CHAPTER 3—AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

General

This chapter discusses resources that may be affected by actions taken to provide fish passage at the Price-Stubb Diversion Dam. During preparation of the Final EA, issues and concerns were received from affected water users; resource agencies, private interests, recreational interest groups and citizens, and other parties (see Chapter 4, Consultation and Coordination, for further details).

For each resource, the potentially affected area and/or interests are identified. For significant issues, existing conditions are described, and impacts expected under the No Action alternative and each passage alternative is discussed. Impacts under the fish passage alternatives are usually similar for most resources. Where there are differences, the alternatives are discussed separately. The chapter concludes with a summary comparison of the alternatives and a list of mitigation measures.

The project is in Mesa County, Colorado along the Colorado River. Mesa County has a population of approximately 120,000. Grand Junction, the largest city in the area, was founded in 1881. The Rio Grande Railroad extended into the area in 1882 and, soon afterward, major irrigation of the valley began. The Price-Stubb Diversion Dam was completed in 1911. It was used to divert irrigation water to lands in the east end of the valley until 1918, when Reclamation's Grand Valley Project Diversion Dam and the Government Highline Canal were constructed. Although agriculture remains important in the valley today, some light manufacturing and service industries influence the economy. Tourism is also a significant source of economic activity for the area. The project area is within a major transportation corridor, with the Union Pacific's railroad tracks along the right bank of the river and the Interstate 70 highway on the left bank.

The upstream extent of the area affected by the fish passage proposals, and other endangered fish recovery activities for the Upper Colorado River, is the Town of Rifle in Garfield County. Rifle has around 5,500 residents involved in agriculture, oil and gas development, and services. Streamflows and floodplain habitat of the river have been significantly altered by water diversions and uses, infringement by railroads, gravel operations, highways and bridges, and by the operations of upstream storage reservoirs, flood control dikes and channelization.

Water Resources

Ute Water Conservancy District Pump Plant Intake

Issue: Dam modification or removal could adversely affect Ute Water's ability to pump water from the Colorado River.

Existing Conditions: Ute Water provides water to about 60,000 residents of the Grand Valley. Their primary water supply is transported via a pipeline from the Plateau Creek drainage off the Grand Mesa. Ute Water's pump plant is located approximately 2,000 feet upstream of the dam and is normally used as an emergency backup water supply.

Pumping operations require a water surface elevation of about 4,722 feet in the river (Collins, 1999). The dam helps maintain the required water elevation for pumping operations, especially during low flow conditions. Ute Water has stated that any loss in water surface elevation would negatively affect their ability to operate the pumping plant.

Impacts

No Action: The No Action alternative would allow Ute Water to operate their pump plant as they have historically.

Conventional Fish Ladder: A control gate would be installed in the fish passage to address Ute Water's concern and allow the fish passage to be closed to maintain historic water elevations for pumping if needed.

Downstream Rock Fish Passage: It is estimated that the downstream rock fish passage would result in less than a 2 inch reduction in water surface elevation under the most extreme low river flow conditions. To address Ute Water's concerns, stop-log channels have been incorporated into the fish passage design to allow Ute Water to close the fish passage under low river flow conditions if needed to maintain historic water surface elevations for pumping.

Downstream Rock Fish Passage with Whitewater Recreation Features: Predicted similar to the Downstream Rock Fish Passage Alternative. Stop-log channels would be incorporated into a second notch for boats to also address Ute Water's concerns. If the Jacobson Hydro No. 1 Plant were constructed in the future, an Obermeyer Gate could be installed in the boater notch to ensure deliveries to the hydro plant.

Dam Removal: As discussed above, the Ute Water pump plant requires a river elevation of at least 4,722 feet. With the dam removed, the river elevation would drop below 4,722 feet whenever the flow is less than 5,500 cfs. Review of historic flow data (average of monthly mean flows from 1933 through 1996) shows Colorado River flows

are usually below 5,500 cfs for 9 months each year, from August through April. Dam removal would negatively affect Ute Water's ability to pump water from their existing facility. Modification to the existing pump plant or a back-up water supply from other sources would be necessary to mitigate impacts to Ute Water.

Water Rights

Issue: Owners of existing water rights with decreed points of diversion at the Price-Stubb Diversion Dam have raised issues regarding potential impacts and the future utilization of their water rights under the Dam Removal alternative.

Existing Conditions: Three existing water rights cite the Price-Stubb Diversion Dam as their decreed point of diversion. The first of these is a 573 cfs water right for power generation with an appropriation[5] date of October 1, 1889 and adjudication[6] date of July 22, 1912. This right is owned by the Palisade Irrigation District (PID) and was used to operate hydraulic pumps to lift their irrigation water. The power right has not been used since 1918; since then, PID's water has been delivered through the Government Highline Canal. The Palisade Irrigation District has retained the right to use the power right to pump irrigation water if irrigation deliveries cannot be made through the Government Highline Canal.

The second right is a 2,100 cfs conditional water right[7] for hydroelectric power generation with an appropriation date of December 20, 1980 and an adjudication date of December 31, 1983. This right is owned by Mr. Eric Jacobson and is associated with the proposed Jacobson Hydro No. 1 Project, which would use the Price-Stubb Diversion Dam to divert Colorado River flows to its hydropower plant. As discussed previously, it is assumed that the Hydro No. 1 Project would not be constructed because of the terminated FERC license.

The third right is a 120 cfs water right for domestic, municipal and industrial uses with an appropriation date of February 17, 1947 and adjudication date of July 25, 1959. Eighty cfs of this right is owned by the City of Grand Junction, 20 cfs by the Clifton Water District and 20 cfs by the Water Development Company. The decree for this right lists five alternate points of diversion, with the Price-Stubb Diversion Dam being one of the decreed points. Approximately 19 cfs of this right has been made absolute[8]. The right was perfected by pumping from the Colorado River at the Clifton Water District Treatment Plant approximately 6 miles downstream from the Price-Stubb Diversion Dam. No water has been diverted at the Price-Stubb Diversion Dam under this water right.

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[5] *Appropriation*: applying water to a beneficial use. Often used interchangeably with the term water right.

[6] *Adjudication*: the judicial process through which existence of a water right is confirmed by court decree.

[7] *Conditional water right*: an appropriation that has not yet been made *absolute* by the water court.

[8] *Absolute*: In Colorado, a conditional water right owner must prove diligence in completing work necessary to apply the water to a beneficial use before the water court makes the water right absolute (also termed perfected).

Impacts

No Action: The No Action alternative would have no affect on existing water rights. The opportunity to use PID's power right to lift irrigation water if the Government Highline Canal was unable to make deliveries would continue. The probability of using the Price-Stubb Diversion Dam to provide an emergency irrigation water supply is very remote. Pumping and conveyance facilities to support this use no longer exist, and it would require a substantial amount of time and money to reestablish them. Likewise, the opportunity to use the Price-Stubb Diversion Dam as a forebay to pump domestic, municipal and industrial water would continue. However, the probability of using this water right at this location is remote, since the City of Grand Junction and the Clifton Water District do not have distribution systems in this area. In addition, FERC established a prescriptive easement for fish passage and providing fish passage as a condition of the Jacobson Hydro No. 1 Project license which has been terminated by FERC.

Conventional Fish Ladder: This alternative would have the same effect on water rights as the No Action Alternative. If constructed, only about 1,000 cfs of the 2,100 cfs water rights associated with the terminated Jacobson Hydro No. 1 Project would be available under the amended FERC license (FERC, 2001).

Downstream Rock Fish Passage: This alternative would have the same effect on water rights as the No Action Alternative.

Downstream Rock Fish Passage with Whitewater Recreation Features: Under this alternative, the Jacobson Hydro No. 1 Project and the Town of Palisade would enter into an agreement to ensure adequate flows over the dam for whitewater recreation. With or without the Jacobson Hydro No. 1 Project, the fish passage would receive the first 80 cfs of flow in the river, ensuring continual fish passage operations.

Dam Removal: The Dam Removal Alternative would preclude the PID from pursuing development of a backup irrigation system or hydropower facility at the dam. Consequently, PID opposes removal of the dam. As co-owners of the dam, PID could prohibit the dam removal alternative.

This alternative would also preclude using the dam as a forebay to pump domestic, municipal and industrial water. The owners of this right have said that this impact would not affect their ability to meet their existing and future needs. The option of constructing and operating the Jacobson Hydro No. 1 Project would be precluded by dam removal and would likely result in the abandonment of hydropower rights.

E.R. Jacobson and PID have both suggested using their decreed rights and facilities as a point of delivery for surplus water from the Green Mountain Reservoir Historic User Pool. This water is available in some years and under certain hydrologic conditions as part of the Orchard Mesa Check Settlement, with the objective of indirectly benefiting endangered fish habitat. However, Reclamation in 2001 completed a contract with the

cities of Grand Junction, Fruita, and the Town of Palisade to deliver water for municipal recreation uses that accomplishes the same objectives for the endangered fish.

Clifton Water District—Downstream Water Quality

Issue: Fish passage construction or dam removal could cause temporary water quality changes downstream. This could affect the ability of Clifton Water District to meet drinking water standards and protect public health.

Existing Conditions: The Clifton Water District provides domestic water to about 30,000 residents in the Grand Valley. Using the Colorado River as their source of water, Clifton Water District produces potable water that exceeds drinking water standards (Clifton Water District, 1997). The District's diversion is approximately 6 miles downstream from the Price-Stubb Diversion Dam.

For all construction alternatives, Reclamation would request Clean Water Act Section 404 authorization from the Army Corp of Engineers under Regional General Permit Number 57, Projects Beneficial to the Recovery of the Upper Colorado Endangered Fish Species. The permit covers Recovery Program activities including construction of fish ladders and fish screen, levee construction and removal, etc.). The State of Colorado provided Section 401 Water Quality Certification for the types of projects covered under Regional General Permit Number 57. General permit conditions are designed to protect water quality and Reclamation would comply with these conditions.

Impacts

No Action: Water quality would remain unchanged if no fish passage is constructed.

Conventional Fish Ladder: Fish ladder construction could cause a temporary increase in erosion and sediment, but impacts are expected to be minor. Construction would occur when the Colorado River is low and a temporary cofferdam would be used to divert water away from construction areas.

Downstream Rock Fish Passage: Temporary effects on water quality are predicted to be greater than the Conventional Fish Passage Alternative since more of the construction activities take place in the river channel. However, implementation of best management practices and construction during low river flows would minimize negative impacts. Temporary cofferdams would also assist in minimizing effect on water quality. Operation of the fish passage would have no effect on water quality.

Downstream Rock Fish Passage with Whitewater Recreation Features: Effects would be similar to the Downstream Rock Fish Passage Alternative.

Dam Removal: Removing the dam would result in sediment deposits being washed downstream. Sediments are deposited in the riverbed as river velocities slow down. The geometry of the river near the dam, the steepness of the river bottom, and the constriction caused by Interstate 70 and the railroad tracks keep the velocities higher that what is commonly found behind dams. Surveys of the river bottom upstream from the dam revealed a thin layer of sediments behind the dam, but due to the water velocities, most of the river bottom is composed of gravels and cobbles (Collins, 1999).

The manger of Clifton Water District has said the District's main concern is knowing what to expect and when. They need to know what sediments exist, their composition, volume, and when the sediments would reach their river diversion. Consequently, Reclamation and the U.S. Geological Survey conducted a sediment study in the area above the dam. To ensure that the study addressed Clifton Water District's concerns, the District reviewed the sediment study proposal. This identified volume and composition of the sediment (USGS, 2000). If dam removal was selected, additional sampling and monitoring may be necessary.

Ute Water Conservancy District Pump Plant—Spring Flooding

Issue: Effects of each alternative on spring flooding of Ute Water pumping plant.

Existing Conditions: The Ute Water pump plant historically flooded when river flows were high and the Colorado River exceeded elevation 4,732 feet. In recent years, Ute Water constructed a concrete retaining wall to an approximate elevation of 4,739.8 feet to protect the pump plant from flooding. The estimated 100-year to 500-year flood events at the dam are 44,500 cfs and 52,800 cfs, respectively (Norval, 1998). The highest recorded flow in this stretch of the Colorado River was 36,000 cfs in 1983. According to Ute Water, the river elevation at that flow was just below the top of their retaining wall in 1983 (elevation 4,738 feet). Ute Water placed sand bags on top of the wall as a precautionary measure, and subsequently has raised the wall to elevation 4739.8 feet.

Impacts

No Action: The No Action Alternative would allow Ute Water to operate their pump plant as they have historically.

Conventional Fish Ladder: The fish ladder would be designed so it would have no effect on flood flows in the Colorado River.

Downstream Rock Fish Passage: The fish passage would also be designed so it would have no effect on flood flows in the Colorado River.

Downstream Rock Fish Passage with Whitewater Recreation Features: Same as the Downstream Rock Fish Passage Alternative.

Dam Removal: With dam removal, the Colorado River elevations at the Ute Water pump plant would be lower at all flow conditions. Flood flow elevations at the pump plant would be reduced by about 1.5 feet by removing the dam. Dam removal would, therefore provide some additional protection from flooding. As discussed previously, Ute Water would not be able to pump water when river flows drop below elevation 4,722 feet and dam removal would negatively affect Ute Water's ability to pump at other times of the year without implemented mitigation measures (see pages 18 and 19). Option 3, which involves construction of a low head dam immediately downstream from the pump plant, would change existing river elevations and would not provide any protection from flooding.

Recreation Resources

Issue: Effects on Colorado River boating in the Grand Valley vicinity.

Existing Conditions: The Colorado River provides recreation opportunities for a growing population with an increasing interest in whitewater boating. The 8 foot-high Price-Stubb Diversion Dam is an extremely dangerous barrier to river navigation, and boaters must currently trespass to portage around the dam. No established take-out sites are near the dam; an undeveloped access site exists about 0.6 miles downstream. The dam is at the lower end of DeBeque Canyon, which runs about 23 miles from the Town of DeBeque to the Town of Palisade. Through most of the canyon, the river is bordered by Interstate 70 on the left bank of the river, and the Union Pacific Railroad on the right bank of the river. A potential "put-in" site within the canyon is at Island Acres State Park, about 3 miles upstream of the Price-Stubb Diversion Dam (Figure 9); however, there currently is no established boat ramp or boat launch (telephone conversation with Colorado State Parks, 3/11/2004). Potential funding sources to construct a boat ramp/launch could be Great Outdoors Colorado and/or the Federal Aide in Sport Fish Restoration—Wallop-Breaux. Limited access and the navigation barriers of the GVIC, Price-Stubb, and Grand Valley Project Diversion Dams have made recreational boating impracticable in the DeBeque Canyon reach of the Colorado River (see Frontispiece Map). State Parks has expressed an interest in pursuing a boat ramp/launch at Colorado State Parks-Island Acres.

For a variety of reasons, there is less recreational boating on the Colorado River in DeBeque Canyon and within the Grand Valley when compared to Glenwood Canyon, Ruby Canyon, and Westwater Canyon areas. Glenwood and Westwater Canyons have superior river conditions for whitewater boating and are advertised by the commercial rafting industry. Ruby Canyon is very scenic and provides access to a Bureau of Land Management (BLM) Wilderness Study Area.

The Colorado River is primarily flat water (Class I), for about 25 miles from Island Acres State Park to Loma, Colorado. There are few Class II rapids in this section, depending on river flows (Table 1). Though recreational use data is not available for the Colorado River upstream of the GVIC Dam at Palisade; it is estimated at 300 to 400 float trips annually. In addition, little information is available regarding river use within the Grand

Valley; the BLM estimates about 2,000 users annually recreate on the Colorado River between Palisade and Loma.

For comparison purposes, the BLM's estimates about 32,213 recreational boaters annually used Ruby Canyon in 2003, just downstream from Loma. The 25 mile-long Ruby Canyon is of Class I and Class II difficulty. Immediately downstream from Ruby Canyon, a total of 13,790 commercial and private boaters used Westwater Canyon in 1998. Whitewater boating in Westwater Canyon is controlled by a permit system administered by the BLM. Depending on flow conditions, the rapids in the 16 mile-long canyon rated at Class II, Class III, and Class IV (telephone conversation with BLM-Moab, UT, and Grand Junction, CO, 3/19/2004). Also for comparison, the commercial use figure for Glenwood Canyon was 43,146 in 1997. About 90 miles upstream from Palisade, Glenwood Canyon is popular for whitewater boating, with Class II and Class III rapids (telephone conversations with BLM, 2/17/99). During the peak tourist season, more than 100 commercial rafts put in each day, and the many access points provide a variety of take-outs along this 20 mile stretch of river (Wheat, 1983).

Table 1-River Difficulty Classes

Class I	Easy, Riffles and small waves.
Class II	Novice. Easy rapids with waves.
Class III	Intermediate. Large waves, obstacles.
Class IV	Advanced. Long, difficult rapids.
Class V	Expert. Nearly impossible to run.
—from the Internet web page of Colorado State Parks River Safety	

Despite the lack of whitewater boating opportunities in the Grand Valley area, it is likely that recreational boating use in the area could double in 5 years (telephone conversation with BLM-Grand Junction, 02/18/2004). Over the past several years, BLM has documented an annual increase in usage at Loma Point between 16% and 20%. River recreational use would be enhanced by many related activities planned by various entities in the Grand Valley. The Colorado Division of State Parks developed a riverfront park near Fruita, Colorado and the Colorado Riverfront Commission has ongoing efforts to improve the river corridor. In 2001, Reclamation entered into a contract with the Cities of Grand Junction, Fruita, and Town of Palisade to deliver water for municipal recreation uses that also benefit endangered fish.

The Western Association To Enjoy Rivers (W.A.T.E.R.) has become active in pursuing a whitewater park at the Price-Stubb Diversion Dam. The Town of Palisade submitted a Great Outdoors Colorado (GOCO) Grant application for funding to support development of whitewater features below the Price-Stubb Diversion Dam as described in the Downstream Rock Fish Passage with Whitewater Features Alternative (see page 16). W.A.T.E.R. and the Town of Palisade envision constructing a world class whitewater park below the Price-Stubb Diversion Dam. However, this is contingent on obtaining funding and access easements and permission from properties owned by the Union

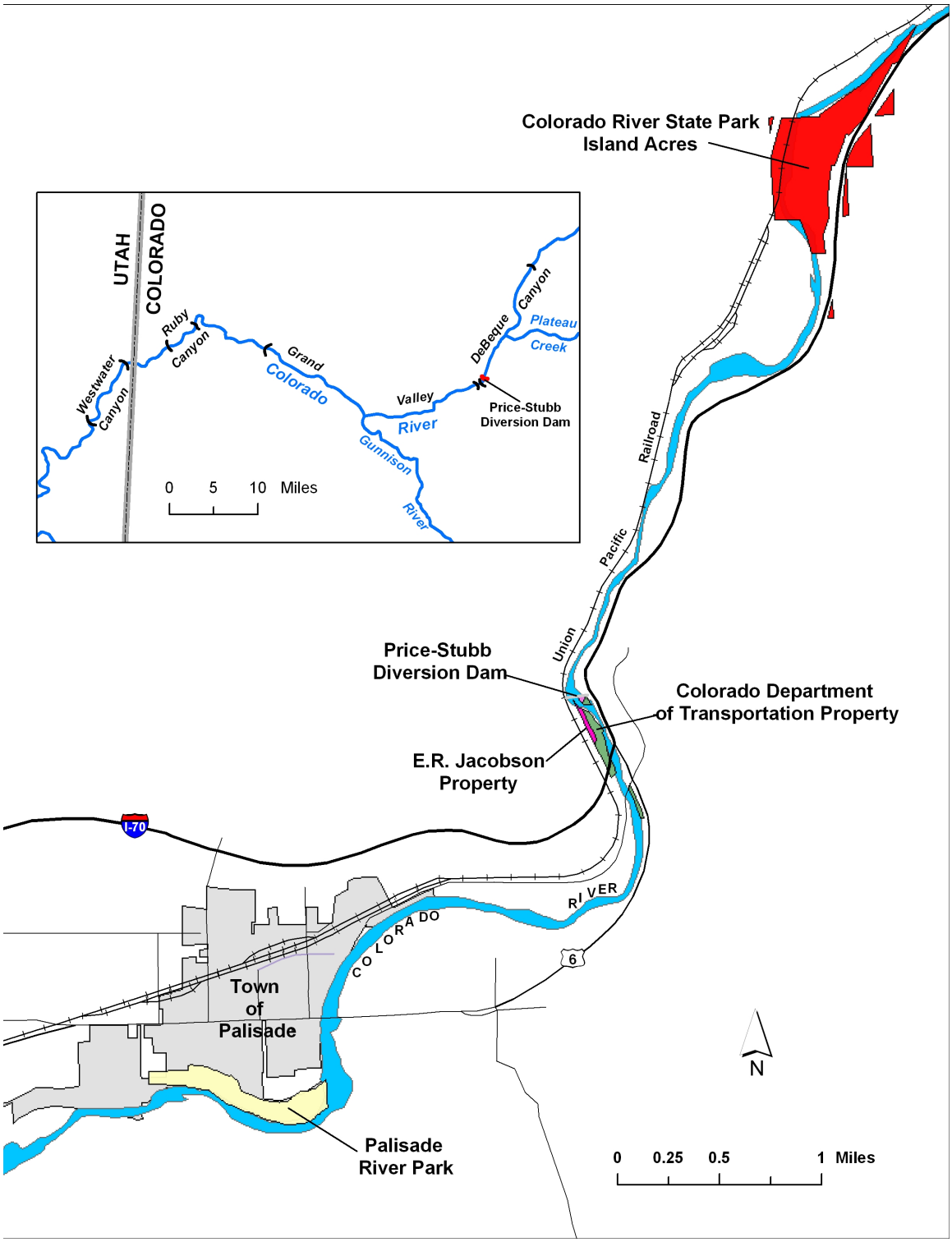

Figure 9-Potential Boating "Put-in" & "Take Out" Sites Near the Price Stubb Diversion Dam.

Pacific Railroad, E.R. Jacobson and CDOT. The whitewater features would include public access below the dam obtained by the Town of Palisade via an existing dirt road through the Union Pacific Railroad and E.R. Jacobson properties. The dirt road is accessed from North River Road (Old Highway 6). The features could also be accessed from Colorado River State Park-Island Acres upriver. Restrooms, kiosks, and other amenities may be constructed in the future with non-recovery program funds as funding becomes available. These additional recreation features are not included in any of Reclamation's alternatives and are discussed further in the cumulative impacts section of this chapter.

If non-Recovery Program funding were not available, or permits, easements and authorization not obtained; Reclamation would construct the 2.5 percent riprap ramp without whitewater features as described in the Downstream Rock Fish Passage Alternative (see Page 12).

Impacts

No Action: If no action is taken, the Price-Stubb Diversion Dam would remain a dangerous barrier to river navigation, and portaging around the dam would involve trespassing. River recreation would continue to increase, and local boating enthusiasts and BLM predict significant growth of river recreation and day use. Increased recreational boating is expected to occur whether or not any action is taken to provide fish passage at the Price-Stubb Diversion Dam. However, the opportunity to extend the river corridor upstream to Island Acres would be diminished. The river would not be a means to connect Colorado River State Park sites in the area and Colorado River State Parks-Island Acres would remain isolated from the other downstream parks.

Conventional Fish Ladder: As with the No Action alternative, construction of a fish ladder around the dam would provide no recreation benefit.

Downstream Rock Fish Passage: This alternative would provide an established portage around the diversion dam on river-left but would reduce the likelihood of additional recreation enhancements occurring in the future at the site. This alternative would address boating safety issues with warning signs posted upstream of the dam and install a log boom or similar-type barrier upstream of the fish passage exit to prevent boaters from attempting to float through the fish passage. The fish passage channel and riprap ramp would not be safe for boat passage and boaters, but the riprap ramp would be safer than the existing conditions. Boaters would be encouraged to portage around the dam. Unauthorized access to the river from Interstate 70 and the Cameo Bridge may occur, however it is not predicted to increase as a result of construction of the Downstream Rock Fish Passage Alternative.

Future recreational enhancements funded with non-Recovery Program funds could improve the remaining portion downstream of the dam as long as it did not interfere with the operation and structural integrity of the fish passage. However, future recreational enhancement would likely be cost prohibitive because of additional costs associated with

construction dewatering, mobilization, permitting, and economy of scale. Future enhancements would also require approval from the dam owners, underlying fee title land owners, and the Recovery Program.

Downstream Rock Fish Passage with Whitewater Recreation Features: This alternative would construct three grouted riprap weirs adjacent to a 860 foot fish passage channel for recreation enhancement. The weirs would create a series of pools and drops (whitewater features) at a gradient of 2.0 percent. The additional costs over and above the Downstream Rock Fish Passage Alternative would be funded with non-Recovery Program funds. This would enable the whitewater features to be constructed at a lower cost because the site would already be dewatered for fish passage construction, provide cost savings on volume of material purchased, and the potential to share contract administration and construction mobilization costs.

Recreational boating in this stretch of river would increase when compared to the Conventional Fish Ladder and Downstream Rock Fish Passage alternatives. Some trespass along Interstate 70 and at the Cameo Bridge to access the river above the Price-Stubb Diversion Dam may also occur, but downstream public access to the whitewater features obtained by the Town of Palisade would make trespass incidents negligible. CDOT has made downstream public access a condition of granting permission to construct the whitewater features to minimize trespass along Interstate 70. In addition, an emergency portage on river-left would provide safe access around the dam.

The Town of Palisade and W.A.T.E.R. envision a world-class whitewater park using the whitewater features to host major events. This scale of recreation use could not be feasible without public access granted from Union Pacific Railroad and E.R. Jacobson. Access to the dam is controlled by the Union Pacific Railroad with a locked gate at the entrance to the access road. E.R Jacobson owns a large portion of the right river bank below the dam and has been supportive of a whitewater park. He has discussed easements and/or land donations with the Town of Palisade. The Union Pacific Railroad identified concerns with public access through the existing railroad right-of-way. Concerns include maintaining access to the railroad for maintenance and repairs and increased liability associated with the public in close proximity of the railroad tracks. These concerns would need to be addressed by the Town of Palisade before the Union Pacific Railroad would consider granting the Town a public easement through the Railroad right-of-way.

Dam Removal: As stated in a January 1991 letter from Gary M. Lacy, P.E., removing the dam could create a naturally appearing, navigable segment of the river. This would open a spectacular canyon segment of the Colorado River to recreational…boating." A possible put-in site is about 3 miles upstream at Colorado River State Park-Island Acres, from which boaters could float down the river to a variety of take-out points. Popular day use take-outs include Palisade; Colorado River State Parks-Corn Lake, Connected Lakes, Fruita; Blue Heron Lake, and Loma. Removal of the Price-Stubb Dam would extend the 25 mile segment from Palisade to Loma by more than three miles.

Many letters received during the scoping process suggested the Recovery Program construct a whitewater park at the dam site. A December 1998 letter from the City of Grand Junction states "the City wishes to remain open on the issue of where a kayak or water park might be conceivable based on the…conceptual feasibility of such a park." Kayakers and other recreational users of the Colorado River have been raising money to study the Price-Stubb Diversion Dam as a water park site. Funding for dam removal would be provided by the Recovery Program and does not include funds specifically for recreation enhancement. However, to the extent that costs to the Recovery Program would not increase, designs for removal could also incorporate measures to enhance recreational boating.

In conjunction with dam removal, one of the mitigation measure options for protecting the ability of Ute Water to pump from the Colorado River (see Page 19) would be implemented. Option 1 and 2 would have no effect on recreation. However, designs for option 3, which involves constructing a low head dam immediately downstream from the pump plant, would also consider a boating passage.

Public Safety

Issue: The dam poses a significant safety threat to all forms of water recreation in the vicinity of the dam.

Existing Conditions: The Price-Stubb Diversion Dam is an extremely hazardous structure. A January 1999 letter from Mesa County Irrigation District describes the Price-Stubb Diversion Dam as "…a deadly hazard to people who climb on or slide down the dam and to boaters who unwittingly go over the dam." Drowning fatalities at the dam site were confirmed by several sources, but no statistics were available (conversations with Town of Palisade, Mesa County Health Department Vital Statistics, Mesa County Sheriff, and the Emergency Medical Services Coordinator for Saint Mary's Hospital). A January 1999 letter from a WATER board member reports the Price-Stubb Diversion Dam is listed as one of the state's top ten safety "hotspots".

Impacts

No Action: The safety hazard would not change. As river recreation grows, more accidents at this dam would be likely. A warning sign is posted upstream of the Price-Stubb Diversion Dam, but due to the restricted access, the narrow river, and corresponding faster river velocities, the dam poses a significant risk to boaters, especially those who may not be familiar with the hazard.

Conventional Fish Ladder: As described in the No Action, constructing a fish ladder around the diversion dam would not change the existing safety hazard.

Downstream Rock Fish Passage: This alternative would reduce the safety hazard with the construction of an established portage around the diversion dam. Signage and installation of a log boom or similar-type barrier upstream of the fish passage exit to

prevent boaters from attempting to float through the fish passage would also improve current conditions. The 2.5% rock ramp would also reduce the hazards associated with the diversion dam; however, boat passage would not be recommended. Rescue features would be incorporated into the fish passage and ramp structure to facilitate emergency response if someone attempted to pass over the dam. These features would include the installation of safety rings on the dam face to allow anchoring during whitewater rescues.

Downstream Rock Fish Passage with Whitewater Recreation Features: This alternative would further reduce safety hazards with the construction of whitewater features by providing a defined route for boaters. Non-Recovery Program funding would be used to cover incremental costs associated with this alternative. The Town of Palisade would maintain the whitewater features, remove debris, and address other safety issues as they arise. Downstream public access easements to the whitewater features would be obtained by the Town of Palisade. The Town of Palisade would assume liability and ownership of the whitewater features and manage the facilities. It is important to note that there are inherent hazards associated with whitewater recreation and these hazards would continue to exist (swift water, rocks, debris, bridge abutments, check structures, etc.).

Dam portage along river-right would not be safe because of the steep slope of the river shoreline and the close proximity of the dam head works, wing-walls, and the railroad. Signage including “no trespass” and “danger, keep out” would be installed to alert boaters to the hazards on river-right above the dam. An emergency portage around the dam would be constructed on river-left. The Town of Palisade would obtain public access below the dam using the existing road within the Union Pacific Railroad right-of-way and the E.R. Jacobson property. The Railroad may require additional improvements to address safety and railroad access concerns with the public using this access road. Rescue features as described in the Downstream Rock Fish Passage would also be incorporated into this alternative to assist in rescue activities.

The Orchard Mesa Irrigation District also identified a safety concern associated with their check structure downstream of the Price-Stubb Diversion Dam. The check structure allows the District, during periods of low river flow, to meet senior water rights at the GVIC Diversion Dam. The GVIC Diversion Dam is a low-head diversion dam that was notched in 1998 to provide fish passage. Boats and kayaks have used this notch to float downstream of the GVIC Diversion Dam. The check structure is a potential hazard similar to bridge abutments, and other river hazards. Appropriate signage to make boaters aware of the approaching hazard should adequately address the District’s concern.

Dam Removal: Removal would eliminate the dam safety hazard. After removal of the dam, the river channel would be typical of similar sections of the Colorado River. All protruding rebar would be removed from the remaining concrete. Riprap would be placed at each abutment to eliminate any vertical concrete faces. The riprap would create sloped surfaces similar to the river banks upstream and downstream of the abutments.

Downstream hazards (i.e. bridge abutments, check structures) would continue to exist but could be signed to notify boaters of the approaching hazards.

In conjunction with dam removal, one of the mitigation measure options for protecting the ability of Ute Water to pump from the Colorado River (see Page 19) would be implemented. Option 1 and 2 would have no effect on recreation. However, designs for option 3, which involves constructing a low head dam immediately downstream from the pump plant, would consider boater safety.

Land and Facility Resources

During construction of any of the construction alternatives, an increase in noise and traffic would occur. To date, Reclamation has not been advised of concerns for disturbances during construction. Any complaints would be resolved on a case-by-case basis. The Colorado Department of Transportation has advised Reclamation that access to the site from Interstate 70 would not be granted.

Protecting Existing Structures

The fish passage project could affect four existing structures in the project area; 1) the Union Pacific Railroad on the right bank of the river, 2) the Interstate 70 Highway on the left bank, 3) the Ute Water pump plant, and 4) the Colorado River Siphon located about 3,600 feet upstream from the dam. The Interstate, railroad, and siphon were built considering river flow and stream bank conditions that existed with the dam in place. Reclamation constructed the siphon, which is a pipeline under the riverbed of the Colorado River that carries water from the Government Highline Canal to the Orchard Mesa Power Canal.

Two factors could affect these structures: 1) scouring of the riverbed and banks, and 2) the rate of wetting or dewatering the foundations of the railroad and Interstate 70. River scour is a function of water velocities, the size of the cobbles in the riverbed, and the size of the riprap along the banks. If the dam is removed, the velocities of the water in the river would increase in the vicinity of the dam. As the velocity increases, the ability of the water to scour the banks and riverbed increases. If the banks and streambed are not adequately protected, the scour could move horizontally toward the railroad and Interstate 70. If the dam is not removed correctly, riverbed scour could extend upstream and could expose and damage the siphon.

Wetting (saturation of) the foundations of the railroad and Interstate 70 would weaken the foundations. If actions taken at the site raise the existing water levels, there could be impact to these structures. Since the siphon is buried beneath the riverbed, foundation wetting is not a concern.

Issue: Effects of alternatives on integrity and use of the highway, railroad, and siphon.

Existing Conditions: Upstream and downstream from the Price-Stubb Diversion Dam, riprap protects the foundations of Interstate 70, and the railroad. The siphon is located in a stable portion of the riverbed that has not shown significant scour. During flood stages and the corresponding high water levels, the railroad bed has reportedly become weakened due to foundation saturation in the vicinity of the dam. This is not a known issue with Interstate 70. However, CDOT has expressed concerns with fish passage construction limiting potential future widening of Interstate 70.

Impacts

No Action: The No Action alternative assumes the Jacobson Hydro No. 1 Project would not be built as described in the terminated FERC license. The No Action Alternative would have no effect on the hydropower plant's ability to divert water for power generation. The design capacity of the amended power plant is about 1,000 cfs. The No Action alternative would have no effect on the foundation of Interstate 70, future widening of Interstate 70, or railroad and Colorado River siphon foundations.

Conventional Fish Ladder: Impacts of constructing a fish ladder around the dam would be similar to those of the No Action alternative. If the Jacobson Hydro No. 1 Project were constructed with the conventional fish ladder, the tailrace of the hydropower plant would serve as an attraction flow for fish to find the fish ladder entrance. If the hydropower plant were not constructed, an attraction flow pipe would increase the cost of this alternative by about $100,000. This alternative would have no effect on the foundation of Interstate 70, future widening of Interstate 70, or railroad and Colorado River siphon foundations. Due to the limited space between the dam and the railroad, construction of this alternative would be challenging.

Downstream Rock Fish Passage: This alternative would also have no effect on existing structures. The fish passage would protect the left bank of the river with additional riprap. If the Jacobson Hydro No. 1 Project as described in the terminated license agreement were constructed, an extended discharge pipe would be needed to attract fish to the fish passage entrance. To address CDOT's concerns with future Interstate 70 widening, the fish passage channel was offset 33 feet from the left river bank to accommodate future widening projects. Reclamation would armor the left river bank with suitable material to protect the fish passage channel during high flow events. Additional fill material to accommodate future Interstate 70 widening would be the responsibility of CDOT.

Downstream Rock Fish Passage with Whitewater Recreation Features: Effects under this alternative would be similar to the Downstream Fish Passage Alternative. This alternative also incorporates the 33 foot fish passage channel offset to accommodate future Interstate 70 widening. Boaters would use Colorado River State Park-Island Acres and public access through E.R Jacobson and Union Pacific Railroad

properties to access the whitewater features. Parking would be permitted only on the E.R. Jacobson property. The Town of Palisade would manage the area and provide law enforcement services through an agreement with Mesa County. Visual screening and signage along Interstate 70 and the railroad may be installed if required by CDOT and the railroad to discourage unauthorized river access and trespass.

Dam Removal: Dam removal would cause an increase in the water velocity upstream from the dam. Reclamation's Technical Service Center conducted a hydraulic and scour analysis of the project (Collins, 1999). Analysis results presented in Figures 10 and 11 show the estimated river velocities with and without the dam. Figure 10 shows the velocities for a 100—year flood; Figure 11 is for comparison at lower peak flow of 10,500 cfs.

The velocity increase would be greatest at the dam and would gradually diminish upstream. Existing angular riprap on the west bank of the river would be sufficient to protect the railroad embankment from scour due to increased velocities upstream of the dam (Collins, 1999). Additional riprap would be placed along the Interstate 70 side of the river. At the Colorado River Siphon, the difference in velocity is negligible. Downstream from the dam, no change in river velocity is expected, and no increase in scour should result.

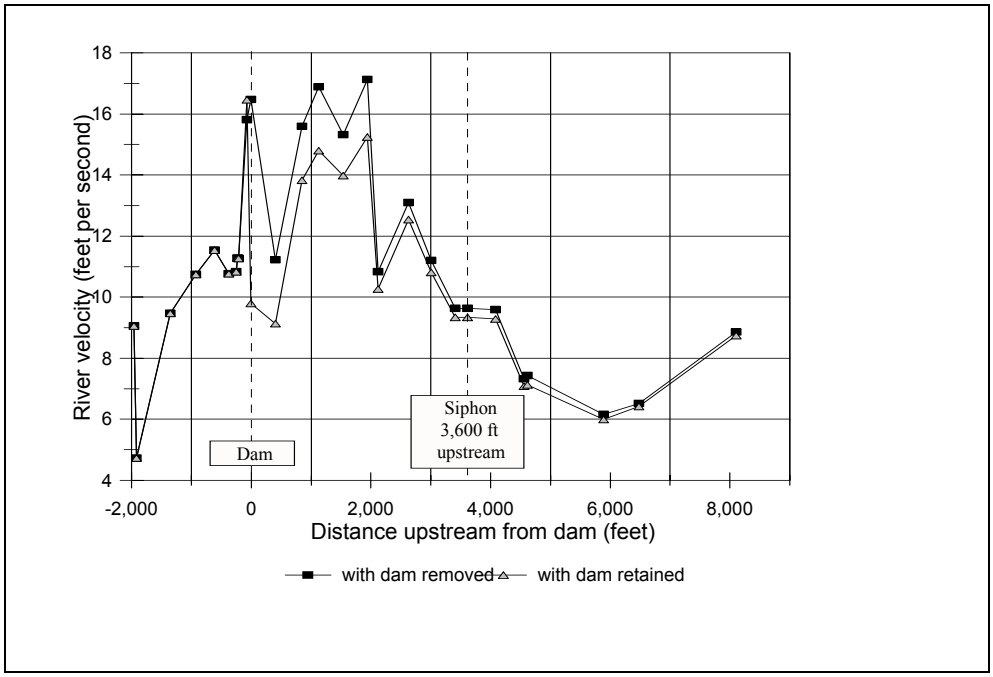

Figure 10-River Velocities at 100—year flood (44,500 cfs)

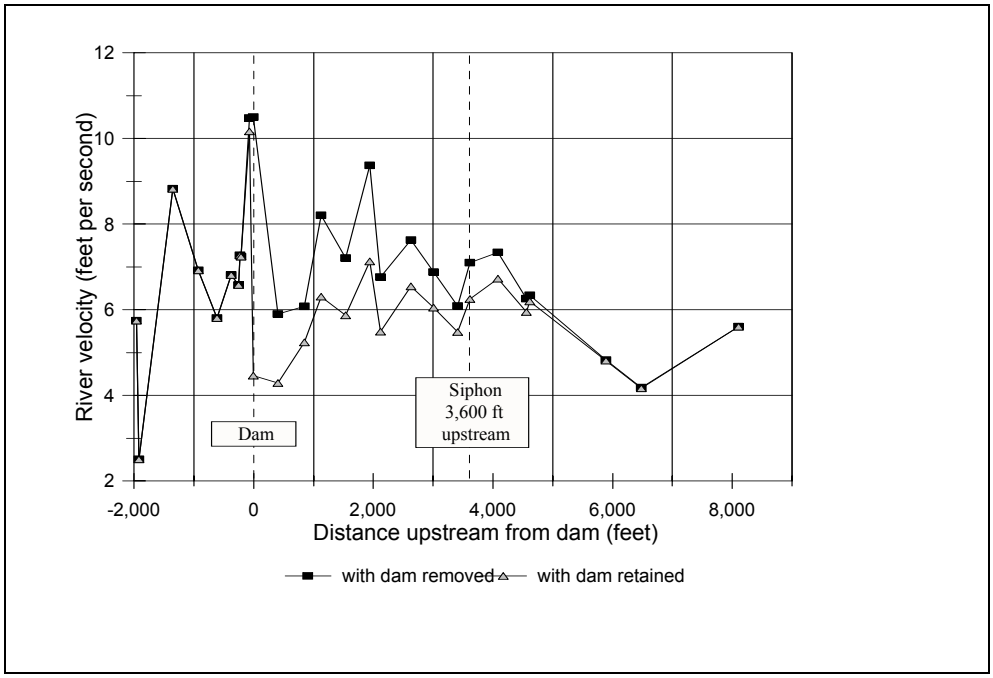

Figure 11-River Velocities at 10,500 cfs

Railroad and Landslide Stability

Approximately 1,000 feet upstream of the Price-Stubb Diversion Dam, on the westside of the Colorado River, is a historically active landslide. This landslide is a small portion of a very large inactive landslide mass that extends upstream about 1 ¼ miles to the Cameo Power Plant and about 1 mile west to Mount Lincoln. The active portion of the landslide lies between the Colorado River and the steep sandstone cliffs forming the west canyon wall (Figure 12). Railroad tracks, owned by the Union Pacific Railroad, are between the Colorado River and the over-steepened slopes of the landslide. The railroad grade cuts through the toe of the landslide.

Issue: Fish passage alternatives could affect the stability of an existing landslide and railroad.

Existing Conditions: The landslide in question is called the Tunnel No. 3 Landslide and is inspected annually as part of Reclamation's Upper Colorado Regional Landslide Surveillance Program. Since, 1988, annual inspections have revealed no visible evidence of movement, however, the slide has been active in the past. In February and March 1950, this slide became active and collapsed part of Tunnel No. 3 through which water for the Government Highline Canal flows. Damage was so extensive that the tunnel had to be rerouted further into the hillside in sandstone bedrock. The slide disrupted railroad traffic as well, and the track alignments had to be reestablished (Murdock, 1950).

In February and March 1988, movement of the landslide occurred again. No damage was done to Reclamation facilities, but railroad traffic was disrupted as the tracks had to continually be realigned. To halt the movement of the landslide, the Denver and Rio Grande Western Railroad, owners of the railroad then, removed material from the top one-third of the slide and stockpiled it just downstream of the slide. No evidence of further movement has been observed or reported since this material was removed.

It is not know what triggered movement of this slide in 1950 and 1988. No clear correlation is evident with high precipitation events. However, the entire area is over-steepened and in a state of delicate balance. Long-term changes in moisture content within the slide mass or removal of supportive material at the toe may have contributed to the historic movement.

The stability of this landslide becomes an issue if the proposed fish passage significantly alters river dynamics. Two basic concerns are: 1) potential erosion of the toe of the landslide caused by increased flow velocities in the river, and 2) potential rise of the water table within the landslide mass. Both conditions would contribute to instability of the landslide mass and may trigger movement that would be detrimental to the railroad.

Erosion of the toe of the landslide mass due to increased flow velocities of the Colorado River would contribute directly to landslide instability. The removal of material by this erosion process essentially removes weight that helps stabilize the landslide mass. Therefore, any erosive action at the toe of the landslide is undesirable. Increased flow velocities would be acceptable if down-cutting or scouring did not occur near the landslide.

A rise of the water table within the landslide mass would also contribute to landslide instability. As water levels rise within a landslide mass, pore-water pressures are increased and slippage along a water-saturated plane is more likely to occur. Furthermore, a sudden increase or decrease in the water table may trigger movement. A gradual decline and maintenance of a lower overall water table would increase the stability of the landslide. The possibility of future movement is high since the area is very unstable and natural climatological and/or hydrological conditions could easily trigger movement of this slide. In addition, the existing road that parallels the railroad tracks below the dam is Union Pacific Railroad's only access to the tracks. Any activity that restricts their access would negatively affect the Railroad's ability to provide railroad track maintenance.

Impacts

No Action: The terminated Jacobson Hydro No. 1 Project proposed to raise the water level with flashboards on the dam, and the 1990 FERC license required development of an erosion control plan for review by the railroad. The fixed flashboards would raise the water table by approximately 4 feet. This could cause a slight decrease in landslide stability. Without the terminated Jacobson Hydro No. 1 Project, the No Action alternative would have no affect on the Tunnel No. 3 landslide.

Conventional Fish Ladder: Construction of a fish ladder around the existing diversion dam would have little or no effect on the stability of the Tunnel No. 3 landslide provided there is not an overall increase in the river water surface elevation. Temporary construction easement from the railroad would be needed to construct the ladder. In discussions with the Railroad, temporary construction access through the railroad right-of-way would not negatively impact the railroad.

Downstream Rock Fish Passage: Construction of the downstream rock fish passage would have no effect on the stability of the Tunnel No. 3 landslide. Temporary construction easement from the railroad would be needed to construct the fish passage. In discussions with the Railroad, temporary construction access through the railroad right-of-way would not negatively impact the railroad.

Downstream Rock Fish Passage with Whitewater Recreation Features: Construction of the downstream rock fish passage and whitewater features would have no effect on the stability of the Tunnel No. 3 landslide. Temporary construction easement from the

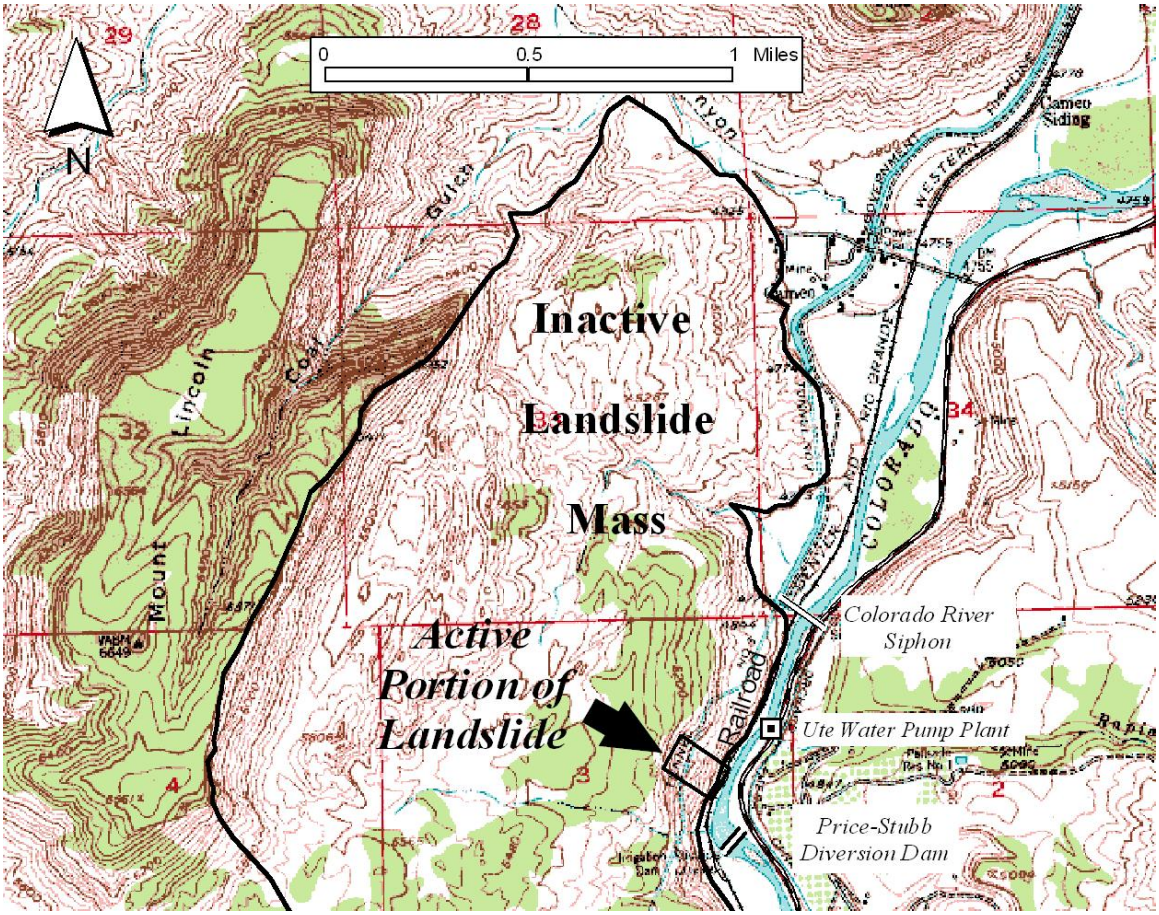

Figure 12-Landslide Location Map.

railroad would be needed to construct this alternative. In discussions with the Railroad, temporary construction access through the railroad right-of-way would not negatively

impact the railroad. Granting public access to the Town of Palisade through the railroad right-of-way could negatively affect the railroad's ability to maintain the railroad tracks and bring the public in close proximity to the railroad tracks. Negative effects could be reduced or avoided by maintaining the existing gate at the access entrance. The gate could be locked when railroad maintenance activities occur to avoid conflicts with the public. In addition, the Town of Palisade could establish a schedule for when the whitewater parks is open and lock the gate after hours. This would help reduce the incidents of undesired activities (parties, camping, etc.) from occurring in the area. Routine patrols and other enforcement activities would further reduce these incidents.

During planned events (whitewater rodeos, competitions, etc.), the use of temporary fencing to separate the Whitewater Park from the Railroad right-of-way could be used to keep the public away from the railroad tracks. In addition, the use of shuttles and other parking areas would further reduce potential conflicts and congestion during large events.

Dam Removal: Removal of the Price-Stubb Diversion Dam would change river dynamics upstream of the dam in the vicinity of the Tunnel No. 3 landslide. A preliminary scour study conducted by Reclamation's Technical Service Center (Lyons, 1998) shows the average flow velocity of the river would increase in the reach from the diversion dam upstream to the Colorado River Siphon. However, this study indicated no channel degradation would be anticipated since there is no extensive area of sediment deposition upstream of the dam.

In the preliminary study, assumptions were made concerning the composition of the riverbed. A more formal study was subsequently conducted, and riverbed samples were taken and analyzed. In addition, scuba divers conducted a survey of the deeper portion of the riverbed upstream from the dam (Collins, 1999). The results of these studies fundamentally agreed with the initial study, except they anticipate the removal of about 2 to 3 feet of fine materials that have been deposited behind the dam. It is believed that under the existing conditions, these materials are flushed annually during spring runoff, and are re-deposited after the higher flows subside.

Another study completed by Reclamation's Technical Service Center specifically analyzed the effects of dam removal on the stability of the Tunnel No. 3 landslide (Pabst, 1999). Detailed geologic information is limited for this slide and a monitoring program is in place. The main conclusion from this study was that dam removal should not have a negative impact on slide stability assuming no river scour occurs. Lowering the river water surface would cause a lowering of the water table within the landslide mass, which would slightly increase landslide stability. A rapid drawdown of water surface or an overall increase in water surface would contribute to instability of the landslide. Since dam removal would occur during low flow conditions, and the dam would be breached in a controlled manner, a rapid drawdown of the river surface would not occur.

Ownership of Dam and Lands

Issue: Before any modification to the dam and site could be made, permission would be needed from the dam and adjacent land owners to access the site and/or use their lands and facilities.

Existing Conditions: For purposes of this project, Reclamation considered two separate ownership issues: 1) ownership of the land that could be affected, and 2) ownership of the Price-Stubb Diversion Dam. Figure 13 shows recorded land ownership. Land owners that may be affected by the project include (Figure 13):

• Colorado Department of Transportation—lands downstream of the dam for construction, access to the site for construction, long-term operations, and maintenance. CDOT also exercises Right-of-Way authority for Interstate 70 within the project area.

• Palisade Irrigation District—land under the Interstate 70 side (river left) of the dam.

• E.R. Jacobson (Jacobson Hydro No. 1 Project)—land owned along the railroad side (river right) of the dam and downstream.

• Union Pacific Railroad—congressional right-of-way next to the dam site; access to the site is within this right-of-way.

The Palisade and Mesa County Irrigation Districts built the actual dam structure. Minutes of their board meetings clearly show both Districts consider themselves the joint owners of the dam.

Impacts

No Action: Since no fish passage or dam removal is considered in this alternative, no land or facility ownership rights would be changed. Current land owners have to resolve any questions regarding dam ownership.

Conventional Fish Ladder: Access agreements and temporary easements would be necessary from all of the land owners identified above. Temporary construction access would be required from the Union Pacific Railroad, and E.R. Jacobson. Reaching an agreement with Palisade and Mesa County Irrigation Districts to modify the dam would also be necessary. Permanent access agreements would also be needed from E.R. Jacobson and the Union Pacific Railroad for long-term operations and maintenance of the fish ladder.

Downstream Rock Fish Passage: Access agreements and temporary easements would be necessary from all land owners. Temporary construction access would be required from E.R. Jacobson, CDOT, and the Union Pacific Railroad. Palisade and Mesa County Irrigation Districts would also have to consent to modify the dam. A permanent easement for the fish passage structure would be needed from CDOT, Palisade and Mesa

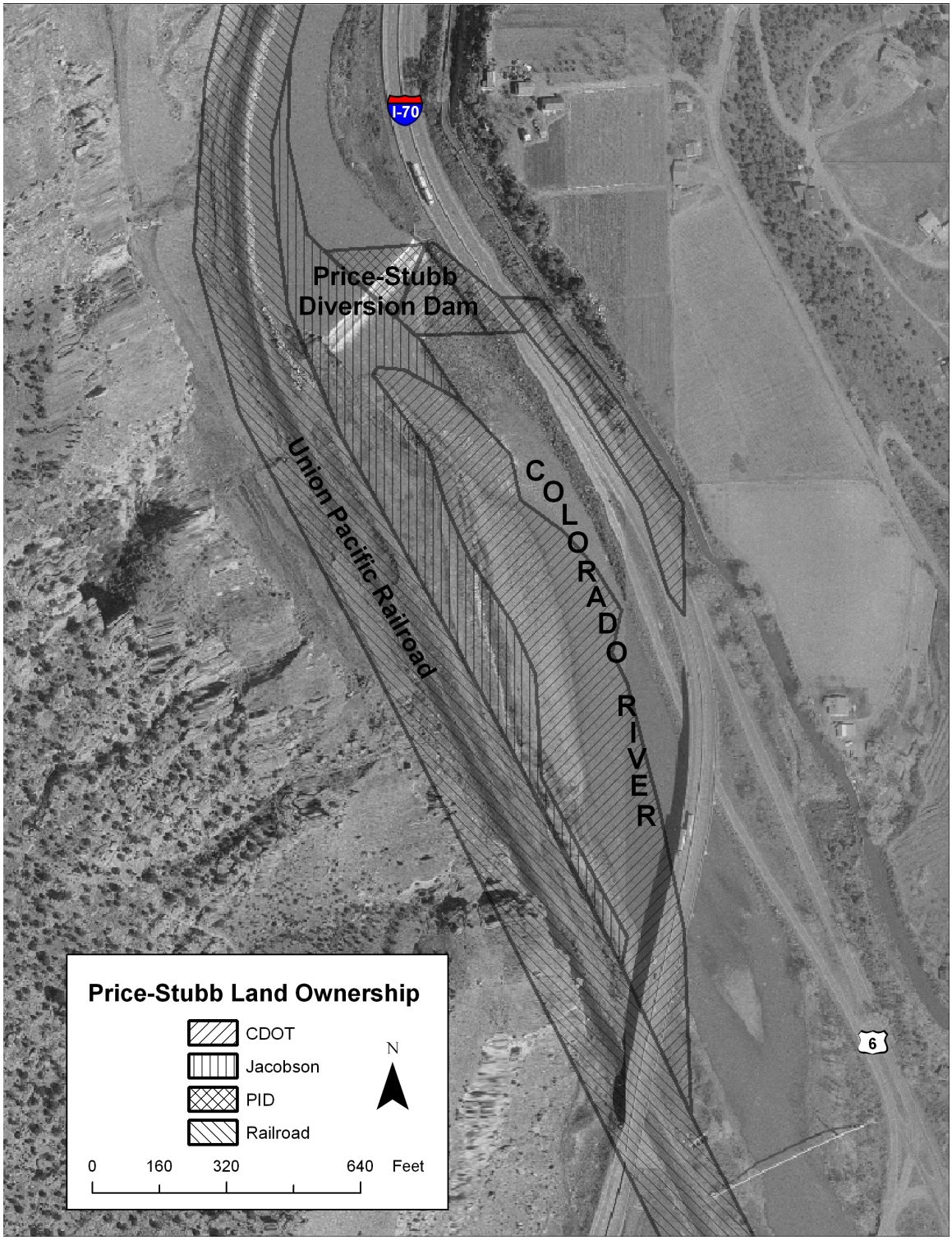

Figure 13-Land Ownership Below the Price-Stubb Diversion Dam

County Irrigation Districts and E.R. Jacobson. Reclamation would request temporary access to provide maintenance of the fish passage as needed.

Downstream Rock Fish Passage with Whitewater Recreation Features: This alternative would require additional authorization from CDOT and E.R. Jacobson for the construction of the whitewater features because these structures would be located on their properties. Public access easements from E.R. Jacobson and Union Pacific Railroad obtained by the Town of Palisade would be required.

The Downstream Rock Fish Passage with Whitewater Features would attract use to this stretch of the river with boaters accessing the Colorado River upstream of the Price-Stubb Diversion Dam from the Colorado River State Park-Island Acres and through the public access below the dam obtained by the Town of Palisade. This alternative would allow uninterrupted boating to Westwater Canyon in Utah, a distance of about 64 miles. The Railroad currently does not allow public access through their right-of-way and has identified concerns with granting public access. The Town of Palisade would need to address these concerns to obtain public access.

Dam Removal: As discussed in the other action alternatives, access, and/or land use agreements would be necessary from all the owners identified above. Construction access would be required from CDOT, Palisade and Mesa County Irrigation Districts, the Union Pacific Railroad, and E.R. Jacobson. Permission from Palisade and Mesa County Irrigation Districts to remove the dam would also be required; the Palisade Irrigation District has opposed dam removal.

Unique Geographic Features

To meet requirements of environmental laws and U.S. Department of the Interior policies, Reclamation specifically addresses potential impacts of any proposed action on unique geographic features—which include prime and unique farmland, wild or scenic rivers, rivers placed on the nationwide river inventory, refuges, floodplains or wetlands. Providing for fish passage at the Price-Stubb Diversion Dam would have no effect on prime or unique farmland. Affected reaches of the Colorado River are not under study or recommendation for designation as a wild or scenic river. Similarly, no refuge exists in the affected area. However, each alternative involves actions that would take place in the Colorado River and its 100-year floodplain.

Floodplain and Wetland Protection

Issue: The Colorado River provides highly valued habitat and floodplain functions that need to be considered as fish passage is restored.

Existing Conditions: The area is highly altered from its natural state. During construction of Interstate 70, the Colorado River channel downstream of the dam was altered. The existing river channel was shifted to the west to create the foundation for Interstate 70. Materials were excavated to create the new channel and used as fill for the foundation. Riprap was used to armor the left riverbank, preventing the river from cutting back to its original location and undermining Interstate 70.

The surface area of the pool upstream of the dam is about one-acre in size, and the riverbank is protected from erosion by riprap along the highway and railroad beds. The plunge pool at the base of the dam is deep, and a long riffle reach extends downstream. Deposition and transportation of sediment in the river depends on variations in seasonal and annual river flows.

Narrow vegetated strips dominated by willow and tamarisk occur along the river, but very little riparian vegetation is in the construction area at the Price-Stubb Diversion Dam. A small patch of shrubs and a mature cottonwood tree at the dam may be of importance to birds.

Impacts

No Action: The No Action alternative assumes the Jacobson Hydro No.1 Project would not be built as described in the terminated FERC license and would have no effect on floodplain or wetland resources. However, if the hydropower project were built, mitigation measures required to reduce wetland impacts from its construction would be identified as part of the licensee's 404 permit.

Conventional Fish Ladder: A mature cottonwood tree at the site would be lost. Due to the limited space, routing a fish ladder around the cottonwood tree is not possible. Revegetation of the site would mitigate for temporary losses of other vegetation. Section 404 permits would be required to discharge fill material for a temporary construction cofferdam and the fish passage entrance and exits in the river. Reclamation would request authorization under Regional General Permit No. 57, Projects beneficial to endangered fish. Permit conditions would be implemented as environmental commitments.

Downstream Rock Fish Passage: Section 404 permits would be required to place boulders, riprap and fill material into the Colorado River to create the downstream fish passage. Reclamation would request authorization under Regional General Permit No. 57, Projects beneficial to endangered fish. Permit conditions would be implemented as environmental commitments. Construction contracts would require protection of downstream water quality, revegetation of disturbed areas would rapidly mitigate losses of vegetation.

Downstream Rock Fish Passage with Whitewater Recreation Features: This alternative is similar to the Downstream Rock Fish Passage alternative; however additional 404 permits would be needed to incorporate the whitewater features.

Reclamation would request authorization for the fish passage under Regional General Permit No. 57, projects beneficial to endangered fish. In initial discussion with the Army Corps of Engineers, additional permits may be needed to construct the whitewater features. In addition, separate 404 permits may be needed for maintenance of the whitewater features. The entity that assumes management and maintenance responsibility of the whitewater features would need to contact the Army Corps of Engineers prior to conducting some maintenance activities to determine if a 404 permit is required. Reclamation would request Section 404 authorization for maintenance of the fish passage as needed, however this is predicted to be infrequent.

Recreational boaters who use established put-in and take-out sites (i.e. Colorado River State Park-Island Acres, if developed) would have minimal impact on riparian areas. Points of unauthorized access may result in the minor loss of some riparian vegetation (i.e. trampled willows). The establishment of a foot trail leading to the river from the parking area on E.R. Jacobson and CDOT properties would help reduce impacts to riparian habitat. This type of damage is predicted to be minimal but could be further diminished using appropriate barriers and "No Trespassing" signs if problem areas develop.

Unauthorized access and riparian vegetation impacts could be further reduced if CDOT and E.R. Jacobson were to grant public access to the whitewater features through their properties downstream of the dam. This would allow for the development of a defined portage trail to manage access around the dam to reduce the amount of riparian disturbance. Recreational interests envision a world class whitewater park possibly managed by the Town of Palisade with a developed parking area downstream of the dam and public restrooms. The whitewater park is not included in this alternative, but could be developed in the future with adequate funding and agreements between recreational interests, the Town of Palisade, Union Pacific Railroad, CDOT and E.R. Jacobson.

Dam Removal: The contract for dam removal would also require Section 404 permits for riprap placement for erosion protection and temporary cofferdams for construction dewatering. Revegetation of disturbed areas would rapidly mitigate losses of vegetation.

Fish and Wildlife Resources

The affected area, for purposes of assessing impacts to fish and wildlife, correspond to the 100-year floodplain of the Colorado River from the Price-Stubb Diversion Dam upstream to Rifle. There are no significant concerns for project effects on fish and wildlife resources in general; concerns focus on avoiding adverse impacts to endangered species (Service, 1999a), as well as complementing efforts to establish self-sustaining populations of endangered Colorado River fish species.

No Federally listed threatened or endangered mammals or plants are known to occur in the project area that would be affected by the proposed action. The bald eagle is a regular winter visitor to the Colorado River corridor that occasionally perches and roosts in large

cottonwood trees along the river. A mature cottonwood tree is present in the vicinity of the Price-Stubb Diversion Dam, however bald eagle use of this tree has not been observed.

Reclamation has concluded that the proposed action would have no effect on bald eagles. Construction contracts would require work to stop if activities are thought to be affecting any listed species.

Effects on Endangered Colorado River Fishes

Issue: Providing fish passage at the dam is needed to allow endangered fish access to upstream habitat (see page 3). Passage actions should complement other Recovery Program efforts such as stocking of endangered fish, controlling competition or predation by nonnative fish, and restoring habitat.

Existing Conditions: The Price-Stubb prevents access by endangered fish to suitable habitat upstream. Two of the four endangered Colorado River fishes, the humpback chub and bonytail, do not occur in the reach of the Colorado River involved in this fish passage project. However, the Recovery Program plans to stock bonytail between Palisade and Loma within the next 5 years. The affected reach is within designated critical habitat for the Colorado pikeminnow and razorback sucker. These fish are known to occupy habitat downstream from the dam, but the Colorado pikeminnow is absent in the 50 miles of its historic range from the Price-Stubb Diversion Dam upstream to Rifle, and razorback sucker are extremely rare.
A dramatic decline in razorback suckers occurred between 1974 and 1991 in the Colorado River. In 1991 and 1992, 28 adult razorback suckers were collected from isolated ponds adjacent to the Colorado River near DeBeque, Colorado. No young razorback suckers have been collected in recent surveys of the Colorado River.

Other native fish species found in the Colorado River include flannelmouth sucker, bluehead sucker, mountain sucker, and roundtail chub. Fish surveys upstream and downstream of the dam show a higher composition of native than nonnative species upstream of the dam, and many of the nonnative species found downstream of the dam are absent upstream (Wydoski, 1994). Nonnative fish species that are absent upstream include channel catfish, northern pike, red shiner, largemouth bass, bluegill, and black crappie. Black bullhead, smallmouth bass, and green sunfish are rare (Service, 1998).

Predation by and competition with nonnative fishes are believed to be significant factors in the decline of the endangered Colorado River fishes. Channel catfish and green sunfish, along with other sport fish such as smallmouth and largemouth bass, and northern pike, are predators of endangered fish. Off channel ponds have been identified as a source of many of the nonnative sport fishes that occur in the river and endangered fish nursery areas. Small nonnative fish (minnows and shiners) are assumed to be significant predators of fish larvae as well as important competitors (Wydoski, 1998). Fathead minnow and sand shiners are more common downstream from the dam, and red

shiners have been found downstream of the dam, but not upstream (Service, 1998). The distribution of native and nonnative fish upstream and downstream of the dam indicate the dam also serves as a barrier to nonnative fish, and may help control the spread of nonnative fish upstream.

One radio-tagged Colorado pikeminnow was documented using the scour hole below the Price-Stubb Diversion Dam in 1986 and 1987 (Burdick, 2002). The portion of the Colorado River and its 100 year floodplain between GVIC Diversion Dam and the Grand Valley Project Diversion Dam (including the Price-Stubb Diversion Dam) are included in the designated critical habitat for the Colorado pikeminnow and razorback sucker.

Impacts

No Action: If no passage is provided, a self-sustaining population of endangered fish would be less likely to develop via a natural upstream recolonization. Even if stocked fish mature, and succeed in reproducing upstream, young fish that drift or move downstream of the dam could not return as adults. If native fish cannot access upstream habitat, related Recovery Program efforts to acquire and restore floodplain habitat, stock endangered fish, and remove nonnative fishes would be less effective.

Conventional Fish Ladder: The ladder would be similar to the Redlands fish ladder constructed in June 1996. Since its completion, 47 Colorado pikeminnow, 5 razorback sucker and about 36,400 native fish have passed through the Redlands fish ladder (Burdick, 2002). Installation of a fish trap to allow selective passage would prevent upstream access by nonnative fish. A fish trap at this location has some advantages, however, a fish trap was included in the construction of the Grand Valley Project Diversion Dam fish passage about 5 miles upstream.

Downstream Rock Fish Passage: Concerns for ease of fish use would be similar to those of building a conventional fish ladder. However, the passage would be more natural than the conventional type.

Filling the scour hole with riprap material below the Price-Stubb Diversion Dam would likely eliminate its use by Colorado pikeminnow. However, restored fish passage at the Price-Stubb Diversion Dam and Grand Valley Project Diversion Dam would provide endangered fish access to about 50 miles of critical habitat. Reclamation formally consulted with the Service (Service, 2003) regarding the downstream rock fish passage and an incidental take statement was issued under the Colorado Programmatic Biological Opinion for potential incidental take associated with nonnative fish and the loss of the scour hole below the dam. The Service concluded that the downstream rock fish passage alternative would be beneficial to the endangered fishes and that selective passage would be constructed at the Grand Valley Project Diversion Dam upstream. A copy of the Biological Opinion from this consultation is included in the appendices.

Downstream Rock Fish Passage with Whitewater Recreation Features: Effects under this alternative would be similar to the Downstream Rock Fish Passage

alternative. Whitewater features would likely draw additional public attention to the fish passage, which could provide opportunities to educate the public about endangered fish needs and the Recovery Program goals. Additional consultation with the Service regarding this alternative may be necessary to comply with Section 7 of the Endangered Species Act. Reclamation has informally discussed this alternative with the Service to identify concerns. Reclamation would request that the Service review the final designs to ensure the existing biological opinion is adequate for Section 7 compliance.

Dam Removal: Removing the man-made barrier and letting the river channel return to a natural condition would be the most beneficial passage alternative for the endangered fish. If the option to modify the river channel upstream of the dam to maintain the water surface elevation at the Ute Water pump plant is pursued (see page 19), designs for the structure would be reviewed by the Service to ensure that it would not create new fish passage problems. Dam removal would also require the filling of the scour hole below the dam with riprap material.

Selective passage has been constructed at the Grand Valley Project Diversion Dam, which is the last remaining barrier to upstream movement. Nonnative fish would thus be prevented from moving further upstream into the critical habitat extending to Rifle, Colorado. However, fish passage at Price-Stubb would allow nonnative fish to access Plateau Creek and the 5 miles of the Colorado River upstream to the Grand Valley Project Diversion Dam.

The benefits of dam removal to endangered fish include (Nelson, 1999):

1. Only one fish ladder would be constructed instead of two. Multiple ladders tend to have cumulative effects on migrating fish. It would be easier and less stressful for fishes to migrate both upstream and downstream. During spawning migrations, adults would expend less energy reserves needed for spawning. Migration delays could adversely affect reproduction success.

2. Fish predators tend to congregate below dams. Downstream migration may result in mortality as endangered fish go over the dam spillway, become stunned and disoriented, and fall prey to predators. Removal of the Price-Stubb Diversion Dam would remove one of the spillways.

3. With the dam in place, there would always be a threat of hydropower development and associated impacts (entrainment, impingement, mechanical injury, and mortality). Fish that pass through power-generation turbines can be injured or killed.

4. Ladders result in fishes being concentrated in one place, which may result in predation, competition, and disease transfer. Fewer ladders may result in less predation on endangered fishes attempting to migrate upstream. The likelihood of moving greater numbers of fish upstream is better with one ladder than two.

Reclamation concludes that each fish passage alternative would have no effect on the humpback chub, and would complement efforts of the Recovery Program to stock bonytail. The Colorado pikeminnow, razorback sucker, and their critical habitat may be adversely affected with nonnative fish access above the Price-Stubb Diversion Dam. During formal consultation regarding the Downstream Rock Fish Passage alternative, the Service identified selective fish passage at the Grand Valley Project Diversion Dam as a reasonable and prudent measure to reduce adverse effects on the endangered fishes and their critical habitats (Service, 2003). A copy of the Service's biological opinion is included in the appendices. Each passage alternative, excluding no action, would assure access to critical habitat by the endangered fish to improve chances of their recovery. Instream construction activities would be avoided from May to September to minimize impacts to endangered fish spawning and larval development.

Cultural Resources

The area of potential effect for an investigation of cultural resource impacts extends along the Colorado River from Palisade to the Price-Stubb Diversion Dam. Prior to settlement and development of irrigation facilities, the area was part of the Ute Indian Reservation that covered western Colorado. After moving the Ute Indians to reservations in Utah and southwestern Colorado, Congress declared the lands public and open for filings in June 1882. By November 1882, the Denver and Rio Grande Railroad was completed from the Gunnison River Valley to Grand Junction. In 1889, tracks were extended along the Colorado River, past the current site at the Price-Stubb Diversion Dam. The dam and associated pumping facilities were completed in 1911 to supply irrigation water to the Price and Stubb Ditches for use by early settlers in the Palisade area.

Reclamation's review of reports and historic preservation actions for various undertakings in the affected area produced documentation of turn of the century irrigation features of historical importance, including the Price-Stubb Diversion Dam. No significant archaeological sites have been found. As a standard cultural resource protection measure, all fish passage construction contracts would require work to be stopped if cultural resource sites were encountered. Work could not resume until measures needed to avoid or minimize adverse impacts to significant resources are agreed to by the Colorado State Historic Preservation Officer (SHPO).

Protect Historic Dam

Issue: The Price-Stubb Diversion Dam is eligible for listing on the National Register of Historic Places, and Federal agencies are responsible for ensuring that their actions do not adversely affect historic qualities of eligible sites.

Existing Conditions: Since 1919, Palisade and Mesa County Irrigation Districts have not used the Price-Stubb Diversion Dam and associated facilities to divert flows of the Colorado River to irrigate their lands. The Price-Stubb Diversion Dam is in good condition despite a long period of non-use. However, there is concern that the scour hole below the dam may be undermining the foundation of the dam. The canal head works have deteriorated, and the associated pump canal and pump plant have been destroyed over the years.

E.R. Jacobson first recorded features of the historic system in 1981 to obtain a preliminary FERC permit to study its water power development potential. Reclamation also recorded the site in 1982, under the name "Palisade Dam (5ME769). The Jacobson Hydro No. 1 Project proposed to use each feature of the abandoned system in developing the hydropower project. The application for the license (Jacobson, 1983) notes the stone lining of the diversion pool at the canal head works is intact only on its northwest side.

After its abandonment, the canal was filled in with earth. A stone wall or lining that is evident on the east side of the canal and next to the river, may be original. Only the foundation of the pump plant remains. Of all the features of the abandoned system, only the Price-Stubb Diversion Dam has not undergone extensive change or obliteration.

In 1984, the SHPO determined that the dam was eligible for listing on the National Register of Historic Places—as a classic example of an ogee crest dam built between 1910-1920 that retains its integrity, and due to its association with a prominent engineer, Charles D. Vail (FERC, 1989). The Price-Stubb Diversion Dam was constructed early in Vail's career; he is best known for his role in the completion of mountain passes and canyon highways as Colorado's State Highway Engineer after 1930.

As discussed in the Railroad and Landslide section, a landslide occurred upstream of the dam in early 1988. The slide did not affect the dam and canal head works, but did impact rail service. When the Denver and Rio Grande Railroad unloaded the slide, they removed material from the top one-third of the slide and deposited it over the abandoned canal route. However, the outline of the wall of this canal remains apparent in 1994 aerial photos of the area.

Consultation between FERC and SHPO on the Jacobson Hydro No. 1 Project confirmed the eligibility of the dam for listing on the National Register of Historic Places (FERC, 1999). In addition, the SHPO determined the old canal and pump plant had lost their integrity, and were not eligible for the Register.

Impacts

Any undertaking that involves the destruction, damage, or alteration of any property that qualifies for inclusion in the National Register of Historic Places is considered an adverse effect (36 CFR Part 800). While FERC has consulted with the SHPO regarding the Jacobson Hydro No. 1 Project, the consultations do not specifically discuss plans for fish passage or its impacts. Reclamation has consulted with the SHPO to verify effects of the

alternatives, and entered into a Memorandum of Understanding regarding mitigation requirements for adverse effects to the Price-Stubb Diversion Dam.

No Action: The No Action alternative would have no effect on the historic qualities of the Price-Stubb Diversion Dam.

Conventional Fish Ladder: Modification of the head gate and the diversion dam would alter the historic dam. Reclamation would agree to document the modifications.

Downstream Rock Fish Passage: The Price-Stubb Diversion Dam would be adversely affected by notching the dam and having the entire downstream face of the dam buried in boulders and riprap material. Reclamation entered into a Memorandum of Understanding (MOU) with the SHPO to collect historic documentation, drawings, and photographs of the dam in a report about the dam's design, construction and abandonment as mitigation for adverse impacts. During fish passage construction, photographs would be taken to meet agreed upon standards for architectural and engineering records.

Downstream Rock Fish Passage with Whitewater Recreation Features: The Price-Stubb Diversion Dam would be adversely affected by the construction of two notches in the dam and having the entire downstream face of the dam buried in boulders and riprap material. As described in the Downstream Rock Fish Passage alternative, Reclamation entered into a MOU with SHPO to mitigate adverse impacts.

Dam Removal: Dam removal would physically destroy the integrity of the Price-Stubb Diversion Dam. Although certain features of the dam would remain, the most visible portion of the dam would be removed. In addition to significantly altering the appearance of the structure, this action would alter the visual landscape by eliminating the sight of the river flowing over the dam.

Reclamation would need to consult with SHPO to determine if mitigation measures described in the current MOU are adequate to mitigate the adverse impacts of this alternative. Reclamation would also consider development of a historic marker/interpretive sign for public viewing. Reclamation would not agree to place any sign or viewing area along Interstate 70 due to public safety concerns associated with the narrow canyon and high speeds of vehicles on the Interstate. Signs and/or a viewing area accessed via roads or trails on the opposite side of the river may be possible. Reclamation's commitment would be contingent on all potentially affected land owners (CDOT, E.R. Jacobson, the Union Pacific Railroad, and Palisade and Mesa County Irrigation Districts) provide written approval of the mitigation measures.

Indian Trust Assets

Indian trust assets are defined as legal interests in property held in trust by the United States for Indian Tribes or individuals, or property that the United States is otherwise

charged by law to protect. No Indian trust assets are known to occur in the project area and therefore no impacts are predicted under any of the alternatives.

Environmental Justice

Executive Order 12898 established environmental justice as a federal agency priority to ensure that minority and low-income groups are not disproportionately affected by federal actions. The ethnicity of the majority (90 percent) of the residents in the project area is Caucasian (Grand Junction Chamber of Commerce, 1997). Other ethnicities of persons in the area include Hispanic (8 percent); and Native American, Asian, and African-American (each less that 1 percent).

There are no disproportionate negative impacts predicted for any particular group of individuals under any of the alternatives.

Social and Economic Factors

Construction of any of the passage alternatives would provide a minor amount of local employment. This would introduce a small amount of money into the local economy, but is not expected to place a strain on public services such as schools or transportation. As discussed previously in the Recreation Resources section, the downstream rock fish passage alternatives and dam removal would increase the potential for recreational boating upstream from the Price-Stubb Diversion Dam and may increase economic activity associated with tourism. The potential for hydroelectric power generation at the dam site would vary under each alternative.

Hydropower

Issue: The Price-Stubb Diversion Dam could be used to generate hydroelectric power. Fish passage alternatives may reduce potential revenues from power generation, and dam removal would preclude hydropower development.

Existing Conditions: Currently, no hydropower generation is taking place at the Price-Stubb Diversion Dam. In 1990, FERC issued a license to develop hydropower, but the project was put on hold in 1994. The licensee applied and received a license amendment in 2001 and the license was terminated in 2002 (FERC, 2001; FERC 2002c).

Impacts

No Action: If constructed as described in the 2001 license amendment, the Jacobson Hydro No. 1 Project license requires the construction, maintenance, and operation by the licensee of such fishways (ladder or passage) as the Secretaries of

Interior and Commerce may prescribe. The Jacobson Hydro No. 1 Project would produce about 6.8 million kilowatt hours (kWh) of power annually (FERC, 1990). For comparison purposes, the coal-fired Xcel Energy's Cameo Power Plant generates about 550 million kWh annually. Income from the hydropower project would be used to recover project development costs and provide long-term revenues. As the population of the Grand Valley increases, power demand would increase. Although the proposed unit is a very small percentage of total power generation in the Grand Valley, it may offset associated impacts to air quality and extraction activities related to generating power using fossil fuels. As discussed previously, Reclamation assumes that under the No Action alternative, the Jacobson Hydro No. 1 Project would not be constructed.

Conventional Fish Ladder: Impacts to hydropower would be similar to the No Action alternative because of the FERC amended license requirements (FERC, 2001). However, if the fish passage were constructed before the hydropower project, the construction area of the hydropower plant would be further confined.

Downstream Rock Fish Passage: Hydropower generation potential would be greater in this alternative because of the additional area available for hydropower plant access and construction. This alternative would also maintain head for power generation. However, the project proponent would be required to pipe the hydropower plant discharge to the fish passage entrance.

Downstream Rock Fish Passage with Whitewater Recreation Features: Construction of the whitewater features would reduce hydropower generation potential when compared to the Downstream Rock Fish Passage alternative. Depending on the location of the hydro plant's discharge, some head could be lost. Recreational interests and E.R. Jacobson have tentatively reached agreements that if the hydro plant were constructed, the hydro plant would not operate or reduce its diversions on weekends and holidays to provide additional water for recreation.

Dam Removal: No power would be generated.

Costs and Benefits

This section discusses the relative costs and benefits of each alternative on the human environment, including benefits to the endangered fish. Success of the Recovery Program in restoring populations of the endangered fish directly affects future development of Colorado River water supplies. Since 1988, the Recovery Program has been relied on to serve as a reasonable and prudent alternative to jeopardizing effects of water development on the endangered fish. Its existence has allowed the Service to issue favorable biological opinions on numerous water projects in Colorado, Utah and Wyoming with a potential to use more than 1.7 million acre-feet of water. Completion of fish passages at the Redlands and GVIC diversion dams contributed to sufficient progress of the Recovery Program in 1996 and 1998.

Issue: Some people question using taxpayers' money to provide passage for endangered fish.

Existing Conditions: The Colorado River is a key factor in the economy of the Grand Valley area. The river supports agricultural enterprises, municipal water supplies, state parks and wildlife areas, tourism, recreational uses, and a population of endangered fish. Recovery of the endangered fish is not without significant expense, controversy, or problems. However, many believe the Recovery Program is the best method to avoid conflicts between endangered fish recovery and allowing water to be developed. The Recovery Program would fully fund costs for construction of fish passage or dam removal.

Impacts

No Action: According to Article 411 of the Jacobson Hydro No. 1 amended FERC license, FERC reserved the authority "to require the licensee to construct, operate, and maintain, or provide for the construction, operation, and maintenance of, such fishway as may be prescribed by the Secretary of the Interior". If no action is taken by the Recovery Program and hydropower is not developed, fish passage would not be constructed at the Price-Stubb Diversion Dam.

Conventional Fish Ladder: Reclamation estimates the cost for this alternative to be about $4,300,000. Long-term operation and maintenance cost are estimated to be about $400,000 for the life of the project. This alternative would preserve the dam structure, which could allow future hydropower development.

Downstream Rock Fish Passage: Reclamation estimates the cost for this alternative to be about $4,800,000. This alternative would provide the benefit to endangered fish while removing the need to mitigate for upstream affects associated with dam removal. The Recovery Program has identified concerns with having two conventional ladders in short proximity of each other. Design criteria for fish passage at the Grand Valley Project Diversion Dam made a rock fish passage cost prohibitive. No long-term maintenance costs are anticipated.

Downstream Rock Fish Passage with Whitewater Recreation Features: The estimated total cost for this alternative is approximately $5,400,000. The incremental costs associated with this alternative are estimated to be between $400,000 and $600,000. The additional funding would be provided from a Great Outdoors Colorado Grant and other funds raised by the Town of Palisade and W.A.T.E.R. The Town of Palisade submitted a Great Outdoors Colorado (GOCO) grant application requesting $400,000 and W.A.T.E.R. has conducted fund raising activities to obtain additional funds. Reclamation's estimated Recovery Program costs for this alternative would be the same as the Downstream Rock Fish Passage Alternative, approximately $4,800,000. If Non-Recovery Program funding is obtained prior to initiating construction of the fish passage, Reclamation would construct the Downstream Rock Fish Passage Alternative with Whitewater Features. This would allow for reduced construction costs associated with

construction dewatering, volumes of materials purchased, and construction mobilization. If funding were not available in time to keep the fish passage construction on schedule, Reclamation would construct the Downstream Rock Fish Passage Alternative.

Recreational interests and the Town of Palisade predict an economic benefit to the local economy from the construction of the whitewater features. Whitewater features would attract visitors and potential future construction of a "Whitewater Park" would increase tourism and support local businesses. Both construction of the whitewater features and the future "Whitewater Park" are contingent on the Town of Palisade obtaining public access below the dam from the Union Pacific Railroad and E.R. Jacobson.

Dam Removal: Reclamation estimates the cost for dam removal to be between $1,900,000 and $2,900,000 depending on mitigation costs associated with the Ute Water pump plant. No long-term operation and maintenance costs are anticipated.

This alternative would provide the most natural conditions for the migratory fish, provides boating opportunities, could increase tourism, and is the least costly alternative. However, this alternative has the greatest effect on upstream uses, hydropower generation, water rights, and potential liability exposure due to landslide, channel scour and water supply concerns.

Additional Discussion of Conventional and Downstream Fish Passage Alternatives: From a public safety and cost perspective, it is more appropriate to compare the Conventional Fish Ladder alternative with the addition of a rock-filled wedge on the downstream face of the dam to the Downstream Rock Fish Passage alternative. This comparison results in very similar costs and provides an equivalent level of public safety. Reclamation does not believe there is a high probability of recreational boaters attempting to boat over the Price-Stubb Diversion Dam under current conditions because it is a known drowning hazard. However, if Reclamation attempted to construct only the rock fish passage channel without the adjacent riprap ramp, it is likely that some boaters may attempt to float the passage channel. There is then an increased possibility that boaters may miss the fish passage channel and then be exposed to the life-threatening drop of the dam face.

Cumulative Impacts

Cumulative impacts are impacts on the environment, which result from the incremental impact of the action, when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

For purposes of this analysis, cumulative impacts are focused on existing and future Recovery Program actions, a proposed whitewater park, and the Jacobson Hydro No. 1 Project.

Recovery Program actions include the Grand Valley Irrigation Company Diversion Dam Fish Passage, Grand Valley Canal Fish Screen, Grand Valley Project Diversion Dam Fish Passage, Government Highline Canal Fish Screen, and Grand Valley Water Management. When restored fish passage at the Price-Stubb Diversion Dam Fish is added, cumulative impacts to the Colorado River endangered fish is beneficial. The Grand Valley Project Diversion Dam Fish Passage relies on restored fish passage at the Price-Stubb Diversion Dam to provide connection to 50+ miles of upstream critical habitat for the endangered fishes. Federal, state and private water users rely on the Recovery Program to serve as the reasonable and prudent alternative to avoid jeopardy to the Colorado River endangered fishes for historic and future water diversions and depletions. A jeopardy determination from the Service would negatively impact all water users within the Upper Colorado River Basin.

The Town of Palisade submitted an application to Great Outdoors Colorado for incremental costs associated with construction of the Downstream Rock Fish Passage with Whitewater Features Alternative. If funding and proper authorization is obtained from CDOT, E.R. Jacobson, Union Pacific Railroad, and Palisade and Mesa County Irrigation Districts, the whitewater features would be constructed. If funding were not obtained in time to construct the whitewater features in conjunction with the fish passage, whitewater features would not necessarily be precluded, but would require additional funds for their construction because of additional costs for construction dewatering, mobilization, etc. Construction of whitewater features separate from fish passage would require additional dewatering of a portion of the Colorado River, which may cause additional impacts to endangered fish and affect water quality. As discussed earlier whitewater features would likely attract boaters that may result in a minor impact to riparian resources from unauthorized boater access to the Colorado River. In addition, whitewater features could increase safety hazards on Interstate 70 if vehicles illegally stop or park within the Interstate 70 right-of-way. If the Union Pacific Railroad and E.R. Jacobson granted public access below the dam, this safety hazard would be reduced.

Construction of a future whitewater park would be contingent on the Town of Palisade obtaining additional funding. Additional site disturbances from road improvements, developed parking areas and public restrooms would likely occur. The potential for unauthorized river access upstream of the Price-Stubb Diversion Dam and from Interstate 70 would likely decrease. Riparian resources would also benefit from defined use areas and trails.

Summary and Mitigation Measures

In summary, the primary effect of fish passage alternatives would be to allow endangered fish to migrate into upstream habitats and assist in the recovery of the endangered Colorado River fishes. Each fish passage alternative was designed and would be operated to avoid impacts or harm to existing uses, water users, and water rights. Construction impacts would be minor and temporary. Table 2 summarizes and compares impacts among alternatives for each issue discussed in this chapter.

Mitigation Measures:

1. Clifton Water District would be advised of the construction schedule for the selected alternative. If the dam is removed, Clifton Water would be advised of the composition and volume of sediments that would be released, and when the sediments would reach their diversion and treatment plant.

2. Permission from all affected land owners would be obtained before commencing any construction activities. Removal of the Price-Stubb Diversion Dam would require approval of the dam owners.

3. Reclamation and/or construction contractors would obtain Clean Water Act authorizations before construction. Permit conditions would be incorporated as environmental commitments.

4. Modification of the historic Price-Stubb Diversion Dam would occur concurrent with measures to avoid or minimize adverse effects. Reclamation executed an MOU with the Colorado SHPO that requires Reclamation to take photographs that meet agreed-upon standards for architectural and engineers records. Reclamation would also collect historical documentation, drawings, and photographs of the dam and prepare a report for the Colorado SHPO archives.

5. Construction contracts would avoid activities that may affect fish spawning and larval fish development. Contracts would also require work to stop if activities affect any federally listed species or if cultural resources are discovered. Consultation with the Service or SHPO would be initiated, as appropriate, and mitigation measures implemented before construction activities could resume.

6. Costs for providing fish passage would be funded by the Upper Colorado River Basin Endangered Fish Recovery Program. Additional costs for constructing whitewater features would be funded with outside funding, if available. Reclamation would coordinate fish passage construction with affected land owners and recreational boating groups (i.e. CDOT, Union Pacific Railroad, E.R. Jacobson, WATER and Town of Palisade).

7. The following conditions would be met before construction of the whitewater features could proceed: 1) securing non-recovery program funds for the incremental costs ssociated with the Downstream Rock Fish Passage with Whitewater Features Alternative, 2) obtaining the necessary permits from underlying land owners (Palisade and Mesa County Irrigation Districts, E.R. Jacobson, and CDOT), 3) the Town of Palisade assuming liability and maintenance responsibility for the whitewater features, and 4) the Town of Palisade obtaining public access below the dam from the Union Pacific Railroad and E.R. Jacobson.

Table 2-Summary Comparison of Alternatives

Issue	No Action	Conventional Ladder	Downstream Rock Fish Passage	Downstream Rock Fish Passage w/ Whitewater Features	Dam Removal
Ute Water Plant	0	0	0	0	---
Water Rights	0	0	0	0	--
Clifton Water Treatment[1]	0	-	-	-	-
Recreation	-	-	-	+++	+++
Public Safety	-	-	+	++	++
Interstate 70	0	0	0	-	--
Railroad & Landslide Stability	0	0	0	0	---
Ownership of Dam & Lands[2]	0	-	-	-	-
Floodplain & Wetlands[3]	0	-	-	-	-
Endangered Fish Recovery[5]	---	+	++	++	+++
Protect Historic Dam[4]	0	-	--	--	---
Indian Trust Assets	0	0	0	0	0
Environmental Justice	0	0	0	0	0
Private Hydropower Revenues	0	-	-	-	---
Construction Costs	n/a	$4.3 M	$4.8 M	$5.4* M	$1.9—$2.9 M
Long-Term Operation and Maintenance Costs	n/a	$0.4 M	n/a	n/a	n/a
Estimated Cost	n/a	$4.7 M	$4.8 M	$5.4* M	$1.9—$2.9 M

*Includes additional non-Recovery Program funding for whitewater features.

Scale of Potential Impacts
+++ greatest positive impact
+ some positive impact
0 no known impact
- some negative impact
--- greatest negative impact

Footnotes: Numbers with Table 2 (e.g. [1]) correspond to the associated mitigation measures listed on pages 54-55