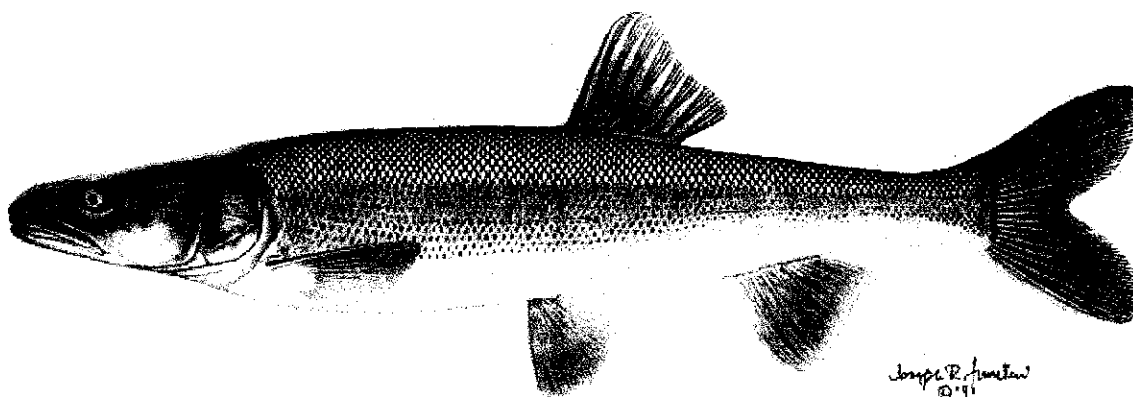


# **EXHIBIT 6**

**COLORADO PIKEMINNOW**  
*(Ptychocheilus lucius)*  
**RECOVERY GOALS**

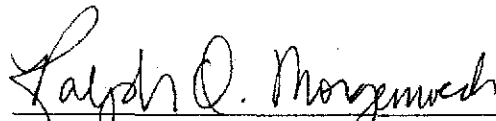


**COLORADO PIKEMINNOW (*Ptychocheilus lucius*)**

**RECOVERY GOALS**  
**Amendment and Supplement to the Colorado Squawfish Recovery Plan**

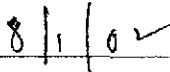
**U.S. Fish and Wildlife Service**  
**Mountain-Prairie Region (6)**  
**Denver, Colorado**

Approved:



Regional Director, Region 6, U.S. Fish and Wildlife Service

Date:



## EXECUTIVE SUMMARY

This document amends and supplements the Colorado Squawfish Recovery Plan of 1991. The common name for this species was changed to Colorado pikeminnow by the American Fisheries Society in 1998. The purpose of this document is to describe site-specific management actions/tasks; provide objective, measurable recovery criteria; and provide an estimate of the time to achieve recovery of the endangered Colorado pikeminnow (*Ptychocheilus lucius*), according to Section 4(f)(1) of the Endangered Species Act of 1973, as amended. Recovery programs that include the Colorado pikeminnow will direct research, management, and monitoring activities and determine costs associated with recovery.

**Current Species Status:** The Colorado pikeminnow is listed as endangered under the Endangered Species Act of 1973, as amended. The species is endemic to the Colorado River Basin of the southwestern United States. Adults attain a maximum size of about 1.8 m total length (TL) and 36 kg in weight. Wild, reproducing populations occur in the Green River and upper Colorado River subbasins of the Upper Colorado River Basin (i.e., upstream of Glen Canyon Dam, Arizona), and there are small numbers of wild individuals (with limited reproduction) in the San Juan River subbasin. The species was extirpated from the Lower Colorado River Basin in the 1970's but has been reintroduced into the Gila River subbasin, where it exists in small numbers in the Verde River.

**Habitat Requirements and Limiting Factors:** The Colorado pikeminnow is a long-distance migrator; moving hundreds of kilometers to and from spawning areas. Adults require pools, deep runs, and eddy habitats maintained by high spring flows. These high spring flows maintain channel and habitat diversity, flush sediments from spawning areas, rejuvenate food production, form gravel and cobble deposits used for spawning, and rejuvenate backwater nursery habitats. Spawning occurs after spring runoff at water temperatures typically between 18 and 23°C. After hatching and emerging from spawning substrate, larvae drift downstream to nursery backwaters that are restructured by high spring flows and maintained by relatively stable base flows. Threats to the species include streamflow regulation, habitat modification, competition with and predation by nonnative fish species, and pesticides and pollutants.

**Recovery Objective:** Downlisting and Delisting.

**Recovery Criteria:** Objective, measurable criteria for recovery of Colorado pikeminnow in the Colorado River Basin are presented for the Upper Colorado River Basin (including the Green River, upper Colorado River, and San Juan River subbasins). Recovery of the species is considered necessary only in the upper basin because of the present status of populations and because existing information on Colorado pikeminnow biology support application of the metapopulation concept to extant populations. The need for self-sustaining populations in the lower basin and associated site-specific management actions/tasks necessary to minimize or remove threats will be reevaluated at the status review of the species, which is conducted at least once every 5 years (provisional recovery criteria for the lower basin are appended). The Colorado pikeminnow was listed prior to the 1996 distinct population segment (DPS) policy. If

lower basin populations are determined necessary for recovery, the Service may conduct an evaluation to designate DPSs in a future rule-making process. If DPSs are designated, these recovery criteria will need to be reevaluated. These recovery goals are based on the best available scientific information, and are structured to attain a balance between reasonably achievable criteria (which include an acceptable level of uncertainty) and ensuring the viability of the species beyond delisting. Additional data and improved understanding of Colorado pikeminnow biology may prompt future revision of these recovery goals.

Downlisting can occur if, over a 5-year period, the upper basin metapopulation is maintained such that: (1) a genetically and demographically viable, self-sustaining population is maintained in the Green River subbasin such that — (a) the trends in separate adult (age 7+;  $\geq 450$  mm TL) point estimates for the middle Green River and the lower Green River do not decline significantly, and (b) mean estimated recruitment of age-6 (400–449 mm TL) naturally produced fish equals or exceeds mean annual adult mortality for the Green River subbasin, and (c) each population point estimate for the Green River subbasin exceeds 2,600 adults (2,600 is the estimated minimum viable population [MVP] needed to ensure long-term genetic and demographic viability); and (2) a self-sustaining population of at least 700 adults (number based on inferences about carrying capacity) is maintained in the upper Colorado River subbasin such that — (a) the trend in adult point estimates does not decline significantly, and (b) mean estimated recruitment of age-6 naturally produced fish equals or exceeds mean annual adult mortality; and (3) a target number of 1,000 age-5+ fish ( $\geq 300$  mm TL); number based on estimated survival of stocked fish and inferences about carrying capacity) is established through augmentation and/or natural reproduction in the San Juan River subbasin; and (4) when certain site-specific management tasks to minimize or remove threats have been identified, developed, and implemented.

Delisting can occur if, over a 7-year period beyond downlisting, the upper basin metapopulation is maintained such that: (1) a genetically and demographically viable, self-sustaining population is maintained in the Green River subbasin such that — (a) the trends in separate adult point estimates for the middle Green River and the lower Green River do not decline significantly, and (b) mean estimated recruitment of age-6 naturally produced fish equals or exceeds mean annual adult mortality for the Green River subbasin, and (c) each population point estimate for the Green River subbasin exceeds 2,600 adults; and (2) either the upper Colorado River subbasin self-sustaining population exceeds 1,000 adults **OR** the upper Colorado River subbasin self-sustaining population exceeds 700 adults and San Juan River subbasin population is self-sustaining and exceeds 800 adults (numbers based on inferences about carrying capacity) such that for each population — (a) the trend in adult point estimates does not decline significantly, and (b) mean estimated recruitment of age-6 naturally produced fish equals or exceeds mean annual adult mortality; and (3) when certain site-specific management tasks to minimize or remove threats have been finalized and implemented, and necessary levels of protection are attained.

Conservation plans will go into effect at delisting to provide for long-term management and protection of the species, and to provide reasonable assurances that recovered Colorado pikeminnow populations will be maintained without the need for relisting. Elements of those

plans could include (but are not limited to) provision of flows for maintenance of habitat conditions required for all life stages, regulation and/or control of nonnative fishes, minimization of the risk of hazardous-materials spills, and monitoring of populations and habitats. Signed agreements among State agencies, Federal agencies, American Indian tribes, and other interested parties must be in place to implement the conservation plans before delisting can occur.

**Management Actions Needed:**

1. Provide and legally protect habitat (including flow regimes necessary to restore and maintain required environmental conditions) necessary to provide adequate habitat and sufficient range for all life stages to support recovered populations.
2. Provide passage over barriers within occupied habitat to allow adequate movement and, potentially, range expansion.
3. Investigate options for providing appropriate water temperatures in the Gunnison River.
4. Minimize entrainment of subadults and adults in diversion canals.
5. Ensure adequate protection from overutilization.
6. Ensure adequate protection from diseases and parasites.
7. Regulate nonnative fish releases and escapement into the main river, floodplain, and tributaries.
8. Control problematic nonnative fishes as needed.
9. Minimize the risk of hazardous-materials spills in critical habitat.
10. Remediate water-quality problems.
11. Provide for the long-term management and protection of populations and their habitats beyond delisting (i.e., conservation plans).

**Estimated Time to Achieve Recovery:** Reliable population estimates, based on a multiple mark-recapture model, are needed for all populations over a 5-year monitoring period for downlisting and over a 7-year monitoring period beyond downlisting in order to achieve delisting. The accuracy and precision of each point estimate will be assessed by the Service in cooperation with the respective recovery or conservation programs, and in consultation with *investigators conducting the point estimates and with qualified statisticians and population ecologists*. First point estimates were completed for all populations in 2001. The Service is reviewing those estimates for reliability, and, if they are accepted by the Service and all recovery criteria are met, downlisting could be proposed in 2006 and delisting could be proposed in 2013. This estimated time frame is based on current understanding of the status and trends of populations and on the monitoring time required to meet the downlisting and delisting criteria.