

**BLUEHEAD SUCKER *CATOSTOMUS DISCOBOLUS*
AND
FLANNELMOUTH SUCKER *CATOSTOMUS LATIPINNIS*
CONSERVATION STRATEGY**



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1.0 INTRODUCTION

This conservation strategy (Strategy) has been developed by the New Mexico Department of Game and Fish (NMDGF) to provide a framework for the long-term conservation of bluehead sucker *Catostomus discobolus* and flannelmouth sucker *Catostomus latipinnis* as directed in the Rangewide Conservation Agreement and Strategy for Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker (Three Species Conservation Agreement and Strategy). The Three Species Conservation Agreement (Appendix I) was signed in 2004 for the goal of ensuring “the persistence of roundtail chub, bluehead sucker, and flannelmouth sucker populations throughout their ranges”, specifically the Colorado River basin in Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming. Each state agreed to work together and independently to conserve and manage these species, including the development and finalization of rangewide and state-level conservation and management strategies. The Rangewide Three Species Conservation Strategy (Appendix I) was completed in early 2005 and provides goals, objectives and conservation actions to serve as consistent guidelines and direction for the development and implementation of individual state management plans for the three species.

This document includes state distribution, population demographics, threats, and conservation and management needs for bluehead and flannelmouth suckers. General information on the biology and rangewide distribution and status of the suckers can be found in the Rangewide Conservation Agreement and Strategy. Management information for roundtail chub, New Mexico state listed as endangered, has been compiled in the Colorado River Basin Chubs Recovery Plan (Appendix II). Biology and management information for Zuni bluehead sucker, a subspecies of bluehead sucker, has been compiled in the Zuni Bluehead Sucker Recovery Plan (Carman 2005). The organization of this Conservation Strategy follows that detailed in the NMDGF *Guidelines for Writing Long Range, Action, and Operational Plans* (Graves 2002). Section 2 of this plan includes background information on the distribution, habitat requirements, biology, and ecology of bluehead and flannelmouth suckers. Also included are a current summary of the population status and existing and potential threats to the species. Section 3 contains the goal for conservation of the species, associated objective and objective parameters, issues affecting attainment of the goal, and corresponding strategies.



2 BACKGROUND

Section 2 consists of background information on the distribution, status, habitat requirements, biology, and ecology of bluehead and flannelmouth suckers. This information provides the basis for assessing current status, threats to persistence, and the most effective conservation strategies for the species.

2.1 NATURAL HISTORY

2.1.1 Name/Relationships

Bluehead and flannelmouth suckers are members of Catostomidae, or sucker family, characterized by thick, fleshy lips covered with papillae or plicae. Bluehead suckers are in the subgenus *Pantosteus*, distinguished by distinct notches at the corners of the lips, while flannelmouth suckers are in the subgenus *Catostomus*, where the lips are more contiguous. Bluehead sucker may erroneously be referred to by its subgenus, *Pantosteus*, or by the genus *Delphinus*, but the currently recognized name is *Catostomus discobolus* (Cope 1872). Flannelmouth sucker is generally only referred to as *Catostomus latipinnis* (Baird and Girard 1853).

Zuni bluehead sucker *C. discobolus yarrowi* is a subspecies of bluehead sucker limited to the Zuni River basin in New Mexico. A detailed description of the relationships, morphology, distribution, ecology, and management strategy for the Zuni bluehead sucker can be found in the Zuni Bluehead Sucker Recovery Plan (Appendix III).

Minckley (1973) recognized flannelmouth sucker in the Little Colorado River as a distinct, undescribed species, but using mt DNA techniques, Dobberfuhl (1995) and Douglas and Douglas (2002) identified it as *Catostomus latipinnis*.

2.1.2 Description

As the common name suggests, bluehead sucker often exhibits a bluish head. The head is short and broad and jaws are strongly developed with cartilaginous scraping ridges (Smith 1966, Minckley 1973, Sublette et al. 1990). The mouth is subterminal and has fleshy lips covered,



except for the outer edge of the upper lip, with small papillae. Small-to-moderate-sized scales cover the body, which is dark olive-to-black above and lighter-to-whitish below. Breeding males develop yellow or orange coloration on their lower fins, tubercles on the anal and caudal fins, and a red band along the lateral line. Adults generally reach 300-450 mm TL, although body size is positively correlated with stream size (smaller fish in tributaries). The maximum recorded length for a bluehead sucker collected in the San Juan River is 548 mm TL (D. Ryden, pers. comm.).

Flannelmouth sucker is fine-scaled and is dark olive to blue-gray above with yellowish sides and a pale white underside. The body is streamlined with a narrow caudal peduncle (Koster 1957, Sigler and Miller 1963, Minckley 1973, Sublette et al. 1990, Bezzerides and Bestgen 2002). The ventrally positioned mouth has large, papillose lips; the lower lip has particularly thick fleshy lobes, that inspire the name “flannelmouth”. Fins of both males and females become orange during spawning season, and males develop tubercles on the anal and caudal fins. Adults are typically between 400-500 mm TL. The maximum recorded size for a flannelmouth sucker collected in the San Juan River is 596 mm TL (D. Ryden, pers. comm.).

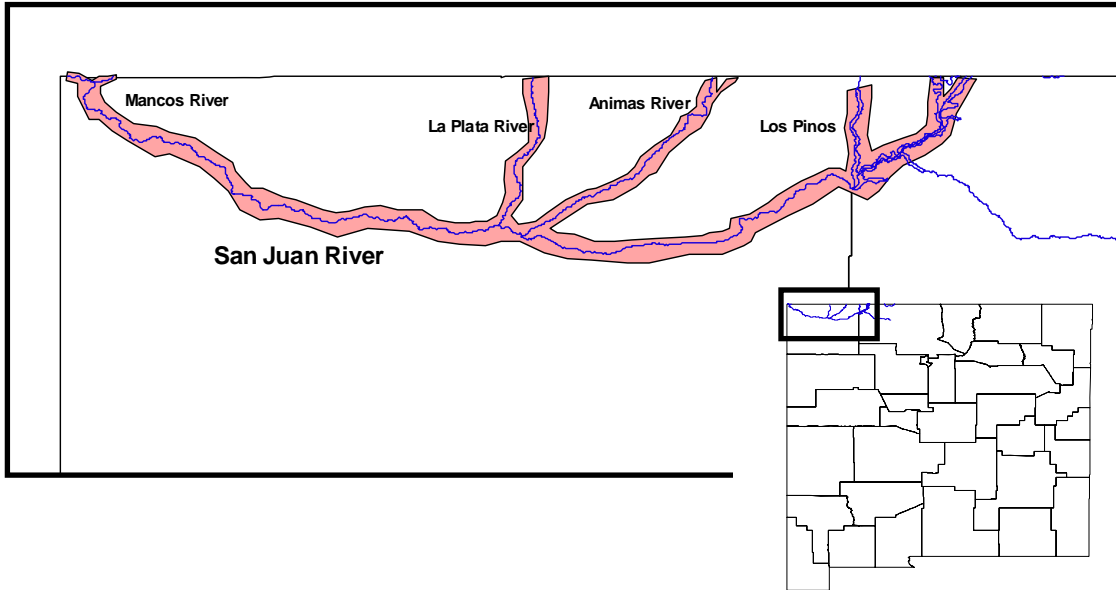
2.1.3 Historic and Current Distribution

Bluehead and flannelmouth suckers were historically widespread in the Colorado River basin. Currently, bluehead and flannelmouth suckers are estimated to occupy approximately 45% and 50%, respectively, of their historical distribution in the Upper Colorado River basin (Bezzarides and Bestgen 2002). Flannelmouth sucker has been nearly extirpated from the Lower Colorado River basin. Bluehead sucker distribution and abundance in the Colorado River basin appear similar to historical patterns (Bezzarides and Bestgen 2002).

In New Mexico, bluehead and flannelmouth suckers currently occupy historical habitats in the San Juan River basin and larger tributaries (Figure 1). These fish were reported in some of the earliest collections made in the basin, although detailed collection data was not available until the late 1980s (Jordan 1891). Collections in the late 1980s verified the presence of bluehead and flannelmouth suckers in the San Juan River in New Mexico (Platania 1990). From 1987 to 1989,



Figure 1. Distribution of flannelmouth and bluehead suckers in New Mexico. Current and historical distribution is the same.



flannelmouth and bluehead suckers were the most common large-bodied native species collected in the San Juan River from Farmington to the New Mexico-Colorado state line.

In 1991, an intensive research program was initiated as part of the San Juan River Basin Recovery Implementation Program (SJRRIP), primarily focusing on the federally endangered Colorado pikeminnow *Ptychocheilus lucius* and razorback sucker *Xyrauchen texanus*. Since 1991, data on the abundance and distribution of adult flannelmouth and bluehead suckers in the San Juan have been collected annually during the adult monitoring study (see Ryden 2000 for a summary). In 1998, small-bodied fish monitoring in the main channel, secondary channels, and backwaters was added. Flannelmouth sucker was the most abundant fish in the adult monitoring from 1991 to 1997, especially in the area from Farmington to Hogback Diversion (Ryden 2000). Bluehead sucker was the third most abundant fish collected in the San Juan River (nonnative channel catfish *Ictalurus punctatus* being the second most abundant), again dominating in the upper portions of the river (Ryden 2000). Flannelmouth and bluehead suckers are also found in many of the tributaries of the San Juan River, including the



Animas, La Plata, and Los Pinos rivers (M. Wethington, NMDGF, pers. comm. February 2006). Both species are also found in the Mancos River (D. Ryden, pers. comm.).

2.1.5 Required Habitats

Bluehead sucker is mostly found in mainstem rivers and tributary streams and infrequently in lakes and reservoirs (Sigler and Miller 1963). Adults are reported to prefer deep water, often with cover, in areas of moderate to fast current over rocky substrate (Sigler and Miller 1963, Banks 1964, Vanicek 1967, Holden and Stalnaker 1975, McAda et al. 1980, Miller et al. 1982, Tyus et al. 1982, Valdez et al. 1982, Sublette et al. 1990, Gorman et al. 1994, Beyers et al. 2001). Juveniles use shallower, lower-velocity habitats (Sigler and Miller 1963, Haines and Tyus 1990, Hoffnagle et al. 1994, Robinson et al. 1998). In the San Juan River, adult and juvenile bluehead sucker are typically found in cobble substrate riffle and run habitats (Lawrence 1999, Ryden 2000). Bluehead sucker also seasonally use secondary channels during high-flow periods when riffle and run habitats are available (Propst and Hobbes 2000). Preferred spawning habitat for bluehead sucker is clean gravel or cobble beds (Maddox and Kepner 1988, Sublette et al. 1990).

Flannelmouth sucker occupy a variety of habitats throughout the Colorado River basin, including riffles, runs, pools, and eddies (Holden and Stalnaker 1975, McAda 1977). In the San Juan River, flannelmouth sucker is collected in a variety of habitats and is not strongly associated with higher-velocity areas or hard substrate habitats (Lawrence 1999, Holden 2000, Ryden 2000). Like bluehead sucker, flannelmouth sucker inhabit secondary channels during high-flow periods and larvae utilize low-velocity habitats in the summer (Archer et al. 2000, Propst and Hobbes 2000). Flannelmouth sucker spawning areas, riffle-run or run habitats, are similar to those of razorback sucker (Muth and Nesler 1993, Bliesner and Lamarra 2000).

2.1.7 Food Habits

Suckers in the sub-genus *Pantosteus*, bluehead sucker included, have adaptations for scraping the substrate to obtain attached algae, including a ventrally placed jaw and a modified lower mandible with a cartilaginous ridge. Additionally, most suckers within the subgenus *Pantosteus* have an elongated intestinal tract, designed to break down rough food items such as algae. Bluehead and flannelmouth suckers are omnivorous, consuming algae, organic and inorganic



debris, and aquatic insects from rocks and boulders (Sigler and Miller 1963, Vanicek 1967, Minckley 1973, Smith and Koehn 1979, Maddux et al. 1987, Childs et al. 1988, Maddux and Kepner 1988).

2.1.7 Reproductive Biology and Growth

Bluehead sucker typically spawn in spring and early summer in areas where water temperatures are higher, and mid-to late summer in cooler waters, when water temperatures are between 15.6 and 24.6°C (Holden 1973, Maddux and Kepner 1988, Sublette et al. 1990, Sigler and Sigler 1996). Water temperatures for flannelmouth sucker spawning activity range from 6 to 18°C (Holden 1973, McAda 1977, Snyder and Muth 1990, Sigler and Sigler 1996).

Fecundity of flannelmouth and bluehead suckers increases with size of the female (Smith 1966, McAda 1977, McAda and Wydoski 1985, Valdez and Carothers 1988). Eggs of flannelmouth and bluehead suckers are demersal, adhering to the substrate or settling into crevices (Muth and Nesler 1993, Sigler and Sigler 1996). Flannelmouth sucker eggs, around 2.39 mm in diameter, are the largest among catostomids in the Colorado River basin (McAda and Wydoski 1985, Snyder and Muth 1990, Weiss 1993). Incubation time in the laboratory is 6-7 days at 15.5 to 17.8°C for flannelmouth sucker and 7-8 days at 15.6 to 17.7°C for bluehead sucker (Carlson et al. 1979).

Bluehead sucker growth varies with size of habitat (Smith 1966, McAda and Wydoski 1983). In the San Juan, young-of-year (yoy) bluehead sucker are less than 60 mm TL, juveniles are 60-300 mm TL, and adults are greater than 300 mm TL, with the majority of adult fish from 1996 to 1999 being 301 and 350 mm TL (Ryden 2003). During spawning, the ratio of males to females at spawning sites is 2:1 (Maddux and Kepner 1988).

Flannelmouth sucker tend to be slightly larger than bluehead sucker. In the San Juan River, yoy flannelmouth sucker are less than 60 mm TL, juveniles are 60-410 mm TL and adults are greater than 410 mm TL. Most adults captured from 1996 to 1999 were 376 to 475 mm TL (Ryden 2003). Flannelmouth sucker reach maturity at 4 to 6 years of age and may live more than 15



years (McAda and Wydoski 1985, Douglas and Marsh 1988). Males and females are found in nearly equal proportions (Weiss et al. 1998).

In the Colorado River basin, bluehead sucker hybridizes with flannelmouth sucker, white sucker *Catostomus commersoni*, and mountain sucker *C. platyrhynchus* (Sigler and Miller 1963, Smith 1966, Holden and Stalnaker 1975, Holden and Crist 1981). In the Colorado River basin, flannelmouth hybridizes with Utah sucker *C. ardens*, desert sucker *C. clarki*, white sucker, and razorback sucker, in addition to bluehead sucker. In the San Juan River, bluehead x flannelmouth sucker hybrids are rarely reported (Ryden 2000, Propst et al. 2004). White sucker are present in very low numbers in the mainstem of the San Juan Rive and hybridization rarely occurs (Ryden 2000). White sucker are more common in tributaries to the San Juan River, such as the Animas River, and hybridization is more common in these areas (M. Wethington, NMDGF, pers. comm., February 2006). Hybridization of flannelmouth sucker with razorback sucker is more common because of greater spatial and temporal overlap in spawning (Holden 2000).

2.1.8 General Habits

Little is known about the movement of bluehead sucker. Movements up to 35 km have been reported, but smaller more localized movements appear to be the norm (Vanicek 1967, Holden and Crist 1981, Cavalli 2000, Beyers et al. 2001).

Flannelmouth sucker movement has been widely studied and indicates a variety of patterns dependent on location and life history stage. Long distance movements (up to 231 km) have been reported throughout the Colorado River basin, primarily near junctions of mainstem and tributary habitats (Holden 1973, Weiss 1993, Cavalli 1999, McKinney et al. 1999, Cavalli 2000). Movements may be size related, with larger individuals becoming more sedentary (Chart and Bergersen 1992). Migrations to spawning grounds have also been reported and are linked with availability of spawning locations (Snyder and Muth 1990, Weiss et al. 1998). Larval movements are generally in the drift, primarily at night (Carter et al. 1986), toward shoreline and low-velocity habitats (Minckley 1973, Carter et al. 1986, Tyus and Haines 1991, Childs et al. 1998).



In the San Juan River, a limited study of bluehead and flannelmouth sucker movement up-or downstream past instream water diversion structures was completed in the 1990s (D. Ryden, pers. comm.). Very few fish were recaptured, but the limited data does indicate some general patterns. Bluehead sucker typically moved 2-4 river miles (RM), with the maximum being 38.4 RM from an individual that moved from the San Juan River downstream of the Animas River confluence into the Animas River near Cedar Hill, NM in 435 days. Flannelmouth sucker recaptures indicated a mean distance moved of 11 RM with a range of 2-36 RM. Both suckers were able to pass Public Service Company of New Mexico (PNM) and Arizona Public Service (APS) diversion structures (D. Ryden pers. comm.).

2.1.9 Diseases

Fish health surveys conducted in the San Juan River from 1992 to 1999 revealed that ailment incidence was low for all species except during spring floods, when incidence of lesions was higher (Landye et al. 2000). Abnormalities were found on less than 2% of bluehead and flannelmouth suckers collected from 1991 to 1997 (Landye et al. 2000). Several bacterial species infected these lesions, but they did not appear to be the cause of the lesions. Common parasites of catostomid species in the San Juan River drainage include the protozoan *Ichthyophthirius* (ich) and the nonnative parasite *Lernaea cyprinacea*. Asian tapeworms *Bothriocephalus acheilognathi* were introduced to the watershed but have not been shown to affect sucker species.

2.1.10 Population Dynamics

In the upper San Juan River (Farmington to Hogback diversion), where cobble substrates are most common, bluehead sucker are the most abundant large-bodied fish (Ryden 2003). Long-term adult and sub-adult monitoring (1991-2002) indicates that abundance of bluehead sucker in the San Juan River is fairly stable, but steadily declines downstream into Utah (Ryden 2000, Ryden 2003, Paroz et al. 2005). Length-frequency distributions from 1996 to 1999 were fairly stable with distributions centered around 301-325 mm TL in 1996 to 1998 and 326-350 mm TL in 1999. The distribution was bimodal in 2000 because of a large class of small (76-100 mm TL) bluehead sucker. Since then, juvenile bluehead sucker have become the numerically dominant life stage in collections (Ryden 2003).



Flannelmouth sucker are the most common large-bodied fish collected in the San Juan River overall (Ryden 2000, 2001, 2003). A decline was reported in flannelmouth sucker catch-per-unit-effort (CPUE) between 1992 and 1998 but was followed in 1999 and 2001 by significantly higher CPUE. Similar to bluehead sucker, flannelmouth sucker populations were dominated by adult fish (greater than 410 mm TL) until 2000 when large numbers of small (76-100 mm TL) fish were collected (Ryden 2003).

2.1.11 Associated Species

Native species that historically occurred in the San Juan River basin include Colorado River cutthroat trout *Oncorhynchus clarki pleuriticus*, roundtail chub *Gila robusta*, bonytail chub *Gila elegans*, Colorado pikeminnow, speckled dace *Rhinichthys osculus*, razorback sucker, and mottled sculpin *Cottus bairdi* (Sublette et al. 1990). Currently, Colorado River cutthroat trout and mottled sculpin are primarily limited to the headwaters of tributary streams but are occasionally collected in the mainstem of the San Juan River (D. Ryden, pers. comm.). Roundtail chub are extremely rare in the main channel but may occur in greater numbers in tributaries. The validity of bonytail chub records in the San Juan River basin has been questioned and the species has not been reported since 1930 in the basin. Razorback sucker and Colorado pikeminnow numbers have declined in the San Juan River to the extent that they were federally listed in 1973 under the Endangered Species Act. Of the nine historic native species of the San Juan basin, only bluehead and flannelmouth suckers and speckled dace are widely distributed currently.

At least 23 nonnative fish species have been introduced into the San Juan River basin (Sublette et al. 1990). Currently, channel catfish *Ictalurus punctatus*, common carp *Cyprinus carpio*, red shiner *Cyprinella lutrensis*, fathead minnow *Pimephales promelas*, and mosquitofish *Gambusia affinis* are common in the mainstem (Ryden 2003, Paroz et al. 2005). Other fish, including rainbow trout *Oncorhynchus mykiss*, brown trout *Salmo trutta*, black bullhead *Ameiurus melas*, plains killifish *Fundulus zebrinus*, green sunfish *Lepomis cyanellus*, and largemouth bass *Micropterus salmoides*, are found less frequently.



2.2 HISTORICAL PERSPECTIVE

2.2.1 Habitat Trends

The San Juan River is the second largest tributary to the Colorado River. From its origins in the San Juan Mountains of Colorado, the river flows approximately 50 km to the New Mexico border, then 305 km to Four Corners (New Mexico, Colorado, Utah, Arizona) where it exits the state. Historically, the San Juan River was a typical southwestern river characterized by large spring peak flows and summer-winter low base flows, with short-duration spikes caused by summer and autumn rainstorms.

Soil erosion caused by intensive livestock grazing in the basin contributed to large quantities of sediment entering the watershed in the late 1800s and early 1900s (Miser 1924, Graf 1987, Gellis et al. 1991). Aerial photographs of the watershed taken in 1935 by the USDA Soil Conservation Service indicated the river had a braided, broad, sandy channel with little or no riparian vegetation. After 1940, there was a significant reduction in sediment load in the basin, in part because of establishment of nonnative tamarisk *Tamarisk chinensis* and Russian olive *Elaeagnus angustifolia* (Bliesner and Lamarra 2000).

In addition to elevated sediment loading and establishment of nonnative riparian vegetation, other human-induced modifications dramatically altered the San Juan River basin, especially in the past 60 years. Several multi-state compacts, beginning in 1922 with the Colorado River Compact, apportioned Colorado River water between Upper and Lower Basin states and Mexico. The 1948 Upper Basin Agreement provided “for the equitable division and apportionment of the use of the waters of the Colorado River System” among Arizona, Colorado, New Mexico, Utah, and Wyoming. Following this agreement, development of Upper Basin water was begun through the Colorado River Storage Project Act of 1956, which included construction of Navajo Dam on the San Juan River from 1958 to 1963. The purposes of impoundments enabled by this act were: regulate flow of the Colorado River; store water for beneficial consumptive uses; make it possible for states of the Upper Basin to use the apportionments made to and among them in the Colorado River Compact and the Upper Colorado River Basin Compact, respectively; provide for the reclamation of arid and semiarid land; control floods; and generate



hydroelectric power. Navajo Dam is primarily used to regulate the flow of the San Juan River and provide flood control, but impounded water is also used for irrigation. Although this dam was essential for development of water resources, construction and operation of the dam significantly altered the river ecosystem. Flows were largely controlled and stabilized, and water temperatures increased (Bliesner and Lamarra 2000).

Currently, the San Juan River in New Mexico upstream of Shiprock is primarily a single channel with cobble substrate; downstream of Shiprock, the channel is braided with cobble and sand substrate. Flows are regulated largely by Navajo Dam; near the unregulated Animas River confluence, flow is more natural. Run habitats are most common, followed by riffles. Riparian vegetation is mainly nonnative salt cedar and Russian olive and native cottonwood *Populus fremontii* and willow *Salix* sp.

Several diversion structures fragment the mainstem San Juan River and reduce flows, including Fruitland, APS, and PNM diversions. Impacts to water quality include agricultural contamination, primarily through irrigation return flows, oil and gas development, and urban development, including street runoff, sewage effluent, and hardening of the watershed. Specific water quality concerns include high levels of selenium, which naturally occurs in the watershed, and polycyclic aromatic hydrocarbons (NMED/SWQB 2004).

In 1991, the San Juan River Basin Recovery Implementation Program (SJRRIP) was begun to conserve native fish species (principally Colorado pikeminnow and razorback sucker *Xyrauchen texanus*) while allowing water development (SJRRIP 1995). After several years of research and discussion, flow recommendations were made to provide operational criteria for Navajo Dam to enhance quality and quantity of habitats needed by endangered fishes (Holden 2000).

Reoperation of Navajo Dam with these recommendations began in 1992 and included maintenance of 500 cubic feet per second (cfs) base flow and spring releases to provide peak flows of rate (cubic feet per second) at frequency and duration specified to meet life history needs of target species. High spring flows to maintain habitat quality (e.g. sediment flushing) and base flow of at least 500 cfs to maximize backwater habitat for Colorado pikeminnow and razorback sucker were the focus of Navajo Reservoir re-operations. Recommendations to



improve habitat also included fish passages at diversions. Importance of these habitat recommendations for bluehead and flannelmouth suckers has not been evaluated.

Historically, the Navajo, Animas, La Plata, and Mancos rivers were perennial tributaries to the San Juan River in New Mexico. The development of water rights over the past century has led to decreased instream flows in these tributaries and currently only the Navajo, Mancos, and Animas rivers are perennial, although the La Plata River is permanently watered in reaches (B. Wegener, BLM, 2006, pers. comm.). Like the mainstem San Juan River, riparian areas of these rivers are heavily infested with salt cedar and Russian olive.

Under the Colorado River Basin Project Act of 1968, the Animas-La Plata Project was authorized in order to provide irrigation and municipal and industrial water supplies to the Colorado Ute Tribes, Animas-La Plata Water Conservancy District, State of Colorado, Navajo Nation, San Juan Water Commission, and La Plata Conservancy District. Construction of water controlling structures was scheduled to begin in the 1980s, but negotiations including incorporation of the Colorado Ute water rights settlement, with water users, environmental groups, and federal managers, delayed the final project proposal until 2000 (Public Law 106-554). The final project was scaled down and includes structural components of Ridges Basin Dam and Reservoir, Durango Pumping Plant, and Ridges Basin Inlet conduit, for an average annual depletion of 57,100 acre-feet from the Animas River. Nonstructural components of the final project include the Colorado Ute Tribes acquiring existing water rights from McElmo Creek and Mancos, La Plata, Animas, Florida, and Pine river basins. Construction, which began in 2005, is expected to be complete in 2008 and the reservoir filled in 2011.

The Final Environmental Impact Statement on the Project, completed in 2000, included a 1999 Biological Opinion from the U.S. Fish and Wildlife Service (USFWS) (USFWS 2000). Although the Biological Opinion did not directly address bluehead and flannelmouth suckers, flow changes in both mainstem San Juan River and its tributaries will likely affect suckers. The Biological Opinion stated that although the project contained projected return flows to the La Plata River, these are non-binding and not likely to occur. The conclusion of the Biological Opinion, concerning the two federally-listed fish species, Colorado pikeminnow and razorback



sucker, in the San Juan River basin, was that “operations of the Project ...without offsetting measures may affect [Colorado pikeminnow and razorback sucker] in the San Juan River and critical habitat.” Potential impacts include reductions in adult fish habitats, spawning habitats, and nursery habitats in the driest years. The Biological Opinion stated that as long as the flows designed to mimic the natural hydrograph are enforced in the San Juan River below Navajo Dam, the Animas-La Plata Project should not negatively affect the San Juan River.

2.2.2 Population Trends

In the Upper Colorado River basin, which includes the San Juan River basin, flannelmouth and bluehead suckers persist in approximately 45 and 50% of their historic habitat (Bezzarides and Bestgen 2002). The primary reasons for decline include the effects of dams and introduced predators (Wiltzius 1978, Platania 1990, Martinez et al. 1994, Wheeler 1997, Miller and Rees 2000). In the San Juan River, populations of bluehead and flannelmouth suckers have remained stable since 1930, and are reported as common and abundant, respectively (Bezzarides and Bestgen 2002). Localized decreases in flannelmouth sucker CPUE during adult monitoring between 1992 and 1997 led to some concern, but were followed by increases in both the juvenile and adult CPUE rates (Ryden 2003). Catch rates of bluehead sucker in the upper reaches also varies on an annual basis, which has been attributed to immigration and emigration of fish in the mainstem and tributaries (Ryden 2003). Overall, the populations of bluehead and flannelmouth sucker in the San Juan River basin are stable and length-frequency distributions indicate recruitment.

2.2.3 Use and Demand Trends

Neither bluehead nor flannelmouth sucker is a game fish and recreational or commercial values have not been identified.

2.2.4 Past Management

In 1991, the San Juan River Basin Recovery Implementation Program (SJRRIP) was begun to conserve native fishes, particularly federally listed Colorado pikeminnow and razorback sucker, in the San Juan River basin while proceeding with water development. As part of this effort, several studies on native fishes in the basin were completed, many of which include information



on bluehead and flannelmouth suckers habitat preferences and occurrence. Additionally, the San Juan River is monitored annually as part of SJRRIP, providing current information on the status of bluehead and flannelmouth suckers in the river. Several management efforts associated with SJRRIP that may have effects on conservation of bluehead and flannelmouth suckers include the re-operation of Navajo Dam to mimic a natural flow regime and efforts to remove nonnative species.

In 2003, New Mexico, Arizona, Colorado, Utah, Wyoming and Nevada entered into *Rangewide Conservation Agreement for Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker* (Appendix I) for the purpose of proactively and cooperatively protecting and recovering these species. As part of the Agreement, each state must design a Conservation Strategy for the species within their legal boundaries, as well as participate in the drafting of the *Rangewide Conservation Strategy for Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker* (Appendix I). This document serves as New Mexico's strategy for bluehead and flannelmouth sucker; the Colorado River Basin Chubs Recovery Plan (Appendix II) serves as New Mexico's strategy for roundtail chub.

In 2006, the New Mexico Department of Game and Fish completed the Comprehensive Wildlife Conservation Strategy (CWCS) in fulfillment of federal requirements to receive State Wildlife Grant funding (NMDGF 2006). The CWCS identifies Species of the Greatest Conservation Need for New Mexico, including roundtail chub and Zuni bluehead sucker. Additionally, the CWCS identifies continued participation in the Three Species Conservation Agreement, including the completion and implementation of this plan, as a Prioritized Conservation Action.

2.3 HABITAT ASSESSMENT

2.3.1 Current Status

Habitat in the San Juan River has been compromised by more than forty years of regulated flows. As part of the SJRRIP, reservoir releases are regulated to mimic a natural flow regime, and this should help restore habitat for flannelmouth and bluehead suckers.



Water quality in the San Juan River basin has been degraded by resource extraction, hydromodification, agriculture, removal of riparian vegetation, streambank destabilization, and overall watershed condition (NMED/SWQB 2004). Currently there are 136 assessed river miles listed in the *2004-2006 State of New Mexico Integrated Clean Water Act §303(d)/§305(b) Report* as “Not Supporting” all of their designated uses. The most common reasons for this are pollution from selenium, nutrients, and pathogens, and elevated temperature (NMED/SWQB 2004). Although not documented, these factors may impair survival and recruitment success of flannelmouth and bluehead suckers.

2.3.2 Projections

The San Juan River basin has experienced a significant increase in human population in recent years, leading to increased pressure on natural resources. From 1990 to 2000, the population of San Juan County, New Mexico increased by 24.2%, and the population of Farmington increased by nearly 7000 people between 1990 and 2003, with the majority of the growth between 2000 and 2003 (Census 2000 Demographic Profile for San Juan County, Bureau of Business and Economic Research, UNM). The development of water rights through the Animas-La Plata Project could impact flow levels in the San Juan River basin. Although there has been a significant increase in population growth and potential resource impacts in the basin, SJRRIP provides a forum for cooperation between water users and native aquatic species interests.

2.4 POPULATION ASSESSMENT

2.4.1 Current Populations

Overall, the populations of bluehead and flannelmouth sucker in the San Juan River basin are stable and length-frequency distributions indicate adequate recruitment (Ryden 2003, Propst et al. 2004). Localized decreases in flannelmouth sucker CPUE during adult monitoring between 1992 and 1997 led to concern but were followed by increases in both the juvenile and adult CPUE rates and may be a cyclic phenomenon in flannelmouth populations (Ryden 2003). Catch rates of bluehead sucker in the upper reaches also vary on an annual basis, attributed to immigration and emigration of fish in the mainstem and tributaries (Ryden 2003). Habitat



degradation and nonnative species interactions, especially predation, are the major threats. Hybridization with white sucker currently occurs at low levels in the San Juan River (Ryden 2000).

2.4.2 Projections

Populations of bluehead and flannelmouth suckers should remain stable or increase under current management actions. Activities such as operation of Navajo Dam to mimic the natural flow regime, removal of nonnative predators, construction of fish passages around barriers, and habitat rehabilitation under the SJRRIP (see <http://www.fws.gov/southwest/sjrip/index.html> for details) should continue to control or alleviate the major threats to bluehead and flannelmouth suckers. Increased hybridization with white sucker, especially in the tributary streams where white sucker are more common, should also be monitored.

2.5 SPECIAL CONSIDERATIONS

2.5.1 San Juan River Basin Recovery Implementation Program

The San Juan River Basin Recovery Implementation Program (SJRRIP) began in 1991 to conserve endangered fish in the San Juan River while proceeding with water development. Participants in the program include USFWS, U.S. Bureau of Reclamation (BOR), U.S. Bureau of Land Management (BLM), U.S. Bureau of Indian Affairs (BIA), states of New Mexico and Colorado, Jicarilla-Apache Nation, Ute Mountain Ute, Southern Ute, and Navajo Nation Indian tribes. Although the SJRRIP was specifically begun for recovery of Colorado pikeminnow and razorback sucker, the research and management objectives of the SJRRIP include the “maintenance and enhancement of the native fish community of the San Juan River”, including bluehead and flannelmouth suckers (SJRRIP 1995).

2.5.2 Three Species Agreement

In 2004, the wildlife management agencies of Utah, Colorado, Wyoming, Nevada, Arizona, and New Mexico signed the *Rangewide Conservation Agreement For Roundtail Chub, Bluehead Sucker, And Flannelmouth Sucker* (Appendix I) to “to expedite implementation of conservation measures for [the three species] throughout their respective ranges as a collaborative and



cooperative effort among resource agencies” (Colorado River Fish and Wildlife Council 2004). Each agency committed to the development and implementation of a conservation and management strategy for the species within their state. This document serves as the New Mexico strategy for bluehead and flannelmouth sucker; the Colorado River Basin Chubs Recovery Plan (Appendix II) serves as the New Mexico conservation strategy for roundtail chub.

2.5.3 Comprehensive Wildlife Conservation Strategy

The New Mexico Department of Game and Fish recently completed the Comprehensive Wildlife Conservation Strategy (CWCS, <http://fws-nmcfwru.nmsu.edu/cwcs/default.htm>) in fulfillment of federal requirements to receive State Wildlife Grant (SWG) funding (NMDGF 2006). One purpose of SWG funding and CWCS is to promote conservation actions before federal listing is necessary; CWCS will guide conservation efforts to be more strategic, holistic and pro-active. The New Mexico Department of Game and Fish has identified Species of the Greatest Conservation Need for New Mexico, including roundtail chub and Zuni bluehead sucker, on which CWCS focuses. Although bluehead and flannelmouth sucker were not specifically identified in the CWCS as Species of Greatest Conservation Need, many of the strategies identified in the San Juan River watershed will assist in the conservation of these fish. Additionally, continued participation in the Three Species Rangewide Conservation Agreement was identified as a Prioritized Conservation Action.

2.5.4 Federal Jurisdiction and PECE Planning

Although the impetus and direction for this conservation strategy originates from New Mexico and interstate initiatives and not from proposed federal listing, NMDGF is taking into consideration the federal Policy for Evaluation of Conservation Efforts (PECE) guidelines during the development of this Strategy, as it may eventually affect federal listing [68 FR 15100]. This policy outlines the standards USFWS will use when evaluating effects current or planned conservation efforts will have on the listing of a species and provides guidance to other agencies and groups in developing agreements or plans that may preclude federal listing.

2.5.5 Tribal Interests and Sovereignty



Several populations of bluehead and flannelmouth suckers occur on tribal lands. The State of New Mexico recognizes the sovereignty of Native American Indian tribes and does not have jurisdiction over wildlife species on tribal lands. The intention of this strategy is to work as partners with the tribes, including the Jicarilla Apache Nation and Navajo Nation, to achieve conservation of the species, both on and off Indian lands.

United States Secretarial Order 3206 details the responsibilities of Federal agencies concerning the Endangered Species Act when Tribal interests are involved, including the management of candidate species. Native American tribes are recognized as sovereign, appropriate governmental entities to manage their resources and as such, the Order instructs Federal agencies to defer to tribal conservation and management plans.

2.6 SUMMARY AND CONCLUSIONS

Bluehead and flannelmouth suckers are native to the San Juan River and tributaries. Although the San Juan River basin has undergone dramatic changes in the past one hundred years, the actions taken by the SJRRIP are alleviating the effects on native fish, including bluehead and flannelmouth sucker. Currently, there is no evidence that either species has declined in population or that habitat is limited. Under current and predicted conditions, bluehead and flannelmouth sucker populations and range in the San Juan River basin should remain stable.



REFERENCE LIST

- Archer, E., T.A. Crowl, and M. Trammel. 2000. Abundance of age-0 native fish species and nursery habitat quality and availability in the San Juan River, New Mexico, Colorado, and Utah. Utah Division of Wildlife Resources, Salt Lake City, Utah.
- Baird, S. F., and C. Girard. 1853. Descriptions of some new fishes from the River Zuni. *Proceedings of the Academy of Natural Sciences, Philadelphia* 6: 368-69.
- Banks, J.L. 1964. Fish species distribution in Dinosaur National Monument during 1961-1962. Master's Thesis, Colorado State University, Fort Collins, CO. 96 p.
- Beyers, D.W., C. Sodergren, J.M. Bundy, and K.R. Bestgen. 2001. Habitat use and movement of bluehead sucker, flannelmouth sucker, and roundtail chub in the Colorado River. Larval Fish Laboratory, Department of Fishery and Wildlife Biology, Colorado State University, Fort Collins, Colorado.
- Bezzerides, N. and K.R. Bestgen. 2002. Status review of roundtail chub *Gila robusta*, flannelmouth sucker *Catostomus latipinnis*, and bluehead sucker *Catostomus discobolus* in the Colorado River Basin. Colorado State University, Fort Collins, Colorado.
- Bliesner, R. and V. Lamarra. 2000. Hydrology, geomorphology and habitat studies. San Juan River Basin Recovery Implementation Program, USFWS, Albuquerque, New Mexico.
- Carlson, C.A., C.F. Prewitt, D.E. Snyder, and E.J. Wick. 1979. Fishes and macroinvertebrates of the White and Yampa Rivers, Colorado. U.S. Bureau of Land Management, Biological Science Series, 1:1-276.
- Carman, S.M. 2005. Zuni Bluehead Sucker (*Catostomus discobolus yarrowi*) Recovery Plan. Conservation Services Division, New Mexico Department of Game and Fish, Santa Fe, New Mexico.
- Carter, B., V.A. Lamarra, and R.J. Ryel. 1986. Drift of larval fishes in the upper Colorado River. *Journal of Freshwater Ecology* 3(4): 567-577.
- Cavalli, P.A. 1999. Fish community investigations in the Lower Price River, 1996-1997. Final Report to the Recovery Implementation Program for the Endangered Fish Species in the Upper Colorado River Basin. Project No. 78. Utah Division of Wildlife Resources, Salt Lake City, Utah.
- Cavalli, P.A. 2000. An evaluation of the effects of Tusher Wash diversion dam on movement and survival of juvenile and subadult native fish. Utah Division of Wildlife Resources, Price, Utah. 33 p.
- Chart, T.E. and E.P. Bergersen. 1992. Impact of mainstream impoundment on the distribution and movements of the resident flannelmouth sucker (Catostomidae: *Catostomus latipinnis*) population in the White River, Colorado. *Southwestern Naturalist* 37:9-15.
- Childs, M.R., R.W. Clarkson, A.T. Robinson. 1998. Resource use by larval and early juvenile Sucker Conservation Strategy



- native fishes in the Little Colorado River, Grand Canyon, Arizona. *Transactions of the American Fisheries Society* 127 (4): 620-629.
- Colorado River Fish and Wildlife Council. 2004. Rangewide Conservation Agreement for Roundtail Chub *Gila robusta*, Bluehead Sucker *Catostomus discobolus*, and Flannelmouth Sucker *Catostomus latipinnis*. Utah Department of Natural Resources, Salt Lake City, Utah.
- Cope, E.D. 1872. Recent reptiles and fishes. Report on the reptiles and fishes obtained by the naturalists of the expedition. Pages 432-443 In: Part IV: Special Reports, in: Preliminary report of the U.S. Geological Survey of Wyoming and portions of contiguous territories,
- Dobberfuhl, A.M. 1995. Population genetic and phylogenetic relationships of *Catostomus latipinnis* based on mitochondrial DNA. Master's Thesis, Arizona State University, Tempe, Arizona.
- Douglas, M.R. and M.E. Douglas. 2002. The Little Colorado River sucker: description and comparison. Heritage Project: I-98-010. Final Report to Arizona Game and Fish Department, Phoenix, Arizona.
- Douglas, M.E., and P.C. Marsh. 1998. Population and survival estimates of *Catostomus latipinnis* in Northern Grand Canyon, with distribution and abundance of hybrids with *Xyrauchen texanus*. *Copeia* 1998(4):915-925.
- Gellis, A., R. Hereford, S.A. Schumm, and B.R. Hayes. 1991. Channel evolution and hydrologic variations in the Colorado River Basin: factors influencing sediment and salt loads. *Journal of Hydrology* 124: 317-344.
- Gorman, O.T., S.C. Leon, and J.M. Seals. 1994. Habitat use by native fishes in the Little Colorado River in the vicinity of the Grand Canyon. *Proceedings of the Desert Fishes Council* 25: 15.
- Graf, W.L. 1987. Late Holocene sediment storage in canyons of the Colorado Plateau. *Geological Society of America Bulletin* 99:261-271.
- Graves, W. D. 2002. Guidelines for Writing Long Range, Action, and Operational Plans. 71, New Mexico Department of Game and Fish, Santa Fe, New Mexico.
- Haines, G.B. and H.M. Tyus. 1990. Fish associations and environmental variables in age-0 Colorado squawfish habitats, Green River, Utah. *Journal of Freshwater Ecology* 5(4): 427-435.
- Hoffnagle, T.L., W.R. Persons, and G. Doster. 1994. Use of backwater areas by juvenile native fishes in the Colorado River, Grand Canyon. Page 33 In: Proceedings of the Desert Fishes Council, Volume XXV, 1993 Annual Symposium 10 to 14 November, Universidad Autonoma de Nuevo Leon, Facultad de Ciencias, Monterrey, Nuevo Leon, Mexico. Edited by Dean Hendrickson. Desert Fishes Council, Bishop, California.



- Holden, P.B. 1973. Distribution, abundance and life history of the fishes in the upper Colorado River Basin. A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Wildlife Science (Ecology). Utah State University, Logan, Utah.
- Holden, P.B. 2000. Program Evaluation Report for the 7-year research period (1991-1997). San Juan River Basin Recovery Implementation Program, USFWS, Albuquerque, New Mexico.
- Holden, P.B. and L.W. Crist. 1981. Documentation of changes in the macroinvertebrate and fish populations in the Green River due to inlet mediation of Flaming Gorge Dam. Report of BIO/West, Inc. for the U.S. Fish and Wildlife Service, Salt Lake City, Utah.
- Holden, P.B. and C.B. Stalnaker. 1975. Distribution and abundance of mainstream fishes of the middle and upper Colorado River basins, 1967-1973. *Transactions of the American Fisheries Society* 104(2):217-231.
- Jordan, D.S. 1891. Report of explorations in Utah and Colorado during the summer of 1889, with an account of the fishes found in each of the river basins examined. *Bulletin of the U.S. Fish Commissioner* 9:1-40.
- Koster, W.J. 1957. Guide to the fishes of New Mexico. University of New Mexico Press, Albuquerque, New Mexico. 116 p.
- Landye, J., B. McCasland, C. Hart, K. Hayden, and J.C. Thoesen. 2000. San Juan River fish health surveys, 1992-1999. U.S. Fish and Wildlife Service, Pinetop Fish Health Center, Pinetop, Arizona.
- Lawrence, K. 1999. Flannelmouth sucker, chapter 3: life history of fishes of the San Juan River. Pages 3-19 to 3-21 in P.B. Holden, editor. Flow recommendation for the San Juan River, San Juan River Basin Recovery Implementation Program, U.S. Fish and Wildlife Service, Albuquerque, New Mexico.
- Maddux, H.R., and W.G. Kepner. 1988. Spawning of bluehead sucker in Kanab Creek, Arizona (Pisces: Catostomidae). *The Southwestern Naturalist* 33 (3): 364-265.
- Maddux, H.R., D.M. Kubly, J.C. deVos, Jr., W.R. Persons, R.H. Staedicke, and R.L. Wright. 1987. Evaluation of varied flow regimes on aquatic resources of Glen and Grand Canyons. Glen Canyon Environmental Studies, Bureau of Reclamation, Upper Colorado Region, Salt Lake City, Utah. 291 p.
- Martinez, P.J., T.E. Chart, M.A. Trammel, J.G. Wullschleger, and E.P. Bergersen. 1994. Fish species composition before and after construction of a mainstem reservoir on the White river, Colorado. *Environmental Biology of Fishes* 40: 227-239.
- McAda, C.W. 1977. Aspects of the life history of three Catostomids native to the Upper Colorado River Basin. Master's thesis, Utah State University, Logan, Utah.



- McAda, C.W. and R.S. Wydoski. 1983. Maturity and fecundity of the bluehead sucker, *Catostomus discobolus* (Catostomidae), in the Upper Colorado River Basin, 1975-76. *The Southwestern Naturalist* 28(1):120-123.
- McAda, W.C. and R. Wydoski. 1985. Growth and reproduction of the flannelmouth sucker, *Catostomus latipinnis*, in the upper Colorado River basin, 1975-1976. *Great Basin Naturalist* 45: 281-286.
- McAda, C.W., C.R. Berry, Jr. and C.E. Phillips. 1980. Distribution of fishes in the San Rafael River system of the upper Colorado River basin. *The Southwestern Naturalist* 25(1): 41-50.
- McKinney, T., W.R. Persons, and R.S. Rogers. 1999. Ecology of flannelmouth sucker in the Lee's Ferry tailwater, Colorado River, Arizona. *Great Basin Naturalist* 59:259-265.
- Miller, W.J. and D.E. Rees. 2000. Final Report: Ichthyological surveys of tributaries of the San Juan River, New Mexico. San Juan River Basin Recovery Implementation Program, USFWS, Albuquerque, New Mexico.
- Miller, W.H., D. Archer, H.M. Tyus, and R.M. McNatt. 1982. Yampa River fishes study, final report. Colorado River Fishery Project. U.S. Fish and Wildlife Service, Salt Lake City, Utah. 79 p.
- Minckley, W.L. 1973. The fishes of Arizona. Arizona Game and Fish Department, Phoenix, Arizona.
- Miser, H.D. 1924. The San Juan Canyon, Southeastern Utah, a geographic and hydrographic reconnaissance. United States Geological Survey, Report #W538, Washington, D.C.
- Muth, R.T. and T.P. Nesler. 1993. Associations among flow and temperature regimes and spawning periods and abundance of young of selected fishes, lower Yampa River, Colorado, 1980-1984. Contribution 58, Colorado State University Larval Fish Laboratory, Ft. Collins, Colorado. 50 p.
- New Mexico Department of Game and Fish. 2006. Comprehensive Wildlife Conservation Strategy for New Mexico. New Mexico Department of Game and Fish. Santa Fe, New Mexico. 526 pp + appendices. , <http://fws-nmcfwru.nmsu.edu/cwcs/default.htm>
- New Mexico Environment Department/Surface Water Quality Bureau. 2004. 2004-2006 State of New Mexico Integrated Clean Water Act §303(d)/§305(b) Report. New Mexico Water Quality Control Commission, Santa Fe, New Mexico.
- Paroz, Y.M., D.L Propst, S.M. Carman, and R.D. Larson. 2005. Small-bodied fish monitoring, San Juan River, September-October 2004. New Mexico Department of Game and Fish. San Juan River Basin Recovery Implementation Program, U.S. Department of the Interior, Fish and Wildlife Service, Albuquerque, New Mexico.
- Platania, S.P. 1990. Biological summary of the 1987 to 1989 New Mexico-Utah ichthyofaunal study of the San Juan River. Report to New Mexico Department of Game and Fish and



- U.S. Bureau of Reclamation. University of New Mexico, Albuquerque, New Mexico.
- Propst, D.L. and A.L. Hobbes. 2000. Seasonal abundance, distribution and population size-structure of fishes in San Juan River secondary channels 1991-1997. Conservation Services Division, New Mexico Department of Game and Fish, Santa Fe, New Mexico.
- Propst, D.L., A.L. Kingsbury, and R.D. Larson. 2004. Small-bodied fish monitoring, San Juan River, 1998-2003. New Mexico Department of Game and Fish. San Juan River Basin Recovery Implementation Program. U.S. Department of the Interior, Fish and Wildlife Service, Albuquerque, New Mexico.
- Robinson, A.T., P.P. Hines, J.A. Sorensen, and S.D. Bryan. 1998. Parasites and fish health in a desert stream, and management implications for two endangered fishes. *North American Journal of Fisheries Management* 18: 599-608.
- Ryden, D. W. 2000. Adult fish community monitoring on the San Juan River, 1991-1997. Final Report. San Juan River Basin Recovery Implementation Program. U.S. Department of the Interior, Fish and Wildlife Service, Albuquerque, New Mexico.
- Ryden, D.W. 2001. Long term monitoring of sub-adult and adult large-bodied fishes in the San Juan River, 2000. U.S. Fish and Wildlife Services, Colorado River Fishery Project, Grand Junction, Colorado.
- Ryden, D. W. 2003. Long term monitoring of sub-adult and adult large-bodied fishes in the San Juan River: 1999-2001 integration report. San Juan River Basin Recovery Implementation Program, U.S. Department of the Interior, Fish and Wildlife Service, Albuquerque, New Mexico.
- San Juan River Basin Recovery Implementation Program (SJRRIP). 1995. Program Document, Cooperative Agreement, Long Range Plans, and RIP Side by Side Analysis. U.S. Department of the Interior, Fish and Wildlife Service, Albuquerque, New Mexico.
- Sigler, W.F. and R.R. Miller. 1963. *Fishes of Utah*. Utah Department of Fish and Game, Salt Lake City, Utah.
- Sigler, W.F. and J.W. Sigler. 1996. *Fishes of Utah*. University of Utah press, Salt Lake City, Utah.
- Smith, G. R. 1966. Distribution and evolution of the North American Catostomid fishes of the subgenus *Pantosteus*, Genus *Catostomus*, Museum of Zoology, University of Michigan, Ann Arbor, Michigan.
- Smith, G. R., and R. K. Koehn. 1979. Status of the Zuni Mountain Sucker, U.S. Department of the Interior, Fish and Wildlife Service, Division of Ecological Services, Albuquerque, New Mexico.
- Snyder, D.E. and R.T. Muth. 1990. Descriptions and identification of razorback, flannelmouth, white, Utah, bluehead, and mountain sucker larvae and early juveniles. Technical Publication No. 38, Colorado Division of Wildlife. 152 p.



- Sublette, J. E., M. D. Hatch, and M. Sublette. 1990. *The Fishes of New Mexico*. University of New Mexico Press: Albuquerque, New Mexico.
- Tyus, H.M. and G.B. Haines. 1991. Distribution, habitat use, and growth of age-0 Colorado squawfish in the Green River Basin, Colorado and Utah. *Transactions of the American Fisheries Society* 120:79-89.
- Tyus, H.M., B.D. Burdick, R.A. Valdez, C.M. Haynes, T.A. Lytle, and C.R. Berry. 1982. Fishes of the Upper Colorado River Basin: distribution, abundance, and status. Pages 12-70 In: *Fishes of the Upper Colorado River System: present and Future*. Proceedings of a Symposium Presented at the Annual Meeting of the American Fisheries Society in Albuquerque, New Mexico, September 18, 1981. William H. Miller, Harold M. Tyus, and Clarence A. Carlson, editors. Western Division, American Fisheries Society, Bethesda, Maryland.
- U.S. Fish and Wildlife Service. U.S. Department of the Interior, Fish and Wildlife Service. 2000. Final Biological Opinion for the Animas-La Plata Project. June 19, 2000, U.S. Fish and Wildlife Service, Denver, Colorado.
- Valdez, R.A., and Steven W. Carothers. 1998. The aquatic ecosystem of the Colorado River in Grand Canyon: Grand Canyon Data Integration Project Synthesis Report. Dorothy A. House, editor. Prepared for the U.S.D.I. Bureau of Reclamation, Salt Lake City, Utah, by SWCA, Inc., Environmental Consultants, Flagstaff, Arizona.
- Valdez, R., P. Mangan, M. McInerny, and R.P. Smith. 1982. Tributary report: fishery investigations of the Gunnison and fish fauna of the American southwest. *Papers of the Michigan Academy of Science, Arts, and Letters*. 46: 365-404.
- Vanicek, C.D. 1967. Ecological studies of native Green River fishes below Flaming Gorge Dam, 1964-1966. Ph.D. dissertation, Utah State University, Logan, Utah.
- Weiss, S.J. 1993. Spawning, movement and population structure of flannelmouth sucker in the Paria River. M.S. Thesis, University of Arizona, Tucson, Arizona. 153 p.
- Weiss, S.J., E.O. Othis, and O.E. Maughan. 1998. Spawning ecology of flannelmouth sucker, *Catostomus latipinnis* (Catostomidae), in two small tributaries of the lower Colorado River. *Environmental Biology of Fishes* 52: 419-433.
- Wheeler, C.A. 1997. Current distributions and distributional changes of fish in Wyoming west of the Continental Divide. M.S. Thesis, University of Wyoming, Laramie, Wyoming. 113p.
- Wiltzius, W.J. 1978. Some factors historically affecting the distribution and abundance of fishes in the Gunnison River. Final Report for Fisheries investigations of the Lower Gunnison River Drainage. Colorado Department of Natural Resources, Division of Wildlife, Fort Collins, Colorado. 215 p.



3.0 MANAGEMENT STRATEGY

Section 3.0 contains the management goal and objective of the Bluehead and Flannelmouth Sucker Conservation Strategy. This section also details problems and opportunities affecting attainment of the stated objective and the broad strategies that will be employed to surmount these issues and reach the objective. Issues identified here follow the Conservation Actions outlined in the Rangewide Conservation Strategy (Appendix I), as appropriate to bluehead and flannelmouth suckers in New Mexico.

3.1 Management Goal and Objective

Goal: Ensure persistence of bluehead and flannelmouth suckers throughout their range in New Mexico.

Objective: Maintain the range and populations of bluehead and flannelmouth suckers within New Mexico to at least current levels as defined in SJRRIP annual reports (i.e. Ryden 2003, Propst et al. 2005).

Objective Parameters:

- Range and populations will be monitored and evaluated annually, as part of the San Juan River annual monitoring (methods and current status in Ryden 2003 and Propst et al. 2005).
- Sufficient connectivity will be maintained between populations so that viable metapopulations are maintained.
- Threats to the persistence of bluehead and flannelmouth sucker will be significantly reduced and/or eliminated

3.2 Management Issues and Strategies

Issue 1. Current programs exist to evaluate the status of bluehead and flannelmouth sucker in the San Juan River basin. *Qualitative and quantitative long-term population and habitat monitoring data on the fishes of the San Juan River as part of the SJRRIP are available from 1987 to the present. Historical data has been investigated and summarized (Platania 1990).*

Strategy 1. Continue to participate in the annual monitoring of fishes of the San Juan River

Strategy 2. Annually review the status of bluehead and flannelmouth suckers as reported in SJRRIP documents.



Strategy 3. If significant declines in range or populations are reported, identify the causes and determine the appropriate actions for the State of New Mexico.

Issue 2. Rangewide database is needed to assist in the conservation of the Three Species. *As described in the Three Species Conservation Agreement and Rangewide Strategy, a compatible database is needed to collate and share information on the status and distribution of the three species throughout the Colorado River basin.*

Strategy 1. Assist in the development of a Three Species Rangewide Database.

Strategy 2. Populate and maintain the database with information on bluehead and flannelmouth in New Mexico.

Issue 3. Aspects of population demographics, life history, habitat requirements, and conservation needs of bluehead and flannelmouth suckers are poorly understood in the Colorado River basin. *Although much research has been completed on bluehead and flannelmouth suckers, several aspects of their biology remains to be investigated.*

Strategy 1. Share information gathered in the San Juan River on the biology of bluehead and flannelmouth suckers with rangewide partners.

Strategy 2. Support appropriate research in the San Juan River basin to investigate aspects of the biology of bluehead and flannelmouth suckers.

Strategy 3. Apply research results to management actions.

Issue 4. Habitat of the San Juan River has degraded over the past 100 years. *Although neither bluehead sucker nor flannelmouth sucker population data indicate that the species are habitat limited, attention to maintaining and restoring habitat in the San Juan River basin is necessary to conserve the native fishes of the basin.*

Strategy 1. Maintain and enhance connectivity in the San Juan River basin.

Strategy 2. Support habitat restoration projects as appropriate.

Issue 5. Native species are threatened by nonnative species. *In the San Juan River basin, much of the current fish fauna is comprised of nonnative species. Nonnative predators, such as channel catfish, particularly pose a threat to bluehead and flannelmouth sucker. Hybridization with nonnative white sucker may also pose a threat to the integrity of the native species.*

Strategy 1. Support nonnative control and eradication efforts in the San Juan River.



Issue 6. Several avenues currently exist for information sharing in the San Juan River basin. *The Three Species Conservation Agreement and SJRRIP currently provide an excellent framework for collaborative efforts in the basin. Although several efforts exist in the San Juan River basin to conserve and recover native fish, there is little support from the public.*

Strategy 1. Coordinate with partners on efforts to maintain bluehead and flannelmouth sucker in the San Juan River basin.

Strategy 2. Inform local agencies, landowners, and users about the life history and conservation of native fishes in the San Juan River basin.