

RECLAMATION

Managing Water in the West

Environmental Assessment

Paonia Dam Intake Structure Repair

Western Colorado Area Office

Upper Colorado Region

WCAO-GJ-EA-2016-03



October 2016

Mission Statements

The mission of the Department of the Interior is to protect and manage the Nation's natural resources and cultural heritage; provide scientific and other information about those resources; and honor its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

FINDING OF NO SIGNIFICANT IMPACT
WESTERN COLORADO AREA OFFICE

WCAO-GJ-FONSI-16-03

Decision: It is the decision of the Area Manager of the Bureau of Reclamation's Western Colorado Area Office to authorize the proposed action identified in Environmental Assessment NO. WCAO-GJ-EA-2016-03.

Finding of No Significant Impact: Based on the analysis of potential environmental impacts contained in the attached environmental assessment, the Area Manager has determined that impacts are not expected to be significant and an environmental impact statement is not required.

Rationale for Decision: The decision to allow the proposed action does not result in any undue or unnecessary environmental degradation.

Recommended by:



Lesley McWhirter
Chief, Environmental and Planning Group

10-17-16

Date

Concur:




Brent Uilenberg
Chief, Technical Services Division

10-17-2016

Date

Approved by:



Ed Warner
Area Manager, Western Colorado Area Office

10-17-16

Date

Introduction

In compliance with the National Environmental Policy Act of 1969, as amended (NEPA), the Bureau of Reclamation (Reclamation) has conducted an environmental assessment (EA) for a proposed action of authorizing the use of Federal funds to repair and stabilize the intake structure at Paonia Dam. Reclamation is providing partial funding for the project, which is located on a federal facility, and is therefore the lead agency for the purposes of compliance with the NEPA for this proposed action.

The EA was prepared by Reclamation to address the potential impacts to the human environment due to implementation of the proposed action.

Alternatives

The EA analyzed the No Action Alternative and the Proposed Action Alternative to authorize and partially fund the repair of the Paonia Dam intake structure.

Decision and Finding of No Significant Impact

Based upon a review of the EA and supporting documents, Reclamation has determined that implementing the proposed action will not significantly affect the quality of the human environment, individually or cumulatively with other actions in the area. No environmental effects meet the definition of significance in context or intensity as defined at 40 CFR 1508.27. Therefore, an environmental impact statement is not required for this proposed action. This finding is based on consideration of the context and intensity as summarized in the EA. Reclamation's decision is to implement the Proposed Action Alternative.

Context

The affected locality is within Paonia Reservoir and downstream in Muddy Creek and the North Fork Gunnison River. Paonia Reservoir is located in Gunnison County, Colorado. Affected interests include Reclamation, the Fire Mountain Canal and Reservoir Company, the North Fork Water Conservancy District (NFWCD), shareholders, adjacent landowners, and recreationists. The project does not have national, regional, or state-wide importance.

Intensity

The following discussion is organized around the 10 significance criteria described in 40 CFR 1508.27. These criteria were incorporated into the resource analysis and issues concerned in the EA.

- 1. Impacts may be both beneficial and adverse.** The proposed action will impact resources as described in the EA. Mitigating measures were incorporated into the design of the action alternatives to reduce impacts. The predicted short-term effects of the proposed action include impacts to water quality, fish and wildlife resources, and recreation due to an expected temporary increase in turbidity and sedimentation within

Muddy Creek and the North Fork Gunnison River during construction and throughout the winter until the following spring when high flows and releases from Paonia Dam flush the sediment downstream. The only predicted long-term effect is an adverse effect to the intake structure as a cultural resource eligible for listing in the National Register of Historic Places (NRHP). This long term effect is being mitigated by the preparation of archival documentation on the intake structure. Beneficial effects include repair of the dam's intake structure, which will help ensure the use of the dam's outlet works, delivery of project water downstream, and maintenance of flood control functions of the dam.

None of the environmental effects discussed in detail in the EA are considered significant. None of the effects from the proposed action, together with other past, current, and reasonably foreseeable actions, rise to a significant cumulative impact.

2. **The degree to which the selected alternative will affect public health or safety or a minority or low-income population.** The proposed action will have no significant impacts on public health or safety. No minority or low income populations would be disproportionately affected by the proposed action.
3. **Unique characteristics of the geographic area.** There are no park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas that would be negatively affected by the proposed action.
4. **The degree to which the effects on the quality of the human environment are likely to be highly controversial.** Reclamation contacted representatives of other federal agencies, state and local governments, public and private organizations, and individuals regarding the proposed action and its effects on resources. Based on the responses received, the effects of the proposed action on the quality of the human environment are not highly controversial.
5. **The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.** There are no predicted effects on the human environment that are considered highly uncertain or that involve unique or unknown risks.
6. **The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.** Implementing the action will not establish a precedent for future actions with significant effects and will not represent a decision in principle about a future consideration.
7. **Whether the action is related to other actions which are individually insignificant but cumulatively significant.** Cumulative impacts are possible when the effects of the proposed action are added to other past, present, and reasonably foreseeable future actions as described under related NEPA documents above; however, significant cumulative effects are not predicted, as described in the EA in Section 3.4.

8. **The degree to which the action may adversely affect sites, districts, buildings, structures, and objects listed in or eligible for listing in the National Register of Historic Places.** The Colorado State Historic Preservation Officer has concurred with a determination of adverse effect to the intake structure, which is a component of the eligible Paonia Dam. Reclamation has entered into a Memorandum of Agreement with the State Historic Preservation Officer and the NFWCD to mitigate the impacts to the intake structure.
9. **The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.** There are no Threatened or Endangered Species or critical habitat that will be directly or indirectly affected by the Proposed Action. Therefore, a no effect determination was made.
10. **Whether the action threatens a violation of Federal, state, local, or tribal law, regulation or policy imposed for the protection of the environment.** The proposed action does not violate any federal, state, local, or tribal law, regulation, or policy imposed for the protection of the environment. In addition, this project is consistent with applicable land management plans, policies, and programs. State, local, and interested publics were given the opportunity to participate in the environmental analysis process.

Environmental Commitments

The following environmental commitments will be implemented as an integral part of the proposed action:

- Existing roads will be used to access the construction and staging areas. Heavy equipment will access the construction area along the rock/sediment interface of the reservoir. No new roads will be constructed.
- All construction equipment will be power-washed and free of soil and debris prior to entering the project site to reduce the spread of noxious and invasive weeds.
- To help minimize noise impacts near the construction area, construction activities will occur during the daylight hours.
- Concrete removed from the bulkhead will be taken to an existing landfill for disposal.
- The public will be notified of construction dates prior to construction via a distribution letter, press releases to local newspapers, and informative flyers sent to fly fishing shops and commercial outfitters.
- Stipulations in the Memorandum of Agreement with the SHPO are incorporated by reference.
- Terms and conditions contained in the CWA Section 404 permit are incorporated by reference.
- If previously undiscovered cultural or paleontological resources are discovered during construction, construction activities must immediately cease in the vicinity of the discovery and Reclamation must be notified. The SHPO will be consulted, and work will

not be resumed until consultation has been completed, as outlined in the Unanticipated Discovery Plan in the attached MOA.

- In the event that threatened or endangered species are discovered during construction, construction activities will halt until consultation is completed with the U.S. Fish and Wildlife Service and protection measures are implemented.
- Flushing flows of 600 cfs will be released from Paonia Dam for a sufficient period of time (estimated to be five days) during the spring following completion of the Proposed Action in order to transport and disperse downstream sediment deposits resulting from the Proposed Action. This release will be timed to coincide with snowmelt flows in Anthracite Creek to further boost the effectiveness of dispersing sediment deposits downstream.
- Reclamation, in cooperation with NFWCD, will ensure that a minimum of 800 AF of water is kept in Paonia Reservoir during normal reservoir operations during low flow periods of fall and winter, except for instances where reservoir drawdown is required for dam safety or maintenance purposes, in the interim between completion of the Proposed Action and implementation of a long-term sediment management alternative. Under existing conditions, an 800 AF pool of water equates to an elevation of 6,385 feet, which is 16.5 feet higher than the top of the intake trash rack. Maintaining a minimum pool in the reservoir will promote sediment and debris deposition farther upstream in the reservoir, reducing the accumulation of sediment and debris against the intake tower, and thereby reducing the amount of sediment released downstream of the dam during normal operations.

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Map Name: PAONIA RESERVOIR
 Horizontal Datum: WGS84
 Print Date: 06/08/16
 Scale: 1 inch = 2,000 ft.
 Map Center: 038° 56' 50.7012" N, 107° 21' 19.7500"

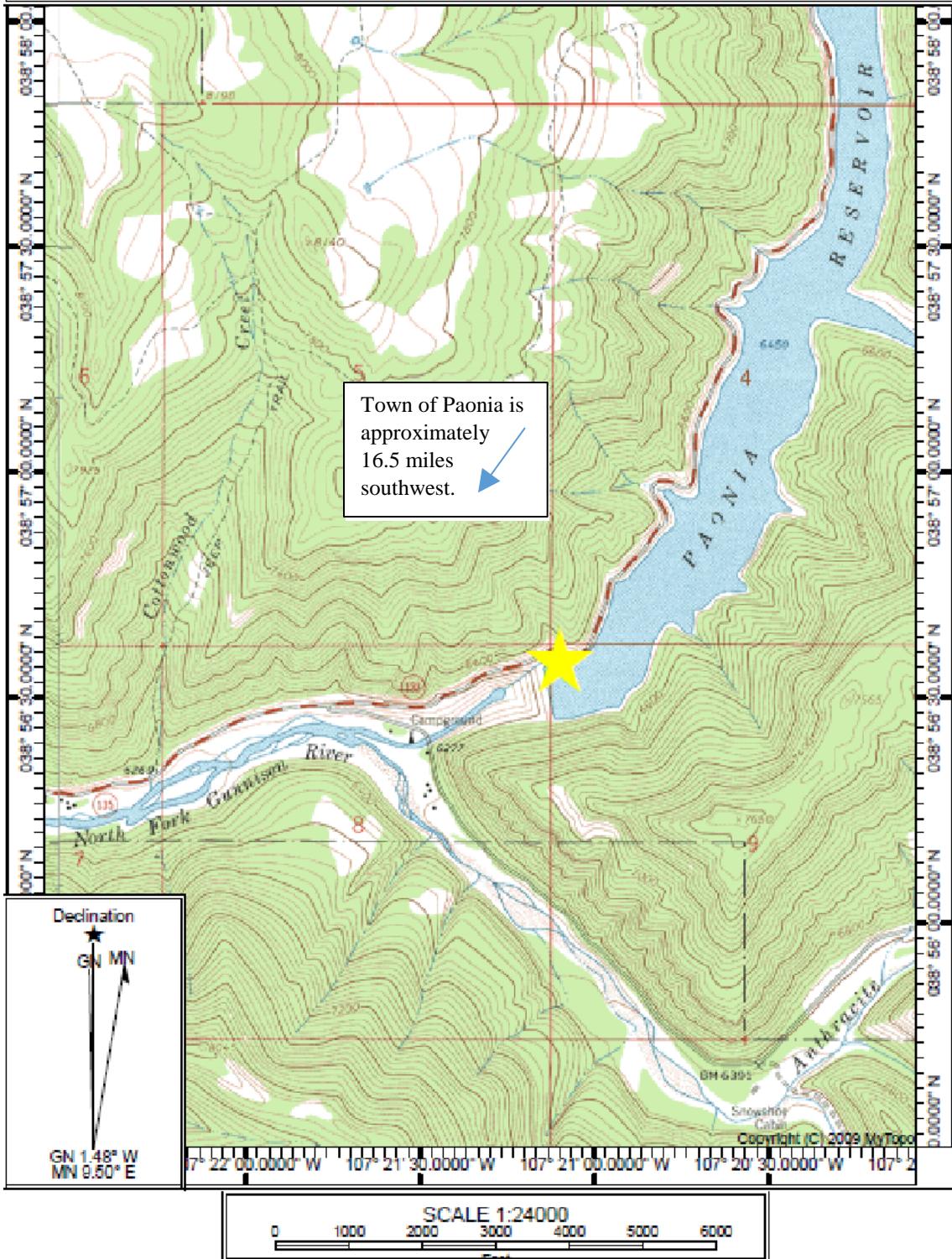


Figure 1. Location of Paonia Dam Intake Structure

CHAPTER 1 – INTRODUCTION

This Environmental Assessment (EA) has been prepared to disclose and evaluate the potential environmental effects of the Bureau of Reclamation’s (Reclamation) proposed Paonia Dam Intake Structure Repair Project (“Project” or “Proposed Action”). The Federal action evaluated in this EA is whether to authorize and provide partial funding to make repairs to the intake structure at the Paonia Dam. This document has been prepared in compliance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ), and the U.S. Department of Interior’s (Interior) NEPA implementing regulations. If potentially significant impacts to environmental resources are identified, an Environmental Impact Statement (EIS) will be prepared. If no significant impacts are identified, a Finding of No Significant Impact (FONSI) will be issued.

1.1 – Project Location and Legal Description

The project is located at Paonia Dam and Reservoir, approximately 16 miles northeast of Paonia, within Sections 8 and 9, Township 13 South, Range 89 West, Sixth Principal Meridian, Gunnison County, Colorado. Paonia Reservoir is located on Muddy Creek, upstream of its confluence with Anthracite Creek. The two creeks together form the North Fork Gunnison River (see Figure 1). The North Fork Gunnison River extends 33.5 miles before its confluence with the Gunnison River.

1.2 – Need for and Purpose of the Proposed Action

The proposed action is to dismantle the damaged upper concrete portions of the intake structure and replace it with modified aluminum support members and a trash rack (Figure 2). The Paonia Dam outlet works intake structure has sustained significant damage and the concrete bulkhead cannot currently function for its designed purpose. When functioning properly, the concrete bulkhead can be closed to prevent flows from entering the outlet works conduit in order to allow for repair and maintenance of the outlet gate or conduit upstream of the gates. The need for the proposed action is to maintain the functionality of the Paonia Dam outlet works so that dam operations are not compromised. The purpose of the proposed action is to make repairs to the concrete bulkhead and trash rack in order to temporarily stabilize the intake structure until a long-term solution is developed and can be implemented. The proposed repairs would not restore full functionality to the intake structure bulkhead because they would not enable the bulkhead to close and prevent water from flowing into the outlet conduit.



Figure 2. Photo of the intake structure.

Under certain conditions, air can become entrained in the water as it moves down the intake structure. Pockets of air can then develop and, if they become large enough, the water and air pocket travel upstream and out of the intake structure, imparting an explosive force on the intake structure. These blowback events have damaged the concrete bulkhead of the intake structure (Figure 3). In recent years, Reclamation, in joint effort with the water users, has developed a procedure to drawdown the reservoir with minimal blowback to the intake structure. However, it is necessary to remove the damaged concrete bulkhead and repair the trash rack to keep the intake structure operable.



Figure 3. Photograph of some of the damage to the Paonia Dam intake structure bulkhead. Yellow arrows show exposed rebar.

1.3 – Decision to be Made

Reclamation must decide whether to authorize and provide partial funding to make temporary repairs to the outlet works intake structure at Paonia Dam.

1.4 – Background

1.4.1 – Paonia Project

Development of the Paonia Project was authorized in 1956 as a participating project within the Colorado River Storage Project. Construction of Paonia Dam was completed in January 1962. Operation and maintenance of the Paonia Project was assumed by the NFWCD in June 1962. By contract, NFWCD transferred the physical operation and maintenance of the project to the Fire Mountain Canal and Reservoir Company (FMCRC).

Paonia Dam and Reservoir provides water for 8,270 acres of irrigated lands and 1,500 acres of non-irrigated lands, for a total of 9,770 acres of land irrigation water to approximately 15,300 acres of land in the vicinity of Paonia and Hotchkiss. In addition, the reservoir provides recreational and flood control benefits. The outlet works on the right abutment of the dam consist of a concrete intake tower, concrete-lined tunnel, gate chamber near the dam axis, and a combination stilling basin for both the outlet works and spillway.

Construction of the Paonia Project included enlargement and extension of the Fire Mountain Canal. The Fire Mountain Diversion Dam, located on the North Fork Gunnison River near the Town of Somerset, diverts flows from the river for delivery to project lands in the Fire Mountain

Division. The Fire Mountain Canal extends 34.7 miles along the north side of the valley. This water is used by the FMCRC and the Leroux Creek Water Users Association for irrigation purposes. (Reclamation, 2009 and 2011.)

The outlet works of Paonia Dam pass through the bedrock which forms the right abutment of the dam. It consists of a trashracked intake tower, a pressurized 11-foot-diameter concrete lined upstream tunnel, a gate chamber with two pairs of 2-foot 9-inch by 2-foot 9-inch hydraulic controlled slide gates (two upstream emergency gates and two downstream regulating gates), and a 10-foot 6-inch by 10-foot 6-inch horseshoe-shaped discharge tunnel. The discharge tunnel empties through the spillway chute into a common stilling basin.

1.4.2 – Sedimentation

When construction of the Paonia Dam was completed in 1962, the reservoir had an active storage capacity of 18,150 acre-feet (AF). Since that time sediment from Muddy Creek, which flows into Paonia Reservoir, has accumulated within the reservoir basin and reduced the water storage capacity of the reservoir to approximately 15,600 AF. In addition, most of the 70-foot high concrete intake tower is buried in the accumulated sediment, leaving only about the top 6 feet exposed. Sediment accumulation within the reservoir is affecting the intake and outlet structures and adversely impacting operations.

Although occasional sediment flushing was performed as early as 1997, beginning in 2011 Paonia Reservoir has been drawn down in late fall for inspection of the outlet works, and again in early spring for sediment flushing prior to the irrigation season. In October 2014, reservoir drawdown revealed that the sediment delta front, which had been located in the reservoir approximately 1,250 feet upstream of the intake structure, had quickly moved towards the dam, completely filling the reservoir's deadpool and raising the lake bottom six feet above the sill of the intake structure (Figure 4). Because there was no longer a dead pool in the reservoir where sediment and debris could drop out, the sediment and debris stacked against the trash gates of the intake structure. Immediate removal of sediment and debris away from the intake structure was required to maintain the functionality of the Dam. The combination of the reservoir drawdown and removing sediment away from the intake structure resulted in the unanticipated release of approximately 137,000 cubic yards (CY) of sediment into Muddy Creek and the North Fork Gunnison River downstream of Paonia Dam (Reclamation 2016A, Reclamation 2015B). The released sediment filled the dam's 30-foot deep stilling basin, and approximately 200 yards of the Muddy Creek streambed downstream of the dam was buried under about 6 to 7 feet of sediment. Based on visual evaluations conducted by Reclamation's Technical Service Center (TSC) in November 2014, sand/fine deposits were detected as far as approximately three miles downstream of the dam (Reclamation 2015A). Trout Unlimited (TU) noted increased turbidity in the mainstem Gunnison River as far downstream as Delta, Colorado (TU comment letter, 2016). After high flow releases in the spring of 2015, the sediment deposits were dispersed and no longer observed downstream in Muddy Creek or North Fork Gunnison River.

Reclamation's TSC has been conducting bathymetric surveys and sediment sampling at Paonia Reservoir in an effort to understand potential effects of sedimentation at Paonia Reservoir. In June 2016, a bathymetric survey was conducted, and results from that survey showed a cone of depression in the sediment around the intake structure. TSC used its One Dimension (SRH-1D) Model to simulate the transport of incoming and outgoing sediment through Paonia Reservoir when the reservoir is completely drained and free flow conditions are occurring during the proposed intake repairs in fall (Reclamation 2016A). The model simulation estimated a sediment erosion volume in the range of approximately 45,100 CY to 137,105 CY during drawdown and repairs. The estimated amount of sediment with the potential to be released downstream was anticipated to be less than what occurred in 2014, given the assumption of the presence of a cone of depression around the intake structure and a low-flow channel through the reservoir basin. The Draft EA for the Paonia Intake Structure Repair, which was released for public comment on September 6, 2016, included a project analysis based on this model.

On September 28, 2016, Reclamation staff were able to access the intake structure and determined that there was no longer a cone of depression around the structure, and the sediment deposition is two to three feet above the sill of the intake structure. TSC utilized this information to confirm that, under current conditions of two to three feet of sediment deposition above the intake sill, the volume of sediment released downstream to accomplish the intake repair work would be approximately 45,100 CY. This is about one-third of the volume discharged in fall 2014. In October 2016, TSC developed a second SRH-1D river model to simulate the downstream transport of 45,100 CY of sediment from the downstream toe of Paonia Dam to the Fire Mountain Canal Diversion, which is approximately 8 miles downstream of the dam. The following parameters were derived from the model and utilized to evaluate impacts of the proposed action:

- Approximately 17% of the sediment discharged from the reservoir would be coarse sediment (sand/gravel) and 83% of the sediment outflow would be fines (silt/clay).
- The extent of coarse sediment deposition would be to the Fire Mountain Canal Diversion, 0.4 mile downstream of the Muddy Creek/Anthracite Creek diversion, with the greatest deposition of coarser sediment occurring within the approximately 2,000-foot reach of Muddy Creek below the Dam.
- The remaining fine silt/clay sediment would advect downstream, with minimal amounts of fine sediment deposits in the channel bed in areas of lower velocity.
- Computed suspended sediment concentrations exiting the reservoir range from 5,000 to 7,000 mg/L during the time of drawdown and construction. This concentration decreases by a factor of 2.5 once the flows reach Anthracite Creek, and would decrease by an additional factor of 10 once the flows reach the main stem Gunnison River. While it is expected that a thin layer of fine sediment would deposit downstream in areas of low enough velocity, the vast majority would continue downstream with further dilution, ultimately depositing in reservoirs or estuarine areas. (Reclamation 2016C.)



Figure 4. Paonia Reservoir in October 2014, prior to excavation work. The intake structure (black arrow) is nearly buried beneath about six to seven feet of sediment, and sediment has filled the reservoir’s dead pool.

1.5 – Relationship to Other Projects

1.5.1 – Paonia Dam Modification Alternatives Study

The Sedimentation and River Hydraulics Group of Reclamation’s TSC in Denver, Colorado, is leading an effort to study the past and current sediment issues at Paonia Dam and Reservoir, evaluate feasible sediment management alternatives, and formulate a plan for future operations and monitoring. The objectives of the study are to rehabilitate the outlet works of the dam; maintain water supply for users; maintain the current reservoir storage; manage debris and abrasion issues; and minimize downstream impacts. Reclamation expects to start the NEPA process on the alternatives study to gather ideas and public input on the Paonia Dam modification alternatives during winter 2016/2017.

1.6 – Public Scoping

Scoping for this EA was completed by Reclamation, in consultation with the following agencies and organizations, during the planning stages of the proposed action to identify the potential environmental and human environment issues and concerns associated with implementation of the Proposed Action and No Action Alternatives:

- North Fork Water Conservancy District, Hotchkiss, CO
- Fire Mountain Canal and Reservoir Company, Hotchkiss, CO

- Colorado Department of Public Health and Environment, Denver, CO
- Colorado River Water Conservation District, Glenwood Springs, CO
- Colorado Office of Archaeology and Historic Preservation, Denver, CO
- Colorado Parks & Wildlife, Montrose, CO
- U.S. Geological Survey, Grand Junction, CO
- U.S. Army Corps of Engineers, Colorado West Regulatory Branch, Grand Junction, CO
- U.S. Fish & Wildlife Service, Ecological Services, Grand Junction, CO

CHAPTER 2 – PROPOSED ACTION AND ALTERNATIVES

Alternatives evaluated in this EA include the No Action Alternative and the Proposed Action Alternative.

2.1 – No Action Alternative

Under the No Action Alternative, repair of the damaged bulkhead of the intake tower would not be completed. Periodic fall reservoir drawdown would continue to occur in order to inspect the damage to the intake structure's bulkhead. The concrete bulkhead is located internal to the frame of the intake structure and is severely damaged. There is a substantial risk that a piece of concrete or the entire bulkhead could collapse and cause further damage to the outlet works, potentially rendering it inoperable. If the outlet works become inoperable, the only other means of releasing water from the reservoir currently in place would be uncontrolled releases over the spillway.

2.2 – Proposed Action

Under the proposed action, Reclamation would authorize the intake repair and the use of Federal funds to stabilize the intake structure at Paonia Dam. The damaged upper concrete portions of the intake would be dismantled and replaced with a modified aluminum trash rack and support members (Figure 5). Removed concrete pieces would be taken to a landfill for disposal. The action is expected to maintain the function of the outlet works to deliver water from the reservoir to downstream water users until sediment management alternatives are developed and evaluated through the Paonia Dam Modification Alternatives Study and associated NEPA process.

The reservoir would be drawn down prior to construction to provide access to the intake structure. Reservoir drawdown is expected to result in the release of 45,100 -CY of sediment. Repair activities are currently scheduled to be performed in October through November, during the non-irrigation season, but before freezing conditions.

In order to mobilize and disperse any sediment deposited in Muddy Creek and North Fork Gunnison River downstream of the dam during the proposed repair work, high flows would be released from the dam as soon as practicable during spring runoff, in the April through June timeframe. In an effort to address concerns about future episodes of large sediment releases during low-flow periods, a minimum pool would be maintained in the reservoir as an interim measure until a long-term sediment management alternative is implemented. As an interim measure, Reclamation, in cooperation with NFWCD, would ensure that a minimum of 800 AF of water would be kept in the reservoir during normal reservoir operations in the low flow periods of fall and winter, except for instances where reservoir drawdown is required for dam safety or maintenance purposes.



Figure 5. The bulkhead (shown in grey at top) is damaged and must be removed. Aluminum bars would be placed through the intake structure to support platforms to enable workers to remove the bulkhead as well as to prevent materials from falling into the intake structure during removal. After removal is complete, the aluminum bars would be attached to the top of the intake structure to act as a trash rack during reservoir operation.

The proposed action to repair the intake structure is a single and complete project that is not part of the development, planning, and implementation of a long-term sediment management solution. Delaying the repair work until implementation of a long-term sedimentation

management strategy would increase the risk of the outlet works becoming inoperable, which would affect the ability to deliver water and affect flood control functions.

2.2.1 – Construction Procedures

2.2.1.1 – Reservoir Drawdown

Reservoir drawdown would begin as soon as practicable in the fall after irrigation season. To avoid blowback through the intake structure during drawdown of the reservoir, outlet releases would be made slowly, staying below 200 cubic feet per second (cfs). When the water level reaches the top of the trash rack of the intake, releases would be limited to 30 cfs to prevent conditions that could result in blowback and further damage to the intake structure. During construction, the entire natural reservoir inflow would need to be passed through the outlet works. Based on Colorado Division of Water Resources gage data from the last 10 years, the average inflow from Muddy Creek into the reservoir during the construction timeframe (October and November) is expected to be approximately 29 cfs (CDWR 2016).

2.2.1.2 – Equipment

Construction equipment would include a 65-foot long reach excavator, mini-excavator, tracked skid loader, UTV, and an air compressor.

2.2.1.3 – Access

Access for all construction equipment and personnel would be from existing roads and disturbed areas. No new roads would be constructed. The project area would be accessed from County Road 12 and onto the existing two-track access road downstream of the left abutment of the dam, down the upstream left groin, and then across the upstream toe of the dam. (Figure 6.) No heavy equipment would travel on the reservoir sediment deposits.

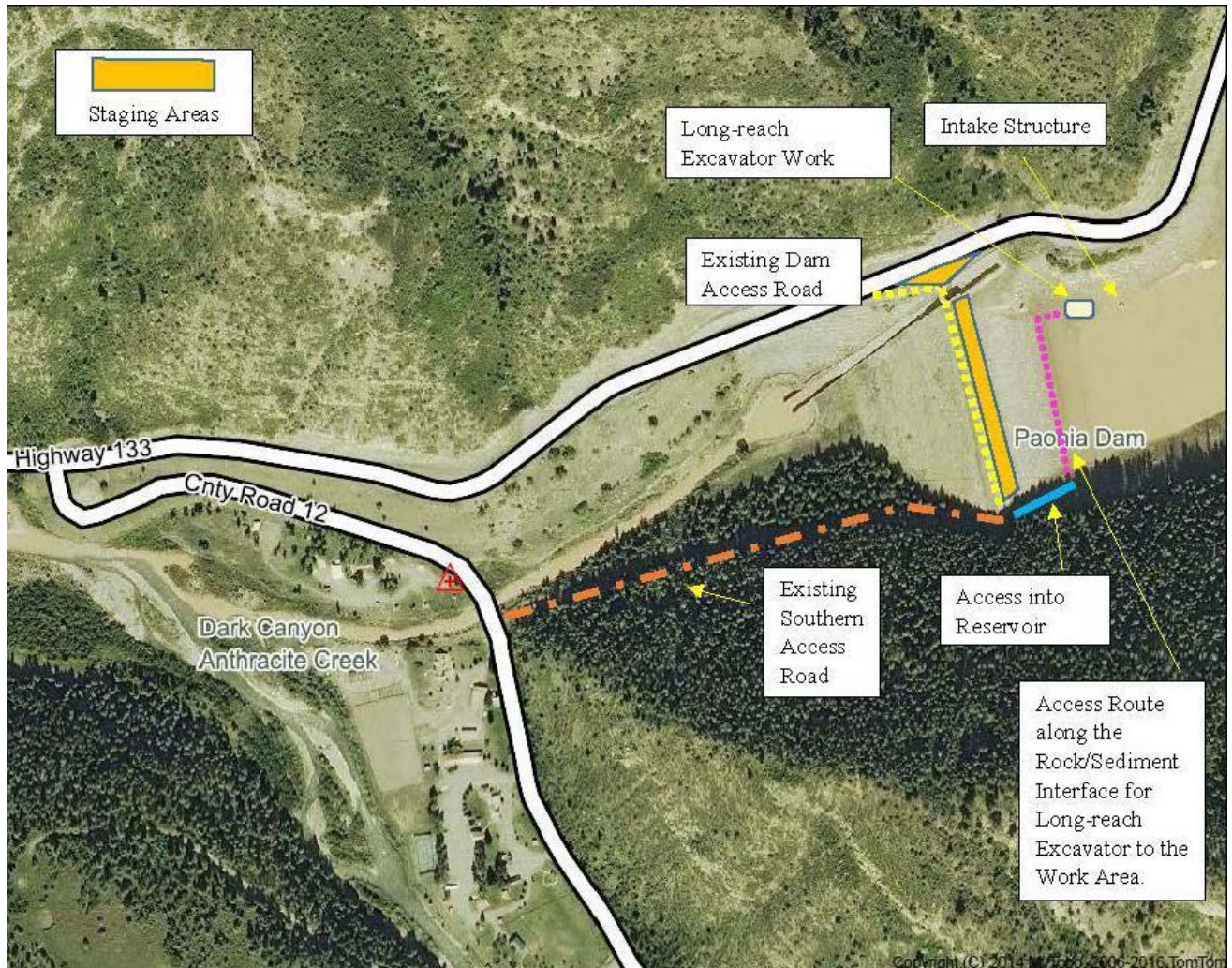


Figure 6. Existing access routes and project staging area.

2.2.1.4 – Staging Areas

Staging areas for equipment and materials would be located in disturbed areas adjacent to the work areas, as depicted in Figure 6.

2.2.1.5 – Construction Sequence

- After the reservoir is drawn down, minor grading along the reservoir shoreline would be completed if needed to create a working platform for the excavator. A long-reach excavator would be used, in combination with manual labor, to remove sediment and debris from around the intake structure and to support removal of concrete from the bulkhead.
- The intake structure would be cleared of sediment or debris, if any, built up on the structure as a result of draining the reservoir. The excavated sediment and debris would be discharged within the work area adjacent to the intake structure.

- Temporary working and support platforms will be constructed manually on the intake structure to enable manual labor and prevent broken pieces of concrete from falling into the intake structure.
- The concrete bulkhead would be broken up and/or cut into small sections and removed. Removing small sections will help to prevent overloading of the support platform and allow the broken pieces of concrete to be handled manually. The long-reach excavator would be used as necessary for support of this work.
- The support platform aluminum members would then be removed and reinstalled to act as a trash rack over the top opening and bracing for the damaged concrete at the top of the structure.
- The working platform would be disassembled and removed.
- Removed concrete pieces would be taken to a landfill for disposal.

2.2.1.6 – Construction Timeframe

Construction would be completed during the non-irrigation season after the reservoir is drawn down and before the reservoir freezes, and is anticipated to be carried out in October through November. High flow releases from the dam would be made during spring runoff in the April through June timeframe.

Due to safety and constructability considerations, construction would be completed during fall low flows. Construction cannot be done during times when there is adequate water to provide flushing flows, which would be during the spring prior to filling the reservoir. During the spring, there is snow melt runoff and inflow into Paonia Reservoir. This high inflow would pass through the construction area before exiting the reservoir through the intake structure, creating a safety hazard for workers. Safe working conditions exist when water passing through the construction area is about 30 cfs. Another complicating factor if work would be done during higher flows is that the intake structure would be partially blocked during construction, potentially pooling water throughout the construction area, and thereby exacerbating the unsafe conditions.

2.3 – Permits, Authorizations, and Compliance

If the proposed action is approved, the following permit would be required prior to project implementation:

- Section 404 Clean Water Act, Nationwide Permit No. 3 - Maintenance Activities

Compliance with the following laws and Executive Orders (E.O.) are also required prior to and during project implementation:

- Natural Resource Protection Laws

- Endangered Species Act (ESA) of 1973 as amended (16 U.S.C. 1531-1544, 87 Stat. 884)
- Clean Water Act (CWA) of 1972 as amended (33 U.S.C. 1251 et seq.)
- Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703-712)
- Bald and Golden Eagle Protection Act (BGEPA) of 1940 (16 U.S.C. 668- 668c)
- Cultural Resource Laws
 - National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. 470 et seq.)
 - Archaeological Resources Protection Act (ARPA) of 1979 (16 U.S.C. 470aa-470mm et seq.)
 - Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (25 U.S.C. 3001 et seq.)
 - Archaeology and Historic Preservation: Secretary of the Interior’s Standards and Guidelines (48 FR 44716)
 - American Indian Religious Freedom Act (AIRF) of 1978 (42 U.S.C. Public Law 95-341)
- Paleontological Resource Laws
 - Paleontological Resources Preservation Act (PRPA) of 2009 [Section 6301-6312 of the Omnibus Land Management Act of 2009 (Public Law 111-11 123 Stat. 991-1456)]

CHAPTER 3 – AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

3.1 - Introduction

This chapter discusses resources that may be affected by the Proposed Action and the No Action Alternatives. For each resource, the potentially affected area and/or interests are identified, existing conditions described, and potential impacts predicted under the No Action and Proposed Action Alternatives. This section is concluded with a summary of impacts and a list of environmental commitments.

3.2 – Resources Eliminated from Further Analysis

Resources that do not exist or would not be affected within the project area and were not carried forward for additional analysis are described in Table 1.

Table 1. Resources Eliminated from Further Analysis

Resource	Rationale for Elimination from Further Analysis
Greenhouse Gases and Climate Change	Given the short duration and limited use of equipment required to implement the proposed action, there would be negligible increases in greenhouse gases during construction, and no increases in greenhouses gases post-construction. Climate change would not be noticeably impacted or influenced by implementation of the proposed action.
Groundwater	Groundwater would not be impacted or influenced by implementation of the proposed action.
Land Use	Paonia Reservoir is used for water storage and recreational activities. There would be no change in land use as a result of the proposed action.
Noise	There would be no long-term increases to the ambient noise levels from the implementation of the proposed action. However, there would be a temporary increase in noise levels during construction. Noise impacts would be minimized by limiting construction activities to daylight hours.
Floodplains	Downstream of Paonia Dam, the mapped floodplain along Muddy Creek and the North Fork Gunnison River closely follows the top of the stream bank, indicating the stream channel is deeply entrenched (FEMA 2016). Because both channels are deeply entrenched and minimal flows (15-30 cfs) are expected to be released from Paonia Dam during construction, there is no potential for impacts to floodplains as a result of implementation of the proposed action.
Paleontology	The project area is located entirely within Reclamation facilities, atop the sediment bed which is accumulating within Paonia Reservoir, and along an existing, previously disturbed access road. There is no potential for paleontological resources within the project area.
Prime, Unique, and Statewide Important Farmland	There are no farmlands of prime, unique, or statewide importance within the project area.
Urban Quality and Design of the Built Environment	The project area is located entirely within Reclamation facilities. There are no urban resources or infrastructure that would be impacted by the proposed action.
Visual Resources	There would be no long term impact to visual resources from the implementation of the proposed action. However, there would be a temporary increase in sediment accumulation, primarily in Muddy Creek downstream of Paonia Reservoir, during and after construction until flows increase with spring runoff and releases from the dam.

Resource	Rationale for Elimination from Further Analysis
Wastes, Solid and Hazardous	There are no solid or hazardous wastes located within the vicinity of the project, and the proposed action would not result in the production of solid or hazardous wastes.
Wilderness and Wild and Scenic Rivers	There are no designated Wilderness or Wild and Scenic Rivers within or adjacent to the project area.

3.3 – Affected Environment and Environmental Consequences

3.3.1 – Water Resources

3.3.1.1 – Irrigation Water

Paonia Reservoir had an original water storage capacity of 18,150 AF; however, that number has been reduced to approximately 15,600 AF due to sediment build-up in the reservoir. The majority of this water is used to irrigate lands and water livestock downstream of Paonia Dam. Paonia Dam and Reservoir provides water for 8,270 acres of irrigated lands and 1,500 acres of non-irrigated lands, for a total of 9,770 acres of land in the vicinity of Paonia and Hotchkiss (Figure 7) (Reclamation 1957). Major crops in the area include livestock feed and fruit, such as apples, peaches, and cherries. Dairy cows and beef cattle are the principal livestock of the area.

No Action Alternative: Under the No Action Alternative, normal operations and periodic reservoir drawdown would continue until the outlet works become inoperable. At that time, water releases from the reservoir would be limited to water which flows over the spillway. Figure 8 depicts the amount of water which would be released from Paonia Dam with and without an operational intake structure and outlet works, based on average releases from 2002 to 2015. The blue line shows average releases with a fully operational dam outlet. The red line shows what average releases would be if the dam’s outlet works were inoperable and the only releases from Paonia Dam were over the unregulated spillway. There would be nearly 100 cfs less water released from Paonia Dam from August 1st through October 1st in the event the outlet works is rendered inoperable, which would reduce the amount of water available for downstream irrigation. Long term solutions are being evaluated in the Paonia Dam Modification Alternatives Study, discussed above in Section 1.5.1.

Proposed Action: Under the proposed action, the repair work would be completed, allowing the intake structure to remain functional, thus enabling the continuation of reservoir operations. Water would continue to be delivered through the outlet works to provide irrigation and livestock water downstream.

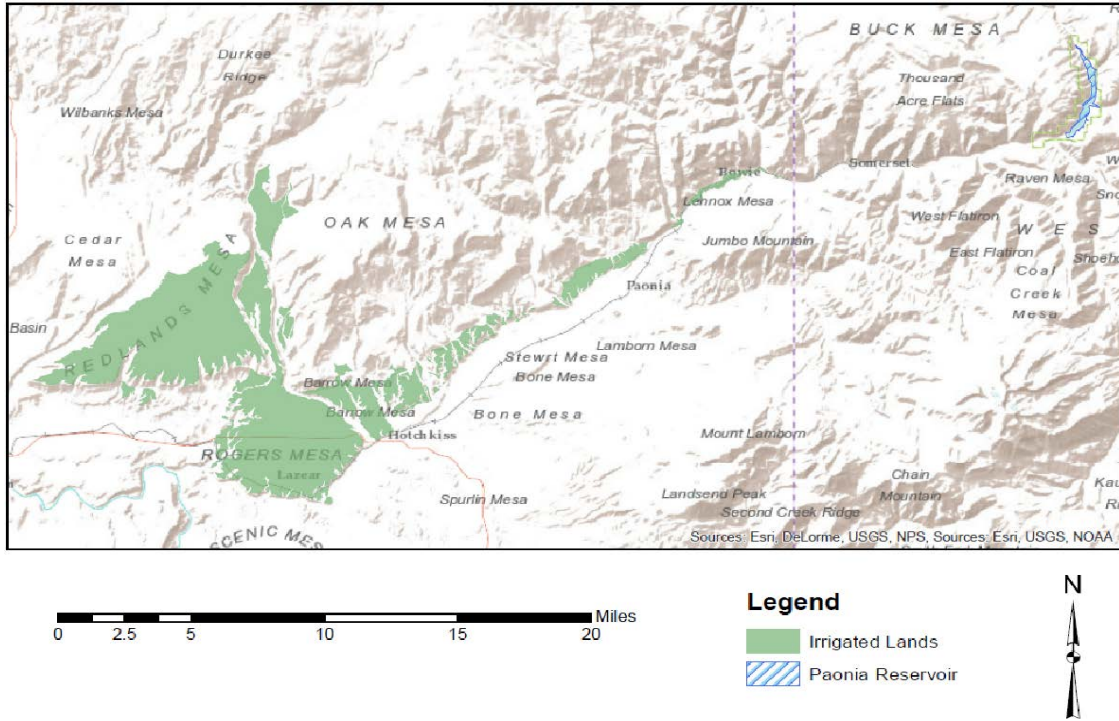


Figure 7. Map of lands receiving irrigation water from the Paonia Project.

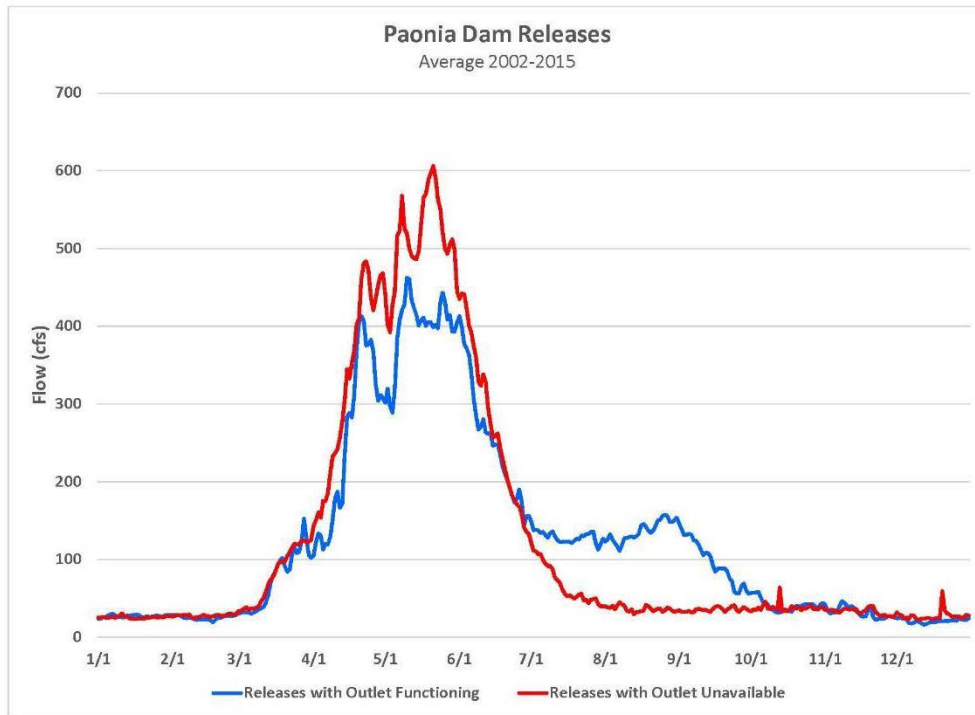


Figure 8. Hydrograph of Paonia Dam releases with a functioning outlet compared to predicted releases without a functioning outlet, based on the 2002-2015 average releases.

Many irrigators in the Paonia and Hotchkiss areas obtain their irrigation water from the North Fork Gunnison River and utilize micro-jet or drip systems to water their crops. Reclamation, in cooperation with NFWCD, would release flushing flows during the spring following completion of the proposed action as a mitigating measure to disperse sediment deposits resulting from the proposed action. The flushing flows, and associated higher turbidity levels, would last for a period of five to seven days and would occur early in the spring when turbidity and flows are already high. Release of flushing flows would not extend the normal, higher turbidity timeframe.

The Paonia Reservoir webpage (<http://www.usbr.gov/uc/wcao/progact/paonia/index.html>) would be updated when dates for the flushing flow releases are finalized to alert the public, including irrigators, of the release dates and associated potential for short-term, higher turbidity levels. For irrigators who continue to pump during flushing flows and/or when suspended sediment and turbidity levels are high, their systems would likely require maintenance resulting from the use of micro-jet or drip systems on a high sediment system.

3.3.1.2 – Drinking Water

The Town of Somerset obtains its drinking water from the North Fork Gunnison River, approximately 6.5 miles downstream of Paonia Dam. The Town of Somerset's drinking water supply is managed by Oxbow Mine. Oxbow Mine has a pump in the river which pumps river water to an infiltration gallery so sediments may settle out of the water. This water is then pumped uphill to a tank for storage. The next town downstream of Somerset is the Town of Paonia, located approximately 16.5 miles downstream of the dam. The Town of Paonia does not use river water and obtains its drinking water from wells located on Mount Lamborn. The next town downstream of Paonia is Hotchkiss, located approximately 24.5 miles downstream of the dam. The Town of Hotchkiss does not use river water and obtains its drinking water from water stored in lakes on the Grand Mesa.

No Action Alternative: Under the No Action Alternative, there would be no effect on the Town of Somerset's ability to continue diverting its drinking water from the North Fork Gunnison River, nor the Town of Paonia's ability to continue obtaining their drinking water from wells on Mount Lamborn, nor the Town of Hotchkiss' ability to continue obtaining their drinking water from lakes on the Grand Mesa.

Proposed Action: Under the Proposed Action Alternative, turbidity in the North Fork Gunnison River would temporarily increase while repairs to the intake structure are being made. The Towns of Paonia and Hotchkiss do not obtain their drinking water from the North Fork Gunnison River. An increase in turbidity in the North Fork Gunnison River would have no effect on the Town of Paonia's or the Town of Hotchkiss' drinking water.

Oxbow Mine is not concerned about a temporary increase in turbidity in the North Fork River. If the turbidity increases to a level which concerns the Oxbow Mine, they could temporarily turn their pump off. The Town of Somerset could be supplied with water for two weeks without

running Oxbow Mine's pump. (Personal Communication, Chuck Sheldon of Oxbow Mine, August 17, 2016.)

3.3.1.3 - Flood Control

Paonia Reservoir provides flood control benefits on the North Fork Gunnison River. Flooding potential on the North Fork Gunnison River is reduced by emptying the reservoir each year and by reserving storage space through forecasts of snowmelt, runoff, and regulation of flood flows. The U.S. Army Corps of Engineers (USACE) directs flood control procedures for Paonia Reservoir and Dam.

No Action Alternative: Under the No Action Alternative, normal operations and periodic reservoir drawdown to inspect the damage to the intake structure would continue until the outlet works become inoperable. At that time, water releases from the reservoir would be limited to water which flows over the spillway. Once the reservoir fills and water releases are limited to flows over the spillway, the reservoir would no longer provide flood control benefits on the North Fork Gunnison River, as all inflow would pass over the spillway.

Proposed Action: During the interim between completion of intake repair and implementation of a long-term sediment management alternative, a minimum pool of 800 AF would be stored in Paonia Reservoir during low flow periods of fall and winter, unless reservoir drawdown is required for dam safety or maintenance purposes. This equates to a water elevation of 6,385 feet in the reservoir. The 6,385 water elevation is 16.5 feet higher than the top of the intake trash rack. Maintaining a minimum pool in the reservoir in this manner would promote sediment and debris to drop out of the water column upstream of the intake structure. (See Section 3.4 for further discussion of maintaining an 800 AF minimum pool in Paonia Reservoir.) The flood control directive at Paonia Reservoir is to keep the reservoir essentially empty (at an elevation which correlates to 150 AF of water in the reservoir) during peak spring runoff to allow the reservoir to collect runoff and reduce the potential for downstream flooding. The 800 AF minimum pool would be held within the reservoir during the winter, and would be evacuated as necessary during spring flows to comply with the Paonia flood control directive. Any water which may be stored to meet the proposed spring 2017 flushing flows environmental commitment will be coordinated with the USACE as necessary.

3.3.2 –Water Quality

3.3.2.1 - Stream Classifications and Water Quality Standards

The Water Quality Control Division (Division) of the Colorado Department of Public Health and Environment (CDPHE), under the authority of federal and Colorado statutes, administers state programs which implement the federal Clean Water Act (CWA). The CWA establishes the basic structure for protection of the quality of Colorado's ambient water bodies – its rivers, streams, lakes, reservoirs, and ground waters. Use classifications and numeric water quality standards have been adopted for streams, lakes, and reservoirs throughout each of the state's river basins. Within each basin, waters are divided into individual stream segments for classification and

standard-setting purposes. Major stream segments which influence and are influenced by the project area are described in Table 2 and Figure 9 (CDPHE 2016A, CDPHE 2013).

Table 2. Description of major stream segments which influence and are influenced by the project area.

Segment ID Number	Description of Segment
COGUNF02	Mainstem of North Fork Gunnison River from its inception at the confluence of Muddy Creek and Coal Creek to the Black Bridge above Paonia.
COGUNF03	Mainstem of North Fork Gunnison River from the Black Bridge above Paonia to the confluence with the Gunnison River.
COGUNF04	Muddy Creek and all tributaries, Coal Creek and all tributaries; all tributaries to the North Fork Gunnison within the national forest boundary.
COGUNF07	Paonia Reservoir and Overland Reservoir

Site-specific water quality classifications are intended to protect all existing uses of state waters and any additional uses for which waters are suitable or are intended to become suitable. The current use classification categories for each stream segment which influence and are influenced by the project area are defined in Table 3 (CDPHE 2016B, CDPHE 2013).

Table 3. Current use classification categories for each stream segment which influence and are influenced by the project area.

Segment ID Number	Use Classification Categories ¹
COGUNF02	Agriculture Aq Life Cold 1 Recreation E Water Supply
COGUNF03	Agriculture Aq Life Cold 1 Recreation E – April 1 – September 30 ² Recreation P – October 1 – March 31 Water Supply
COGUNF04	Agriculture Aq Life Cold 1 Recreation E Water Supply
COGUNF07	Agriculture Aq Life Cold 1 Recreation E Water Supply

¹ **Agriculture:** These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado and are not hazardous as drinking water for livestock.

Aq Life Cold 1: These are waters that (1) currently are capable of sustaining a wide variety of cold water biota, including sensitive species, or (2) could sustain such biota but for correctable water quality conditions.

Recreation E: These surface waters are used for primary contact recreation. These surface waters are suitable or intended to become suitable for recreational activities in or on the water when the ingestion of small quantities of water is likely to occur.

Recreation P: These surface waters have the potential for primary contact recreation.

Water Supply: These surface waters are suitable or intended to become suitable for potable water supplies. (BASIN 2016)

² A “seasonal” qualifier can be adopted to limit applicability of a classification to certain periods of the year.

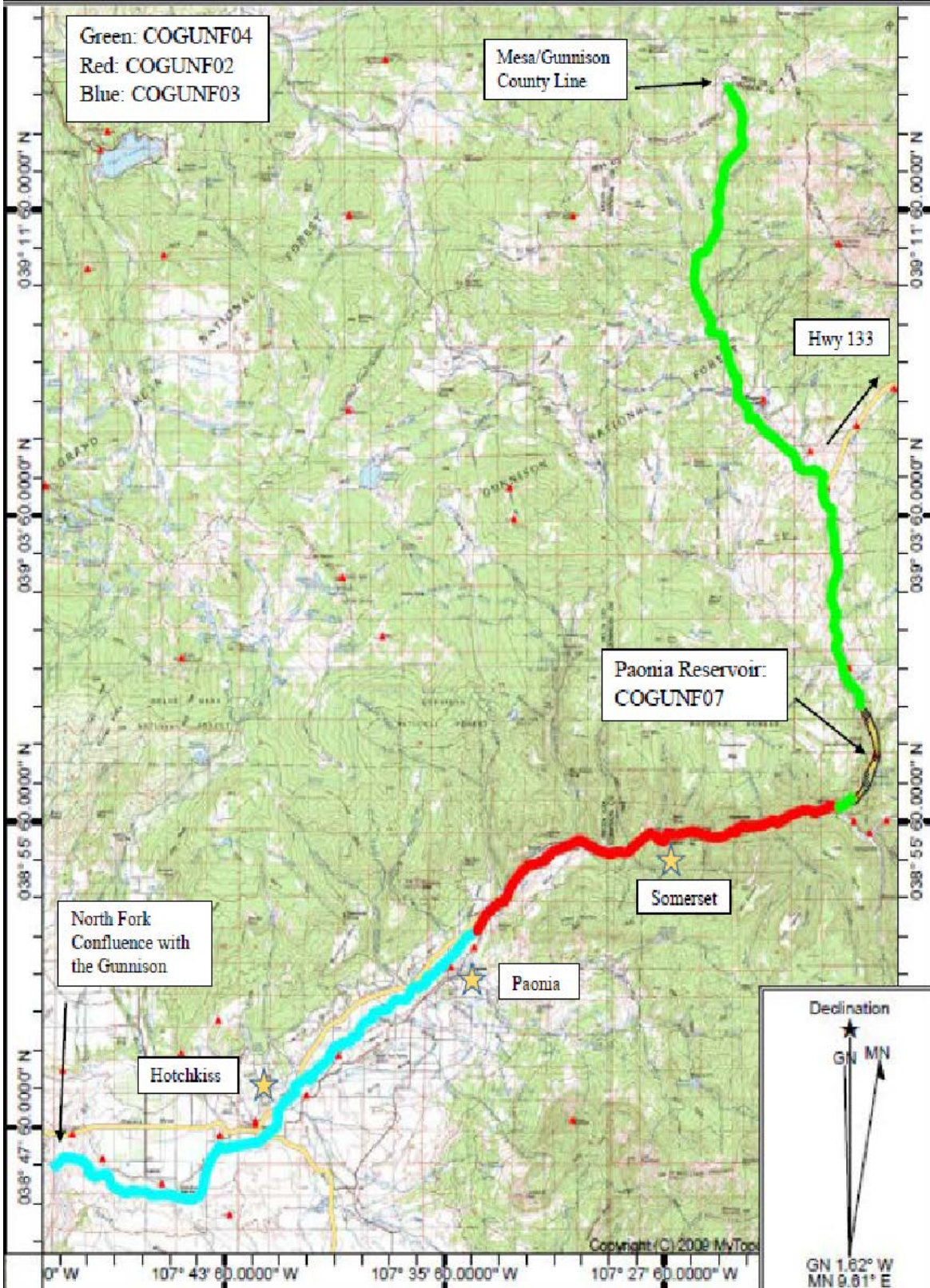


Figure 9. Map of major stream segments which influence and are influenced by the project area.

Section 303(d) of the CWA requires each state to identify waters within its boundaries for which technology-based effluent limitations and other required controls are not adequate to attain water quality standards. Segments are included on the Section 303(d) list of impaired waters based on an evaluation of biological, chemical, or physical data demonstrating nonattainment of numeric or narrative standards or use impairment. Once listed, the state is required to prioritize these water bodies or segments for analysis as to the causes of the water quality problem and for allocation of the responsibility for controlling the pollution (CDPHE 2013). Segment COGUNF04 is on the 303(d) list for exceedances in recoverable iron (high priority) and arsenic (low priority) (CDPHE 2016A).

No Action Alternative: Under the No Action Alternative, there would be no change to the affected stream segments' ability to maintain current stream classifications and water quality standards.

Proposed Action: Under the Proposed Action Alternative, approximately 45,100 CY of sediment would be released from Paonia Reservoir during the approximate one-month drawdown and construction period. In the state of Colorado, the Environmental Protection Agency delegated authority for compliance with water quality requirements under the Clean Water Act to the CDPHE. Reclamation coordinated with CDPHE regarding water quality in relation to the proposed action. CDPHE determined no water quality permitting was needed for this action (personal communication, August 25, 2016, with Scott Garncarz and Amanda Jensen of CDPHE's Water Quality Control Division). Based on the limited water quality data collected to date by USGS and Reclamation, any changes in water quality resulting from the proposed action would be similar to baseline conditions (e.g., during reservoir drawdown).

The sediment release would result in a noticeable increase in turbidity in the North Fork Gunnison River, with decreasing turbidity downstream due to dilution. The majority of the fine sediment released from the reservoir would continue downstream to the Gunnison River, remaining in suspension as wash load. Wash load is the portion of sediment that is always in suspension, particularly in coarse-bedded mountain rivers such as the North Fork Gunnison River. However, a thin layer of fine sediment (silt/clay) which is transported as wash load would deposit downstream in areas of low enough velocity (e.g., interstitial spaces, along channel margins, and pools), ultimately depositing in reservoirs or estuarine areas (Reclamation 2016C). Because this release would occur after the irrigation season, and Paonia Reservoir does not provide winter water to livestock, the proposed action would have no effect on the water's suitability for agricultural uses.

Due to temporary increases in turbidity and suspended sediment caused by the proposed action, there would be a short-term impact on cold water aquatic habitat downstream of Paonia Dam during construction and until high flows disperse sediment in the riverine system. Effects on aquatic habitat are discussed in Section 3.3.6.2.

Recreational activities below Paonia Dam would experience temporary increases in turbidity and suspended sediment during construction. However, the repair work would occur at a time when

recreation on the river is lower because of low flows and cooler, late fall temperatures. The temporary increase in sediment would have a minor impact on the water's suitability for primary contact recreation.

The North Fork Gunnison River would continue to serve as a suitable potable water supply. However, the temporary increase in sediment may require the Town of Somerset to temporarily stop pumping from the river, as discussed in Section 3.3.1.2.

There would be no long term effects to the stream's ability to maintain current water quality standards as a result of project implementation, nor would there be any change in the suitability of the water below Paonia Dam to maintain its current use classifications.

Those who are interested in being informed of water quality parameters in the North Fork Gunnison River can subscribe to the United States Geological Survey's (USGS) WaterAlert service (<http://water.usgs.gov/wateralert/>). The WaterAlert service sends email or text messages to interested users when certain parameters, as measured by a USGS real-time data collection station, exceed user-definable thresholds. In most cases, USGS' information is updated once every hour (USGS 2013). Users may subscribe to be alerted when water quality parameters (including turbidity) in the North Fork River exceed certain thresholds, including during the time that repair work would be conducted at Paonia Reservoir.

3.3.2.2 - Sediment

CDPHE provides guidance regarding sediment and its effects on water quality in their Guidance for Implementation of Colorado's Narrative Sediment Standard Regulation #31, Section 31.11(1)(a)(i): Policy 98-1 (Policy 98-1). Deposition of sediment may form stream bottom deposits detrimental to beneficial uses of the water body. Policy 98-1 provides guidance in implementing the narrative standard to determine whether sedimentation has impaired the beneficial or classified uses of a water body (CDPHE 2014). The three components used to determine whether sedimentation has impaired the beneficial use of a water body are:

- 1) A comparison of the actual condition to the expected condition;
- 2) Determining if there is a significant departure from the expected condition, using a measurement of percent fines and/or the weighted average Tolerance Indicator Value (TIV_{sed}) for a benthic macroinvertebrate sample; and,
- 3) If indicators exceed both of the thresholds provided in the policy, a watershed review is recommended.

The North Fork Gunnison River system, even under existing conditions, is naturally high in suspended sediment. Highly erosive geologic formations produce naturally high sediment loads in the river (North Fork River Improvement Association 2010). Since its construction in 1962, Paonia Dam has reduced sedimentation in the system by trapping most of the sediment from Muddy Creek and Deep Creek that would otherwise flow downstream into the North Fork and main stem Gunnison Rivers. According to unpublished provisional data from USGS collected

from April 2013 to October 2015, the average suspended sediment concentration in Muddy Creek above Paonia Reservoir is 1,311 milligrams per liter (mg/L). USGS recorded one episode in August of 2013 where the suspended sediment concentration reached 27,300 mg/L in Muddy Creek above the reservoir. If not for the existence of Paonia Reservoir, this range of sediment concentrations would occur downstream into the North Fork Gunnison and main stem Gunnison Rivers as part of the natural sediment loading of the system.

After the unintentional release of approximately 137,105 CY of sediment from the reservoir in 2014, Reclamation reinitiated its data collection efforts with the USGS. Sediment deposition and channel morphology are being monitored through an interagency agreement between Reclamation and USGS, using repeatable cross-section surveys and pebble counts at six locations below the reservoir. The cross-sections and pebble counts assess changes in grain size distribution (percent sands) and measure embeddedness. These efforts began in the late summer/early fall of 2015. The data collected was compared to the Policy 98-1 guidance. “Sediment Region 2” referenced in Policy 98-1 is used as the expected condition for the project area, with threshold values of 7 for TIV_{sed} and 29.3% fines of <2 millimeters (mm). The fall 2015 pebble count provisional data provided by the USGS at the six sites along Muddy Creek and the North Fork Gunnison River have a fines percentage well below the thresholds and guidelines in Policy 98-1 (Figure 10 and Appendix C). Because the fines percentages are well below the thresholds, the Muddy Creek and the North Fork Gunnison River are not considered to be impaired for beneficial or classified uses, despite the 2014 large sediment release. Data collection efforts with the USGS are scheduled to continue in 2016 and 2017.

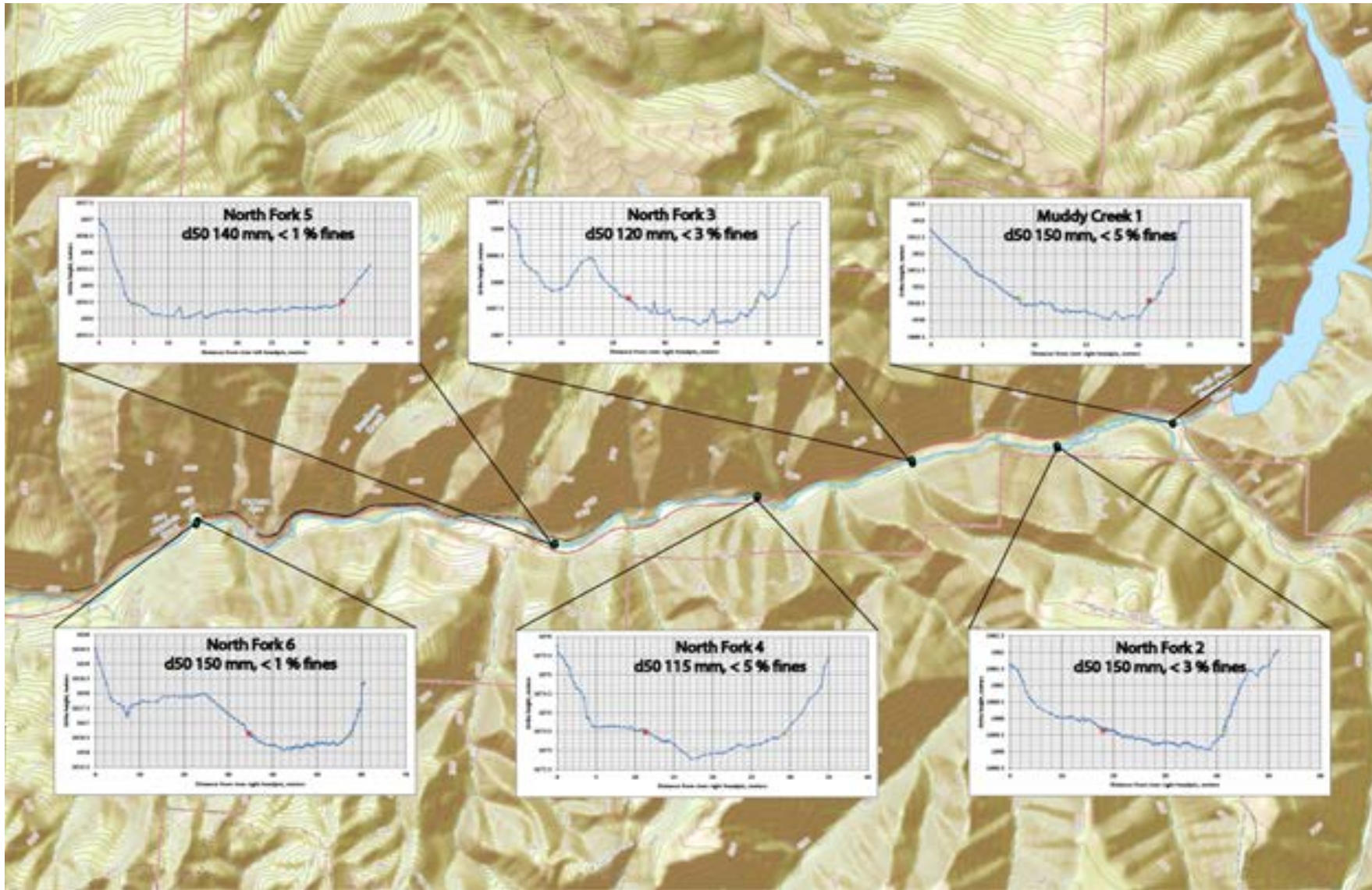


Figure 10 - Cross-Sections and Pebble Count Surveys performed by USGS in fall 2015 (provisional data). The green triangle (river left bank) and red square (river right bank) are the water surface elevation at the time of survey. Cross-sections are oriented looking upstream.

No Action Alternative: Sediment releases associated with periodic reservoir drawdown would continue to occur in order to allow for inspection of the damaged intake structure, until the outlet works become inoperable. Releases associated with reservoir drawdown activities have the potential to increase the volume of coarse (sand/gravel) and fine (silt/clay) sediment deposited downstream. Continued drawdown occurrences may result in exceedance of the CDPHE thresholds for fine sediments. If the outlet works become inoperable, the only other means of releasing water from the reservoir currently in place would be uncontrolled releases over the spillway. At that time, downstream sediment transport is expected to be greatly reduced.

Proposed Action: During implementation of the proposed action, there would be a temporary increase in suspended sediment in Muddy Creek below the dam, and in the North Fork and main stem Gunnison Rivers downstream of the Muddy/Anthracite Creek confluence. Most of the temporary coarse sediment (sand/gravel) deposits would occur in the 2,000 foot section of Muddy Creek below the dam, with lesser deposits extending downstream in the North Fork Gunnison River (Reclamation 2016C). Coarse sediment deposits would largely remain in place until high flows the following spring erode and mobilize the deposits.

The majority of sediment exiting the reservoir is comprised of fine silt and clay, and stays in suspension as wash load. Consequently, only minimal amounts of wash load material are found in the bed material (measured by pebble counts), even if the wash load dominates the total sediment load. Wash load, by definition, has little influence on the morphology of a given river system, given the river's competence in transporting wash load even at low base flows. Most of the coarse sediment (sand/gravel) would deposit upstream of the Anthracite/Muddy Creek confluence, with some coarse sediment deposits extending downstream (Reclamation 2016C and 2014 observations).

The total volume of sediment estimated that would be released from the reservoir is 45,100 CY, with levels of suspended sediment concentrations exiting the reservoir estimated to reach 7,000 mg/L initially, decreasing to 5,000 mg/L, during the reservoir drawdown and intake repair activities (Reclamation 2016C). For comparison, USGS provisional data collected in 2013-2014 for Muddy Creek below the dam, excluding the reservoir drawdown in 2014, showed an average suspended sediment concentration of 323 mg/L with an episode of elevated concentrations reaching 6,278 mg/L. In Muddy Creek upstream of the reservoir, provisional data collected by USGS from 2013-2015 showed a mean suspended sediment concentration of 1,311 mg/L, with one recorded episode of 27,300 mg/L. Based on this data, downstream concentrations of suspended sediment resulting from the proposed action would be below suspended sediment concentrations recorded in Muddy Creek upstream of the reservoir.

Suspended sediment concentrations would decrease by an average factor of 2.5 at the confluence of Muddy Creek and Anthracite Creek (Figure 11), and would be further reduced by a factor of about 10 at the North Fork Gunnison/main stem Gunnison River confluence (Reclamation 2016C). However, turbidity may still be observable farther downstream. While it is expected that a thin layer of fine sediment or wash load would deposit downstream of the dam in areas of

low enough velocity, the vast majority of wash load would continue downstream with further dilution, ultimately depositing in reservoirs or estuarine areas (Reclamation 2016C).

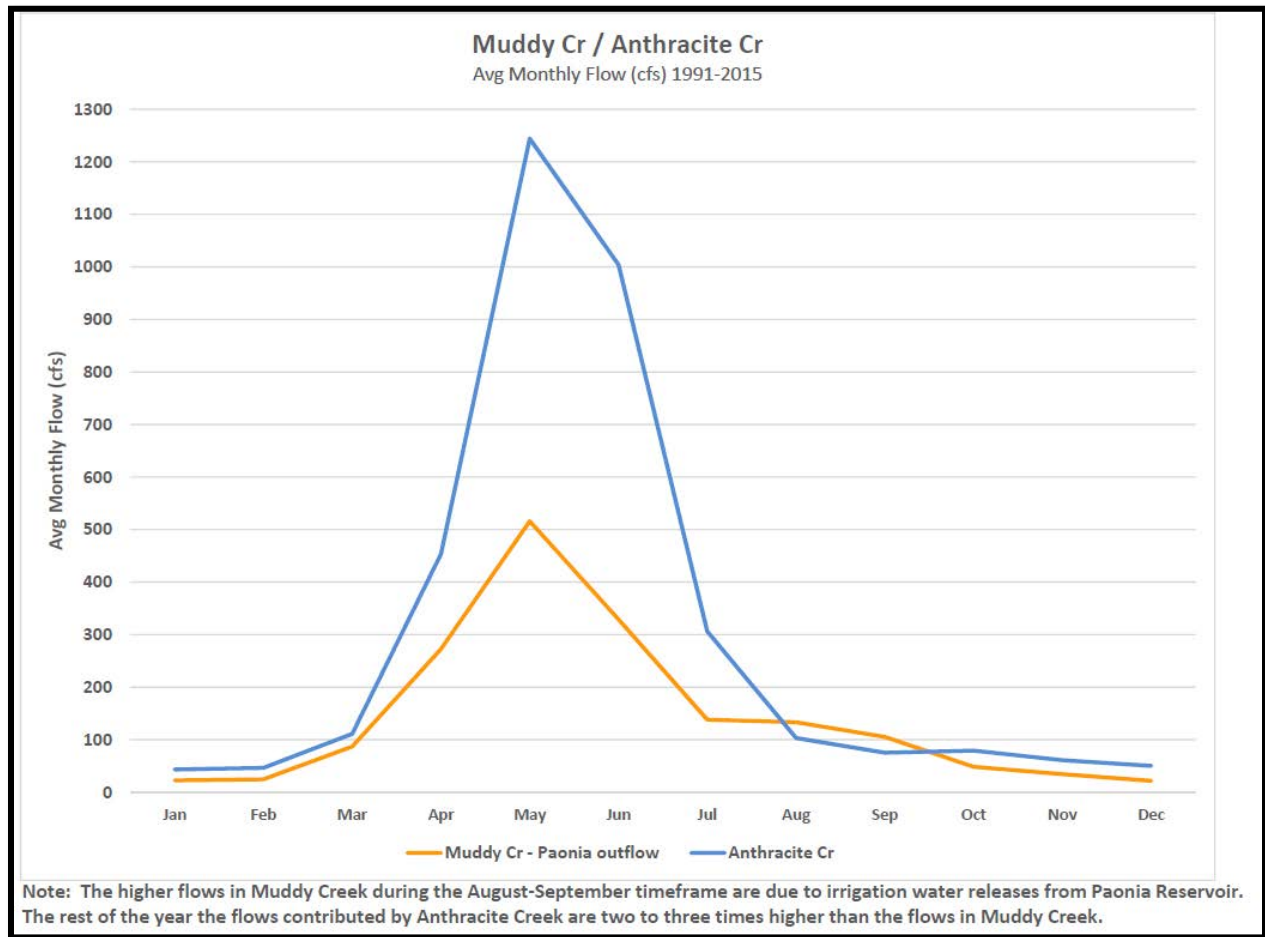


Figure 11. This graph depicts natural flows from Anthracite Creek throughout the year, along with flows in Muddy Creek due to average releases from Paonia Dam. Note that flows from Anthracite Creek are two to three times higher than the flows in Muddy Creek, with the exception of the August - September timeframe. Water from Anthracite Creek would dilute the suspended sediment concentration downstream of the Anthracite Creek/Muddy Creek confluence.

In order to transport and disperse sediment deposits in Muddy Creek and North Fork Gunnison River resulting from the proposed action, flows of sufficient magnitude and duration would be released from the dam as soon as practicable during spring runoff following implementation of the proposed action. October 2016 model results show that flows of 400 to 600 cfs over a period of about five days would transport and mobilize sediment deposits in Muddy Creek and North Fork Gunnison River resulting from the proposed action. The model results correlate well with observations from spring 2015, where flushing flows of 400 to 600 cfs from Paonia Dam were sufficient to erode the coarse sediment deposit after the fall 2014 release, and are also supported by the relatively small percentage of fine sediment present in pebble counts along the North Fork

Gunnison River in 2015. While the modeling assumed no increase in the Anthracite Creek baseflow of 60 cfs, sediment flushing would be timed to coincide with the snowmelt flows from Anthracite Creek to further boost effectiveness of dispersing coarse sediment deposits far downstream.

A controlled release of this amount creates minimal additional risk to achieving a fill at Paonia Reservoir. If storage of inflow to Paonia Reservoir occurs during the late winter and early spring months, the analysis of historic inflow data shows the reservoir typically would store enough water by the middle of April to provide for a controlled release of 600 cfs for five to seven days. This level of release is similar to the magnitude and duration of the 2015 spillway flow during the first week in May that eroded all visible sediment deposits in the Muddy Creek reach downstream of Paonia dam.

Analysis of computed mean daily inflows to Paonia Reservoir and measured mean daily releases from the dam over the period from water year 1996 through 2015 indicate initial spring runoff flow releases from Paonia Dam can be expected to exceed 400 to 600 cfs as early as March 19 and as late as May 20. Over the 20 water years analyzed, the average dates initial spring runoff flow releases exceeded 400 and 600 cfs were April 15 and April 22, respectively. Over the past 20 water years of record at Paonia dam, flow releases exceeded 400 cfs 85 percent of the time and 600 cfs 70 percent of the time.

In addition, as described in Section 3.3.1.3, maintaining a minimum pool in the reservoir during fall and winter low flow conditions would promote sediment and debris to drop out of the water column upstream of the intake structure during the interim between completion of the proposed action and implementation of a long-term sediment management alternative at the reservoir. Maintaining an 800 AF minimum pool would reduce the volume of sediment released from the reservoir during the fall and winter when flows are low.

3.3.3 – Air Quality

Air quality in the State of Colorado is regulated by the U.S. Environmental Protection Agency (EPA) and the CDPHE Air Quality Control Commission. The National Ambient Air Quality Standards (NAAQS) established by the EPA under the Clean Air Act (CAA) specify limits of air pollutants levels for several criteria pollutants: carbon monoxide, particulate matter (PM) 10, PM 2.5, ozone, sulfur dioxide, lead, and nitrogen. When an area exceeds the specified pollutant limits, that area is said to be a non-attainment area.

Air quality is generally excellent in the project area, and there are no air quality non-attainment areas in the vicinity (EPA 2016).

No Action Alternative: Under the No Action Alternative, there would be no change in air quality.

Proposed Action: Under the Proposed Action Alternative, there would be a minor, short-term effect on air quality in the immediate vicinity of the intake structure as a result of exhaust from

construction equipment. There would be no long-term impacts on air quality from the proposed action.

3.3.4 – Wetland and Riparian Resources

The Paonia Reservoir is a man-made feature that collects and stores irrigation water resources from several drainages including Muddy Creek, Williams Creek, and Deep Creek. Sediment deposition in the reservoir has provided the substrate for willows to establish in isolated areas within the reservoir, concentrated near the boat ramp and the reservoir inlet, about 2.5 miles upstream of the intake structure. Narrowleaf cottonwood (*Populus angustifolia*) and hawthorn (*Crataegus spp*) occur in isolated locations around the perimeter of the reservoir and can be found interspersed with conifers. The project area in the vicinity of the intake structure is devoid of vegetation. Releases from the reservoir provide a consistent water source to the riparian corridor downstream throughout the year with fluctuations in flow being highest in spring during snow melt runoff and lowest during fall and winter.

No Action Alternative: Sediment deposition within the Paonia Reservoir basin is an historic and ongoing occurrence. Under the No Action Alternative, sediment deposition would continue to occur within the reservoir at the current rate of approximately 100 AF per year, creating more substrate for riparian vegetation to establish within the reservoir sediments. If the outlet works fail and become inoperable, a potential consequence of the No Action Alternative, sediment deposition in the reservoir would occur at an accelerated rate.

Proposed Action: Under the Proposed Action Alternative, no direct impacts to wetland or riparian resources would occur. Sediment released downstream during implementation of the proposed action would be dispersed during high flows the following spring, and effects, if any, on downstream wetlands and riparian areas that may occur below the ordinary high water mark of the river would be minimal and short-term.

3.3.5 – Upland Vegetation

The proposed project is located within the reservoir boundary. The area surrounding the intake structure is devoid of vegetation. Vegetation surrounding the reservoir consists of mixed deciduous-coniferous forest, consisting of oak (*Quercus gambelii*), spruce (*Picea spp*), and fir (*Abies spp* and *Pseudotsuga spp*) with an understory including snowberry (*Symphoricarpos spp*) and wild rose (*Rosa spp*). The reservoir dam outside of the rock riprap and high water mark contains sparse vegetation, including: common mullein (*Verbascum Thapsus*), raspberry (*Rubus spp*), clover (*Melilotus spp*), milkweed (*Asclepias spp*), and thistle (*Cirsium spp*). Narrowleaf cottonwood (*Populus angustifolia*) and hawthorn (*Crataegus spp*) are intermixed with deciduous and coniferous species.

No Action Alternative: Under the No Action Alternative, there would be no effects to upland vegetation if the proposed project does not occur.

Proposed Action: Under the Proposed Action Alternative, no vegetation removal is proposed. Impacts to upland vegetation would be minimal and isolated to vegetation on the access roads utilized during project work.

3.3.6 – Fish and Wildlife Resources

3.3.6.1 – Terrestrial Wildlife

The habitat surrounding the reservoir is utilized by coyote (*Canis latrans*), mountain lion (*Puma concolor*), turkey (*Meleagris gallopavo*), beaver (*Castor canadensis*), bobcat (*Lynx rufus*), reptiles, birds, and a variety of small mammals. In addition, the reservoir and surrounding area are within black bear (*Ursus americanus*) summer concentration range, moose (*Alces americanus*) summer range, mule deer (*Odocoileus hermionus*) summer and winter range and elk (*Cervus elaphus*) summer and severe winter range (CPW 2016A).

No Action Alternative: Under the No Action Alternative, no impacts to terrestrial wildlife are anticipated.

Proposed Action: The project area currently experiences disturbance from boaters, campers, and other recreational users, as well as vehicles travelling on the highway. The proposed action would temporarily affect terrestrial wildlife through direct disturbance and human presence in the project area. Temporary displacement and habitat avoidance of some terrestrial species would be short-term. There would be no permanent impacts on terrestrial wildlife under the proposed action.

3.3.6.2 – Aquatic Wildlife

In 2012, Colorado Parks and Wildlife (CPW) successfully completed a chemical reclamation of the Paonia Reservoir to remove northern pike (*Esox lucius*), in order to protect native fish downstream in the Gunnison River. CPW manages Paonia Reservoir as a coldwater fishery and has stocked it annually with Rainbow Trout (*Oncorhynchus mykiss*) since the treatment in 2012. Under normal reservoir operation procedures, water is periodically drawn down in the fall to inspect the integrity of the intake structure of the reservoir's outlet works. Despite these drawdown procedures, CPW's gill netting survey in 2015 revealed the fisheries makeup in the reservoir consisted of white sucker (*Catostomus commersonii*), flannelmouth sucker (*Catostomus latipinnis*), longnose sucker (*Catostomus catostomus*), sucker hybrids, brook trout (*Salvelinus fontinalis*), and rainbow trout. These species are thought to be persisting in nearby tributaries, such as Deep Creek, or upstream in Muddy Creek during low water episodes in the reservoir.

The reservoir flows into Muddy Creek approximately 0.4 mile upstream of its confluence with Anthracite Creek; this junction creates the North Fork Gunnison River. The 0.4 mile section of Muddy Creek below the dam and above the confluence of Anthracite Creek provides marginal habitat for aquatic species, due to a relatively steep gradient, lack of in-channel habitat diversity, and high turbidity during normal reservoir operations in the fall when the water levels are typically low and contracted irrigation water is being delivered to water users and/or inflows are

being passed to meet a call on the water and comply with State water law. Anthracite Creek contains multiple sport fish species including: brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), cutthroat trout (*Oncorhynchus clarkia*), and rainbow trout (CPW 2016B). The North Fork Gunnison River has the following sport fish: brown trout and rainbow trout. In addition, CPW reports the following native fish in the North Fork Gunnison River: mottled sculpin (*Cottus bairdii*), longnose dace (*Rhinichthys cataractae*), bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*Catostomus latipinnis*), and roundtail chub (*Gila robusta*) (personal communication, Eric Gardunio, August 18, 2016).

Fish sampling conducted by CPW approximately one mile below the dam in September 2016 found viable populations of brown trout, rainbow trout, bluehead sucker, mottled sculpin and speckled dace (*Rhinichthys osculus*) (personal communication, John Alves, September 15, 2016). Based on their September 2016 fish sampling, CPW provided population estimates of: 316 brown trout per mile, 458 rainbow trout per mile, 281 bluehead sucker per mile, 20,860 mottled sculpin per mile, and 38,022 speckled dace per mile (CPW comment letter, September 21, 2016). All of these fish species, except for brook trout and brown trout, spawn during the spring and summer. No fish kills were reported during, immediately after, or at any time following the large sediment release in fall of 2014. Based on the September 2016 CPW fish sampling data, it can be inferred there is a viable macroinvertebrate population, as well.

In addition to fish, the reservoir and downstream waters harbor an assemblage of macroinvertebrates or aquatic insects. Aquatic invertebrates are aquatic animals without backbones that live on the bottom of freshwater habitats during all or part of their life cycle and that are large enough to be seen with the naked eye. Major groups of macroinvertebrates include arthropods (i.e., crustaceans and insects), mollusks, sponges and nematode worms. The most abundant are typically immature life states (larvae) of aquatic insects such as mayflies, stoneflies, and caddis flies. The benthic macroinvertebrate community or “assemblage” is largely determined by the range of habitat conditions, such as water quality, vegetation structure and bottom substrate. More complex habitats generally support a more diverse assemblage than more uniform habitats. Aquatic insects are important in the food web of many species including fish, some avian species, bats, some mammals, spiders, and amphibians.

In fall 2015, less than one year following the fall 2014 sediment release, USGS cross-section and pebble count provisional data (Figure 10 and Appendix C) showed fine sediment accumulations were well below the 29.3% fines threshold for protection of macroinvertebrates defined in the Colorado Department of Public Health and Environment Policy 98-1 for Region 2 (CDPHE 98-1), and well below the 20% guideline for salmonid spawning habitat (CDPHE 98-1). All six data collection sites were exposed to the fall 2014 sediment release (estimated at 137,105 CY).

Amphibians may also be present along waters upstream and downstream of the reservoir and the perimeter of the reservoir itself. Common species include western chorus frogs (*Pseudacris triseriata*), tiger salamanders (*Ambystoma tigrinum*), Woodhouse’s toads (*Anaxyrus woodhousii*), and American bullfrogs (*Rana catesbeiana*).

Due to numerous variables associated with suspended sediment, research literature varies widely as to its effects on salmonids. Significant suspended sediment levels have been observed to alter fish community composition from salmonid to non-salmonid fish, which better tolerate or prefer more turbid water (Gradall and Swenson 1982). Salmonids are fish in the Salmonidae family, including salmon, trout, grayling, and whitefish. Some studies have shown significant mortality of salmonids (>50 percent) at suspended sediment concentrations in the range of 500 to 6,000 mg/l (Lloyd 1987; Sigler et al. 1984). Older, larger salmonids are generally more tolerant of high suspended sediment concentrations (200 to 20,000 mg/l) than juvenile salmonids, eggs, and larvae (Sigler et al. 1984). In another study, an 85% reduction in a brown trout population was observed when exposed to suspended sediment concentrations of 5,838 mg/l for 8,670 hours. (361.25 days) (Herbert et al. 1961). Sedimentation can cause high losses of incubating eggs and fry in redds (trout spawning areas), particularly by interfering with oxygen exchange. Fine sediment deposits may also seal rubble and gravel substrates, decreasing spawning area, egg survival, emergence of fry, and hiding cover for fingerlings (Hall and Lantz 1969; Satterlund and Adams 1992). Sand, silt, and fines in the makeup of the substrate can reduce intergravel water flow, decrease intergravel dissolved oxygen concentrations, and result in high Biological Oxygen Demand (BOD) over long periods (Chamberlin 1982). A dissolved oxygen concentration of at least 11.0 mg/l is needed in the water column to maintain an intergravel dissolved oxygen concentration of at least 8.0 mg/l (EPA 1987). Sedimentation without cleansing and scouring flows can result in permanent rearing and spawning habitat changes (Platts et al. 1987). However, turbidity can be beneficial to some fish species. Fish that remain in turbid water experience a reduction in predation from fish and birds (Gregory and Levings 1998). A study done regarding the effects of turbidity on fish predation showed that prey are more active in turbid water and utilize areas in the turbid water column that would otherwise be unsafe in clear water. The results of this study show that turbid water acts as protective cover and allows fish to exist in otherwise “riskier” habitat (Gregory 1993). A laboratory study that looked at the effects of turbidity and predation by rainbow and brown trout on native chubs found that an increase in turbidity resulted in less predation (Ward et al. 2016).

The insect orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and some Trichoptera (caddisflies) (EPT taxa) are all gill breathers. These EPT taxa are less tolerant to environmental stressors than other aquatic invertebrate groups and are a major component in the trout diet. For filter-feeding invertebrates, high levels of suspended sediment can clog feeding structures, reducing feeding efficiency and therefore reducing growth rates, stressing and even killing these organisms (Hynes, 1970). Suspended sediment can affect benthic invertebrates by subjecting them to abrasion and scouring as suspended sediment being carried in the flow move over the channel bed. This can damage exposed respiratory organs or make the organism more susceptible to predation through dislodgement (Langer, 1980). A number of studies have shown that increased suspended sediment are associated with an increase in invertebrate drift (down- or up-channel migration of organism). Benthic invertebrates exposed to suspended sediment concentrations of 743 mg/L for 2400 hours showed a population reduction of 85% Wagener and LaPerriere, 1985).

No Action Alternative: Under the No Action Alternative, sediment would continue to be released downstream at rates associated with normal reservoir operations and periodic drawdown. Sediment may need to be excavated from the intake trash rack to maintain functionality of the intake. The effects of turbidity and suspended sediment on aquatic wildlife would be variable, depending on the volume of sediment and debris around the trash rack, amount of sediment excavation needed to keep the structure functional, and associated downstream sediment releases.

If repairs to the intake structure are not completed, the outlet works could become inoperable. If the outlet works become inoperable, the only way for water to exit the reservoir would be over the spillway. Under this scenario, there would no longer be drawdown procedures in the fall and the release of sediment downstream would be reduced. Aquatic species in the reservoir would no longer be impacted by low water levels in the fall. A reduction in turbidity and sediment downstream would be beneficial to sport fish and certain macroinvertebrates, but harmful to native fish and macroinvertebrate species that prefer more turbid waters. Flows below the dam would no longer be controlled and downstream flows would be reduced during the late summer to early fall months. Reduced flows have the potential to decrease available habitat for spawning and increase water temperatures. The roughly 2,000 foot section of Muddy Creek below the dam above the confluence of Anthracite Creek would be the area of greatest impact.

Proposed Action: The proposed action could affect aquatic wildlife within the reservoir from the drawdown associated with normal operations and also associated with the proposed action. Additionally, the drawdown process and proposed intake repair would release sediment downstream into Muddy Creek and the North Fork Gunnison River. The proposed action would have the greatest effect on species within the reservoir and in Muddy Creek below the dam.

Coarse sediment deposition would occur primarily in Muddy Creek above the confluence with Anthracite Creek, with lesser deposits occurring downstream in the North Fork Gunnison River. Suspended sediment concentrations exiting the reservoir would range between 5,000 to 7,000 mg/L during drawdown and construction (Reclamation 2016A, 2016C). Sediment deposition under current conditions is discussed in more detail in section 3.3.2.2.

The effect of suspended sediment on aquatic biota is dependent on several key factors. These include: concentration, duration of exposure, chemical composition, and particle-size distribution of the solids (Bilotta and Brazier, 2008). These key factors also vary between organisms, age classes, and between environments, making the applicability of research findings to the proposed action difficult to interpret. Therefore, the expected effects of the proposed action on aquatic wildlife are based on research literature, as well as the fish sampling data and pebble count provisional data discussed above.

The short-term, direct effects of the proposed action are mortality of salmonid (such as, brown trout) juveniles, eggs, and larvae due to sediment deposition, elevated suspended sediment concentrations and turbidity levels. Because the proposed action would occur during brown trout spawning season, the brown trout population in the North Fork Gunnison River is expected to

experience the greatest short-term impact. Other fish species, especially juveniles, are also expected to be negatively impacted due to elevated suspended sediment concentrations. These effects may be lessened because of the habitat and refugia provided by Anthracite Creek. The impacts would be greatest in the reservoir and Muddy Creek below the reservoir to the confluence of Anthracite Creek, decreasing downstream as suspended sediment concentrations are further diluted. Suspended sediment concentrations and turbidity levels would temporarily increase again during spring high flows. Habitat conditions are expected to recover after flushing flows in the spring, allowing for recovery of fish populations as soon as one or two breeding seasons following the proposed action.

Suspended sediment and coarse sediment deposition associated with the proposed action would cause temporary, adverse effects to other aquatic biota, including gill breathing aquatic macroinvertebrates, such as mayflies, stoneflies and caddisflies. The greatest adverse effects are expected within Muddy Creek, with decreasing effects farther downstream as sediment concentrations are further diluted.

Aquatic insect abundance is expected to recover quickly through drift and immigration of adults from tributaries and non-impacted downstream reaches, and from life stages of existing bugs not in a gill breathing life stage. Nearby tributary streams, springs, and seeps, also provide habitat and would serve as sources for recolonization. As a result, no taxa are expected to be lost, and re-establishment is expected to occur within a few months following high flows, resulting in temporary, short-term impacts.

Short-term, indirect impacts on amphibians include the temporary reduction in prey species (e.g., aquatic insects) from sedimentation, and increased turbidity and suspended sediment.

Based on the above information, USGS' 2015 provisional cross-section and pebble count data, and the existence of a viable fish population one mile downstream of the dam, it is expected that any adverse effects on aquatic wildlife would be of short duration. The release of flushing flows as early as practicable during the spring following completion of the proposed action is expected to mitigate short-term effects.

3.3.7 – Special Status Species

3.3.7.1 – Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973 protects federally listed endangered, threatened and candidate plant and animal species and their critical habitats. Table 4 summarizes the federally-listed species that may occur within or near the project area (FWS 2016) and explains habitat requirements and potential effects of the proposed action on each species. Species with suitable habitat in the proposed action area, or otherwise potentially affected by the proposed action, are discussed following Table 4. Unless otherwise specified, all information related to the species below was obtained from resources available on FWS' Environmental Conservation Online System (ecos.fws.gov).

Table 4. Federally-listed species occurring in or near the proposed action area.

Common Name	Status	General Habitat
Bonytail Chub (<i>Gila elegans</i>)	Endangered	Although no habitat is present within the project area, there is downstream designated critical habitat on the Gunnison and Colorado Rivers.
Canada Lynx (<i>Lynx canadensis</i>)	Threatened	Moist boreal forests with cold, snowing winters and a high-density snowshoe hare prey base.
Colorado Pikeminnow (<i>Ptychocheilus lucius</i>)	Endangered	Although no habitat is present within the project area, there is downstream designated critical habitat on the Gunnison and Colorado Rivers.
Greenback Cutthroat Trout (<i>Oncorhynchus clarki stomias</i>)	Threatened	High elevation cold water streams and cold water lakes with adequate stream spawning habitat present during spring.
Humpback Chub (<i>Gila cypha</i>)	Endangered	Although no habitat is present within the project area, there is downstream designated critical habitat on the Gunnison and Colorado Rivers.
Razorback Sucker (<i>Xyrauchen texanus</i>)	Endangered	Although no habitat is present within the project area, there is downstream designated critical habitat on the Gunnison and Colorado Rivers.
Yellow-Billed Cuckoo (<i>Coccyzus americanus</i>)	Threatened	Breeds in low elevation river corridors with fairly extensive mature cottonwood galleries with dense shrub understory.

The endangered bonytail, Colorado pikeminnow, humpback chub, and razorback sucker are found in the Gunnison and Colorado Rivers downstream from the project area, and are influenced by water use activities in the basin that affect both the quantity of flows and quality of water. Designated critical habitat for the Colorado pikeminnow and razorback sucker occurs downstream at the confluence of the Gunnison and Uncompahgre Rivers (approximately 55 aerial miles west of the project area), and designated critical habitat for the bonytail and humpback chub occurs downstream of Fruita, Colorado (approximately 112 aerial miles west of the project area). In accordance with Section 7 of the ESA, as amended (16 U.S. C. 1531 et seq.), and the Interagency Cooperation regulations (50 CFR 402), the U.S. Fish and Wildlife Service issued a Programmatic Biological Opinion (PBO) for the Gunnison River and effects on the four endangered Colorado River fishes and their critical habitats (FWS 2009). Consultation for the Gunnison River Basin included the continued operations and depletions associated with existing Reclamation projects, including the Paonia Project, other Federal projects, and existing non-federal water depletions.

The Canada Lynx habitat can generally be described as moist boreal forests that have cold, snowy winters and a high-density snowshoe hare prey base. The predominant vegetation of

boreal forest is conifer trees, primarily species of spruce (*Picea spp.*) and fir (*Abies spp.*). The project area is approximately 150 miles west of the nearest designated critical habitat.

Greenback cutthroat trout inhabit cold water streams and cold water lakes which have adequate spawning habitat present during the spring. There is no suitable habitat within the project area. The upper portions of Deep Creek have cutthroat trout but access to the project area is prevented by a fish barrier. There is no designated or proposed critical habitat listed for this species.

The preferred breeding habitat of the yellow-billed cuckoo is low elevation old-growth cottonwood forests or woodlands with dense, scrubby understories of willows or other riparian shrubs. There is no potential habitat within the project area. The project area is approximately 13 miles east of the nearest proposed critical habitat.

No Action Alternative: Under the No Action Alternative, there would be no effect to any threatened, endangered, or candidate species or their designated or proposed critical habitat.

Proposed Action: There is no critical habitat or suitable habitat within the project area; therefore, no federally-listed species are expected to occur in the project area. The proposed action would have no effect on any federally threatened, endangered, or candidate species or their designated or proposed critical habitat.

3.3.7.2 – Migratory Birds

The Migratory Bird Treaty Act of 1981 (MBTA) prohibits the take, capture, or killing of any migratory birds, and any parts, nests, or eggs of any such birds [16 U.S.C. 703 (a)]. Under the MBTA, Federal agencies are liable for both intentional and unintentional take of migratory birds.

The 1988 amendment to the Fish and Wildlife Conservation Act mandates the USFWS to “identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973.” The “*Birds of Conservation Concern 2008*” (FWS 2008) is the most recent effort to carry out this mandate. The conservation concerns are the result of population declines - natural or human-caused, small ranges or population sizes, threats to habitat, or other factors.

Although there are general patterns that can be inferred, there is no single reason why any species is included on the Birds of Conservation Concern list. Habitat loss is believed to be the major reason for the decline of many species. When considering potential impacts to migratory birds, the degree of impact on habitat must be taken into account, including:

- 1) the degree of fragmentation/connectivity expected from the proposed project relative to before the proposed project; and
- 2) the fragmentation/connectivity within and between habitat types (e.g., within nesting habitat or between nesting and feeding habitats).

Continued private land development, surface disturbing activities in key habitats (e.g. riparian areas) and the proliferation of roads, pipelines, power lines and trails are local factors that can reduce habitat quality and quantity for many species.

The project area is within the Southern Rockies/Colorado Plateau Bird Conservation Region (BCR). The habitat around the Paonia Reservoir consists of a mixed coniferous and montane riparian forest. Within the reservoir boundary there is a narrow willow dominated area around the boat ramp and at the inlet of the reservoir. Migratory birds of conservation concern that have suitable habitat or are known to occur in the area include: Bald Eagle (*Haliaeetus leucocephalus*), Peregrine Falcon (*Falco peregrines*), Cassin's Finch (*Carpodacus cassinii*), Lewis's Woodpecker (*Melanerpes lewis*), Veery (*Catharus fuscescens*), and Willow Flycatcher (*Empidonax traillii*). Cassin's Finch and Lewis's Woodpecker are associated with mixed coniferous woodland habitats. Bald Eagles, Veery, Peregrine Falcon, and Willow Flycatchers are associated with riparian areas near streams, reservoirs, and other bodies of water. According to the CPW Species Account Map, the Paonia Reservoir is within Bald Eagle winter and winter forage range; the nearest roost site is over 9 miles from the project area (CPW 2016A). The nearest potential Peregrine Falcon nest is 4 miles away and 8 miles from an active nesting area. With the exclusion of the Bald Eagle, Peregrine Falcon, and Veery, these species' populations are considered to either be secure or apparently secure in Colorado (Natureserve 2016). The Veery population in Colorado is vulnerable, the Peregrine Falcon population is imperiled, and the Bald Eagle population is critically imperiled (Natureserve 2016).

No Action Alternative: Under the No Action Alternative, no direct disturbance to migratory birds from construction activities would take place. Downstream sediment deposition has the potential to negatively affect certain migratory bird prey species and habitat due to sediment flushing from normal reservoir operations.

Proposed Action: The proposed action does not require the removal of vegetation. In addition, the timing of project work is planned for October and November, which is outside of migratory bird breeding season. Migratory birds may experience short-term disturbance and displacement during construction activities. Downstream sediment deposition has the potential to temporarily reduce migratory bird prey species, such as benthic invertebrate species and non-native fish. There would be no permanent or long-term effects on migratory birds as a result of the proposed action.

3.3.8 – Recreation

Paonia Reservoir is within Paonia State Park, which has been administered by CPW since 1965. The park offers recreational opportunities such as waterskiing, fishing, boating, camping, sightseeing, and picnicking. There are two separate campgrounds in the park: Spruce Campground, located next to Highway 133, and Hawsapple Campground, located across the river. Both campgrounds are located over 3 miles from the project area. Boating is allowed from mid-June until mid-August. There are no hiking trails at the park. Fishing in the reservoir is best from mid-June to mid-August; no ice fishing is allowed. CPW stocks the reservoir with rainbow

trout annually. Streams below the reservoir provide for better fly fishing opportunities than at the reservoir; however public access to Muddy Creek approximately 1,050 feet downstream from the dam is prohibited, and access to the river farther downstream from the reservoir is limited due to private landownership. Gold Medal fishing waters are located approximately 35 miles downstream of the project on the main stem of the Gunnison River.

No Action Alternative: Under the No Action Alternative, low flows and sediment releases associated with normal reservoir operations and periodic drawdown procedures would continue to occur. The low flows, turbidity and suspended sediment would continue to impact recreational opportunities, such as fishing. Any additional turbidity that may be generated from and associated with repair maintenance activities would not be released downstream. There would be no additional effects to recreation. If the reservoir outlet structure becomes inoperable, the reservoir would remain full which offers improved sightseeing opportunities. The amount of sediment released downstream would be greatly reduced, improving the recreational fishing experiences below the dam in the North Fork Gunnison River.

Proposed Action: The timing of the construction activities is outside the allowed boating times at the reservoir and would, therefore, have no effect on boating opportunities. The release of sediment downstream due to drawdown and construction activities would adversely affect late fall fishing opportunities below the dam and on the North Fork Gunnison River. Prior to any repairs, appropriate notifications would be implemented regarding the planned activities, including notifying local fishing shops and fishing websites. Notifications may include signing, press releases, and/or other public announcements to inform the public about planned activities. Notifications would alert recreationists as to dates the activities would occur. Turbidity below the dam is associated with normal reservoir drawdown operations, and the impacts to recreation associated directly with repairs are expected to be similar to normal operations. Since the reservoir is long and narrow, there is no direct line of sight to the project area from the campgrounds, and therefore it is not anticipated that the proposed action would impede camping or sightseeing opportunities at the park. Noise associated with project work would be temporary and limited to daylight hours and is anticipated to have minimal effects to recreationists. The annual stocking of rainbow trout would not be affected, but fishing within the reservoir would be temporarily impacted from the drawdown and construction work and would last until stocking occurs again. Gold Medal fishing waters would not be impacted by this project.

During the interim between the proposed action and implementation of a long-term sediment management alternative, an 800 AF minimum pool would be maintained in the reservoir during low flow periods of fall and winter, except for instances where reservoir drawdown is required for dam safety or maintenance purposes. An 800 AF pool correlates to a water surface elevation of 6,385 feet. Recreational facilities at Paonia Reservoir, including the boat ramp and campground, are located at least 1,200 feet upstream of the high water mark when the reservoir is held at 6,385 feet. Sediment and debris which drop out of the water at this elevation would have no effect on recreational facilities at Paonia Reservoir.

3.3.9 –Social, Economic, Environmental Justice

Executive Order 12898 on Environmental Justice provides that Federal agencies analyze programs to assure that they do not disproportionately adversely affect minority or low income populations or Indian Tribes.

Paonia Reservoir is located in Gunnison County, Colorado and provides full and supplemental irrigation water supplies for 15,300 acres of land in the vicinity of Paonia and Hotchkiss. Paonia and Hotchkiss are both small towns located in Delta County of western Colorado. According to the 2010 U.S. Census Bureau statistics, the population for this area is 3,792. Minorities make up 12% of the population (EPA 2016). The Center for Disease Control reports that 15.1% of residents in Delta County live below the poverty line which is slightly higher than the 12.9% average for the state (CDC 2016). In 2014, the Colorado Department of Local Affairs reported that agriculture employed roughly 11% of the residents in Delta County, surpassed only by government which makes up approximately 19% of the work force (DOLA 2016).

No Action Alternative: Under the No Action Alternative, there would be no adverse human health or environmental effects on minority or low-income populations. If the reservoir becomes inoperable, there would be negative impacts to the agricultural community, which represents one of the larger employers in Delta County.

Proposed Action: Repairs to the outlet works of the reservoir would help continue water delivery to 15,300 acres of agricultural land the reservoir serves. The proposed action would not involve any relocations, health hazards, hazardous waste, property takings, or substantial economic impacts. The project would not have disproportionately high or adverse human health or environmental effects on minority or low-income populations or Indian Tribes.

3.3.10 – Public Safety, Access, and Transportation

The major transportation route in the general vicinity of the project area is U.S. Highway 133. The Colorado Department of Transportation applies restrictions on Extra Large Vehicles or Loads on certain portions of highway. There are no such restrictions on Highway 133 or Highway 50 between Grand Junction, Colorado, and its junction with Highway 133. There are two existing access roads to the project area (figure 6, above). The access roads are located on Reclamation land.

No Action Alternative: Under the No Action Alternative, there would be no change in public safety, access, and transportation.

Proposed Action: Equipment necessary for project implementation include a long-reach excavator, ATV, tracked skid loader, and a mini excavator. This equipment would be hauled in from Grand Junction along Highway 50 and Highway 133, and hauled away along the same route. Equipment would be staged at the project area during the repair work; therefore, there would be minimal effects to transportation associated with equipment hauling on and off-site and construction personnel's vehicles. The equipment would be stored on Reclamation land in the

project area during the repair work. The project area is behind two locked gates, and the public would not have access to the equipment or construction area. There would be no effects on public safety as a result of implementation of the proposed action.

Access possibilities include entering the project site with small vehicles on the existing road on top of the dam, and entering the project site with the long-reach excavator via an existing road along the south side of Muddy Creek. Vehicles would need to utilize approximately 0.3 miles of County Road 12, including transporting equipment across the County Road 12 Bridge over Muddy Creek, to access the southern access road. The bridge is a county road bridge, and meets the standard HS20 rating; therefore, the bridge is equipped to withstand the weight of the long-reach excavator. The long-reach excavator would be unloaded directly onto the southern access road to ensure the metal tracks of the excavator do not travel across the paved roadway. The long-reach excavator would access the work area along the rock/sediment interface at the toe of the dam. This route would also be used by ATVs to deliver construction materials to the project site. There would be no construction of new access routes or impacts to existing access routes as a result of implementation of the proposed action.

3.3.11 – Cultural Resources

Cultural resources are defined as physical or other expressions of human activity or occupation. Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to take into account the potential effects of a proposed Federal undertaking on historic properties. Historic properties are any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP).

The affected environment for cultural resources is identified as the area of potential effect (APE) in compliance with the regulations in Section 106 of the NHPA (36 CFR 800.16). The APE is defined as the geographic area within which Federal actions may directly or indirectly cause alterations in the character or use of historic properties. The APE for the proposed action encompasses the area of potential ground disturbance associated with the intake structure repair, including all staging areas and access routes.

In accordance with 36 CFR 800.4, the site was evaluated for significance in terms of NRHP eligibility. The significance criteria applied to evaluate cultural resources are defined in 36 CFR 60.4 as the quality of significance in American history, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- A. that are associated with events that have made a significant contribution to the broad patterns of our history; or
- B. that are associated with the lives of persons significant in our past; or
- C. that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a

significant and distinguishable entity whose components may lack individual distinction;
or

D. that have yielded, or may be likely to yield, information important in prehistory or history.

Paonia Dam, recorded as Colorado Site 5GN1334, was determined eligible for the NRHP under Criteria A and C, as a result of consultation with the Colorado State Historic Preservation Officer (SHPO) completed in 2016. Site 5GN1334 consists of the dam embankment, outlet works, spillway, and the intake structure for the outlet.

No Action Alternative: Under the No Action Alternative, there would be no effect to eligible cultural resources.

Proposed Action: Reclamation has determined that the dismantling and modification of the intake structure is an adverse effect to a historic property under 36 CFR 800.5. Reclamation has entered into a Memorandum of Agreement (MOA) with the SHPO for resolution of adverse effects to the Paonia Dam intake structure (Appendix A).

3.3.12 – Indian Trust Assets and American Indian Sacred Sites

Indian Trust Assets (ITAs) are legal interests in property held by the United States for Indian Tribes or individuals. Reclamation and other Federal agencies share the responsibility to protect these assets. In managing Federal lands, Federal agencies must, to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions, accommodate access to and ceremonial use of American Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites. No ITAs have been identified within the project area. No American Indian Sacred Sites are known within the project area.

No Action Alternative: Under the No Action Alternative, there would be no change to ITAs or American Indian Sacred Sites.

Proposed Action: The proposed action would not impact ITAs or American Indian Sacred Sites.

3.4 – Cumulative Impacts

NEPA requires federal agencies to consider the cumulative effects of proposals under their review. Cumulative effects are defined in the Council on Environmental Quality (CEQ) regulations 40 CFR §1508.7 as “...the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency...or person undertakes such other actions.” The CEQ states that the “cumulative effects analyses should be conducted on the scale of human communities, landscapes, watersheds, or airsheds” using the concept of “project impact zone” or more simply put, the area that might be affected by the proposed action.

The general cumulative impacts analysis area is defined as Paonia Reservoir, Muddy Creek below the Paonia Dam, and the North Fork Gunnison River. Past, present and reasonably foreseeable future actions within the analysis area that affect and are affected by river-related resources in the area include irrigation, mining, fishing and other recreational activities, residential and commercial development, and municipal water use.

The proposed action involves limited disturbance and impacts in the form of an increase in suspended sediment, turbidity, and sediment deposition in Muddy Creek and in the North Fork Gunnison River. Impacts would be short-term during construction and until high flows disperse sediment deposits the following spring. Given the short duration and limited effects associated with the repair work, no cumulative impacts are anticipated from the proposed action when added to other actions already occurring and expected to continue to occur within the cumulative impacts analysis area.

Sediment releases from Paonia Reservoir associated with ongoing reservoir operations are outside the scope of the proposed action. However, in an effort to address concerns about future episodes of large sediment releases during low-flow periods, a minimum pool would be maintained in the reservoir as an interim mitigating measure until a long-term sediment management alternative is implemented. As an interim mitigation measure, Reclamation, in cooperation with NFWCD, would ensure that a minimum of 800 AF of water would be kept in the reservoir during normal reservoir operations in the low flow periods of fall and winter, except for instances where reservoir drawdown is required for dam safety and maintenance purposes. Under existing conditions, an 800 AF pool of water equates to an elevation of 6,385 feet, which is 16.5 feet higher than the top of the intake trash rack. Maintaining a minimum pool in the reservoir would allow sediment and debris to deposit farther upstream in the reservoir, reducing the accumulation of sediment and debris against the intake tower, thereby reducing the amount of sediment released downstream of the Dam during normal operations. Maintaining an 800 AF pool in the fall and winter would not affect the delivery of water. Annual coordination would be conducted with the USACE regarding deviations from the Paonia Dam flood control directive.

3.5 – Summary

Table 5 provides a summary of environmental consequences for the resources evaluated in this EA. Resource impacts are outlined for both the No Action and the Proposed Action Alternatives. Mitigation, if required, is also described.

Table 5. Summary of Impacts for the No Action and Proposed Action Alternatives.

Resource	Impacts: No Action Alternative	Impacts: Proposed Action Alternative
Water Resources	Downstream water deliveries would continue to be made until the intake structure becomes inoperable, at which time delivery of water would no longer occur through the dam's outlet works and would only occur when the reservoir spills.	The proposed intake repair would allow the outlet works to remain functional, and thus maintain the existing reliable water source in the North Fork Gunnison River. Irrigators with micro-jet or drip systems may choose to not pump from the river during spring flushing flows, or they may have to conduct maintenance activities on their system due to having micro-jet or drip technologies on a heavy sediment system. Oxbow Mine may have to temporarily shut off their pump which provides drinking water to the Town of Somerset if the river's sediment load becomes too high during drawdown and construction. Except where drawdown would be required for dam safety or maintenance purposes, Paonia Reservoir would be operated to maintain an 800 AF minimum pool during low flow periods of fall and winter in the interim between completion of the proposed action and implementation of a long-term sediment management alternative.
Water Quality	Downstream water quality would continue to be impacted when the reservoir is drawn down.	Temporary increases in turbidity would have a short term effect on the cold water aquatic habitat and recreational water classification uses. Most of the coarse sediment (sand/gravel) deposits would occur in the 2,000 foot section of Muddy Creek below the dam, with lesser deposits extending downstream in the North Fork Gunnison River. The majority of released sediments would advect downstream as wash load, exiting the reservoir at a range from 5,000 to 7,000 mg/L, with concentrations being reduced as the wash load travels farther downstream due to diluting effects of tributaries. Flushing flows of 600 cfs over a period of approximately five days would be released as soon as possible in the spring following completion of the proposed action to transport sediment deposits downstream. There would be no long-term effect to water quality.
Air Quality	No Effect	Minor short-term impacts due to equipment exhaust from construction activities.

Resource	Impacts: No Action Alternative	Impacts: Proposed Action Alternative
Wetland and Riparian Resources	<p>Sediment deposition would continue to occur within the reservoir at the current rate of approximately 100 AF per year, creating more substrate for riparian and wetland vegetation. Sediment releases from the reservoir would continue to occur during normal reservoir operations and drawdown. If the outlet works fail, the rate of sediment deposition within the reservoir would accelerate, and the release of sediment from the reservoir would be reduced.</p>	<p>Any sediment released as a result of the proposed action would be scoured during high flows the following spring, and effects, if any, on downstream wetlands and riparian areas that may occur below the ordinary high water mark of the river would be minimal and short-term.</p>
Upland Vegetation	No Effect	<p>Impacts to upland vegetation would be minimal and limited to vehicles and equipment driving over vegetation on the existing access roads utilized during project work.</p>

Resource	Impacts: No Action Alternative	Impacts: Proposed Action Alternative
Fish and Wildlife Resources	Increased turbidity and suspended sediments and associated impacts to fish and wildlife resources would continue to occur downstream of the reservoir in Muddy Creek and the North Fork Gunnison River during reservoir drawdown until the outlet works become inoperable. After the outlet works are inoperable, turbidity and suspended sediment levels attributable to releases from Paonia Reservoir would decrease, and adverse effects to fish and wildlife resources caused by sediment releases would be less extensive and of shorter duration.	Temporary, short-term effects may occur to terrestrial wildlife through direct disturbance from human presence in the project area. Temporary, short-term effects would occur to aquatic wildlife, with the greatest adverse effects occurring in the 2000' reach of Muddy Creek below the dam. Aquatic species that breed and reproduce in Muddy Creek below the dam and in the North Fork Gunnison River during the October-November timeframe, such as brown trout, would experience short-term adverse effects during the proposed action. Increased suspended sediment would temporarily adversely affect aquatic biota, including gill breathing aquatic invertebrates, and benthic invertebrates due to abrasion and scouring. Sediment deposition would also temporarily adversely affect benthic macroinvertebrates. There would be potential indirect, temporary impacts on amphibians due to reduction in prey, and increased turbidity and suspended sediment.
Special Status Species	No Effect to Threatened and Endangered Species. No direct disturbance to migratory birds from construction activity. Downstream sediment deposition has the potential to negatively affect certain migratory bird prey species and habitat due to sediment flushing from normal reservoir operations.	No Effect to Threatened and Endangered Species. Migratory birds may experience short-term disturbance and displacement during construction activities. Downstream sediment deposition has the potential to temporarily negatively affect migratory bird prey species, such as benthic invertebrates and fish.
Recreation	No change from existing operation.	No effect on boating and camping at Paonia Reservoir. Temporary adverse effects to fishing within the reservoir and downstream of the dam, although public access is limited in this area. No long-term effects to recreation.

Resource	Impacts: No Action Alternative	Impacts: Proposed Action Alternative
Social, Economic, Environmental Justice	No Effect	No Effect
Public Safety, Access, and Transportation	No Effect	No Effect
Cultural Resources	No Effect	There would be an adverse effect to the intake structure, which is a component to the NRHP-eligible Paonia Dam. Reclamation has entered into an MOA with the SHPO and NFWCD to mitigate the adverse effect.
Indian Trust Assets and American Indian Sacred Sites	No Effect	No Effect
Cumulative Impacts	n/a	Given the short duration and limited effects associated with repair work as proposed, as well as the mitigative measure of maintaining 800 AF within Paonia Reservoir to promote sediment and debris to drop out of the water column upstream of the intake structure, no cumulative impacts are anticipated from the proposed action when added to other actions already occurring and expected to continue to occur within the cumulative impacts analysis area.

CHAPTER 4 – ENVIRONMENTAL COMMITMENTS

The following measures would be implemented by Reclamation and the NFWCD if the proposed action is implemented.

- Existing roads will be used to access the construction and staging areas. Heavy equipment will access the construction area along the rock/sediment interface of the reservoir. No new roads will be constructed.
- All construction equipment will be power-washed and free of soil and debris prior to entering the project site to reduce the spread of noxious and invasive weeds.
- To minimize noise impacts near the construction area, construction activities will occur during the daylight hours.
- The public will be notified of construction dates prior to construction via a distribution letter, press releases to local newspapers, and informative flyers sent to fly fishing shops and commercial outfitters.

- Concrete removed from the bulkhead will be taken to an existing landfill for disposal.
- Stipulations in the Memorandum of Agreement with the SHPO are incorporated by reference.
- If previously undiscovered cultural or paleontological resources are discovered during construction, construction activities must immediately cease in the vicinity of the discovery and Reclamation must be notified. The SHPO will be consulted, and work will not be resumed until consultation has been completed, as outlined in the Unanticipated Discovery Plan in the attached MOA.
- Terms and conditions outlined in the CWA Section 404 permit are incorporated by reference.
- In the event that threatened or endangered species are discovered during construction, construction activities will halt until consultation is completed with the U.S. Fish and Wildlife Service and protection measures are implemented.
- Flushing flows of 600 cfs would be released from Paonia Dam for a sufficient period of time (estimated to be five days) during the spring following completion of the proposed action in order to transport and disperse downstream sediment deposits resulting from the proposed action. This release would be timed to coincide with snowmelt flows in Anthracite Creek to further boost the effectiveness of dispersing sediment deposits downstream.
- Reclamation, in cooperation with NFWCD, would ensure that a minimum of 800 AF of water is kept in Paonia Reservoir during normal reservoir operations during low flow periods of fall and winter, except for instances where reservoir drawdown is required for dam safety or maintenance purposes, during the interim between completion of the proposed action and implementation of a long-term sediment management alternative. Under existing conditions, an 800 AF pool of water equates to an elevation of 6,385 feet, which is 16.5 feet higher than the top of the intake trash rack. Maintaining a minimum pool in the reservoir would promote sediment and debris deposition farther upstream in the reservoir, reducing the accumulation of sediment and debris against the intake tower, and thereby reducing the amount of sediment released downstream of the dam during normal operations.

CHAPTER 5 – CONSULTATION AND COORDINATION

5.1 – Introduction

Reclamation’s public involvement process presents the public with opportunities to obtain information about a given project, and allows interested parties to participate in the project

through written comments. The key objective is to create and maintain a well-informed, active public that assists decision makers throughout the process, culminating in the implementation of an alternative. This chapter discusses public involvement activities taken to date for the proposed action.

5.2 – Public Involvement

News Releases announced the availability of the EA and draft FONSI, and the documents were placed on Reclamation’s website at: www.usbr.gov/uc/ under environmental documents. The EA and draft FONSI were also announced with request for comments in a distribution letter mailed to agencies, downstream ditch companies, stakeholders, and landowners adjacent to Muddy Creek and the North Fork Gunnison River from Paonia Dam down to Hotchkiss, Colorado, as shown below:

- State Representative Jared Polis
- State Representative Ken Buck
- State Representative Mike Coffman
- State Representative Diana DeGette
- State Representative Ed Perlmutter
- State Representative Scott Tipton
- State Representative Doug Lamborn
- State Senator Cory Gardner
- State Senator Michael Bennet
- U.S. Fish and Wildlife Service, Grand Junction, CO
- U.S. Army Corps of Engineers, Grand Junction, CO
- U.S. Geological Survey, Grand Junction, CO
- U.S. Forest Service, Gunnison, CO
- Natural Resources Conservation Service, Gunnison, CO
- Colorado Department of Public Health and Environment, Denver, CO
- Colorado Historical Society, Denver, CO
- Colorado Parks and Wildlife, Gunnison & Crawford, CO
- Colorado Water Conservation Board, Denver, CO
- Colorado River Water Conservation District, Glenwood Springs, CO
- Gunnison County Commissioners, Gunnison, CO
- Gunnison County Planning Commission, Gunnison, CO
- Gunnison County Road & Bridge, Marble, CO
- Town of Paonia, CO
- Town of Hotchkiss, CO
- Western Slope Conservation Center, Paonia, CO
- Trout Unlimited, Denver, CO
- Delta Conservation District, Delta, CO
- West Elk Mine, Somerset, CO
- Oxbow Mine - Somerset Water Supply, Somerset, CO

- Fire Mountain Canal & Reservoir Company, Hotchkiss, CO
- North Fork Water Conservancy District, Hotchkiss, CO
- 144 Interested Parties and Adjacent Landowners

In addition, a website has been developed for the public to find information about the upcoming repair work and/or sedimentation issues at Paonia Reservoir. The website can be accessed at: <http://www.usbr.gov/uc/wca/progact/paonia/index.html>. The public will be notified of the availability of the website through a distribution letter, press release and fliers to be provided to guide and fishing shops in the area.

5.3 – Colorado State Historic Preservation Office

Reclamation submitted a consultation letter to the SHPO on August 24, 2016, with a determination of historic properties affected by the proposed action. SHPO concurred on the finding of adverse effect. Reclamation, the NFWCD, and the SHPO have entered into an MOA to mitigate adverse effects to historic properties as a result of the proposed action.

5.4 – U.S. Army Corps of Engineers

Reclamation and NFWCD have held several meetings with the USACE before and during the USACE's review of the pre-construction notification (PCN) for a Nationwide Permit (NWP) No. 3-Maintenance submitted to USACE on September 6, 2016. Pursuant to Section 404 of the Clean Water Act, a permit is required because the proposed action would result in an unavoidable discharge of dredged material to waters of the United States. The proposed action would commence after issuance of a permit by the USACE.

5.5 – Colorado Parks and Wildlife

Reclamation accessed Colorado Parks and Wildlife (CPW) websites to acquire species activity data for the project area. Multiple personal communications with the Area Aquatic Biologist (Eric Gardunio) occurred to document the occurrence and status of fish populations, management strategies for Paonia State Park fisheries, and effects to aquatic species. Reclamation continues to coordinate with CPW regarding potential effects on fish populations, and results of CPW's fish sampling downstream of the dam.

5.6 - U.S. Geological Survey

Through an interagency agreement between Reclamation and the USGS, USGS is monitoring incoming and outgoing sediment loads, conducting pebble counts and cross-section surveys, and collecting water quality samples. The sediment released by implementation of the proposed action would provide USGS with a unique opportunity to collect data on large sediment releases downstream of Paonia Reservoir. The data would inform fate and transport modeling of

sediments released from Paonia Reservoir associated with the proposed action and any potential long-term sediment management strategies.

5.7 – EA Comments

An EA and Draft FONSI was released for public comment and review on September 6, 2016, and comments from the general public were accepted up to and through September 22, 2016. During the comment period, Reclamation received six responses (Appendix B). Following are responses to comments received on the Draft EA:

5.7.1 – Andrew T Thliveris

Comment 1:

Many orchards rely on sand media filtration to remove sediment allowing water clean enough to not plug micro-jet or drip systems. These systems were designed to handle sediment loads in the North Fork PRIOR to 2014 when spring sediment removal drawdown of the Paonia reservoir was implemented. This has caused issues with our micro-jet sprinkler system, essentially rendering it non-functional. High sediment loads plug these systems and are extremely hard on pump bearings.

Response 1:

The proposed action analyzed in this EA is repair of the intake structure. Repair of the intake structure is needed to maintain the functionality of the dam outlet works and continue the delivery of irrigation water to downstream users. Spring drawdown is part of normal reservoir operations, and was implemented at Paonia Reservoir prior to 2014. The year 2014 is discussed in this EA because it was the year there was an unanticipated, large release of sediment downstream of the reservoir during emergency maintenance activities. Analysis of potential downstream effects of normal reservoir operations is outside the scope of this EA.

The North Fork Gunnison River watershed system is naturally high in suspended sediment. Since its construction in 1962, Paonia Reservoir has trapped sediment from Muddy Creek and created artificially lower sediment conditions in the North Fork Gunnison River. Because the reservoir is filling with sediment and losing storage capacity, potential alternatives for long-term management of sedimentation at Paonia Reservoir, including operational and physical strategies, are currently being studied. An evaluation of the environmental effects of potential long-term sedimentation management alternatives will be conducted. Coordination with agencies, stakeholders, and the public will be conducted as part of that evaluation.

Comment 2:

If the project results in increased water turbidity for the months of May and into June, this could cause a serious issue for delivering water to crops using drip irrigation systems. The current practice of sediment flushing from the Paonia reservoir in April has been problematic for our farm in that it has inhibited us to use our micro-jet sprinklers.

Response 2:

Reclamation anticipates an increase in suspended sediment concentrations during spring releases from the reservoir, which would occur within the April to June timeframe. However, an increase in suspended sediment concentrations associated with the proposed action would not span the entire period of April through June. As early as possible during the spring following completion of the intake repair work, releases of approximately 600 cfs would be made from the reservoir. The releases would be made as a mitigating measure to mobilize sediment deposits in Muddy Creek and the North Fork Gunnison River that would occur as a result of the proposed action. These “flushing flows” are expected to last approximately five to seven days and would result in temporary increases in suspended sediment concentrations and turbidity levels in the North Fork Gunnison River and mainstem Gunnison River downstream. Flushing flows from the reservoir would be made during spring when flows, suspended sediment and turbidity levels are already high in the North Fork and mainstem Gunnison Rivers. Updates will be posted to the Paonia Reservoir Sedimentation webpage (<http://www.usbr.gov/uc/wcao/progact/paonia/index.html>), including dates for flushing flow releases, to alert irrigators and others of the release dates and associated potential for short-term, higher turbidity levels. This information has been added to the EA in Section 3.3.1.1.

5.7.2 – Shawn LaBounty

Comment 1:

Anyone who pays attention to Paonia Reservoir or the North Fork of the Gunnison River at all knows that the core issue is unnatural over-sedimentation of the river and the river bed.

Response 1:

The North Fork Gunnison River system, even under existing conditions, is naturally high in suspended sediment. Paonia Dam affects sedimentation in the system by trapping most of the sediment from Muddy Creek and Deep Creek that would otherwise flow downstream into the North Fork and mainstem Gunnison Rivers. According to unpublished provisional data from USGS collected from April 2013 to October 2015, the average suspended sediment concentration in Muddy Creek above Paonia Reservoir is 1,311 mg/L. USGS recorded one episode in August of 2013 where the suspended sediment concentration reached 27,300 mg/L in Muddy Creek above the reservoir. If not for the existence of Paonia Reservoir, a wide range of sediment concentrations would occur downstream into the North Fork Gunnison and main stem Gunnison Rivers as part of the natural sediment loading of the system.

Reclamation's modeling data predict that the levels of suspended sediment concentrations exiting the reservoir could reach 7,000 mg/L initially, decreasing to 5,000 mg/L, during the reservoir drawdown and maintenance activities. For comparison, USGS provisional data collected in 2013-2014 for Muddy Creek below the dam, excluding the reservoir drawdown in 2014, showed an average suspended sediment concentration of 323 mg/L with an episode of elevated concentrations reaching 6,278 mg/L, similar to the initial suspended sediment concentration of

7,000 mg/L expected during final drawdown and higher than the suspended sediment concentration of 5,000 mg/L expected during construction. In fall 2014 when the reservoir was drawn down, and approximately 137,105 CY of sediment was released, USGS recorded suspended sediment concentrations in Muddy Creek immediately downstream of the reservoir in the range of 22,500 mg/L to 26,000 mg/L. These downstream concentrations are below the concentrations recorded in Muddy Creek upstream of the reservoir. This information has been included in Section 3.3.2.2 of the Final EA.

Comment 2:

To impose unnatural sediment transporting events in the fall during low water leaves no other threads of cleaner water from tributaries, and amplifies the effect on the stream.

Response 2:

The proposed action must be conducted during fall low flows for access, constructability and safety reasons. Increased sedimentation downstream would be unavoidable because incoming flows would have to be released during construction. Water from tributaries (namely Anthracite Creek) would continue to enter the North Fork Gunnison River during construction and the following months, although the flows are not as high as during spring runoff. Anthracite Creek typically contributes about 2.5 times the flow of Muddy Creek to the North Fork Gunnison River throughout the year (Figure 11). There would be a temporary increase in suspended sediment in the North Fork and mainstem Gunnison Rivers downstream of the Muddy/Anthracite Creek confluence during the proposed action. The largest volume of sediment deposits resulting from the proposed action would occur above the confluence of Muddy Creek/Anthracite Creek (2014 observations and Reclamation 2016C). High spring flow releases from the dam would mobilize and disperse sediment deposits (Reclamation 2016B, 2016C). Below the confluence of Muddy Creek and Anthracite Creek, i.e. the North Fork Gunnison River, there would still be suspended sediment with increasing dilution the farther it travels downstream. This information has been included in Section 3.3.2.2 of the Final EA.

Comment 3:

Boiler plate data, and glossed over scenarios will not change the fact that unnatural sedimentation on the downstream stretches of the river will have negative effects on the ecology of the river over the course of succeeding years.

Response 3:

The EA discloses anticipated effects on the ecology of the river that would result from the No Action and Proposed Action Alternatives. The analyses are based on the best available scientific and empirical data.

Observable, supporting evidence that the proposed action would result in temporary, minimal effects to the aquatic environment relates back to the impacts associated with the fall 2014 emergency event that released an estimated 137,105 CY (85 acre-feet) of sediment downstream

into Muddy Creek and the North Fork Gunnison River. No fish kills were reported during, immediately after, or following the fall 2014 event.

In spring 2015, approximately 600 cfs was released from the dam over a period of several days. Those flushing flows mitigated the short-term effects of the unanticipated sediment release in 2014. Similarly, as early as practicable in the spring following completion of the proposed action, Reclamation and NFWCD would release sufficient flushing flows from the reservoir to mobilize sediment deposits and allow for recovery of the system.

In fall 2015, less than one year following the fall 2014 sediment release, provisional USGS cross-section and pebble count data (Figure 10) showed fine sediment accumulations were well below the 29.3% fines threshold for protection of macroinvertebrates defined in the Colorado Department of Public Health and Environment Policy 98-1 for Region 2 (CDPHE 98-1), and well below the 20% guideline for salmonid spawning habitat (CDPHE 98-1). All six data collection sites were exposed to the much larger fall 2014 sediment release. Because the fines percentages are well below the Policy 98-1 thresholds, Muddy Creek and the North Fork Gunnison River are not impaired for beneficial or classified uses due to sedimentation, despite the 2014 sediment release. This information has been included in Sections 3.3.2.2 and 3.3.6.2 of the Final EA.

After distribution of the Draft EA for public comment, CPW conducted fish sampling in September 2016 and found a viable fish population of native fish and non-native sport fish about one mile downstream of Paonia Dam, just one spawning season after the 2014 sediment release. This information has been added to the Final EA in Section 3.3.6.2.

Given this information, it is expected that any negative effects on river ecology would be of short duration and the release sufficient flushing flows as early as practicable during the spring following completion of the proposed action would mitigate the short term effects.

Comment 4:

I pay close attention to insect and fish populations, and saw firsthand the decrease in some insect species and a noticeable change in fish health during the fateful winter of 2014 when unnatural amounts of sediment was injected into the stream in winter.

Response 4:

The EA discusses the impacts that could occur to macroinvertebrate and fish species as a result of project implementation. Reclamation sent notice of the EA and the proposed action to 13 fishery and outdoor outfitters, and no comments on the EA were received from those entities. The results of CPW's September 2016 fish sampling show a viable fishery in the North Fork Gunnison River less than two years after the 2014 sediment release. It can be inferred that macroinvertebrate populations are present to support these populations. This information has been added to the Final EA in Section 3.3.6.2.

Comment 5:

My recommendation is that there should be a limit on the amount of sediment that is produced during draining/construction; say, 500 mg/L for periods of 2000 hours or less. This could be achieved by placing an acoustic Doppler meter at the USGS gauging station near Somerset. It would be informative and useful to have suspended solids measured in real time. This would also certainly minimize the impacts of the construction.

Response 5:

All inflows to the reservoir would need to be passed through the outlet works of the dam to allow for repair of the intake structure, and associated releases of sediment through the outlet works cannot be controlled during the approximate one-month reservoir drawdown and construction time period. Reclamation is coordinating various data collection efforts with the USGS to determine the extent and magnitude of the effects of the sediment release. These coordinated data collection efforts include utilizing an ADVN (acoustic doppler velocity meter). An ADVN can measure suspended sediments; however, it cannot achieve limiting the amount of sediment leaving Paonia Reservoir or minimizing the impacts of construction. Information collected by the ADVN is available to the public at (<http://nrtwq.usgs.gov/>). USGS will continue to monitor turbidity, suspended sediment, conduct pebble counts and cross-section surveys, and collect water quality samples in 2017. Information regarding USGS sampling data has been added to the Final EA in Section 5.6. In order to mitigate the temporary impacts of the expected sediment release, flushing flows of 600 cfs would be released from the dam for a sufficient period (estimated to be five days) as soon as practicable during spring following completion of the intake repair project, to transport sediment deposits downstream. This release would coincide with higher flows in Anthracite Creek to further boost effectiveness of dispersing coarse sediment deposits far downstream.

Comment 6:

I will be measuring the total suspended solids downstream of the dam, and keeping environmental groups, Trout Unlimited, and other interested parties.

Response 6:

Reclamation and NFWCD would appreciate receiving any data collected.

5.7.3 – Colorado Parks and Wildlife

Comment 1:

Sections of the North Fork may not provide suitable fish habitat for up to nine months after the release or until spring flows can remobilize the sediment and scour riffles and pools.

Response 1:

It is anticipated that fine sediments may fill interstitial spaces in the bed of the North Fork Gunnison River and affect the fall spawning of brown trout, and potentially affect fish habitat for

non-native sport fish during the fall/winter following implementation of the proposed action. Flows sufficient to mobilize sediments would be released as early as possible during high spring flows. Therefore, impacts are expected for six to seven months immediately following construction of the proposed action. Higher levels of turbidity tend to benefit native fish populations because they can more readily hide from predacious, non-native fish such as brown trout. Native fish species are also adapted to and can tolerate the higher suspended sediment levels they could experience as a result of the proposed action. Both non-native and native fish are also able to find refuge in Anthracite Creek and other tributaries, and farther downstream in the North Fork Gunnison River. Monitoring would be conducted in fall 2017 to document the effectiveness of the flushing flows in restoring aquatic habitat.

Comment 2:

On September 1, 2016, CPW personnel sampled the North Fork in the reach approximately 1.1 miles downstream of Paonia Reservoir Dam to collect baseline information prior to the proposed 2016 sediment release. Survey results suggest that the adult trout population is estimated at 316 brown trout per mile and 458 rainbow trout per mile. This reach also supports an estimated 281 adult bluehead sucker per mile. Flannelmouth sucker and roundtail chub were not detected within the sampled reach directly downstream of Paonia reservoir, but are known to occur further downstream in the North Fork.

Two sites were sampled using electrofishing methods to evaluate trout fry, mottled sculpin, and speckled dace populations. Based on our survey results, we conclude that natural reproduction of brown and rainbow trout is occurring in the North Fork with an estimated 1760 brown trout fry and 460 rainbow trout fry per mile. There are also healthy populations of native mottled sculpin (estimated at 20,860 per mile) and speckled dace (estimated at 38,022 per mile).

Response 2:

These fishery conditions, which were described as "viable" by CPW (personal communication with John Alves, CPW Senior Aquatic Biologist), exist less than 2 years after the unanticipated 2014 sediment release. Because fish populations are considered viable, it can be inferred that macroinvertebrate populations are present to support these populations. This survey information further supports the conclusion that, with sufficient flushing flows, the fishery is able to recover from large amounts of sediment in the system. The survey information has been included in the Final EA in Section 3.3.6.2.

Comment 3:

The proposed release will directly overlap with the brown trout spawning and rearing period in the North Fork (October 1-May 1). CPW is concerned that although recovery will occur, it may take longer than two breeding seasons to recover if multiple age classes are lost and habitat is impaired.

Response 3:

The work during the fall, low flow period is discussed in Reclamation's response to Trout Unlimited's Comment 7, below. The overlap of the sediment release and the brown trout spawning period is discussed in the EA in Section 3.3.6.2. Reclamation anticipates the project could impact one to two age classes of the downstream fishery as a result of implementing the proposed action. The results of CPW's September 2016 fish sampling showed a viable fishery in the North Fork Gunnison River less than 2 years after the 2014 sediment release. Similar recovery is expected after the proposed construction is completed and flushing flow releases are made.

Comment 4:

The [Draft Environmental Assessment] reports that significant mortality of salmonids (up to 50% of the adult population) may occur when sediment rates are between 500 and 6,000 mg/L, indicating that direct mortality of a substantial portion of the adult rainbow and brown trout population is possible.

Response 4:

As discussed in Section 3.3.6.2 of the EA, the effects of suspended sediment on aquatic biota are dependent on several factors including: concentration, duration of exposure, chemical composition, particle-size distribution, organisms, age classes, and environments. Due to all these variables, there is a wide range of impacts reported in research literature. Important to note is that neither NFWCD nor Reclamation received any reports of fish kills during or after the 2014 event. In addition, CPW's fish sampling data in 2016 show viable populations less than two years following the much larger 2014 event. The diversity and numbers of fish currently living in the North Fork Gunnison River just downstream of the reservoir are evidence that the proposed action would not cause direct mortality to a substantial portion of adult rainbow and brown trout.

Comment 5:

CPW is also concerned with the unknown long-term effects of repeated sedimentation events of similar magnitude of the October 2014 and proposed 2016 releases on the fishery.

Response 5:

Sediment releases from Paonia Reservoir associated with normal operations are outside the scope of the proposed action. However, in an effort to address concerns about future episodes of large sediment releases during low-flow periods, a minimum pool would be maintained in the reservoir as an interim mitigating measure between completion of the proposed action and implementation of a long-term sediment management alternative. As an interim mitigation measure, Reclamation, in cooperation with NFWCD, would ensure that a minimum of 800 acre-feet (AF) of water is kept in the reservoir during normal reservoir operations in the low flow periods of fall and winter, except for instances where reservoir drawdown is required for dam safety or maintenance purposes. Under existing conditions, an 800 AF pool of water equates to

an elevation of 6,385 feet, which is 16.5 feet higher than the top of the intake trash rack. Maintaining a minimum pool in the reservoir would allow sediment and debris to deposit farther upstream in the reservoir, reducing the accumulation of sediment and debris against the intake tower, thereby reducing the amount of sediment released downstream of the Dam during normal operations.

Comment 6:

The proposed release will directly overlap with the brown trout spawning and rearing. We recommend avoiding sediment deposition between October 1st and May 1st to circumvent negative impacts to brown trout reproduction.

Response 6:

The overlap of the sediment release and the brown trout spawning period is discussed in the EA in Section 3.3.6.2. It is anticipated the proposed action could impact one to two age classes of brown trout. The repair work must be conducted during the fall, low flow time period, as discussed in the response to Trout Unlimited's Comment 7.

Comment 7:

Sediment depositions may also cause indirect mortality to juvenile trout and small bodied fishes like mottled sculpin and speckled dace due to habitat loss. These fish require complex habitat consisting of interstitial spaces between cobbles which they use as refuge from current velocity and predators. Loss of this habitat type until a major spring flushing event is likely to reduce fry survival for brown and rainbow trout and have negative impacts on the native populations of mottled sculpin and speckled dace.

Response 7:

Impacts to fish habitat and fry survival are discussed in the Section 3.3.6.2 of the EA. The results of CPW's September 2016 fish sampling showed a viable fishery, with large numbers of native mottled sculpin and speckled dace, in the North Fork Gunnison River about one mile downstream of the dam less than two years after the 2014 sediment release. Similar recovery is expected after the proposed construction is completed and planned flushing flows are released. In addition, as discussed in Response 3 to Shawn LaBounty's comment letter, provisional 2015 pebble count data collected by the USGS at six locations downstream of Paonia Reservoir revealed fine sediment percentages well below the thresholds and guidelines in CDPHE Policy 98-1. This information has been included in Section 3.3.2.2 of the Final EA.

Comment 8:

CPW understands the acute sedimentation issues within Paonia Reservoir and the importance of maintaining Paonia Reservoir's functionality.

Response 8:

Comment noted.

Comment 9:

We strongly recommend conducting future sediment release projects in the spring of the year to minimize the duration and magnitude of impact on the aquatic ecosystem of the North Fork, and to closely mimic the natural hydrologic cycle.

Response 9:

The proposed action is an intake repair project, not a sediment release project. NFWCD currently operates the reservoir to release sediment during high flows in the spring.

Comment 10:

CPW intends to monitor the stream at annual or biannual intervals as part of our on-going fisheries work and to evaluate the effects the proposed action (or future releases) on the fishery.

Response 10:

Comment noted. Reclamation intends to coordinate monitoring efforts with CPW in order to inform potential future actions associated with Paonia Dam and Reservoir.

Comment 11:

CPW appreciates the efforts of the BOR to create a long-term sediment mitigation plan to reduce the sediment accumulation within Paonia Reservoir. We look forward to working collaboratively with you to address the sediment issues in Paonia Reservoir, to modify releases to reduce negative impacts on the fishery, and to identify opportunities to improve the downstream aquatic environment.

Response 11:

Reclamation appreciates CPW's willingness to collaborate on collecting data on the fishery and aquatic environment downstream of Paonia Dam. Reclamation will continue to coordinate with CPW on future proposed projects at Paonia Reservoir and Dam, including any sedimentation management alternatives.

5.7.4 – Trout Unlimited

Comment 1:

TU understands the significance of the proposed repair work to the inlet tower for the water users who depend on reliably accessing water stored in the reservoir.

Response 1:

Comment noted.

Comment 2:

The background information of the EA states that the Paonia project provides supplemental water for 15,300 acres. The Fire Mountain Ditch Company provides irrigation water for less than 8,000 acres.

Response 2:

Paonia Dam and Reservoir provides water for 8,270 acres of irrigated lands and 1,500 acres of non-irrigated lands, for a total of 9,770 acres. The Leroux Creek diversion is considered to be a component of the Paonia Project, although the Leroux Creek Diversion obtains its water from reservoirs developed by the Leroux Creek water users. The Leroux Creek Diversion provides irrigation water to 4,800 acres of irrigated lands and 730 acres of non-irrigated lands, for a total of 5,530 acres. The combination of all components of the Paonia Project (the Fire Mountain division and the Leroux Creek division) provide water for 15,300 acres. We misstated in Section 1.4.1 and Section 3.3.1.1 of the draft EA that all 15,300 acres of water came from Paonia Reservoir. This information has been corrected in the final EA.

Comment 3:

The 2014 sediment release occurred during a period of low flow and impacted the North Fork of the Gunnison River as well as the Gunnison River as far as 4 miles downstream of the confluence with the North Fork. Heavy sediments coated portions of the river bottom and suspended sediments created higher than normal turbidity levels impacting recreation and river based business on the Gunnison River.

Response 3:

Modeling conducted subsequent to release of the Draft EA found that most of the coarse sediment released would deposit upstream of the Anthracite/Muddy Creek confluence, with minimal coarse sediment deposits extending downstream. The majority of the sediment volume is comprised of fine silt and clay, and stays in suspension as wash load, continuing downstream with further dilution, ultimately depositing in reservoirs or estuarine areas. The concentration of suspended sediment would decrease by an average factor of 2.5 at the confluence of Anthracite Creek. Suspended sediment concentrations are further reduced by a factor of about 10 once the flows reach the main stem Gunnison River. A thin layer of fine sediment (silt/clay) which is transported as wash load would deposit downstream in areas of low enough velocity (e.g., interstitial spaces, along channel margins, and pools), ultimately depositing in reservoirs or estuarine areas (Reclamation 2016C). This information has been included in Section 3.3.2.2 of the Final EA. Any adverse effects to recreation and river-based business on the Gunnison would be of short duration during the fall/winter season during and following the proposed action until flushing flows are released the following spring.

Reclamation notified 13 guide/outfitters with an anticipated interest in the North Fork Gunnison River and Gunnison River of the proposed action and the availability of the EA and Draft FONSI for comment. No comments were received. Reclamation did not receive any calls, letters, or

comments regarding any impact to recreation and river based business, or from any other entity or individual, as a result of the 2014 sediment release. Reclamation is not aware of any impact on recreation or river based business on the Gunnison River resulting from the 2014 sediment release.

Comment 4:

The Environmental Commitments section of the introduction to the EA states 'In order to mobilize and disperse any sediment deposited in Muddy Creek and North Fork of the Gunnison River downstream of the dam during the proposed repair work, high flows would be released from the dam as soon as practicable during spring runoff in the April through June timeframe.' While we are pleased that this step is being required, it is worth pointing out that the term 'high flows' are relative and there is no guarantee that flows adequate to effectively disperse sediments like those in 2015 would be available. We suggest that the EA include a requirement to maximize the use of stored water as well as spring runoff to disperse sediment in the spring of 2017.

Response 4:

An environmental commitment would be included to release flushing flows of 600 cfs from Paonia Dam in the spring following the proposed action for a sufficient period of time (estimated to be 5 days) in order to transport and disperse sediment deposits resulting from the intake repair project. Sediment flushing would be timed to coincide with the snowmelt flows from Anthracite Creek to further boost effectiveness of dispersing coarse sediment deposits far downstream (Reclamation, 2016c). See also Section 3.3.2.2 of the EA.

Comment 5:

Based on the sediment dispersal in 2014 and the estimated sediment release, we can assume the proposed project will impact aquatic life including the following year's age class of brown trout.

Response 5:

This impact is discussed in the EA in Section 3.3.6.2. Since the distribution of the Draft EA for public comment, CPW conducted fish sampling in the North Fork Gunnison River about 1.1 miles downstream of Paonia Dam. Results of this sample are discussed in CPW's Comment 2 above, and are included in Section 3.3.6.2. The sampling showed a viable fishery, with large numbers of native mottled sculpin and speckled dace, in the North Fork Gunnison River less than two years after the 2014 sediment release. Unavoidable, temporary impacts would likely occur to brown trout spawning in the fall. However, it is anticipated that spring flushing flow releases would mitigate short-term effects to spawning habitat, just as high flow releases in May 2015 mitigated short-term effects of the 2014 sediment release.

Comment 6:

Take additional steps to mitigate potential impacts from sediment releases related to the proposed project, including minimizing sediment releases to only that which is necessary to make proposed repairs.

Response 6:

The repair work would be completed as quickly as possible within the approximately one-month window after irrigation season and before the reservoir freezes. Sediment releases associated with passing reservoir inflows would be unavoidable during that time. Other potential mitigating measures were considered, including mechanical excavation using amphibious excavators, pulsed releases, off-channel settling basins, a boom line upstream of the reservoir pool, small dam/debris basin upstream of the intake structure, channel grinder at upstream face of intake tower, downstream sediment capture structures, and a pump/siphon system. These measures were determined to not be feasible to implement for the intake repair structure due to prohibitive costs and/or logistics and given the scope of the proposed action. However, some of these measures would be considered in the Paonia Dam Modification Alternatives Study as long-term options.

Comment 7:

Recommendation: Initiate construction times when adequate water exists to provide flushing flows.

Response 7:

Due to safety and constructability considerations, construction must be completed during fall low flows. Construction cannot be done during times when there is adequate water to provide flushing flows, which would be during the spring prior to filling the reservoir. During the spring, there is snow melt runoff and inflow into Paonia Reservoir. This inflow would pass through the construction area before exiting the reservoir through the intake structure, creating a safety hazard for workers. Safe working conditions exist when water passing through the construction area is about 30 cfs. Another complicating factor to take into account if work would be done during higher flows is the intake structure would be partially blocked during construction, potentially pooling water throughout the construction area, and thereby exacerbating the unsafe conditions. This information has been added to the EA in Section 2.2.1.6.

Comment 8:

Recommendation: Create stilling pools around the inlet works to minimize sediment transport through the dam.

Response 8:

Construction of stilling pools around the inlet works is not practical for the proposed repair work on the intake structure. Construction of stilling pools would involve substantial construction with

costs that would be orders of magnitude greater than the cost of the proposed action. More importantly, given the current levels of sediment around the intake structure, construction of stilling pools would likely generate a much larger sediment release than what is estimated for the proposed work.

Comment 9:

Recommendation: Install sediment baffles or other structures to slow water velocity between the dam and Anthracite Creek to allow larger sediment to drop out.

Response 9:

Based on observations from the unanticipated 2014 sediment release, the area between the dam and Anthracite Creek is the area where most of the coarser sediments drop out of the water column. The existing State stream gage weir, located about 800 feet downstream of the stilling basin and upstream of the CR 12 bridge, essentially acts as a baffle without the additional disturbance associated with installing structures. Installation of sediment baffles or other structures would not likely reduce impacts on the aquatic environment. Access to remove sediment from upstream of the rock berms would require putting heavy equipment in the river during low flows. This would have the potential of disturbing and destabilizing the stream bed and banks below the deposited sediment. The wet, unconsolidated sediment would then need to be transported by the excavator to trucks on the top of the bank, and sediment would be spilling from the bucket along the way. In addition, sediment would mobilized during excavation would likely deposit just a little farther downstream because flows would not be sufficient to fully disperse the sediment.

Comment 10:

Recommendation: Use the project to evaluate sediment control techniques and help inform future work on the reservoir.

Response 10:

Pre- and post-project monitoring is underway and planned that will help inform future work on the reservoir. For the reasons discussed above, sediment control techniques are not feasible to implement for the proposed repair project. USGS is monitoring suspended sediment, conducting pebble counts and cross-section surveys, and collecting water quality samples. This information will help inform any potential long-term sediment management strategies.

Comment 11:

Recommendation: Maximize storage and runoff potential to disperse accumulated sediments below Paonia Reservoir in spring of 2017.

Response 11:

As described in Response 4, an environmental commitment is being included to store enough water to release flushing flows of 600 cfs as soon as practicable in the spring following

completion of the proposed action. This environmental commitment is further described in Section 3.3.2.2 of the EA.

5.7.5 – Western Slope Conservation Center

Comment 1:

The Conservation Center supports the North Fork Water Conservancy District (NFWCD) as they look to repair infrastructure and improve the capacity of the Paonia Reservoir. The Paonia Reservoir provides an important storage and flood control resource to the North Fork Valley. Consequently, the Conservation Center very much supports the Bureau of Reclamation authorization and funding to the NFWCD to make necessary repairs to the outlet works intake structure at Paonia Dam provided the following concerns are addressed: Sediment impacts, downstream monitoring, evaluating upstream conditions, cohesive planning with regards to future management, and public outreach.

Response 1:

Comment noted. Flood control as a function provided by Paonia Reservoir is discussed in Section 3.3.1.3. Concerns are addressed in comment responses below.

Comment 2:

The Conservation Center is concerned with the possibility that in the case of low flows, the NFWCD, Fire Mountain Canal Ditch and Reservoir Company, and BOR would be unable to meet the needs of users dependent on irrigation water while also protecting the health of the watershed by flushing the sediment downstream below threshold dilution levels.

Response 2:

After the 2014 sediment release, spring 2015 inflows filled the reservoir, activating the spillway on May 4. Spillway flows began on May 4 at 107 cfs and peaked at 681 cfs on May 7 with flows decreasing to 433 cfs by May 12. According to eyewitness accounts from the dam operator, all visible sediment deposits were eroded from the Muddy Creek reach within a few days as a result of spillway flows. As part of the proposed action, Reclamation plans to store enough water to provide flushing flows of 600 cfs for a period of five to seven days. This release would be timed to coincide with higher flows in Anthracite Creek. If storage of inflow to Paonia Reservoir occurs during the late winter and early spring months, the analysis of historic inflow data shows the reservoir typically would store enough water by the middle of April to provide for a controlled release of 600 cfs for five to seven days. This level of release is similar to the magnitude and duration of the 2015 spillway flow during the first week in May that eroded all visible sediment deposits in the Muddy Creek reach downstream of Paonia dam. A controlled release of this amount creates minimal additional risk to achieving a fill at Paonia Reservoir.

Analysis of computed mean daily inflows to Paonia Reservoir and measured mean daily releases from the dam over the period from water year 1996 through 2015 indicate initial spring runoff flow releases from Paonia Dam can be expected to exceed 400 to 600 cfs as early as March 19

and as late as May 20. Over the 20 water years analyzed, the average dates initial spring runoff flow releases exceeded 400 and 600 cfs were April 15 and April 22 respectively. Over the past 20 water years of record at Paonia dam, flow releases exceeded 400 cfs 85 percent of the time and 600 cfs 70 percent of the time. Exceedance probabilities of 70 percent or greater provide reasonable assurance that release flows would be sufficient to remove sediments deposited in the 2,000-foot reach downstream of the dam during construction/repair activities for a given hydrologic regime. Information regarding exceedance probabilities and our proposed flushing flows have been added to Section 3.3.2.2 in the Final EA.

Comment 3:

The Western Slope Conservation Center is concerned that the EA does not adequately address contingency plans in the case of a low water event in the Muddy drainage during the first half of the 2017 CO water year. In the case of a low water event, the proposed construction could result in sediment loading which could significantly impact downstream water quality including fisheries, macroinvertebrates, wetland, and riparian health.

Response 3:

An environmental commitment is being included to store enough water to release flushing flows of 600 cfs as soon as practicable in the spring following completion of the proposed action. This environmental commitment is further described in Section 3.3.2.2 of the EA.

Comment 4:

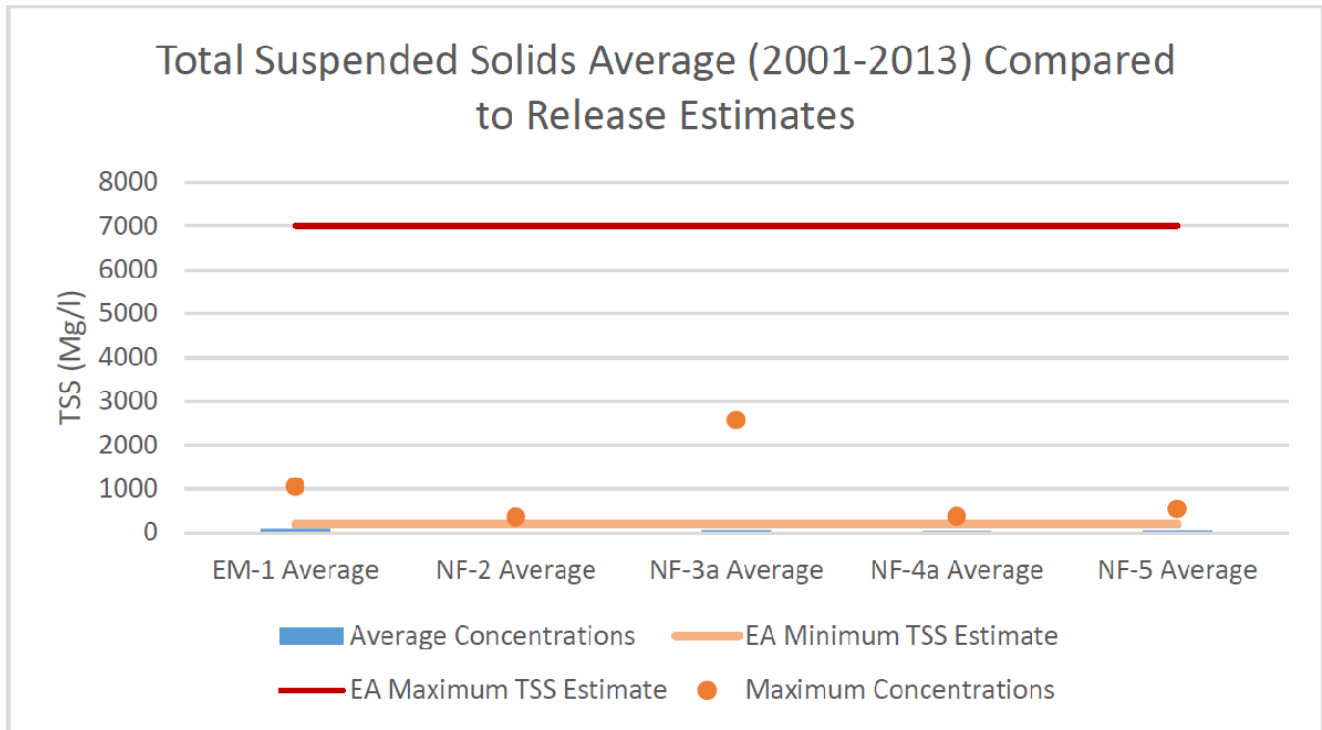
A 2014 Paonia Dam inadvertent release flushed 137,000 cubic yards (CY) of sediment into Muddy Creek and the North Fork Gunnison River downstream of Paonia Dam (Reclamation 2015B, Reclamation 2016A) (4). The immediate associated turbidity concerned local residents, business owners, and water users. The remaining sediment in the North Fork was successfully dispersed during the high flow releases in 2015. However, 2015 experienced high water which likely assisted NFWCD and BOR to disperse the sediment during high flows while also meeting the needs of water users.

Response 4:

Please see Response 3 above.

Comment 5:

This range of total suspended sediment (TSS) concentrations is concerning when compared to average TSS concentrations below the Paonia Dam on the North Fork of the Gunnison River. According to River Watch data gathered between 2001 and 2013, the average total suspended solids (TSS) concentration below the Fire Mountain canal diversion (station NF-2) was 37.82 mg/l and the maximum TSS concentration was 358.8 mg/l (see figure below). This data does not include the 2014 release.



Data gathered by River Watch Volunteers
 Site Locations:
 EM-1: East Muddy
 NF-2: North Fork of the Gunnison below Somerset/Fire Mountain Canal
 NF-3a: North Fork of the Gunnison below Paonia
 NF-4a: North Fork of the Gunnison below Hotchkiss

Figure 12. Graph of Total Suspended Solids Average (2001-2013) Compared to Release Estimates created by Western Slope Conservation Center and included in their comment letter.

Response 5:

Comparing TSS to Suspended Sediment Concentration (SSC) is not an “apples to apples” comparison. SSC data are produced by measuring the dry weight of all the sediment from a known volume of a water-sediment mixture. TSS data are produced by several methods, most of which entail measuring the dry weight of sediment from a known volume of a subsample of the original. SSC values include percentages of sand-size material, which shows bias in the relation between SSC and TSS -- SSC values tend to increase at a greater rate than their corresponding paired TSS values. As sand-size material in samples exceeds about a quarter of the sediment dry weight, SSC values tend to exceed their corresponding paired TSS values. The method for determining TSS, which was originally designed for analyses of wastewater samples, is shown to be fundamentally unreliable for the analysis of natural water samples. In contrast, the method for determining SSC produces relatively reliable results for samples of natural water, regardless of the amount or percentage of sand-size material in the samples (USGS 2000). Because there is

an inherent difference between TSS and SSC, the TSS values included in the graph are unreliable when attempting to compare to potential SSC concentrations.

The suspended sediment concentrations referenced in the EA are projections of suspended sediment concentrations exiting the reservoir. These concentrations would decrease as the suspended sediment progresses downstream to the data sites referenced in Western Slope Conservation Center's letter, due to dilution from tributaries. Data collection efforts by Reclamation and USGS above the reservoir and below the reservoir show that the reservoir retains a large volume of sediment, preventing it from entering the downstream system, which creates a "cleaner" environment downstream. Data stations have been established specifically for this project to monitor the fluctuations in the system in relation to reservoir operations and in comparison to natural conditions above the reservoir. This data is available to the public at: <http://co.water.usgs.gov/> and <http://waterdata.usgs.gov/co/nwis/qw>. As disclosed in the EA, the proposed work is anticipated to increase the suspended sediment concentrations above accustomed normal ranges. A section discussing sedimentation has been included in Section 3.3.2.2 of the Final EA.

Comment 6:

A temporary increase in sedimentation and turbidity is unlikely to cause significant long-term harm to downstream water quality, instream, wetland, and riparian habitat, and subsequent impacts to macroinvertebrates, fish, and wildlife. However, should the Muddy Creek and Anthracite drainages experience a low water event of significant duration, the impacts to macroinvertebrates and fish, in particular, could be much greater due to increased levels of sediment load.

Response 6:

Based on available information, Reclamation agrees a temporary increase in sedimentation and turbidity is unlikely to cause significant long-term harm to downstream water quality, instream, wetland, and riparian habitat, and subsequent impacts to macroinvertebrates, fish, and wildlife. Sufficient flushing flows would be released in the spring following the proposed action to help ensure the effects of increased sedimentation and turbidity are temporary, as discussed in the responses to Comments 2 and 3 above.

Comment 7:

The current EA does not provide for any water quality monitoring during the proposed construction nor during high flow releases in 2017. The Conservation Center is concerned that the impacts of the proposed construction will not be quantifiable without data regarding water quality, fish, and macroinvertebrates. This is of particular importance in anticipation of future long-term management solutions.

Response 7:

Reclamation has an agreement with the USGS for USGS to monitor suspended sediment, conduct pebble counts and cross-section surveys, and monitor water quality before, during and after the proposed action. CPW conducted fish sampling in September 2016 about one mile downstream of the dam, and has agreed to sample for macroinvertebrates prior to the proposed action and to sample again for fish and macroinvertebrates during the fall after completion of the proposed action. This information will help to quantify impacts of the proposed action. Future monitoring needs will be developed for the long-term sediment management alternatives study. Reclamation's monitoring plan with USGS is discussed in Section 5.6 of the Final EA.

Comment 8:

The presence of metals and nutrients and their respective concentrations were not adequately taken into account when evaluating the impacts of the proposed action, even though data exists from the Bureau of Reclamation, US Geologic Survey, and River Watch.

Response 8:

The Colorado Department of Public Health and Environment has been delegated authority for compliance with water quality requirements under the Clean Water Act. Reclamation coordinated with CDPHE regarding the intake maintenance project, and CDPHE determined no water quality permitting was needed for this action. This information has been included in Section 3.3.2.1 of the Final EA. The North Fork Water Conservancy District and Reclamation are working with CDPHE to determine monitoring and permitting requirements for any future proposed long-term sediment management alternatives. Water quality data is being collected by USGS, and Reclamation is in the process of collecting and analyzing data on the presence of metals and nutrients within the reservoir's sediment pool. We anticipate this data will be valuable for future evaluation of proposed long-term sediment management alternatives.

Comment 9:

In anticipation of a long-term solution, the Conservation Center does not believe that the current EA adequately evaluates the "No Action" alternative with the intent of taking on this proposed construction as part of a future, cohesive long-term solution.

By combining short-term and long-term projects, the potential impacts to downstream water quality, instream, wetland, and riparian habitat, and subsequent impacts to macroinvertebrates, fish, and wildlife may be minimized and/or mitigated.

Response 9:

Under the No Action Alternative, repair of the damaged bulkhead of the intake tower would not be completed (see Section 2.1) Due to the observed damage to the concrete bulkhead, pieces of broken concrete could fall into the outlet works at any time, rendering the outlet works inoperable. The proposed action to repair the intake structure is a single and complete project that is not part of the development, planning, and implementation of a long-term sediment

management alternative. Delaying the repair work until implementation of a long-term sedimentation management strategy would increase the risk of the outlet works becoming inoperable, which would affect the ability to deliver water and affect flood control functions. This has been clarified in Section 2.2 of the EA. Effects of a non-functioning outlet works structure are depicted in Figure 8.

Comment 10:

While the BOR did reach out to state, regional, and local agencies and organizations, downstream ditch companies, stakeholders, and landowners adjacent to Muddy Creek and the North Fork Gunnison River from Paonia Dam down to Hotchkiss, Colorado, public involvement did not include outreach to the general public which will be at least temporarily impacted by the proposed construction and high flows. This lack of public outreach in the form of press releases and public meetings meant that the general public did not have adequate opportunity to comment on the proposed construction.

Response 10:

Reclamation reached out to state, regional, and local agencies and organizations, downstream ditch companies, stakeholders, and landowners adjacent to Muddy Creek and the North Fork Gunnison River from Paonia Dam down to Hotchkiss, Colorado. Reclamation did not conduct public meetings but did issue press releases to The Gunnison Times, Delta County Independent and Merchant Herald. The only paper that decided to publish the press release was The Merchant Herald. A website has been developed for the public to find information about the upcoming repair work and/or sedimentation issues at Paonia Reservoir. The website can be accessed at: <http://www.usbr.gov/uc/wca/progact/paonia/index.html>. No formal public scoping is required for an EA, and no formal public review of an EA is required (only public notice of the availability of a FONSI is required). The general public has received adequate opportunity to comment on the proposed action.

Comment 11:

The Conservation Center urges the BOR to produce a final EA that includes monitoring and safeguards which will adequately evaluate and minimize impacts to the health of the downstream watershed.

Response 11:

Monitoring is discussed in response to Comment 7 above. The EA has been updated to include more information about the release of flushing flows in the spring following completion of the proposed action (see Section 3.3.2.2 and Chapter 4). The EA has also been updated to include information about Reclamation's agreement with USGS to monitor suspended sediments, conduct pebble counts and cross-section surveys, and monitor water quality downstream of the dam (see Section 5.6).

CHAPTER 6 – PREPARERS

The following list contains the Reclamation employees who participated in the preparation of this EA.

Name	Title	Area of Responsibility
Lesley McWhirter	Environmental and Planning Group Chief	NEPA Coordinator, Clean Water Act Permitting
Jenny Ward	Environmental Protection Specialist	Cultural Resources, Native American Religious Concerns, Soils, Air Quality, Water Resources, Water Quality, Land Use, Environmental Justice
Amanda Ewing	Biologist	T&E Species, Migratory Bird Treaty Act, Terrestrial & Aquatic Wildlife, Vegetation, Recreation, Wetland and Riparian
John Sottolare	Hydrologist	Water Quality
Ernie Rheume	Archaeologist	SHPO Consultation
Phil Ipson	Civil Engineer	Operations, Construction Procedures, Review
Tom Fowlds	Facilities Group Chief	Operations, Construction Procedures, Review
Sean Kimbrel	Hydraulic Engineer	Sediment Transport Modeling
Bill Dressel	Civil Engineer	Project Lead

CHAPTER 7 – REFERENCES

- Bilotta, G., & Brazier, R. 2008. Understanding the influence of suspended solids on water quality and aquatic biota. *Water Research*, 42(12), 2849-2861.
doi:10.1016/j.watres.2008.03.018
- CDC 2016. Centers for Disease Control and Prevention. National Center for Environmental Health, Environmental Health Tracking Branch. Environmental Public Health Tracking – Info by Location [Online]. Available at <http://ephtracking.cdc.gov/InfoByLocation/>. Accessed on August 29, 2016.
- CDPHE 2013. Colorado Department of Public Health and Environment. A Guide to Colorado Programs for Water Quality Management and Safe Drinking Water. August 2013. [Online version <https://www.colorado.gov/pacific/sites/default/files/A-Guide-To-Colorado-Programs.pdf>.]
- CDPHE 2014. Colorado Department of Public Health and Environment. Guidance for Implementation of Colorado’s Narrative Sediment Standard Regulation #31, Section 31.11(1)(a)(i): Policy 98-1. November 10, 2014. [Online version https://www.colorado.gov/pacific/sites/default/files/98-1SedimentGuidance2014withAppendices_1.pdf.]
- CDPHE 2016A. Colorado Department of Public Health and Environment. 5CCR 1002-93, Regulation #93, Colorado’s Section 303(D) List of Impaired Waters and Monitoring and Evaluation List. January 11, 2016. [Online version https://www.colorado.gov/pacific/sites/default/files/93_2016%2803%29.pdf.]
- CDPHE 2016B. Colorado Department of Public Health and Environment. 5CCR 1002-35 Regulation No. 35 Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins Appendix 35-1: Stream Classifications and Water Quality Standards Tables. June 30, 2016. [Online version https://www.colorado.gov/pacific/sites/default/files/35_2016%2806%29-Appendix35-1.pdf.]
- CDWR 2016. Colorado Department of Natural Resources, Division of Water Resources. Colorado’s Surface Water Conditions; Station Name: Muddy Creek Above Paonia Reservoir (MUDAPRCO) [Online]. Available at http://www.dwr.state.co.us/SurfaceWater/data/detail_graph.aspx?ID=MUDAPRCO. Accessed on: August 23, 2016.
- Chamberlin, T.W. 1982. Influence of Forest Management on Anadromous Fish Habitat in Western North America. Timber Harvest. USDA Forest Service Anadromous Fish Habitat Program. U.S. Department of Agriculture, Pacific Northwest Forest and Range Experiment Station. General Technical Report PNW-136 April. 27pp.

- DOLA 2016. Colorado Department of Local Affairs, State Demography Office. Jobs by Sector (NAICS) [Online]. Available at <https://demography.dola.colorado.gov/economy-labor-force/data/jobs-by-sector/>. Accessed on: August 29, 2016.
- EPA 1987. U.S. Environmental Protection Agency. Quality Criteria for Water 1986. 44015-86-001. Updated May 1, 1987.
- EPA 2016. Environmental Justice Screening and Mapping Tool [Online]. U.S. Environmental Protection Agency. Generated August 29, 2016.
- CPW 2016A. Colorado Parks and Wildlife. Colorado Parks and Wildlife: Wildlife GIS Unit. 2016. All Species Activity Mapping Data [Online]. Available at <http://www.arcgis.com/home/group>. Accessed on: August 15, 2016.
- CPW 2016B. Colorado Parks and Wildlife. Colorado Parks and Wildlife: Colorado Fishing Atlas. [Online]. Available at <http://ndismaps.nrel.colostate.edu/index.html?app=FishingAtlas>. Accessed on: August 15, 2016.
- EPA 2016. U.S. Environmental Protection Agency. Criteria Pollutant Nonattainment Summary Report [Online]. June 17, 2016. Available at <https://www3.epa.gov/airquality/greenbook/anc13.html>. Accessed on: June 8, 2016.
- FEMA 2016. U.S. Federal Emergency Management Agency. FEMA GeoPlatform [Online]. Available at <http://fema.maps.arcgis.com/home/>. Accessed on: August 17, 2016.
- FWS 2008. U.S. Fish and Wildlife Service, Division of Migratory Bird Management. Birds of Conservation Concern 2008. Arlington, Virginia. 85 pp. 2008. [Online version <https://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>.]
- FWS 2009. U.S. Fish and Wildlife Service, Ecological Services, Colorado Field Office. Final Gunnison River Basin, Programmatic Biological Opinion. Denver, Colorado. December 4, 2009. [Online version <http://www.coloradoriverrecovery.org/documents-publications/section-7-consultation/GUPBO.pdf>.]
- FWS 2016. U.S. Fish and Wildlife Service. Endangered Species Act Species List [Online]. 2013. Available at <https://ecos.fws.gov/ipac/project/S57CN-FLMBN-ENRJ2-LO5Y3-6QTXAI>. Accessed on: August 12, 2016.
- Gradall, K.S., and W.A. Swenson. 1982. Responses of Brook Trout and Creek Chubs to Turbidity. Transactions of the American Fisheries Society 111: 392-395.
- Gregory, R.S. 1993. Effect of Turbidity on the Predator Avoidance Behavior of Juvenile Chinook Salmon (*Oncorhynchus tshawytscha*). Canadian Journal of Fisheries and Aquatic Sciences 50: 241-246.

- Gregory, R.S., and C.D. Levings. 1998. Turbidity Reduces Predation on Migrating Juvenile Pacific Salmon. *Transactions of the American Fisheries Society* 127: 275-285.
- Hall, J.D. and R.L. Lantz. 1969. Effects of Logging on the Habitat of Coho Salmon and Cutthroat Trout in Coastal Streams. In H.R. MacMillan Lectures In Fisheries. A symposium held at the University of British Columbia February 22-24, 1968. University of British Columbia, Vancouver, Canada. pp. 355-375.
- Hynes, H.B.N., 1970. *The Ecology of Running Waters*. Liverpool University Press, Liverpool.
- Langer, O.E., 1980. Effects of sedimentation on salmonid stream life. In: Weagle, K. (Ed), *Report on the Technical Workshop on Suspended Solids and the Aquatic Environment*. Whitehorse.
- Lloyd, D.S. 1987. Turbidity as a Water Quality standard for Salmonid Habitats in Alaska. *North American Journal of Fisheries Management*. 7: 34-45.
- NatureServe 2016. NatureServe. NatureServe Explorer: An online encyclopedia of life. Version 7.1. Arlington, Virginia. [Online]. Available at <http://www.natureserve.org/explorer>. Accessed on: August 15, 2016
- NRCS 2016. Natural Resources Conservation Service. Custom Soil Resource Report for Paonia Area, Colorado, Parts of Delta, Gunnison, and Montrose Counties. Generated August 15, 2016.
- Platts, W. S., C. Armour, G. D. Booth, M. Bryant, L. Judith, P. Cuplin, S. Jensen, G. W.
- Lienkaemper, G. W. Minshall, S. B. Monsen, R. L. Nelson, J. R. Sedell, and J. S. Tuhy. 1987. *Methods for Evaluating Riparian Habitats with Applications to Management*.
- North Fork Water Improvement Association. 2010. *North Fork of the Gunnison River Watershed Plan Update*. June 30, 2010.
- Reclamation 1957. U.S. Bureau of Reclamation. Paonia Project, Colorado, Definite Plan Report Appendix A: Water Supply, Project Lands and Drainage. Salt Lake City, Utah. May 1957.
- Reclamation 2011. U.S. Bureau of Reclamation. Projects and Facilities Database; Paonia Dam [Online]. May 11, 2011. Available at: http://www.usbr.gov/projects/Project.jsp?proj_Name=Paonia+Project. Accessed on: August 17, 2015.
- Reclamation 2015A. U.S. Bureau of Reclamation, Technical Service Center, Sedimentation and River Hydraulics Group. Draft Paonia Reservoir Sediment Management: November 12-13 Site Visit and November 19-20 Survey Trip Report. Denver, Colorado. January 2015.

- Reclamation 2015B. U.S. Bureau of Reclamation, Technical Service Center, Sedimentation and River Hydraulics Group. Developing a Sediment Management Plan for Paonia Reservoir. Denver, Colorado. March 2015.
- Reclamation 2016A. U.S. Bureau of Reclamation, Technical Service Center, Sedimentation and River Hydraulics Group. Draft Memorandum: One Dimension (SRH-1D) Model to Simulate the Transport of Incoming and Outgoing Sediment through Paonia Reservoir. Denver, Colorado. August 2016.
- Reclamation 2016B. U.S. Bureau of Reclamation, Technical Service Center, Sedimentation and River Hydraulics Group. Draft Analysis of Spring Flow Releases from Paonia Dam. Denver, Colorado. August 2016.
- Reclamation 2016C. U.S. Bureau of Reclamation, Technical Service Center, Sedimentation and River Hydraulics Group. Draft Memorandum: Numerical Modeling and Analysis of Sediment Transport below Paonia Dam along Muddy Creek and the North Fork Gunnison River. Denver, Colorado. October 2016.
- Satterlund, D. R., Adams, P. W. 1992. Wildland Watershed Management. Second Edition. John Wiley & Sons, New York.
- Sigler, J.W., T.C. Bjornn, and F.H. Everest. 1984. Effects of Chronic Turbidity on Density and Growth of Steelheads and Coho Salmon. Transactions of the American Fisheries Society 113: 142-150.
- United States Department of Agriculture, Forest Service. General Technical Report INT-221. Intermountain Research Station, Ogden, Utah. 177 pp.
- USGS 2000. United States Geological Survey. Comparability of Suspended-Sediment Concentration and Total Suspended Solids Data. Water-Resources Investigations Report 00-4191. Reston, Virginia. August 2000. [Online version <http://water.usgs.gov/osw/pubs/WRIR00-4191.pdf>.]
- USGS 2013. United States Geological Survey. WaterAlert [Online]. October 1, 2013. Available at <http://water.usgs.gov/wateralert/>. Accessed on: August 23, 2016.
- Wagener, S.M., LaPerriere, J.D., 1985. Effects of placer mining on the invertebrate communities of interior Alaska. Freshwater Invertebrate Biol. 4, 208–214.
- Ward, David L., Rylan Morton-Starner, and Ben Vaage (2016) Effects of Turbidity on Predation Vulnerability of Juvenile Humpback Chub to Rainbow Trout and Brown Trout. Journal of Fish and Wildlife Management: June 2016, Vol. 7, No. 1, pp. 205-212.

CHAPTER 8 – ABBREVIATIONS AND ACRONYMS

Abbreviation or Acronym	Definition
AIRF	American Indian Religious Freedom Act
APE	Area of potential effect
ARPA	Archaeological Resources Protection Act
BGEPA	Bald and Golden Eagle Protection Act
CAA	Clean Air Act
CDPHE	Colorado Department of Public Health and Environment
CEQ	Council on Environmental Quality
CPW	Colorado Parks and Wildlife
CWA	Clean Water Act
CY	Cubic Yard
Division	Water Quality Control Division
EA	Environmental Assessment
E.O.	Executive Order
EPA	Environmental Protection Agency
EPT Taxa	Ephemeroptera (mayflies), Plecoptera (stoneflies), and some Trichoptera (caddisflies)
ESA	Endangered Species Act
FMCRC	Fire Mountain Canal and Reservoir Company
FONSI	Finding of No Significant Impact
FWS	Fish and Wildlife Service
Interior	U.S. Department of the Interior
ITA	Indian Trust Asset
MBTA	Migratory Bird Species Act
MOA	Memorandum of Agreement
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NFWCD	North Fork Water Conservancy District
NRHP	National Register of Historic Places
PBO	Programmatic Biological Opinion
PM	Particulate Matter
Policy 98-1	Guidance for Implementation of Colorado’s Narrative Sediment Standard Regulation #31, Section 31.11(1)(a)(i): Policy 98-1

Abbreviation or Acronym	Definition
“Project” or “Proposed Action”	Intake Structure Repair
Reclamation	U.S. Bureau of Reclamation
SSC	Suspended Sediment Concentration
SHPO	State Historic Preservation Officer
TSC	Technical Service Center
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

APPENDIX A - Memorandum of Agreement

**MEMORANDUM OF AGREEMENT
BETWEEN
THE WESTERN COLORADO AREA OFFICE, BUREAU OF RECLAMATION
AND THE COLORADO STATE HISTORIC PRESERVATION OFFICER
REGARDING THE PAONIA DAM INTAKE STRUCTURE MODIFICATION
PROJECT, PAONIA PROJECT, GUNNISON COUNTY, COLORADO**

WHEREAS, the Bureau of Reclamation (Reclamation) and the North Fork Water Conservancy District (NFWCD) plan to stabilize the Paonia Dam Intake Structure (Project); and

WHEREAS, Reclamation and NFWCD will accomplish stabilization of the intake structure by dismantling the damaged upper concrete portions of the intake and replacing it with a modified aluminum trash rack. The Paonia Project is a component of the Federal Colorado River Storage Project, thereby making the Project an undertaking subject to review under Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470f, and its implementing regulations, 36 CFR Part 800; and

WHEREAS, Reclamation has defined the undertaking's area of potential effect (APE) as contained within the red polygons depicted in Attachment A; and

WHEREAS, Reclamation as lead Federal agency has determined that the Project will have an adverse effect on the Paonia Dam (5GN.1334). This cultural resource has been determined by Reclamation, in consultation with the Colorado State Historic Preservation Officer (SHPO), to be eligible for inclusion on the National Register of Historic Places under Criteria A and C; and

WHEREAS, NFWCD is a sponsor of the Project, and has participated in the consultation, and has been invited to sign the MOA; and

WHEREAS, in accordance with 36 CFR § 800.6(a)(1), Reclamation has notified the Advisory Council on Historic Preservation (Council) of its adverse effect determination providing the specified documentation, and the Council has chosen not to participate in the consultation pursuant to 36 CFR § 800.6(a)(1)(iii);

NOW, THEREFORE, pursuant to Section 106 of the NHPA, Reclamation and the SHPO agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the effect on historic properties.

STIPULATIONS

Reclamation shall ensure that the following measures are carried out:

- I. Prior to any modification associated with this undertaking, Reclamation will ensure that the Paonia Dam (5GN.1334) will be recorded in accordance with the guidance for Level II Documentation found in "Historic Resource Documentation, Standards for Level I, II, and III Documentation" (Office of Archaeology and Historic Preservation Publication

1595, March 2013). The documentation will be of archival quality, and will include mapping of the property and photographic documentation of the portions of the historic property to be included in the intake stabilization. Photographs will be black and white archival quality (4" x 6") prints.

- II.** Reclamation will supplement the Level II Documentation with a descriptive and historical narrative. The narrative will synthesize the existing documentation on 5GN.1334, and describe the Dam in the context of the development and history of the North Fork Valley area. The narrative will include photographs of the landscape features taken during the cultural resources survey. A Summary Report for the Paonia Dam project, which includes the Level II Documentation and the narrative, will be prepared.
- III.** Stipulation I must be satisfied prior to construction and/or any earth disturbances within the APE.
- IV.** Reclamation will submit a copy of the Level II Documentation to the SHPO within one (1) year of the execution of this MOA. The SHPO shall review and provide comments within thirty (30) calendar days of receipt. Once accepted by SHPO, SHPO shall receive a minimum of one archival stable copy of the final recordation for its files and provide documentation of acceptance. The activities prescribed by the stipulations of this MOA shall be carried out by or under the direct supervision of a person or persons meeting, at minimum, the Secretary of the Interior Profession Qualification Standards (48 FR 44738-39) (PQS). This does not preclude the use of properly supervised persons who do not meet the PQS.
- V.** Reclamation will present a copy of the final Paonia Dam historical narrative to the Gunnison Pioneer and Historical Society museum and the Paonia Branch or the Delta County Libraries. Reclamation staff will also offer those institutions a public presentation on the history of the Paonia project to coincide with the delivery of the historic narrative.

VI. DURATION

This MOA will be null and void if its terms are not carried out within one (1) year from the date of its execution. Prior to such time, Reclamation may consult with the other signatories to reconsider the terms of the agreement. Unless terminated pursuant to Stipulation X, below, this MOA will be in effect through Reclamation's implementation of the stipulations of this MOA, and will terminate and have no further force or effect when Reclamation, in consultation with the SHPO, determines that the terms of the MOA have been fulfilled in a satisfactory manner.

VII. POST-REVIEW DISCOVERIES

If potential historic properties are discovered or unanticipated effects on historic properties found, Reclamation shall implement the discovery plan included as Attachment B of this MOA.

VIII. MONITORING AND REPORTING

Each year following the execution of this MOA until its stipulations are carried out, it expires, or is terminated, Reclamation shall provide all parties to this MOA a summary report detailing work carried out pursuant to its terms. Such report shall include any scheduling changes proposed, any problems encountered, and any disputes and objections received in Reclamation's efforts to carry out the terms of this MOA.

The signatories may monitor activities pursuant to this MOA, and the Council will review such activities if so requested by a party to this MOA. Reclamation will cooperate with the signatories in carrying out their review and monitoring responsibilities.

IX. DISPUTE RESOLUTION

Should any signatory or concurring party to this MOA object at any time to any actions proposed or the manner in which the terms of this MOA are implemented, Reclamation shall consult with such party to resolve the objection. If Reclamation determines that such objection cannot be resolved, Reclamation will:

- a. Forward all documentation relevant to this dispute, including Reclamation's proposed resolution, to the ACHP. The ACHP shall provide Reclamation with its advice on the resolution of the objection within thirty (30) days of receiving adequate documentation. Prior to reaching a final decision on the dispute, Reclamation shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the ACHP, signatories and concurring parties, and provide them with a copy of this written response. Reclamation will then proceed according to its final decision.
- b. If the ACHP does not provide its advice regarding the dispute within the thirty (30) day time period, Reclamation may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, Reclamation shall prepare a written response that takes into account any timely comments regarding the dispute from the signatories and concurring parties to the MOA, and provide them and the ACHP with a copy of such written response.
- c. Reclamation's responsibility to carry out all other actions subject to the terms of this MOA that are not the subject of the dispute remain unchanged.

X. AMENDMENTS

This MOA may be amended when such an amendment is agreed to in writing by all signatories. The amendment will be effective on the date a copy signed by all of the signatories is filed with the ACHP.

XI. TERMINATION

If any signatory to this MOA determines that its terms will not or cannot be carried out, that party shall immediately consult with the other signatories to attempt to develop an amendment per Stipulation X, above. If within thirty (30) days (or another time period agreed to by all signatories) an amendment cannot be reached, any signatory may terminate the MOA upon written notification to the other signatories.

Once the MOA is terminated, and prior to work continuing on the undertaking, Reclamation must either (a) execute an MOA pursuant to 36 CFR § 800.6 or (b) request, take into account, and respond to the comments of the ACHP under 36 CFR § 800.7. Reclamation shall notify the signatories as to the course of action it will pursue.

Execution of this MOA by Reclamation, NWCD, and CO SHPO and implementation of its terms evidence that Reclamation has taken into account the effects of this undertaking on historic properties and afforded the ACHP an opportunity to comment.

SIGNATORIES

Colorado State Historic Preservation Officer

By:  Date: 9/30/14
Steve Turner, AIA, SHPO

Bureau of Reclamation, Western Colorado Area Office

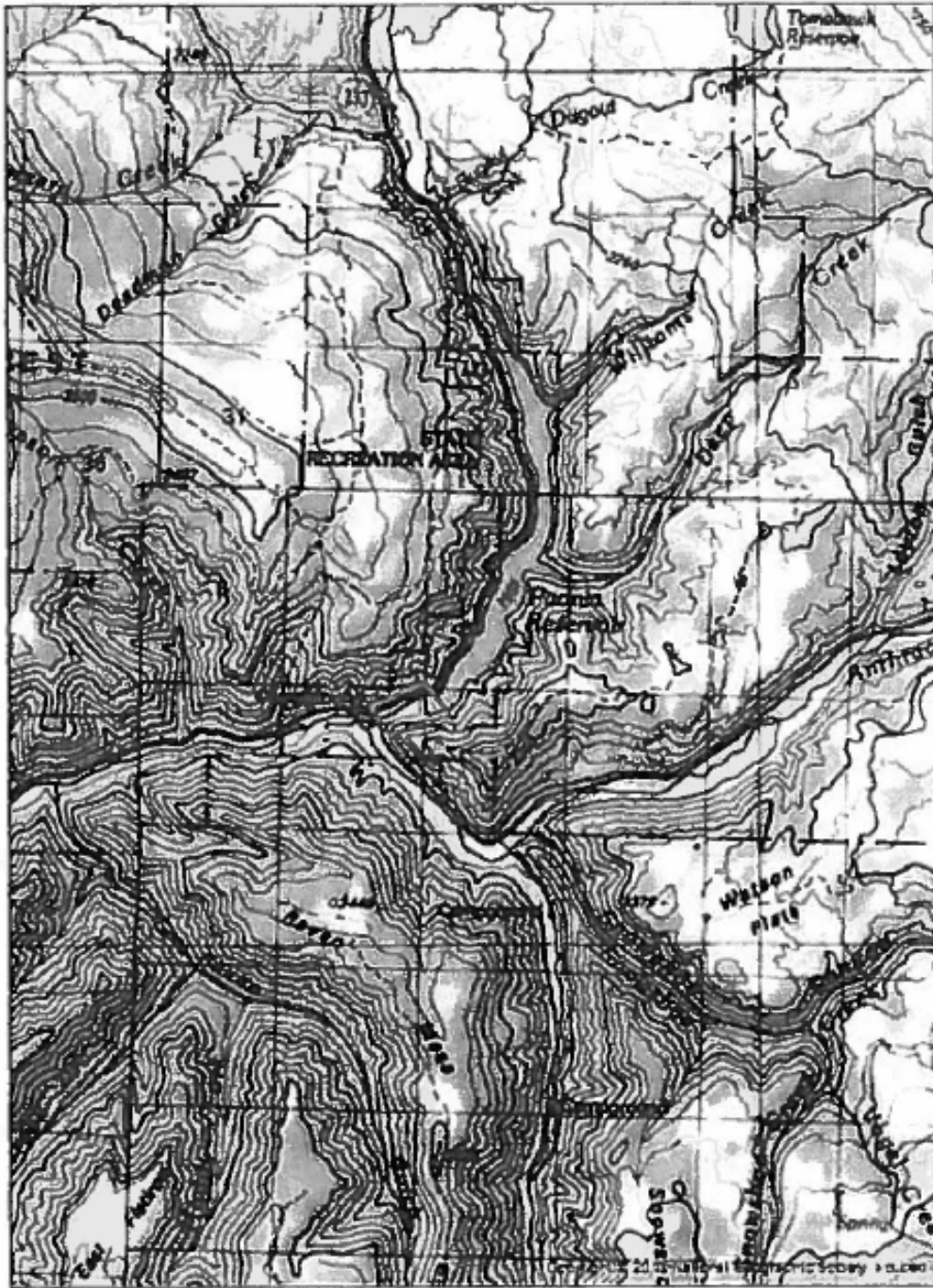
By:  Date: 9/27/16
Ed Warner, Area Manager

INVITED SIGNATORIES:

North Fork Water Conservancy District

By:  Date: 9/27/16
Thomas Alvey, President

ATTACHMENT A – AREA OF POTENTIAL EFFECT





ATTACHMENT B – UNANTICIPATED DISCOVERY PLAN

PLAN AND PROCEDURES FOR THE UNANTICIPATED DISCOVERY OF CULTURAL RESOURCES

PAONIA DAM INTAKE STRUCTURE MODIFICATION PROJECT, GUNNISON COUNTY, COLORADO

1. INTRODUCTION

The Bureau of Reclamation (Reclamation) and the North Fork Water Conservancy District (NFWCD) plan to stabilize the Paonia Dam Intake Structure (Project). The following Unanticipated Discovery Plan (UDP) outlines procedures to follow, in accordance with state and federal laws, if archaeological materials are discovered.

2. RECOGNIZING CULTURAL RESOURCES

A cultural resource discovery could be prehistoric or historic. Examples include, but are not limited to:

- An accumulation of shell, burned rocks, or other food related materials
- An area of charcoal or very dark stained soil with artifacts,
- Stone tools or waste flakes (i.e. an arrowhead, or stone chips),
- Clusters of tin cans or bottles, logging or agricultural equipment that appears to be older than 50 years,
- Buried railroad tracks, decking, or other industrial materials.

When in doubt, assume the material is a cultural resource.

3. ON-SITE RESPONSIBILITIES

STEP 1: STOP WORK. If any Reclamation/NFWCD employee, contractor or subcontractor believes that he or she has uncovered a cultural resource at any point in the project, all work adjacent to the discovery must stop. The discovery location should be secured at all times.

STEP 2: NOTIFY MONITOR. If there is an archaeological monitor for the project, notify that person. If there is a monitoring plan in place, the monitor will follow its provisions. If there is not an archaeological monitor, notify the project manager.

STEP 3: NOTIFY BUREAU OF RECLAMATION. Contact the Project Overseer at the Bureau of Reclamation:

Project Manager:
Thomas Alvey
970-712-4030
mcf@wic.net

Reclamation Project Overseer:
Ernest Rheume
970-385-6521
erheume@usbr.gov

The Project Manager or the Reclamation Project Overseer will make all other calls and notifications.

If human remains are encountered, treat them with dignity and respect at all times. Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection in place and to shield them from being photographed. Do not call 911 or speak with the media.

4. FURTHER CONTACTS AND CONSULTATION

A. Project Manager's Responsibilities:

- Protect Find: The Reclamation / NFWCD Project Manager is responsible for taking appropriate steps to protect the discovery site. All work will stop in an area adequate to provide for the total security, protection, and integrity of the resource. Vehicles, equipment, and unauthorized personnel will not be permitted to traverse the discovery site. Work in the immediate area will not resume until treatment of the discovery has been completed following provisions for treating archaeological/cultural material as set forth in this document.
- Direct Construction Elsewhere On-site: The Reclamation / NFWCD Project Manager may direct construction away from cultural resources to work in other areas prior to contacting the concerned parties.
- Contact CR Manager: If there is a CR Program Manager, and that person has not yet been contacted, the Project Manager will do so.
- Contact Project Overseer: If the Project Overseer at the Bureau of Reclamation has not yet been contacted, the Project Manager will do so.
- Identify Find: The Project Manager will ensure that a qualified professional archaeologist examines the find to determine if it is archaeological.
 - If it is determined not archaeological, work may proceed with no further delay.
 - If it is determined to be archaeological, the Project Manager will continue with notification.
 - If the find may be human remains or funerary objects, the Project Manager will ensure that a qualified physical anthropologist examines

the find. If it is determined to be human remains, the procedure described in Section 5 will be followed.

B. Project Overseer's Responsibilities

- Notify SHPO: The Project Overseer will notify the Colorado State Historic Preservation Office (SHPO).

Colorado State Historic Preservation Office:

Mr. Steve Turner, AIA
State Historic Preservation Officer
Colorado Historical Society
1200 Broadway
Denver CO, 80203
(303)-866-2776

C. Further Activities

- Archaeological discoveries will be documented as described in Section 6.
- Construction in the discovery area may resume as described in Section 7.

5. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL MATERIAL

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect.

Because the project is a Federal undertaking, the provisions of the Native American Graves Protection and Repatriation Act of 1990 apply, and the Project Overseer will follow their provisions. If the project extends off of Federal lands, the requirements under State Law Colorado Revised Statute (CRS) 24-80 part 13 apply. If the remains are not modern, NAGPRA and ARPA apply if they are found to be Native American. ARPA and the Unmarked Human Graves Colorado Statute (CRS 24-80-1301-1305) apply if the human remains are Native American and/or determined to be of archaeological interest.

In the event possible human skeletal remains are discovered, Reclamation / NFWCD will comply with applicable state and federal laws, and the following procedure:

A. Notify Law Enforcement Agency or Coroner's Office:

In addition to the actions described in Sections 3 and 4, the Project Manager will immediately notify the local law enforcement agency or coroner's office.

The coroner (with assistance of law enforcement personnel) will determine if the remains are human, whether the discovery site constitutes a crime scene, and will notify SHPO.

Gunnison County Coroner
(970)-641-9213

B. Further Activities:

When consultation and documentation activities are complete, construction in the discovery area may resume as described in Section 7.

6. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological deposits discovered during construction will be assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Manager will ensure the proper documentation and assessment of any discovered cultural resources in cooperation with the Bureau of Reclamation, SHPO, affected tribes, and a contracted consultant (if any). All prehistoric and historic cultural material discovered during project construction will be recorded by a professional archaeologist in accordance with all state and federal laws.

7. PROCEEDING WITH CONSTRUCTION

Project construction outside the discovery location may continue while documentation and assessment of the cultural resources proceed. A professional archaeologist must determine the boundaries of the discovery location. In consultation with SHPO and affected tribes, the Project Manager and Project Overseer will determine the appropriate level of documentation and treatment of the resource.

Construction may continue at the discovery location only after the process outlined in this plan is followed and Reclamation has determined that compliance with state and federal laws is complete.

APPENDIX B - EA and Draft FONSI Comment Response Letters

From: ANDREW T THLIVERIS <atthlive@wisc.edu>
Date: September 12, 2016 at 10:34:24 PM MDT
To: "lmcwhirter@usbr.gov" <lmcwhirter@usbr.gov>
Subject: Environment Assessment - Paonia Dam Intake Structure Repair - Comments

Hi Lesley,

I have reviewed the EA and Draft FONSI and have a few comments. I feel the document is well written and is comprehensive. I am not sure that all the potential effects on Agriculture have been considered. My concern centers on the effects of the project on water quality particularly in the spring (April thru June) which is a timeframe that agriculture irrigation practices are very active.

Problem: Many orchardists have installed micro-jet systems aimed towards preserving soil quality and composition. Many of these systems utilize micro-jet and drip irrigation systems. There are two features of these systems that are important as it pertains to water quality. *i)* many orchards rely on sand media filtration to remove sediment allowing water clean enough to not plug micro-jet or drip systems. These systems were designed to handle sediment loads in the North Fork **PRIOR** to 2014 when spring sediment removal drawdown of the Paonia reservoir was implemented. This has caused issues with our micro-jet sprinkler system, essentially rendering it non-functional. High sediment loads plug these systems and are extremely hard on pump bearings. *ii)* key to the layout of these micro-jet designs is that furrow irrigation may or may not be taken into account, since micro-jet irrigation is effective regardless of grade. Thus, in many instances, crops cannot be furrow irrigated when micro-jet sprinklers cannot be used. This could result in significant loss in crops and trees which in some cases take over 10 years to archive full production.

The study clearly addresses the increased turbidity of the North Fork during construction in the months of October thru November. It points out that the effects of Agriculture are minimal since active irrigation practices have ceased which is the case. My concern centers on the projected increase in turbidity in the spring outlined in section 2.2 which states " In order to mobilize and disperse any sediment deposited in Muddy Creek and North Fork Gunnison River downstream of the dam during the proposed repair work, high flows would be released from the dam as soon as practicable during spring runoff, in the April through June timeframe". This is also noted in section 2.2.1.6.

I could not find the impact of water quality during these spring months. If the project results in increased water turbidity for the months of May and into June, this could cause a serious issue for delivering water to crops using these irrigation systems. As mentioned before, the current practice of sediment flushing from the Paonia reservoir in April has been problematic for our farm in that it has inhibited us to use our micro-jet sprinklers. Fortunately, this practice has ceased in early May allowing our trees to get much needed water.

Thank you for the opportunity to respond and please feel free to call with any questions.

Andy
Berg Harvest
Cell: 608-332-8167

Ed Warner
Area Manager
Bureau of Reclamation
Western Colorado Area Office
445 West Gunnison Ave. Suite 221
Grand Junction, CO 81501

Mr. Warner,

I have great doubt that the Environmental Assessment Paonia Dam Intake Structure Repair prepared by the Bureau of Reclamation does justice to the impacts of the proposed project. Anyone who pays attention to Paonia Reservoir or the North Fork of the Gunnison River at all knows that the core issue is unnatural over-sedimentation of the river and the river bed. It is expressed in the document that impacts on the river may or may not be felt. The document implies that these impacts will be short term, and really not worth discussing. Tucked in the middle of this mostly useless document, however, the heart of the issue is discussed briefly: Populations of insects and fish will be impacted, and this impact solely depends on the sediment load the work produces. This impact will be felt through the ecosystem.

I live on the banks of the North Fork of the Gunnison River downstream of the dam. In years past, I have published papers on anthropogenic impacts on the river and how these impacts change the river over time. Currently, I spend time along various stretches of the river downstream of the dam. I pay close attention to insect and fish populations, and saw firsthand the decrease in some insect species and a noticeable change in fish health during the fateful winter of 2014 when unnatural amounts of sediment was injected into the stream in winter.

The North Fork of the Gunnison River, like all rivers, is a complex system of variables that takes dedicated study and time to truly understand. In a natural sediment transporting event on the North Fork of the Gunnison, the total suspended solids from one tributary are offset downstream by other tributaries with cleaner water. To impose unnatural sediment transporting events in the fall during low water leaves no other threads of cleaner water from tributaries, and amplifies the effect on the stream. Boiler plate data, and glossed over scenarios will not change the fact that unnatural sedimentation on the downstream stretches of the river will have negative effects on the ecology of the river over the course of succeeding years.

My recommendation is that there should be a limit on the amount of sediment that is produced during draining/ construction; say, 500 mg/L for periods of 2000 hours or less. This could be achieved by placing an acoustic Doppler meter at the USGS gauging station near Somerset. It would be informative and useful to have suspended solids

measured in real time. This would also certainly minimize the impacts of the construction.

Either way, I will be measuring the total suspended solids downstream of the dam, and keeping environmental groups, Trout Unlimited, and other interested parties aware of the levels. If you would like updates yourself or would care to comment, please email me at shawnlab@tds.net

Shawn LaBounty



COLORADO

Parks and Wildlife

Department of Natural Resources

Gunnison Service Center
300 New York Avenue
Gunnison, CO 81230
P 970.641.7060 | F 970.641.7883

Mr. Ed Warner, Area Manager
Bureau of Reclamation
Western Colorado Area Office
445 West Gunnison Ave.
Grand Junction, CO 81501

September 21, 2016

RE: Environmental Assessment and Draft Finding of No Significant Impact, Paonia Dam Intake Structure Repair, Gunnison County, Colorado (WCAO-GJ-EA-2016-03)

Dear Mr. Warner:

Colorado Parks and Wildlife (CPW) has reviewed the Paonia Reservoir Dam Intake Structure Repair Draft Environmental Assessment (DEA). The project involves making repairs to the concrete bulkhead and trash rack of the intake structure. The reservoir would be drawn down and repairs are scheduled in October and November of 2016.

We understand that the project is intended to maintain the functionality of the Paonia Reservoir intake structure. The reservoir draw down will release approximately 43,500-137,000 cubic yards of sediment into the North Fork of the Gunnison River (the North Fork). The proposed release will directly overlap with the brown trout spawning and rearing period in the North Fork (October 1-May 1). CPW has concerns about the amount of sediment and the timing of sediment release¹. We are also concerned that the effects of the release will linger, as the timing of the release will allow the sediment to remain in the channel until spring flows wash it downstream (April-June 2017), and we anticipate losing at least one entire age class of brown trout.

A sediment release of this magnitude² in the spring would not cause the same concern, because the sediment would be mobilized by high flows and washed downstream mimicking the natural hydrologic cycle for this type of riverine system. When released during the low flow season (October) sediment mobilization does not occur. This results in substantial sediment accumulation downstream of the reservoir. (The DEA documents accumulations of 6 to 7 feet of sediment in Muddy Creek directly downstream of the reservoir following the October 2014 release). Sections of the North Fork may not provide suitable fish habitat for up to nine months after the release or until spring flows can remobilize the sediment and scour riffles and pools. Our concerns and suggestions are further detailed below.

¹ CPW generally recommends avoiding sediment deposition between October 1 and May 1 to circumvent negative impacts to brown trout reproduction.

² Annually, Paonia Reservoir accumulates approximately 100 acre-feet per year of sediment (personal communication Amanda Ewing, BOR). This translates to approximately 161,000 cubic yards of sediment. Thus, the proposed project will release between 27 and 85 percent of the total annual sediment accumulation in the Reservoir.

Status of the Fishery in the North Fork

The North Fork contains a diverse and valuable fishery, both from a recreational and conservation perspective. Wild brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) offer quality angling opportunities, while bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*Catostomus luttipinnis*), roundtail chub (*Gila robusta*), mottled sculpin (*Cottus bairdii*) and longnose dace (*Rhinichthys cataractae*) represent a relatively intact native fish community.

On September 1, 2016, CPW personnel sampled the North Fork in the reach approximately 1.1 miles downstream of Paonia Reservoir Dam to collect baseline information prior to the proposed 2016 sediment release. Survey results suggest that the adult trout population is estimated at 316 brown trout per mile and 458 rainbow trout per mile. This reach also supports an estimated 281 adult bluehead sucker per mile. Flannelmouth sucker and roundtail chub were not detected within the sampled reach directly downstream of Paonia Reservoir, but are known to occur further downstream in the North Fork.

Two sites were sampled using electrofishing methods to evaluate trout fry, mottled sculpin, and speckled dace populations. Based on our survey results, we conclude that natural reproduction of brown and rainbow trout is occurring in the North Fork with an estimated 1760 brown trout fry and 460 rainbow trout fry per mile. There are also healthy populations of native mottled sculpin (estimated at 20,860 per mile) and speckled dace (estimated at 38,022 per mile).

Fishery Concerns

The proposed release has the potential to significantly impact the native and sport fisheries of the North Fork in two ways: suspended sediment within the water column and sediment deposition on the river substrate. Both factors are discussed in the DEA (primarily in section 3.3.6.2), with the conclusion that they may cause a temporary reduction in the fishery population but that recovery should occur within one or two breeding seasons. CPW is concerned that although recovery will occur, it may take longer than two breeding seasons to recover if multiple age classes are lost and habitat is impaired. CPW is also concerned with the unknown long-term effects of repeated sedimentation events of similar magnitude of the October 2014 and proposed 2016 releases on the fishery.

The DEA reports a wide range of possible suspended sediment concentrations ranging from 200 to 7,000 mg/L at the estimated 29 cfs that will be flowing out of the reservoir during the intake structure repair work. Available stream gauge data from the Anthracite Creek USGS gauge (gauge number 091302095) suggests that flows in Anthracite Creek historically average 60 cfs during October and November. The additional flows should result in an approximate 2/3 sediment dilution rate for the reach below the confluence of Anthracite Creek and the North Fork.

While the North Fork will benefit from the additional flows from Anthracite Creek, the range of possible suspended sediment levels at the 2/3 dilution rate is approximately 67 to 2,333 mg/L in the North Fork. The DEA reports that significant mortality of salmonids (up to 50% of the adult population) may occur when sediment rates are between 500 and 6,000 mg/L, indicating that direct mortality of a substantial portion of the adult rainbow and brown trout population is possible. In addition to the direct mortality that may occur due to suspended sediments in the water, sediment deposition has the potential to eliminate egg survival during spawning by smothering eggs. The proposed release will directly overlap with the brown trout

spawning and rearing. We recommend avoiding sediment deposition between October 1st and May 1st to circumvent negative impacts to brown trout reproduction.

Sediment deposition may also cause indirect mortality to juvenile trout and small-bodied fishes like mottled sculpin and speckled dace due to habitat loss. These fish require complex habitat consisting of interstitial spaces between cobbles which they use as refuge from current velocity and predators. Loss of this habitat type until a major spring flushing event is likely to reduce fry survival for brown and rainbow trout and have negative impacts on the native populations of mottled sculpin and speckled dace.

Future Monitoring of the North Fork


After the BOR notified CPW about the project, CPW prioritized monitoring the North Fork fishery prior to the planned sediment release. Additionally, we will attempt to sample baseline aquatic macro-invertebrates and conduct benthic pebble count surveys prior to the scheduled release to evaluate the effects of the release on invertebrate populations and on trout spawning substrate³.

CPW understands the acute sedimentation issues within Paonia Reservoir and the importance of maintaining Paonia Reservoir's functionality. We strongly recommend conducting future sediment release projects in the spring of the year to minimize the duration and magnitude of impact on the aquatic ecosystem of the North Fork, and to closely mimic the natural hydrologic cycle. CPW intends to monitor the stream at annual or biannual intervals as part of our on-going fisheries work and to evaluate the effects the proposed action (or future releases) on the fishery.

Conclusion

CPW appreciates the efforts of the BOR to create a long-term sediment mitigation plan to reduce the sediment accumulation within Paonia Reservoir. We look forward to working collaboratively with you to address the sediment issues in Paonia Reservoir, to modify releases to reduce negative impacts on the fishery, and to identify opportunities to improve the downstream aquatic environment. Thank you for the opportunity to comment on this DEA.

Sincerely,


J. Wenum
Area Wildlife Manager Gunnison

xc: P. Dorsey, J. Alves, E. Gardunio, A. Taylor, B. Magee, SWR File, Area 16 File

³ Surveys will be conducted using the "Guidance for Implementation of Colorado's Narrative Sediment Standard Regulation #31, Section 31.11(1)(a)(i)" released by the Colorado Water Quality Control Commission (https://www.colorado.gov/pacific/sites/default/files/98-1SedimentGuidance2014withAppendicies_1.pdf).



Cary Denison, Gunnison Basin Project Manager

September 20, 2016

Ed Warner
Area Manager
Bureau of Reclamation
Western Colorado Area Office
445 West Gunnison Ave. Suite 221
Grand Junction, CO 81501

CC: Jenny Ward
Bureau of Reclamation
jward@usbr.gov

Re: Environmental Assessment- Paonia Dam Intake Structure Repair (WCAO-GJ-EA-2016-03)

Dear Mr. Warner,

On behalf of Trout Unlimited "TU", its 10,000 Colorado members and local chapters, I am pleased to offer the following comments on the Environmental Assessment "EA" and Draft Finding of No Significant Impact "FONSI" for the Paonia Dam Intake Structure Repair. TU appreciates the opportunity to provide comments on this important matter.

TU understands the significance of the proposed repair work to the inlet tower for the water users who depend on reliably accessing water stored in the reservoir.

Of note, the background information of the EA states that the Paonia project provides supplemental water for 15,300 acres. The Fire Mountain Ditch Company provides irrigation water for less than 8,000 acres.

As mentioned in the EA, efforts in 2014 to access the inlet tower and perform maintenance resulted in considerable sediment releases to the river; approximately 45,100 cubic yards. This sediment release occurred during a period of low flow and impacted the North Fork of the Gunnison as well as the Gunnison River as far as 4 miles downstream of the confluence with the North Fork. Heavy sediments coated portions of the river bottom and suspended sediments created higher than normal turbidity levels impacting recreation and river based business on the Gunnison River. The release likely affected trout and benthic invertebrate populations and if not for higher than normal flows in the spring of 2015 these impacts would likely have had a much greater and lasting effect on the river. The Environmental Commitments section of the Introduction to the EA states 'In order to mobilize and disperse any sediment deposited in Muddy Creek and North Fork of the Gunnison River downstream of the dam during

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the proposed repair work high flows will be released from the dam as soon as practicable during spring runoff in the April through June timeframe". While we are pleased that this step is being required, it is worth pointing out that the term 'high flows' are relative and there is no guarantee that flows adequate to effectively disperse sediments like those in 2015 will be available. We suggest that the EA include a requirement to maximize the use of stored water as well as spring runoff to disperse sediment in the spring of 2017.

The EA describes how heavy sediment distribution can result in trout population reductions including brown trout that spawn in the fall. We have great concern that the impacts from the estimated 45,100 to 137,000 cubic yards would create considerable negative impacts on the fishery health, downstream water users, local economy and the general riparian health in the North Fork as well as the Gunnison River. The EA does not provide detail on how the approximate sediment release from proposed project would be diluted by flows during and after the project. Based on the sediment dispersal in 2014 and the estimated sediment release we can assume the proposed project will impact aquatic life including the following year's age class of brown trout.

For these reasons TU asks the proposed project managers including the North Fork Water Conservancy and Fire Mountain Ditch and Reservoir Company staff to take additional steps to mitigate potential impacts from sediment releases related to the proposed project. These steps include minimizing sediment releases to only that which is necessary to make proposed repairs, maintaining a pool around inlet works until the start of the project and establishing that pool as soon as possible after the project to prevent drawing additional sediment through the dam to the river, and installation of a sediment boom or baffle dam downstream of the dam before Muddy Creek joins Anthracite Creek to prevent heavy sediment from reaching the river system. The sediment boom or baffle should be located in the river channel immediately upstream of the Muddy Creek below Paonia Reservoir gauging station the baffle would allow for at least some of the heavier sediments to drop out of the water column to be excavated after the project and dispersed by spring flows.

In section 1.5 Relationships to Other Projects, the EA discusses the Paonia Modification Alternatives study that will among other things "evaluate feasible sediment management alternatives". Considering the importance of future operations and sediment management to water supply and fisheries health, TU asks the Bureau of Reclamation to use the proposed inlet repair project to compliment future operation changes. TU encourages the Bureau of Reclamation and partners in the Paonia Project to use the inlet repair project as a building block toward addressing the sediment issues and creating a water management in the near future.

In conclusion TU requests that project proponents and the BOR employ the following techniques to minimize the release of sediment into the main-stem and North Fork of the Gunnison Rivers.

- 1) Initiate construction during times when adequate water exists to provide flushing flows.
- 2) Create stilling pools around the inlet works to minimize sediment transport through the dam.

- 3) Install sediment baffles or other structures to slow water velocity between the dam and Anthracite Creek to allow larger sediment to drop out.
- 4) Use the project to evaluate sediment control techniques and help inform future work on the reservoir.
- 5) Maximize storage and runoff potential to disperse accumulated sediments below Paonia Reservoir in spring of 2017.

Thank you for considering our comments. We look forward to the final decision.

Sincerely,



Cary Denison, Trout Unlimited
Gunnison Basin Project Manager



September 22, 2016

Ed Warner
Area Manager
Bureau of Reclamation
Western Colorado Area Office
445 West Gunnison Ave. Suite 221
Grand Junction, CO 81501

RE Environmental Assessment—Paonia Dam Intake Structure Repair (WCAO-GJ-EA-2016-03)

Dear Mr. Warner:

Thank you for the opportunity to submit comments regarding the Environmental Assessment (EA) for the Paonia Dam Intake Structure Repair (WCAO-GJ-EA-2016-03). This comment is on behalf of the board and members of the Western Slope Conservation Center (Conservation Center).

The Conservation Center supports the North Fork Water Conservancy District (NFWCD) as they look to repair infrastructure and improve the capacity of the Paonia Reservoir. The Paonia Reservoir provides an important storage and flood control resource to the North Fork Valley. Consequently, the Conservation Center very much supports the Bureau of Reclamation authorization and funding to the NFWCD to make necessary repairs to the outlet works intake structure at Paonia Dam provided the following concerns are addressed:

- Sediment Impacts
- Downstream Monitoring
- Evaluating Upstream Conditions
- Cohesive Planning with Regards to Future Management
- Public Outreach

Sediment Impacts:

The current EA does not take into account the possibility of low water for the upcoming winter and spring (2017 CO water year) nor does it evaluate the full scope of possible sediment impacts that could occur with varying sediment releases and flows. The Conservation Center is concerned with the possibility that in the case of low flows, the NFWCD, Fire Mountain Canal Ditch and Reservoir Company, and BOR will be unable to meet the needs of users dependent on irrigation water while also protecting the health of the watershed by flushing the released sediment downstream below threshold dilution levels.

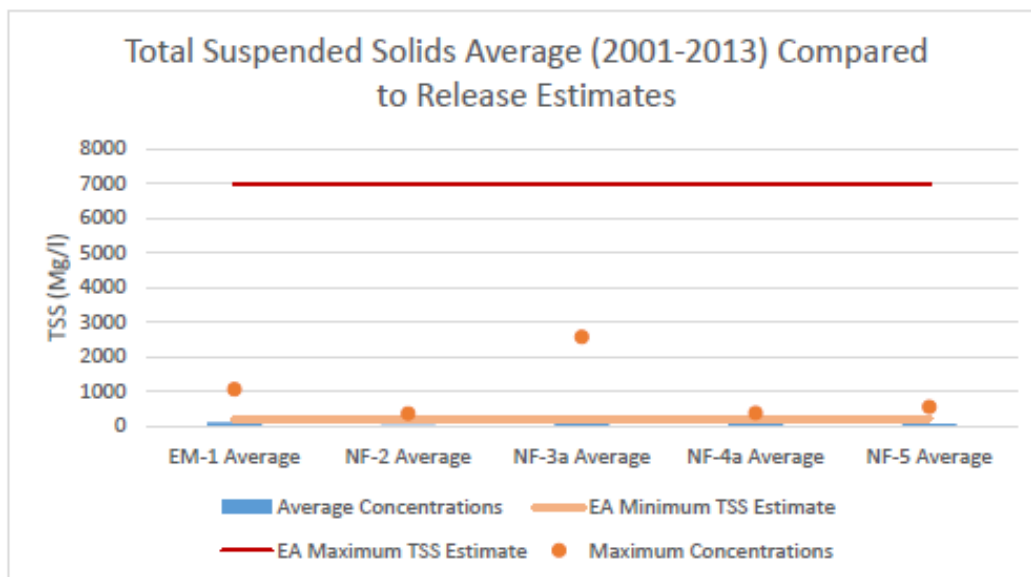
The Western Slope Conservation Center is concerned that the EA does not adequately address contingency plans in the case of a low water event in the Muddy drainage during the first half of the 2017 CO water year. In the case of a low water event, the proposed construction could result in sediment loading which could significantly impact downstream water quality including fisheries, macroinvertebrate, wetland, and riparian health.



A 2014 Paonia Dam inadvertent release flushed 137,000 cubic yards (CY) of sediment into Muddy Creek and the North Fork Gunnison River downstream of Paonia Dam (Reclamation 2015, Reclamation 2016) (4). The immediate associated turbidity concerned local residents, business owners, and water users. The remaining sediment in the North Fork was successfully dispersed during the high flow releases in 2015. However, 2015 experienced high water which likely assisted NFWCD and BOR to disperse the sediment during high flows while also meeting the needs of water users.

Should the models stand correct, the proposed construction will release 45,100 CY of sediment during construction (with the potential of releasing 137,000 CY of sediment), less than the 2014 release. However, the increased sediment loads will likely still be above historical averages and maximum concentrations (known through data gathered by River Watch available upon request). As stated in the Environmental Assessment, “Modeling data associated with the proposed project work show the estimated total suspended sediment concentration could range from 200 mg/l to 7,000 mg/l depending on the inflows to the reservoir and the sediment accumulations around the intake structure (Reclamation 2016)” (21).

This range of total suspended sediment (TSS) concentrations is concerning when compared to average TSS concentrations below the Paonia Dam on the North Fork of the Gunnison River. According to River Watch data gathered between 2001 and 2013, the average total suspended solids (TSS) concentration below the Fire Mountain Canal diversion (station NF-2) was 37.82 mg/l and the maximum TSS concentration was 358.8 mg/l (see figure below). This data does not include the 2014 release.



Data gathered by River Watch Volunteers
 Site Locations:
 EM-1: East Muddy
 NF-2: North Fork of the Gunnison below Somerset/Fire Mountain Canal
 NF-3a: North Fork of the Gunnison below Paonia
 NF-4a: North Fork of the Gunnison below Hatchkiss



As stated in the Environmental Assessment: “The effect of suspended sediment on aquatic biota is dependent on several key factors. These include: concentration, duration of exposure, chemical composition, and particle-size distribution of the solids (Bilotta and Brazier, 2008)” (21). A temporary increase in sedimentation and turbidity is unlikely to cause significant long-term harm to downstream water quality, instream, wetland, and riparian habitat, and subsequent impacts to macroinvertebrates, fish, and wildlife. However, should the Muddy Creek and Anthracite drainages experience a low water event of significant duration the impacts to macroinvertebrates and fish, in particular, could be much greater due to increased levels of sediment load.

Downstream Monitoring:

The current EA does not provide for any water quality monitoring during the proposed construction nor during high flow releases in 2017. The Conservation Center is concerned that the impacts of the proposed construction will not be quantifiable without data regarding water quality, fish, and macroinvertebrates. This is of particular importance in anticipation of future long-term management solutions.

The proposed construction’s resulting downstream sedimentation will also carry various metals, chemicals, and other particles downstream with it. Information regarding those associated metals, chemicals, etc will be unknown unless the Muddy Creek and the North Fork of the Gunnison are continuously monitored during the time of construction (October – November) and during high flow releases in 2017 (April – June).

While the Conservation Center does administer water sampling through Colorado Parks and Wildlife River Watch Program, we believe additional monitoring will be necessary to evaluate and understand the impacts of construction on downstream water quality, instream, wetland, and riparian habitat, and subsequent impacts to macroinvertebrates, fish, and wildlife.

Evaluating Upstream Conditions:

The types and quality of the sediment that has caused the need to flush and repair the Paonia Dam may cause harmful impacts to the Muddy Creek and North Fork of the Gunnison’s water quality, instream, wetland, and riparian habitat, and subsequent impacts to macroinvertebrates, fish, and wildlife. Naturally occurring or human caused metals, chemicals, and other particles can be carried by sediment. While in small quantities, most of these parameters are safe for the environment, wildlife, and humans, these parameters do have the ability to negatively impact the environment, wildlife, and humans through processes such as bioaccumulation.

The presence of metals and nutrients and their respective concentrations were not adequately taken into account when evaluating the impacts of the proposed action, even though data exists from the Bureau of Reclamation, US Geologic Survey, and River Watch.

Cohesive Planning with Regards to Future Management:

As stated in the EA, the purpose of the proposed construction is to “temporarily stabilize the intake structure until a long-term solution is developed and can be implemented” (1). The Conservation Center values the services that the Paonia Reservoir provides water users in the North Fork, and we are interested in the ongoing improvements and future management decisions that will enable the water users in the North Fork to have access to their water. However, in anticipation of a long-term solution, the



Conservation Center does not believe that the current EA adequately evaluates the “No Action” alternative with the intent of taking on this proposed construction as part of a future, cohesive long-term solution.

By combining short-term and long-term projects, the potential impacts to downstream water quality, instream, wetland, and riparian habitat, and subsequent impacts to macroinvertebrates, fish, and wildlife may be minimized and/or mitigated.

Public Involvement:

While the BOR did reach out to state, regional, and local agencies and organizations, downstream ditch companies, stakeholders, and landowners adjacent to Muddy Creek and the North Fork Gunnison River from Paonia Dam down to Hotchkiss, Colorado, public involvement did not include outreach to the general public which will be at least temporarily impacted by the proposed construction and high flows. This lack of public outreach in the form of press releases and public meetings meant that the general public did not have adequate opportunity to comment on the proposed construction.

Thank you for this opportunity to comment on the Environmental Assessment (EA) for the Paonia Dam Intake Structure Repair (WCAO-GJ-EA-2016-03). The Western Slope Conservation Center strongly supports the North Fork Water Conservancy District (NFWCD) as they look to repair infrastructure and improve the capacity of the Paonia Reservoir. The Conservation Center urges the BOR to produce a final EA that includes adequate monitoring and safeguards which will adequately evaluate and minimize impacts to the health of the downstream watershed.

Sincerely,

A handwritten signature in black ink, appearing to read "Alex Johnson". The signature is written over a faint, light-colored background that looks like a scan of a document with some ghosting of text.

Alex Johnson, Executive Director
Western Slope Conservation Center
204 Poplar Ave.
Paonia, CO 81428
director@theconservationcenter.org
(970) 527-5307

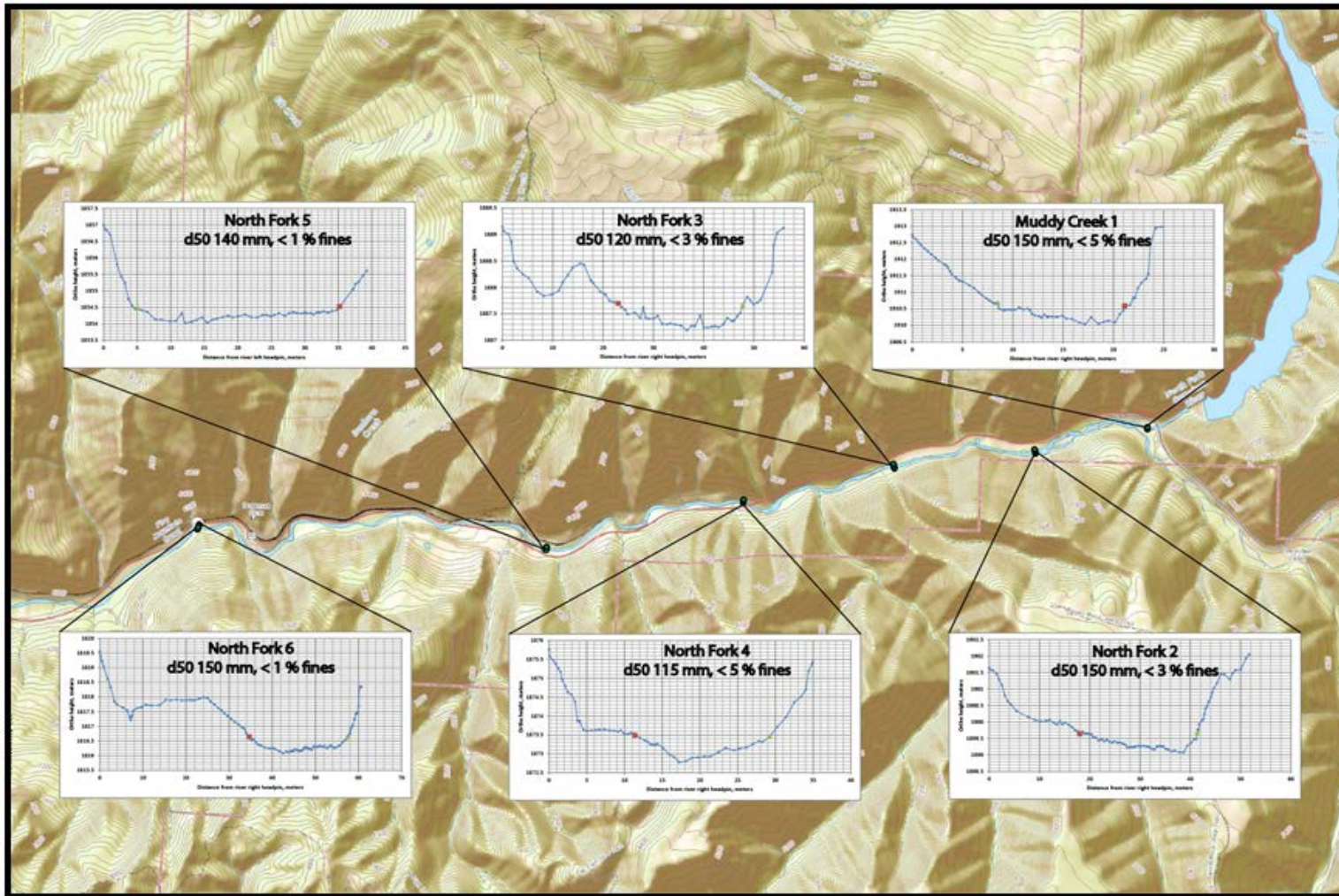
About the Western Slope Conservation Center:

The Conservation Center is a grassroots conservation organization based in the North Fork Valley of western Colorado. We represent 450 members who live within the region. For the last 40 years, the Conservation Center has remained committed to its mission of building an active and aware community to protect and enhance the lands, air, water and wildlife of the Lower Gunnison Watershed.

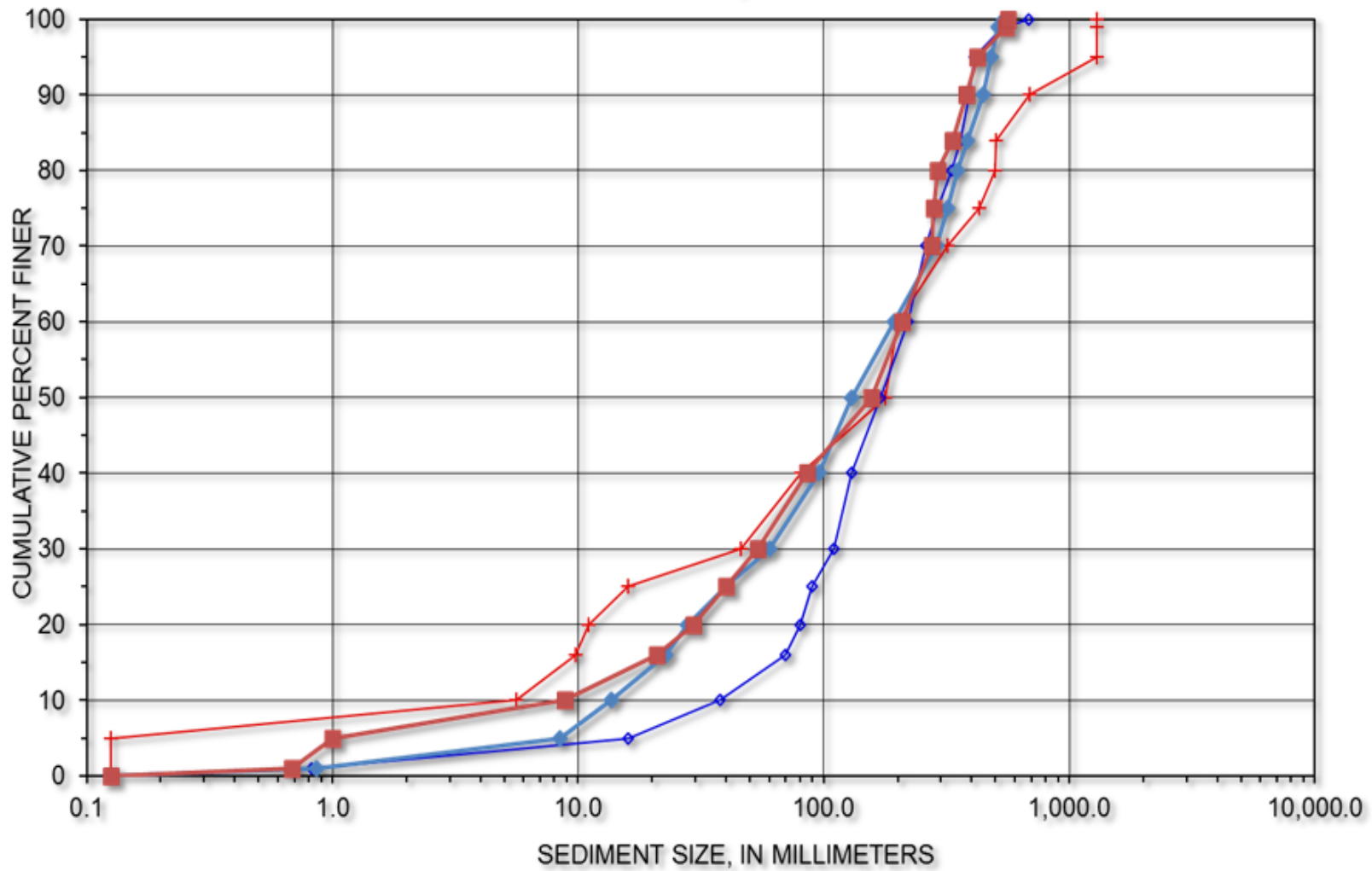
APPENDIX C - USGS 2015 Provisional Cross-section and Pebble Count Data

The diagram shows the locations of each of the six data collection sites. The d50 grain size refers to the median size of material calculated from the cross-section data and the percent fines (<0.0625 mm shown on diagram) calculation from the pebble counts. The green triangle (river left bank) and red square (river right bank) are the water surface elevation at the time of the survey. Cross-sections are oriented looking upstream.

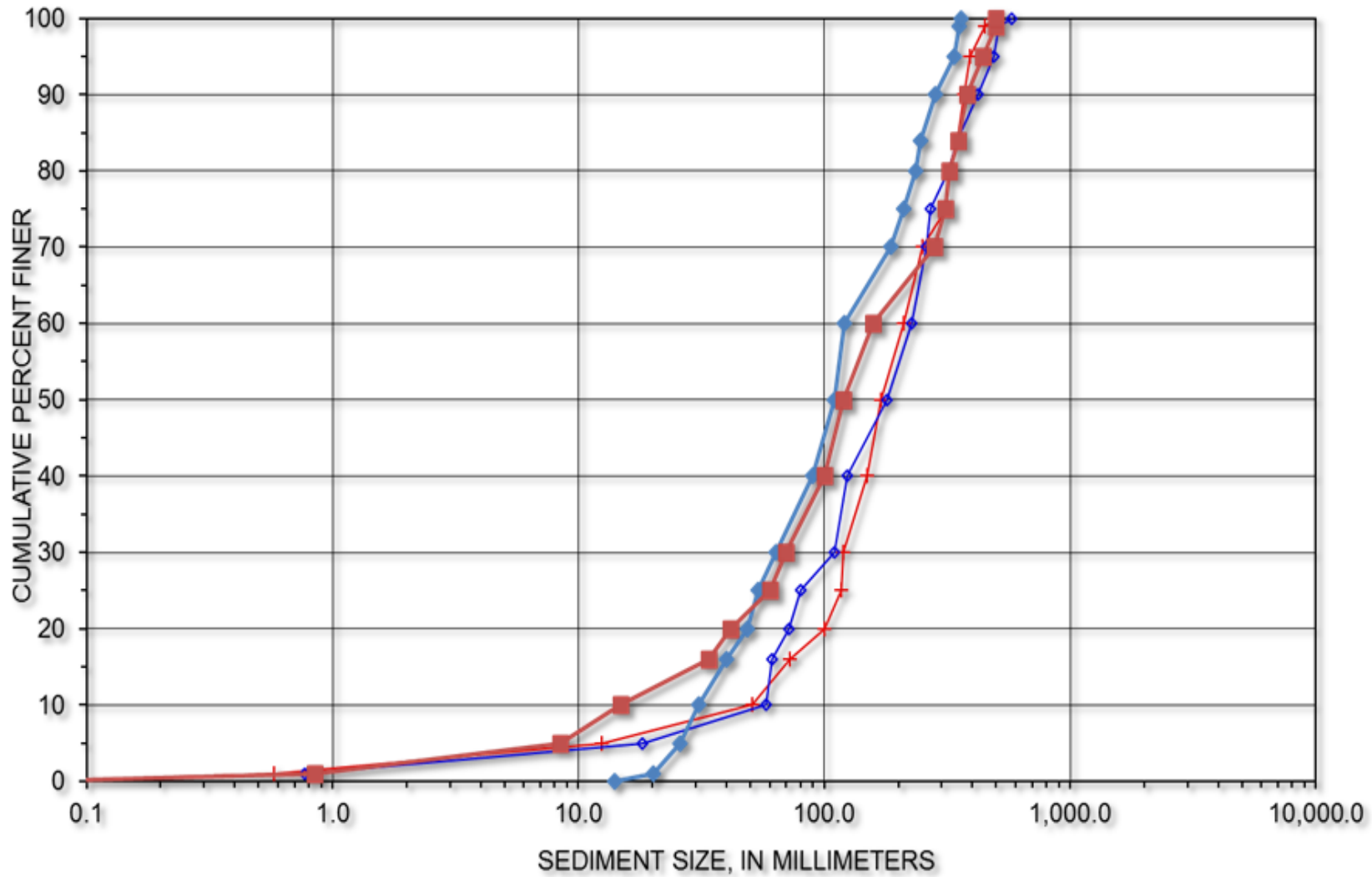
Each cross-section site includes four transects. The graphs show data from each of the four transects associated with each data collection site.



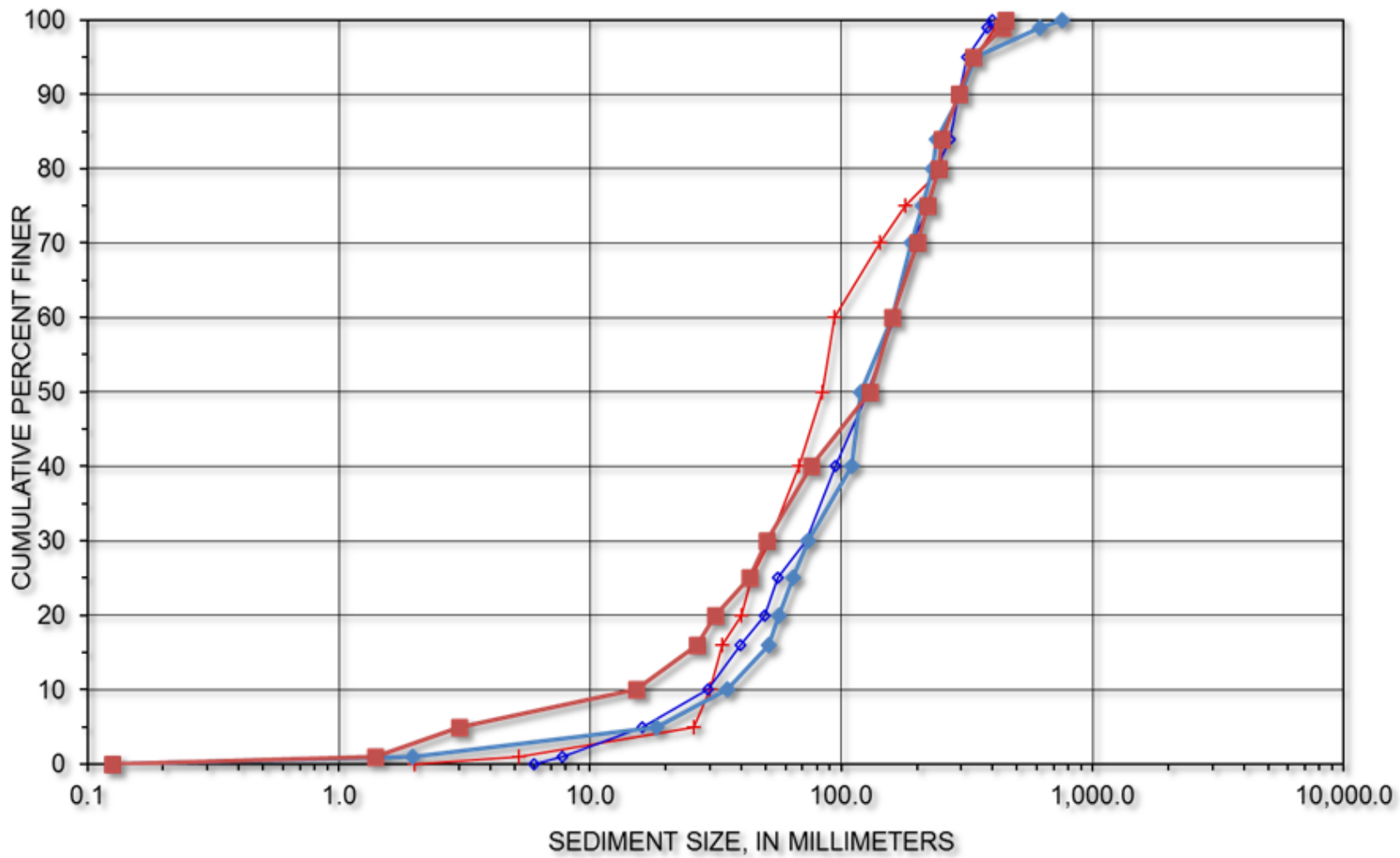
Cumulative Sediment-Size Distributions
North Fork Gunnison River near Somerset, Colorado
Muddy Creek 1



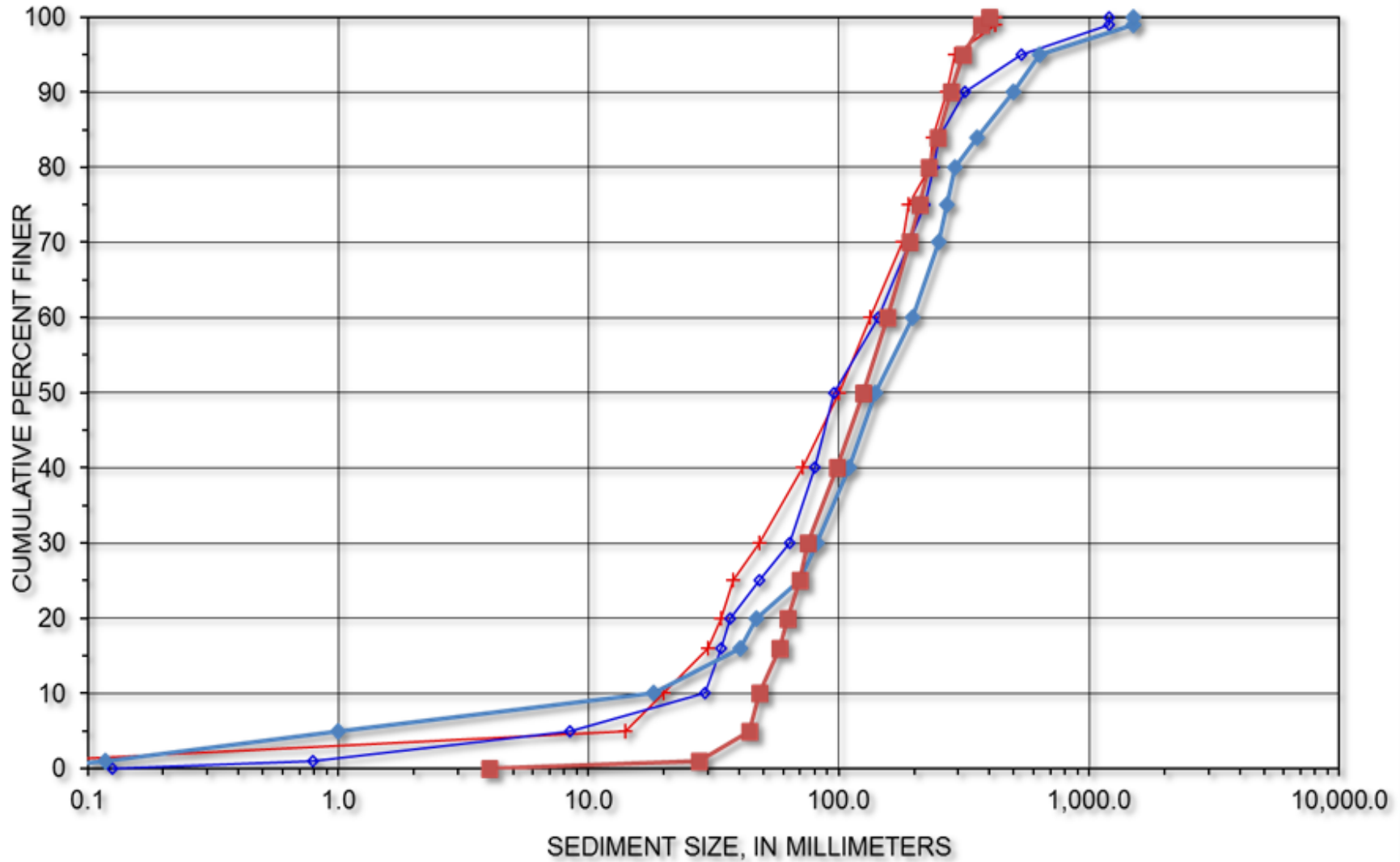
Cumulative Sediment-Size Distributions
North Fork Gunnison River near Somerset, Colorado
North Fork 2



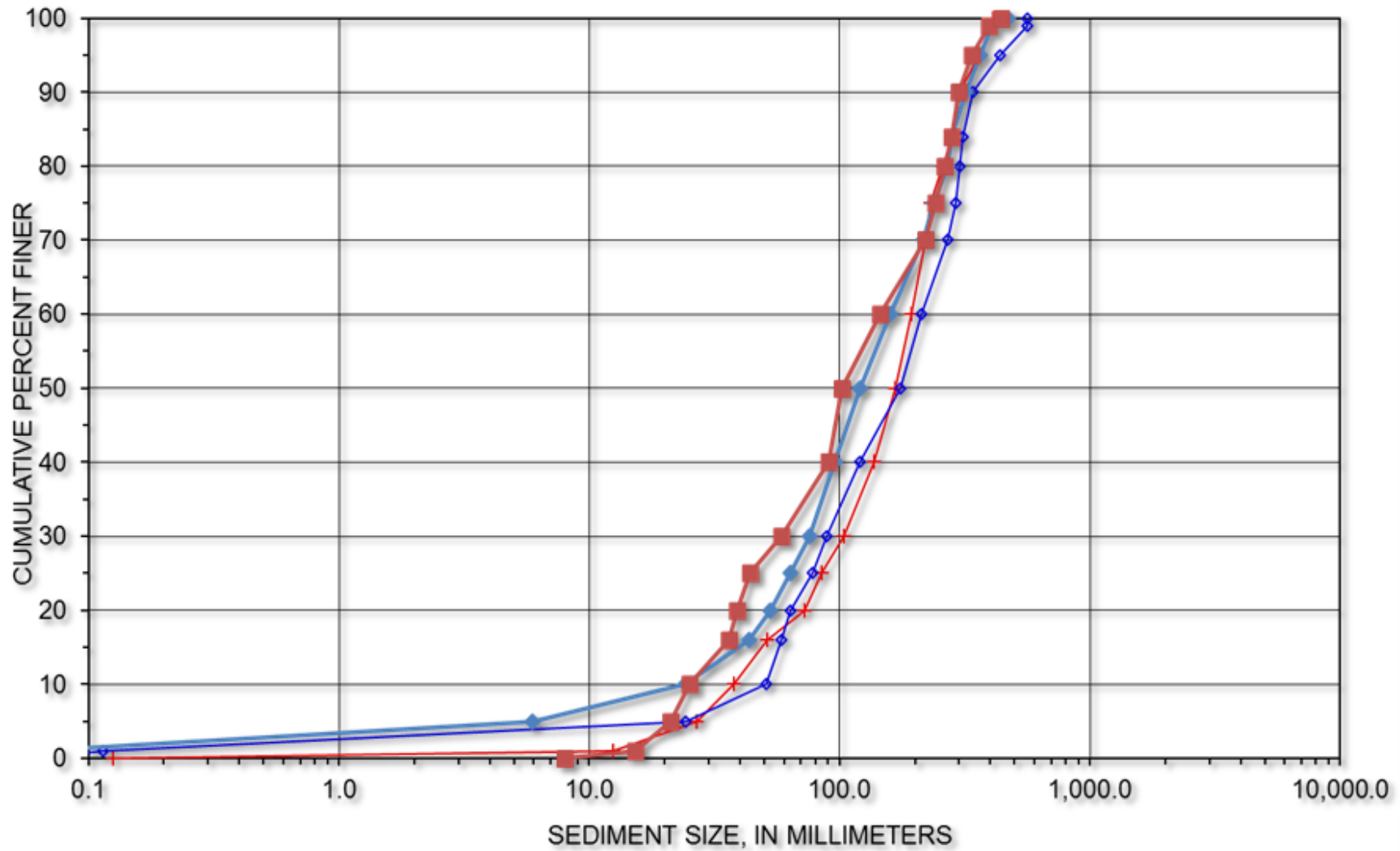
Cumulative Sediment-Size Distributions
North Fork Gunnison River near Somerset, Colorado
North Fork 3



Cumulative Sediment-Size Distributions
North Fork Gunnison River near Somerset, Colorado
North Fork 4



Cumulative Sediment-Size Distributions
North Fork Gunnison River near Somerset, Colorado
North Fork 5



Cumulative Sediment-Size Distributions
North Fork Gunnison River near Somerset, Colorado
North Fork 6

