Bonytail Reintroduction and Status Report to Colorado Legislators per HB00-1314

Colorado Parks and Wildlife
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The bonytail (*Gila elegans*) is one of the most endangered fish species in the US. Native only to the Colorado River Basin, it was once common and widely distributed in the warmwater portions of the basin, but declined to near-extinction by the mid-1970s. It has been listed as endangered under the federal Endangered Species Act (ESA) since 1980. From 1976 to 1988, 34 bonytail were captured and brought into hatcheries. These fish and their progeny are the source of all captive breeding and reintroduction efforts.

Bonytail recovery efforts in the Colorado River Basin above Lake Powell are coordinated by the Upper Colorado River Endangered Fish Recovery Program (UCRIP or Program). A partnership of state and federal agencies, water and power interests, and environmental groups, the UCRIP exists to recover four federally listed fish species while enabling water development to proceed in compliance with state water law, interstate compacts, and the ESA.

Upper Colorado River Basin

Major, basin-wide actions on behalf of these fishes include flow augmentation, habitat improvement, construction of fish passages and entrainment screens at water diversion structures, non-native fish control, and endangered fish propagation and stocking. All these efforts have measurably improved status of the other three species under the UCRIP, and presumably benefit bonytail. Progress toward bonytail recovery has been slower and more limited, likely because it was the most imperiled when recovery efforts began. However, in recent years biologists have observed encouraging signs.

Role of propagation and stocking

Hatchery propagation and stocking are obligatory for recovery, given that bonytail are functionally extinct in the wild. Additionally, because the species' life history was virtually unknown when it disappeared, biologists are trying to ascertain its preferred habitat and other requirements by observing the behavior of stocked fish.

At least 35,000 age-2+ bonytail averaging 250 millimeters (roughly 10 inches) in length are stocked annually throughout the Upper Colorado Basin, in accordance with a basin-wide Integrated Stocking Plan (revised 2015). CPW's Mumma Native Aquatic Species Restoration Facility (NASRF) produces at least 5,000 of these fish annually, which are stocked within Colorado. The remainder are reared in federal hatcheries and stocked primarily in Utah. Once they are in the system, stocked fish may move among rivers or across state boundaries.

2018 stocking within Colorado occurred as follows:

Date	Location	Number	Average length
6/19/2018	Yampa River within Dinosaur National Monument	2,592	328 mm / 12.9 in.
7/17/2018	Salt Creek, tributary to Colorado River near Fruita	763	312 mm / 12.3 in.
9/25/2018	Debeque Canyon, Colorado River	2,504	307 mm / 12.1 in.

All fish are implanted with a Passive Integrated Transponder (PIT) tag prior to stocking. Similar to a microchip for livestock or pet animals, this tag individually identifies the fish, and can be detected with a hand scanner if the fish is recaptured in the wild, and also by antennas that the UCRIP has deployed in at least a dozen locations throughout the basin. These data enable biologists to estimate survival rates and growth rates, and gain insight into movement patterns and habitat preferences. Biologists regularly sample the major rivers in the basin specifically to monitor status of the endangered fish, and re-encounter bonytail incidentally during other recovery actions such as non-native fish removal.

Recovery goals and status

The US Fish and Wildlife Service's demographic criteria for de-listing the bonytail require genetically and demographically viable, self-sustaining populations in the Colorado and Green River sub-basins (additional populations are required in the Lower Colorado Basin). A population size of 4,400 adults was estimated to be sufficient to ensure genetic diversity and resiliency to unfavorable conditions (demographic viability), with the two populations providing redundancy should a catastrophic event impact a basin.

Although roughly 350,000 bonytail have been stocked since 1996, only about .01% of these have been recaptured a year or more post-stocking, indicating poor long-term survival. There is also no evidence of the progeny of stocked fish surviving to adulthood, a necessary condition for a self-sustaining population. Biologists are experimenting with multiple aspects of the rearing and stocking regimes in an effort to improve survival. Factors under evaluation include permutations of the hatchery diet, flow training to condition fish for the river environment, size of fish at stocking, and timing and location of stocking.

In the most promising development, wild-spawned young-of year bonytail were first collected in 2015, and subsequently in 2016 and 2017 (though none in 2018). These fish were captured in Stewart Lake, a large wetland in eastern Utah that seasonally connects to the Green River at higher flows. Wetlands of this type, occurring mainly in Utah, are important rearing habitat for several native fish species of the Upper Colorado Basin including other endangered Colorado River fishes. This important discovery not only shows that stocked fish can acclimate to the system well enough to reproduce, but also that the system still affords suitable spawning conditions and habitat. Survival of wild-spawned fish to age-1+ has not been documented, but the likelihood will increase if more adults persist long enough to spawn.

Wild-spawned bonytail captured at Stewart Lake, UT

Also noteworthy are preliminary findings on tributary use by adult bonytail. Anecdotally, initial stocking into tributaries may be associated with better long-term survival, athough small sample size precludes any statistical evaluation. To investigate this and related life-history questions, CPW biologists (with cooperation of the Bureau of Land Management and concurrence of the UCRIP) have released bonytail and deployed PIT antennas in Salt Creek northwest of Grand Junction. Results to date have not shown a link between higher survival and tributary stocking. However, an unexpected number of bonytail were detected in the stream that had not previously been re-encountered (captured or detected by antennas). From 2015-2017, 70 bonytail were detected moving into and out of Salt Creek, nearly all of which were initially stocked into the Colorado River up to 50 miles away (an unsurprising distance for this highly mobile species). Notably, four of these fish had been at large, undetected for over a year, and only three have been subsequently detected elsewhere, though none apparently remained in Salt Creek. Collectively these observations, while preliminary, suggest that survival in the wild may be somewhat underestimated due to non-detection, and illustrate the value of diversifying the types of habitat sampled.

Endangered fish recovery and water development

Under the Cooperative Agreement establishing the UCRIP, the Program has broad latitude to determine and direct recovery actions, contingent upon an annual assessment of progress and finding of sufficiency by the US Fish and Wildlife Service. Under this unique arrangement, the Program has provided ESA compliance for 1,232 water projects in Colorado depleting more than 2.1 million acre-feet per year.

Under its authorizing federal legislation, the Program will expire September 30, 2023. Partners concede that at least some of the endangered fish, particularly the bonytail, will not be fully recovered by that date, and discussions are underway to determine a post-2023 approach.

Previous bonytail stocking

Colorado Revised Statute 33-2-105.6 (II) provides that bonytail reintroduction "shall be conducted consistent with the five-year stocking plan for endangered Colorado river fish species in Colorado, as approved [by the UCRIP in 1998] or as may be amended." In 2015 the UCRIP amended the stocking plan to increase the number and size of bonytail stocked, and encourage stocking in more diverse locations. The revisions had little practical effect in Colorado, as NASRF was already producing fish of the newly recommended size, and biologists continue to judiciously select stocking locations based on the best available data.

495 mm bonytail reared at NASRF

The table below lists all stocking events within Colorado since the reintroduction effort began.

Date	Location	Number	Avg. length (in.)
7/13/2000	Green River at Echo Park, Dinosaur National Monument	11080	4.48
3/23/2001	Green River at Echo Park, Dinosaur National Monument	13000	3.19
4/18/2001	Colorado River, Debeque Canyon	7000	3.19
10/4/2002	Green River at Echo Park, Dinosaur National Monument	8464	8.84
10/10/2002	Green River at Echo Park, Dinosaur National Monument	4962	8.22
4/8/2003	Colorado River, Grand Valley to state line	885	8.56
10/7/2003	Green River at Echo Park, Dinosaur National Monument	1593	8.13
5/24/2004	Colorado River, Grand Valley to state line	2587	8.70
9/12/2004	Green River at Echo Park, Dinosaur National Monument	3673	8.48
9/16/2004	Green River at Echo Park, Dinosaur National Monument	3000	9.53
9/20/2004	Colorado River, Grand Valley to state line	2547	9.06
6/9/2005	Green River at Echo Park, Dinosaur National Monument	2580	8.97
6/15/2005	Colorado River, Grand Valley to state line	2567	8.86
9/8/2006	Colorado River, Grand Valley to state line	2271	9.39
9/20/2006	Green River at Echo Park, Dinosaur National Monument	1598	8.83
9/21/2007	Colorado River, Grand Valley to state line	1449	8.31
9/21/2007	Colorado River, Grand Valley to state line	1451	8.82
9/27/2007	Green River at Echo Park, Dinosaur National Monument	2730	8.90
11/20/2007	Pond near Colorado - Gunnison confluence (grow-out)	4181	3.76
9/18/2008	Green River at Echo Park, Dinosaur National Monument	4900	8.61
11/15/2008	Colorado River, Grand Valley to state line	3243	10.22
8/12/2009	Pond near Colorado - Gunnison confluence (grow-out)	199	6.94
8/12/2009	Pond near Colorado - Gunnison confluence (grow-out)	913	10.91
8/12/2009	Pond near Colorado - Gunnison confluence (grow-out)	451	3.81
10/15/2009	Green River at Echo Park, Dinosaur National Monument	2707	9.61
11/5/2009	Colorado River, Grand Valley to state line	1576	10.65
11/5/2009	Colorado River, Debeque Canyon	1000	10.41
6/17/2010	Pond near Colorado - Gunnison confluence (grow-out)	1017	9.86
9/23/2010	Green River at Echo Park, Dinosaur National Monument	2813	10.58
6/24/2011	Pond near Colorado - Gunnison confluence (grow-out)	1237	11.49
8/2/2011	Colorado River, Debeque Canyon	1462	11.49
9/9/2011	Colorado River, Debeque Canyon	1430	9.83
10/18/2011	Colorado River, Debeque Canyon	1277	9.83
11/3/2011	Green River at Echo Park, Dinosaur National Monument	2833	9.76
8/1/2012	Green River at Echo Park, Dinosaur National Monument	2831	11.27
8/30/2012	Colorado River, Debeque Canyon	2720	10.26
8/13/2013	Colorado River, Debeque Canyon	2934	11.94
9/19/2013	Green River at Echo Park, Dinosaur National Monument	2466	12.12
11/25/2013	I-70 Divide Pond (grow-out)	14363	3.09
11/25/2013	I-70 Divide Pond (grow-out)	25875	5.14
7/31/2014	Yampa River within Dinosaur National Monument	3034	12.13
8/21/2014	Colorado River, Debeque Canyon	2407	10.33

8/11/2015	Green River at Echo Park, Dinosaur National Monument	2713	12.17
9/10/2015	Colorado River, Debeque Canyon	2255	13.05
11/19/2015	Salt Creek	525	12.33
8/10/2016	Colorado River, Debeque Canyon	2711	12.66
9/7/2016	Yampa River within Dinosaur National Monument	2796	12.81
11/16/2016	Mack Wash	520	13.48
8/10/2017	Yampa River within Dinosaur National Monument	2321	12.23
9/6/2017	Colorado River, Debeque Canyon	2344	12.35
11/14/2017	Salt Creek	507	12.63
6/19/2018	Yampa River within Dinosaur National Monument	2,592	12.92
7/17/2018	Salt Creek	763	12.27
9/25/2018	Colorado River, Debeque Canyon	2,504	12.10