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Passageway Around the Redlands Diversion Dam and Interim Agreement to Provide Water for Endangered Fish

Bureau of Reclamation

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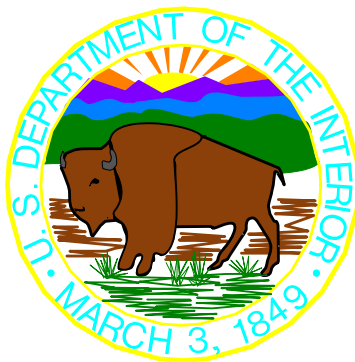


**DRAFT ENVIRONMENTAL ASSESSMENT
GUNNISON RIVER ACTIVITIES**

Passageway Around the Redlands Diversion Dam

and

**Interim Agreement to Provide Water
for Endangered Fish**



**Bureau of Reclamation
and
Fish and Wildlife Service
Grand Junction, Colorado**

February 1995

Frontispiece Map

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CHAPTER 1 - INTRODUCTION

Purpose and Need

This draft environmental assessment (EA) discusses two related actions proposed to assist in the recovery of two Federally-listed endangered fish species. The actions are intended to restore use of historic and designated critical habitat of the Gunnison River by the Colorado squawfish and razorback sucker. The proposed actions are to:

- construct and operate a fish passageway around the Redlands Diversion Dam; and
- execute an interim (short-term) memorandum of agreement (water agreement) to supply streamflows needed to operate the passageway and maintain downstream fish habitat and access for fish to the passageway.

The EA is prepared jointly by the Bureau of Reclamation (Reclamation) and the Fish and Wildlife Service (Service) in compliance with the National Environmental Policy Act (NEPA) of 1969 (Public Law 91-190), the Endangered Species Act, and related Department of Interior policies and regulations.

A need has been identified to allow endangered fish species to move upstream past the Redlands Diversion Dam on the Gunnison River so they can complete their life cycle and establish self-sustaining populations. In meeting this need, the following purposes and objectives are considered:

- flexibility to study effectiveness of the passageway and river flows;
- maintenance of adequate flows to operate a fish passageway and to allow native fish movement in the lower Gunnison River below the Redlands Diversion Dam;
- protection of the purposes of the Redlands Diversion Dam;
- prevention of non-native fish from moving upstream past the Redlands Diversion Dam; and
- protection of existing water rights and uses.

Once required flows have been identified and passageway effectiveness has been monitored, it is expected that a long-term water supply contract will be negotiated that will replace the interim water agreement. Development of the long-term contract involves additional public input and documentation under NEPA and the Endangered Species Act.

Background Information

Recovery Program

The Colorado squawfish (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*) are only found in the Colorado River Basin and are listed as endangered under the 1973 Endangered Species Act. A number of factors, ranging from habitat reduction or alteration to introduction of non-native species, account for the current rarity of these species. Since 1978, the Service has maintained that a jeopardy (risk of extinction) situation exists due to these factors and due to the declining numbers of the endangered fish. The Service has concluded that timely actions should be taken to offset these factors.

In response, the Recovery Implementation Program (Recovery Program) for Endangered Fish Species in the Upper Colorado River Basin was organized in cooperation with private, State, and Federal interests (Fish and Wildlife Service, 1987a). A Final Environmental Assessment on the Recovery Program was published by the Service in 1987 (Fish and Wildlife Service, 1987b). That assessment provided a general review of impacts of the Recovery Program and called for site specific NEPA compliance documents as individual parts of the program were implemented. The program is designed to recover the fish while providing for water development and use to proceed in a manner compatible with applicable State and Federal laws. So long as progress is being made under the Recovery Program, it serves as the best method of avoiding a confrontation between resource protection and water development; a confrontation that would benefit neither the native or endangered fish nor water use and development. The Recovery Program consists of five principal elements:

1. Habitat management
2. Habitat development and maintenance
3. Native fish stocking
4. Non-native species and sportfishing management
5. Research, data management, and monitoring

The Recovery Implementation Program Recovery Action Plan (RIPRAP) was developed under the Recovery Program to spell out specific actions and timeframes believed to be required to recover the fish (Fish and Wildlife Service, 1993). The RIPRAP also provides a framework to measure progress toward recovery. As timeframes are met, water development will continue. Reclamation serves as the lead agency in implementing construction projects and water acquisition activities under the RIPRAP. Restoring passage for endangered fish to historic habitat in the Gunnison River and providing water to critical habitat for the fish have been identified as two high priority tasks in the RIPRAP. Accomplishing these tasks will provide a measurable increase in suitable habitat available to endangered fish and will constitute significant progress toward recovery of the Colorado squawfish and razorback sucker.

Gunnison River

The Gunnison River originates in west central Colorado at the junction of the East and Taylor Rivers in Gunnison County. From there, it flows 25 miles into Blue Mesa Reservoir, one of three reservoirs comprising the Aspinall Unit. Downstream from the reservoirs, the river flows approximately 110 miles to its confluence with the Colorado River at Grand Junction.

The Redlands Diversion Dam is a privately owned and operated structure located on the Gunnison River 2.3 miles upstream from the confluence with the Colorado River (Frontispiece Map). The Redlands Water and Power Company (RWPC) constructed the diversion dam in 1918 and has since modernized and upgraded it. The concrete dam is 8.5 feet high and consists of a 312-foot-long spillway with a 6-foot-wide crest and two 10-foot-wide by 6-foot-high sluice gates. A flow of 750 cubic feet per second (cfs) is diverted through four 14-foot-wide headgates on the west side into the Redlands Canal. This flow is used for irrigation water and hydroelectric power generation. In 1983, the Federal Energy Regulatory Commission (FERC) exempted the Redlands Water and Power Company from licensing under FERC regulations. This exemption required that fish passage be allowed around the dam.

Related Projects

Many existing water projects and related activities are in place and new developments are being considered for the Gunnison River Basin. There are more than 5,000 direct diversion decrees presently in use on the Gunnison River. In addition to water rights for these direct diversions, there are water storage rights; with the largest single developed storage right being the 939,206 acre-foot decree (plus a refill decree of 122, 702 acre-feet) for Blue Mesa Reservoir of the Aspinall Unit. Major existing projects upstream from the Redlands Diversion Dam site include: the Uncompahgre Project which diverts over 300,000 acre-feet of water from the Gunnison River for irrigation and the Aspinall Unit which stores water in Blue Mesa, Morrow Point, and Crystal Reservoirs for conservation and beneficial use, flood control, fish and wildlife, recreation, and hydropower. Smaller Reclamation projects include the Paonia, Smith Fork, Dallas Creek, Bostwick Park, and Fruitgrowers Projects. Projects such as the Uncompahgre Project and the Redlands Diversion Dam have very senior water rights.

Over the last decade, several new projects have been considered on the river that could be developed for hydropower, transmountain diversion, or water supply. These include the Rocky Point and Union Park Projects in the upper reaches; the AB Lateral Project near Montrose; and the Dominguez Project located between Delta and Grand Junction. Of these, the AB Lateral Project is the only one that has progressed to the stage of filing a draft and final environmental impact statement. Presently, the Dominguez Project, which would be developed for hydropower and water storage, has applied for a preliminary study permit through FERC. In 1992, the Department of Interior submitted comments on the study permit and cited significant concerns with endangered species, wilderness, cultural resources, recreation and aesthetics, and other issues.

The National Park Service is pursuing a Federally reserved water right for the Gunnison River through the Black Canyon of the Gunnison National Monument. The Fish and Wildlife Service is conducting studies of the Gunnison River under the Endangered Species Act. These studies will result in a "Biological Opinion" on the operation of the upstream reservoirs of the Aspinall Unit. The Biological Opinion is a report that contains recommendations on how the operations (water releases) can be changed to protect and help recover endangered fish. Test flows have been provided from the Aspinall Unit for the last 3 years to assist in determining fishery needs. The Biological Opinion is scheduled to be completed in 1997, and a NEPA document will be prepared to address any changes in Aspinall Unit operations which may be necessary as a result of the Biological Opinion.

CHAPTER 2 - PROPOSED ACTIONS AND ALTERNATIVES

Proposed Actions

Two actions are proposed. One is to construct a fish passageway around the east side (right abutment) of the Redlands Diversion Dam. The other is to provide water when needed from the Aspinall Unit under an interim (temporary) water agreement as needed to operate the fish passageway and maintain downstream flows. Flows required to operate the passageway would either be released from water stored in the Aspinall Unit or consist of natural Gunnison River flows in excess of the needs of the senior downstream Gunnison River Basin water rights, including the Redlands Diversion Dam and the city of Grand Junction.

Fish Passageway Design

The proposed concept for the fish passageway is a concrete chute, 6-feet wide and 350-feet long, routed around the Redlands Diversion Dam and the city of Grand Junction's pump station located on the right bank of the river (Figure 1). The chute will be divided into a series of small pools by baffles; the water flow through the chute will be approximately 25 cfs. The upstream entrance to the fish passage will have a log boom and trash rack to prevent debris from entering. There will be a forebay (widened section of fish passage) near the upper end that allows fish to be trapped and separated before they move upstream into the river. Non-native fish will be returned to the river downstream from the diversion dam.

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Successful use of a passageway by razorback suckers and Colorado squawfish is currently undocumented; and water flow velocities, barriers, and attraction to the fish passage entrance may

control whether passage is successful. Therefore, the passageway will be designed to incorporate measures for added flexibility in controlling water velocities and entrance conditions. The design will allow for variation in baffle spacing, pool length, height of water drop between pools, and water flow rates in order to test various conditions.

Monitoring performance of the passageway and fish behavior under variations in the passageway will help determine the design parameters necessary for successful passage. This facility will serve as an example for future passageway facilities within the Colorado River Basin by helping develop specific design criteria for endangered fish.

An existing sediment bar along the east bank of the river will be dredged as necessary at the upper end of the fish passageway to facilitate water movement. A 42-inch bypass pipe will be constructed underground and adjacent to the chute. This bypass pipe will carry water (approximately 75 cfs) into the river below the Redlands Diversion Dam to attract fish to the passage structure and to maintain habitat downstream. A 12-inch pipe will also parallel the fish passage to return non-native fish captured in the fish trap, thus preventing them from moving upstream into the Gunnison River.

The passageway site will be fenced with a 6-foot-high fence for facility and public safety; a bridge over the passageway will permit vehicle access to the right side of the Redlands Diversion Dam and the city of Grand Junction's pumping plant.

The overall concept and design of the fish passageway was developed through a series of studies, reviews and meetings conducted cooperatively among the Fish and Wildlife Service, Redlands Water and Power Company, Reclamation, the Recovery Implementation Program, the city of Grand Junction, environmental organizations, and the states of Colorado, Utah, and Wyoming. A more detailed description of the fish passage is contained in Attachment A.

Fish Passageway Construction

The proposed passageway will be constructed on land owned by the Redlands Water and Power Company. Property interests (such as an easement or exchange) will be acquired by the United States. The city of Grand Junction also has a lease on the land for their pumping facilities. The passageway will be built under a contract administered by Reclamation; funding will be provided by Reclamation through the Recovery Program.

The construction area is comprised of river alluvium overlain at some locations by 2 to 10 feet of man-placed fill material. The fill was apparently obtained from the immediate area and consists primarily of lean clay with sand, silty lean clay with sand, and silty sand with some gravel at the surface. Along the alignment of the fish passage, the alluvium consists of up to 9.5 feet of fine-grained material overlying an unknown thickness of coarse gravel and cobbles. The coarse gravel and cobbles lie on bedrock (Morrison Formation) at an unknown depth. The groundwater table in the area is quite shallow and appears to be directly controlled by the river-water elevation.

Standard construction practices will be used. Excavators and similar construction equipment will be needed to perform required earthwork. Sheetpiling or cofferdams and dewatering will be required for work in some excavations and in the river channel. A Section 404 permit under the Clean Water Act is required. If dewatering results in a discharge into the Gunnison River, a Section 402 permit will also be needed. Commercial concrete and sand and gravel fill will be used. Construction activities will require 10 to 25 workers. Construction is scheduled to begin in the summer of 1995 and be completed by April 1996.

Fish Passageway Operation

The passageway will be operated by the Service on a daily basis, and Reclamation will be responsible for maintenance. Redlands Water and Power will continue to operate the Redlands Diversion Dam in accordance with Colorado water law and their FERC order granting exemption from licensing of a small hydroelectric project (Project No. 6964). Redlands Water and Power will not be responsible for any costs associated with the passageway. Normal operation and maintenance of the Redlands Diversion Dam will not be affected by the fish passage facilities. A construction, operation, and maintenance agreement is being negotiated between RWPC, Reclamation, the Service, and the city of Grand Junction. This agreement will spell out specific responsibilities of the parties. A summary of this agreement is found in Attachment C. The Service will monitor fish use of the passageway and of the Gunnison River. This monitoring, to begin in 1996, will include radio tracking the fish to determine their movements in relation to the passageway.

Interim Water Agreement

To ensure adequate flows to operate the fish passageway and to maintain and study habitat in the Gunnison River downstream from the Redlands Diversion Dam, an interim (temporary, 5 year) water agreement is being negotiated among Reclamation, the State of Colorado represented by the Colorado Water Conservation Board, and the Fish and Wildlife Service. Under the agreement, Reclamation will deliver sufficient water from the Aspinall Unit to maintain a minimum flow of 300 cfs in the Gunnison River below the Redlands Diversion Dam during the months of July through October. Based on records from 1973 through 1994, the 300 cfs flow is already met or exceeded 81 percent of the time in July through October and 86 percent of the time in November through June, based on monthly averages. Thus releases under the agreement would only be necessary a limited time to meet the 300 cfs.

The 300 cfs represents the interim recommendation of the Fish and Wildlife Service and may be modified as additional data is collected. A portion of the same water will be used to operate the fish passageway. The Fish and Wildlife Service and the State of Colorado will study and evaluate the effects of the releases on occupied habitat of endangered fish in the Gunnison River. Recommendations will be made, based on these studies, on development of a long-term water supply contract. In addition, the effects of the interim agreement on other water uses in the basin will be monitored, thus providing important data for use in developing a long-term contract. Attachment B highlights provisions of the draft agreement.

Three alternatives are being considered for how the agreement will address historic water use patterns that have developed since the completion of the Aspinall Unit and these are discussed below. Alternative A, which provides fish flows of 300 cfs from July through October and historic levels of protection to water users based on water supplies and existing contracts, is the preferred alternative. Under all alternatives, including No Action, water would be available for sale from the Aspinall Unit for municipal, industrial, irrigation, or other purposes.

Alternatives

No Action

On any program, the "No Action" alternative exists. Under this alternative, a fish passageway would not be constructed under the Recovery Program and the interim water agreement would not be executed. There would be no special effort to maintain a flow of 300 cfs below the Redlands Diversion Dam at this time, nor would there be special efforts to protect downstream water users, although indirect benefits to water users would be expected to occur dependent on water supplies. The need for a fish passage would remain and a passageway could be constructed under other programs. Under No Action, the endangered fish studies on the Gunnison River would still continue, leading to recommendations for changing Aspinall Unit operations to protect the fish. However, the Recovery Program would no longer serve as the reasonable way (reasonable and prudent alternative) to offset impacts of water development, and existing and future water development and use in Colorado could be adversely affected.

Fish Passageway

Alternative designs for the fish passageway were also considered, and several different types of passage structures were appraised. All but one of the alternatives had a vertical slot and orifice in each baffle. The primary variable of the different alternatives was the location of the passageway in relation to the diversion dam. Several alternatives considered building the passageway over the Redlands Diversion Dam in different locations. Alternatives involving building the passageway directly over the diversion dam were eliminated because they would decrease the ability of the diversion to handle flood flows, could interfere with operation of the diversion, and could increase the potential for ice damage to the passageway. One alternative provided for the fish passageway leading into the Redlands Canal and included a pipeline from the canal into the Gunnison River. This alternative was eliminated because it would force the native fish to use an enclosed pipe to exit from the canal into the river and would probably increase the potential of fish to be lost in the downstream powerplant.

Interim Water Agreement

Three alternatives are being considered for the interim water agreement. These are, basically, two alternatives to provide water for the endangered fish from the Aspinall Unit with protection of historic water uses and one alternative to provide water for the interim agreement with no special protection of historic water uses:

Alternative A (Protection of Basin Water Users through Operational Flexibility)--The agreement would maintain flows of 300 cfs downstream from the Redlands Diversion Dam in July through October. Based on water supplies available, Aspinall Unit operation planning would try to maintain that flow in other months, much as is done under present conditions but would not be part of the water agreement. The agreement would specify that during the Aspinall Unit operation meetings (held each year during January, April, and August), Reclamation would develop an operating plan and water release schedule that attempts to satisfy the needs of downstream Gunnison River mainstem water users senior in priority to the Aspinall Unit. Dependent upon current hydrologic conditions and the available water supply, Reclamation would implement an operating plan which removes the need for administrative calls by these senior water rights when making releases for endangered fish. If an operating plan cannot be implemented which removes the need for administrative calls, then the parties to the agreement may reduce the 300 cfs fish release in order to minimize administrative calls. Simply, this means that historic post-Aspinall Unit water availability would be maintained as much as possible through Aspinall Unit operational flexibility, and increased calls on the river (which could harm some water users) would not be likely.

Alternative B (Protection of Basin Water Users through Contracts)--The agreement would maintain flows of 300 cfs downstream from the Redlands Diversion Dam as in Alternative A. In order to provide formal protection of downstream mainstem water users, it would be necessary to execute water delivery contracts with each individual and entity who have historically benefitted from Aspinall Unit operations. These contracts would be subject to the Reclamation Reform Act (RRA). The RRA contains, among other things, provisions that limit the amount of acreage a landowner and/or lessee is allowed to irrigate with water purchased from Reclamation. The RRA also contains provisions that may affect the price paid for Reclamation irrigation water. Water users with contracts would not be affected by protection of the interim water deliveries to endangered fish. Water users without contracts would be subject to water rights administration, and some of the indirect benefits that have occurred to these water users since the Aspinall Unit was constructed could be lost.

Alternative C (No Special Protection of Basin Water Users)--The agreement would maintain flows of 300 cfs downstream from the Redlands Diversion Dam in the months of July through October. The agreement would not specify any special operational considerations for determining releases from the Aspinall Unit to help maintain post-Aspinall Unit water supplies. Under this alternative, some of the indirect benefits that have occurred to all Gunnison River Basin water users since the Aspinall Unit was constructed would be lost.

Under all alternatives, water would be available to interested water users, based on available supplies, from the Aspinall Unit through contracts. These alternatives for the interim water agreement are discussed in more detail in Chapter 3, under "River Flows, Water Rights, and Water Use."

CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

General

This chapter discusses resources associated with the Gunnison River that could be affected by the proposed actions of constructing a fish passageway and providing water flows through an interim water agreement. The passageway and associated interim water agreement are designed to benefit endangered fish and could affect other resources as discussed below. Concerns have been expressed by the public and other entities (see Chapter 4 on Consultation and Coordination) about some of these impacts, and efforts have been made to address these concerns in this report.

Vegetation and Land Use

Existing Conditions

The Gunnison River Basin is primarily rural. Much of the over 8,000 square mile watershed is National Forest or Bureau of Land Management lands. Valleys are largely private and were originally developed for ranching, farming, and mining. In recent years, recreation, retirement living, and second-home development have become important. In the vicinity of the Redlands Diversion Dam, lands are a combination of parcels privately owned by individuals, sand and gravel operations, or Redlands Water and Power Company; and Federal lands managed by the Bureau of Land Management. The Southern Pacific Railroad's line parallels the Gunnison River in this area and primarily hauls coal in unit trains. The railroad and the Redlands Diversion Dam are the primary land use. The city of Grand Junction has a water intake structure on the east side of the diversion dam. Immediately upstream on the east side of the river agricultural lands are irrigated; however, future plans are to use this area for sand and gravel mining. There has been some home development on the west side of the river in the last few years.

The riparian areas upstream from the Redlands Diversion Dam are dominated by cottonwood trees, willows, Russian olives, tamarisk, wild rose, and skunkbush sumac. Downstream there has been more disturbance to vegetation although bands of willow and bulrush occur. The disturbed areas are vegetated primarily with kochia, bindweed, and grasses and forbs. Away from the influence of the river, vegetation changes to upland communities of greasewood, rabbitbrush, and saltbush.

Wetlands in the vicinity of the fish passage include scattered areas of shrub-scrub and emergent wetlands dominated by willows and bulrush, respectively. Also present is a riparian component with a canopy of cottonwoods.

Impacts

Under the No Action Alternative, the major land use change in the immediate vicinity is projected to be conversion of upstream riparian and agricultural areas on the east side of the river to sand and gravel extraction uses.

Construction, operation of the fish passageway, and provision of water under the interim agreement will have no significant effect on land use. Approximately 1 acre of land will be used permanently for the fish passage facility. Designs and operation and maintenance agreements are being developed to protect the structures and uses associated with both the Redlands Diversion Dam and the city water intake.

During construction, an area on the east side of the river between the cliffs and the city of Grand Junction pumping plant will be used as a parking and staging area for vehicles and equipment. The same area will be used to dispose of excess material. The area is vegetated primarily with greasewood/rabbitbrush with large barren areas, and approximately 1 acre will be cleared. Revegetation of this site and other disturbed areas with grasses and saltbush will reduce impacts. Activities will be distanced from the railroad to avoid any conflicts or effects on the railroad operations.

There will be no disturbance to the riparian areas on the west bank of the river. Approximately 0.22 acres of shrubs, including two to four mature Russian olive, skunkbush, and tamarisk shrubs, will be lost due to the fish passage. All cottonwood trees will be protected, although several branches have been identified that will need to be removed. Soil compaction from construction activity could adversely affect the vigor of approximately four mature cottonwoods. Downstream from the diversion, less than .01 acres of emergent wetland (bulrush) will be lost. Up to 200 feet of shoreline will be disturbed by the passage entrance or concrete work; and in this area, .06 acres of emergent wetlands will be lost. The Fish and Wildlife Service (1994a) has recommended that these vegetation losses be replaced by plantings of similar number/area of cottonwood trees, skunkbush sumac, willows, and bulrushes along the Gunnison River and this will be done. In addition the construction zone will be clearly marked to reduce any unnecessary damage to vegetation and disturbed areas will be restored.

River Flows, Water Rights, and Water Use

Existing Conditions

The Gunnison River flows from its beginning at the confluence of the Taylor and East Rivers near Almont, Colorado to its confluence with the Colorado River near Grand Junction (see frontispiece map). The Aspinall Unit Reservoirs (Blue Mesa, Morrow Point, and Crystal) are located approximately 100 miles upstream from the river's mouth. Major river measurement stations (gages) are located downstream from Crystal Dam and near Whitewater, Colorado. A new gage has been installed downstream from the Redlands Diversion Dam. Major tributaries are the Uncompahgre and North Fork of the Gunnison Rivers.

Near Whitewater, average flows are approximately 2,600 cfs and extremes have ranged from 35,700 cfs in 1920 to 106 cfs in 1934. Under natural conditions, the river was characterized by high flows in the spring and early summer due to snowmelt and lower flows in the late summer and winter. Storage of water in the Aspinall Unit and other reservoirs such as Taylor Park has reduced high spring flows and increased flows during other periods of the year. Figure 2 on the next page shows how the monthly distribution of flows has been affected by storage and other water uses.

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Individuals and water user groups began using Gunnison River water in the 19th century with establishment of numerous irrigation water rights. A water right is a real property right which allows the holder to use a certain portion of the river's water for beneficial use. Most of the water rights on the Gunnison River and its tributaries are direct diversion rights which allow the owner to take water out of the river or stream; however, water is not always physically present in a stream to meet the needs of the water rights. In shortage cases, "senior" (earlier in time) water right holders can place a "call" on the river--a request to the State Engineer to force some of the water users with junior rights to cease or lower their diversions and let the water pass downstream to the senior right. Significant senior diversion rights, established between 1900 and 1910, include the Gunnison Tunnel of the Uncompahgre Project (1,300 cfs) and the Redlands Diversion Dam (750 cfs).

An example of how water rights are administered might be: in a dry year, flows above the Redlands Diversion Dam might fall to 600 cfs; in response, the Redlands Water and Power Company could request a call on the river to try to maintain their diversion of 750 cfs. They would ask the State Engineer to shut off upstream junior rights on the Gunnison River or its tributaries. This can, and has in the past, affected water users along the river from Gunnison and Lake Counties to Mesa County. For example, on streams upstream from Blue Mesa Reservoir, junior water users were historically shut down when the Redlands Diversion Dam or Gunnison Tunnel placed calls on the river.

In addition to direct diversion rights, there are storage rights, which allow a water user to store water in a reservoir for later release. Water stored under the State water rights system can later be released when needed for a downstream use. Once stored, the water can be released and protected past all other water rights such as the Gunnison Tunnel and Redlands Diversion Dam, even if there is a call on the river. The largest single storage right on the Gunnison River is the 939,206 acre-foot decree for Blue Mesa Reservoir. A block of storage water in Blue Mesa--estimated at 148,000 acre-feet--has been set aside to mitigate impacts of the Dallas Creek and Dolores water projects on endangered fish and will be used for the interim agreement water supply.

Calls on the river have decreased since the Aspinall Unit began operations in the 1960's. This is because the Unit stores water in high flow periods when there are no shortages and increases river flows by hydropower releases in normally low water periods as shown in Figure 2. Thus, senior water right holders such as the Redlands Diversion Dam, have had more dependable water supplies and junior water rights have been less likely to be "called out."

Concerning the specific operation of the Redlands Diversion Dam, flow is diverted into the Redlands Canal year-round. About 60 cfs of irrigation water is pumped or diverted from the canal to serve residents of the Redlands Mesa. The irrigation season lasts approximately 6 months from April 15 to October 15. The rest of the year, the power canal is operated solely for generation of hydroelectric power. Redlands Water and Power Company operates the diversion dam to maintain the 750 cfs flow into their canal as much as possible.

Redlands Water and Power Company has the following water rights, totalling 750 cfs:

670 cfs - priority date July 31, 1905.

Allowed usages: irrigation, domestic stock, and power generation.

80 cfs - priority date June 26, 1941.

Allowed usages: power generation and irrigation.

There are approximately 45 cfs of absolute water rights between the Redlands Canal and the gage at Whitewater, including the city of Grand Junction's water right of 18.6 cfs (the city also has a conditional right of 101.4 cfs). The city's right is designed to supplement other water supplies; the conditional right has not been used and may or may not be used in the future.

Impacts

In the future, whether or not the proposals outlined in this assessment are implemented, it is projected that there will be more administration of water rights and uses in the Gunnison Basin due to a variety of factors. First of all, a Biological Opinion on the Aspinall Unit will be prepared in approximately 2 years that will recommend operation changes to help protect and recover endangered fish species downstream in the Gunnison and Colorado Rivers. Recommendations will likely call for higher spring releases and lower releases later in the year. This would be more like historic conditions and could lead to more calls on the river. A second factor that is expected to come in to play is the quantification of the reserved water right for the Black Canyon of the Gunnison National Monument. This right is established and is senior to Aspinall Unit storage rights but its quantity in flow (cfs) has not been determined. When this is determined, a set quantity of water will be required in the river through the Monument, and this may affect water available to junior water rights upstream in the Upper Gunnison Basin and water storage in Blue Mesa Reservoir. Future sales of Aspinall Unit water may also result in increased administration of water rights. Finally, there are several water projects that could potentially be constructed upstream from the Redlands Diversion Dam, including the Dominguez Reservoir Project between Delta and Grand Junction and transmountain diversion projects studied to divert Gunnison flows to eastern Colorado.

In summary, it is highly probable that there will be changes in Gunnison River flows in the future that may lead to increased administration of water rights with or without construction of the fish passageway or implementation of the interim water agreement.

Under the No Action Alternative, Recovery Program timeframes would not be met and the Program would not serve to offset impacts of water development and use on endangered species. This could harm permitting of future water activities and/or lead to more stringent requirements on existing water uses.

The fish passageway will have no direct effect on river flows, water rights, or water uses. Provision of flows under the interim agreement, however, will have effects on river flows and could have effects on water uses. Water rights will not be affected, although the water supply historically used by these rights could change.

As indicated previously, water users on the Gunnison River have benefitted from the operation of the Aspinall Unit which has increased streamflows in periods of high water demand. Under the interim agreement, 300 cfs will be protected and delivered to the reach of the river below the Redlands Diversion Dam from July through October in most years. In other words, storage water will be released from the Aspinall Unit and this water will be protected from diversion. If this were occurring in a low flow period, the Redlands Diversion Dam (or other senior right) might not have sufficient water to legally divert their total water need and they could request a call on the river. With a call on the river, junior water rights upstream (for example in the Upper Gunnison Basin or along the North Fork of the Gunnison) would be reduced or shut down and the Redlands Diversion Dam water supply would increase. This call could also occur without the protection of flows for endangered fish, but it could occur more frequently with the interim flow agreement as presented in Alternative C.

During public meetings and water agreement negotiations open to the public, this was the greatest concern expressed--will existing water uses be affected? In response to these concerns, and following a review of assignment contracts and authorizing legislation of the Aspinall Unit and other factors, two alternatives (described on page 10 as Alternatives A and B) have been developed. Operations of the Aspinall Unit would be planned to provide historic supplies as much as possible considering water availability--in essence the benefits that have indirectly gone to water users over the past 30 years would continue. Under Alternative C, Aspinall Unit operations would not consider downstream users as in the past and impacts would occur to existing water uses.

Tables 1, 2, and 3 summarize river changes by showing what would happen to average monthly flows at three points on the Gunnison River under Alternatives A, B, and C in wet, normal, dry, and very dry water years. Tables 1 and 3 show that Alternatives A and B provide increased flows above the Redlands in portions of dry years. This provides for the planned fish flows and protects existing water uses. With the interim agreement in effect, there will be changes in river flows and in Blue Mesa Reservoir. Morrow Point and Crystal Reservoirs, which have smaller capacities, would not be affected. Table 4 shows end-of-month storage in Blue Mesa in wet, normal, dry, and very dry water years as projected under Alternatives A, B, and C. Changes in Blue Mesa storage are minor except in a dry year such as 1990 which was preceded by a dry year.

More detailed tables, showing monthly flows for the entire period of record considered in this report, are found in Attachment E. Attachment E also contains tables estimating the number of months a "call" would occur on the river under the different alternatives including No Action.

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Table 1 - Gunnison River average monthly flows near Whitewater

Table 2 - Gunnison River average monthly flows below Redlands

As can be seen from Tables 1 through 4, water supplies in Blue Mesa would be managed under Alternatives A and B so that no significant impacts to water uses would occur. Water available to downstream diverters would not be significantly affected and thus "calls" on the river should not increase appreciably. This would protect junior water users upstream and downstream from Blue Mesa Reservoir. When flows are 1,095 cfs or greater at the Whitewater Gage as shown in Attachment E, there is sufficient water for Redlands Diversion (750 cfs), other seniors (45 cfs), and endangered fish (300 cfs). Under Alternative C, more effect on water uses is noted and the possibility of junior water rights being "called out" increases. Table 5 on page 20 summarizes the number of months in which shortages or river administration (calls) would occur under the alternatives.

Water supplies in Blue Mesa would be used for the interim agreement but large drawdowns are not seen in the hydrology tables except in a series of dry years such as 1989 through 1990. In a dry period such as this, delivery of 300 cfs to the endangered fish and other Aspinall Unit releases could reduce the reservoir content by over 100,000 acre-feet (see tables in Attachment E). This represents a "worst-case" situation, because improved streamflow forecasting and operating criteria could reduce the impacts of a dry period. Also, the 1990 data reflects attempts to maintain 300 cfs in nearly all months. In a dry year, shortages would be shared by users throughout the basin, including the endangered fish; this will be specified in the water agreement under all alternatives. In extreme drought years such as 1977, minimum flows of 300 cfs would not be maintained and fish habitat would be reduced.

As indicated previously, there are several water projects being considered for development in the Gunnison River. The water rights for these projects would not be affected. Concerns were expressed in public meetings that the fish passage or interim water agreement could lead to establishment of a more stable population of endangered fish species in the Gunnison River, and this would make construction of the Dominguez Project more difficult to permit. The goal of the proposed actions is to establish a larger self-sustaining population of the endangered fish in the Gunnison River. The proposed location of the Dominguez Dam is in a reach of the river already designated as critical habitat for the endangered fish and already occupied by the fish, thus protection for the fish exists on the river and will exist whether or not the fish passageway and interim agreement are completed. Recovery of the fish and their removal from the endangered species list is probably the most advantageous thing that could occur with respect to future water developments.

Previously, 148,000 acre-feet of storage in Blue Mesa Reservoir was planned for use by endangered fish, and the interim agreement water will come from this storage. Thus water will not be removed from other possible uses. In addition, the water delivery agreement will be an interim or temporary agreement; and effects on water uses as well as fisheries will be monitored to provide data for eventual development of a long-term contract.

Table 5

Comparison of River Administration Occurrences

Alternative	Number of Months River Administration Occurs ¹	Percentage of Months River Administration Occurs ¹
No Action		
January - December	13	5%
July - October	3	3%
A and B		
January - December	12	5%
July - October	4	5%
C		
January - December	23	9%
July - October	13	15%

¹ Based on the 22-year period of study as shown in Attachment E.

In summary, the interim contract as described in Alternatives A and B should not significantly affect water supplies available for water users, nor should it significantly affect Blue Mesa Reservoir operations. Language in the water agreement will be designed to protect water supplies in cases of extreme drought such as occurred in 1977. Under Alternative C the possibility of "calls" on the river affecting junior water users would increase.

Fish and Wildlife

Existing Conditions

The primary fish and wildlife resources associated with this proposal are found in the Gunnison River itself and with the riparian and agricultural lands along the river. Reservoirs of the Aspinall Unit support cold water fisheries of kokanee salmon, rainbow trout, and brown trout. Downstream from the reservoirs, portions of the river support a self-sustaining Gold Medal fishery of rainbow and brown trout. In the vicinity of the Redlands Diversion Dam, the river is warmer and more turbid and supports a limited sport fishery. There are 15 species of non-native fish and 6 species of native fish in the river above the Redlands Diversion Dam. In terms of total fish numbers, 75 percent of the fish upstream are native which is considered an unusually high percentage (Fish and Wildlife Service, 1994a). Downstream from the diversion dam, occasional low flow periods reduce the quality of the habitat for fish. There is movement of fish from the Colorado River into this lower reach of the Gunnison River.

The riparian lands, particularly those upstream from the diversion dam, provide valuable wildlife habitat. Forested wetlands in western Colorado are very scarce and support a disproportionately high percentage of wildlife in terms of number of species and number of individual animals. This type habitat is rapidly being lost to sand and gravel development, recreation development, and floodplain alterations. The lower Gunnison River is an important wintering area for waterfowl.

Impacts

Under the No Action Alternative and the proposed actions, there will be alterations of riparian vegetation and wildlife habitat upstream from the Redlands Diversion Dam as private gravel operations are started. River flows downstream from the diversion dam will occasionally be very low, resulting in poor habitat conditions.

Under the proposed alternative, no significant impact on wildlife species is projected due to the small acreage involved with the fish passageway and due to plans to replace vegetation losses.

It is recognized that altered operation of the Aspinall Unit can affect fisheries in Blue Mesa Reservoir and in the Gold Medal trout fishery downstream. The proposed interim water agreement will involve releases of water from the reservoir and maintenance of these flows past the Redlands Diversion Dam. These changes are shown in Tables 1 through 4 on pages 19 and 19, and in Attachment E. Resultant effects on fish and wildlife resources will not be significant under Alternatives A and B because changes in river flows and reservoir content are minor in most years as can be seen from the tables. In a series of dry years exemplified by 1990, the reduction in Blue Mesa Reservoir's water content would reduce productivity of the reservoir. There will be some benefits to the trout fishery in the Black Canyon and Gunnison Gorge areas as low summer flows would occasionally be supplemented over existing conditions.

Improved flow regimes in the Gunnison River downstream from the Redlands Diversion Dam in low flow periods will benefit both terrestrial and aquatic resources down to the confluence with the Colorado River by better supporting associated riparian vegetation communities and increasing the wetted perimeter of the river channel.

Endangered Species

Existing Conditions

The large rivers of the Upper Colorado River Basin are home for four native fish species that are listed as endangered under the Endangered Species Act. This means that the fish are in danger of extinction. The four fish are the Colorado squawfish (*Ptychocheilus lucius*), the razorback sucker (*Xyrauchen texanus*), the humpback chub (*Gila cypha*), and the bonytail chub (*G. elegans*). A variety of factors--diversion of flows, introduction of non-native species, floodplain alterations, barriers to migration, and water quality--have significantly changed the rivers these fish live in and their numbers have dropped sharply. In the Gunnison River (McAda and Kaeding, 1991) flows have been depleted and the naturally occurring high spring flows have been reduced. The Redlands Diversion Dam has cut off migrations of fish from the Colorado River into the Gunnison.

Various sources indicate that the Colorado squawfish and razorback suckers were common in the Gunnison River from the Delta area to Grand Junction (Kidd, 1977; Chamberlain 1946; and Osmundson and Kaeding, 1989). There is no documentation on whether the Gunnison River was ever important habitat for the humpback and bonytail chubs.

A fish inventory was conducted in 1992 and 1993 in the Gunnison River upstream of the Redlands Diversion Dam. Five adult Colorado squawfish were collected in 1993 and none collected in 1992. Several other sightings of squawfish were made in this area in 1992 and 1993. No razorback suckers were collected. One humpback chub was collected in 1993.

In 1993, eight adult squawfish were captured in the 2.3 mile reach of the Gunnison River downstream from the Redlands Diversion Dam. Five of these fish, along with two additional squawfish captured upstream from the Redlands Diversion Dam, were implanted with radio transmitters and returned to the Gunnison River at three different locations upstream of the dam. Their movements were tracked from April 1993 through July 1994. All seven radiotagged fish moved both upstream and downstream of their release site. A total of 112 individual radio contacts were made periodically with these seven fish between July 20 and August 7, 1993, when spawning might occur. Although no spawning fish were observed or captured during this time, the observed grouping together of these fish upstream from the Redlands Diversion Dam suggests possible spawning behavior.

In 1994, 38 individual squawfish were captured in the Gunnison River downstream from the Redlands Diversion Dam, and 14 of these squawfish were recaptured at least once. This indicates a relatively large number of fish that could move upstream through the fish passageway.

Other native fish are found in the Gunnison River, including the flannelmouth sucker (*Catostous latipinnis*) and roundtail chub (*Gila robusta*), both of which have been declining in the Colorado River Basin and are considered candidate species for listing as threatened or endangered status. The Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) is also a candidate species but has

not been found in the mainstem of the Gunnison River since around 1900 (Wiltzius, 1978). The Gunnison River does have a higher percentage of native fish than most Upper Colorado River Basin rivers (Fish and Wildlife Service, 1994a). One theory is that the Redlands Diversion Dam has served as a barrier to upstream migration of non-native fish and has helped maintain a high percentage of natives.

The Gunnison River has relatively high levels of salinity and selenium which are two major factors affecting the water quality in the river. Selenium, which is a trace element and occurs naturally in some of the soils in western Colorado, is also toxic in small concentrations. Increased leaching of selenium into the watershed from agricultural practices is thought to be impacting fish and wildlife that use these waters.

Waterborne selenium concentrations of 2 parts per billion or greater should be considered hazardous to the health and long term survival of fish and wildlife populations due to the high potential for food-chain bioaccumulation, dietary toxicity, and reproductive effects. In some cases, trace amounts of selenium may lead to bioaccumulation and toxicity even when total waterborne concentrations are less than 1 part per billion (Lemly, 1993).

Selenium concentrations in the Gunnison River downstream from Delta ranged from 4 to 10 parts per billion in 1988. Currently, studies are being done to determine what effect will be seen in native fish that use waters with high selenium concentrations. It is thought by some researchers that native fish may have a higher tolerance for selenium than some other fish species, but this has not been confirmed.

Other endangered or threatened species that have been confirmed to use the Gunnison River or its floodplain include the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), and possibly the whooping crane (*Grus americana*). The bald eagle is a fairly common winter resident and historically nested in area river bottoms. Food sources in the area include waterfowl, fish, rabbits, and carrion. The rivers are the primary focus of activities, although the eagles do feed and roost away from the river occasionally. Sandhill cranes frequent the Gunnison Basin during migration and experimentally introduced whooping cranes accompany these migrations between Idaho and New Mexico. This introduction experiment has ended and the whooping cranes in these flocks are not reproducing so their small numbers will gradually disappear from the Gunnison Basin.

The peregrine falcon (*Falco peregrinus*) nests in the Black Canyon of the Gunnison National Monument and along the Colorado River downstream from the Gunnison River confluence.

One bird proposed for endangered species listing--the southwestern willow flycatcher (*Empidonax traillii extimus*)--and two birds that are candidates for listing--the black tern (*Chlidonias niger*) and the white-faced ibis (*Plegadis chihi*)--are considered to possibly use the Gunnison River Basin.

An endangered plant, the clay-loving wild buckwheat (*Eriogonum pelinophilum*), and a threatened plant, the Uinta Basin hookless cactus (*Sclerocactus glaucus*), occur in scattered desert uplands in

the Gunnison Basin. The Brandege milk-vetch (*Astragalus brandegei*), a candidate plant species occurs in the upper Gunnison Valley in Gunnison County.

Impacts

The historical range of endangered fish species in the Colorado River Basin has been fragmented by construction of dams and diversions that serve as barriers to fish movement. Under the No Action Alternative, this condition would continue on the Gunnison River unless a fish passageway was constructed under another program. Under No Action a self-sustaining population of endangered fish would be less likely to develop in the Gunnison River. Under No Action and Alternatives A, B, and C changes in Aspinall Unit operations would still be recommended in the future for protection and recovery of endangered fish.

Construction and operation of the fish passage is intended to correct this problem for the Gunnison River. It is projected that the endangered fish and other native fish will begin to move above the Redlands Diversion Dam on the Gunnison River in the years following installation of the passage. The passageway will essentially open up approximately 50 miles of river for these fish, with the plan that they will eventually develop into self-sustaining populations. The fish passageway will be designed and operated to prevent non-native fish from moving upstream, and this will reduce or eliminate the problem of introducing more non-natives to the Gunnison River.

Provision of water under the interim agreement is a critical element in meeting the goal of self-sustaining populations. The agreement will assure a dependable water supply for operation of the passage and will improve flows in the 2.3 mile reach of the Gunnison River downstream from the Redlands Diversion Dam. The flow in this reach occasionally drops below a level that can support the movement of fish. In extreme drought years such as 1977, flows would not be supplemented as much below the Redlands Diversion. In cases such as this, the fish might remain in the Colorado River where water conditions would be better.

In summary, the proposal is designed to result in a self-sustaining population of razorback suckers and Colorado squawfish in the Gunnison River. It is recognized that there are some unknowns in this plan. For example, fish passages of this type have not been used for these species before and actual use will only be determined by monitoring actual operations. Also habitat conditions above the diversion have been affected by factors other than the diversion--water quality has changed from historic conditions, flow regimes have been altered, channelization has occurred, and non-native fish are present. Some of these concerns are simultaneously being addressed by the Recovery Program.

The program should not affect any other threatened, endangered, or candidate species. Habitats for the bald eagle, whooping crane, and peregrine falcon will not be affected by the fish passage, and flow changes from the interim agreement are not expected to have a measurable effect on riparian vegetation or wetlands used by these species. The southwestern willow flycatcher, black tern, and white-faced ibis would also be expected to be found along the river corridor and similarly would not

be affected. Plant species listed for the Gunnison Basin would not be affected because they occur in upland habitats unaffected by the proposed actions.

This EA also serves as a Biological Assessment under the Endangered Species Act. The proposed actions will not have an effect on proposed species nor the threatened or endangered species considered with the exception of the Colorado squawfish and the razorback sucker. These fish and their critical habitat may be affected but in a beneficial manner. Based on these conclusions and consistent with regulations in 50 CFR 402.13, formal consultation under the Endangered Species Act is not necessary.

Socio-Economic Factors

Existing Conditions

The Gunnison River has long been a key factor in the economy of the Gunnison Basin. The river supports agricultural enterprises, municipal water supplies, and a growing recreation sector in the economy. The Aspinall Unit is important for supporting a variety of water uses, fish and wildlife, and recreation as well as producing hydropower. The operation of the Redlands Diversion Dam and other water projects in the basin is important for the maintenance of existing agricultural and suburban lifestyles in the area.

Impacts

With or without the proposed actions being implemented, the Gunnison River will continue as an important factor in the economy of western Colorado and, when hydropower and water storage are considered, an important factor in the economy of the west. It is anticipated that increasing amounts of water in the Aspinall Unit will be purchased in the future as municipalities and industries grow and require reliable water supplies.

Construction of the fish passageway will introduce money into the local economy, but it is a relatively small project and will not significantly affect the local economy nor place a strain on any services such as schools or transportation. There should be no significant impact on existing socio-economic conditions due to implementing the proposals under Alternatives A and B because of the minor changes in river flows (see Tables 1-3) and the minor changes in water availability. Plans to protect existing water rights and water uses under Alternatives A and B, either through operational considerations or contracts, will preclude any significant impacts on water uses. Under Alternative C, indirect benefits to water users that have occurred since the construction of the Aspinall Unit will be reduced and "calls" on the river would decrease water available to junior water users, as occurred prior to the construction of the Aspinall Unit. This would reduce the supply of late season irrigation water and lead to production losses. Alternatives A, B, and C will result in more energy generation in the summer months and less in winter months; however, hydropower production should not be significantly affected by the minor changes in release patterns. Water would not bypass powerplants

under the agreement. Therefore on an annual basis the amount of energy produced would not be affected.

Water for the interim agreement will come from water already reserved in the Aspinall Unit for endangered fish use (148,000 acre-feet has been set aside) so future water uses and sales will not be affected.

Cultural Resources

Existing conditions

Over the years, lands in the immediate project area have been disturbed by various construction projects related to the Redlands Diversion Dam, by railroad construction, by agricultural practices, and by other activities. Evidence of prehistoric resources is not present. The Redlands Diversion Dam itself has an interesting history. Construction on the Redlands project began in 1905 and Benjamin and Frank Kieffer incorporated the Redlands Irrigation Company in 1906. The original diversion dam was about 1,000 feet upstream from the present location; the existing dam was built in 1918. Operators of the Redlands project originally sold electric power and water, and irrigated substantial acres of company land. Later, the company's agricultural lands were sold to private farmers and the company operated primarily as a water distributor and power producer. Today, the company still operates in this manner, although most customers are now homeowners rather than farmers.

Impacts

The proposed fish passageway and interim water agreement would not have direct effects on the diversion dam or its operation and thus would not affect its historic qualities. The fish passageway would change the appearance of the east side of the dam, giving the area a more "developed" and less "rural" appearance, but would not significantly affect its historic qualities.

No Indian Trust assets are known to exist in the Redlands Diversion Dam area, nor in the Aspinall Unit reservoirs. Therefore alternatives being considered would have no effect on such assets.

Recreation and Visual Resources

Existing conditions

The Gunnison River between Delta and Grand Junction is used by anglers and motorized and non-motorized boaters. Recreational floating occurs in the summer months. There is also some fall and early winter floating associated with hunting. The river is accessible upstream at Whitewater and a 1 day float can be made between that point and the Redlands Diversion Dam. If access to and from the river were improved, it is projected that use would increase.

The Redlands Diversion Dam is a barrier to uninterrupted river travel, and boaters must currently use private property to take out or to portage around the dam. Permission has to be received from the private landowners. There is no public take out at the present time. The diversion represents a significant safety problem to boaters that approach it too closely. Agencies and organizations familiar with the lower Gunnison River generally agree that a safe take out is needed somewhere upstream of the Redlands Diversion Dam. Although the Redlands Diversion Dam site is posted, there continues to be recreation immediately downstream from the diversion. Uses include fishing, swimming, and "partying". There have been drownings at this location in the past.

The Redlands Diversion Dam is located near the lower end of a wide canyon, with scenery dominated by the river, sandstone cliffs, and cottonwood groves. The area has potential for being a very attractive natural area within the city of Grand Junction; however, the general area has problems with vandalism, illegal trash disposal, and overall misuse by trespassers. The Gunnison River and its fringe of riparian vegetation is attractive from most locations. Extreme low flows during dry summers detract from its appearance, but overall it remains a positive part of the visual landscape.

Blue Mesa Reservoir and the Gunnison River through the Black Canyon of the Gunnison National Monument and the Gunnison Gorge are significant state and national recreation areas, providing boating, fishing, and other uses.

Impacts

Under the No Action Alternative, problems associated with a river portage or take out will remain the same with no safe, legal public facility. Trespass will not be affected unless enforcement activities are increased. The appearance of the area will change substantially as gravel operations begin upstream under all alternatives.

With construction of the fish passageway on the east side of the river, the conditions cited above will not change. During planning of the passageway, suggestions have been made that a river portage and/or river take-out be made part of the proposal. This has not been included in the plan for several reasons: First, it is unknown how human activity around the portage would affect the behavior of the endangered fish. Second, this would place the portage or takeout very near the Redlands Diversion Dam and create a potentially dangerous situation for boaters. Finally, the land on which the portage would be built is private land and the landowners do not support the idea because of safety, liability, and vandalism concerns. Plans to fence the passageway facility will reduce the trespass use of the downstream area of the diversion dam, where river currents are most hazardous.

The fish passageway and associated fencing will be another human development introduced into the visual landscape. It is located in the immediate vicinity of a pumping plant and the diversion dam so the new structure will be compatible with existing uses, but it will be noticeable. Revegetation efforts will help reduce any visual impacts, and the presence of more people working in the area will

hopefully reduce vandalism and trash dumping. Additional river flows in the 2.3 mile reach downstream from the diversion in dry periods will be beneficial from an aesthetic standpoint.

Recreational use of Blue Mesa Reservoir will not be seriously affected because changes in reservoir content will not be significant (see Table 4 and Attachment E). In some dry periods such as shown in 1990, content would be reduced noticeably by the end of the year. Recreational use of the Gunnison River downstream from Crystal Dam would benefit in dry years as flows would be supplemented in the summer months. In very dry years, water available for recreation in Blue Mesa would be reduced. Better forecasting and operation planning will reduce this impact.

Summary and Environmental Commitments

In summary, the primary effects of the proposed actions will be to allow native fish to move into habitat that has been blocked for almost 80 years. River flows downstream from the Redlands Diversion Dam will be improved in low water periods to the benefit of aesthetics, fish and wildlife, and recreation. Water rights will not be affected, but water supplies could be affected in very dry years. The Aspinall Unit has provided indirect benefits to water users in western Colorado for nearly 30 years--these benefits would continue through operational considerations under Interim Water Agreement Alternatives A and B and would be reduced under Alternative C.

The following environmental and social/economic commitments are included in the proposals:

- Minor wetland losses that will occur will be replaced through special plantings in the vicinity of the impacts.
- Disturbed areas will be restored through placement of topsoil, preparation of land for seeding, and seeding with grasses and shrub species.
- Minimum flows will be improved downstream from the Redlands Diversion Dam to the benefit of endangered species, other fish and wildlife, and aesthetics. The effectiveness of these flows will be monitored to develop recommendations for a long-term contract.
- Under Interim Water Agreement Alternatives A and B, indirect benefits to water users from the Aspinall Unit will continue based on water availability.
- Interim water agreement will provide for shared water shortages in drought years.
- Effects of the interim agreement on water users will be monitored and data will be used in development of a long-term contract in the future.
- No interference to operations of the Redlands Diversion Dam and the city of Grand Junction pumping station will occur due to operations of the fish passageway.

- Power interference will be paid to the Redlands Water and Power Company if maintenance or operation of the fish passage facility causes a decrease in power generation at the Redlands power installation.

CHAPTER 4 - CONSULTATION AND COORDINATION

Fish passage at the Redlands Diversion Dam has been studied for many years. Wiltzius (1978) believed that the Redlands Diversion Dam reduced Colorado squawfish numbers in the Gunnison River by preventing upstream movement from the Colorado River. In 1986, the U.S. Army Corps of Engineers published a study, "Redlands Dam Fishway Feasibility Study" that examined alternatives for providing fish passage. FERC granted exemption from licensing for the Redlands Water and Power Company in 1983, and as part of this exemption, required compliance with any terms and conditions that Federal or State fish and wildlife agencies determined appropriate to prevent loss of, or damage to, fish and wildlife resources. These conditions included allowing construction and operation of a fish passageway.

The 1993 "Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin" published by the Fish and Wildlife Service stated that recovery efforts on the Gunnison River would focus on providing fish passage at the Redlands Diversion Dam, providing better flow/habitat conditions by water releases from the Aspinall Unit, and restoring bottomland habitats along the river.

Since 1992, a variety of public meetings have been held on Gunnison River activities. Discussions at these meetings centered on operations of the Aspinall Unit to meet various needs and on endangered fish programs. A common concern heard from the public at these meetings was that the benefits (environmental, recreational, agricultural, economic, fish and wildlife) that are occurring from present Gunnison River operations should not be lost or reduced by new programs. Also in 1992 Reclamation began to conduct Aspinall Unit operation meetings involving a variety of agencies and organizations, and input on the effects of operations have been obtained from this coordination.

Negotiations on the interim water contract began in 1994 and have been open to the public. In June 1994, three public meetings were held in Delta, Gunnison, and Grand Junction to discuss the fish passageway and the interim water agreement. Nearly 300 citizens attended these meetings. A summary (Reclamation, 1994) of the meetings was sent to attendees in July 1994; it can be obtained from Reclamation in Grand Junction. A few of the issues raised at these meetings follow.

COMPACT ENTITLEMENT--How does providing water under the interim agreement for endangered fish affect Colorado's ability to use water under the Colorado River Compact? *The temporary water agreement will use water already set aside for endangered fish. The State of Colorado intends to fully develop its share of water under the compact, and the purpose of the Recovery Program--recovering endangered fish while allowing continued water development--supports this goal. The Colorado Water Conservation Board is currently conducting studies to determine how to implement the Recovery Program without any effect on Colorado's portion of*

the Colorado River Compact waters. Colorado is firm that the Recovery Program should not adversely affect the Compact.

ASPINALL UNIT--Why does this unit have to provide water for endangered fish; what is the relation between the Dolores and Dallas Creek Projects and the Aspinall Unit; will the program affect water available for other uses in Blue Mesa Reservoir; and what are the economic effects of using Aspinall water? *When the Dallas Creek and Dolores Projects were constructed to help develop Colorado's water, it was agreed to use Aspinall Unit storage to offset the impacts of these projects. This set aside some of the water in the reservoir for endangered fish. Water is available in Blue Mesa for a variety of purposes, including fish and wildlife and economic development. In the total picture, all the water for endangered fish will not come from the Aspinall Unit. Recovery efforts are basinwide. For example, releases are now being made for endangered fish from Ruedi Reservoir, which is part of a transmountain diversion project.*

RECOVERY PROGRAM--Who represents different interests on this program? There is not local support. *The Recovery Program includes strong representation of State and private organizations including water user and development interests, in addition to groups whose primary interest is conserving endangered species. There is support for the program as being the best solution for protecting endangered species and water development interests. It is recognized that the program is controversial. Local public input has stressed that the program should not adversely affect benefits associated with existing water projects and reservoir operations.*

RIVER FLOWS--How much water is needed for the endangered fish; what are priorities during droughts; how does the endangered fish water relate to water for the Black Canyon of the Gunnison National Monument's reserved water right; and how will water releases affect recreation? *Under the interim water agreement, a flow of 300 cfs will be maintained downstream from the Redlands Diversion Dam in the July through October period. This flow, and its effects, will be monitored. In droughts, the interim agreement provides for decreased flows for endangered fish to help preserve water storage. Following completion of endangered fish studies, long-term flow recommendations will be evaluated. Endangered fish water comes from water stored in Blue Mesa Reservoir and does not directly relate to the Monument's reserved water right. Under the interim agreement, endangered fish water would most likely flow through the Monument and help meet its needs. River recreation should be slightly benefitted as flows are improved in July and August of dry years. Reservoir recreation at Blue Mesa will be affected in certain years when drawdowns are increased. This would most likely occur in a series of dry years.*

FUTURE DEVELOPMENT--Will there be water left for private development; will permitting of work near the river be more difficult if fish do become established in the Gunnison River; and will the program affect construction of the Dominguez Project? *Water in Blue Mesa is available for a variety of uses including supporting private development. To date the demand for acquiring this water for development has been small, but water remains for sale. The Colorado*

Water Conservation Board is conducting studies to determine how the Recovery Program can be implemented without affecting Colorado's existing and future water uses. The Board believes the program can and should protect both the fish and present and future water development. The Gunnison River downstream from Delta is established as critical habitat for the endangered fish and projects adversely affecting the river must address this at the present time, whether or not a fish passageway is constructed. The Dominguez Project would inundate areas of critical habitat and the Federal Energy Regulatory Commission will have to consider this when evaluating the project. In terms of overall water resources development, the Recovery Program's goal is to recover the fish species while allowing water development.

ENDANGERED FISH--Why not use a hatchery program to assist endangered fish rather than the proposed actions; how can the fish flows be protected (to remain in river); will additional releases from the Aspinall Unit make water too cold for endangered fish; will the fish really migrate up the Gunnison River; when do you conclude that the fish have enough habitat or water; will non-native game fish be harmed; and what if the problem with endangered fish is really water quality? *A hatchery program has been started under the Recovery Program and is an important part of the recovery efforts. The ultimate goal for recovering the fish, however, is to establish populations that sustain themselves rather than depend on periodic stocking. The fish passageway is considered an important part of this effort on the Gunnison River. Water for the fish will come from the Aspinall Unit storage and will be protected from diversion under Colorado's water right system in a manner similar to any other reservoir release. In general, the fish will be recovered when there are self-sustaining populations in several portions of their historic habitat. Non-native game fish will not be affected by the passageway itself. The interim flow agreement may provide slight benefits to the Gold Medal trout waters of the Gunnison River as well as to the trout habitat between the North Fork and Delta. The releases will be small (300 cfs maximum) and occur in warm summer months and are not expected to affect water temperatures in the lower Gunnison River. A slight cooling effect could occur in the river upstream from Austin. In most years, productivity of Blue Mesa Reservoir should not be significantly affected. In a series of dry years, reservoir drawdowns will be increased and this will reduce productivity.*

FISH PASSAGE--Will the fish passageway increase problems with non-native fish competing with native fish; will the fish use the passageway; and how much water is needed to operate the passageway? *The passageway could increase the number on non-native fish in the lower Gunnison River; to prevent this from happening, the passageway will be designed and operated to allow only native fish to move upstream. Approximately 100 cfs will be needed to operate the passageway. A passageway of this type has not been used for the endangered fish in the Colorado River drainage, so success cannot be guaranteed. The fish, particularly the Colorado squawfish, are a strong migratory fish so it is likely they will use the passageway. Monitoring will provide the final answer.*

NEPA COMPLIANCE--Is there an overall EIS needed for changes in the operation of the Aspinall Unit; and shouldn't an EIS be required for the fish passageway and water agreement? *One of the*

purposes of the environmental assessment is to determine whether an environmental impact statement is needed. It should be noted that the water agreement is temporary and effects will be monitored. Prior to implementation of long-term flow changes, additional NEPA compliance, perhaps involving an environmental impact statement, will be needed.

WATER RIGHTS--What effect will the fish passageway and interim agreement have on existing water rights; what is the effect of the proposal on Redlands Diversion Dam water rights and water use; and does the proposal only intend to protect water for fish but not for water users? *There will be no effect on water rights which are protected under State law. The Redlands Diversion Dam has a very senior right and in low flow conditions can call upon junior water rights to shut down. As explained in the environmental assessment, many water users have benefitted from flow regimes that followed construction of the Aspinall Unit. The proposal, under the interim agreement, is designed to protect these existing water uses dependent upon water availability. The agreement would provide that water shortages be shared by endangered fish in drought periods.*

ECONOMICS--Will the proposals affect hydropower production; what are the cumulative economic effect of these and other Federal programs? *Hydropower should not be significantly affected as discussed in the environmental assessment. Interim agreement provisions state that endangered fish water cannot bypass the powerplants of the Aspinall Unit. The economic effects of the present proposals have been considered, and Alternatives A and B have been developed to try to protect economic benefits related to historic operations of the Aspinall Unit. From a larger perspective, the effect of this program and others of the Recovery Program, are designed to recover endangered fish species while allowing water development and use to continue.*

Following the public meetings, there has been more input on protection of historical water uses. There have been several meetings to discuss possible ways to legally provide for boaters to take out of the Gunnison River upstream from the Redlands Diversion Dam or to portage around it. The issues that have been raised are addressed in the planning of the fish passageway and interim contract negotiations and in the draft environmental assessment.

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ATTACHMENT A

SUMMARY DESCRIPTION OF FISH PASSAGEWAY (Fishpro, 1994)

The Redlands Fish Passageway will be constructed on the right bank of the Gunnison River. This location minimizes impacts to the operations of the diversion dam and access will be maintained. Impacts to the city of Grand Junction will be minimized by routing the passageway around the city's pump station and access to the pump station will be maintained. The increased flows on the right bank into the fish passageway may assist in maintaining a river channel and may minimize sediment impacts in front of the pump station.

The passageway will be designed with removable vertical slot and orifice type fish passage baffles. This design allows for a consistent flow pattern over a reasonable range of headwater and tailwater variations. Slots in the passageway will allow placement of baffles at various locations. The fish passageway's entrance is located downstream of the Redlands Diversion Dam's spillway apron and will be controlled by manual slide gates. The fish passageway's exit is located as far upstream of the Redlands Diversion Dam as possible without impacting riparian vegetation (vegetation along the river corridor). A log boom and trash rack will be used to prevent debris from entering the forebay. A trap structure will be built within the forebay for trapping, sorting, and monitoring fish. The fish will be forced into a basket and raised up to a sorting table located under a covered work area. Fish will be sorted, and non-native fish will be returned to the Gunnison River downstream through a 12-inch diameter fish return pipe. Native fish to be passed upstream can be placed in the forebay upstream of the trap and allowed to swim out through the trash rack. A bypass pipe will be provided along the fish passageway to provide flows of 60 to 75 cfs to attract fish to the entrance of the passageway.

Access will be provided by a gravel road to the trap area and the forebay entrance for maintenance of the log boom, trash racks, and sediment removal. A storage shed for secure storage will be in the work area. The fish sorting area will be covered. Electrical service will be provided for fish hoisting, lighting, pumps, and other equipment.

Design Criteria is summarized below:

Layout

- Located on the right bank of the Gunnison River.
- Routed around the existing city pump station with minimum of 30 feet clearance.
- Personnel will be on site daily during operations.
- Operation period will probably be April through September.
- Operating Gunnison River flow range will be 300 to 6,360 cfs.

Fish Passageway

- Type: 12" wide full depth vertical slot with 12"w x 18"h orifice.
- Width: 6 feet.
- Slope: 1 vertical foot to 30 horizontal feet.
- Slot Spacing: 6 feet for adjustable placement of baffles.
- Baffle Spacing: 6 feet for a 2.4 inch drop per pool.
- Prefabricated baffles constructed for flexibility.
- Flow through passage: 11-17 cfs.
- Maximum operating water surface elevation differential: 10 feet.
- Total number of baffles: 50 with 0.2 foot drop per pool.
- Flow control by slide gates, dewatering fish passageway will be required.
- Access bridge over fish passageway provided for construction and maintenance vehicles.

Forebay

- Flow into forebay: 75 cfs at low water, 100 cfs at high water.
- Forebay includes fish passageway exit, fish trap, and water bypass entrance.
- Bypass pipe entrance located on forebay floor to prevent air entrainment.
- Bypass pipe controlled by slide gate.

Fish Passageway Entrance

- Dimensions: 6 feet wide by 18 feet long.
- Three side openings and one end opening.
- Slide gates at openings.
- Invert elevation: 4560 feet.
- Minimum water depth: 2.9 feet.
- Entrance velocity at minimum flow of 75 cfs: 1.3 feet per second.

Fish Passageway Trap

- Dimensions: 6 feet x 16 feet, with adjustable length.
- Guide slots for adjustable placement of screens.
- Trap area covered with grates, removable sections for access.
- Perforated aluminum screen at upstream and downstream ends.
- Vertical crowder for observation, tagging, and sorting.
- Hoist for removing fish.
- Invert elevation: 4570.5 feet; minimum water depth: 2.6 feet.
- Concrete pad work area.
- Fish return pipe for returning non-native fish downstream.

General

- Site perimeter fenced with 6-foot high fence.
- Railing or grating provided.
- Access gates provided.
- Vehicle access provided to entrance and forebay.
- Bridge over fish passageway provided.
- Clearances around city pump station provided for maintenance operations.

ATTACHMENT B

SUMMARY OF DRAFT MEMORANDUM OF AGREEMENT FOR FURNISHING WATER FOR ENDANGERED FISH

The Memorandum of Agreement (Agreement) would be among the Bureau of Reclamation, the Colorado Water Conservation Board (CWCB), and the Fish and Wildlife Service (Service). The preferred alternative for the agreement is described in Chapter 2 of this EA and provides water from Aspinall Unit storage for endangered fish and protection of water users who presently receive indirect benefits from the Aspinall Unit. Major points of the agreement are:

- Agreement shall remain in effect for no more than 5 years or until the conclusion of the Section 7 consultation (endangered species consultation) on the Aspinall Unit.
- The agreement may be renewed up to an additional 5 years upon agreement of signatory parties.
- During July through October, Reclamation will release, from the Aspinall Unit, sufficient water to maintain a minimum flow of 300 cfs in the Gunnison River from the Redlands Diversion Dam to the confluence with the Colorado River.
- During the Aspinall Unit operation meetings held each year in January, April, and August; Reclamation would develop an operating plan and water release schedule that attempts to satisfy the needs of downstream Gunnison River mainstem water users senior in priority to the Aspinall Unit decrees. Dependent upon current hydrologic conditions and the available water supply, Reclamation would implement an operating plan which reduces the potential for administrative calls by these senior water rights when making releases for endangered fish. If an operating plan cannot be implemented which reduces the potential for administrative calls, then the parties to the agreement may reduce the 300 cfs fish release in order to minimize administrative calls.
- Releases shall not result in water bypassing the Blue Mesa, Morrow Point, and Crystal powerplants.
- The agreement shall not interfere with historic operations of the Aspinall Unit, including those authorized in the Colorado River Storage Project Act, the 1975 Exchange Agreement for Taylor Park Reservoir, the 1990 Taylor Park Agreement, or the 300 cfs minimum Aspinall Unit release through the Black Canyon of the Gunnison National Monument.
- The CWCB will be responsible for calling the State Engineer for delivery of Aspinall releases for endangered fish species and for protection of those releases. The CWCB will take such action under state law; releases will be subject to such transit losses as may be imposed by the State Engineer.
- The CWCB and Service shall study and evaluate the effects of the releases on endangered fish species and their occupied habitat. The study data shall be used by the Service and the CWCB to evaluate minimum streamflow requirements in the Gunnison River to preserve the natural

environment to a reasonable degree. Formal evaluation of minimum streamflow requirements will follow the CWCB's March 9, 1994, "Statement of Policy and Procedure."

- The water released under the agreement will not generate flows greater than 18,000 cfs at Delta nor greater than 20,000 cfs at Whitewater.
- The water released pursuant to this agreement shall not prevent Reclamation from drawing Blue Mesa Reservoir down to its January 1 target level to minimize ice jam flooding above Blue Mesa nor shall the releases cause Blue Mesa to drop below the minimum power pool.
- The water released pursuant to this agreement to the extent possible shall not be stacked on top of other releases, but shall satisfy as many mutually compatible purposes as possible.
- Reclamation shall provide annual reports in January on the water releases, and the Service shall provide annual reports in January on studies related to the releases and endangered fish and their habitat.

ATTACHMENT C

SUMMARY CONSTRUCTION, OPERATION, AND MAINTENANCE AGREEMENT FISH PASSAGEWAY FACILITIES AT REDLANDS DIVERSION DAM

Bureau of Reclamation (Reclamation) Responsibilities

- Secure all land interest necessary for construction and access
- Provide funding for construction
- Administer construction contract
- Maintain the fish passageway facilities after construction
- Provide within the forebay of the fish passageway facilities an intake to the City's pumping plant facilities
- Reclamation pays power interference to Redlands Water and Power if maintenance of fish passage facility causes decrease in power generation

Fish and Wildlife Service (Service) Responsibilities

- Operate the fish passageway facilities after construction-Divert no more than 100 cubic feet per second for the operation of the fish passageway facilities (the 100 cfs will be part of the water specifically released by agreement from the Aspinall Unit, or part of the natural flow of the Gunnison River in excess of the RWPC's and City's water right entitlement)
- Service pays power interference to Redlands Water and Power if operation of fish passage facility causes decrease in power generation

City of Grand Junction (City) Responsibilities

- Maintain at its expense the new pumping plant intake located within the forebay of the fish passageway facilities
- Will be allowed access over the fish passageway facilities to operate and maintain the City's pumping plant facilities

Redlands Water and Power Company (RWPC) Responsibilities

- Will convey a land interest to Reclamation for the purposes of construction of the fish passageway facilities and access to the fish passageway facilities for operation and maintenance
- Will not be responsible for any construction, operation, or maintenance of the fish passageway facilities
- Will be allowed access over the fish passageway facilities to operate and maintain the Redlands Diversion Dam

ATTACHMENT D

ENVIRONMENTAL ASSESSMENT DISTRIBUTION LIST

FEDERAL

U.S. Department of Agriculture
Forest Supervisor, Delta CO
Natural Resources Conservation Service, Delta CO
" " " " Grand Junction CO

U.S. Department of the Army
Corps of Engineers, Grand Junction CO

U.S. Department of Energy
Federal Energy Regulatory Commission, San Francisco CA
Western Area Power Administration, Denver CO
" " " " Golden CO
" " " " Montrose CO
" " " " Salt Lake City UT

U.S. Department of the Interior
Bureau of Land Management, Grand Junction CO
" " " " Area Manager, Montrose CO
Bureau of Reclamation, Montrose CO
National Park Service, Fort Collins CO
" " " " Gunnison CO
" " " " Montrose CO
Fish and Wildlife Service, Water Resources, Denver CO
" " " " Ecological Services, Denver CO
" " " " Golden CO
" " " " Grand Junction CO
Geological Survey, Grand Junction CO
" " " " Lakewood CO

U.S. Environmental Protection Agency, Denver CO

CONGRESSIONAL DELEGATION

Senator Hank Brown, Grand Junction CO
Senator Ben Nighthorse Campbell, Grand Junction CO
Congressman Scott McInnis, Grand Junction CO

STATE GOVERNMENT

Colorado Department of Agriculture, Lakewood CO
Colorado Department of Health, Director, Denver CO
" " " " Grand Junction CO
Colorado Department of Natural Resources, Denver CO
Colorado Division of Parks and Outdoor Recreation, Clifton CO
Colorado Division of Water Resources, Denver, CO
" " " " " Montrose CO

Colorado Division of Wildlife, Fort Collins CO
" " " " Grand Junction CO
" " " " Gunnison CO
" " " " Montrose CO
Colorado State Historic Preservation Officer, Denver CO
Colorado Water Conservation Board, Denver CO

STATE LEGISLATORS

Steve Acquafresca, Cedaredge CO
Tilman Bishop, , Grand Junction CO
Ken Chlouber, Leadville CO
Lewis Entz, Hooper CO
Tim Foster, Grand Junction CO
Robert L. Pastore, Monte Vista CO
Linda Powers, Crested Butte CO
Dan Prinster, Grand Junction CO

CITY AND COUNTY GOVERNMENT

City of Colorado Springs, Colorado Springs CO
City of Delta, Delta CO
City of Grand Junction, Grand Junction CO
City of Gunnison, Gunnison CO
City of Montrose, Montrose CO
County of Arapahoe, Littleton CO
County of Delta, Delta CO
County of Gunnison, Gunnison CO
County of Jefferson, Golden CO
County of Mesa, Grand Junction CO
County of Montrose, Montrose CO

LIBRARIES

Delta Library, Delta CO
Gunnison County Public Library, Gunnison CO
Mesa County Public Library, Grand Junction CO
Montrose Regional Library, Montrose CO

INTERESTED ORGANIZATIONS

American Rivers, Washington DC
Audubon Society of Western Colorado, Grand Junction CO
Club 20, Grand Junction CO
Colorado Environmental Coalition, Grand Junction CO
Colorado Sportsmen Wildlife Fund, Inc., Grand Junction CO
CREDA, Salt Lake City UT
Dvorak's Kayak and Rafting Expeditions, Nathrop CO
Elam Construction, Grand Junction CO
Environmental Defense Fund, Boulder CO

Far Flung Adventures, Terlingua TX
Gunnison Basin POWER, Gunnison CO
Gunnison River Expeditions, Montrose CO
High Country Citizens Alliance, Crested Butte CO
National Organization for River Sports, Colorado Springs CO
National Parks and Conservation Association, Salt Lake City UT
Nature Conservancy, Boulder CO
Region 10, Montrose CO
Sierra Club, Palisade CO
Sigma Consultants, Sudbury MA
Southern Pacific Transportation, Denver CO
Telluride Institute, Telluride CO
Trout Unlimited, Englewood CO
Trout Unlimited, Crested Butte CO
Trout Unlimited, Grand Junction CO
Trout Unlimited, Montrose CO
Uncompahgre Valley Association, Montrose CO
Upper Colorado River Commission, Salt Lake City UT
Western Colorado Congress, Montrose CO
Western States Water and Power, Aurora CO
Whitewater Building Materials Corporation, Grand Junction CO
Wilderness Aware, Buena Vista CO
Wilderness Society, Denver CO

WATER DISTRICTS

Colorado River Water Conservation District, Glenwood Springs CO
Grand Valley Irrigation Company, Grand Junction CO
Grand Valley Water Users Association, Grand Junction CO
Orchard City Irrigation District, Cedaredge CO
Orchard Mesa Irrigation District, Palisade CO
Redlands Water and Power Company, Grand Junction CO
Tri-County Water Conservancy District, Montrose CO
Uncompahgre Valley Water Users Association, Montrose CO
Upper Gunnison River Water Conservancy District, Gunnison CO
Ute Water Conservancy District, Grand Junction CO

RECOVERY PROGRAM

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Gene Jencsok, Colorado Water Conservation Board, Denver CO
Christine Karas, Bureau of Reclamation, Salt Lake City UT
Reed Kelley, Meeker CO
Clayton Palmer, Western Area Power Administration, Salt Lake City UT
Stephen Petersburg, National Park Service, Dinosaur CO
Tom Pitts, Hall, Pitts & Associates, Loveland CO
Barry Saunders, Utah Department of Natural Resources, Salt Lake City UT

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George Smith, Fish and Wildlife Service, Denver CO
Robert Wigington, Nature Conservancy, Boulder CO
Holt Williamson, Fish and Wildlife Service, Denver CO

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Clyde J. Robinson, Grand Junction CO
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Myrna Roy, Whitewater CO
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Joe Scheetz, Grand Junction CO
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Jim Schmidt, Crested Butte CO
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Jay Shideler, Grand Junction CO
Arthur Smith, Grand Junction CO
Peter Smith, Gunnison CO
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Alex Stafford, Grand Junction CO
Dennis Steckel, Gunnison CO
W.D. Steele, Grand Junction CO
Red Stephenson, Whitewater CO
C. E. Stockton, Grand Junction CO

William R. Stoddard, Mesa CO
Bob Strobl, Grand Junction CO
Orval Swim, Grand Junction CO
Anne Taylor, Grand Junction CO
G.W. Taylor, Grand Junction CO
Doyle Templeton, Sargents CO
Pat Thompson, Grand Junction CO
Gary Tomsic, Gunnison CO
Joel Tuck, Almont CO
Peter Ungerman, Montrose CO
Mary Vader, Almont CO
Joe Vader, Gunnison CO
Mark VanSteeter, Boulder CO
Erida VanWie, Montrose CO
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Lyman G. Walker, Grand Junction CO
Harry Warren, Grand Junction CO
John Welfelt, Delta CO
Fred Wetlaufer, Montrose CO
Bob White, Hotchkiss CO
Charles B. White, Esq., Denver CO
Lee Wildhaber, Grand Junction CO
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Marlene Zanetell, Gunnison CO
Peter H. Ziemke, Littleton CO
Paul J. Zilis, Esq., Boulder CO

ATTACHMENT E

HYDROLOGY TABLES

The following pages contain hydrology tables for the Gunnison River basin. The tables document historic hydrologic conditions and forecast what conditions would be under the alternatives described in Chapters 2 and 3 of this report.

Hydrology tables are included for Blue Mesa Reservoir and three locations on the Gunnison River for the 22-year period from November 1972 through September 1994.

The Blue Mesa Reservoir tables show end-of-month total content in acre feet (af). The Gunnison River tables show average monthly flows in cubic feet per second (cfs) for three locations: below the Gunnison Tunnel (Black Canyon), near Whitewater, and below the Redlands Water and Power Diversion Dam.

Three sets of tables demonstrate hydrologic conditions that would result from the alternatives described in this report: the No Action Alternative; Alternatives A and B; and Alternative C.

The hydrology tables were developed using the following criteria:

No Action Alternative

Historic gaged (measured) flows and reservoir content records were compiled and used as the basis for the 22-year study period. The historic records were revised to indicate the current commitment to provide flows of 300 cfs in the Black Canyon of the Gunnison.

Alternatives A and B

Using the No Action alternative historical data as the basis, estimated flows and reservoir content were computed to meet the following requirements:

- To the extent that basin hydrologic conditions allow, Aspinall releases would be made to provide a flow of 1,095 cfs at the Whitewater gage. The 1,095 cfs is based on providing 300 cfs below Redlands plus 795 cfs for absolute water rights on the Gunnison River between the Whitewater gage and the Redlands Water and Power Diversion Dam (Gunnison rights). Aspinall releases are separated into two periods within a given year:

- 1)July through October: administration of Aspinall releases would be made to maintain 300 cfs below Redlands. Based on water supply conditions, Aspinall

operations attempt to provide a 795 cfs supply to the Gunnison rights located downstream from the Whitewater gage.

The table for flows below Redlands shows a 200 cfs flow in 1977. This is shown as an example of sharing water shortages in a very dry year.

2) November through June: no administration of Aspinall releases for flows below Redlands. If water supply conditions allow, Aspinall operations maintain 1,095 cfs at Whitewater. In a very dry year, a full supply is not maintained for Gunnison rights or the reach below Redlands.

• Hydrologic calculations include a 10 percent transit loss adjustment for Aspinall releases (losses due to evaporation, seepage, etc.).

Alternative C

Estimated flows and reservoir content were computed using the same requirements as Alternatives A and B, with the following changes:

1) July through October: administration of Aspinall releases would be made to maintain 300 cfs below Redlands. Aspinall operations do not attempt to maintain a full supply to Gunnison rights.

2) November through June: no attempt is made to maintain Gunnison rights or 300 cfs flows below Redlands.