

Bonytail *(**Gila elegans**)*

5-Year Review: Summary and Evaluation

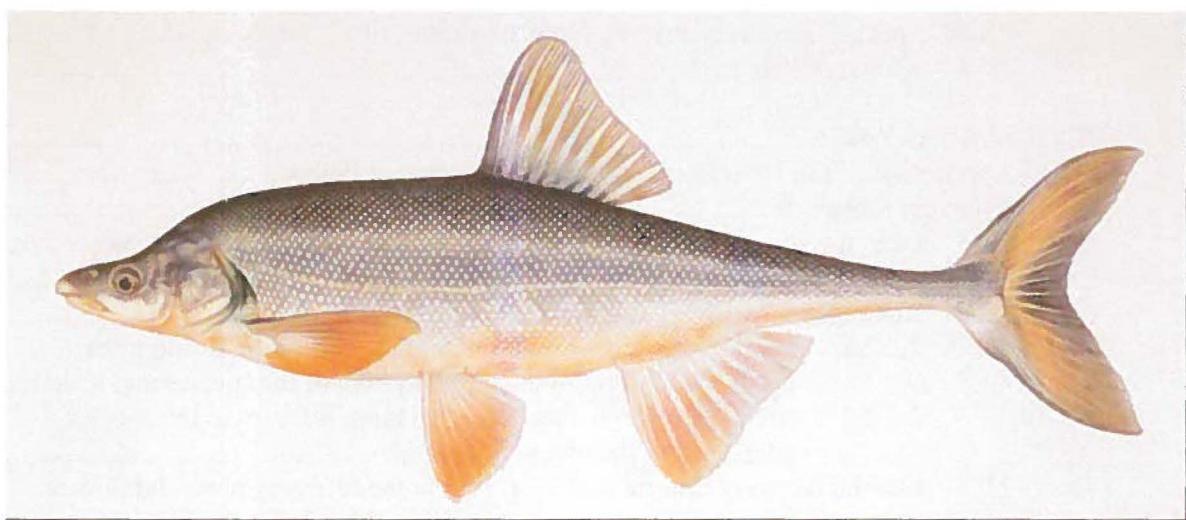


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**U.S. Fish and Wildlife Service
Upper Colorado River Endangered Fish Recovery Program
Denver, Colorado**

July 2012

5-YEAR REVIEW

Species reviewed: Bonytail (*Gila elegans*)

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5-YEAR REVIEW

Bonytail/*Gila elegans*

1.0 GENERAL INFORMATION

1.1 Purpose of 5-year Reviews

The U.S. Fish and Wildlife Service (Service) is required by Section 4(c)(2) of the Endangered Species Act (ESA) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing as endangered or threatened is based on the species' status considering the five threat factors described in Section 4(a)(1) of the ESA. These same five factors are considered in any subsequent reclassification or delisting decisions. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process including public review and comment.

1.2 Reviewers

Lead Regional Office: Mountain-Prairie Region (6)

Michael Thabault, Assistant Regional Director-Ecological Services, 303/236-4210

Bridget Fahey, Chief-Endangered Species, 303/236-4258

Seth Willey, Regional Recovery Coordinator, 303/236-4257

Lead Field Office:

Upper Colorado River Endangered Fish Recovery Program

Thomas Chart, Program Director, 303/969-7322 ext. 226

Cooperating Field Offices:

Ecological Services Field Sub-Office, Grand Junction, Colorado

Patty Gelatt, Assistant Field Supervisor, 970/243-2778

Colorado River Fisheries Program, Grand Junction, Colorado

Dale Ryden, Field Supervisor, 970/245-9319 ext.19

Utah Ecological Services Field Office, Salt Lake City, Utah

Larry Crist, Field Supervisor, 801/975-3330 ext. 126

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Mark Sattelberg, Field Supervisor, 307/772-2374 ext. 34

Arizona Fish and Wildlife Conservation Office, Whiteriver, Arizona
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Arizona Ecological Services Office, Phoenix, Arizona
Steve Spangle, Field Supervisor, 602/242-0210 ext. 244

Nevada Fish and Wildlife Office, Reno, Nevada
Ted Koch, Field Supervisor, 775/861-6331

Cooperating Regional Offices:

Southwest Region (Region 2)

Michelle Shaughnessy, Assistant Regional Director-Ecological Services, 505/248-6920
Susan Jacobsen, Chief-Endangered Species, 505/248-6641
Wendy Brown, Regional Recovery Coordinator, 505/248-6664

Pacific Southwest Region (Region 8)

Michael Fris, Assistant Regional Director-Ecological Services, 916/414-6464
Michael Long, Chief-Listing, Recovery & Environmental Contaminants, 916/414-6478
Larry Rabin, Deputy Chief-Listing, Recovery & Environmental Contaminants, 916/414-6464

1.3 Methodology Used to Complete the Review

On April 18, 2007, we published a Notice of Review in the Federal Register (72 FR 19549) soliciting any new information on the bonytail that may have a bearing on its classification as endangered or threatened. Fewer than 20 people/agencies provided comments. All substantive comments and issues raised were considered. This 5-year review was primarily written by the Upper Colorado River Endangered Fish Recovery Program (UCREFRP) Office with substantive contributions and review by cooperating field and regional offices. It summarizes and evaluates information provided in the recovery goals, current scientific research, and surveys related to the species. All pertinent literature and documents on file at the UCREFRP Office were used for this review (see References section below for cited documents). Interviews with individuals familiar with bonytail were conducted as needed to clarify or obtain specific information.

1.4 Background

1.4.1 Federal Register Notice Citation Announcing Initiation of This Review

72 FR 19549; April 18, 2007

1.4.2 Listing History

Original Listing

FR notice: 45 FR 27710

Date listed: April 23, 1980

Entity listed: Chub, bonytail; *Gila elegans*

Classification: Endangered rangewide

1.4.3 Associated Rulemakings

59 FR 13374; March 21, 1994 - Critical Habitat Designated

1.4.4 Review History

Historic 5-year reviews for all species, including bonytail, were initiated by the Service's Washington, D.C. office in 1985, and 1991 (50 FR 29901, July 22, 1985; 56 FR 56882, November 6, 1991). The bonytail's status also was considered in the 1990 recovery plan and 2002 recovery goals (Service 1990; 2002).

1.4.5 Species' Recovery Priority Number at Start of 5-year Review:

The bonytail has a recovery priority number (RPN) of 5C. This rank indicates that the bonytail: faces a high degree of threat; has a low recovery potential; is listed at the species level; and there is the potential for conflicts between needed recovery actions and economic activities (see TABLE 1 below).

1.4.6 Recovery Plan

Name of plan: Bonytail (*Gila elegans*) Recovery Goals: amendment and supplement to the Bonytail Chub Recovery Plan.

Date approved: August 1, 2002

Dates of previous revisions, if applicable: September 4, 1990

TABLE 1. Recovery Priority Numbers Ranking System. The above ranking system for determining RPNs was established in 1983 (48 FR 43098, September 21, 1983, as corrected in 48 FR 51985, November 15, 1983).

Degree of Threat	Recovery Potential	Taxonomy	Priority	Conflict
High	High	Monotypic Genus	1	1C
		Species	2	2C
		Subspecies/DPS	3	3C
	Low	Monotypic Genus	4	4C
		Species	5	5C
		Subspecies/DPS	6	6C
Moderate	High	Monotypic Genus	7	7C
		Species	8	8C
		Subspecies/DPS	9	9C
	Low	Monotypic Genus	10	10C
		Species	11	11C
		Subspecies/DPS	12	12C
Low	High	Monotypic Genus	13	13C
		Species	14	14C
		Subspecies/DPS	15	15C
	Low	Monotypic Genus	16	16C
		Species	17	17C
		Subspecies/DPS	18	18C

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment Policy

This section of the 5-year review is not applicable to this species because the bonytail was not listed as a Distinct Population Segment (DPS) nor is there relevant new information for this species regarding the application of the DPS policy. For the time being, we believe continued listing at the species level is the most appropriate way to manage this listed species under the ESA. This issue will be further evaluated in the recovery plan, including consideration of whether potential DPSs could be delisted independently once recovery is achieved in each unit.

2.2 Recovery Criteria

Recovery plans provide guidance to the Service, States, and other partners and interested parties on ways to minimize threats to listed species, and on criteria that may be used to determine when recovery goals are achieved. There are many paths to accomplishing the recovery of a species and recovery may be achieved without fully meeting all recovery plan criteria. For example, one or more criteria may have been exceeded while other criteria may not have been accomplished. In that instance, we may determine that, over all, the threats have been minimized sufficiently, and the species is robust enough, to downlist or delist the species. In other cases, new recovery approaches and/or opportunities unknown at the time the recovery plan was finalized may be more appropriate ways to achieve recovery. Likewise, new information may change the extent that criteria need to be met for recognizing recovery of the species. Overall, recovery is a dynamic process requiring adaptive management, and assessing a species' degree of recovery is likewise an adaptive process that may, or may not, fully follow the guidance provided in a recovery plan. We focus our evaluation of species status in this 5-year review on progress that has been made toward recovery since the species was listed (or since the most recent 5-year review) by eliminating or reducing the threats discussed in the five-factor analysis. In that context, progress towards fulfilling recovery criteria serves to indicate the extent to which threat factors have been reduced or eliminated.

Bonytail recovery is planned to occur basinwide within the Colorado River basin, but Glen Canyon Dam separates the upper and lower basins into two recovery units. Three programs in the Colorado River Basin are working to recover or conserve bonytail. The UCREFRP is a coordinated effort of State and Federal agencies, water users, energy distributors, and environmental groups to recover four endangered fishes in the upper basin downstream to Glen Canyon Dam, excluding the San Juan River. The Native Fish Work Group is a conservation program coordinating efforts of State and Federal agency biologists, as well as university staffs and volunteers, to conserve and protect bonytail. The Lower Colorado River Multi-Species Conservation Program (LCRMSCP) is a conservation program aimed at protecting sensitive, threatened, and endangered species of fish, wildlife, and their habitat. The bonytail is one of many species covered by this program.

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

- Yes
 No

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?

 Yes
X No

We recommend revising the Service's 2002 bonytail recovery goals (2002) to more clearly recognize that re-established populations will likely fluctuate in the abundance of adults over time. The Service also should re-evaluate repatriation stocking efforts and the results of recent research / monitoring to better understand the effectiveness of recovery actions.

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?

X Yes
 No

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information.

The current status of bonytail is endangered. Only the downlisting criteria are considered in this 5-year status review to determine if status can be changed (downlisted) from endangered to threatened. The delisting criteria will be used when the species is removed from the list, i.e., from threatened to recovered. Analysis of each criterion is provided in italics directly below the criterion. Recovery of the species is considered basinwide, where re-established populations are being developed. The downlisting recovery criteria are from the 2002 revision to the species' recovery goals (Service 2002).

DEMOGRAPHIC DOWNLISTING CRITERIA FOR BONYTAIL

Bonytail were once widespread throughout the Colorado River and its tributaries. Currently, no self-sustaining populations of bonytail exist in the wild, and few individuals have been caught throughout the basin.

Upper Basin Recovery Unit Criterion 1a. In the Green River Subbasin, a self-sustaining population is maintained over a 5-year period, starting with the first point estimate acceptable to the Service,¹ such that the trend in adult (age 4+; ≥ 250 millimeters [mm] total length [TL]) point estimates does not decline significantly.

¹ 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.

Status of Upper Basin Recovery Unit Criterion 1a. This criterion has not been met. While stocking has been occurring for over a decade, no self-sustaining population has been established.

Upper Basin Recovery Unit Criterion 1b. In the Green River Subbasin a self-sustaining population is maintained over a 5-year period, starting with the first point estimate acceptable to the Service, such that mean estimated recruitment of age-3 (150–249 mm TL) naturally produced fish equals or exceeds mean annual adult mortality.

Status of Upper Basin Recovery Unit Criterion 1b. This criterion has not been met. While augmentation has been occurring for over a decade, recruitment of age-3 fish to adult (age-4) has not been realized; therefore, the population is not considered self-sustaining.

Upper Basin Recovery Unit Criterion 1c. In the Green River Subbasin, a self-sustaining population is maintained over a 5-year period, starting with the first point estimate acceptable to the Service, such that each point estimate exceeds 4,400 adults (Note: 4,400 is the estimated minimum viable population [MVP] number).

Status of Upper Basin Recovery Unit Criterion 1c. This criterion has not been met. While augmentation has been occurring for over a decade, the recapture of stocked fish has been small. Tagged fish have been detected where remote PIT-tag antennas operate, such as the Stirrup floodplain in the middle Green River and Price-Stubb fish ladder on the upper Colorado River, which demonstrates that survival of stocked fish is occurring. Fish that have been recently stocked are often encountered through other projects, some of these have had heavy Lernea or fungal infections (Bestgen et al. 2008). However, too few fish have been captured to estimate the population size. Based on these surveys, it is reasonable to assume we have a population well below 4,400 adults.

Upper Basin Recovery Unit Criterion 2a. In the Upper Colorado River Subbasin a self-sustaining population is maintained over a 5-year period, starting with the first point estimate acceptable to the Service, such that the trend in adult (age 4+; ≥ 250 mm TL) point estimates does not decline significantly.

Status of Upper Basin Recovery Unit Criterion 2a. This criterion has not been met. While augmentation has been occurring for over a decade, no self-sustaining population has been established.

Upper Basin Recovery Unit Criterion 2b. In the Upper Colorado River Subbasin a self-sustaining population is maintained over a 5-year period, starting with the first point estimate acceptable to the Service, such that mean estimated recruitment of age-3 (150–249 mm TL) naturally produced fish equals or exceeds mean annual adult mortality.

Status of Upper Basin Recovery Unit Criterion 2b. This criterion has not been met. While augmentation has been occurring for over a decade, recruitment of age-3 fish to adult (age-4) has not been realized; therefore, the population is not considered self-sustaining.

Upper Basin Recovery Unit Criterion 2c. In the Upper Colorado River Subbasin, a self-sustaining population is maintained over a 5-year period, starting with the first point estimate acceptable to the Service, such that each point estimate exceeds 4,400 adults (MVP).

Status of Upper Basin Recovery Unit Criterion 2c. *This criterion has not been met. While augmentation has been occurring for over a decade, the recapture of stocked fish has been small. As many as 22 individuals have been captured at selective fish ladders in the Upper Colorado River Subbasin (Burdick 2011a). Unfortunately, too few fish have been captured to estimate population size.*

Lower Basin Recovery Unit Criterion 1. Genetic variability of bonytail is identified and a genetic refuge (e.g., in Lake Mohave, Lake Havasu, or other suitable locations) is maintained over a 5-year period.

Status of Lower Basin Recovery Unit Criterion 1. *This criterion has been met. Dexter National Fish Hatchery and Technology Center maintains a genetic refuge for bonytail. Production of bonytail for repatriations into the upper and lower basins is done under a draft genetic management plan (Service 2004). A second broodstock has been authorized and will be developed over the next several years, as a precaution against a catastrophic event that may destroy the primary broodstock.*

Lower Basin Recovery Unit Criterion 2a. Two self-sustaining populations (e.g., mainstem and/or tributaries) are maintained over a 5-year period, starting with the first point estimate acceptable to the Service, such that for each population the trend in adult (age 4+; \geq 250 mm TL) point estimates does not decline significantly.

Status of Lower Basin Recovery Unit Criterion 2a. *This criterion has not been met. While augmentation has been occurring in several reaches of the Lower Colorado River, no self-sustaining population has been established. Attempts are being made to re-establish bonytail populations in reaches 2 (Lake Mohave), 3 (Lake Havasu) and 4/5 (Parker Dam to Imperial Dam). In addition, rearing ponds located adjacent to Lakes Mohave and Havasu are being used to grow fish to larger sizes prior to stocking. Efforts are showing a small success in Lake Havasu following telemetry studies (LCRMSCP 2011) and reports of angler captures of bonytail (Fitzpatrick 2011, pers. comm.).*

Lower Basin Recovery Unit Criterion 2b. Two self-sustaining populations (e.g., mainstem and/or tributaries) are maintained over a 5-year period, starting with the first point estimate acceptable to the Service, such that for each population mean estimated recruitment of age-3 (150–249 mm TL) naturally produced fish equals or exceeds mean annual adult mortality.

Status of Lower Basin Recovery Unit Criterion 2b. *This criterion has not been met. While augmentation has been occurring, recruitment of age-3 (to adult age-4) fish has not been realized (Mueller et al. 2005). Therefore, no self-sustaining populations exist in the Lower Basin Recovery Unit.*

Lower Basin Recovery Unit Criterion 2c. Two self-sustaining populations (e.g., mainstem and/or tributaries) are maintained over a 5-year period, starting with the first point estimate acceptable to the Service, such that for each population each point estimate exceeds 4,400 adults (MVP).

Status of Lower Basin Recovery Unit Criterion 2c. This criterion has not been met. While augmentation has been occurring for many years, the number of stocked fish recaptures remains low.

RECOVERY FACTOR DOWNLISTING CRITERIA FOR BONYTAIL TO MINIMIZE OR REMOVE THREATS TO THE SPECIES

UPPER BASIN RECOVERY UNIT

Factor A — Adequate habitat and range for recovered populations is provided. It is believed that bonytail once inhabited the larger rivers of the Colorado River Basin from Wyoming and Colorado to northwestern Mexico. The bonytail was reported in decline following a period of dam construction throughout the Colorado River Basin. Cold-water releases downstream of dams have created temperature regimes outside the thermal preferences of bonytail and eliminated turbid conditions that historically provided cover from predators. Seven barriers are identified in the upper basin upstream of Glen Canyon Dam within occupied habitat of bonytail. Like many of the *Gila* genus, bonytail are thought to migrate to natal spawning areas; therefore, maintenance of streamflow is important to this species' recovery and conservation.

Criterion 1. Flow regimes to benefit bonytail populations in the Green River and Upper Colorado River Subbasins are 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.
- b) Adequate nursery habitat is available to maintain self-sustaining populations.
- c) Adequate juvenile and adult habitat (e.g., cover, resting, and feeding areas) are available to maintain self-sustaining populations.

Status of Criterion 1. Criterion 1 has been partially met. Flow recommendations have been developed throughout the Green River Subbasin (Irving et al. 2004 [White River]; Muth et al. 2000 [Green River]; Modde and Keleher 2003 [Duchesne River]; Modde et al. 1999 [Yampa River]); and the Upper Colorado River Subbasin (Osmundson et al. 1995 [15-mile reach]; McAda 2003 [upper Colorado and Gunnison Rivers]). These flow recommendations are being implemented and monitored by the UCREFRP. A Green River study plan has been developed (Green River Study Plan ad hoc Committee 2007) to determine the response of endangered fish to the implemented flow recommendations downstream of Flaming Gorge Dam. The UCREFRP collaborated with the Colorado River Water Conservancy District (District) and the City of Craig, Colorado, on the enlargement of Elkhead Reservoir in the Yampa River drainage and

thereby secured 5,000 acre-feet of "fish water" (with the option to lease an additional 2,000 acre-feet annually) to augment Yampa River baseflows. Since the enlargement was completed in 2007, the "fish water" has been delivered every year. Although the necessary flows have been identified and implemented, they are still under evaluation and may need to be revised.

Since 1997, the District, Northern Colorado Water Conservancy District, Denver Water, and Bureau of Reclamation have coordinated with the Service to deliver in excess of 1 million acre-feet of water to assist in the recovery of the endangered fish in the 15-mile reach of the Colorado River near Grand Junction during base flow (TABLE 2). These volumes of water have resulted in increased river flows on average of 282 cubic feet per second (cfs) to a maximum of 1,156 cfs during critical low flow and warm temperature periods of late summer.

TABLE 2. Coordinated water releases to benefit endangered fish in the Colorado River, Colorado, 1997–2011.

RESERVOIRS	ACRE-FEET
Windy Gap	3,718
Willow Creek	9,852
Granby	39,914
Palisade Bypass	93,038
Williams Fork	89,342
Wolford Mountain	137,879
Ruedi	272,287
Green Mountain	532,000
Total	1,178,030

Criterion 2. Passage over Redlands Diversion and Grand Valley Diversion continues to allow adequate movement of bonytail in the upper Colorado River and Gunnison River.

Status of Criterion 2. Criterion 2 has been met. A 350-foot long, U-shaped fish passage at the Redlands Water and Power Company Diversion Dam on the Gunnison River was completed in 1996. The passage restored access to 50 miles of critical habitat for the endangered fish. To date, 108 Colorado pikeminnow (*Ptychocheilus lucius*), 27 razorback sucker (*Xyrauchen texanus*), 1 bonytail, 1 humpback chub (*Gila cypha*), and over 97,000 other native fish have used the passage (Burdick 2011b).

A 300-foot long, rock channel fish passage at the Grand Valley Irrigation Company Diversion Dam on the Colorado River became operational in 1998. Unlike the fish passage structure at the Redlands diversion, this fish passage is a "non-selective" passage, meaning that all fish species are allowed to move through it. A gate was installed in 2007 to remotely open and close the passage. The elevation of the pond can be adjusted and adequately maintained at user

selected set-points by adjusting the pressure in the air bladders within the system control range (full inflation to full deflation). These passages continue to be operated and allow adequate movement of bonytail.

Criterion 3. Modify the Price-Stubb Dam and Government Highline Dam to allow adequate movement of bonytail in the upper Colorado River.

Status of Criterion 3. *Criterion 3 has been met. Construction was completed on Price-Stubb Dam of a passive non-selective fish passage structure and began functioning on March 20, 2008.*

Construction of a 373-foot long concrete fish passage at the Grand Valley Project Diversion Dam (also referred to as the Government Highline Dam) on the Colorado River was completed in 2005. The structure provides selective passage for native fish only at this historic dam across the Colorado River. During trial operations in 2005 and 2006, 1 razorback sucker, 3 humpback chubs, and about 14,000 other native fish moved upstream. Beginning in 2008, the passage has operated from the spring through the fall, passing 1 razorback sucker in 2008 and over 37,300 native fish for both years (Burdick 2011a).

Criterion 4. Investigations are initiated on the feasibility of modifying releases from Aspinall Unit dams to increase water temperatures in the Gunnison River that would allow for upstream range expansion of bonytail.

Status of Criterion 4. *Criterion 4 has been partially met. Osmundson (1999) recommended a feasibility study for increasing Gunnison River temperatures near Delta, Colorado, by modification of outlet structures on the Aspinall Unit dams. A 2-phased study completed in 2004 suggested temperature could be modified through the timing of release through Crystal Dam (Hydrosphere Resource Consultants 2001, 2004; Boyer and Cutler 2004). This feasibility study indicated that the installation of a multi-level outlet would be needed at Blue Mesa Reservoir to create a measurable warming effect in the Gunnison River at Delta, Colorado. However, the authors recommended that additional temperature data be collected to address uncertainty associated with their results. Those additional data have been / are being collected. For the time being, the Upper Colorado River Program has determined that the expense of retrofitting Blue Mesa dam with a multi-level outlet is not worth the limited amount of recovery benefit.*

Criterion 5. Measures are identified to minimize entrainment (incidental trapping of fish in waters being diverted for irrigation) of subadult and adult bonytail at problematic diversion structures.

Status of Criterion 5. *Criterion 5 has been partially met. Screens are in place and operated at Grand Valley Irrigation Company (since 2002), Grand Valley Project (since 2004), and Redlands Diversion (since 2007). The Recovery Program is still considering screening the Tusher Wash diversion on the Green River. No other problematic diversion structures are known at this time.*

Criterion 6. Habitats necessary for the establishment and maintenance of bonytail populations in the Green River and upper Colorado River Subbasins are identified.

Status of Criterion 6. *Criterion 6 has not been met.* Habitat requirements for bonytail are uncertain. Bonytail are currently being stocked in alluvial reaches of the river and floodplains in an attempt to increase their survival. Recaptures are low from fish stocked in or upstream of canyon habitats. Bottomland sites were identified and either acquired or had easements made in perpetuity. These sites are being managed to benefit the endangered fish (Valdez and Nelson 2004, 2006).

Factor B — Protection from overutilization for commercial, recreational, scientific, or educational purposes. Overutilization of bonytail for commercial, recreational, scientific, or educational purposes is not currently considered a threat to the species. Bonytail have no commercial or recreational value and are not sought by commercial fishermen or anglers. Collection of bonytail for scientific or educational purposes is regulated by the Service under the ESA.

Criterion 7. Overutilization of bonytail for commercial, recreational, scientific, or educational purposes re-evaluated and, if necessary, actions identified to ensure adequate protection.

Status of Criterion 7. *Criterion 7 has been met.* No commercial or recreational activities exist. Scientific activities are minimal and not considered a threat. Educational activities are minimal and do not threaten bonytail.

Factor C — Adequate protection from diseases and predation. Diseases and parasites are not considered to be significant by themselves in the decline of the bonytail.

A large number of nonnative fishes are found in historic and currently occupied habitat of bonytail. Nonnative species are a major cause for lack of recruitment in bonytail. A Strategic Plan for Nonnative Fish Control was developed for the Upper Colorado River. Control of the release and escapement of nonnative fishes into the main river, floodplain, and tributaries also is a necessary management action to stop the introduction of new fish species into occupied habitats and to thwart periodic escapement of highly predaceous nonnatives from riverside features. Three management actions are identified to reduce the threat of nonnative fishes including: high spring flows to disadvantage spawning activities, nonnative fish control strategies, and stocking agreements. Active control programs should be implemented or continued for problematic nonnative fishes in bonytail nursery habitats (potentially flooded bottomlands), such as small-bodied cyprinids, northern pike (*Esox lucius*) in the middle Green River, and channel catfish (*Ictalurus punctatus*) in river reaches occupied by bonytail.

Criterion 8. Effects of diseases and parasites on bonytail populations are re-evaluated and, if necessary, actions identified to ensure adequate protection.

Status of Criterion 8. *Criterion 8 has not been met.* The effects of disease and parasites on bonytail populations have not been re-evaluated. Bestgen et al. (2008) noted many stocked bonytail at large less than 4 months had *Lernaea* or fungal infections.

Criterion 9. Procedures are developed, implemented, evaluated, and revised for stocking nonnative fish species in the Upper Colorado River Basin to minimize negative interactions between nonnative fishes and bonytail.

Status of Criterion 9. Criterion 9 has been partially met. Nonnative fish stocking procedures for the Green River and Colorado River Subbasins were initially developed in 1996 and modified in 2009 (Service 1996; 2009). Colorado Parks and Wildlife intend to implement the revised procedures in 2012. Once implemented, we will need to evaluate the effectiveness in minimizing negative interactions between nonnative fish and bonytail.

Criterion 10. Control programs for small-bodied nonnative fishes in nursery habitats in river reaches occupied by young bonytail are developed and implemented to identify levels of control that will minimize predation.

Status of Criterion 10. Criterion 10 has been partially met. Small-bodied cyprinid (e.g., bluegill [*Lepomis macrochirus*], green sunfish [*Lepomis cyanellus*], and redear sunfish [*Lepomis microlophus*]) control studies indicate that reduction in the numbers of small-bodied cyprinids only lasted for a short period of time (Trammel et al. 2004). In a reset floodplain (inundated after dewatering), survival of larval bonytail at high and low densities in the presence of age-0 nonnative fish was 1.7% and 1.3% respectively, while survival in the control enclosure without nonnative fish was 17.1% (Christopherson et al. 2004; Brunson and Christopherson 2005). Growth rates for fish from both densities were 0.8 mm/day. Control through resetting of the floodplain wetland may not always be possible in high water years, therefore, other forms of control should be considered.

Criterion 11. Channel catfish control programs in river reaches occupied by bonytail are developed and implemented to identify levels of control that will minimize predation.

Status of Criterion 11. Criterion 11 has been partially met. Various attempts to mechanically remove channel catfish (Fuller 2009; Badame and Jones 2009) in the Upper Colorado River Basin have had minimal effects on channel catfish populations. The Upper Colorado River program has shifted focus to nonnative smallmouth bass and northern pike, which were found to have a larger bioenergetic impact on native fish communities (Johnson et al. 2008).

Criterion 12. Northern pike control programs in reaches of the Yampa and middle Green Rivers occupied by bonytail are developed and implemented to identify levels of control that will minimize negative interactions.

Status of Criterion 12. Criterion 12 has been partially met. Interim Yampa River Nonnative Fish Removal Criteria have been developed, and a Yampa River Nonnative Fish Control Strategy (Valdez et al. 2008) is being implemented. A control program for northern pike in the Yampa River was initiated in 1999, and removal of northern pike in the middle Green River was initiated in 2001. Based on trends in catch rates of subsequent years, removal efforts have been successful at significantly reducing the number of northern pike in the middle Green River. Control efforts since 2003 have resulted in the capture of less than 40 northern pike and as a result, total effort was reduced to only a maintenance level beginning in 2005 (Skorupski and

Breen 2011). Northern pike control in the Yampa and Green Rivers is specifically implemented through four ongoing projects by the UCREFRP. Northern pike are removed whenever encountered during all other UCREFRP projects.

Factor D — Adequate existing regulatory mechanisms. Implementation of regulatory mechanisms is necessary for recovery of the bonytail and to ensure long-term conservation of the species. After removal from the list of threatened and endangered species and from protection by the ESA, the bonytail and its habitat will continue to receive consideration and some protection through the following Federal laws and related State statutes: National Environmental Policy Act; Clean Water Act; Organic Act; and Fish and Wildlife Coordination Act.

The need for conservation plans and agreements is identified in these recovery goals to provide reasonable assurances that recovered bonytail populations will be maintained.

Criterion 13. Mechanisms are determined for legal protection of adequate habitat.

*Status of Criterion 13. Criterion 13 has been partially met. Filing for legal rights to protect water for fish would be junior to the legal rights of others that have already claimed water for irrigation and power. Utah is currently reviewing the water rights from Flaming Gorge Reservoir and how they may be modified for fish protection. See also Recovery Factor downlisting Status of Criterion 1 above. Full implementation of the nonnative fish stocking procedures and agreed upon content of a nonnative fish basinwide strategy are necessary mechanisms to aid in the protection of habitat. Recognition of the problem is exemplified by Utah in instituting a “must kill” policy on smallmouth bass and burbot (*Lota lota*) that enlists the help of anglers to remove them if caught in the Green River. In addition, Wyoming increased the penalty for “stocking fish without consent to” \$10,000 and the loss of fishing and hunting privileges for life. Not all mechanisms for habitat protection have been explored, for instance, channel and flow manipulations.*

Criterion 14. Elements of conservation plans are identified that are necessary to provide for the long-term management and protection of bonytail populations.

Status of Criterion 14. Criterion 14 has not been met. Conservation plans and the necessary elements have not been developed.

Factor E — Other natural or manmade factors for which protection has been provided. The present levels of hybridization among *Gila* species is not considered a threat to the species, but this factor will be re-evaluated at downlisting because there will be enough bonytail and other *Gila* in the system to determine impacts. Any necessary actions to reduce deleterious levels of hybridization will be implemented before and after delisting.

Many potential contaminants (e.g., petroleum products, radionuclides, selenium, pesticides, and heavy metals such as mercury) enter into the Colorado River Basin from a variety of sources, but their role in affecting populations is not generally well understood. Potential spills of petroleum products threaten wild populations of bonytail. All States have hazardous materials spills emergency response plans that provide a quick cleanup response to accidental spills.

Another cause of degraded water quality is the Atlas Mills tailings pile located on the north bank of the Colorado River near Moab, Utah. There are significant threats to endangered fish posed by the Atlas Mills tailings pile: toxic discharges of pollutants, particularly ammonia, and the risk of catastrophic pile failure.

Criterion 15. Risk of hybridization to bonytail populations is evaluated and, if necessary, actions identified to minimize the risk.

*Status of Criterion 15. Criterion 15 has not been met. The risk of hybridization with other *Gila* spp. and bonytail has not been evaluated. Populations of wild reproducing bonytail need to be established before this determination can be made.*

Criterion 16. State and Federal hazardous materials spills emergency response plans are reviewed and modified to ensure adequate protection for bonytail populations from hazardous materials spills.

Status of Criterion 16. Criterion 16 has not been met. The hazardous-materials spills emergency-response plans have not been reviewed or modified.

Criterion 17. Locations of all petroleum-product pipelines within the 100-year floodplain of critical habitat identified and the need for emergency shut-off valves is assessed.

Status of Criterion 17. Criterion 17 has been partially met. Although some progress has been made in locating all petroleum-product pipelines, the determination of emergency shut-off valves has not been fully assessed. The Service now requires (via Section 7 consultation) that new pipelines crossing the rivers are equipped with emergency shut-off valves.

Criterion 18. Actions are identified for remediation of groundwater contamination at the Atlas Mills tailings pile located near Moab, Utah.

Status of Criterion 18. Criterion 18 has been met. Under the Moab Uranium Mill Tailings Remedial Action Project Site Record of Decision (70 FR 55358), the action identified for remediation of groundwater contamination (principally ammonia) at the Atlas Mills tailings pile located near Moab, Utah, was to move the tailings pile to Crescent Junction, Utah. The pile is currently in the process of being moved and ground-water remediation (a very long-term commitment) is underway.

LOWER BASIN RECOVERY UNIT

Factor A — Adequate habitat and range for recovered populations is provided. Streamflow regulation and associated habitat modification are identified as primary threats to bonytail. The decline of the species throughout the basin is attributed largely to extensive habitat loss, modification, fragmentation, and blocked fish passage associated with dam construction and operations. Bonytail were once abundant through most of the Colorado River Basin and a major cause of decline has been loss of a contiguous complement of habitats used by the various life history phases. Maintenance of streamflow is important to the ecological integrity of large western rivers.

Criterion 1. Flow regimes necessary for the establishment and maintenance of bonytail populations in the mainstem and/or tributaries are 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.
- b) Adequate nursery habitat is available to maintain self-sustaining populations.
- c) Adequate juvenile and adult habitats (e.g., cover, resting, and feeding areas) are available to maintain self-sustaining populations.

Status of Criterion 1. Criterion 1 has not been met. Flows on the lower Colorado River are determined through dam releases in accordance with agreements and interstate compacts that do not consider the habitat needs of bonytail. The ability of current and future river flow management to provide the needed habitat features without changes in flows will require additional research and monitoring.

Criterion 2. Measures are identified to minimize entrainment of subadult and adult bonytail at problematic diversion and/or out-take structures.

Status of Criterion 2. Criterion 2 has not been met. Locations where entrainment could occur on the lower Colorado River were identified in the LCRMSCP and a portion of the stocking of bonytail into the river is intended to offset any losses from entrainment. However, measures to minimize such entrainment of subadult or adult bonytail from problematic diversion or take out structures have not been identified.

Criterion 3. Habitats are identified that are necessary for the establishment and maintenance of bonytail populations in the mainstem and/or tributaries.

Status of Criterion 3. Criterion 3 has been partially met. Riverside sites have been identified and opportunities are being assessed (Service 2005; LCRMSCP 2011). Cooperative agreements are in place to provide development of riverside sites, including long-term monitoring and support.

Factor B — Protection from overutilization for commercial, recreational, scientific, or educational purposes. Overutilization of bonytail for commercial, recreational, scientific, or educational purposes is not currently considered a threat to the species. Bonytail have no commercial or recreational value and are not sought by commercial fishermen or anglers; however, on Lake Havasu bonytail are occasionally captured by anglers near the mouth of the Bill Williams River (Service data). Signs are posted at fishing access points around the lake with photographs of bonytail and instructions to release any captured alive and report the capture to the Service or State game and fish agency. Collection of bonytail for scientific or educational purposes is regulated by the Service under the ESA.

Criterion 4. Overutilization of bonytail for commercial, recreational, scientific or educational purposes re-evaluated and, if necessary, actions identified to ensure adequate protection.

Status of Criterion 4. Criterion 4 has been met. *No commercial or deliberate recreational activities exist. Educational activities are minimal and do not threaten bonytail. Scientifically, mortality was independent of handling; however, bonytail recaptured in hoopnets multiple times had significantly lower growth than those not handled (Paukert et al. 2005). Trammel net captures at temperatures 20°C or greater result in delayed mortality of bonytail (Hunt 2008). Researchers recommend that sampling with trammel nets should stop when water temperatures are 20°C or greater. In the Lower Basin, individual fish are taken occasionally by fishermen in Lake Havasu, but not considered a threat.*

Factor C — Adequate protection from diseases and predation. Diseases and parasites are not considered to be significant by themselves in the decline of the bonytail.

A large number of nonnative fishes are found in historic and currently occupied habitat of bonytail. Nonnative species are a major cause for lack of recruitment in the native fishes, particularly bonytail. Control of the release and escapement of nonnative fishes into the main river, floodplain, and tributaries also is a necessary management action to stop the introduction of new fish species into occupied habitats and to thwart periodic escapement of highly predaceous nonnatives from riverside features.

Criterion 5. Effects of diseases and parasites on bonytail populations are re-evaluated and, if necessary, actions identified to ensure adequate protection.

Status of Criterion 5. Criterion 5 has not been met. *The effects of diseases and parasites on bonytail populations have not been re-evaluated. The parasitic crustacean anchor worm (*Lernaea* sp.) and fungal infections may affect populations being re-established because the individuals come from clean facilities and must develop an immunity once released to the wild. In the Upper Basin, Bestgen et al. (2008) noted many stocked bonytail at large less than 4 months had *Lernaea* or fungal infections.*

Criterion 6. Procedures are developed, implemented, evaluated, and revised for stocking and to minimize escapement of nonnative fish species into the mainstem, floodplain, and tributaries to minimize negative interactions between nonnative fishes and bonytail.

Status of Criterion 6. Criterion 6 has not been met. *No procedures have been developed for stocking or minimizing the escapement of nonnative fish species in the Lower Colorado River Basin.*

Criterion 7. Control programs for problematic nonnative fishes in the mainstem, floodplain, and tributaries are developed and implemented to identify levels of control that will minimize negative interactions between nonnative fishes and bonytail.

Status of Criterion 7. *Criterion 7 has not been met.* No control programs have been developed for problematic nonnative fish to minimize negative interactions between nonnative fishes and bonytail in the Lower Colorado River Basin.

Factor D — Adequate existing regulatory mechanisms. Implementation of regulatory mechanisms is necessary for recovery of the bonytail and to ensure long-term conservation of the species. After removal from the list of threatened and endangered species and from protection by the ESA, the bonytail and its habitat will continue to receive consideration and some protection through the following Federal laws and related State statutes: National Environmental Policy Act; Clean Water Act; Organic Act; and Fish and Wildlife Coordination Act.

The need for conservation plans and agreements is identified in these revised recovery goals to provide reasonable assurances that recovered bonytail populations will be maintained.

Criterion 8. Mechanisms are determined for legal protection of adequate habitat.

Status of Criterion 8. *Criterion 8 has been partially met.* The LCRMSCP has focused on securing partnerships with resource agencies to ensure adequate land and water resources were available to create habitat and provide for its long-term maintenance. Eleven conservation areas are now in the program or being considered for inclusion. These conservation areas are distributed over 276 river miles from Laughlin, Nevada, to the boundary with Mexico and include over 200 acres of marsh and 15 acres of backwater dedicated to native fish. Mechanisms to adequately control nonnative species need to be more fully explored.

Criterion 9. Elements of conservation plans are identified that are necessary to provide for the long-term management and protection of bonytail populations.

Status of Criterion 9. *Criterion 9 has been met.* The Lower Colorado River Management Plan (Service 2005) provides for the long-term management and protection of bonytail populations in the lower Colorado River. This signatory document among the Service and the States of Arizona, California, and Nevada for the management of big-river fish in the Lower Colorado River Basin provides management strategies for genetic and habitat protection, along with population management.

Factor E — Other natural or manmade factors for which protection has been provided. Intergrades among the Colorado River *Gila* have been reported by several investigators. The present levels of hybridization among *Gila* species are not considered a threat to the species, but this factor will be re-evaluated at downlisting and any necessary actions to reduce deleterious levels of hybridization will be implemented before and after delisting.

Criterion 10. Risk of hybridization to bonytail populations evaluated and, if necessary, actions identified to minimize the risk.

Status of Criterion 10. *Criterion 10 has not been met.* The risk of hybridization between other *Gila* species and bonytail has not been evaluated, but is likely very low because other *Gila* species are not distributed in areas where bonytail is being recovered in the lower basin.

2.3 Synthesis

Recovery is based on reduction or removal of threats and improvement of the demographic status of a species. Recovery is achieved when management actions and associated tasks have been implemented and/or completed to allow genetically and demographically viable, self-sustaining populations to thrive under minimal ongoing management and investment of resources. Achievement of recovery does not mandate returning a species to all or a significant portion of its historic range, nor does it mandate establishing populations in all possible habitats, or everywhere the species can be established or re-established.

Bonytail evolved in warm-water reaches of large rivers of the Colorado River Basin from Mexico to Wyoming. At the time of listing, habitat losses were documented, but the threats to bonytail were poorly understood, and distribution and abundance of the species were not well known. The decline of the species was probably due to a combination of threats, including direct loss of habitat, changes in flow and temperature, and blockage of migration routes by the construction of large reservoirs. In addition, interaction with nonnative fish may have decimated bonytail in many areas, including waters not affected by dams.

Recovery of bonytail is considered basinwide, with the basin being separated into an upper basin and lower basin recovery unit. The analysis above of the demographic criteria has shown that 1 of 10 has been met, none have been partially met, and 9 have not been met (TABLE 3). Thus, the species has not yet achieved the demographic recovery goals we identified as likely to be indicative of healthy, viable, and sustainable population levels. From the analysis above of the recovery factor criteria, 6 of the 28 downlisting recovery factor criteria have been met; 11 have been partially met, and 11 have not been met. Thus, the majority of the most meaningful threats remain unresolved including providing adequate habitat, protection from predation and protection from degraded water quality. These factors continue to act upon the species both inhibiting the ability of the species to achieve its demographic goals and, thus, precluding achievement of recovery and delisting. Although the category “has been partially met” is identified, this is only to reflect that some progress is being made on that particular criterion. Since the majority of demographic (9 out of 10) and recovery factor downlisting criteria (22 out of 28) have not been completely met, threats remain and populations remain unsustainably low and the species still qualifies for the status of endangered (“any species which is in danger of extinction throughout all or a significant portion of its range—” Section 3.6 of the ESA); no change in status of bonytail is recommended. The definition of endangered applies here until the demographic criteria are met and the threats minimized or removed.

TABLE 3. Summary of the downlisting demographic and recovery factor criteria in the Colorado River Basin and a determination if the criteria have been met, partially met, or not met for analyzing whether bonytail can be downlisted.

CRITERIA FOR DOWNLISTING	Has Been Met	Has Been Partially Met	Has Not Been Met
Demographic			
Upper Colorado River Subbasin			1a, 1b, 1c, 2a, 2b, 2c
Lower Colorado River Subbasin	1		2a, 2b, 2c
Upper Basin Recovery Factors			
Recovery Factor A	2, 3	1, 4, 5	6
Recovery Factor B	7		
Recovery Factor C		9, 10, 11, 12	8
Recovery Factor D		13	14
Recovery Factor E	18	17	15, 16
Lower Basin Recovery Factors			
Recovery Factor A		3	1, 2
Recovery Factor B	4		
Recovery Factor C			5, 6, 7
Recovery Factor D	9	8	
Recovery Factor E			10

3.0 RESULTS

3.1 Recommended Classification

X No change is needed; remain as endangered.

3.2 New Recovery Priority Number: Imminent threats of habitat modification, predation by nonnative fish, and potential spills or leaching of environmental contaminants still remain high for bonytail. Bonytail is taxonomically classified as a species and represents a distinctive gene pool. Bonytail has a low recovery potential because its biological and ecological limiting factors along with threats are poorly understood. In addition, intensive management is required with uncertain probability of success. Under the 1983 “Endangered and Threatened Species Listing and Recovery Priority Guidance” (45 FR 43098) these three qualities result in a RPN of “5.” Also, bonytail, as with the other three endangered fish of the Colorado River basin, are designated with a “C” after their RPN to indicate they are in conflict with development projects, such as water diversions or dam construction, and affect economic activities within the basin. Hence, no change in the RPN of “5C” is recommended.

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

The UCREFRP and the LCRMSCP continue to work on meeting the recovery criteria to minimize or remove threats to the bonytail in their respective areas. These programs develop annual work plans through adaptive management (Recovery Implementation Program Recovery Action Plan, and Work Plan and Budget, respectively) to minimize and remove threats to the bonytail and thus, achieve the recovery criteria. Improving augmentation programs to re-establish populations and meeting recovery criteria, the demographics of the species should improve.

We recommend revising the Service's 2002 bonytail recovery goals to incorporate information on population dynamics and other relevant information gathered since 2002. More specifically, the as-written Recovery Goal requirement that these populations always display positive recruitment (i.e., recruitment that is greater than adult mortality) contradicts the best available information that indicates these re-established populations likely will experience fluctuations.

Uncertainty surrounding the effects of climate change to the bonytail should be considered for each of the threats as those impacts are realized. For example, the potential for alteration of flows in the basin as a result of climate change should at least be mentioned in the recovery goals. Climate change could have large impacts on the basin's aquatic ecosystem, resulting in (but not limited to):

- Change in the timing of peak flows from an earlier snowmelt;
- Change in the size of peak flows because of altered snowpacks; and
- Higher water temperatures from increased air temperature.

Not only could climate change affect the ecology of the species because of the factors listed above, but it also would greatly affect the management of the programs through changes in politics and economics, such as:

- Greater evaporation losses in the larger reservoirs may reduce flexibility of operations; and
- Drier conditions in the basin may cause irrigators to call on their water rights more often or request more water rights.

Therefore, we recommend that the recovery programs collaborate with their respective Landscape Conservation Cooperatives as means to address the challenges associated with climate change on the appropriate scale.

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**U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Bonytail***

Current Classification: Endangered rangewide

Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
 Uplist to Endangered
 Delist
 No change needed

Review Conducted By: Upper Colorado River Endangered Fish Recovery Program Office

FIELD OFFICE APPROVAL:

Upper Colorado River Endangered Fish Recovery Program Office

Approve

Thomas Chart, Program Director

Date 8/21/12

LEAD REGIONAL OFFICE APPROVAL:

Mountain-Prairie Region (Region 6)

Approve

Michael Thabault, ARD-Ecological Services

Date 8/21/12

COOPERATING REGIONAL OFFICES:

Southwest Region (Region 2)

Concur

Do Not Concur

Signature

*Acting
for*

Michelle Shaughnessy, ARD-Ecological Services

Date 8/24/12

Pacific Southwest Region (Region 8)

Concur

Do Not Concur

Signature

Michael Fris, ARD-Ecological Services

Date 8/30/12