOULDERS) AFTER INITIAL PLACEMENT WILL BE REQUIRED TO ACHIEVE REQUIRED SLOPES, GRADES, ELEVATIONS, AND POSITION.
8. REFER TO PROJECT TECHNICAL SPECIFICATIONS FOR ROCK AND OTHER REQUIREMENTS FOR INSTALLING STRUCTURES

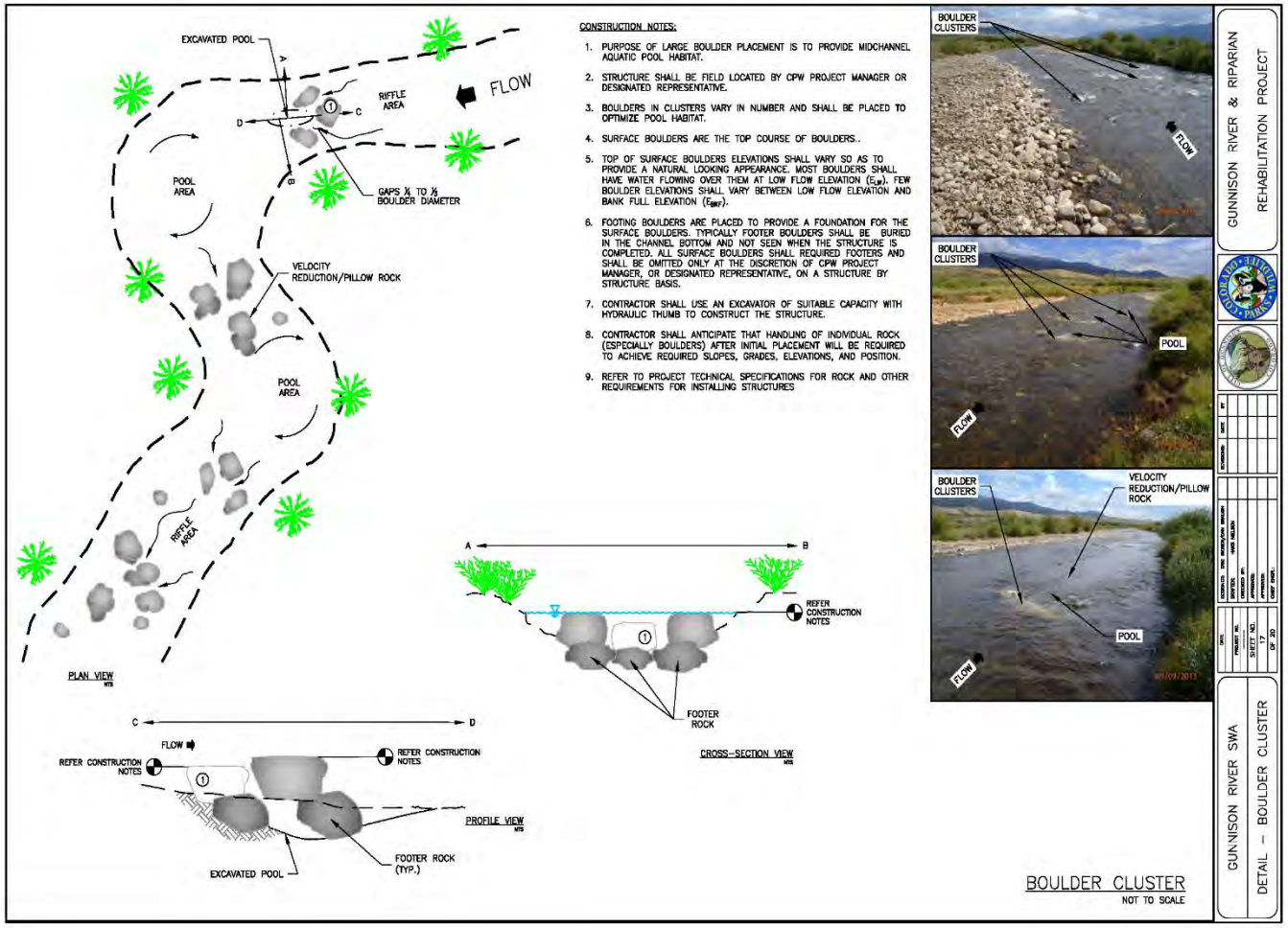
BOULDER GARDEN
NOT TO SCALE

GUNNISON RIVER & RIPARIAN REHABILITATION PROJECT

GUNNISON RIVER SWA

DETAIL – BOULDER GARDEN

Fishery habitat improvements include construction boulder gardens and boulder clusters on all project area river reaches.



# *Low Profile Boulders Clusters at Work*

# *Channelization Challenges*
# *Establishing Thalweg & Sinuosity*

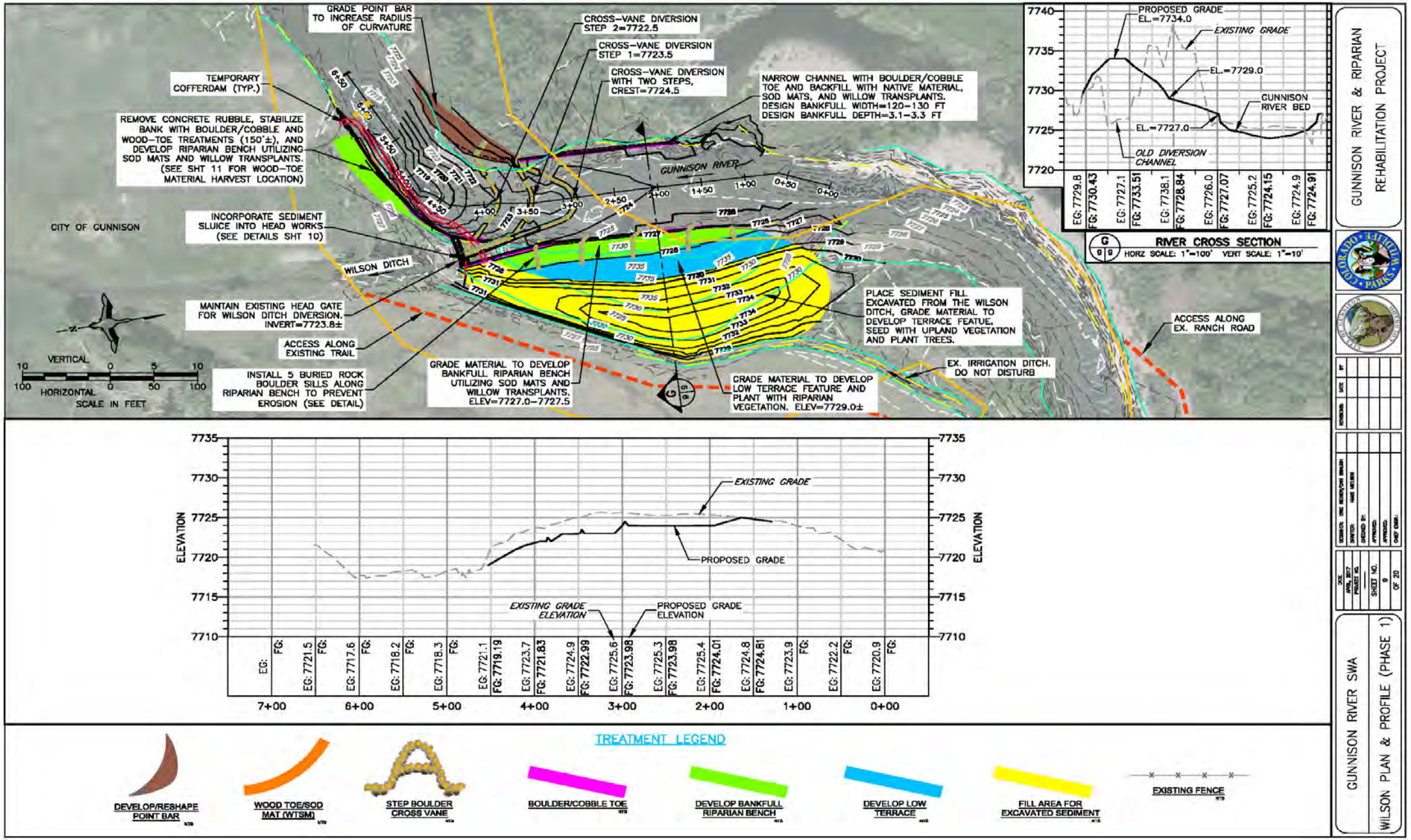
# *Thalweg & Sinuosity- Boulder Gardens in lieu of point bars*

# *Wilson Diversion Pre-Construction Conditions*

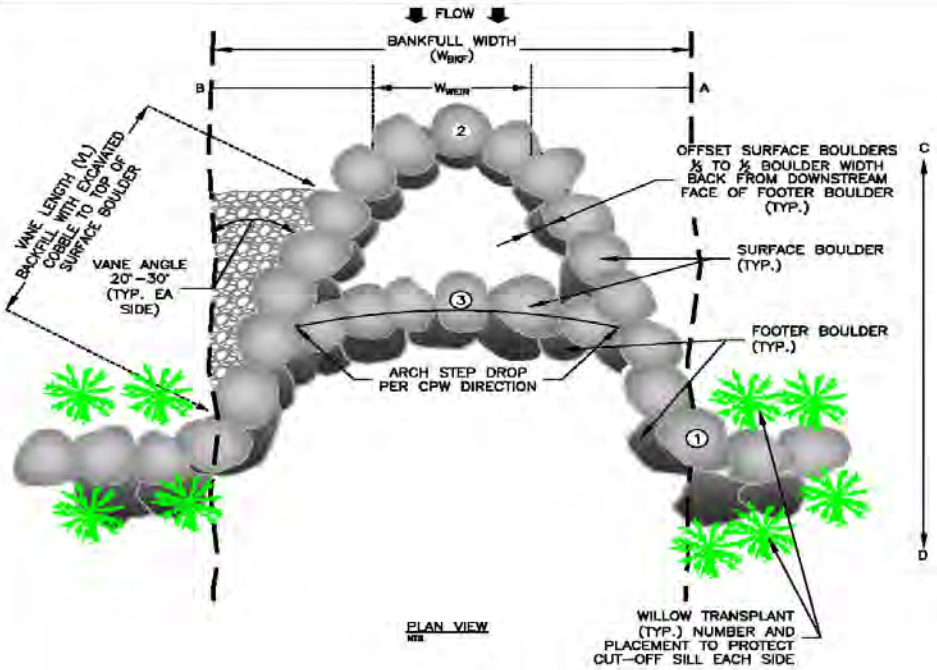
Significant design & construction challenges


# *Wilson Diversion Pre-Construction Conditions*

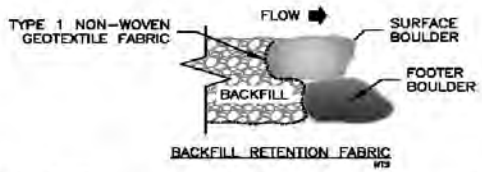
# Wilson Diversion Plan and Profile



# *Low Profile Cross Vanes*



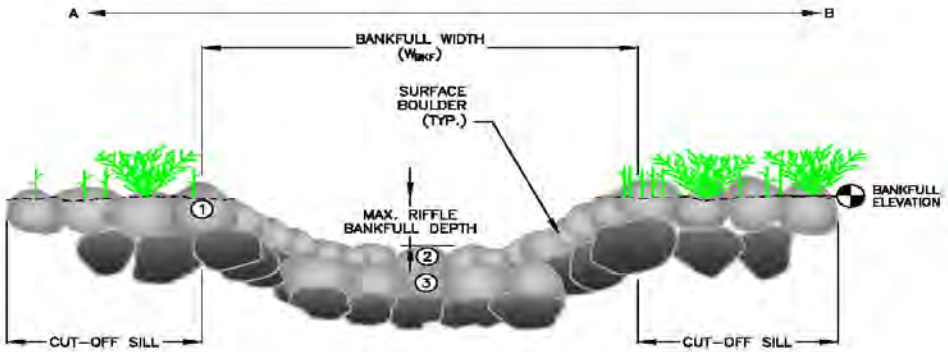

PLAN VIEW
NTS



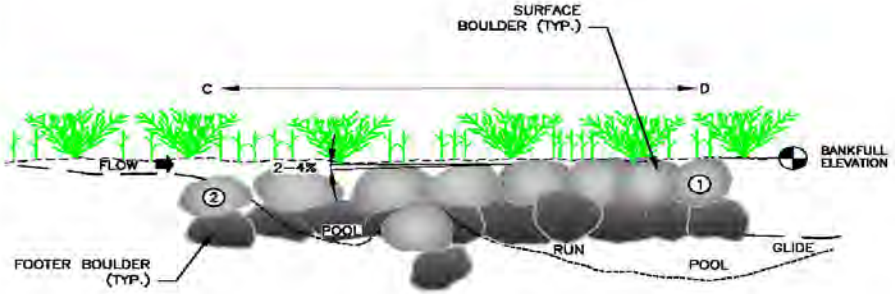

BACKFILL RETENTION FABRIC
NTS

BACKFILL RETENTION FABRIC NOTES:

1. THE PURPOSE OF THE BACKFILL RETENTION FABRIC IS TO INHIBIT THE PASSING OF BACKFILL MATERIAL (I.E. CHANNEL BED MATERIAL) THROUGH OR UNDER THE STRUCTURE.
2. FABRIC SHALL BE USED ON THE VANE OF ALL STRUCTURES AND SHALL BE OMITTED ONLY AT THE DISCRETION OF CPW PROJECT MANAGER, OR DESIGNATED REPRESENTATIVE, ON A STRUCTURE BY STRUCTURE BASIS.
3. FABRIC MANUFACTURER'S ROLL WIDTH SHALL GO FROM SURFACE BOULDER, ALONG FACE OF BOULDERS AND EXTEND UPSTREAM UNDERNEATH BACKFILL. ROLL WIDTH SHALL NOT BE CUT.
4. FABRIC SHALL START ½ DOWN SURFACE BOULDER FACE. FABRIC SHALL NOT BE VISIBLE AFTER BACKFILL..




CROSS–SECTION VIEW
NTS




PROFILE VIEW
NTS

CONSTRUCTION NOTES:

1. STRUCTURE SHALL BE FIELD LOCATED BY CPW PROJECT MANAGER OR DESIGNATED REPRESENTATIVE.
2. SURFACE BOULDERS ARE THE TOP COURSE OF BOULDERS. ALL SURFACE BOULDERS CAN BE SEEN PROTRUDING FROM THE WATER SURFACE ONLY DURING LOW FLOWS.
3. FOOTING BOULDERS ARE PLACED TO PROVIDE A FOUNDATION FOR THE SURFACE BOULDERS. TYPICALLY FOOTER BOULDERS SHALL BE BURIED IN THE CHANNEL BOTTOM AND NOT SEEN WHEN THE STRUCTURE IS COMPLETED. ALL SURFACE BOULDERS SHALL REQUIRED FOOTERS AND SHALL BE OMITTED ONLY AT THE DISCRETION OF CPW PROJECT MANAGER, OR DESIGNATED REPRESENTATIVE, ON A STRUCTURE BY STRUCTURE BASIS.
4. THE SURFACE OF THE CROSS–VANE SHALL BE FINISHED TO A SMOOTH AND COMPACT SURFACE IN ACCORDANCE WITH THE LINES, GRADES AND CROSS–SECTIONS OR ELEVATIONS SHOWN ON THE DRAWINGS. THE DEGREE OF FINISH FOR INVERT ELEVATIONS SHALL BE WITHIN ± ONE–INCH OF THE GRADES AND ELEVATIONS INDICATED PROVIDED ANY HEIGHT DOES NOT EXCEED 1.5 INCHES. ALL GAPS AND/OR VOIDS ALONG THE VANE SHALL BE PLUGGED WITH ROCK TO FORM A TIGHT FITTING SEAL TO 2 – 4 INCHES BELOW THE HEAD ROCK ELEVATION.
5. CONTRACTOR SHALL USE AN EXCAVATOR OF SUITABLE CAPACITY WITH HYDRAULIC THUMB TO CONSTRUCT THE STRUCTURE.
6. CONTRACTOR SHALL ANTICIPATE THAT HANDLING OF INDIVIDUAL ROCK (ESPECIALLY BOULDERS) AFTER INITIAL PLACEMENT WILL BE REQUIRED TO ACHIEVE REQUIRED SLOPES, GRADES, ELEVATIONS, AND POSITION.
7. REFER TO PROJECT TECHNICAL SPECIFICATIONS FOR ROCK AND OTHER REQUIREMENTS FOR INSTALLING STRUCTURES

## STEP BOULDER CROSS–VANE

NOT TO SCALE

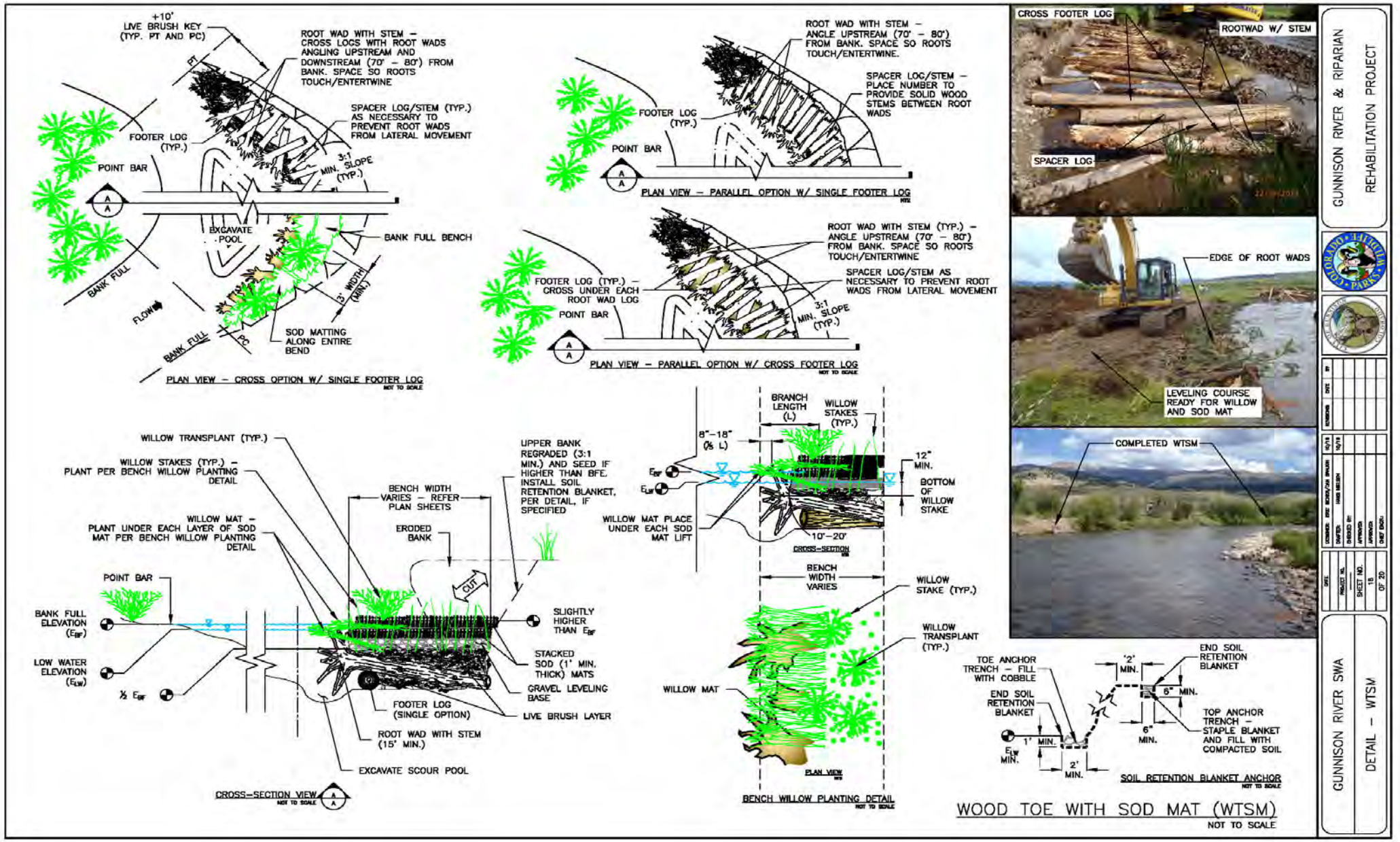
GUNNISON RIVER & RIPARIAN
REHABILITATION PROJECT

GUNNISON RIVER SWA

DETAIL – VANE

SHEET NO. 15 OF 20

# *Wood Toe and Sod Mat Details*




Local contactor Spallone Construction was awarded the Bid in August 2017. CSI Concrete was a subcontractor for the project.

Work on the Wilson diversion began in late October 2017. Favorable weather conditions allowed for completion of all rock structures & concrete work. The majority of vegetation work was also complete during the warm fall season.

## *Riparian Habitat Treatments*

Bank stabilization, willow transplanting & other work will improve riparian habitat. Reconnection of the floodplain, where appropriate, was also a project goal


Wood Toe Construction

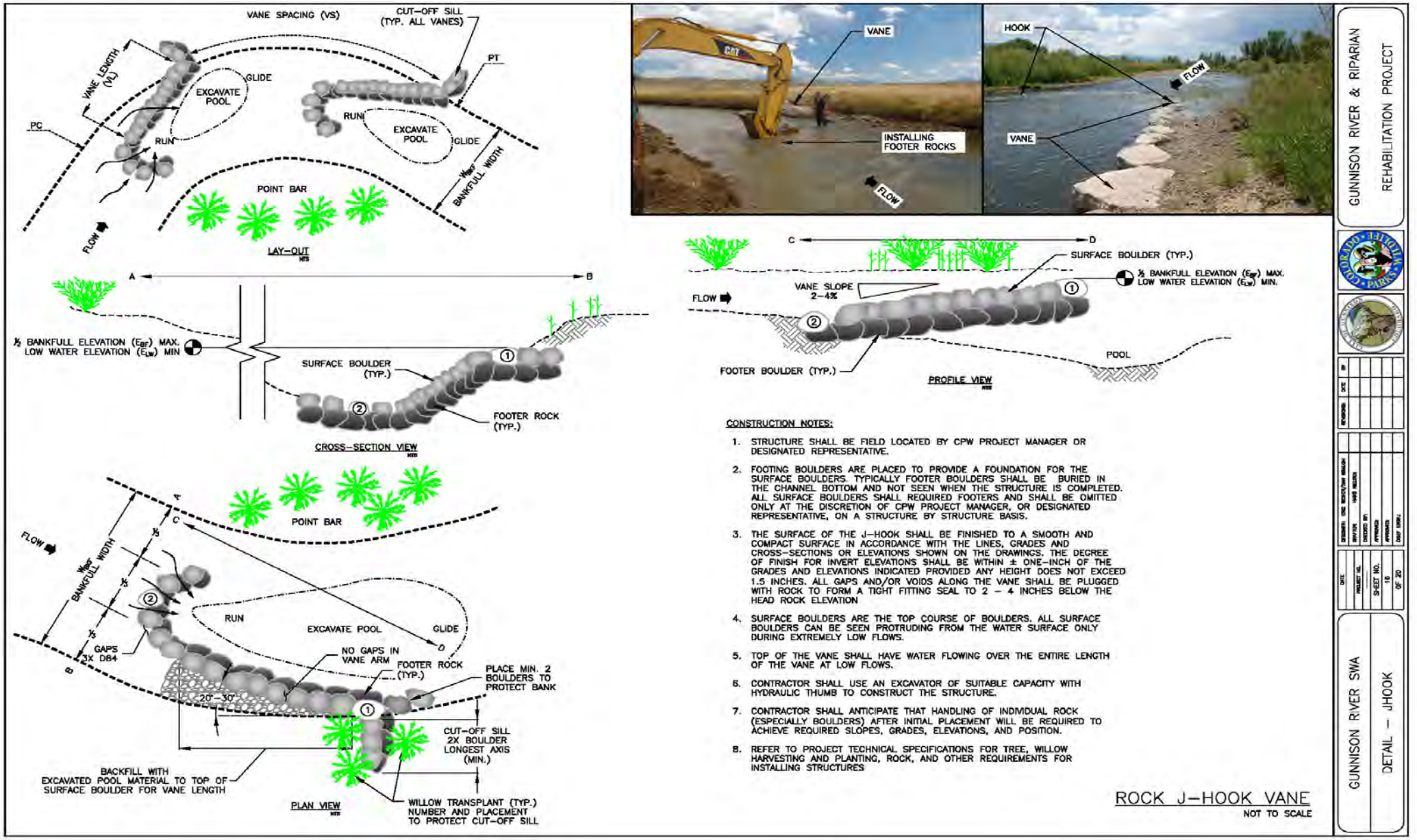

Willow Transplanting


Sod Mats

***Floodplain Connection***

Terrace & Floodplain Riparian Habitat Treatment

# J-Hook Design Details



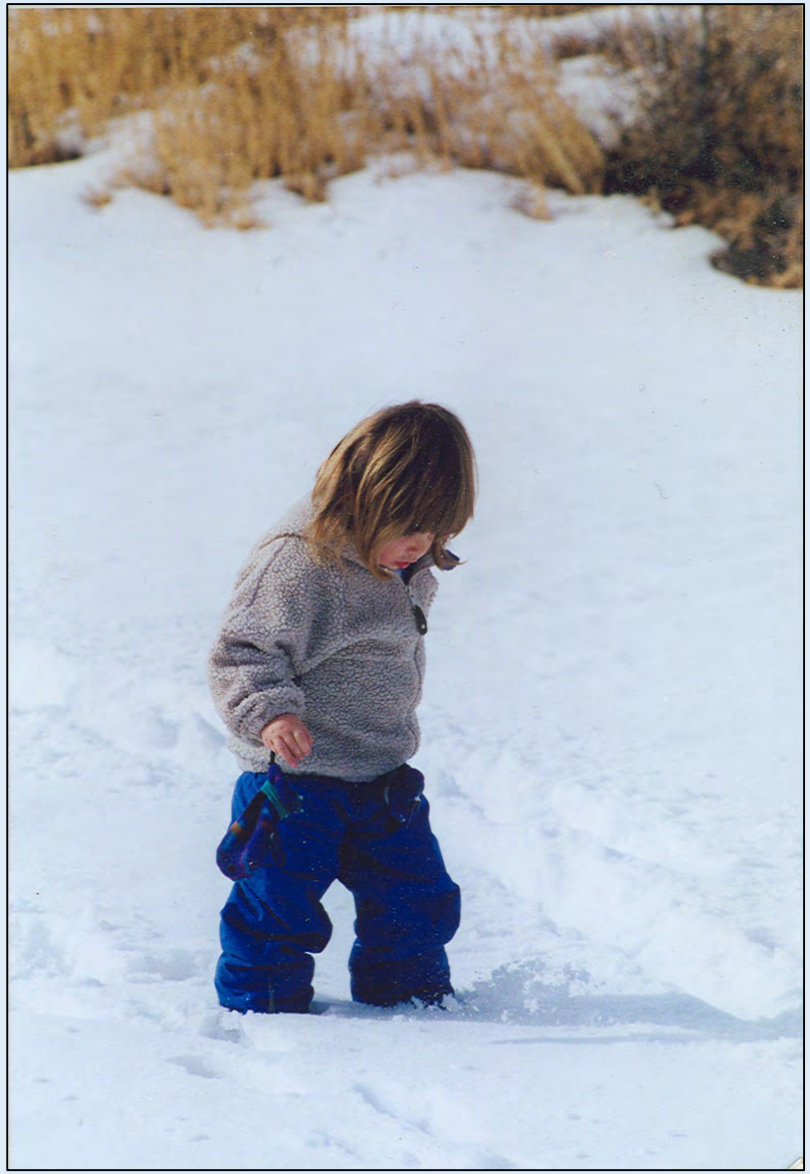

While equipment was staged at the Wilson Diversion, work to stabilize the Ohio Creek/Gunnison confluence was accomplished.

A J-Hook structure and boulder cluster habitat features were constructed at the confluence.

## *Observations – Lessons Learned*

- Develop partnerships & allies - focus on possible stakeholders
- Be a champion of Great Projects
- Good ideas take time – do not loose focus
- Be a steward of natural resources – it is what *sustainability* requires

**'A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.'**
**Aldo Leopold**



**Gunnison River and Riparian Rehabilitation Project:**
**Floodplain Analysis and Preliminary Design Report**

Prepared by:
Eric E. Richer, Hydrologist
Colorado Parks and Wildlife, 317 W. Prospect Road, Fort Collins, Colorado 80526

## Summary

The objective of this report is develop preliminary designs and evaluate floodplain impacts for three water diversion structures located within the Gunnison River State Wildlife Area (SWA). Pushup dams are currently used to divert water into the irrigation ditches. The construction and maintenance of pushup dams and irrigation ditches has impacted aquatic and riparian habitats. Replacing the pushup dams with cross-vane diversion structures should reduce maintenance needs while improving stream functions and aquatic habitat. Preliminary designs are presented as proposed conditions in Appendices A-C. Floodplain impacts were evaluated by comparing existing and proposed conditions in accordance with Colorado Water Conservation Board (CWCB) rules for regulatory floodplains. As none of the proposed designs create a vertical rise in excess of 0.3 ft, the proposed structures should not require a Letter of Map Revision (LOMR).

## Introduction

The Gunnison River and Riparian Rehabilitation Project was funded by the Gunnison Basin Roundtable and CWCB in March 2014, and received the official Notice to Proceed on September 24, 2014. The goals of the project include:

- Increase wild brown and rainbow trout biomass and densities;
- Improve conditions for quality-sized adult trout;
- Improve fishing access with a trail system;
- Assist water right holders in improving and/or relocating existing water diversion structures to improve habitat, stability and channel alignment;
- Create in-channel deep pools to provide lower velocity holding areas;
- Explore the potential to reconnect the floodplain with the existing channel to improve river function, flood storage, and aquifer recharge;
- Assess aggradation and degradation near the bridges;
- Maintain the existing river planform to maintain property boundaries;
- Incorporate in-channel habitat improvement structures while not raising flood stage;
- Improve riparian habitat for wildlife and improve the river functions by planting native woody vegetation; and,
- Improve and manage boater access.

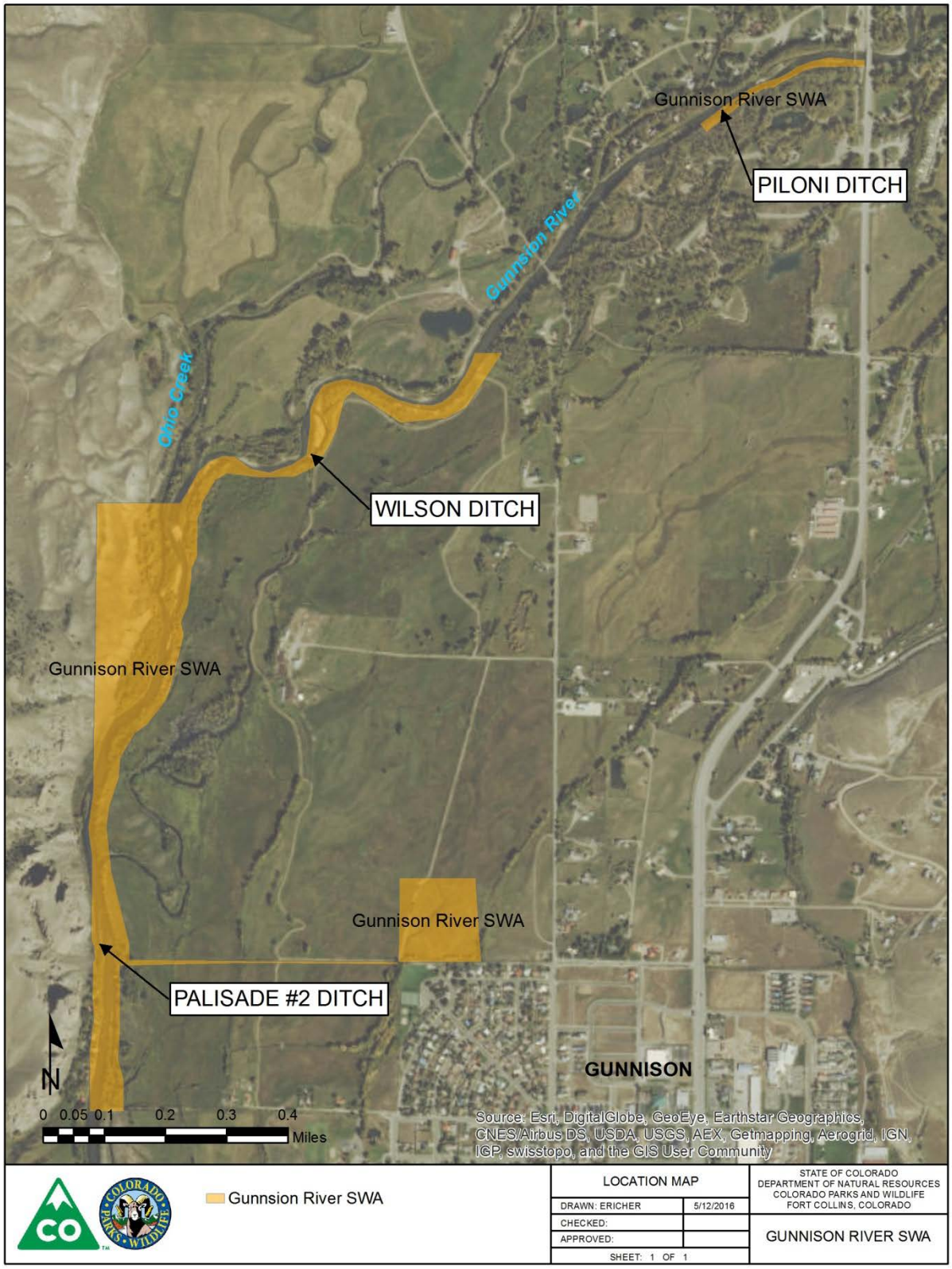



**Figure 1.** Location map for the Piloni Ditch, Wilson Ditch, and Palisade #2 Ditch near Gunnison, Colorado.

The objective of this report is to provide preliminary designs and floodplain analyses for three water diversion structures: the Piloni Ditch, Wilson Ditch, and Palisade #2 Ditch. All of the structures are located within the Gunnison River SWA near Gunnison, Colorado (Figure 1). The existing structures require frequent maintenance including re-construction of instream pushup dams and excavating ditch inlets. Replacing the existing pushup dams with boulder cross-vane structures (Rosgen, 2006) will reduce the need for maintenance while improving aquatic habitat and channel stability. Standard rules and regulations were used to evaluate the impact of the proposed structures on regulatory floodplains in accordance with CWCB (2010). These rules state that a LOMR is needed whenever a stream alteration activity is suspected to increase or decrease the base flood elevation in excess of 0.3 vertical feet. All design alternatives that resulted in a rise in excess of 0.3 ft were eliminated from consideration. The preferred alternatives for the Piloni Ditch, Wilson Ditch, and Palisade #2 Ditch are presented as proposed conditions in Appendices A, B, and C, respectively.

**Site Description**

The Gunnison River within the project reach has been impacted by channelization and construction of pushup dams to divert water into irrigation ditches. These activities have impaired floodplain connectivity and channel morphology, impacting riparian conditions and aquatic habitat. Floodplain analyses were focused on the reaches immediately upstream and downstream of the water diversions structures. Site characteristics for each location are unique and will be discussed independently.

*Piloni Ditch* — The Piloni diversion structure is located in the upstream section of the Gunnison River SWA below HW 135 (Figure 1). The Piloni diversion structure consists of a pushup dam that extended approximately 210 ft upstream from the head gate when surveyed in April 2015. Historical photos show that the pushup dam can extend an additional 60 ft upstream following construction. It appears that the upper 60 ft of the structure is often washed out during runoff. The Piloni Ditch has a decreed water right of 40 cfs (City of Gunnison, personal communication). However, flow records obtained from the Colorado Division of Water Resources (DWR) show that flows in the Piloni Ditch are typically much lower than 40 cfs (Table 1). It appears that flows in the Piloni Ditch over the past ten years have decreased compared to historical values due to conditions at the Piloni head gate. During surveys in April 2015, the head gate culvert was clogged with sediment and provided only 0.3 ft of free board between the invert of the ditch and top of the culvert (Figure 2). The issues with sediment accumulation below the Piloni head gate highlight the need for a new head gate structure that includes a sediment sluice. Sedimentation has also impaired flows through the ditch system and some ditch maintenance will likely be needed to optimize water delivery. Furthermore, there is a road culvert in the ditch approximately 23 ft downstream of the head gate. This culvert had a surveyed diameter of 2.13-2.32 ft, which is not sufficient capacity to accommodate 40 cfs. Existing conditions for the Piloni Ditch are depicted in Appendix A-1.

**Table 1.** Summary statistics for diverted flows into the Piloni Ditch, 1975-2015.

| | Diverted Flow (cfs) | | | | |
|---|---|---|---|---|---|
| **Time Period** | **Maximum** | **Average** | **Median** | **Minimum** | **Standard Deviation** |
| 1975-2015 | 38.9 | 5.5 | 3.3 | 0.0 | 6.9 |
| 2006-2015 | 10.6 | 3.8 | 3.3 | 0.0 | 2.7 |


**Figure 2.** Outlet of the head gate culvert showing accumulation of sediment with adverse impacts on flows into the Piloni Ditch.

*Wilson Ditch* — The Wilson Ditch is located approximately 0.3 miles above the confluence with Ohio Creek (Figure 1). The inlet to the Wilson Ditch requires frequent maintenance due to issues with sediment aggradation. Maintenance activities at the Wilson Ditch have impacted channel morphology, sediment transport, riparian vegetation, and floodplain connectivity. To improve conditions at the Wilson Ditch, a boulder cross-vane diversion structure will be installed to provide grade control, improve sediment transport, and deliver water to the irrigation ditch. The Wilson Ditch does not have a decreed water right and is being designed to divert 15 cfs under "free river" conditions. Currently, there is no structure at the Wilson Ditch to divert flows from the Gunnison River. The current point of diversion is located on the downstream end of point bar, an area typically associated with sediment aggradation. Sediment deposition in the Wilson Ditch requires frequent maintenance that entails excavating ditch and piling sediment in the riparian area between the ditch and the Gunnison River (Figure 3). These maintenance activities have been ongoing for a number of years, impacting both channel morphology and riparian conditions. The river channel is notably wide at the point of diversion, which is exasperating issues with sediment aggradation. Existing conditions for the Wilson Ditch are shown in Appendix B-1.


**Figure 3.** Inlet to the Wilson Ditch showing large pile of sediment that has been removed from the ditch and placed between the ditch and the Gunnison River.

*Palisade #2 Ditch* — The Palisade #2 Ditch is located approximately 0.7 miles below the confluence with Ohio Creek (Figure 1). The existing diversion structure is a pushup dam that requires frequent maintenance. The DWR database shows that the Palisade Ditch #2 (WDID #5900647) has a decreed water right of 5 cfs. The Palisade #2 diversion structure consists of a pushup dam that extends approximately 350 ft upstream of the ditch inlet (Figure 4). Construction and maintenance of the pushup dam has widened the river channel, impacting channel morphology and aquatic habitat. Sedimentation at the ditch inlet also requires maintenance to optimize flows into the ditch. The existing head gate does not include a sediment sluice, which limits the ability to manage sediment in the vicinity of the ditch inlet and head works. The channel is bounded by a narrow vegetated bank on river right and a high, eroding bank on river left. Bank erosion near the terminus of the pushup dam on river left has undermined a number of cottonwood trees, exposed their root systems and compromising their stability (Figure 4). While recruitment of large wood to the river channel would benefit aquatic habitat, these are large trees that could accumulate at bridges and damage important infrastructure. Existing conditions for the Palisade #2 Ditch are shown in Appendix C-1.


**Figure 4.** Looking upstream at the Palisade #2 pushup dam, note the vegetated bank on river right and the exposed cottonwood roots on river left.

**Preliminary Designs**

*Piloni Ditch Design* — The proposed design for the Piloni diversion replaces the existing pushup dam with a boulder vane arm (Appendix A-2). To minimize floodplain impacts, the vane arm was set at the same elevations as the existing pushup dam. Based on historical photos and survey data, the vane arm was extended an additional 60 ft upstream to replicate the extent of the existing pushup dam prior to runoff. To provide additional stability at the terminus of the boulder vane arm, an optional boulder sill is shown on the proposed design layout. This sill would be set at the elevation of the existing stream bed and extend across the channel. The proposed structure may require maintenance following ice flows or floods, but can be repaired in the wet when flows are sufficiently low to accommodate equipment access.

Sediment issues at head gates and within irrigation ditches can increase maintenance needs for water users. Sediment sluice or bypass structures can be used to improve water and sediment management near head works. The head gate for the Piloni Ditch is constructed of landscape timbers that could be damaged during installation of a sediment sluice. Installing a new head gate and sediment sluice at the ditch inlet would improve water delivery and reduce sedimentation. Increasing culvert capacity within the irrigation ditch system would also improve water delivery. These design options should be evaluated by project stakeholders prior to developing the final design package.

*Wilson Ditch Design* — The objectives of the proposed design are to improve aquatic and riparian habitat by providing a stable water diversion structure that can deliver 15 cfs to the Wilson Ditch. Currently, there is not a water diversion structure at the inlet to the Wilson Ditch. The proposed design will use a boulder, cross-vane diversion structure (Figure 5; Rosgen, 2006) that will tied directly into the head works to divert flows into the Wilson Ditch. The elevation of two culvert inverts at the Wilson head gate structure were used inform design elevations for the cross-vane diversion structure. The invert of these culverts was surveyed at 7723.78 ft and the crest of the new cross-vane diversion structure was set 0.78 ft higher at 7724.50 ft. This design elevation should provide sufficient hydraulic head to deliver water to the Wilson head gate. Two steps were incorporated into the diversion structure design to provide additional grade control and to protect the upstream crest from scour. The vertical drop between each step was set to 1.0 ft. Proposed conditions for the Wilson Ditch are presented in Appendix B-2.

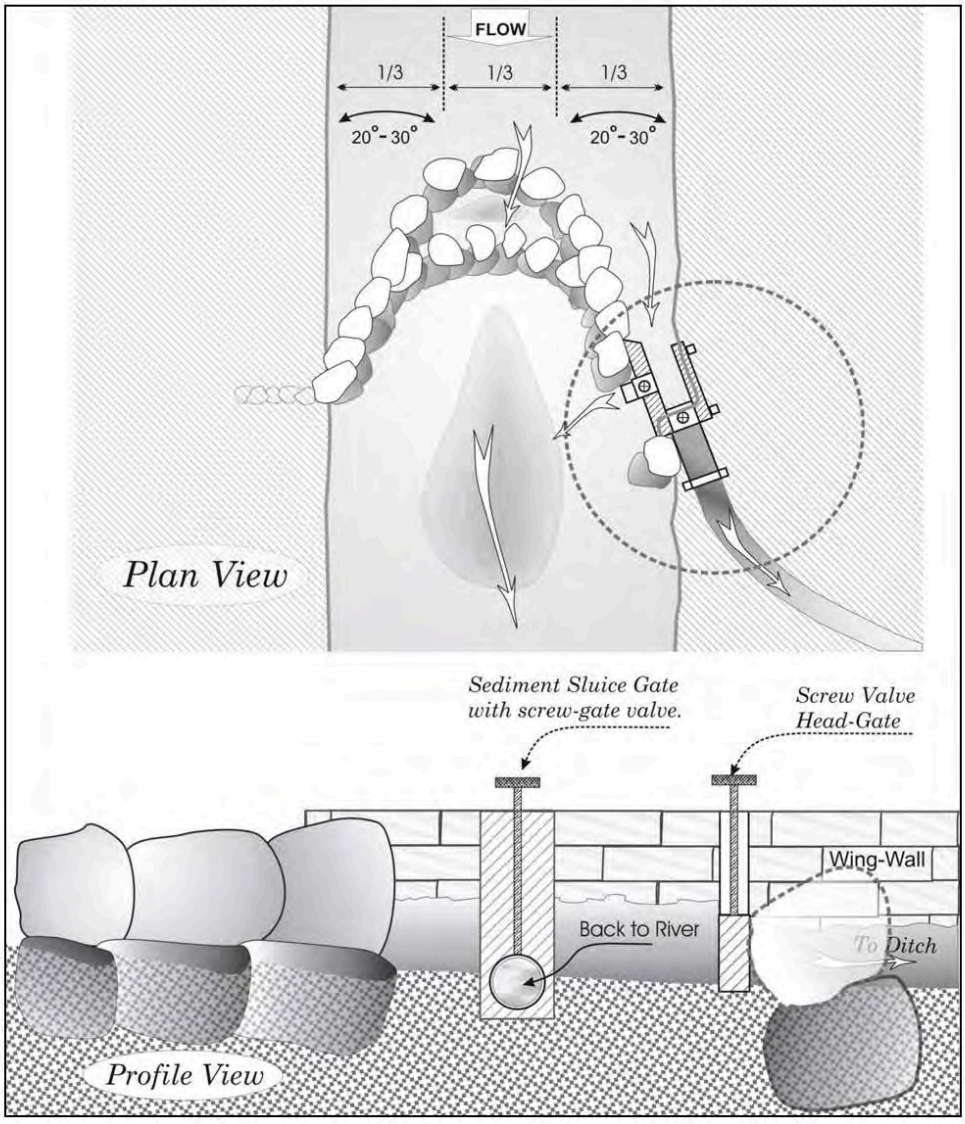



**Figure 5.** Example of a cross-vane diversion structure with irrigation head gate and sediment sluice (Rosgen, 2006).

Sedimentation at the ditch inlet, within the ditch itself, and at the head gate is a major issue at the Wilson Ditch under existing conditions. Relocating the ditch inlet to an area that is not prone to sedimentation should reduce issues with sediment aggradation. Furthermore, incorporating a sediment sluice into the head works should reduce maintenance needs and improve operations. Sediment that was previously excavated from the ditch will be graded into a multi-stage channel design that includes a low-flow channel, bankfull riparian bench, and terrace features. New streambanks will be stabilized with a boulder and cobble matrix and backfilled with native material. Willows, trees, and sod mats will be transplanted to riparian benches and terrace features to initiate revegetation, followed by seeding and planting with native riparian and upland species as specified on final construction documents. Concrete rubble previously used for bank stabilization will be removed from the left streambank downstream of the diversion structure. The new streambank will be stabilized with a combination of boulders and large wood that will also enhance aquatic habitat. The opposite point bar will be shaped to increase the radius of curvature around bend and reduce shear stress on the outside bank.

*Palisade #2 Ditch Design* — The existing pushup dam at the Palisade #2 diversion will be removed and replaced with a cross-vane diversion structure with a single step (Appendix C-2). The proposed design should reduce the need for maintenance, including re-construction of the pushup dam and removal of sediment from the ditch inlet. The crest of the cross-vane diversion structure was set at an elevation of 7696.90 ft, which is 0.5 ft higher than the invert of the culvert at the head gate (i.e., 7696.40 ft). The proposed structure should provide sufficient hydraulic head to deliver water the Palisade #2 Ditch. Bank erosion near the terminus of the existing pushup dam has undermined a number of cottonwood trees by exposing their root systems. Stabilizing the bank on river left would protect the cottonwoods from further erosion while improving channel morphology, sediment transport, and aquatic habitat. Bank stabilization around these cottonwood trees was not included in the preliminary design due to uncertainty regarding constructability and cost. The need for bank stabilization should be discussed with project stakeholders prior to developing the final design package.

**Hydraulic Modeling and Floodplain Analysis**

The 100-year flood is used to determine the regulatory floodplain in Colorado (CWCB, 2010). Any activity that increases the 100-year flood elevation in excess of 0.3 ft will require a LOMR. Existing and proposed conditions were modeled in HEC-RAS using the same cross-section locations, roughness values, and boundary conditions. This approach should determine if the proposed changes in channel morphology will impact the 100-year flood elevation. The preliminary designs presented in this report were developed with goal of minimizing floodplain impacts by limiting any rise in the 100-year flood to less than 0.3 ft, thereby preventing the need for a LOMR.

*Site Survey* — Existing conditions were surveyed with a Trimble GNSS surveying system to support assessment, design, and floodplain analysis. All survey data were corrected to the base station using an OPUS solution (Table 2) and checked against two NGS control points (i.e., JL0212 and JL0248). In some locations, floodplain elevations were supplemented with elevation data from a 30 meter Digital Elevation Model (DEM). All surveyed and supplemental points used to analyze existing conditions and inform

proposed conditions are shown in Appendices A-C. The initial site survey was conducted during April 2013. Additional surveys were conducted at the Piloni Ditch during April 2015 and at the Wilson Ditch and Palisade #2 Ditch during November 2015.

**Table 2.** NGS OPUS Solution for base point used to correct all survey data.

| Description | Latitude | Longitude | Elevation (ft) |
|---|---|---|---|
| Base Station | 38.564908 | -106.921515 | 7834.17 |

*Hydrologic Analysis* — Flows for hydraulic analysis were identified using discharge records for two gauging stations, USGS 09114500 Gunnison River Near Gunnison, CO and USGS 09113980 Ohio Creek Above Mouth Near Gunnison, CO. To estimate the stream flow that corresponds to the surveyed WSE at the Piloni and Wilson diversions, instantaneous discharge records from Ohio Creek were subtracted from the Gunnison River records and averaged over the times when surveying took place. Discharge records for the Gunnison River Near Gunnison, CO were used evaluate flows at the Palisade #2 diversion. Daily summary statistics for Gunnison River above Ohio Creek were analyzed for WY 1999-2015 to evaluate typical flow conditions at the Piloni and Wilson diversions and select design discharge values (Figure 6). Daily summary statistics for Gunnison River near Gunnison were analyzed for WY 1999-2015 to evaluate typical flow conditions and select design discharge values for the Palisade #2 diversion (Figure 7).

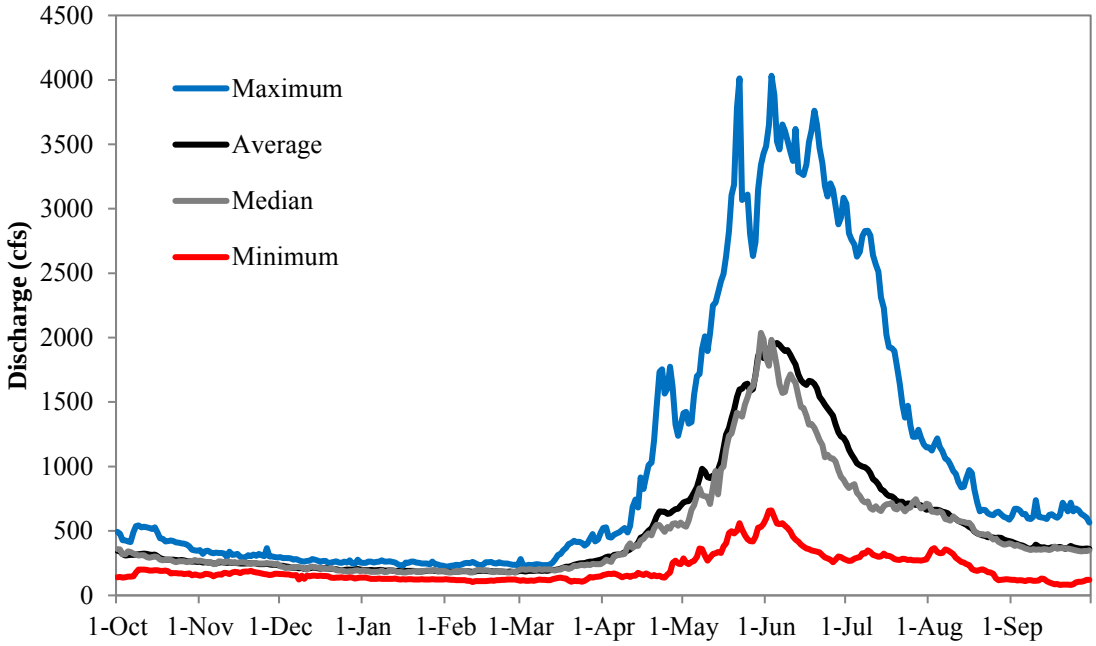



**Figure 6.** Average daily discharge statistics for Gunnison River above Ohio Creek, 1999-2015.

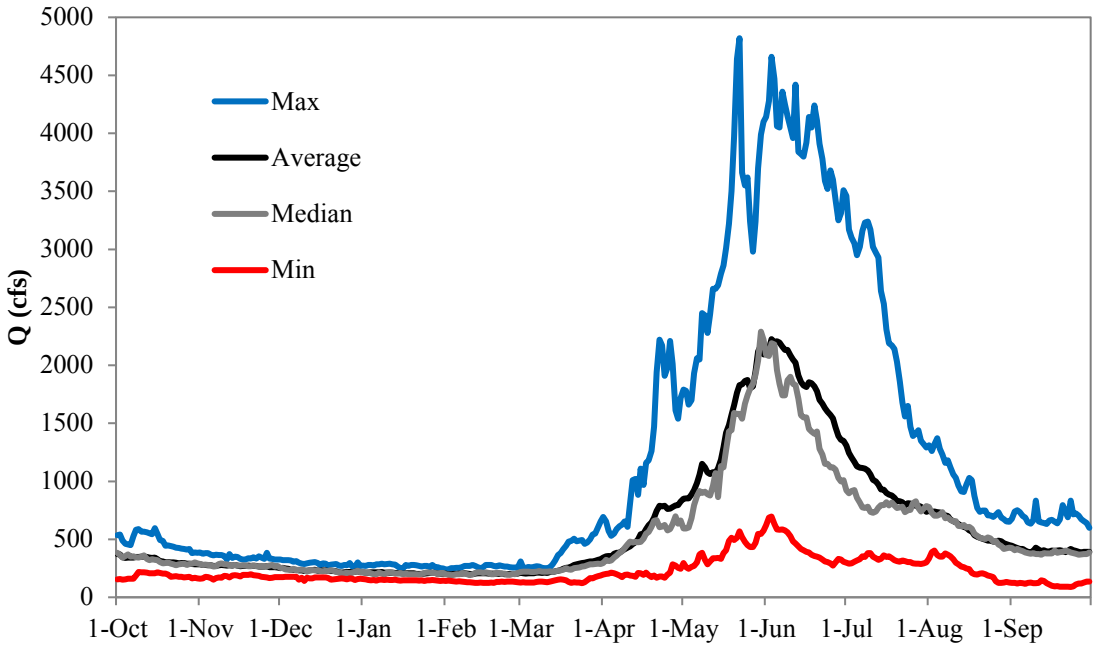



**Figure 7.** Average daily discharge statistics for Gunnison River near Gunnison, 1999-2015.

Peak flow statistics for the Gunnison gauge were obtained from the USGS StreamStats application. The Gunnison River gauge is located below Ohio Creek near the town of Gunnison. As the Piloni and Wilson ditches are located upstream of the Ohio Creek confluence, flow contributions from Ohio Creek were removed from peak flow estimates for the Gunnison gauge. To estimate flows for the reaches above Ohio Creek, peak flow data for Ohio Creek were subtracted from Gunnison River peak flow records for 1999-2014. These data were then used to develop a regression equation for estimating peak flows in the Gunnison River upstream of the Ohio Creek confluence. All flow profiles used to evaluate the proposed designs for the three diversion structures are presented in Table 3.

**Table 3**. Flow data (Q) used for the floodplain and design analysis at the Piloni, Wilson, and Palisade #2 diversion structures.

| Flow Profile | Piloni Q (cfs) | Wilson Q (cfs) | Palisade #2 Q (cfs) | Description and Data Source |
|---|---|---|---|---|
| Cal | 445 | 275 | 280 | Calibration flow; Instantaneous discharge records |
| Design1 | NA | 500 | 500 | Design flow; Average daily discharge records |
| Design2 | 1000 | 1000 | 1130 | Design flow; Average daily discharge records |
| Design3 | 2000 | 2000 | 2260 | Design flow; Average daily discharge records |
| Q2 | 3030 | 3030 | 3640 | 2-year flood; USGS StreamStats |
| Q5 | 4440 | 4440 | 5330 | 5-year flood; USGS StreamStats |
| Q100 | 8160 | 8160 | 9810 | 100-year flood; USGS StreamStats |

*Hydraulic Analysis* — Flood elevations for existing and proposed conditions were modeled using HEC-RAS (USACE, 2010). The locations of cross section lines used in model configuration are depicted in Appendices A-C. The primary objective of hydraulic analysis was to evaluate the floodplain impacts for

the 100-year flood. To calibrate the models for existing conditions, Manning's n was varied between 0.035-0.055 to minimize the difference between surveyed and observed water surface elevations (WSE) across all cross-sections. Model calibration resulted in Manning's n values that varied between 0.039 and 0.055 depending on the site and amount of flow in the river (Table 5). The values presented in Table 4 were applied for all in-channel areas, and are typical for mountain streams with steep banks and bed material consisting of gravel, cobbles, and a few boulders (Chow, 1959; USACE, 2010). Manning's n for all over-bank areas was assumed to be 0.075, which is representative of floodplains with heavy brush. As Manning's n is known to decreased as stage increases (Chow, 1959), USGS field measurements for the Gunnison River Near Gunnison stream gauge and topographic survey data were used to evaluate the change in Manning's n across a range of flows (Figure 8) and estimate in-channel n-values for each flow profile (Table 4). Known WSE surveyed at upstream and downstream cross-sections were used for boundary conditions during model calibration. Following calibration, all other flow profiles were modeled using normal depth with site-specific bed slopes for the downstream boundary conditions.

**Table 4.** In-channel Manning's n-values for each flow profile used in hydraulic analysis.

| Flow | Piloni Ditch | | Wilson Ditch | | Palisade #2 Ditch | |
|---|---|---|---|---|---|---|
| Profile | Q (cfs) | Manning's n | Q (cfs) | Manning's n | Q (cfs) | Manning's n |
| Cal | 445 | 0.039 | 275 | 0.047 | 280 | 0.055 |
| Design1 | NA | NA | 500 | 0.040 | 500 | 0.052 |
| Design2 | 1000 | 0.039 | 1000 | 0.040 | 1130 | 0.043 |
| Design3 | 2000 | 0.038 | 2000 | 0.039 | 2260 | 0.041 |
| Q2 | 3030 | 0.038 | 3030 | 0.038 | 3640 | |
| Q5 | 4440 | 0.037 | 4440 | 0.037 | 5330 | 0.037 |
| Q100 | 8160 | 0.035 | 8160 | 0.035 | 9810 | 0.035 |

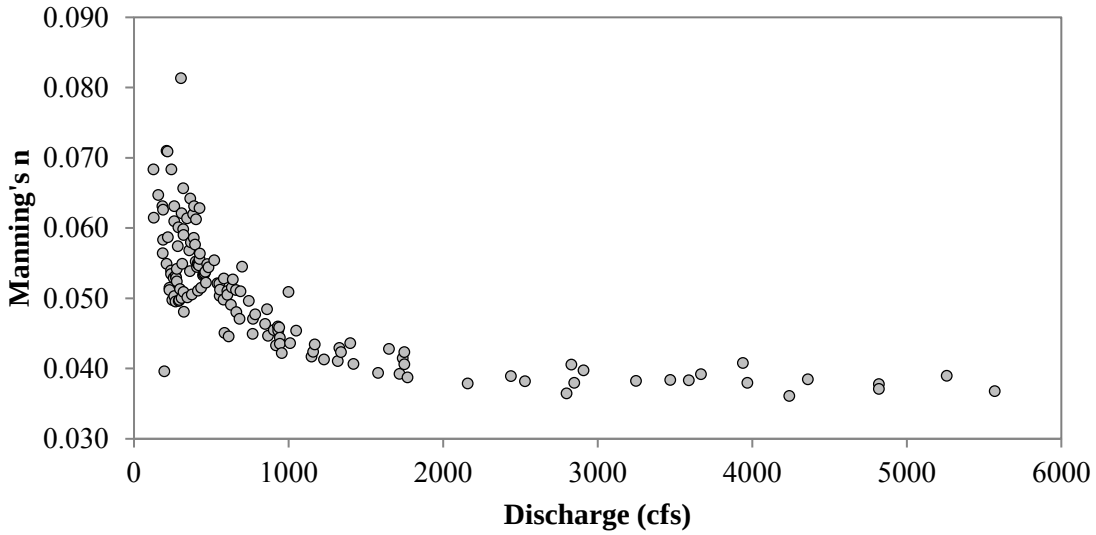



**Figure 8.** Manning's n values calculated from flow measurements at the USGS Gunnison River Near Gunnison, CO stream gauge.

*Floodplain Analysis Results* —Modeled WSE were compared between existing and proposed conditions to evaluate if the proposed designs will cause a rise in WSE for the 100-year flood. Results from the floodplain analysis for proposed designs are summarized in Table 6. The maximum change in water surface elevation (WSE) represents the maximum change in WSE at an individual cross section within a given reach. The average change in WSE describes the average change in WSE across all cross sections within a given reach, and provides a more general characterization of floodplain impacts for the reach in question. The maximum and average changes in water surface elevation for the 100-year flood at the Piloni Ditch were 0.01 ft and -0.01 ft, respectively (Table 5). This indicates the proposed design for the Piloni Ditch will not cause a rise. The maximum and average changes in water surface elevation (WSE) for the 100-year flood at the Wilson Ditch were 0.17 ft and -0.19 ft, respectively (Table 5). This indicates the proposed design for the Wilson Ditch will not cause a rise greater than 0.3 ft at any cross-section. The reach-average change in WSE indicates the proposed design for the Wilson Ditch will actually lower flood stage for the Wilson reach. These results indicate that a LOMR will not be required for the proposed design at the Wilson Ditch. The maximum and average changes in water surface elevation (WSE) for the 100-year flood at the Palisade #2 Ditch were 0.24 ft and 0.06 ft, respectively (Table 5). This indicates the proposed design for the Palisade #2 Ditch will not cause a rise greater than 0.3 ft at any cross-section. Based on these results, a LOMR will not be required for the proposed design at the Palisade #2 Ditch. Detailed graphic and tabular modeling results from floodplain analyses are presented in Appendices A-C.

**Table 5.** Results from floodplain analysis for each diversion structure showing the difference between modeled water surfaces for proposed and existing conditions across all cross-sections for the 100-year flood. WSE = Water Surface Elevation.

| Site | Return Interval (years) | Q (cfs) | Difference between Proposed and Existing WSE | | | |
|---|---|---|---|---|---|---|
| | | | Maximum (ft) | Average (ft) | Median (ft) | Minimum (ft) |
| Piloni Ditch | 100 | 8160 | 0.01 | -0.01 | 0.00 | -0.11 |
| Wilson Ditch | 100 | 8160 | 0.17 | -0.19 | -0.01 | -1.13 |
| Palisade #2 Ditch | 100 | 9810 | 0.24 | 0.06 | 0.01 | -0.07 |

**Diverted Flow Analysis**

HEC-RAS models were not configured to evaluate split-flow conditions into the irrigation ditches because the primary objective of hydraulic modeling was to evaluate the impact of proposed activities on the regulatory floodplain. However, the resultant WSE are indicative of the hydraulic head available in the vicinity of the head gate structure and were used to estimate potential flows into the irrigation ditches. It should be noted that the WSE estimated through hydraulic analysis are conservative. The standard-step backwater procedure works from downstream to upstream and fails to capture the true nature of split-flow conditions at the crest of the existing or proposed diversion structures. The influence of split-flow becomes less pronounced as flow increases and the diversion structures are submerged. Low flow conditions would be more accurately represented with split-flow or two-dimensional models. For low flows when the structures are not fully submerged, the modeled WSE will underestimate hydraulic head in the vicinity of the head gates.

*Diverted Flow Analysis for the Piloni Ditch* — To evaluate flows into the Piloni Ditch, modeled WSE at cross section 371.8 were compared to the invert elevation of existing Piloni head gate (i.e., 7752.5 ft). As the proposed design did not alter channel morphology at or below cross section 371.8, there was no difference in modeled WSE between the existing and proposed conditions at or below cross section 371.8. This issue highlights a limitation of the standard-step backwater approach used in HEC-RAS. For this analysis, flows into the Piloni Ditch were calculated with the assumption that the existing head gate structure would be replaced. The following specifications were used for the proposed head gate design: bottom width = 5.0 ft, side slopes = 0.0 H/V, Manning's n = 0.015, and a bottom slope = 0.001. Diverted flow estimates for the Piloni Ditch show that the ability to divert the full decree should occur around flows at and above 2000 cfs (Table 6). To help place modeling results into context, the surveyed water surface elevation corresponding to 445 cfs was also included in analysis of hydraulic head at the Piloni head gate. The proposed design should provide WSE at the Piloni head gate similar to or higher than existing conditions. Furthermore, replacing the existing head gate with a new concrete structure would improve flows into the ditch while reducing maintenance needs.

**Table 6.** Diverted flow estimates into the Piloni Ditch. WSE = Water Surface Elevation

| Data Source | Cross Section | Discharge (cfs) | WSE (ft) | Hydraulic Head (ft) | Diverted Flow (cfs) |
|---|---|---|---|---|---|
| Survey | 371.8 | 445 | 7753.82 | 1.32 | 18.8 |
| HEC-RAS | 371.8 | 445 | 7752.56 | 0.06 | 0.14 |
| HEC-RAS | 371.8 | 1000 | 7753.65 | 1.15 | 15.4 |
| HEC-RAS | 371.8 | 2000 | 7754.97 | 2.47 | 44.7 |
| HEC-RAS | 371.8 | 3030 | 7756.04 | 3.54 | 71.5 |
| HEC-RAS | 371.8 | 4440 | 7757.18 | 4.68 | 101 |
| HEC-RAS | 371.8 | 8160 | 7759.36 | 6.86 | 161 |

*Diverted Flow Analysis for the Wilson Ditch* — To evaluate flows into the Wilson Ditch, modeled WSE at cross section 357.5 were compared to the invert elevation of the existing Wilson head gate (i.e., 7723.78 ft). The City of Gunnison provided design criteria illustrating the WSE needed at the Wilson head gate to achieve the design discharge of 15 cfs into the Wilson Ditch (Figure 9). Based on these criteria, 1.8 ft of water depth is needed above the invert of Wilson head gate to achieve 15 cfs of discharge into the Wilson Ditch. As previously mentioned, modeled WSE will underestimate actual WSE near the head gate during low flows when the diversion structure is not fully submerged. Given this limitation, flow estimates into the Wilson Ditch are not assumed to represent actual conditions. Regardless, modeling results indicate there should be sufficient head to divert 15 cfs when flow in the Gunnison River is somewhere between 1000-2000 cfs (Table 7). In actuality, more water will be delivered to the Wilson Ditch head gate at low flows (e.g., <1000 cfs) than is indicated in Table 7 because the crest of the new diversion structure will be set 0.72 ft above the invert of the head gate culverts. For example, modeling results suggest there will be little to no water at the head gate when flows are 500 cfs in the Gunnison River. However, the proposed structure should be able to deliver some flow to the Wilson Ditch when the river is flowing 500 cfs. The model simply fails to capture the true nature of split-flow conditions created by the proposed structure. Therefore, the proposed design should deliver 15 cfs to the Wilson Ditch at flows lower than those indicated in Table 7.

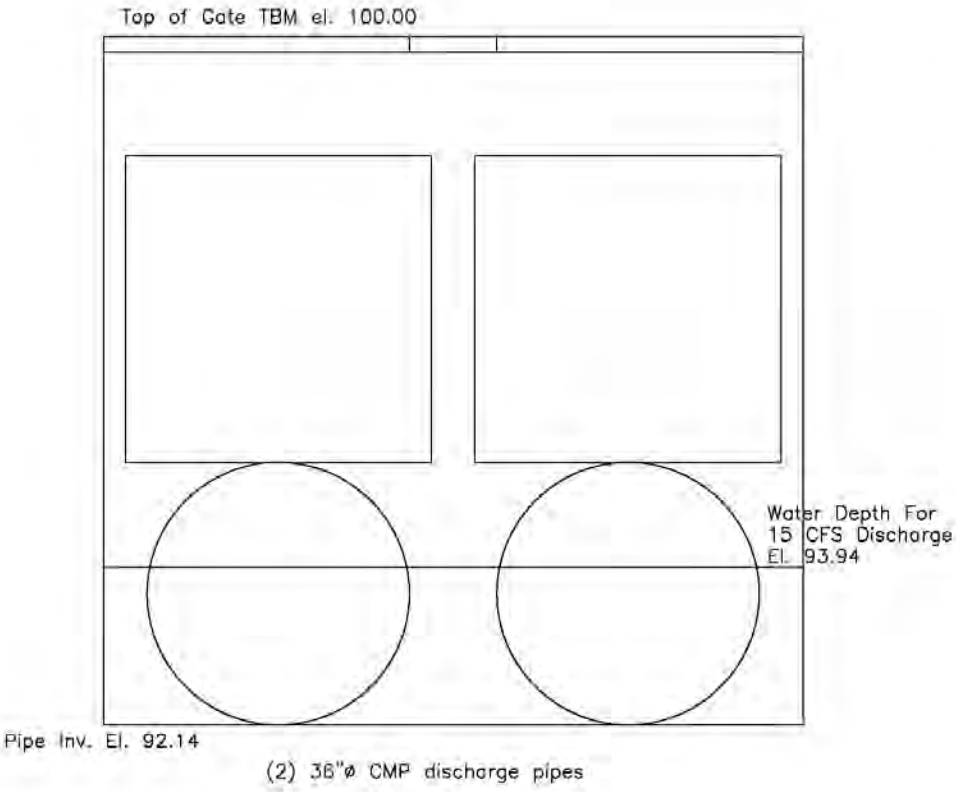



**Figure 9.** Wilson Ditch head gate schematic used to evaluate flows into the Wilson Ditch (not to scale).

**Table 7.** Diverted flow estimates into the Wilson Ditch. Hydraulic head needs to be greater than 1.80 ft to achieve 15 cfs of diverted flow. WSE = Water Surface Elevation.

| Flow Profile | Cross Section | Discharge (cfs) | WSE (ft) | Hydraulic Head (ft) | Diverted Flow ≥ 15 cfs |
|---|---|---|---|---|---|
| Cal | 357.5 | 275 | 7723.40 | 0.00 | No |
| Design1 | 357.5 | 500 | 7723.79 | 0.01 | No |
| Design2 | 357.5 | 1000 | 7724.80 | 1.02 | No |
| Design3 | 357.5 | 2000 | 7726.30 | 2.52 | Yes |
| Q2 | 357.5 | 3030 | 7726.94 | 3.16 | Yes |
| Q5 | 357.5 | 4440 | 7727.14 | 3.36 | Yes |
| Q100 | 357.5 | 8160 | 7727.72 | 3.94 | Yes |

*Diverted Flow Analysis for the Palisade #2 Ditch* — The proposed design for the Palisade #2 diversion structure should deliver the full decreed water right of 5 cfs to the Palisade Ditch. However, the model configuration used to evaluate floodplain impacts is inadequate for evaluating flows into the Palisade #2 Ditch. Limitations associated with 1-D hydraulic modeling were previously discussed and apply to the Palisade #2 Ditch. Regardless, diverted flows into the Palisade #2 Ditch were evaluated by using WSE at cross section 323.7, which is directly upstream of the ditch inlet. Hydraulic head at the ditch inlet was calculated by comparing modeled WSE to the invert of the ditch (i.e., 7697.0 ft). Flows into the Palisade #2 Ditch were then estimated using Manning's equation for a trapezoidal channel with the following

assumptions: bottom width = 7.8 ft, side slopes = 1.0 H/V, Manning's n = 0.025, and slope = 0.001. The selected slope of 0.001 was based on the assumption that deposited sediment below the ditch inlet will be excavated to optimize flows into the ditch.

To help place modeling results into context, the surveyed WSE corresponding to 280 cfs was also included in analysis of hydraulic head at the ditch inlet. Estimated flows into the Palisade #2 Ditch are presented in Table 8. Modeled WSE will underestimate water depths at the ditch inlet during low flows, as previously discussed. As the crest of proposed cross-vane diversion structure is set 0.5 ft higher than the ditch head gate, the proposed design should provide WSE at the ditch inlet that are similar to or higher than existing conditions. During the November 2015 survey, water was not flowing into the ditch due to sedimentation below the ditch inlet. However, diverted flow estimates suggest that water would have been flowing into the ditch if the area of sediment accumulation below the ditch inlet was excavated. This evidence suggests that the diverted flow estimates for 280-1130 cfs should be greater than 0 cfs, and that the 1-D hydraulic model fails to capture the true nature of split-flow conditions created by the water diversion structure during lower flows. Higher flow estimates suggest that there will be sufficient head to divert the full decree of 5 cfs when river flows are between 1130-2260 cfs (Table 8). In reality, the full decree should be diverted at flows lower than 1130 cfs. More detailed analyses with a split-flow or 2-D hydraulic model would be needed to improve diverted flow estimates. Estimates for diverted flow at higher discharges (e.g., 5330 cfs) suggest that substantial amounts of water could be diverted into the Palisade #2 Ditch during floods, which highlight the need for a sediment sluice near the head works to return sediment and excess water to the river during floods.

**Table 8.** Diverted flow estimates into the Palisade #2 Ditch. WSE = Water Surface Elevation

| Data Source | Cross Section | Discharge (cfs) | WSE (ft) | Hydraulic Head (ft) | Diverted Flow (cfs) |
|---|---|---|---|---|---|
| Survey | 323.7 | 280 | 7697.48 | 0.48 | 4.3 |
| HEC-RAS | 323.7 | 280 | 7695.33 | 0.00 | 0.0 |
| HEC-RAS | 323.7 | 500 | 7695.80 | 0.00 | 0.0 |
| HEC-RAS | 323.7 | 1130 | 7696.59 | 0.00 | 0.0 |
| HEC-RAS | 323.7 | 2260 | 7697.83 | 0.83 | 10.7 |
| HEC-RAS | 323.7 | 3640 | 7699.01 | 2.01 | 47.7 |
| HEC-RAS | 323.7 | 5330 | 7699.87 | 2.87 | 89.0 |
| HEC-RAS | 323.7 | 9810 | 7701.17 | 4.17 | 175 |

**Conclusions**

The proposed designs for the Piloni Ditch, Wilson Ditch, and Palisade #2 Ditch should be able to the deliver the full decreed water right to each ditch. In addition, the proposed designs will reduce the need for maintenance while improving channel stability, riparian conditions, and aquatic habitat. None of the proposed designs caused a rise in excess of 0.3 ft for the 100-year flood, indicating that a LOMR will not be needed for the project in accordance with CWCB rules and regulations (CWCB, 2010).

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COLORADO
Parks and Wildlife
Department of Natural Resources

Southwest Region
415 Turner Drive
Durango, CO 81303
P 970-375-6710| F 970-375-6705

Mr. Steve Westbay
Director of Community Development, City of Gunnison
201 W. Virginia Avenue
Gunnison, CO 81230

July 18, 2017

Mr. Westbay,

CPW (Dan Brauch and Nathan Seward) reviewed the application and grants SB-40 Wildlife Certification for the City of Gunnison regarding the GUNNISON RIVER RIPARIAN AND DIVERSION RESTORATION PROJECT. Given compliance with the recommendations in this letter, the proposed bank stabilization and channel modification project will not create significant impacts to wildlife.

This project is proposed to be constructed during the brown trout egg incubation time period. Release of silt may impact brown trout eggs within and for a short distance downstream of the project area. In the case of this section of the Gunnison River, CPW work during this time of the year (mid-October-December) is preferable due to the potential to significantly impact migrating kokanee salmon (during the August-mid-October) and during to higher flows (May-July) which may limit access. We also expect that impacts to the brown trout population are less significant due to high brown trout reproduction within this reach of the Gunnison River.

Gunnison Sage Grouse habitat occurs within the project area on the west bank of the river between river mile 1.4 and 2.0 (measured in miles downstream from Hwy 135 "North" Bridge). Lek and brood-rearing activity do not occur within 0.6 miles of the project area. Gunnison sage grouse are listed as a threatened species under the Federal Endangered Species Act. For further information on this topic we recommend contacting the U.S. Fish and Wildlife Service.

Access to treatment sites will require travel through riparian areas. It is recommended that transport of materials and equipment is completed in a way that minimizes impacts to riparian vegetation and that disturbed areas are fully restored after construction is completed.

In order to prevent the spread of aquatic nuisance species, all equipment must be thoroughly cleaned using 140°F water to remove all visible mud, plants and other organisms prior to entering the waterway.

Sincerely,

Patricia D. Dorsey
Southwest Region Manager

Hand delivered
7-19-17

xc: Wenum, Alves, Brauch, Seward

Bob D. Broscheid, Director, Colorado Parks and Wildlife • Parks and Wildlife Commission: Robert W. Bray • Jeanne Horne
John Howard, Vice-Chair • Dale Pizel • James Pribyl, Chair • James Vigil • Dean Wingfield • Michelle Zimmerman, Secretary • Alex Zipp

# Gunnison Project Progress Report (1)

**Date(s):** 11/13/2017-11/17/2017

## Contract Personnel:

**Policky Aquatics, LLC**

Hours - 44.5 (also 28.5 hours worked prior to construction for meetings, site visits, administration).

Work Performed - Over-site including elevation surveying for landscaping at Wilson Diversion; flagging boulder garden and rock cluster locations and quantifying rock needs from the railroad bridge crossing downstream to the Wilson Diversion; quantifying material needs for Wilson Diversion area (rock, sod mats, willow transplants); identified vegetation transplant locations; future construction needs, scheduling and sequencing performed; monitored rock delivery; Change Order input for Wilson Diversion area, Ohio Creek J-Hook, Eroded Bank site just upstream of Wilson.

**Spallone Construction**

Approximate Heavy Equipment Hours – 41.5 track hoe and dozer (primarily Vern but Randy and Nicki helped some).

Work Performed – fill old diversion channel with historic dredged material and landscaping, grade control, willow transplants on new river right bank at Wilson Diversion.

## Materials Delivered:

Rock - 11/15/2017 - 129.86 ton. 11/16/2017 unknown at this time (will include in next report).

Vegetation - Willow Transplants – 27; cottonwood trees – 4.

## Additional Information:

Track hoe delivered morning of 11/15/2017 but battery issue had to be fixed before operational at 2:30 pm. Bucket thumb issue (doesn't maintain pressure when release thumb button) was not resolved before the end of the week. Voiced concern to Nick that this issue needed to be fixed before rock work begins next week.

**Photographs:**


# Gunnison Project Progress Report (2)

Prepared By: Greg Policky

**Date(s):** 11/20/2017-12/1/2017

## Contract Personnel:

**Policky Aquatics, LLC**

Work Performed - Over-site and on-site direction for all work performed by Spallone Construction (see below). Also attended Change Order meeting; elevation/grade surveying; flagging/lathing and planning for upcoming project pieces; sod mat and willow transplant instruction; monitored rock delivery and staging; future construction needs, scheduling and sequencing performed.

**Spallone Construction**

Work Performed – Considerable work completed at Wilson Diversion project location. Completed river left boulder toe above diversion head gate including two rock sills and upstream bank tie-in; constructed rock sill/grade control in river right side channel above diversion; cross vanes completed to west third of river including bank tie-in for upper two; upstream cross vane completed and most of second one; river right downstream point bar pulled back; removed concrete rubble from river left bank and used along with cobble to construct coffer dam below diversion for future work on river left bank (boulder and wood toes); switched upstream coffer dam to flip river to east side so cross vane construction could be completed; sod mat transplants completed on river left boulder toe and river right sill/grade control area.

## Materials Used:

Rock – Spallone Construction tracking deliveries to staging areas from which amount used can be later calculated.

Vegetation – Sod Mats – 1891 sq ft planted as of 12/1/2017.

## Additional Information:

**Photographs:**


# Gunnison Project Progress Report (3)

Prepared By: Greg Policky

**Date(s):** 12/4/2017-12/20/2017

## Contract Personnel:

**Policky Aquatics, LLC**

Work Performed - Over-site and on-site direction for all work performed by Spallone Construction (see below). Assessed and adjusted wood toe material needs; elevation/grade surveying; flagging/lathing and planning for upcoming project pieces; monitored rock and materials delivery and staging; future construction needs, scheduling and sequencing performed.

**Spallone Construction**

Work Performed – Considerable work completed during this period. River cross vanes completed in entirety; graded riffle slope through cross vane area; completed river right cobble toe and sod/willow transplants; completed river left boulder toe below Wilson Diversion; coffer dam manipulation and dirt removal; pumped out diversion area so concrete work could begin. Completed Ohio Creek J-Hook, boulder clusters (23 rocks) and point bar grading at large rock hazard location; completed bank erosion area rock vane (60 ft), bank fill (1670 sq ft), sod/willow transplants (650 sq ft), and tried to pull back opposite point bar (frozen – will have to complete Spring 2018) above Wilson Diversion. Completed all work for wood toe/sod mat area just below Wilson Diversion (used seven cottonwood trees – 2 harvested , 5 already down and several aspen Spallone delivered) to complete; sod mats frozen so monitor survival next Spring. Completed entire boulder cluster install just upstream of the eroded bank site (126 total). Finished 'yellow' area grading at Wilson Diversion. Nearly finished boulder vane and boulder toe tie in to headgate and sluice structures at Wilson Diversion.

## Materials Used:

Rock – Spallone Construction tracking deliveries to staging areas from which amount used can be later calculated. See above for rock used to date at the boulder cluster locations.

Dirt Fill from Wilson site – 1670 sq ft just upstream at the Eroded Bank site. More fill will be added in old ditch after new ditch is aligned.

Vegetation – Sod Mats – 1310 sq ft planted on river right cobble toe above Wilson Diversion; two sod mats planted at Ohio Cr J-Hook (~64 sq ft); bank erosion area (650 sq ft). Used 24 spruce trees, seven cottonwood, and ~five aspen; 1620 cubic ft (60 cubic yds) of spruce slash and 2125 sq ft of sod mats in the wood toe.

**Photographs:**

# Gunnison Project Progress Report (4)

Prepared By: Greg Policky

**Date(s):** 12/21/2017-1/10/2018

## Contract Personnel:

**Policky Aquatics, LLC**

Work Performed - Over-site and on-site direction for all work performed by Spallone Construction (see below). Elevation/grade surveying; flagging/lathing and planning for upcoming project pieces; monitored rock and materials delivery and staging; future construction needs, scheduling and sequencing performed.

**Spallone Construction**

Work Performed – Completed Wilson headgate and sluice boulder tie-ins, wood toe pool excavation and grading, opposite point bar pull back/grading and channel widening; completed boulder garden structures just below old railroad bridge using a total of 250 rocks at three locations (69 lower, 94 middle, and 87 upper); began Piloni Diversion work including river right boulder vane, mid channel arch, and river left boulder vane to old cobble arm. Suspended work for the season at this point due to extreme freezing and inability to excavate cobble material for new boulder vane.

## Materials Used:

Rock – Spallone Construction tracking deliveries to staging areas from which amount used can be later calculated. See above for rock used at the boulder garden locations.

**Photographs:**


DEERE

# Gunnison Project Progress Report (5)

Prepared By: Greg Policky

**Date(s):** 3/26/2018-4/4/2018

## Contract Personnel:

**Policky Aquatics, LLC**

Work Performed - Over-site and on-site direction for work performed by Spallone Construction (see below). Elevation/grade surveying; flagging/lathing and planning for upcoming project pieces; monitored rock and materials delivery and staging; future construction needs, scheduling and sequencing performed.

**Spallone Construction**

Work Performed – Completed Piloni Diversion rock vane to headgate tie-in (Spallone installed slide gates on diversion and sluice box walls) and sluice outlet construction to river; completed boulder cluster area adjacent to Piloni Diversion using a total of 62 rocks; sod mat transplants at rock vane below Wilson Diversion (frozen mats that fragmented easily - assess viability fall 2018)and filled in donor transplant areas, pulled back opposite point par to attain proper channel width and river function; pulled back point bar opposite the eroded bank area to achieve proper channel width and river function; re-routed ditch in the eroded bank area to further protect river bank; removed two access points across irrigation diversion ditch near Wilson Diversion. Seeding at Wilson Diversion area to be completed in the future with volunteer assistance from Trout Unlimited and direction from CPW. Spallone installed sluice box slide gate at Wilson Diversion and new slide gate installed on diversion wall. Fence reconstructed at Wilson site and new culvert installed in ditch at main Wilson diversion access point.

## Materials Used:

Rock – Spallone Construction tracking deliveries to staging areas from which amount used can be later calculated. See above for rock used at the Piloni boulder cluster location.

My contractual obligations should be met for this project with this report. I will submit a final payment invoice.

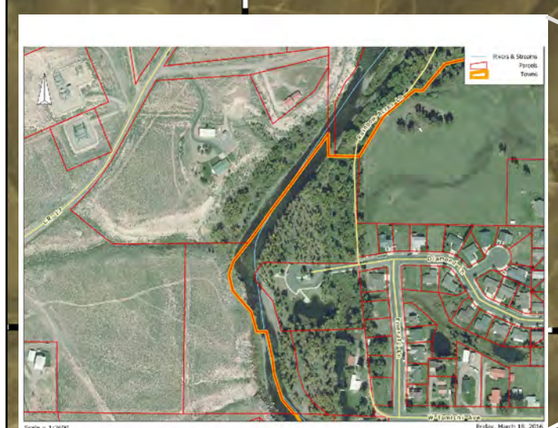
**Photographs:**


DEERE

# *Gunnison River Restoration Project Map*
## *T50N, R1W, NMPM*

Gunnison River State Wildlife Area
BOR Quite Claim Deed to Colo Park & Wildlife

21 22 23 24 19
28 27 26 25 30
33 34 35 31
03 02 01 06



EXISTING
BOR Property

**Legend**

- Gunnison SWA
- sections
- quarter_sections

**Project**

**Segments**

- Segment 1
- Segment 2
- Segment 3
- Segment 4
- Segment 5
- Segment 6
- VanTuyl Ranch
- City Boundary

N

0 600 1,200 2,400 3,600 4,800
Feet

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

ACTUAL BUDGET

| Task | Description | Start Date | Finish Date | Measure | Quantity | Unit Price | Other Direct Cost | WSRA Funds | City | GOCO | TU | Goddard | City & CPW In-Kind | Total Costs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | |
| **TASK 1 and 2 - DESIGN & PERMITTING** | | | | | | | | | | | | | | |
| 1 | Complete Survey & Geomorphic Assessment | 10/1/2014 | 11/2/2015 | $/Hours | 584.00 | $60.00 | $0.00 | | | | | | $35,040.00 | $35,040.00 |
| 1 | Complete Project Permitting (ACOE & FWS) | 10/1/2014 | 3/15/2017 | $/Hours | 471.00 | $54.00 | | | | | | | $25,434.00 | $25,434.00 |
| 1 | Permit Consulting Work Wetland & Cult. Inven | 5/1/2015 | 12/30/2016 | Lump Sum | From Old Contract | | $9,703.00 | $5,703.00 | $4,000.00 | | | | | $9,703.00 |
| 2 | Develop Final Design | 11/2/20115 | 2/15/2017 | $/Hours | 1200.00 | $60.00 | $0.00 | | | | | | $63,952.00 | $63,952.00 |
| | | | | | Design & Permitting subtotal | | $9,703.00 | $5,703.00 | $4,000.00 | | | | $124,426.00 | $134,129.00 |
| | | | | | | | | | | | | | | |
| **TASK 3 and 4** | | | | | | | | | | | | | | |
| 3 | Complete Phase 1 Bid, Contract | 9/1/2016 | 11/30/2019 | $/Hours | 400.00 | $54.00 | | $0.00 | | | | | $21,600.00 | $21,600.00 |
| 3 | Construction Oversight - Policky Aquatics, LLC | 8/22/2017 | 4/4/2018 | Lump Sum | | | $25,000.00 | $25,000.00 | | | | | | $25,000.00 |
| 3 | Engineering / Change Orders | 9/1/2017 | 10/30/2017 | Lump Sum | | | $3,383.00 | $3,383.00 | | | | | | $3,383.00 |
| 4 | Perform Mobilization (Transport, Overhead, etc.) | 5/1/2017 | 1/30/2019 | Lump Sum | | | $34,550.00 | $34,550.00 | | | | | | $34,550.00 |
| | | | | | Task 3 and 4 subtotal | | $62,933.00 | $62,933.00 | | | | | $21,600.00 | $84,533.00 |
| | | | | | | | | | | | | | | |
| **TASK 5 - PILONI** | | | | | | | | | | | | | | |
| 5 | Piloni Ditch Access Improvements | 8/1/2014 | 10/1/2014 | Lump Sum | 1.00 | $16,593.60 | $593.60 | $593.60 | | | | | $16,000.00 | $16,593.60 |
| 5 | Piloni Ditch Remove Pushup Dam | 2/1/2017 | 11/30/2019 | Lineal Ft | 250.00 | $20.00 | $5,000.00 | $5,000.00 | | | | | | $5,000.00 |
| 5 | Piloni Ditch Rock Cross Vane | 2/1/2017 | 11/30/2019 | Lineal Ft | 215.00 | $80.00 | $17,200.00 | $17,200.00 | | | | | | $17,200.00 |
| 5 | Piloni Ditch Rock Diversion Vane | 2/1/2017 | 11/30/2019 | Lineal Ft | 536.46 | $65.00 | $34,869.90 | $34,869.90 | | | | | | $34,869.90 |
| 5 | Piloni Ditch Slide Gate and Flume | 2/1/2017 | 11/30/2019 | Each | 1.00 | $9,596.00 | $9,596.00 | $9,596.00 | | | | | | $9,596.00 |
| 5 | Piloni Concrete Diversion Structure | 2/1/2017 | 11/30/2019 | Each | 1.00 | $6,875.00 | $6,875.00 | $6,875.00 | | | | | | $6,875.00 |
| 5 | Segment 1 Willow Transplant | 2/1/2017 | 11/30/2019 | Each | 20.00 | $5.75 | $115.00 | $115.00 | | | | | | $115.00 |
| 5 | Segment 1 Boulder Cluster | 2/1/2017 | 11/30/2019 | Each | 64.00 | $275.00 | $17,600.00 | $17,600.00 | | | | | | $17,600.00 |
| 5 | Streamflow Guaging Station | 1/9/2017 | | Each | 1.00 | $16,000.00 | $16,000.00 | $16,000.00 | | | | | | $16,000.00 |
| | | | | | Piloni subtotal | | $107,849.50 | $107,849.50 | | | | | $16,000.00 | $123,849.50 |
| | | | | | | | | | | | | | | |
| **TASK 5 - WILSON** | | | | | | | | | | | | | | |
| 5 | Wilson Diversion Remove Rubble | 2/1/2017 | 11/30/2020 | Square Feet | 2500.00 | $2.00 | $5,000.00 | $5,000.00 | | | | | | $5,000.00 |
| 5 | Wilson Diversion Point Bar Development | 2/1/2017 | 11/30/2019 | Square Feet | 3500.00 | $2.75 | $9,625.00 | $9,625.00 | | | | | | $9,625.00 |
| 5 | Wilson Diversion Rock Cross Vane | 2/1/2017 | 11/30/2019 | Lineal Ft | 1071.00 | $82.00 | $87,822.00 | $87,822.00 | | | | | | $87,822.00 |
| 5 | Wilson Diversion Cobble Bank Toe Protection | 2/1/2017 | 11/30/2019 | Lineal Ft | 635.00 | $34.00 | $21,590.00 | $21,590.00 | | | | | | $21,590.00 |
| 5 | Wilson Diversion Sod Mat Transplant | 2/1/2017 | 11/30/2019 | Square Feet | 1150.00 | $4.50 | $5,175.00 | $5,175.00 | | | | | | $5,175.00 |
| 5 | Wilson Diversion Cobble Channel Narrowing | 2/1/2017 | 11/30/2019 | Square Feet | 1800.00 | $7.00 | $12,600.00 | $12,600.00 | | | | | | $12,600.00 |
| 5 | Wilson Diversion Slide Gate (2) and Flume | 2/1/2017 | 11/30/2019 | Each | 1.00 | $12,385.00 | $12,385.00 | $12,385.00 | | | | | | $12,385.00 |
| 5 | Wilson Diversion Concrete Diversion Structure | 2/1/2017 | 11/30/2019 | Each | 1.00 | $12,000.00 | $12,000.00 | $12,000.00 | | | | | | $12,000.00 |
| 5 | Wilson Diversion Earthwork (±5,100 cubic yards) | 2/1/2017 | 11/30/2019 | Lump Sum | 1.00 | $41,905.00 | $41,905.00 | $41,905.00 | | | | | | $41,905.00 |
| 5 | Segment 2 & 3 Willow Transplant | 2/1/2017 | 11/30/2019 | Each | 156.00 | $5.75 | $897.00 | $897.00 | | | | | | $897.00 |
| 5 | Segment 2 & 3 Boulder Cluster | 2/1/2017 | 11/30/2019 | Each | 126.00 | $275.00 | $34,650.00 | $33,030.00 | | | $1,620.00 | | | $34,650.00 |
| 5 | Segment 2 & 3 Rock J-Hook w/ Sill | 2/1/2017 | 11/30/2019 | Each | 1.00 | $8,500.00 | $8,500.00 | $8,500.00 | | | | | | $8,500.00 |
| 5 | Segment 2 & 3 Boulder Point Bar | 2/1/2017 | 11/30/2019 | Each | 1.00 | $14,130.25 | $14,130.25 | $14,130.25 | | | | | | $14,130.25 |
| 5 | Segment 2 & 3 Wood Toe | 2/1/2017 | 11/30/2019 | Lineal Ft | 478.00 | $18.00 | $8,604.00 | $8,604.00 | | | | | | $8,604.00 |
| | | | | | Wilson subtotal | | $274,883.25 | $273,263.25 | | | $1,620.00 | | | $274,883.25 |
| | | | | | | | | | | | | | | |
| **TASK 5 - TRAIL ACCESS** | | | | | | | | | | | | | | |
| 5 | Public Access Trail | 3/1/2017 | 11/30/2017 | | Trail Const Subtotal | | $237,459.00 | | $65,734.00 | $171,725.00 | | | | $237,459.00 |
| | | | | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | | | | $0.00 |
| | | | | | **Total** | | **$445,665.75** | **$444,045.75** | **$69,734.00** | **$171,725.00** | **$1,620.00** | **$0.00** | **$140,426.00** | $827,550.75 |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |