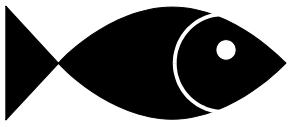
Biological Assessment
for
Redlands Water and Power Company
Fish Screen
on the Gunnison River

Prepared by
U.S. Bureau of Reclamation
Western Colorado Area Office
Grand Junction, Colorado

For
Upper Colorado River Basin Endangered Fishes Recovery Program
U.S. Fish and Wildlife Service
Denver, Colorado



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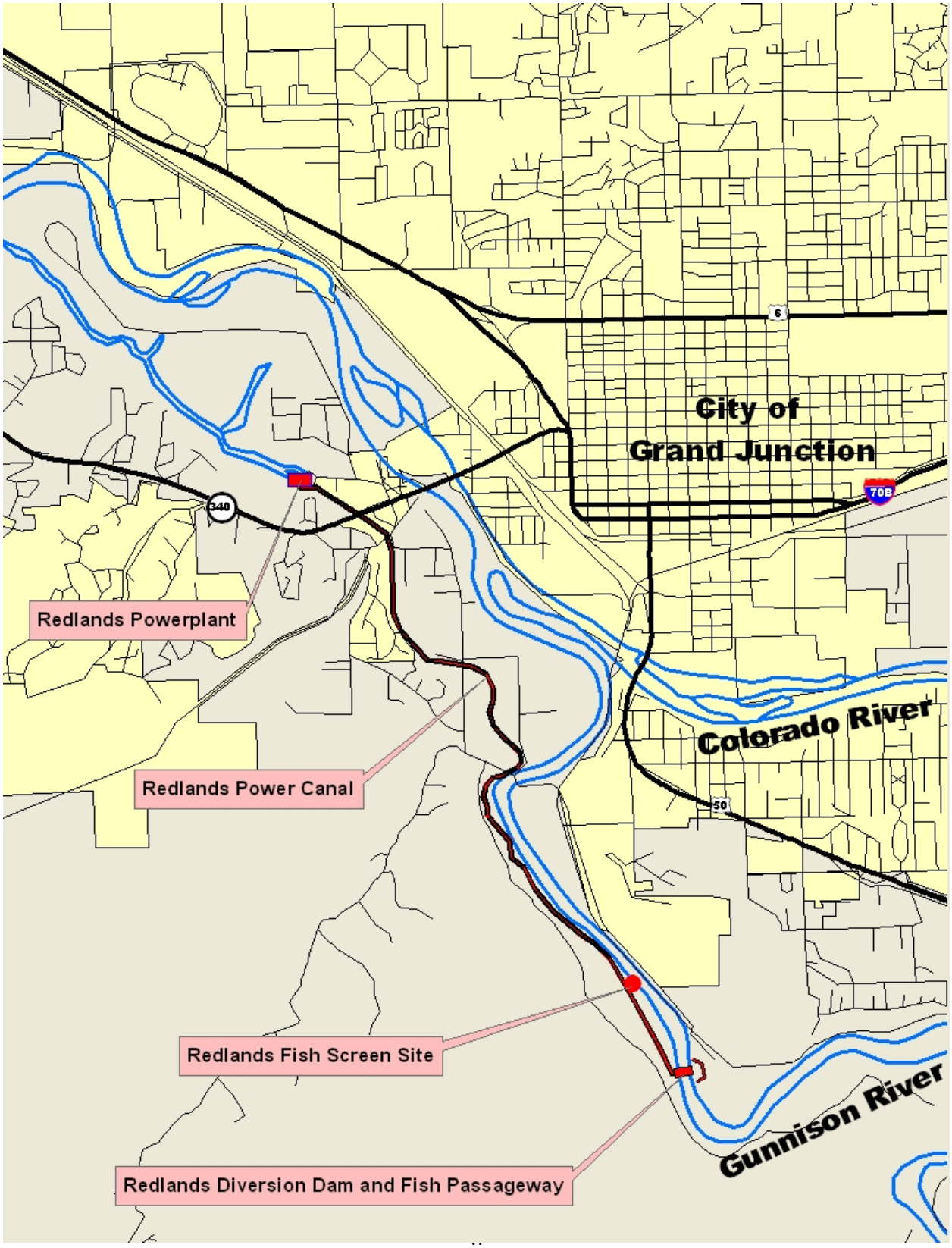
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INTRODUCTION

Redlands Water and Power Company

The Redlands Water and Power Company (***RWPC***) was established to supply irrigation water from the Gunnison River to the Redlands community near Grand Junction, Colorado. Gunnison River water is diverted at the Redlands Diversion Dam approximately 2.3 mile upstream of the Gunnison River's confluence with the Colorado River (***Figure 1***). RWPC constructed the diversion dam in 1918 and has since modernized and updated the structure. The concrete dam is 8.5 feet high and consists of a 312-foot-long spillway with a 6-foot-wide crest and two 10-foot-wide by 6-foot-high sluice gates. A flow of 850 cubic feet per second (***cfs***) is diverted through four 14-foot-wide headgates on the west side into the Redlands Power Canal. The Redlands Power Canal is approximately 4 miles in length and terminates at Redland's electric pumps and power plant. Pumped water is lifted to smaller distribution pipelines and canals to service the Redlands community. Water that passes through the power plant is discharged directly into the Colorado River. ***Figure 2*** shows RWPC's service area, which incorporates the Redlands Diversion Dam, Redlands Power Canal and delivery systems, and RWPC's pumps and power plant.

During the irrigation season (April-October), water is lifted 120 feet by electric pumps to supply water to RWPC shareholders or used for hydropower generation at the Redlands Power Plant. During the remaining portions of the year, water is diverted only to the Redlands Power Plant. In 1983, the Federal Energy Regulatory Commission (***FERC***) exempted RWPC from licensing under FERC regulations. This exemption required that fish passage be allowed around the dam.

The Redlands Diversion Dam is a recognized barrier to upstream endangered fish movements; and the operation of the Diversion Dam, Redlands Power Canal, electric pumps and power plant can all result in the unauthorized incidental take of all life stages of the Colorado River endangered fishes. To assist in recovery efforts for the Colorado pikeminnow (*Prychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*), RWPC has worked with the Upper Colorado River Endangered Fishes Recovery Program ***(Recovery Program)*** to minimize take. To mitigate for unavoidable incidental take of the Colorado pikeminnow and razorback sucker, Redlands has agreed to address potential impacts to Colorado pikeminnow and razorback sucker associated with RWPC operations. This biological assessment was prepared in consultation with the U.S. Fish and Wildlife Service ***(Service)*** and Recovery Program, and RWPC.

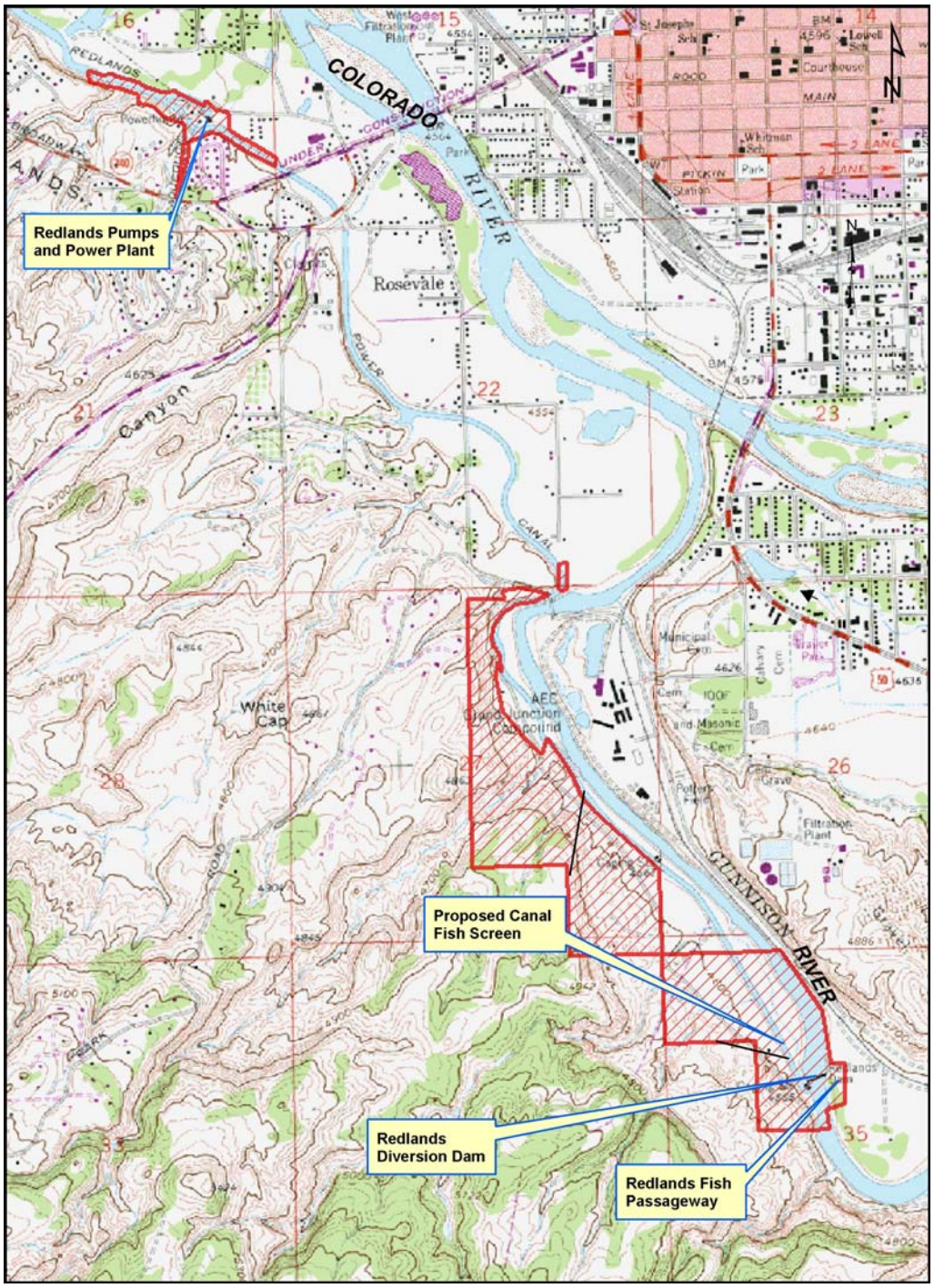

Figure 1-USGS Quadrangle Map with Project Area

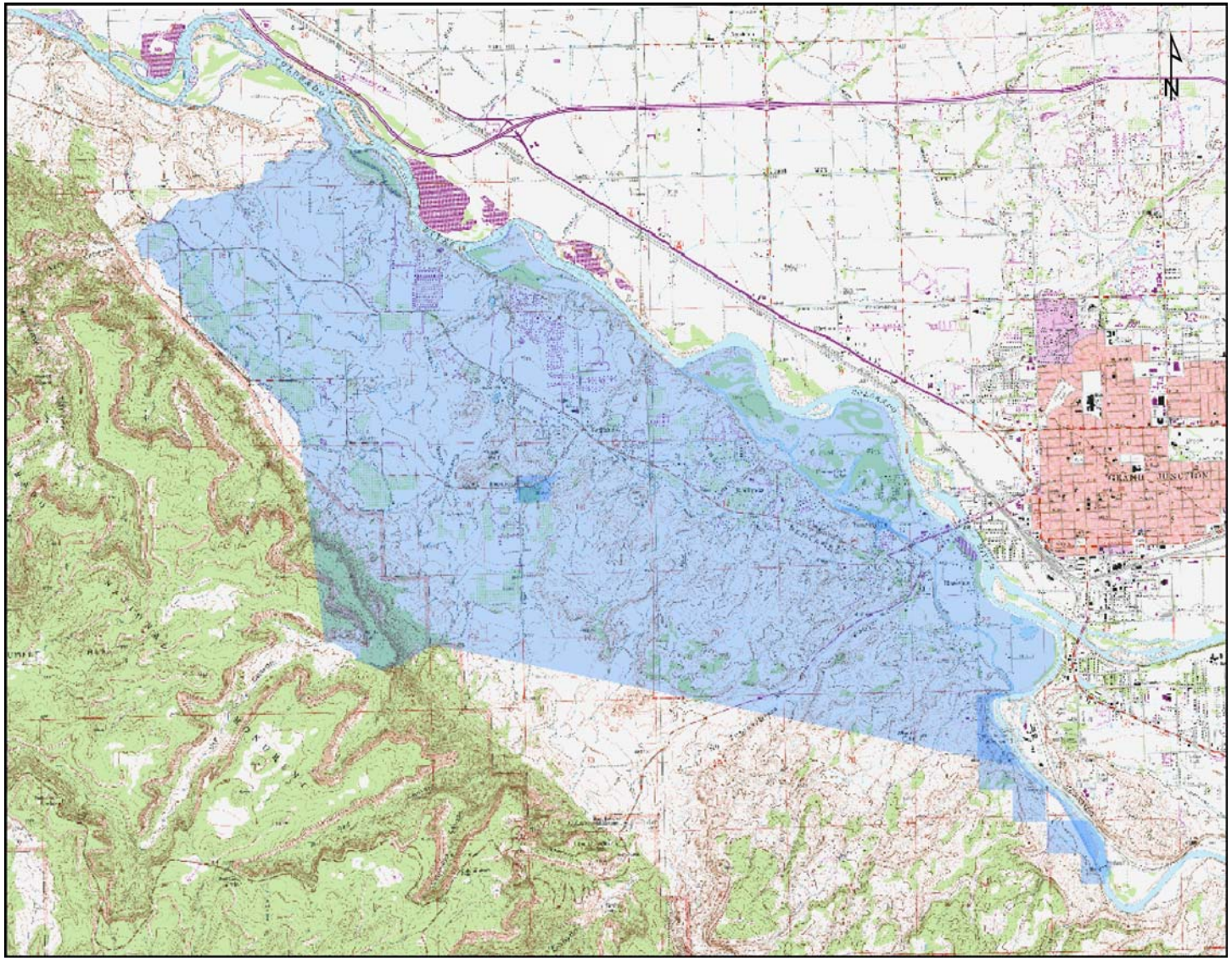

Figure 2-USGS Quadrangle Map with RWPC Service Area

Upper Colorado Endangered Fishes Recovery Program

The Upper Colorado River Endangered Fishes Recovery Program (***Recovery Program***) was established in 1988 to recovery four endangered Colorado River fish within the Upper Colorado River Basin. The endangered Colorado River fishes include the Colorado pikeminnow, razorback sucker, humpback chub (*Gila chypha*), and bonytail (*Gila elegans*). The Recovery Program is comprised of private, State and Federal interests and is designed to recover the endangered fishes, while providing for water development and use to proceed in a manner compatible with applicable State, and Federal laws. In 1996, the Recovery Program constructed a fish passageway around the Redlands Diversion Dam to allow endangered and native fish movement upstream. On behalf of the Recovery Program, the Bureau of Reclamation (***Reclamation***) constructed the fish passageway, and the Service operates the fish passageway to prevent the movement of non-native fish species upstream. The dam was identified by the Recovery Program as a barrier to fish movement and was included as an action item in the Recovery Program's Recovery Action Plan (***RIPRAP***). The RIPRAP also includes action items to construct and operate a fish screen in the Redlands Power Canal to minimize endangered fish canal entrainment and incidental take.

The RWPC currently owns lands to be used to construct the fish screen and the Recovery Program will provide funding as authorized by Congress to construct the fish screen.

This biological assessment (***BA***) includes commitments for mitigation of all reasonably anticipated incidental take within the RWPC's service area. The BA discusses methods to avoid, minimize, and mitigate impacts to the Colorado pikeminnow and razorback sucker. The mitigation section of this document provides commitments for minimizing the incidental takings the Colorado pikeminnow and razorback sucker within RWPC's service area.

RWPC has requested extended coverage for incidental take and RWPC's depletions in conjunction with Reclamation's Section 7 consultation for the construction and operation of the Redlands fish screen. Extended Section 7 coverage would allow RWPC to continue its historic diversions and depletions, and allow for the incidental take of Colorado pikeminnow and razorback sucker within RWPC's service area. The Recovery Program will complete all mitigation, monitoring, and conservation measures. Other mitigation measures (i.e. operation of the Redlands fish passageway and fish screen) within RWPC service area will also require incidental take coverage. After sunset of the Recovery Program, any "take" within the said geographic boundaries will require reauthorization by the Service unless previously deferred based on agreements between the Service, RWPC and the Recovery Program. The intent is for the Recovery Program to continue for as long as the Secretary of Interior recommends and Congress appropriates funds.

PROJECT PURPOSE AND STATUS

The purpose of the Redlands fish screen is to reduce the potential for incidental take of Colorado pikeminnow and razorback sucker associated with continued RWPC's operations, and to provide mechanisms to avoid, minimize, and mitigate for any incidental take of the Colorado pikeminnow and razorback sucker within the RWPC service area. The Redlands fish screen is listed in the Recovery Program's RIPRAP as an item needed to assist in the recovery of the endangered Colorado River fishes.

Informal consultation with the Service identified the following federally listed species, which may occur within the project area, which includes the RWPC service area:

Colorado pikeminnow	**(*Prychocheilus lucius*)**
razorback sucker	**(*Xyrauchen texanus*)**
bonytail	**(*Gila elegans*)**
humpback chub	**(*Gila chypha*)**
bald eagle	**(*Haliaeetus leucocephalus*)**

PURPOSE AND NEED FOR THE PROJECT

The Recovery Program has identified a need to screen the Redlands Power Canal to reduce the potential for take of Colorado pikeminnow and razorback sucker from continued RWPC operations. The purpose of the project is to assist in endangered Colorado River fishes recovery efforts and to allow continued operations of the RWPC to deliver irrigation water supplies and generate hydroelectric power to meet the current and future needs of the Redlands community southwest of Grand Junction, Colorado.

The Service and Recovery Program identified the Redlands Diversion Dam as a complete barrier to all fish movement. In 1996, the Recovery Program, in cooperation with RWPC, constructed a fish passageway around the Redlands Diversion Dam. The Service has operated the fish passageway since 1996 to allow endangered fish movement upstream to access additional critical habitat. Also, the fish passageway allows other native fish to move upstream but prevents non-native fish movements with the operation of the selective passage (fish trap). From 1996 to 2000, the Service reported 43,123 fish comprising 19 different species and three catostomid hybrids used the Redlands fish passageway. A total of 40,274 native fish, including 51 Colorado pikeminnow, used the passageway during this period (Burdick, 2001a). Additionally, in 2001, razorback sucker began using the passageway. Five razorback sucker were documented using the Redlands fish passageway in 2001 (Burdick, 2002).

The Service has also identified the potential for incidental take of Colorado pikeminnow and razorback sucker as a result of diversion of the Gunnison River at the Redlands Diversion Dam

into the Redlands Power Canal. Fish could be incidentally taken at Redland's electric pumps, power plant, during canal dewatering, or transported through ditches to irrigated fields.

PROJECT COMPONENTS

The Redlands Water and Power Company was established to deliver water to an area southwest of the confluence of the Gunnison and Colorado Rivers (known as the Redlands),. In 1918, RWPC moved its diversion dam on the Gunnison River, down stream ¼ mile to its present location. The diversion dam is approximately 2.3 miles upstream of the Gunnison River's confluence with the Colorado River. Gunnison River water is diverted at the dam into the Redlands Power Canal, which terminates at the Redlands Power House (electric pumps and power plant) and returns water to the Colorado River. About 70 cfs is pumped and delivered to the Redlands community for irrigation uses. Table 1 provides additional information on Redlands Facilities.

Table 1.0 – Redlands Water and Power Facilities and Operations

Feature	Description	Capacity
Redlands Diversion Dam	8.5-foot high diversion dam constructed in 1918 that spans the Gunnison River, consists of two 10-foot-wide by 6-foot sluice gates and 14-foot-wide head gates	Capable of diverting 750 cfs of the Gunnison River
Redlands Power Canal	Earthen canals and laterals 26 miles in length.8 Canal flows are monitored at a gage station operated by the State of Colorado	850 cfs
Redlands Power House - **Pumps** - **Power Plant**	Electric pumps capable of lifting water 120 feet 1 Generator	~70 cfs 1.5 Megawatts
Water Rights	670 cfs-priority date July 31, 1905 80 cfs-priority date June 26, 1941 100 cfs-priority date 1995	Allowed Uses: irrigation, domestic stock, and power generation Allowed Uses: irrigation and power generation Allowed Uses: All the above.
Redlands Depletions	Dewatering of Gunnison River (up to 750 cfs, of which ~690 cfs is returned directly to the Colorado River).	2.3 Miles

DESCRIPTION OF THE AFFECTED ENVIRONMENT

RWPC facilities are located in Mesa County in western-central Colorado. The diversion dam is located on the Gunnison River approximately 2.3 miles southwest of the City of Grand Junction. The Redlands Power Canal parallels the Gunnison River for about 4 miles and terminates at the Redlands Powerhouse. At the Powerhouse, approximately 70 cfs of water used for irrigation is electrically pumped to an upper terrace along the Colorado River to the Redlands and the remaining ~680 cfs is used to generate hydroelectric power and is returned to the Colorado River. The irrigation season lasts approximately 6 months from April 15 to October 15. During the remaining 6-month period, the power canal is used solely for hydroelectric power.

Mesa County has a population of about 120,000. Historically, land use in the Redlands area evolved much the same as other areas in the Grand Valley near the City of Grand Junction. Agriculture dominated as semi-arid lands were converted to productive farmland with the addition of irrigation. Gradually, due to the close proximity to a major city, residential development increased. Small subdivisions and many residential corridor developments are scatter throughout the Redlands area. The remaining land use is now residential with scattered agricultural parcels. Gravel mining, other water development projects on the Gunnison and Colorado Rivers (i.e. Reclamation's Uncompahgre Project and Aspinall Unit on the Gunnison River, and Grand Valley Project on the Colorado River), and other land use changes have altered the Colorado and Gunnison rivers in the project area and decreased the size of the floodplain.

The RWPC's service area is bound by the Gunnison River from the east, the Colorado River to the north, and the Colorado National Monument to the south, and includes approximately 10,625 acres (***Figure 2***).

Colorado pikeminnow and razorback sucker habitat within the RWPC service area is limited to the Gunnison and Colorado Rivers. These river reaches are within the designated critical habitat for both species, which includes the river and its 100-year floodplain (USFWS, 1994). Historically, RWPC could divert all or a significant portion of the Gunnison River into the Redlands Power Canal. RWPC has a senior water right for 750 cfs, and a junior water right for an additional 100 cfs. In 1996, Reclamation entered into a temporary agreement with the Colorado Water Conservation Board to deliver water from the Aspinall Unit to ensure that a 300 cfs minimum was maintained downstream of the Redlands Diversion Dam in the months of July through October for the benefit of the Colorado pikeminnow and razorback sucker. This agreement will be superceded by arrangements made in the future Aspinall Unit Section 7 consultation. The 300 cfs below Redlands allows for the operation of the Redlands Fish Passage and allows endangered fish access in a reach of the Gunnison River below Redlands that would prevent fish movement if Gunnison River flows decreased below 250 cfs below the Redlands Diversion Dam. In 1996, the Recovery Program constructed the Redlands Fish Passageway, which was been described previously in Section 2.1 of this BA. Since completion of the fish passageway, the Service has operated the fish passageway from March through October each

year. Both Colorado pikeminnow and razorback sucker have used the fish passageway at the Redlands Diversion Dam to access the Gunnison River upstream (Burdick, 2001a).

During the drought of 2002, RWPC entered into an agreement with the Colorado River Water Conservation District to forego power production in lieu of payment for power interference to prevent a "river call" to upstream junior water users. This also allowed for the continued operation of the fish passageway and sufficient flows downstream of the dam during the drought.

Approximately 720 acres of irrigated agriculture, 20 acres of wetlands, 850 acres of riparian habitat, 4,150 aces of upland habitat, 270 acres of gravel mined areas, and 4,615 acres of residential and commercial development are located within the RWPC's service area (***Figure 3***).

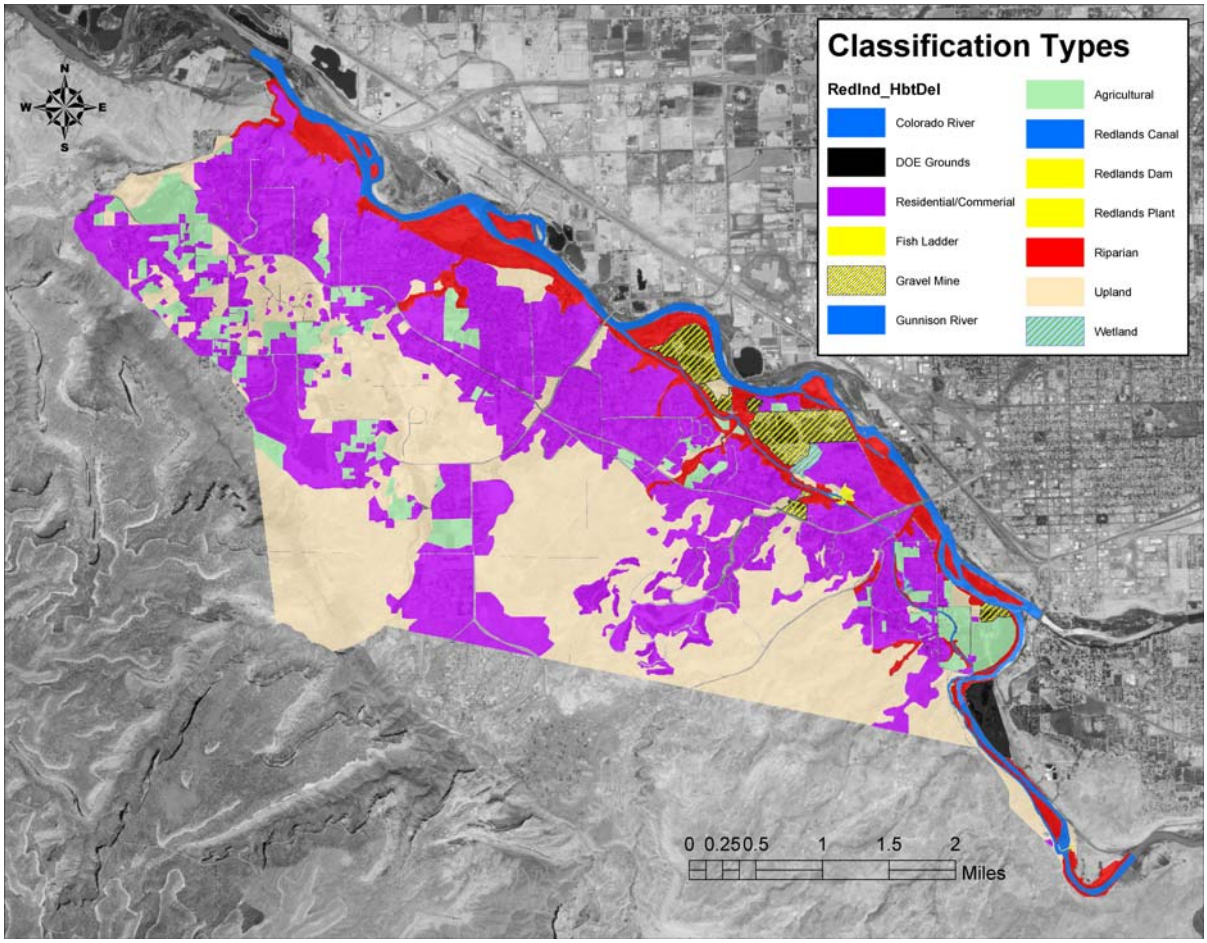

Figure 3-Habitat Types within RWPC Service Area

ALTERNATIVES INCLUDING THE PROPOSED ACTION

This section briefly discusses a range of project alternatives, including all "reasonable alternatives" considered for the proposed project and those "other alternatives" eliminated from detailed study. Included is a discussion of how and why the proposed alternative was selected for detailed study and why other alternatives were eliminated. This is section provided as background information on various alternatives examined and is not intended to fulfill the National Environmental Policy Act requirements. For further information regarding alternatives examined for the proposed project, see the Environmental Assessment for the Redlands Fish Screen in the Redlands Power Canal.

No-Action Alternative

Under the No-Action Alternative, RWPC would not implement measures to address incidental take during RWPC operations. A fish screen would not be installed in the Redlands Power Canal, however the operation of the fish passageway at the Redlands Diversion Dam would continue. RWPC would not receive Recovery Program funding to operate and maintain the fish screen, and maintain the fish passageway.

The unauthorized incidental take of Colorado pikeminnow and razorback sucker would continue. This alternative does not meet the need for the proposed project.

Pump Replacement

The pump replacement alternative would replace the existing hydro-pumps used to lift irrigation and municipal water supplies up to the Redlands with electric pumps. This alternative would reduce the volume of water diverted at the Redlands Diversion Dam from 750 cfs to 70 cfs.

While this alternative would provide some benefit, incidental take would still occur at the electric pumps and RWPC would not be able to put their entire water right for beneficial use generating hydroelectric power. Junior water rights upstream could divert additional water from the Gunnison River and negatively affecting upstream critical habitat. Because this alternative would not reduce the likelihood of incidental take and possibly dewater critical habitat upstream of the Redlands Diversion Dam, it was discarded from further discussion.

Fish Screen-Preferred Alternative

This alternative would construct a fish screen in the Redlands Power Canal to prevent canal entrainment and incidental take of adult and sub-adult Colorado pikeminnow and razorback sucker. The Recovery Program would design and construct the fish screen and provide operation and maintenance funding to RWPC for the fish screen. RWPC would assume ownership of the fish screen and could also operate the screen without Recovery Program funding.

RWPC would also assume ownership of the Redlands fish passageway. The Service would continue to operate the fish passageway and RWPC would perform maintenance activities with funding provided by the Recovery Program.

The fish screen was designed based on the biology and characteristics of the Colorado pikeminnow and razorback sucker. ***Figure 4*** provides a general site plan for the fish passage structure, which includes the fish screen, a bypass channel, and a fish return pipeline. The fish screen would be a "V-Type" configuration with each leg of screen being 160 feet long. The screen is designed for a total diversion flow of 890 cfs, returning 40 cfs for the fish return pipe, for a total screened flow of 850 cfs. The fish pipeline would be constructed using 36 inch PVC pipe with a total length of approximately 460 feet. Upstream and downstream bulkheads would be used for isolation during icing and other times when the fish screen is bypassed.

DETERMINATION OF ANTICIPATED INCIDENTAL TAKE LEVELS FOR RWPC OPERATIONS AND THE FISH SCREEN.

The potential for incidental take of Colorado pikeminnow and razorback sucker is anticipated to result from the continued RWPC operations and diversions of water from the Gunnison River via the Redlands Diversion Dam. Depletions from the Gunnison River are also anticipated to have an adverse affect on Colorado pikeminnow and razorback sucker and their designated critical habitat within the Gunnison and Colorado Rivers. RWPC would reduce the level of incidental take associated with diversions by screening adult and sub adult fish, and returning these fish to the Gunnison River and continue selective fish passage upstream of the diversion dam. The selective fish passage would prevent non-native fish species from moving upstream and occupying additional habitats.

The incidental taking of adult and sub-adult Colorado pikeminnow and razorback sucker would likely occur when the fish screen is not operating because of fish screen icing, fowling, or mechanical failure. In addition, current technology allows for screening of only adult and sub adult fish. The current standard fish screen size of 3/32" would not prevent larval fish and eggs from continuing down the Redlands Power Canal, passing through the pumps and generating turbines, and onto irrigated properties. The area of impacts to Colorado pikeminnow and razorback sucker includes approximately 2.3 miles (80 acres) of the Gunnison River, XX miles of canal and laterals, 850 acres of riparian floodplain habitat, 720 acres of irrigated agricultural lands, and 4,615 acres of residential and commercial development.

ENDANGERED COLORADO RIVER FISHES

The Colorado River Basin originally supported a depauperate fish fauna with 36 species from 20 genera and 9 families. Of these 36 native species, 64 percent were endemic to the basin and only eight were found in both upper and lower portions of the basin. Because of widespread

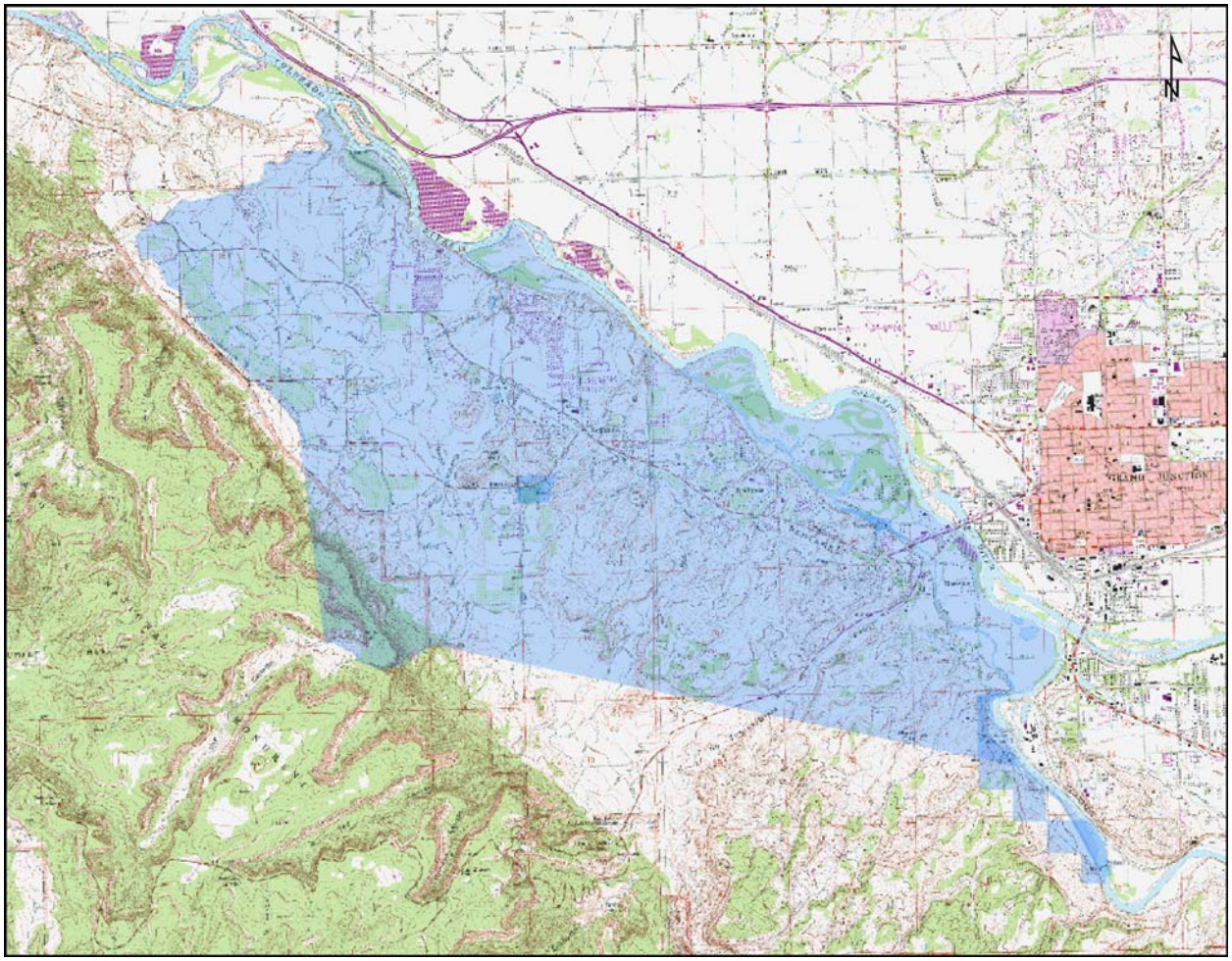

Figure 4-General Site Plan Drawing

introductions, over 100 species are now found in the basin (Carlson and Muth, 1989). In recent years, Tyus et al. (1982) documented 13 native and 42 non-native fishes reported from the Colorado River and its tributaries upstream of Lake Powell. Four native fish species to the large rivers of the Colorado River Basin are listed as endangered under the Endangered Species Act of 1973. The endangered fish are the Colorado pikeminnow, razorback sucker, humpback chub, and bonytail. The Colorado pikeminnow and razorback sucker occur within the project area and are discussed in detail in this section. The humpback chub and bonytail do not occur within these reaches of the Colorado and Gunnison rivers, and are not discussed in great detail.

This section is not intended to be an exhaustive literature review of the four endangered species, but to provide an overview of the known information that is pertinent to the fish screen and RWPC's operations. Literature reviews of the life history and ecology of these species are available in Bestgen (1990), Minckley et al. (1991), Tyus (1991) and Muth et al. (2000).

COLORADO PIKEMINNOW

Colorado pikeminnow (formerly known as Colorado squawfish is a large piscivorus cyprinid endemic to the Colorado River Basin (Minckley 1973) and is one of four large cyprinids of the genus *Ptychocheilus* native to the western United States (Robins et al., 1991).

Colorado pikeminnow is the largest of the four and reportedly reached lengths approaching 1.8 m and weights of 45 kg (Minckley, 1973) during European settlement of the west. The largest Colorado pikeminnow captured in recent years was 960 mm long and exceeded 5-kg (McAda, 2000). In 2002, an adult female Colorado pikeminnow 940 mm long and 7.6 kg was captured at the Redlands fish passageway.

The species was once widespread in the large rivers of the Colorado River Basin, but it was eliminated from the basin downstream of Lake Powell by the late 1960s (Minckley, 1973). Although it still exists in the upper basin, its range has been reduced by construction of large reservoirs that eliminated habitat and changed downstream water quality (e.g. Vanicek et al. 1970) and construction of instream barriers that blocked access to historic range (Burdick and Kaeding, 1990). The reduced habitat and declining number of fish occupying the remaining habitat prompted the species to be included as endangered when a list of endangered species was published in 1967 (USFWS, 1967).

Colorado Pikeminnow Distribution-Colorado River

Colorado pikeminnow are distributed throughout the Colorado River from Price Stubb Dam, an impassible barrier at the upper end of the Grand Valley (RM 188.3), downstream to Lake Powell (***Figure 5***, Osmundson and Burnham 1988). The Recovery Program is planning construction of a fish passageway at the Price Stubb Diversion Dam in 2005. The Grand Valley Project Diversion Dam, an additional barrier upstream of the Price Stubb Diversion Dam, will have a fish passage constructed in 2004. The removal of these two barriers will allow Colorado pikeminnow access to about 50 miles of critical habitat upstream to Rifle, Colorado.

Although pikeminnow use the entire river, there are distinct differences in distribution among age classes. In general, most adults are found in the upper reaches of the river and most sub-adults, juveniles, and young-of-year (YOY) are found in the lower reaches (McAda, 2000; Valdez et al. 1982b; Archer et al. 1985; McAda and Kaeding 1991; Osmundson et al. 1997). Osmundson and Burnham (1998) conducted an intensive river-wide study using mark recapture to estimate the population size of sub adult (250-500 mm long) and adult Colorado pikeminnow (>500 mm long) in the Colorado River. The river was divided into two sub reaches — Westwater Canyon upstream to the Price Stubb Diversion Dam (RM 125-188) and confluence with the Green River upstream to Westwater Canyon (RM 0-113). They estimated that the average population size in 1991—1994 was 253 (95% CI, 161-440) for the upper reach and 334 (95% CI, 196-604) for the lower reach.

Although most adults were captured from the upper river, they were not distributed equally throughout the reach. Catch rates in two segments of the upper reach—known as the 18-mile reach (RM 154-171) and the 15-mile reach (RM171-185)—where five to six times higher than in the lower third of the reach (McAda, 2000).

Density and distribution of YOY Colorado pikeminnow have been monitored in the Colorado River since 1982 (McAda and Ryel, 1999). Density has been highly variable over that period, but YOY have been captured every year since monitoring began (McAda, 2000). YOY Colorado pikeminnow were found throughout the Colorado River downstream from the confluence with the Gunnison River, but were most abundant in the 65 miles between Moab, Utah and the mouth of the Green River (McAda, 2000).

Although they did not find a significant difference in population size among the 4 years of the study (1991-1994), Osmundson and Burnham (1998) noted what appeared to be a general increase in the number of adult pikeminnow in the upper river over time. Catch rates increased steadily in the upper reach during that period. Osmundson and Burnham (1998) attributed this to recruitment of a large group of individuals from 1985-1987 year-classes recruiting to young adulthood and moving into the upper reach. The strong year-classes of young adults corresponded to high density of YOY Colorado pikeminnow in 1985-1986. An increasing population in the Colorado River during the mid 1990s was also implied by a constant increase in catch per unit effort during spring Interagency Standardized Monitoring Program (ISMP) electrofishing (McAda et al. 1998). Osmundson (2002) investigated population dynamics of the Colorado River population of Colorado pikeminnow. Two multi-year data collection efforts were made: 1991 to 1994, and 1998 to 2000. Annual estimates of whole-river population size (all fish $\geq$ 250 mm TL) averaged 582 during the early study period and 742 during the more recent study period, a 27% increase. Annual estimates of adults ($\geq$ 500 mm TL) averaged 362 during the early study period and 490 during the recent study period, representing a 35% increase in adults. Backwater-netting catch rates supported this trend with an increase in rates between 1994 and 1998.

In both 1999 and 2000, males comprised 51% of the population: females, 49% (Osmundson, 2002). Average body condition for almost all length-classes of pikeminnow significantly declined between the early and recent study periods (Osmundson, 2002).

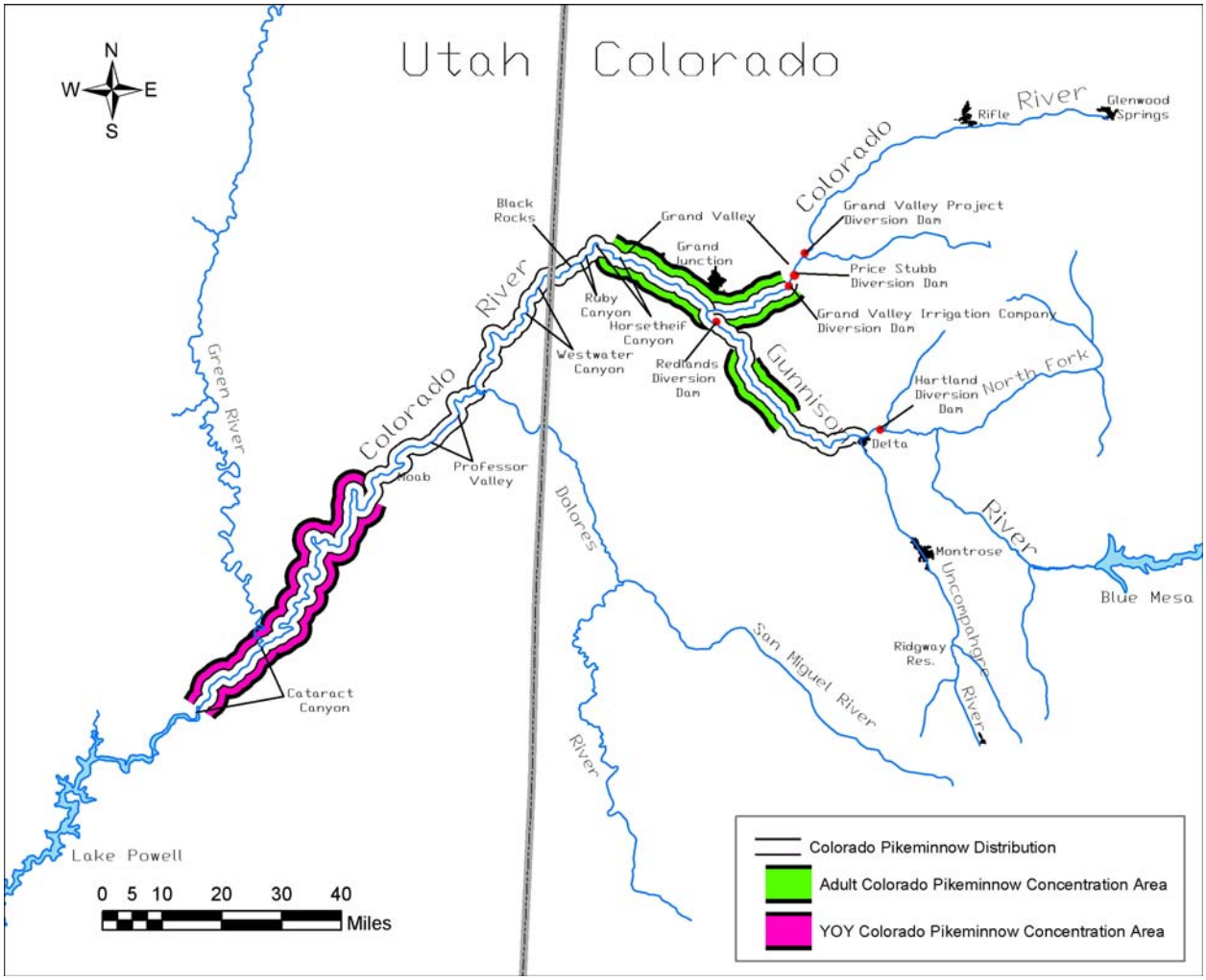

Figure 5-Distribution of Colorado Pikeminnow in the Colorado and Gunnison Rivers.

Colorado Pikeminnow Distribution-Gunnison River

Although isolated from the Colorado River population by construction of the Redlands Diversion Dam in 1917, a small, remnant population of Colorado pikeminnow persisted upstream of the dam (***Figure 6.1)***. Burdick (1995) captured five adult Colorado pikeminnow (ranging from 497-847 mm total length) in the Gunnison River upstream from the dam during an intensive study from 1992-1994. Four fish were positively identified while electrofishing but were not captured. Two of the captured fish were ripe males found together in a large eddy at RM 33.7 on July 14, 1993. Of the remaining pikeminnows, one was captured at RM 33.5, one in the flooded mouth

of Kannah Creek (RM 18.2) on May 5, 1993 and another at RM 16.7 on the same day. Fish that were observed, but not captured were seen at RM 7.7, 30.8 and 32.9 in 1992 and at RM 48.4 in October of 1993 (***Figure 6)***. In earlier investigations, Valdez et al. (1982a) captured four adult Colorado pikeminnow between RM 26.7 and RM 33 and observed, but did not collect, four more between RM 22.1 and 31.4 (***Figure 6)***. The upstream limit of Colorado pikeminnow in the Gunnison River is Hartland Diversion Dam, an impassible barrier at RM 59.9, about 57 miles upstream from Redlands Diversion Dam (Burdick, 1995).

In addition, 51 Colorado pikeminnow used the Redlands Fish Passageway from 1996 to 2000 (Burdick, 2001a). Eight additional Colorado pikeminnow ascended the passageway in 2001 and 2002. All pikeminnow used the passageway in July and August. There is some movement back and forth between the Colorado and Gunnison Rivers: two pikeminnow ascended the passageway in 1997, were recaptured in 1998. In addition, one other Colorado pikeminnow that ascended the passageway in 1997 was recaptured in 1998 from the Colorado River upstream of its confluence with the Gunnison River (Burdick, 2000). It is not know when these fish moved back downstream over the Redlands Diversion Dam or how many other fish have returned to the Colorado River and have not been recaptured.

Colorado pikeminnow movements in the Gunnison River were monitored during 1993 and 1994 (Burdick, 1995). Seven adult Colorado pikeminnow were implanted with radio transmitters. The radio-tagged fish used most of the Gunnison River between Redlands and Hartland Diversion Dams and one pikeminnow moved back downstream of the Redlands Diversion Dam after 78 days. Forty-eight percent of the radio contacts were made between RM 30—40.9, and thirty-two percent were made between RM 15—29. Colorado pikeminnow congregated in a short reach between RM 30—33 during the estimated spawning period in 1993, with four fish between RM 32—33. The reach contained numerous riffles with cobble and gravel substrates similar to reaches in other rivers identified as Colorado pikeminnow spawning areas (Lamarra et al., 1985; Harvey et al., 1993; Miller and Ptacek, 2000). Occurrence of a congregation at the same location for 2 consecutive years during the estimated spawning period suggests that Colorado pikeminnow were spawning there (McAda, 2000).

Larval Colorado pikeminnow have also been collected from the Gunnison River in 1995 and 1996 (Anderson, 1999), but downstream locations do not help locate specific spawning sites because the larvae may have drifted downstream for an unknown distance.

Colorado Pikeminnow Population Augmentation

The Recovery Program has identified Colorado Pikeminnow augmentation as a third priority behind razorback sucker and bonytail (Nesler et al., 2003). The integrated stocking plan for the Colorado River is presented in Table 2 (Nesler et al., 2003).

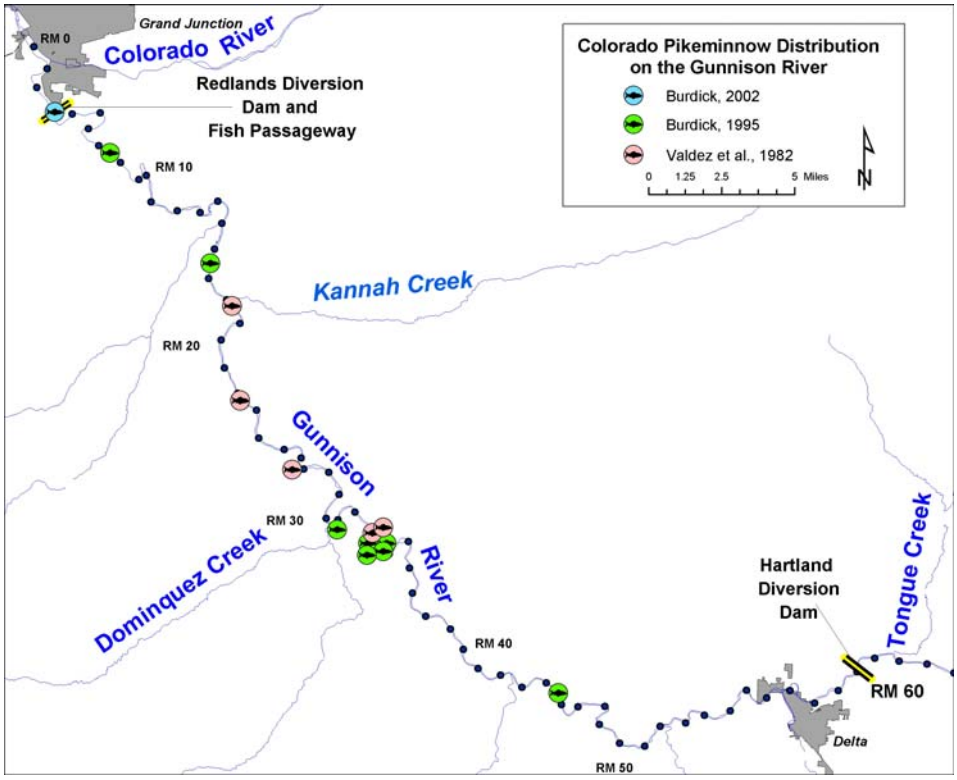

Figure 6-Gunnison River Colorado Pikeminnow Distribution

Table 2. Integrated stocking plan for Colorado pikeminnow, third priority species.

Priority by State and River Reaches	Fish age and Size (mm TL)	Season Stocked[1]	Numbers of fish stocked per year	Number of years stocked
Colorado:				
Colorado River: Rifle to DeBeque Canyon	Age 3+ 150	1° Fall 2° Spring-Summer	1,125[2]	6
Gunnison River: Hartland to Redlands dams	Age 3+ 150	1° Fall 2° Spring-Summer	1,125[2]	6

[1] 1° refers to the primary season; 2° refers to secondary season to cull fish and allow smaller individuals to achieve stocking size by the next fall.

[2] Represents one population in the Upper Colorado and Gunnison rivers.

Colorado Pikeminnow Habitat Use

Adult and Sub-Adults—Adult Colorado pikeminnow use a variety of habitats, but exhibit preferences for specific habitats during different periods of the year (Tyus and McAda, 1984; Osmundson et al., 1995). In the Colorado River near Grand Junction, pools and slow runs (<2.0 ft/sec) accounted for 77 to 95% of all habitats used by Colorado pikeminnow from November through February (Osmundson et al., 1995). More than 74% of all observations during this

period had mid-column velocities <1.0 ft/sec. Eddies and backwaters were the only other habitats used by Colorado pikeminnow in the winter.

During April—June, river discharge and velocities increased and Colorado pikeminnow sought off-channel habitats with reduced water velocities and warmer water temperatures that the main river channel (Osmundson et al., 1995). In the Colorado River, Osmundson et al. (1995) found that backwaters and flooded gravel pits (combined) comprised 45% of radio tagged Colorado pikeminnow locations in April, 49% in May, and 47% in June. These quiet, warm water areas allow Colorado pikeminnow to minimize energy expenditures and begin somatic growth or gonad maturation sooner than would be possible if they were unable to escape swift, cold water of the main river channel (Valdez and Wick, 1983). Other habitats such as eddies and shorelines were also used to a lesser degree (Osmundson et al., 1995). Use of main-channel habitats increased at summer base flows with slow and fast runs accounting for 49 to 52% of habitats selected during July—September (Osmundson et al., 1995). Eddies were used 9 to 16% , pools 13 to 16%, and riffles 3 to 10% of the time.

Osmundson and Kaeding (1991) determined that radio-tagged Colorado pikeminnow preferred river segments with complex channels (i.e. areas with islands, backwaters, and side channels) over simple channels with no side channels or islands. These braided areas provide a greater diversity of habitats for Colorado pikeminnow to exploit for resting or foraging and were preferred during all seasons.

Young-of-Year and Yearlings—Small Colorado pikeminnow are highly dependent upon backwaters or shallow embayments for nursery habitat (Tyus and Haines 1991; Trammel and Chart, 1999a,b). Archer et al. (1985) concentrated sampling efforts on backwaters in the Colorado River. More than 98% of the small Colorado pikeminnow collected were found in backwaters. Although backwaters are preferred habitat, young Colorado pikeminnow move between backwaters and the main channel in response to environmental variables, including changes in water temperatures (McAda and Tyus, 1984; Tyus 1991). Trammel and Chart (1999b) divided backwaters into six categories, but two backwater types were found in greatest abundance in the lower Colorado River—scour channels and migrating sand waves. Scour channels are formed by the erosion of small channels behind large sandbars during spring runoff and are revealed by receding water levels and typically deep and permanent. Migrating sand wave backwaters are formed by the movement of migrating sand waves adjacent to sandbars and are relatively shallow and ephemeral. Density of Colorado pikeminnow was highest in scour channels and Colorado pikeminnow exhibited a significant preference for scour channels (Trammel and Chart, 1991a,b). Winter habitat use by YOY Colorado pikeminnow has not been studied.

Colorado Pikeminnow Reproduction

Colorado pikeminnow spawn as spring flows decrease and water temperatures increase (Haynes et al., 1984; Nesler et al., 1988; Tyus 1990, 1991; McAda and Kaeding, 1991; Bestgen et al.

1998; Anderson, 1999; Trammel and Chart, 1999a,b). In the Colorado River, Colorado pikeminnow do not migrate to the extent that they do in the Green River, but migration occurs with movement beginning in response to declining runoff and increasing water temperature (McAda and Kaeding, 1991). Although some spawning may occur at cooler temperatures, most spawning in the Colorado, Green and Yampa rivers occurs at water temperatures between 18—22 ^{o}C (McAda and Kaeding, 1991; Tyus, 1991, Bestgen et al., 1998; Anderson, 1999, Trammel and Chart, 1999a,b).

Specific spawning sites in the Colorado River are not as well documented as those in the Green River sub-basin, although successful spawning occurs every year (Anderson, 1999; McAda and Ryel, 1999; Trammel and Chart, 1999a). McAda and Kaeding (1991) concluded that spawning in the Gunnison River is generally done by smaller groups and in more locations than Green River sub-basin. McAda and Kaeding(1991) reported a presumed spawning aggregation of radio-tagged Colorado pikeminnow upstream from the mouth of the Gunnison River, but the aggregation was not repeated in subsequent years. Recent efforts have identified five more possible spawning sites based on aggregation of Colorado pikeminnow during the presumed spawning season (***Figure 7***) (McAda, 2000).

Aggregations of pikeminnow at one of the sites downstream of the mouth of the Gunnison River were documented in 3 different years. A total of 18 fish were collected from a pool-rifle complex in 1994 during the spawning period (D. Osmundson, unpublished data). Ten of these fish were ripe males and five others appeared to be females, but no eggs were emitted (sex of three other could not be determined). The area was sampled again during the presumed spawning period in 1998 and 12 fish were collected, including 7 ripe males and 4 apparent females (D. Osmundson, unpublished data). About 25 additional Colorado pikeminnow were observed during electrofishing, but could not be captured by the sampling crew. In 1999, nine Colorado pikeminnow were captured at this site, including five ripe males and one ripe female (gentle pressure extruded eggs when the fish was captured and it was spawned in the hatchery later that day without hormone injections [McAda, 2000]).

Colorado pikeminnow are broadcast spawners that deposit their eggs on cobble substrates in riffles and runs (Tyus, 1991). Lamarra et al. (1985) described a known spawning site on the Yampa River as being composed of cobble substrate with large interstitial spaces. Hamman (1981) documented that Colorado pikeminnow embryos adhered to clean cobble substrate in hatchery raceways, so it is likely that a similar process occurs in rivers. After deposition and fertilization, the embryos incubate in the cobble for 4-7 days depending on water temperature (Hamman, 1981; Marsh, 1985; Bestgen and Williams, 1994). The larvae remain in the gravel for another 6-7 days after hatching before emerging from the substrate and becoming entrained in the river current (Bestgen et al., 1998). Colorado pikeminnow larvae may drift downstream for many miles before settling in low-gradient reaches with abundant backwaters and other quiet-water habitats (Tyus and Haines, 1991, Bestgen et al., 1998; Anderson, 1999; Trammell and Chart, 1999a).

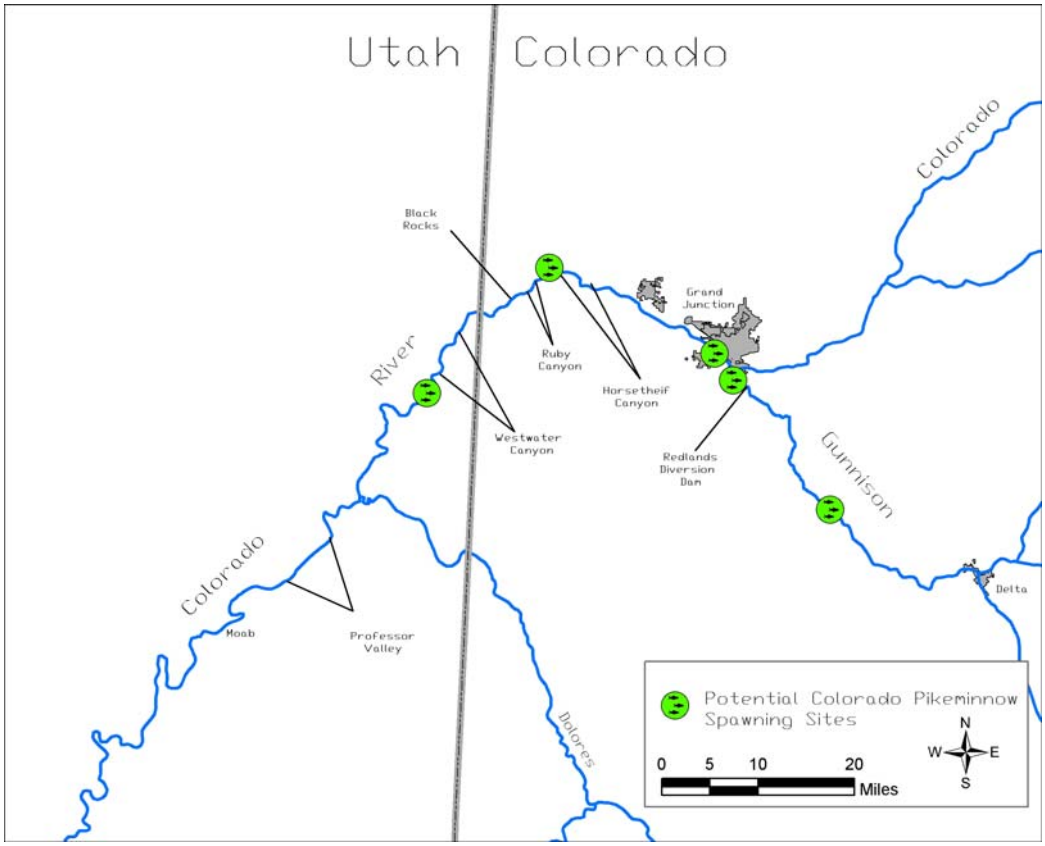

Figure 7-Potential Colorado Pikeminnow Spawning Sites in the Colorado and Gunnison Rivers.

RAZORBACK SUCKER

The razorback sucker is a large catostomid, endemic to the Colorado River Basin of the western United States (Minckley, 1973). The species belongs to a monotypic genus that is distinguished by a prominent dorsal keel that rises immediately posterior to the occiput (Minckley, 1973). Large individuals may reach a meter in length and weights of 5 or 6 kg (Minckley, 1973), but most individuals captured in the upper basin are less than 650 mm long and weigh less than 3 kg (McAda and Wydoski, 1980; Tyus, 1987; Tyus and Karp, 1990). It is long-lived and individuals may exceed 40 years of age (McCarthy and Minckley, 1987). The historic distribution of razorback sucker has been reduced by 75% (Minckley et al., 1991) and its extremely low abundance within remaining habitat caused it to be listed as endangered under the Endangered Species Act of 1973, as amended (USFWS 1991).

Razorback Sucker Distribution-Colorado River

In the Colorado River upstream of Lake Powell, most razorback suckers have been captured in the Grand Valley (Loma to Palisade) near the confluence of the Gunnison and Colorado rivers (***Figure 8***). However, their abundance has decreased to the point that they were only

infrequently captured there. During intensive efforts that were specifically targeted at known concentration areas of razorback sucker, Kidd (1977) and McAda and Wydoski (1980) captured a combined total of 54 razorback suckers in 1974 and 204 in 1975 from two gravel-pit ponds connected to the Colorado River near Grand Junction. These numbers reflect the combined total of independent collections, but probably include some recaptures of the same fish since sampling was done in the same area and Kidd (1977) did not mark fish before release. All of these fish exhibited signs of old age (i.e. large size, missing eyes, heavy scarring) (McAda, 2000). The high numbers of razorback suckers captured in 1975 were not repeated in subsequent years (summarized by Osmundson and Kaeding, 1991). The highest number captured in later years was 30 fish that were collected in 1982 from the same gravel-pit pond sampled by Kidd (1977) and McAda and Wydoski (1980). Only 11 razorback suckers have been collected from the Grand Valley since 1990 despite intensive sampling in some years (Osmundson and Kaeding, 1991; McAda, 2000). All of these fish have been removed from the river to support propagation activities for the Recovery Program (McAda, 2000).

Although most razorbacks have been collected from the Grand Valley, they have also been collected both up and downstream of the area. Kidd (1997) reported 22 razorbacks from the Colorado River near DeBeque (RM 209.7) in 1974-1975. No razorbacks have been collected from that reach since then (Valdez et al., 1982; Burdick, 1992). Burdick (1992) captured one razorback sucker from a gravel-pit pond along the river at RM 243.8 and discovered a small population in another gravel-pit pond at RM 204.5. About 75 razorback suckers were captured from the second pond, but DNA analysis revealed that they were siblings. They were probably offspring from two or three razorback suckers trapped in the pond during the high water year of 1983 or 1984. Three razorbacks were incorporated into the propagation program, but their close relationship precluded extensive use in the brood stock program. Forty-five razorback suckers stocked in the Gunnison River as part of an experimental stocking; six of those fish were confirmed alive at the end of the 2-year study (Burdick and Bonar 1997).

Few razorback sucker have been captured downstream from the Grand Valley, between Loma and Lake Powell. Taba et al. (1965) captured eight juveniles in backwaters of the Colorado River downstream of Moab, Utah. One adult was captured near Salt Wash (RM 144.2 in 1988 (McAda et al. 1994). Further downstream, Valdez et al. (1982) captured two razorback suckers within 2 miles of the confluence with the Green and Valdez (1990) captured one more in the same area.

Razorback Sucker Distribution-Gunnison River

Anecdotal accounts indicate that razorback sucker were common in the Gunnison River near Delta in the early and middle portions of the 20th Century (Kidd, 1997; Quartrone, 1993). Razorback suckers in the Gunnison River recorded from knowledgeable collectors are rare. Two specimens from the 1940s are in the University of Michigan Museum of Zoology (reported by Wiltzius, 1978). Wiltzius (1978) captured one razorback sucker near Delta in 1975 and Holden et al. (1981) captured three razorbacks in the same general area in 1981 (***Figure 6.4)***.

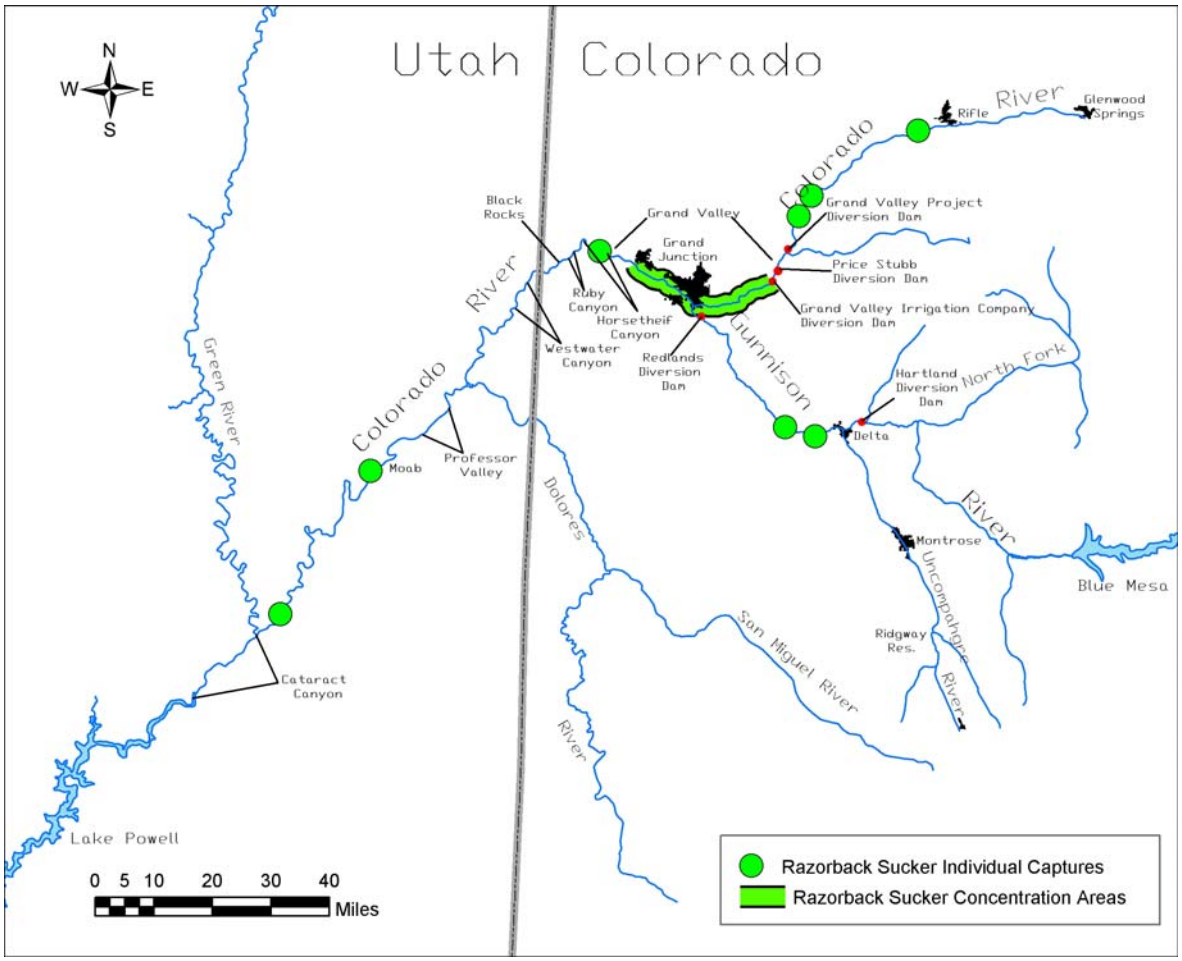

Figure 8-Razorback Sucker Distribution in the Colorado and Gunnison Rivers.

Extensive sampling by Valdez et al. (1982a) and Burdick (1995) failed to capture any razorback suckers from the Gunnison River. Sampling efforts in 2002 collected the first larval razorback suckers at two locations on the Gunnison River at a site near Roubideau Creek and a site near Whitewater (***Figure 9***) (C. McAda, unpublished data). These were the first collection of larval razorback suckers from the Colorado or Gunnison rivers. In addition, Taba et al. (1965) collected the only record of juvenile razorback sucker from the Colorado or Gunnison rivers.

In 2001 and 2002, six razorback suckers ascended the Redlands fish passageway (B. Burdick, unpublished data). The fish passageway was constructed in 1996, however, razorback suckers did not begin using the passageway until 2001.

Razorback Sucker Population Augmentation

Although razorback sucker populations have dramatically declined in abundance in recent years, the Recovery Program considers the Colorado and Gunnison rivers to be suitable habitat for razorback suckers and has begun a reintroduction program to restore populations in the two rivers (Burdick, 1992). The Recovery Program developed a broodstock to supplement razorback sucker populations in the Colorado and Gunnison Rivers. The Recovery Program in 1996 initiated a five-year stocking program with the stocking of 7,700 young razorback suckers into the Gunnison River near Delta, Colorado (Burdick, 1999). The stocking program has continued with the fish stocking of 18,423 juvenile, sub-adult, and adult razorback sucker in the Gunnison River and 31,531 juvenile, sub-adult, and adult razorback sucker in the Upper Colorado River between April 1994 and October 2001 (Burdick, 2001b). ***Table 3*** presents the sizes, number and locations of razorback stocking from 1996—2001 (Burdick, 2001b). The goal of the stocking plan is to establish a self-sustaining population of 600 individuals in the 57 miles of usable habitat between Harland and Redlands diversion dams.

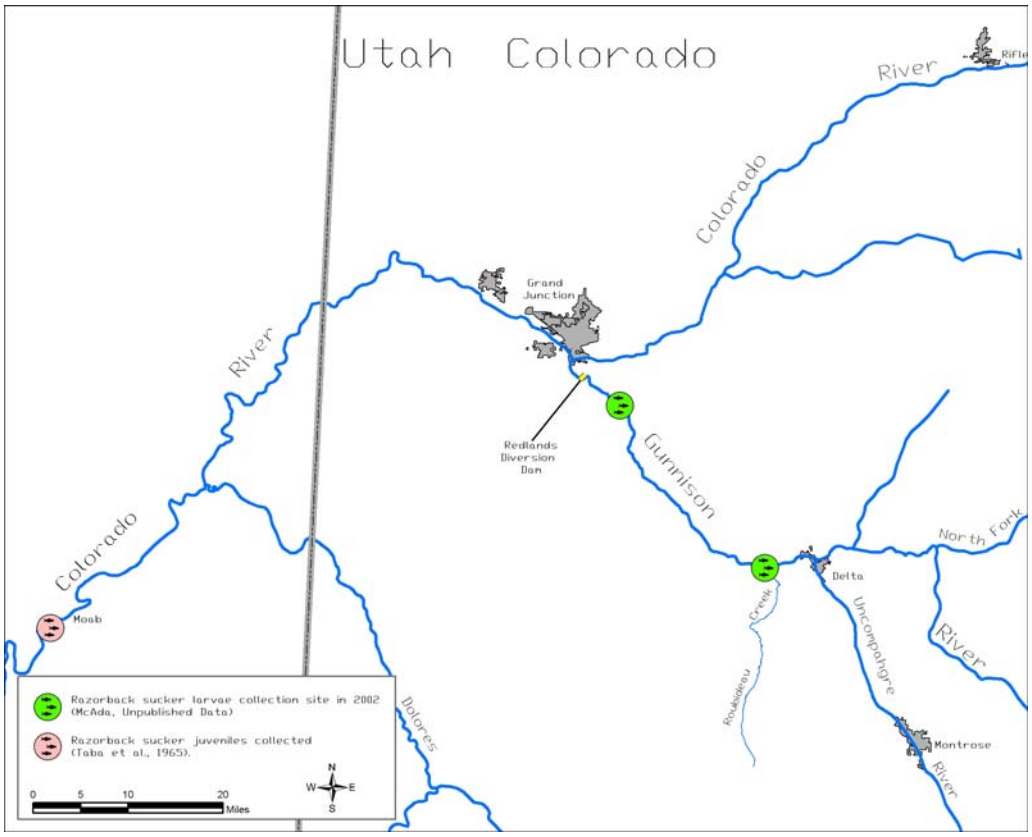

Figure 9-Larval and Junvenile Razorback Sucker Collections from the Colorado and Gunnison Rivers.

The Recovery Program also approved a stocking plan by the Colorado Division of Wildlife (***CDOW***) (Nesler, 1998) for the Colorado and Gunnison rivers that includes and expands on Burdick's (1992) plan. The goal of CDOW's plan is to establish populations of 475 razorbacks

per mile in suitable habitat within Colorado. An equivalent plan has been developed for the Colorado River within Utah (Hudson et al., 1999) which recommends a population of about 3,190 or an average of about 30 fish per mile in the section of river razorback suckers are expected to inhabit. An integrated stocking plan for Colorado and Utah was developed in 2002 to address inconsistencies between the states stocking plans (Nesler et al., 2003). ***Table 4*** on the follow page presents priority by State and river reaches as well as fish size, seasons to stock, number of fish per year, and number of years to stock razorback sucker.

Burdick (2001b) reported that 235 razorback sucker stocked in the Gunnison and Colorado river were either captured (226) from sampling or were found dead (9) during other research sampling efforts. This represented about 0.5% of all razorback suckers stocked prior to 2002 (50,254) An additional 93 razorback sucker were found dead on the trash grates at the Redlands fish passageway in 1999 and 2001 (Burdick, 2001b).

Table 3. Recovery Program razorback sucker stocked in the Gunnison and Colorado rivers 1996—2001.

Year	*Stocking Location*	*Mean Size of Fish*	*Actual Number of Fish Stocked*
Prior to 1996	Gunnison River Colorado River	18”-21” 18”-21”	25 20
1996	Gunnison River near Delta	8”	316
1997	Gunnison River near Delta	8” 12”	3,732 282
1998	Gunnison River near Delta	12”	608
1999	Gunnison River near Delta	8” 12”	2,742 30
1999	Colorado River near Parachute	8”	3,498
2000	Gunnison River near Delta	8”	6,587
2000	Colorado River near Parachute and Price Stubb Diversion Dam to the confluence with the Gunnison River	8”	25,859
2001	Gunnison River near Delta	8”	4,101
2001	Colorado River near Parachute and Price Stubb Diversion Dam to the confluence with the Gunnison River	8”	2,154

Table 4. Integrated stocking plan for razorback sucker, first priority species.

Priority by State and River Reaches	Fish age and Size (mm TL)	Season Stocked[1]	Numbers of fish stocked per year	Number of years stocked
Colorado				
1C: Colorado River: Rifle to DeBeque Canyon	Age 2+ 300	1° Fall 2° Spring-Summer	3,310[2]	6
2C: Gunnison River: Hartland to Redlands Dams	Age 2+ 300	1° Fall 2° Spring-Summer	3,310[2]	6
3C: Colorado River: Palisade to Stateline	Age 2+ 300	1° Fall 2° Spring-Summer	3,310[2]	6
Utah				
1U: Middle Green River: (RM 302-249)	Age 2+ 300	1° Fall 2° Spring-Summer	9,930	6
2U: Lower Green River: (RM 120-249)	Age 2+ 300	1° Fall 2° Spring-Summer	9,930[3]	6

[1] 1° refers to the primary season; 2° refers to secondary season to cull fish and allow smaller individuals to achieve stocking size by the next fall.
[2] Represents one population in the Upper Colorado and Gunnison rivers.
[3] Represents an additional population in case of catastrophic event.

Razorback Sucker Habitat Use

Adults and Sub-adult—Because few razorback suckers remain in the Colorado River, little habitat use data are available. Early collections by Kidd (1977) and McAda and Wydoski (1980) concentrated in gravel-pit ponds connected to the river. The most heavily used pond was in Walker State Wildlife Area (near Grand Junction, Colorado) where razorback sucker were collected year-round even though there was access to the Colorado River at all times. This site was highly altered by high spring run-off in 1983 and 1984, and razorback sucker use was reduced. Osmundson and Kaeding (1989) monitored radio tagged razorback sucker in the Colorado River and found in the river, pools and slow runs were the most commonly used habitats on a year-round basis, with highest use occurring from early autumn through late winter. Backwaters were also used year round, but were most heavily used during spring runoff when use of flooded gravel-pit ponds was also high. The greatest variety of habitats were used in summer when eddies, riffles, fast runs, and shorelines were occupied; however, slow runs were still the most heavily used habitats during that period. Burdick and Bonar (1997) also monitored radio-tagged razorback sucker habitat use from fish stocked into the Colorado and Gunnison rivers after rearing in riverside gravel-pit ponds. These fish primarily used the main river channel (47%), backwaters (23%), and eddy/pools (16%). Fish movements were monitored from March—October, however the data was not partitioned by season.

Larvae and Juveniles—Prior to 2002, no razorback sucker larvae had been collected for the Colorado or Gunnison rivers. In 2002, razorback sucker larvae were collect from the Gunnison River. Larval razorback sucker were collect downstream of the mouth of Roubideau Creek and downstream of Whitewater, Colorado providing evidence that stocked razorback sucker have

successful spawned in the Gunnison River. Habitats were consistence with those reported by Muth et al. (1998) from the middle Green River where 95% of razorback sucker larvae were collected from the flood mouths of tributaries or other floodplain-type habitats. It is presumed that swim up larvae emerge from the gravel and are carried by the rising river into floodplain habitats where they remain during the runoff period (McAda, 2000).

The only juvenile razorback suckers reported from the Colorado River were captured by Taba et al. (1965), who found eight juveniles (90-115 mm TL) in a "quiet backwater area" of the river between Moab and Dead Horse Point. This observation was consistent with juvenile razorback sucker collected from backwater habitats on the Green River (Modde, 1996).

Razorback Sucker Reproduction

Because of the limited number of razorback suckers found in the upper Colorado River, most information comes from other parts of the basin. Ripe female razorback sucker have been found in Lake Mohave from December through early June (Minckley et al. 1991), but most spawning occurs in January—April (Minckley, 1983; Langhorst and Marsh, 1986; Mueller, 1989). Based upon capture of ripe fish and subsequent capture of larvae, riverine razorback suckers in the upper basin spawn in spring during increasing and peak snow-melt flows (McAda and Wydoski, 1980; Tyus, 1987; Tyus and Karp, 1990; Muth et al., 1998; Modde and Irving, 1998).

Osmundson and Kaeding (1991) summarized data collected from the Colorado River near Grand Junction and reported that 42 of 157 razorback suckers captured were in spawning condition when handled. Of the 42 ripe fish, 40 (95%) were captured between May 24 and June 17. Riverine razorback suckers spawn in riffles or shallow runs over gravel or cobble bars (McAda and Wydoski, 1980; Tyus, 1987; Tyus and Karp, 1990). Water depths and water velocities vary, but are generally relatively shallow (<1 m) and swift (>1 ft/s). In the upper Colorado River basin, most ripe fish have been captured from main-channel habitats, but a few were found in floodplain habitats (Tyus and Karp, 1990.). In most cases, floodplain habitats were near known spawning bars and the fish were probably staging in preparation for spawning (Tyus and Karp, 1990). McAda and Wydoski (1980) captured two ripe females with a single tremmel net along a shoreline with gravel and cobble substrate at Walker State Wildlife Area. Also, 38 of the 42 razorbacks sucker in spawning condition collected in the Grand Valley during 1974—1991 were found in flooded gravel pits (Osmundson and Kaeding, 1991).
No specific spawning sites have been identified in the Colorado, but the presence of ripe adults and presence of mid-channel cobble bars similar to those used in the Yampa and middle Green rivers suggests that most spawning in the Colorado River occurred near Grand Junction, Colorado (McAda, 2000). The collection of razorback sucker larvae at two locations on the Gunnison River (C. McAda, unpublished data), confirms that suitable spawning habitat occurs in the Gunnison River, however, no spawning locations have been identified.

In rivers, razorback sucker larvae emerge from the gravel after swim up and are entrained in the current, which carries many of the young fish into floodplains, backwaters, flooded tributary

mouths or other quiet-water habitats for rearing (Tyus and Karp, 1990). Timing of spawning (at or approaching the peak of runoff) ensures that these habitats are available to the larvae when they emerge from the substrate. Floodplains, backwaters, and other quiet-water areas are the most productive habitats of the river (Wydoski and Wick, 1998) and provide important nursery habitat for young razorback suckers during the first few months of their lives (Tyus, 1987; Tyus and Karp, 1980; Modde, 1996, 1997;Wydoski and Wick, 1998; Muth et al., 1998). These habitats are temporary and, with the exception of main channel backwaters, usually do not last the growing season. Reduced spring flows caused by water development, and construction of dikes and levees reduced the availability of flooded bottomlands (McAda, 2000).

Humpback Chub and Bonytail

The humpback chub and bonytail are mid-sized cyprinid endemic to the Colorado River Basin (Minckley 1973). Both species closely related to the roundtail chub (*Gila robusta*).

Humpback chub are currently found in discrete populations, within canyon-bound reaches or other areas of similar habitat (Valdez and Clemmer, 1982). Bonytail is the most imperiled of the four endangered fishes (Maddux et al., 1993) and it distribution in recent years is limited to scattered individuals. Most recently collected individuals were from reservoirs in the lower basin where remnant populations remain (***Figure 10***). One individual humpback chub was found during an intensive survey of the Gunnison River from Delta, Colorado to its mouth (Burdick, 1995). It was captured in a deep eddy-pool complex within a canyon-bound reach at RM 22.0 and is the only record of a humpback chub from the Gunnison River. The Black Canyon of the Gunnison contains habitat similar to that of other canyon-bound areas where humpback chubs are currently found. It is possible that they were eliminated from the Black Canyon after water temperature was reduced by Blue Mesa Reservoir, but only *Gila* spp. Reported during pre-impoundment surveys were roundtail chub (summarized by Wiltzius, 1978). The humpback chub and bonytail, except for the one humpback chub record as noted, do not occur within the Gunnison River are not discussed in further detail. Because all four of the endangered fish evolved together in the Colorado River ecosystem and flow recommendations based on habitat requirements of the more common species and basic river restoration principals (Stanford et al., 1996) should also benefit humpback chub and bonytail (McAda, 2000). The Recovery Program has plans to stock bonytail in the Colorado River from Palisade to Loma including the its confluence with the Gunnison River as presented in the next section.

Bonytail Population Augmentation

Because of its extreme rarity, the Recovery Program began a reintroduction program in 1997 and has stocked about 35,000 bonytail into the Colorado River near Moab to reestablish populations (McAda, 2000). Nesler et al. (2003) in the Colorado/Utah integrated stocking plan, identified

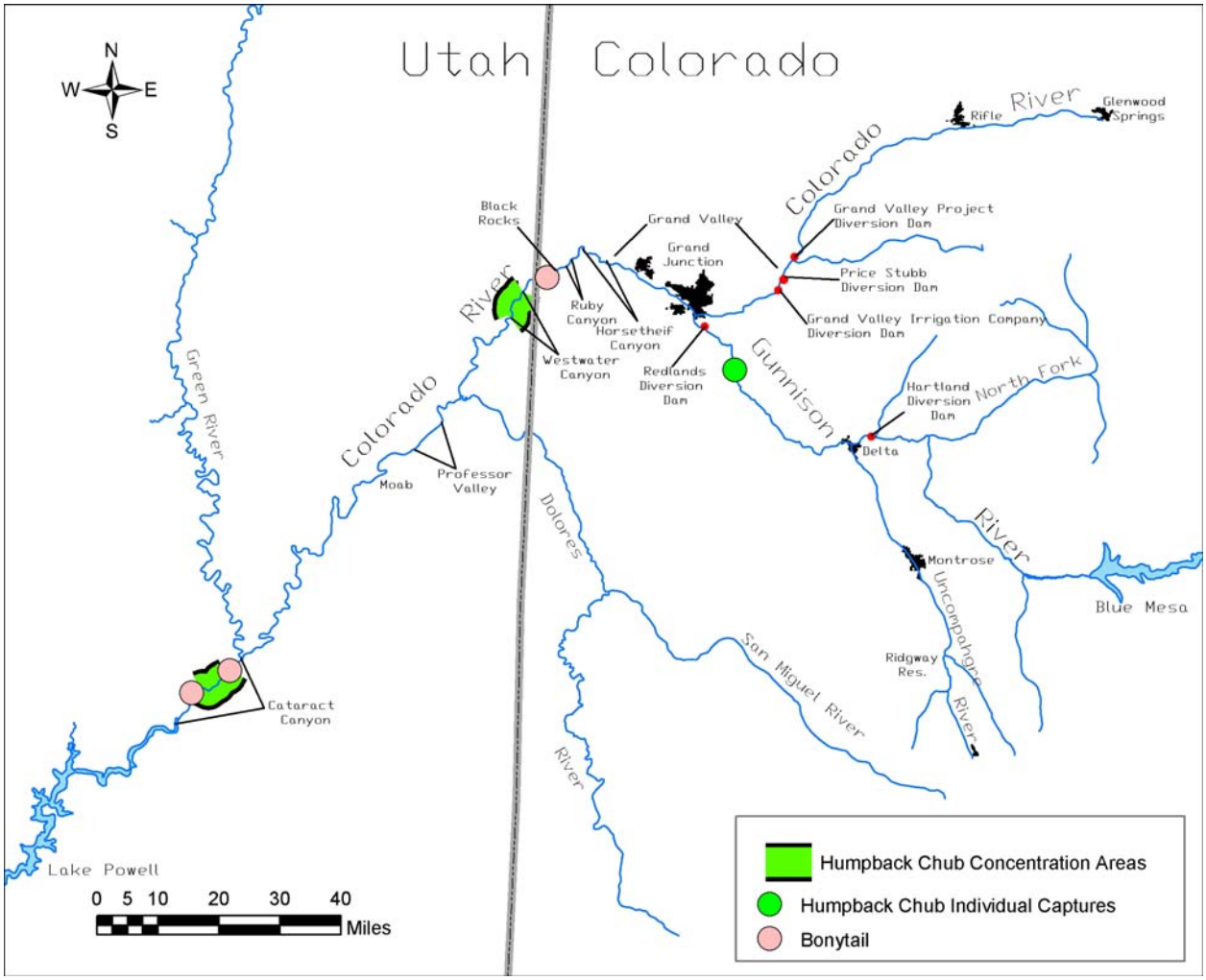

Figure 10-Distribution of Humpback Chub and Bonytail in the Colorado and Gunnison Rivers.

Table 5. Integrated stocking plan for bonytail, second priority species.

Priority by State and River Reaches	Fish age and Size (mm TL)	Season Stocked[1]	Numbers of fish stocked per year	Number of years stocked
Colorado:				
Colorado River: Palisade to Loma	Age 2+ 200	1° Fall 2° Spring-Summer	2,665[2]	6
Utah				
Colorado River: (RM 110.5)	Age 2+ 200	1° Fall 2° Spring-Summer	2.665[2]	6

[1] 1° refers to the primary season; 2° refers to secondary season to cull fish and allow smaller individuals to achieve stocking size by the next fall.

2 Represents one population in the Upper Colorado River.

bonytail stocking in the Colorado River between Palisade and Loma as a secondary priority species behind razorback sucker. The integrated stocking plan for the Colorado River is as follows in Table (Nesler et al., 2003).

EFFECTS ON ENDANGERED COLORADO RIVER FISHES

Construction, operation, and maintenance of the Redlands fish screen is predicted to be beneficial to the Colorado pikeminnow, razorback sucker, and bonytail. The Redlands Power Canal is currently unscreened and the fish screen will reduce the potential for incidental take in the canal, laterals, ditches, hydraulic pumps, and generating turbines. The fish screen is designed to return adult and sub adult fish to the Gunnison River. Larval fish and eggs may still become entrained and in the canal downstream of the fish screen resulting in incidental take. In addition, there is potential for adult, sub-adult, and larval fish to become impinged on the fish screen, stranded in the fish return pipe or entrained when the fish screen is bypassed, resulting in death or injury. The fish screen has been designed with adequate mesh size and sweeping velocities to minimize the potential for take. However, incidental take may occur. Therefore, the proposed Redlands fish screen project is predicted to may affect, likely to adversely affect, the Colorado pikeminnow, razorback sucker, and bonytail.

The proposed fish screen is predicted to have no effect on humpback chub. There is one isolated record of humpback chub collected upstream of the Redlands Diversion Dam. This is thought to be a remnant from prior to construction of the Aspinall Unit (McAda, 2000). The State of Colorado does not plan to augment the humpback chub populations and the closest population in Westwater Canyon is a considerable distance downstream in the Colorado River and humpback chub movement upstream to the Redlands Diversion Dam and fish passage is not predicted.

RWPC operations would continue reduced flows in the lower 2.3 miles of the Gunnison River and deplete water from the Gunnison River. The continued RWPC operations may affect, likely to adversely affect, the Colorado pikeminnow, razorback sucker, bonytail and humpback chub. During previous consultations regarding historic depletions, the Service has identified the Upper Colorado River Endangered Fishes Recovery Program as the reasonable and prudent alternative to avoid jeopardy to the endangered Colorado River fishes.

BALD EAGLE

The bald eagle (*Haliaeetus leucocephalus*) was classified as endangered in 43 of the 48 contiguous states on February 14, 1978. The species was reclassified threatened by the U.S. Fish nd Wildlife Service August 11, 1995 (USFWS, 1995b).

The bald eagle is distinctive by it white head, white tail plumage, dark brown to charcoal black wing and body plumage, and massive yellow bill. The bald eagle ranges from 30-43 inches (75-108 cm) in height and has a wingspan between 7-8 ft. Males often appear darker than females.

Females are larger than males. Immature bald eagles (6 months to 2 years old) have a dusky head and tail plumage (Peterson, 1990; USBR, 1994).

Feeding habitats are eclectic, reflecting the opportunistic behavior of large raptors. Prey species includes: fishes, ground dwelling scuirids, waterfowl, ungulate carrion and lagomorphs (USBR, 1994).

Age of first breeding is commonly assumed to be coincident with acquisition of definitive adult plumage. Breeding commonly occurs between ages 6 and 7 years old. Nest building and repair occur every year. Both male and females build stick nests used over many years. Nests can be as large as 3 m (10 ft.) high and 2.1 m (7 ft.) wide. Alternate nests may be present in the breeding area, but pairs usually use one nest until it either falls from the tree or the tree is lost (USBR, 1994).

Egg laying normally occurs in early February to mid-April depending on elevation. Average clutch size is two eggs. Incubation averages 31 to 35 days. Eggs hatch in mid-March to mid-May and the nesting period lasts 11 to 14 weeks. Both genders incubate, brood and feed young but the female performs most of the tasks. Fledglings are dependent on adults for 6 to 10 weeks and adults will feed juveniles other than their own (USBR, 1994).

Bald Eagle Habitat Preference

Bald eagles occupy riparian or lacustrine habitats almost exclusively during the breeding season, but occasionally exploit upland areas for food and roost sites, especially during the winter. Nests sites are mostly commonly distributed around the periphery of lakes and reservoirs larger than 80 acres in size. Nesting also occurs linearly along forested corridors of major rivers, usually within 1 mile of shore, however cases have been reported of birds nesting as far as 9.3 miles from water while exploiting locally abundant prey such as prairie dogs (USBR, 1994).

Bald Eagle Distribution and Abundance

The bald eagle is the only species of *Haliaeetus* occurring in and restricted to North America. Historic bald eagle distribution included every state (except Hawaii) and Canadian province and portions of northern and eastern Mexico (Brown, 1976). Populations became depressed in the 1960's from effects of use of the pesticide DDT.

The Gunnison and Colorado rivers both provide suitable wintering habitat for the bald eagle and are considered to be good winter areas. Bald eagle nesting is uncommon. The closest known nest site is on the Colorado River near Ruby Canyon approximately 30 miles downstream of its confluence with the Gunnison River. Eagles have also attempted to nest at sites near Walter Walker and Horsethief Canyon State Wildlife Areas downstream on the Colorado River (CDOW, 2003). Bald eagles are known to be seasonal winter residents to the Colorado River Wildlife Area located at the confluence of the Gunnison and Colorado rivers approximately 2.3

miles downstream of the project area (Shannon, 2003). These birds have been observed roosting in large cottonwood trees on the Colorado River in the fall, winter and early spring. No eagles have been observed roosting within the wildlife area along the Gunnison River.

EFFECTS ON BALD EAGLE

Roosting and nesting habitat occur within the project area, however no bald eagles nesting has been documented. Eagles may use the project area during winter for foraging. Large cottonwood trees are found on both sides of the Gunnison River upstream and downstream of the diversion dam, however no known winter concentration area occurs within the project area. It is estimated that approximately 7 mature cottonwood trees would be removed during construction of the fish screen return pipeline. The cottonwood trees lost would be mitigated on-site with a planting ratio of 10 cottonwood saplings to 1 mature cottonwood tree removed. Fish screen construction would begin prior to the arrival of wintering bald eagles. Bald eagles may avoid the project area during construction, however, project effects are predicted to be short-term in duration. Continued operation and maintenance of RWPC's facilities is predicted to have no effect on the bald eagle.

INDIRECT PROJECT AND CUMULATIVE EFFECTS

The continued operations of RWPC will likely have indirect effect within the project area including increased noise levels, impacts to air quality and water quality, increased light levels, and land use changes within the project area.

As part of the Reclamation's proposed mitigation, endangered Colorado fishes will be preserved through actions of the Recovery Program including the continued operations of the Redlands Fish Passageway, construction and operation of the Redlands Fish Screen, continued Colorado pikeminnow and razorback sucker population augmentation, and re-operation of the Aspinall Unit to attempt to meet Gunnison and Colorado River flow recommendations (McAda, 2000) to assist in the recovery of the endangered Colorado River fishes. The goal of the proposed mitigation is to protect, preserve and enhance endangered Colorado River fish habitats within the project area as well as known endangered fish populations upstream and downstream of the project area potentially affected by RWPC's operations. Additionally, Reclamation relies on the Recovery Program's educational and outreach components to educate the public about the endangered Colorado River fishes within the proposed project area.

CONSIDERATION OF FEDERALLY THREATENED AND ENDANGERED PLANTS

At this time, there are no known federally threatened or endangered plants within the proposed project area. A total of six habitat types were identified during the biological assessment for this project. The primary cover types in the area are: 1) residential and commercial development (building, roads, lawns, dams, gravel mines, golf courses, etc.), agricultural, riparian, wetland, rivers, and upland habitats.

CRITICAL HABITAT

The Colorado and Gunnison rivers and their 100-year flood plains within the project area designated as critical habitat for the endangered Colorado River fishes (USFWS, 1994) (***Figure 11***).

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Figure 11-Upper Colorado River Basin Endangered Fishes Critical Habitat

MINIMIZING AND MITIGATING IMPACTS TO THE COLORADO RIVER ENDANGERED FISHES

The Governors of the states of Colorado, Utah, and Wyoming, the Secretary of the Interior, and the Western Area Power Administrator established the Upper Colorado River Endangered Fish Recovery Program in 1988. The Recovery Program is a cooperative partnership involving public and private agencies and interests dedicated to recovering the endangered Colorado River fishes while water development proceeds in compliance with Federal and State laws. Recently in 2002,

the Recovery Program participants signed a ten-year extension of the cooperative agreement, extending the program through September 30, 2013.

The Recovery Program, through the implementation of the Recovery Implementation Program Recovery Action Plan (***RIPRAP***), has been the reasonable and prudent alternative to avoid jeopardy for Service consultations on 707 water projects depleting approximately 1,719,273 acre-feet per year in the upper basin. The Service simplified the Section 7 consultation process, and waived depletion charges for water projects that deplete less than 100 acre-feet of water per year. Through the implementation of the RIPRAP action items within the lower Gunnison River, it is reasonable to assume that the continued operations of RWPC will have minimal impact on the continued existence of the endangered Colorado River fishes. Incidental take, however may occur, and requires Service authorization through Sections 7 and 10 of the Endangered Species Act.

It is Reclamation's recommendation that the authorized level of incidental take be consistent with that issued for consultation under the "15 mile Reach" Programmatic Biological Opinion (***PBO***) (USFWS, 1999). The PBO set the level of incidental take at 1 percent of the current adult Colorado pikeminnow population above Westwater Canyon. The PBO also estimated the anticipated level of take for razorback sucker to 2 adult fish per year until augmentation efforts are successful above the diversion structures. The Service estimated the future incidental take to be 1 percent of population. The following activities would be implemented to avoid, minimize, and mitigate for the impacts to the endangered Colorado River fishes as a result of the continued RWPC operations:

◄The Recovery Program would continue to fund operation and maintenance of the Redlands Fish Passageway to provide Colorado pikeminnow and razorback sucker passage upstream of the Redlands Diversion Dam. The Service would continue to operate the fish passageway to allow endangered and native fish passage upstream, while removing non-native fish species. The fish passageway would continue to be operated each year from April through October or at times determined as reasonable by the Service. RWPC, through an executed Operating and Maintenance (O&M) Agreement with Reclamation, would perform maintenance on the fish passageway, subject to funding from the Recovery Program.

◄RWPC would assume ownership of the Redlands Fish Passageway from Reclamation and allow the Service continued access to the fish passageway for operations.

◄RWPC would allow Reclamation to design and construct a fish screen in the Redlands Power Canal to return canal entrained adult and sub-adult Colorado pikeminnow and razorback sucker to the Gunnison River. RWPC will assume ownership of the Redland Fish Screen and through an executed O&M agreement, operate and maintain the fish screen with funding provided by the Recovery Program.

◄RWPC would operate the fish screen at all times with exceptions to periods when the screen is not functioning properly because of inadequate river flows, icing, or screen fouling.

RWPC would work directly with the Service and Reclamation to promptly address fish screen operation and maintenance issues to ensure that incidental take of the endangered Colorado River endangered fishes is limited. The Recovery Program would monitor incidental take levels, and would assume responsibility of modifying the fish screen as needed in consultation with the Service and RWPC.

◄Reclamation, the Service, Western Area Power Administration, and the National Park Service (Federal Agencies of the Recovery Program) would continue to participate in and support the Upper Colorado River Recovery Endangered Fishes Recovery Program.

◄Reclamation would continue to work with the Service to implement Colorado and Gunnison River flow recommendations when finalized.

SUMMARY AND CONCLUSIONS

The construction, operation and maintenance of the Redlands fish screen is predicted to have no effect on the humpback chub and bald eagle. The Redlands fish screen would reduce canal entrainment and the potential for incidental take of Colorado pikeminnow, razorback sucker and bonytail. Incidental take may still occur, but at a significantly lower level. Therefore, the construction, operation and maintenance of the Redlands fish screen is predicted to may affect, likely to adversely affect, Colorado pikeminnow, razorback sucker and bonytail. Incidental take coverage is needed for the operation of the fish screen.

RWPC depletions and operations may affect, likely to adversely affect, the Colorado pikeminnow, razorback sucker, bonytail and humpback chub. The Upper Colorado River Endangered Fishes Recovery Program has served as the reasonable and prudent alternative to avoid jeopardy during consultations since 1988 on 707 water projects.

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