

**U.S. FISH AND WILDLIFE SERVICE
SPOTLIGHT SPECIES ACTION PLAN**

Common Name: Colorado pikeminnow
Scientific Name: *Ptychocheilus lucius*
Lead Region: Mountain-Prairie Region (Region 6), Denver, Colorado
Lead Field Office: Upper Colorado River Endangered Fish Recovery Program
U.S. Fish and Wildlife Service
P.O. Box 25486, DFC
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Species Information:

Status: Endangered

Recovery Priority Number: The Colorado pikeminnow has a recovery priority number of 8c meaning there is a moderate degree of threats, it has a high degree of recovery potential and it is at the species level taxonomically. The "c" identifies that there is the potential for conflicts between needed recovery actions and economic activities.

Recovery Plan: Colorado pikeminnow (*Ptychocheilus lucius*) Recovery Goals: amendment and supplement to the Colorado Squawfish Recovery Plan (2002).

5-year Review: Initiated April 18, 2007, but not yet completed.

Other:

- Upper Colorado River Endangered Fish Recovery Implementation Program Recovery Action Plan,
- San Juan River Recovery Implementation Program Fiscal Year 2008 Annual Budget and Work Plan, and
- San Juan River Basin Recovery Implementation Program. 2009. Long-range plan. San Juan River Basin Recovery Implementation Program, U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

Threats: Primary Threats to Colorado pikeminnow:

- The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range - Streamflow regulation and associated habitat modification are identified as primary threats to Colorado pikeminnow populations. Regulation of streamflows in the Colorado River System is manifested as reservoir inundation of riverine habitats and changes in flow patterns, sediment loads, and water temperatures. For example, streamflow regulation has generally reduced the magnitude of spring peak flows and increased the magnitude of summer through winter base flows. Since 1950, annual peak flows of the Colorado River in occupied Colorado pikeminnow habitat upstream of Westwater Canyon have decreased by 29–38% (Van Steeter and Pitlick 1998). Flows of the Green River at Jensen, Utah, upstream of principal Colorado pikeminnow nursery habitat, have decreased by 13–35% during spring and increased by 10–140% during summer

through winter due to regulation by Flaming Gorge Dam (Muth et al. 2000). Peak discharge of the San Juan River during the post-dam period (1962–1991) averaged 54% of the spring peak during the pre-dam period (1929–1961), and median monthly flow for the base-flow months of August through February averaged 168% of the pre-dam period (Holden 1999). The effect of flow modifications on Colorado pikeminnow includes reduction in high-velocity flows that flush sediments from spawning cobbles (Van Steeter and Pitlick 1998), reduced channel and habitat complexity and concomitant losses in food production (Osmundson 1999), reduced availability and quality of backwater nursery habitats (Tyus and Karp 1989), and loss of flooded bottomlands during spring runoff as feeding areas and thermal refugia for gonadal maturation (Tyus 1990).

Total Colorado pikeminnow habitat lost to reservoir inundation in the upper basin is about 700 km, including Flaming Gorge Reservoir on the Green River (160 km), Lake Powell (320 km on the Colorado River and 120 km on the San Juan River), and Navajo Reservoir on the San Juan River (100 km). Much of the habitat lost to reservoir inundation cannot be reasonably regained in the near future.

Cold-water releases have eliminated most native fishes from river reaches immediately downstream of dams, except for small numbers of flannelmouth sucker (*Catostomus latipinnis*), bluehead sucker (*C. discobolus*), and speckled dace (*Rhinichthys osculus*) that remain in some tailwaters. River temperatures have been modified from seasonal lows of near freezing and highs of nearly 30°C to relatively constant dam releases of about 4–13°C. Depending on dam elevation, time of year, and river volume, river temperatures may not equilibrate with atmospheric temperatures for nearly 400 km downstream (as in the Colorado River below Glen Canyon Dam). These cold releases have caused reproductive failure and slowed growth of the warm-water native fishes.

Adult Colorado pikeminnow are long distance migratory fish that move to and from spawning sites (Tyus 1990). Historically, the only physical barriers to movement were natural rapids and swift turbulent flows, which were probably only seasonal impediments to fish movement. Since 1905, numerous human-made dams have been constructed throughout the Colorado River

System, fragmenting Colorado pikeminnow habitat and blocking migration corridors. These dams have also reduced river flow, altered water-temperature and flow regimes, trapped sediments and nutrients, changed water quality, and created reservoirs as a source of nonnative fishes (Maddux et al. 1993; Valdez and Muth 2005). In the lower basin, 14 major dams have restricted fish movement through the Colorado, Gila, Salt, and Verde rivers since completion of Hoover Dam in 1935; other dams on the Colorado River include Davis, Parker, Palo Verde Diversion, Imperial, and Laguna. Glen Canyon Dam approximately divides the lower from the upper basin and is also a barrier to fish movement.

- Degraded water quality - Degraded water quality was not identified as a threat to Colorado pikeminnow at the time of listing or in the 1991 Recovery Plan. There are many potential contaminants (e.g., petroleum products, radionuclides, selenium, pesticides, and heavy metals such as mercury) that find their way into the Colorado River System from a variety of sources, but their role in suppressing populations is not always well understood. The downlisting and delisting criteria for Colorado pikeminnow focus on the following water-quality issues because current information indicates that these threaten the species. Selenium contamination is a water-quality factor that may inhibit recovery of Colorado River System endangered fishes by impacting localized portions of populations (U.S. Fish and Wildlife Service 1998b, 2002e). It has been shown to adversely affect reproduction and recruitment in freshwater fish species (Lemly 1996; Hamilton 2003; Holm et al. 2003, 2005; Palace et al. 2004a, 2004b; Hinck et al. 2007), and the effects of selenium on various life stages of Colorado pikeminnow have been investigated (Hamilton 1995; Hamilton et al. 2003, 2004). Levels of selenium contamination in certain reaches of endangered fish critical and occupied river habitat exceed those shown to impact fish and wildlife elsewhere (e.g., Stephens et al. 1992; Stephens and Waddell 1998). Tissue samples from endangered fish in some of these areas (Simpson and Lusk 1999; Osmundson et al. 2008) had selenium concentrations greater than toxicity guidelines for fish muscle tissue suggested by Lemly (1996) and NIWQP (1998) for protection of reproductive health in freshwater fish. The EPA and individual States have water-quality standards for selenium toxicity; the current EPA chronic selenium standards of 5 µg/L total and 4.6 µg/L dissolved are under revision.
- Disease and Predation - Colorado pikeminnow populations in the upper basin live sympatrically with about 20 species of warm-water, nonnative fishes (Tyus et al. 1982; Lentsch et al. 1996) that are potential predators, competitors, and vectors for parasites and diseases. Backwaters and other low-velocity shoreline habitats in alluvial reaches of the upper Colorado, Green, and San Juan rivers are important nursery areas for larval and juvenile Colorado pikeminnow (Tyus 1991; Holden 1999; McAda 2003; Muth et al. 2000), and researchers believe that nonnative fish species in those habitats limit the success of Colorado pikeminnow recruitment (e.g., Muth and Nesler 1993; Bestgen 1997; Bestgen et al. 1997; McAda and Ryel 1999; Valdez et al. 1999).

Smallmouth bass (*Micropterus dolomieu*), northern pike (*Esox lucius*), and channel catfish (*Ictalurus punctatus*) have been identified as the principal nonnative fish species that threaten subadult and adult Colorado pikeminnow in the upper basin. Smallmouth bass escaped Elkhead Reservoir and entered the Yampa River in the early 1990's. The number of smallmouth bass in the middle Yampa River increased dramatically during a dry period between 2001 and 2003. The species is prolific and highly predaceous and possess a threat to small and medium-size native fishes in the Yampa River.

Targets: Our target for the Colorado pikeminnow is a determination that downlisting from endangered to threatened is warranted.

Measures¹: Meet the 3 demographic and 19 recovery factor downlisting criteria listed below:

Downlist criteria

Demographic criteria for downlisting (population demographics in all subbasins must be met in order to achieve downlisting)

Green River Subbasin

1. A self-sustaining population is maintained over a 5-year period, starting with the first point estimates acceptable to the Service, such that:
 - a. the trends in separate adult (age 7+; ≥ 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 3,100 adults (Note: 3,100 adults is the estimated MVP number).

Upper Colorado River Subbasin

2. A self-sustaining population of at least 700 adults (number based on inferences about carrying capacity) is maintained over a 5-year period, starting with the first point estimate acceptable to the Service, such that:
 - a. the trend in adult (age 7+; ≥ 450 mm TL) point estimates does not decline significantly, and

¹ These measures are from draft 2009 revision to the Colorado pikeminnow revised recovery goals. Should the final 2010 revision to the Colorado pikeminnow revised recovery goals differ from the proposed, it may be appropriate to revise this species action plan's measures.

- b. mean estimated recruitment of age-6 (400–449 mm TL) naturally produced fish equals or exceeds mean annual adult mortality.

San Juan River Subbasin

3. A target of 1,000 age-5+ fish (≥ 300 mm TL; number based on estimated survival of stocked fish and inferences about carrying capacity) is established through augmentation and/or natural reproduction.

Recovery factor criteria for downlisting

Factor A.—Adequate habitat and range for recovered populations provided.

1. Flow regimes to benefit Colorado pikeminnow populations in the Green River, upper Colorado River, and San Juan River subbasins identified, implemented, evaluated, and revised, such that:
 - a. Adequate spawning habitat and appropriate spawning cues (e.g., flow patterns and water temperatures) are available to maintain self-sustaining populations, as reflected by downlisting demographic criteria.
 - b. Adequate nursery habitat is available to maintain self-sustaining populations, as reflected by downlisting demographic criteria.
 - c. Adequate juvenile and adult habitat (e.g., cover, resting, and feeding areas) is available to maintain self-sustaining populations, as reflected by downlisting demographic criteria in section.
2. Operation and maintenance of fish passage at Redlands Water and Power Company Diversion, Grand Valley Irrigation Company Diversion, Grand Valley Project Diversion, Craig Diversion, Hogback Diversion, and Public Service Company of New Mexico Weir continued to allow adequate movement of Colorado pikeminnow.
3. Arizona Public Service Company Weir and Fruitland Diversion evaluated and modified (as necessary) to provide fish passage to allow adequate movement of Colorado pikeminnow in the San Juan River.

4. Determination made as to the need for modifying releases from Aspinall Unit dams to increase water temperatures in the Gunnison River to achieve demographic criteria of Colorado pikeminnow for the upper Colorado River subbasin.
5. Operation and maintenance of fish screens on canals at Redlands Water and Power Company Diversion, Grand Valley Irrigation Company Diversion, and Grand Valley Project Diversion continued to minimize entrainment of subadult and adult Colorado pikeminnow.
6. Installation of devices and/or implementation of other measures to minimize entrainment of subadult and adult Colorado pikeminnow initiated at Tusher Wash Diversion and Hogback Diversion.

Factor B.—Protection from overutilization for commercial, recreational, scientific, or educational purposes.

7. Overutilization of Colorado pikeminnow for commercial, recreational, scientific, or educational purposes reevaluated and, if necessary, actions identified to ensure adequate protection.

Factor C.—Adequate protection from diseases and predation.

8. Effects of diseases and parasites on Colorado pikeminnow populations reevaluated and, if necessary, actions identified to ensure adequate protection.
9. Procedures developed, implemented, evaluated, and revised for stocking nonnative fish species in the Upper Colorado River Basin (including the San Juan River subbasin) to minimize negative interactions between nonnative fishes and Colorado pikeminnow.
10. Control programs for small-bodied nonnative fishes in backwater nursery habitats in river reaches occupied by young Colorado pikeminnow developed and implemented to identify levels of control that will minimize negative interactions.
11. Channel catfish control programs in river reaches occupied by Colorado pikeminnow developed and implemented to identify levels of control that will minimize negative interactions.
12. Northern pike control programs in reaches of the Yampa and middle Green rivers occupied by Colorado pikeminnow developed and implemented to identify levels of control that will minimize negative interactions.

13. Centrarchid control programs (e.g., smallmouth bass, largemouth bass, green sunfish, etc.) in reaches of the Upper Colorado River Basin (i.e., Yampa, Middle Green, Upper Colorado rivers) occupied by Colorado pikeminnow developed and implemented to identify levels of control that will minimize negative interactions.

Factor D.—Adequate existing regulatory mechanisms.

14. Mechanisms determined for legal protection of adequate habitat.
15. Elements of conservation plans identified that are necessary to provide for the long-term management and protection of Colorado pikeminnow populations.

Factor E.—Other natural or manmade factors for which protection has been provided.

16. State and Federal hazardous-materials spills emergency-response plans reviewed and modified to ensure adequate protection for Colorado pikeminnow populations from hazardous-materials spills.
17. Locations of all petroleum-product pipelines within the 100-year floodplain of critical habitat identified and the need for emergency shut-off valves assessed.
18. Actions implemented for remediation of groundwater contamination at the Atlas Mills tailings pile located near Moab, Utah.
19. Appropriate selenium remediation plans, which include monitoring fish populations dynamics and selenium concentrations, developed and implemented for river reaches where selenium contamination is at levels that (based on weight-of-evidence) would adversely affect Colorado pikeminnow reproduction and recruitment, and progress toward reducing deleterious levels of selenium demonstrated.

Actions: The Upper Colorado River Endangered Fish Recovery Implementation Program Recovery Action Plan, for all four species, and the San Juan River Recovery Implementation Program Fiscal Year 2008 Annual Budget and Work Plan, for Colorado pikeminnow and razorback sucker, identify the recovery actions, timeframes, responsible parties, and estimated annual costs to meet the downlisting recovery criteria.

Identify responsible parties for the actions: The partners (responsible parties) for the Upper Colorado River Endangered Fish Recovery Program are: U.S. Fish and Wildlife

Service; U.S. Bureau of Reclamation; National Park Service; Western Area Power Administration; State of Colorado; State of Utah; State of Wyoming; The Nature Conservancy; Western Resource Advocates; Colorado Water Congress; Utah Water Users Association; Wyoming Water Development Association; and Colorado River Energy Distributors Association. The partners (responsible parties) for the San Juan River Basin Recovery Implementation Program are: State of Colorado; State of New Mexico; Jicarilla Apache Nation; Navajo Nation; Southern Ute Indian Tribe; Ute Mountain Ute Tribe; Bureau of Indian Affairs; Bureau of Land Management; Bureau of Reclamation; The Nature Conservancy; U.S. Fish and Wildlife Service; and, Water Development Interests.

Estimated costs of the actions:

Estimated cost to achieve downlisting of the Colorado pikeminnow during the 5-year downlist period is \$23.5 million or about \$4.7 million per year. This cost estimate is based on annual base funding and capital construction costs.

The annual base funding is based on expenditures for fiscal year 2008 of approximately \$6.3 million for the Upper Colorado River Endangered Fish Recovery Program (UCREFRP) and approximately \$2.5 million for the San Juan River Recovery Implementation Program (SJRRIP). The UCREFRP is working to recover four species (Colorado pikeminnow, humpback chub, razorback sucker, and bonytail); whereas, the SJRRIP is working to recover two species (Colorado pikeminnow and razorback sucker). For the purpose of estimating the annual costs of Colorado pikeminnow recovery, the species was allocated one-fourth of the UCREFRP annual expenditures or about \$1.6 million, and one-half of the SJRRIP annual expenditures or about \$1.3 million for a total of about \$2.9 million per year in base funding.

In addition to the base funding, there are capital construction costs that are necessary for structures and facilities (e.g., hatcheries, fish passages, fish screens). Many of these costs have already been incurred, but an additional \$12 million of capital costs is estimated for the SJRRIP and \$15 million for the UCREFRP from 2008 through 2023. The total of \$27 million in capital costs adds about \$1.8 million per year to the annual base funding of \$2.9 or about \$4.7 million per year in total estimated expenditures. These annual costs are projected for the 9-year downlist and delist periods because most of the management actions necessary to achieve recovery are ongoing, long-term activities that may change through adaptive management.

Costs of specific management actions for recovery is impracticable to estimate because these actions are dynamic and applied uniquely by each recovery program. Experience shows that these management actions will be revised through adaptive management, and action-related priorities and costs will change over time. Also, because the recovery programs of the Upper Colorado River Basin recovery unit are working to recover up to four endangered species, many management actions and tasks for one species are the same or similar for the other species. Therefore, it is not practical to assign costs to each specific action for each species. Therefore, estimated costs of achieving recovery as described in these recovery goals are apportioned by the number of species that each

recovery program is working to recover. These actual and projected expenditures are considered to be the most reliable estimate of costs available.

The UCREFRP and SJRRIP operate under similar recovery elements that include management actions that are consistent with the recovery goals. The long-range operational plan for the UCREFRP is the Recovery Implementation Program Recovery Action Plan (RIPRAP) which is updated annually. A Long-Range Plan and annual work plans define actions implemented by the SJRRIP (SJRRIP 2008). Each recovery program maintains a comprehensive web site: <http://www.coloradoriverrecovery.org> and <http://www.fws.gov/southwest/sjrip/>.

Role of other agencies: The Upper Colorado River Endangered Fish Recovery and San Juan River Basin Recovery Implementation Programs have a broad range of partners – and an even broader range of supporters. Recovery Program partners recognize and have embraced the fact that collaboration and broad grassroots support are essential given the Upper Colorado River Basin’s complex and significant habitat changes, continuing additional demands on water resources, and the long-term commitments required for species’ recovery efforts. Each partner fully participates in developing and implementing management actions leading toward delisting of the endangered Colorado River fishes.

Role of other ESA programs: Section 7 consultation plays a strong role in the Upper Colorado River Endangered Fish Recovery Program and the San Juan River Basin Recovery Implementation Program. A Section 7 Consultation, Sufficient Progress, and Historic Projects Agreement (Section 7 Agreement) and a Recovery Implementation Program Recovery Action Plan (RIPRAP) were developed (available on the Recovery Program website: see above) to establish a framework for conducting section 7 consultations on depletion impacts related to new projects and impacts associated with existing projects in the upper basin. Procedures outlined in the Section 7 Agreement are used to determine if sufficient progress is being accomplished in the recovery of endangered fishes to enable the Recovery Program to serve as a reasonable and prudent alternative to avoid the likelihood of jeopardy and/or adverse modification of critical habitat and to provide ESA compliance for new and existing projects. The San Juan Program has a similar agreement. Together, the recovery programs provide ESA compliance for more than 1,700 water projects depleting more than 3 million acre-feet of water per year.

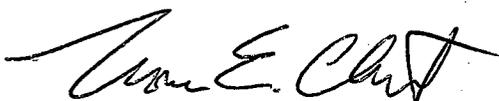
Role of other FWS programs: Hatchery-produced, genetically diverse stocked fish form the foundation to reestablish a naturally self-sustaining population of Colorado pikeminnow in the San Juan River. The Dexter National Fish Hatchery provides Colorado pikeminnow to meet the 2003 stocking plan. In addition, the Mountain-Prairie Region’s Water Resources Division provides critical support in managing water releases to benefit the endangered fishes.

Additional funding analysis: The Upper Colorado River Endangered Fish Recovery Program and the San Juan River Basin Recovery Implementation Program have cost-sharing agreements with their partners and receive significant funding through

Congressional authorization of both capital and base funds. Base funding of up to \$6 million per year (adjusted annually for inflation) comes from Colorado River Storage Project power revenues. Through these mechanisms, funding is provided to meet most of the needs of these programs to implement the activities believed necessary to recover Colorado pikeminnow (and the other three listed endangered fishes) in the upper Colorado River basin. Additional funding potentially beyond the recovery programs' capacity may be needed for selenium research and remediation, research and remediation on other contaminants (e.g., mercury, pharmaceuticals), and nontraditional approaches to nonnative fish management (e.g., genetic biocontrol).

Cost estimates are not yet available for these activities; however, the Bureau of Reclamation will be developing and implementing a Selenium Management Program (SMP), in cooperation with the State of Colorado and Gunnison River basin water users to reduce adverse effects of selenium on endangered fish species in the Gunnison and Colorado rivers. The SMP will incorporate and accelerate ongoing selenium reduction efforts in the Uncompahgre Valley and other areas of the Gunnison Basin and will add several new elements. The overall long-term goal of the program is to assist in species recovery per the Recovery Goals. Reclamation will seek supplemental funding (subject to appropriation) to assist in implementing all facets of the SMP. The initial goal of the program will be to meet the Colorado water quality standard for selenium in critical habitat in the Gunnison and Colorado Rivers. The long term goal will be to sufficiently improve water quality conditions by reducing selenium to assist in recovery of the Colorado pikeminnow and razorback sucker.

Although precise estimates of the future impacts of climate change to runoff throughout the Colorado River Basin at appropriate spatial scales are not currently available, these impacts may include decreased mean annual flow and increased variability, including more frequent and more severe droughts. Even without precise knowledge of the effects on runoff, increasing temperatures alone would likely increase evaporation, transpiration and sublimation, resulting in reduced runoff. The recovery programs' existing adaptive management processes will respond to new knowledge and ongoing monitoring will evaluate the physical response of habitat and biological response of the endangered fish to flow regimes.


Thomas E. Chart, Program Director

10/01/09
Date

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