Scientific Name: *Ptychocheilus lucius*
Common Name: Colorado pikeminnow
BISON No.: 0010465

Legal Status:

- Arizona, Species of Special Concern
- ESA, Endangered
- ESA, Proposed Endangered
- ESA, Proposed Threatened
- ESA, Threatened
- New Mexico-WCA, Endangered
- New Mexico-WCA, Threatened
- USFS-Region 3, Sensitive
- None

Distribution:

- Endemic to Arizona
- Endemic to Arizona and New Mexico
- Endemic to New Mexico
- Not Restricted to Arizona or New Mexico
- Northern Limit of Range
- Southern Limit of Range
- Western Limit of Range
- Eastern Limit of Range
- Very Local

Major River Drainages:

- Dry Cimmaron River
- Canadian River
- Southern High Plains
- Pecos River
- Estancia Basin
- Tularosa Basin
- Salt Basin
- Rio Grande
- Rio Mimbres
- Zuni River
- Gila River
- Rio Yaqui Basin
- Wilcox Playa
- Rio Magdalena Basin
- Rio Sonoita Basin
- Little Colorado River
- Mainstream Colorado River
- Virgin River Basin
- Hualapai Lake
- Bill Williams Basin

Status/Trends/Threats (narrative):

Federal (USDI): Endangered, State AZ: Endangered, State NM: Endangered.
The status of the Colorado pikeminnow is that it has declined throughout its historic range (Propst 1999). The Colorado pikeminnow currently occupies approximately 20-25% of their historic range (Tyus 1986, 1990). The Colorado pikeminnow is now extirpated from the lower Colorado River basin (Minckley 1973, 1991). Rediscovery of adult Colorado pikeminnow, presence of several age classes, and documentation of its successful spawning in the San Juan River reconfirmed the species as a viable component of the ichthyofauna of the San Juan River (Platania et. al. 1991). The status of populations is restricted in the San Juan drainage (Sublette et. al. 1990). Subsequent surveys confirmed a small, reproducing population of the species, apparently concentrated in the San Juan River between Shiprock, New Mexico and the Four Corners area (Ryden and Pfeifer 1996). The San Juan River supports a small, but reproducing

population of the largest populations of Colorado pikeminnow occur in the Green, White, Yampa, and Colorado Rivers above Lake Powell (Holden and Wick 1982). The last known specimens from the Gila River system were seined at the U.S. 60 bridge in Salt River canyon, and the Colorado pikeminnow is now considered rare and endangered in most of its native range and is essentially extinct in Arizona (Minckley 1973).

Threats facing the Colorado pikeminnow are large-scale water development; introduction and establishment of nonnative fish species, and habitat degradation along the river corridor, as well as other factors have contributed to the decline of the Colorado pikeminnow (Wydoski and Hamill 1991). Declines of Colorado pikeminnow have been attributed to dewatering; mainstream dams and impoundments; altered stream flow, channel morphology, and water quality, water chemistry, silt loads; and introduction of exotic fishes (Miller 1961, Sublette et. al. 1990, Muth and Snyder 1995). It has been suggested that lower water temperatures associated with hypolimnetic reservoir releases may curtail reproduction (Kaeding and Zimmermann 1983). Hypolimnetic discharges from dams result in downstream temperatures that are colder in summer and warmer in winter (Marsh 1985). Abnormally high water releases from upstream dams during the primary nursery period of Aug-Sept are detrimental to the survival of larvae, and surviving larvae show significantly lower growth rate (Sublette et. al. 1990). Nursery areas in warmer water tributaries may produce larvae which drift downstream to encounter cold water plumes from upstream reservoirs; such as thermal shocks can produce adverse effects or death of young larvae (Berry 1988). Access to spawning areas is prevented by barrier dams (Sublette et. al. 1990). Low-head diversion dams on the Colorado River prevent upstream movement of adult Colorado pikeminnow into their original habitat (McAda and Kaeding 1991). Muth and Snyder (1995) hypothesize that nonnative fishes adversely affect survival of young Colorado pikeminnow through competition and predation. Red shiner, because of extreme abundance is a serious competitor for food with young Colorado pikeminnow shiner (Muth and Snyder 1995). Channel catfish, red shiner, and several centrarchids species have been implicated in the decline of Colorado pikeminnow (Karp and Tyus 1990). Several exotic fish species may prey upon and compete Colorado pikeminnow, particularly juveniles (Sublette et. al. 1990).

Distribution (narrative)**:**

Colorado pikeminnow formerly occupied the mainstem Colorado River, its major tributaries, and the Colorado River delta in Mexico (Jordan and Everman 1896, Minckley 1973, Lee et. al 1981, Tyus and McAda 1984, Sublette et. al. 1990). The Colorado pikeminnow once occupied all the major rivers of the Gila basin, moving upstream in the Verde at least to Perkinsville (Minckley and Alger 1968). The Green river and its two large tributaries, the Yampa and White Rivers in Colorado and Utah, contain the largest known concentration of Colorado pikeminnow (Halden and Stalnaker 1975, Tyus and McAda 1984, Tyus and Karp 1989, Muth and Snyder 1995). The Colorado pikeminnow may have occurred in the Gila Basin of New Mexico historically (LaBounty and Minckley 1972). Colorado pikeminnow were thought to be historic residents of the San Juan drainage in Colorado, New Mexico, and Utah (Platania et. al. 1991). In 1987, a Colorado pikeminnow was captured from the San Juan River of New Mexico approximately 25 km downstream of Shiprock, New Mexico (LaBounty and Minckley 1972). Self-sustaining populations of Colorado pikeminnow are extant in the Upper Colorado River Basin (Holden and Wick 1982). Recent captures in the Price, San Juan, and Gunnison demonstrate the use of

tributaries by Colorado pikeminnow (Thompson et. al. 1997). The Colorado pikeminnow is now restricted to the upper river in Colorado, Utah, and Wyoming (Lee et. al 1981).

Key Distribution/Abundance/Management Areas:

Panel key distribution/abundance/management areas:

Breeding (narrative)**:**

Reproduction by Colorado pikeminnow in the Green River appears to occur in July and August, near the end of spring runoff depending on increasing water temperatures exceeding 18° C. and receding water levels (Vanicek and Kramer 1969, Minckley 1973, Haynes et. al. 1985, Tyus 1986, Minckley 1991). Spawning areas are a complex of deep pools, eddies, and rapid velocity water (40 to 80 cm/sec) over cobble substrates (Tyus and Karp 1989). Observed breeding behavior of the Colorado pikeminnow is as follows; a ripe female is followed by males and dips near the bottom, usually over a crevice, arches her back, and spawns with vibratory, lateral movements males then move over and about her in a "solid mass", presumably emitting sperm (Minckley 1973). Only a small number of eggs are released at a time, so a female must perform the act repeatedly to deplete her ovaries (Minckley 1973). The eggs adhere to the substrate (Minckley 1973). Colorado pikeminnow eggs hatch in 78-108 hours at 20° C and 63 hours at 25° C, and embryo and hatch are maximum at 20° C (Marsh 1985). Larvae emerge from spawning bars after 6 to 10 day incubation (Haynes et. al 1984). Tyus (1986) hypothesized Colorado pikeminnow larvae in the Green River basin drift downstream as far as 100-160 km. He stated that the most extensively used spawning and rearing habitats were separated by such distances. The larvae drift downstream until they reach a size where they can move into shoreline areas consisting of embayments, backwaters and isolated backwater pools (Haynes and Muth 1985b). Larvae entrained in the current and drift downstream to nursery areas (Tyus and Haines 199). Backwaters and embayments are the primary nursery areas of larval (Haynes et. al. 1984).

Habitat (narrative)**:**

The Colorado pikeminnow is a "big river" fish characteristic of waters deeper than a meter and generally with strong to moderate currents (Minckley 1973). The Colorado pikeminnow occurs in turbid, deep, and strong flowing water (Holden 1977). The Colorado pikeminnow inhabits mainly the larger rivers of the Colorado River system (Tyus 1991) and is adapted to life in highly variable systems with extremes in flow and turbidity (Tyus 1990). Adults are found in a variety of water velocities, at a variety of depths, and over a variety of substrates (Holden and Wick 1982). During high flows associated with runoff, adults often are found in backwaters and flooded bottomlands (Tyus and Karp 1989). Habitats of Colorado pikeminnow include deeper pools, eddies, riffles, slough, quiet backwaters, creek mouths, swift runs, and shallows along shore (Minckley 1991). Colorado pikeminnow are predominate in shoreline habitats and were associated with sandy substrate, however, they also used eddy, run, backwater, and pool habitats and silt boulder, rubble, and gravel substrates (Tyus and McAda 1984). Young Colorado

pikeminnow frequent backwaters over almost any bottom type, where currents are slight or absent (Minckley 1973). Young prefer small, quiet backwaters, adults generally use eddies, runs, or backwaters (Lee et. al. 1981, Minckley 1991). Young of the year, juveniles, and sub-adults occupy shallow backwater areas with little or no current and sand/silt substrates (Holden 1977). Young of the year Colorado pikeminnow are relatively absent from the Yampa River after spawning season but are common in the Green River below the mouth of the Yampa (Tyus and McAda 1984) indicating that the Yampa River is not suitable nursery habitat. Tyus and McAda (1984) reported that the larvae are transported out of the spawning area to more suitable nursery habitat in the Green River. The Colorado pikeminnow inhabits the lowermost reach of Colorado River, which readily passes through canyon reaches, but rarely live there (Minckley 1991).

Key habitat components: Deep riffles and pools.

Breeding Season:

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December

Panel breeding season comments:

Aquatic Habitats:

Large Scale:

- Rivers
- Streams
- Springs
- Spring runs
- Lakes
- Ponds
- Sinkholes
- Cienegas
- Unknown
- Variable

Small Scale:

- Runs
- Riffles
- Pools
- Open Water
- Shorelines

Panel comments on aquatic habitats:

Important Habitat Features (Water characteristics):

Current
- Fast (> 75 cm/sec)
- Intermediate (10-75 cm/sec)
- Slow (< 10 cm/sec)
- None
- Unknown
- Variable

Gradient
- High gradient (>1%)
- Intermediate Gradient (0.25-1%)
- Low Gradient (<0.25%)
- None
- Unknown
- Variable

Water Depth
- Very Deep (> 1 m)
- Deep (0.25-1 m)
- Intermediate (0.1-0.25 m)
- Shallow (< 0.1 m)
- Unknown
- Variable

Panel comments on water characteristics:

Important Habitat Features (Water Chemistry)

Temperature (general)
- Cold Water (4-15°C)
- Cool Water (10-21°C)
- Warm Water (15-27°C)
- Unknown
- Variable

Turbidity
- High
- Intermediate
- Low
- Unknown
- Variable

Conductivity
- Very High (> 2000 µS/cm)
- High (750-2000 µS/cm)
- Intermediate (250-750 µS/cm)
- Low (< 250 µS/cm)
- Unknown
- Variable

Panel comments on water chemistry:

Important Habitat Features (Structural elements):

Substrate
- Bedrock
- Silt/Clay
- Detritus
- Sand
- Gravel
- Cobble
- Boulders
- Unknown
- Variable

Cover
- Rocks, boulders
- Undercut banks
- Woody debris
- Aquatic vegetation
- Rootwads
- Not important
- Overhanging vegetation
- Unknown
- Variable

Panel comments on structural elements:

Diet (narrative)**:**

The Colorado pikeminnow is the "top carnivore" in the Colorado River Basin and one of world's largest minnows, reaching lengths of 6 feet and 200 pounds. Colorado pikeminnow consume a variety of food items, but aquatic insects are the principal part of the diet (Muth and Snyder 1995). Zooplankton is also a particularly important food item for Colorado pikeminnow (Muth and Snyder 1995). Foods of the Colorado pikeminnow in the Green River consist of crustaceans and aquatic dipteran larvae when fish are shorter than 50 mm (Minckley 1973). Young feed mostly on crustaceans and insects, shifting to fishes after becoming longer than 75 to 100 mm (Minckley 1991). An increasing number of aquatic insects, plus terrestrial insects, are taken when the fish is between 50 and 100 mm, and other fishes predominate the diet of Colorado pikeminnow longer than 101 mm (Minckley 1973). Juvenile Colorado pikeminnow feed primarily in quiet backwater areas and side channels, taking insects and crustaceans. Individuals over 200 mm become principally piscivorous (Vanciek 1967, Muth and Snyder 1995) and move out into deeper, swifter main channels (Sublette et. al. 1990). Adult Colorado pike minnows eat other fishes, native and nonnative fishes present (Holden and Wick 1982), probing the water and wander extensively in search for food (Minckley 1991). During flood periods, adults move out of the river channels and occupy flooded bottomlands where they may feed on terrestrial animals (Sublette et. al. 1990).

Diet category (list):

- Planktivore
- Herbivore
- Insectivore
- Piscivore (Fish)
- Omnivore
- Detritivore

Grazing Effects (narrative):

Occupation of deeper riffles and pools in large rivers precludes any direct effect of grazing on this species. Indirect, watershed effects in the form of changes in hydrograph and water quality are conceivable, but not undefinable due to the cumulative effects of many factors affecting large, downstream reaches of the river.

Panel limiting habitat component relative to grazing and comments:
Panel assessment: Is this species a priority for selecting a grazing strategy? Throughout the species' distribution in New Mexico and Arizona YES NO UNKNOWN In key management area(s) YES NO UNKNOWN

Principle Mechanisms Through Which Grazing Impacts This Species (list):

May be Revised

- Alteration of bank structures
- Alteration of substrate
- Alteration of water regimes
- Altered stream channel characteristics
- Altered aquatic vegetation composition
- Altered bank vegetation structure
- Change in food availability
- Change in water temperature
- Change in water quality
- Habitat fragmentation
- Increased turbidity
- Other biotic factors
- Parasites or pathogens
- Population genetic structure loss
- Range improvements
- Trampling, scratching
- Unknown

Panel causal mechanisms comments:

Authors

- **Draft:** Rinne, J.N. and Magaña, H.A.
- **GP 2001:**
- **GP 2002:**
- **Revision:**

Bibliography:

Lee, D. S., Gilbert C. R., Hocutt C. H., Jenkins R. E., Callister D. E., and Stauffer J. R. 1981. Atlas of North American Freshwater Fishes: North Carolina, North Carolina State Museum of Natural History, 1981, c1980.

Marsh, P.C. 1985. Effect of incubation temperature on survival of embryos of native Colorado fishes. The Southwestern Naturalist (30) 1: 129-140.

McAda, C.W. and Kaeding, L.R. 1991. Movements of the Colorado squawfish during spawning season in the Upper Colorado River. Transactions of the American Fisheries Society 120: 339-345.

Minckley, W. L. 1973. Fishes of Arizona. Arizona Game and Fish Department. Phoenix, Arizona. 293 pp.

Minckley, W.L. 1991. Native fishes of arid lands: A dwindling resource of the desert southwest. USDA Forest Service. General Technical Report RM-GTR-206. pp 18.

Muth, R.T. and Snyder, D.E. 1995. Diets of young Colorado squawfish and other small fish in backwaters of the Green River, Colorado and Utah. The Great Basin Naturalist 55 (2): 95-104.

Platania, S.P., Bestgen, K.R., Moretti, B. A., Propst, D.L., and Brooks, J.E. 1991. Status of Colorado squawfish and razorback sucker in the San Juan RIver, New Mexico, and Utah. The Southwestern Naturalist 36 (1): 147-150.

Propst, D. L. 1999. Threatened and endangered fishes of New Mexico. New Mexico Game and Fish Technical Report 1. Santa Fe, New Mexico. 84 pp.

Ryden, D.W. and Ahlm, L.A. 1996. Observations on the distribution of Colorado squawfish, Ptychochelius lucius, in the San Juan River, New mexico, Colorado, and Utah. The Southwestern Naturalist 41 (2): 161-168.

Sublette, J. E., M. D. Hatch, and M. Sublette. 1990. The Fishes of New Mexico. University of New Mexico Press. Albuquerque. 393 pp.

Thompson, P.D., Cavalli, P., and Lentsch, L.D. 1997. Recent captures of Colorado squawfish, *Ptychocheilus lucius*, in the Price River: An example of the importance of tributaries to Colorado squawfish recovery. Proceedings of the Desert Fishes Council 6-9 Nov, 1996. La Paz, Baja California Sur, Mexico.

Tyus, H.M. and McAda, C.W. 1984. Migration, movements, and habitat preferences of Colorado squawfish, *Ptychocheilus lucius*, in the Green, White, and Yamps Rivers, Colorado and Utah. he Southwestern Naturalist 29(3): 289-299.