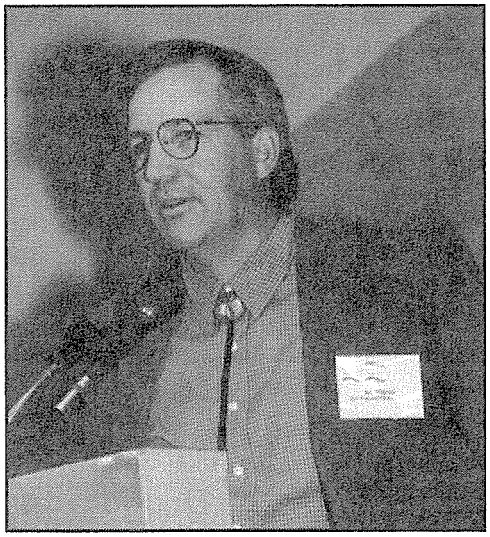
Jeff Whitney is a native of Arizona and has worked professionally in both Arizona and New Mexico over the past 25 years. He graduated from Northern Arizona University with a bachelor's degree in botany and will complete an M.S. in riparian ecology in December at Arizona State University. During his career with the U.S. Forest Service, Jeff was able to study and manage riparian systems and native fisheries not only in Arizona and New Mexico but also in central Chihuahua and Sonora in Mexico and as far north as salmon headwater streams in Idaho. In August 1995 he was hired by the U.S.D.I. Fish and Wildlife Service, New Mexico Ecological Services Office as the Middle Rio Grande Coordinator. His main duty is to implement the interagency Bosque Biological Management Plan, including coordination of the Recovery Plan for the Rio Grande Silvery Minnow.



RECOVERING THE RIO GRANDE SILVERY MINNOW

Jeff Whitney
U.S. Fish and Wildlife Service
New Mexico Ecological Services Office
2105 Osuna Road NE
Albuquerque, NM 87113

I appreciate the opportunity to come and visit with you today about some of the ongoing efforts to recover the Rio Grande silvery minnow. It has been a topic of discussion for a number of years and we are in the process of developing an effective recovery plan for the silvery minnow. I will bring you up-to-date on where we are in the process. I am unable to give you much detail as to what measures will be finally agreed upon to recover the species because the process is continuing and at this point much of what needs to be decided has yet to be developed. Briefly, I will discuss the biology and ecology of the fish and the habitat it occupies. I also will review the activities to date and the composition of the recovery team.

There has been a terrific amount of quality dialogue today about some of the uses to which water is applied. One environmental use for water in the West is to provide habitat for native species. Of the sixteen native Rio Grande fishes that have occurred historically in New Mexico, seven are either extirpated or extinct. Extirpated means the species no longer occurs in a particular reach of the river. A number of native species have been extirpated and others are now common. Numerous non-native species have been introduced. The most common fish species currently inhabiting this portion of the river include red shiner (*Cyprinella lutrensis*), flathead chub (*Platygobio gracilis*), fathead minnow (*Pimephales promelas*), longnose dace (*Rhynichthys chataractae*), white sucker (*Catostomus commersoni*), mosquitofish (*Gambusia affinis*), river carpsucker (*Carpiodes carpio*), and channel catfish (*Ictalurus punctatus*) (Platania 1993). Three species endemic to this portion of the Rio Grande have been extirpated: Rio Grande shiner (*Notropis jemezanus*), phantom shiner (*Notropis orca*), and Rio Grande bluntnose shiner

(*Notropis simus simus*), with the latter two species presumed extinct (Platania 1991). The particular species I will be talking about today is the Rio Grande silvery minnow (*Hybognathus amarus*).

The final rule for the Rio Grande silvery minnow, which listed it as a federally endangered species, was published in the Federal Register on July 20, 1994 and became effective August 19, 1994 (FR 1994). During the petition review that proposed listing the species, there was substantial discussion with the water community. Because of the inability to identify water available for the species to assure riverine habitat throughout the year and during most years, the species was placed on the endangered list. Dialogue continued through the recovery planning effort, which I will discuss in more detail later.

One activity associated with selecting the silvery minnow as an endangered species was an economic analysis of the proposed designation of critical habitat (FR 1993). The analysis was undertaken via a contract with an economic consultant, with input from affected interests, and now has ceased. Currently, a moratorium has been placed by Congress directing the Service not to conduct any future economic analyses or to designate any critical habitat. Because there was an existing contract for the economic analysis, the analysis continued and culminated in a nearly completed draft report. Nothing further will be done in this regard and no designation of critical habitat will occur until Congress repeals the moratorium.

A recovery team has been appointed and the initial stages of developing a comprehensive recovery plan for the species currently is in progress. The team was formed about ten months ago and it had about 23 months at that point to get a lot of work done. The team now has about 15 months to accomplish quite a few different activities to get to the point where an acceptable recovery plan for the species exists. The Rio Grande Silvery Minnow Recovery Team is made up of biological and participation subteams; the participation subteam comprises 14 members representing the spectrum of interests in water management on the Rio Grande. The team's objective is to develop a workable recovery plan and an implementation schedule for the silvery minnow. With full involvement from the various stakeholders, hopefully the recovery team will be able to develop an acceptable implementation schedule and strategy that fits within the constraints of existing water management policies, such as those we have heard about today.

The silvery minnow species is a small-bodied cyprinid with moderately small eyes and a small slightly oblique subterminal mouth. The adult is about 95 mm in length, the life colors are silvery in reflection as is the mid-dorsal stripe when present, the belly is a silvery white, the fins are plain, the barbels are absent, and there is very little sexual dimorphism between male and female.

The Rio Grande silvery minnow appears to be a species which travels in schools. The fishes are omnivorous, probably opportunistically consuming a variety of algae, detritus and aquatic invertebrates available in the substrate or in the drift. The probable maximum life span is likely only to be about 2-3 years. Since it is a relatively short-lived fish, it should be fairly abundant in the system. It is at the lower end of the trophic level in terms of the suite of fishes. From that standpoint in the population dynamics, you would expect them to be one of the most abundant fish species in the Middle Rio Grande. The proposed critical habitat encompasses the Middle Rio Grande from San Marcial upstream 170 miles to the spillway at Cochiti Reservoir. However, this represents only about five percent of the total habitat that it occupied historically. By studying early collection records, the silvery minnow was found to have occupied the Pecos River in New Mexico and Texas and the Rio Grande from possibly the Chama/Española area south all the way to Brownsville. Currently, the minnow survives from Cochiti to Elephant Butte Reservoir, and is declining even there.

The silvery minnow is a spring spawner. It lays semibuoyant eggs which drift downstream. Spawning is presumed to be triggered by the onset of high flows during the spring runoff. One female can produce over 3,000 eggs which are hatched in 24-48 hours (depending upon water temperature) at which time the larvae remain in the drift. After a few days, the larvae appear to select shallow, low-velocity habitats which expedites development. Generally, these areas have warmer water, provide refuge from predators, and contain a high availability of food, primarily algae. These factors contribute to rapid growth, which is necessary for the young to survive. The survival rate during these initial development periods is vital

for the eventual recruitment into the adult population. During this stage, larval fish would typically occupy slower backwater sites.

In drier times, the fish are found in isolated pool habitat refugia. We know that historically the Rio Grande experienced low flows and isolated pools were the extent of the minnow's occupiable habitat. However, this allowed them to carry over by pooling up in these sites. As a result of their particular habitat needs, they were to a certain extent selected for and had an ability to out-compete some of the other native and later non-native introduced species. The species can withstand high temperatures and high turbidity in the water as well as a fairly high alkaline content. Thus, this sort of habitat is vital to carry over the species in drier times.

It is worthy to note that while we recognize we will have droughts occasionally and flows will be interrupted, there are refugia available at various locations up and down the river which provide an opportunity for a certain part of the population to survive drought, as in the past. These individuals then comprise the reproductive pool from which the next generation comes. If these species only live 2-3 years—and we think probably 5 percent of the species will make it to year two—it becomes even more important that the appropriate habitat is available through all years to sustain the populations.

The specific habitat requirements for the Rio Grande silvery minnow are being studied. Conditions under which the species now exist suggest that they use a variety of habitats depending on their developmental stage and the seasonal availability of habitat. Generally, the minnow is found in low-gradient reaches in the Middle Rio Grande, which are characterized by highly variable flows and shifting sand and silt substrates. Adult silvery minnows often are encountered in shallow braided runs over shifting sand substrates, and also are observed in backwaters and isolated pools, usually greater than one meter in depth. Some of the largest collections of adult silvery minnows have been found in scour pools downstream of diversion dams (Bestgen and Platania 1991). These dams may concentrate the silvery minnow during certain times of the year as bottlenecks to upstream movement. The habitats downstream from these dams provide deeper water, lower temperatures, higher dissolved oxygen levels, and more nutrient materials than upstream. The habitat also exposes them to a relatively high rate of predation because other large fish that prey on fish species also are found in these deeper pools. Young-of-the-year silvery minnows primarily occupy shallow, low-velocity areas. These conditions are often associated with off-channel areas, such as braided secondary channels, sandbars, and backwaters (Platania 1995).

Historically, the Rio Grande silvery minnow was one of the most abundant, widespread fishes in the Rio Grande Basin occurring from Española down to Brownsville. The species also was found in some large perennial tributaries of the Rio Grande, such as the Rio Chama. It occurred in the Pecos River from Santa Rosa downstream to the confluence with the Rio Grande in southern Texas. The species is endemic to the Rio Grande and has not been collected outside the drainage. No records exist that indicate the existence of the species in large tributaries in the Lower Rio Grande in northern Mexico. Similar species occur in nearby drainages. A recent systematic study supports the notion that the Rio Grande silvery minnow is a separate species (Bestgen and Propst 1994).

As mentioned earlier, the species' current distribution is located primarily within a 170-mile reach from Cochiti to Elephant Butte Reservoir. This reach represents about five percent of its former range. The refugia the minnow historically utilized during droughts are not available given the constrictions and the diversion points on the river today. By reviewing monthly, annual and long-term hydrographs, we have come to understand that there is tremendous variability in the river's flows. Obviously, the fish evolved within this dramatically fluctuating natural hydrograph. The current modified system has had a profound affect on the existence of the species in the system. Surveys between 1987 and 1992 found the silvery minnow distributed between Bernalillo and the headwaters of Elephant Butte Reservoir. Numerous samples from Cochiti Reservoir resulted in no collection of the species and suggested that the species was extirpated from that reach by the 1960s. The last collections of the minnow in downstream localities in Texas occurred in the early 1960s. In the Pecos River, the species was present until 1955, but absent from the 1960s collections. Reviewing these collection sets over time leads us to believe that there has been a

continuous decline of the species in the Rio Grande basin.

Surveys by fish biologists over the past decade indicate that we are still seeing a bit of a shift in relative abundance of the species among the various Middle Rio Grande reaches delineated by existing irrigation diversion structures. The San Acacia to Elephant Butte area comprises the largest portion of the population—approximately 70 percent of the species (personal communication with Platania 1995). There has been a bit of a shift over time between the Isleta/San Acacia reach from 1987 to 1992. During the 1992 survey, the Isleta reach provided some habitat. Angostura diversion near Algodones, New Mexico, located about 15 miles north of Albuquerque to about 10 miles south of Cochiti holds probably the second-largest concentration of the species at this time.

One of the challenges we face concerns the low-flow conveyance channel originating at the diversion point at San Acacia and continuing downstream about 80 miles to Elephant Butte Reservoir. The conveyance channel was constructed to assist New Mexico in meeting our compact delivery requirements and is one locale where a significant amount of dewatering occurs, particularly during lower flows. Unfortunately, this particular reach of the river also is home to the largest component of the existing population and, at times, this segment of the river can be dry for intermittent periods.

Dams, either for reservoirs or diversions, alter any aquatic system. The reservoirs in the upper part of the middle reach have created a situation where the river is poor in sediment. As water is released and moves downstream, it picks up sediment substrate that historically provided habitat and structure for the silvery minnow. That sediment is being accumulated downstream and receives some contributions from the Rio Salado and Rio Puerco, but retained by Elephant Butte Reservoir.

Other impacts resulting in a loss of habitat are the confining features that have been put in place to protect agriculture and development within the floodplain, thereby constricting the channel. Changes in sediment transport, moderating peak flows as a result of flood-control structures, dewatering for agricultural uses, and introducing contaminants or poor water quality have dramatically changed the habitat's character and all have impacted the species. In large measure, we suspect that is why the species is declining. We know we are locked into accepting a number of those aspects. What we are trying to do is sort through what we have and attempt to find as much environmental opportunity as we can to provide habitat and water for the fish so that we can perpetuate this species.

The water stored in Elephant Butte Reservoir provides tremendous opportunities for those living downstream from the reservoir. Developing enormous structures such as reservoirs have environmental consequences. The Rio Grande silvery minnow may well be the canary in the mine shaft that is warning us that serious environmental problems result when we harness water resources to provide adequate habitat for man.

New Mexico's reservoirs are integrally connected. Because of various roles and responsibilities, the U.S. Fish and Wildlife Service continually coordinates with the Bureau of Reclamation and the Corps of Engineers to meet our respective mandates while observing our obligations under the Endangered Species Act. The system is extremely complicated. Many talented people have taken on the challenges of the recovery planning effort. This effort marks the first time the Fish and Wildlife Service has involved stakeholders in developing a recovery plan. Hopefully, we will be able to offset some of the obvious challenges of providing water for fish habitat while still maintaining agricultural and municipal water uses. Thank you.

References

Bestgen, K.R. and S.P. Platania. 1991. Status and conservation of the Rio Grande Silvery minnow, (Hybognathus amarus). *The Southwestern Naturalist*, 36:2:225-232.

Bestgen, K.R. and D.L. Propst. 1994. Redescription, geographic variation, and taxonomic status of Rio Grande silvery minnow, Hybognathus amarus (Girard 1856). A report prepared for New Mexico Department of Game and Fish, Contribution 69 of the Larval Fish Laboratory, Colorado State University. 101 pp.

Federal Register (FR) 1993. Department of Interior, Fish and Wildlife Service. Proposed rule to list Rio Grande silvery minnow as endangered, with

critical habitat. March 1, 1993. 58:38:11821-11828.

Federal Register (FR). 1994. Department of Interior, Fish and Wildlife Service. Final rule to list the Rio Grande silvery minnow as endangered. 59:138: 36988-36995. Effective 19 August 1994.

Platania, S.P. 1991. Fishes of the Rio Chama and the upper Rio Grande, New Mexico, with preliminary comments on their longitudinal distribution. *The Southwestern Naturalist*, 36:2:186-193.

Platania, S.P. 1993. The Fishes of the Rio Grande between Velarde and Elephant Butte Reservoir and their Habitat Associations. UNM Ichthyofaunal Studies Program submitted to NMDGF and USBR, 188 pp.

Platania, S.P. 1995. Reproductive biology and early life-history of Rio Grande silvery minnow, Hybognathus amarus. A report prepared for the U.S. Army Corps of Engineers, Albuquerque District.