COLORADO RIVER RECOVERY PROGRAM Project No.: C-6-bt
FY-2002-2003 PROPOSED SCOPE OF WORK for:

Evaluation of middle Green River floodplains for the restoration of bonytail

Lead Agency: U. S. Fish and Wildlife Service

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Category:
___ Ongoing project
___ Ongoing-revised project
___ Request new project
_X_ Unsolicited new project

Expected Funding Source:
_X_ Annual funds
___ Capital funds
___ Other (explain)

I. Title: Evaluation of middle Green River floodplains for the restoration of bonytail

II. Relationship to RIPRAP:
Green River Action Plan: Mainstem
II.A.2.a Identify and evaluate floodplain sites (Restore habitat)
IV.A.1.c. Implement Augmentation Plan (bonytail)

III. Study Background/Rationale and Hypotheses: Because little is known of its life history, efforts to recover bonytail have been hampered. Even the question of what habitats they occupied is unclear. Prior to mainstem impoundments bonytail were widespread among the larger rivers of the Colorado River basin (Jordan and Evermann 1896). Most recent captures of bonytail in the upper Colorado River basin were made in high gradient, canyon reaches (summarized by Valdez et al. 2001). However, historical records suggest bonytail may have been more abundant in alluvial reaches. Bonytail were reported in

alluvial reaches of the Colorado River in the Grand Valley (Ellis 1914, Jordan 1891), and Green River (McDonald and Dotson 1960). Based on historical accounts, bonytail were captured by anglers in the alluvial reaches of the Colorado River near Palisade and Moab in the early 20th century (Quartarone 1993). Because bonytail declined so precipitously following mainstem impoundment, a virtual information void exists regarding habitat requirements in riverine systems. Among the three large river *Gila* species, roundtail chub are more abundant in tributaries or larger rivers with gravel and cobble substrate, and humpback chub are primarily deep-water, high-gradient oriented species, leaving the mainstem alluvial reaches as an "available" niche for other *Gila* species, such as bonytail (Nesler 1998).

Among the large river fishes in the Colorado River basin, the bonytail has responded to altered habitats in a manner more similar to the razorback sucker than other native species. Unlike the Colorado pikeminnow, humpback chub or roundtail chub, both the razorback sucker and bonytail chub are able to survive and reproduce in artificial impoundments. In addition, both species seem to have flexible spawning requirements, having successfully spawned on gravel bars or wind swept gravel shorelines, and in ponds with little or no gravel substrate without flow. Given the relatively broad life history requirements and historical distribution of bonytail, it seems appropriate to investigate the use of floodplain habitats as potential nursery areas for bonytail. If life history needs are similar to razorback sucker, then habitat restoration efforts being planned for razorback sucker will also benefit bonytail. Although the current bonytail stocking plan for the state of Utah specifies riverine stocking (Lentsch et al. 1996), the Colorado bonytail stocking plan recognizes the potential need of floodplain habitat to restore bonytail (Nesler 1998).

Currently, UDWR-Vernal is evaluating survival, growth and voluntary movement from the floodplain of razorback suckers stocked into floodplain depressions (UDWR work in progress). This evaluation has seen many positive results. The most significant of which is the contribution of healthy razorback suckers from the floodplain into the Green River. After the first growing season in the floodplain, age I razorbacks stocked into the Stirrup, Baeser Bend, and Above Brennan floodplains tripled in size (growing from 103 mm TL in April to 323 mm in October). Voluntary movement of razorbacks suckers out of these floodplain depressions has been documented through collections in traps set in levee breeches at the Stirrup, Baeser Bend and Above Brennan sites. Additionally, movement of stocked razorback suckers out of these depressions was also documented in the spring of 2001 through captures of razorbacks by UDWR and USFWS personnel. Four of seven razorback suckers collected by UDWR- Vernal during sampling activities associated with nonnative fish control and population estimates of Colorado pikeminnow in the middle Green River originated from stockings into floodplain depressions. If bonytail respond similar to razorback sucker, it is probable that off-channel floodplain wetlands may contribute significantly to its recovery. However in the same study, none of 58,000 larvae stocked into one impoundment survived. Thus, the critical life stage for both razorback sucker and bonytail have not been observed to survive in either mainstem or offchannel habitats in the presence of nonnative fishes.

A key to the potential survival of larval bonytail and razorback sucker may be a combination of cover (i.e. aquatic vegetation) and the abundance of small nonnative fishes. The largest number of juvenile razorback sucker found in the upper Colorado River Basin were found in an offchannel wetland (Old Charley Wash) with abundant aquatic vegetation and only those nonnative fish entering the wetland after connection to the river. During 1995 and 1996 razorback sucker larvae in the wetland had grown to a size in which they were less vulnerable to predation by juvenile nonnatives produced in the wetland. Thus, at the time razorback sucker larvae are particularly vulnerable to predation, large numbers of juvenile nonnative fish were not present. Such was not the situation in The Stirrup in 2000 when larval razorback sucker stocked into an impoundment with little submerged vegetation and extremely large numbers of juvenile and subadult black bullheads. It is the intent of this study to stock bonytail in a variety of wetland types, including those which will not overwinter nonnative fishes, to gain a perspective on what wetland characteristics are beneficial to recovery survival and growth of bonytail.

The purpose of this study is to determine if larval bonytail can survive in the presence of nonnative fish in off-channel wetlands, and if larval survival is different between stocked and naturally reproduced fish.

IV. Study Goals, Objectives, End Product:

Goal: Determine the potential for bonytail reproduction and larval survival in floodplain wetlands in the middle Green River.

Objectives:

1. Determine growth and survival of larval bonytail stocked into seasonal floodplain wetlands.

   H_o: Larval bonytail will not survive in a seasonal wetland in the presence of nonnative fishes.

2. Determine the reproductive success of bonytail in off-channel wetlands in the presence of nonnative fishes.

   H_o: Bonytail will not successfully spawn and produce larval bonytail in permanent wetlands.

3. Contrast growth, and survival of bonytail larvae stocked in off-channel wetlands with fish naturally spawned fish in off-channel wetlands.

   H_o: No differences exist between the growth and survival of age-0 bonytail stocked into seasonal wetlands and bonytail spawned in permanent wetlands.

End Product:

A report contrasting growth, survival of stocked and naturally reproduced bonytail in floodplain habitat, and describing reproductive success of bonytail stocked into floodplain habitats with nonnative fishes. The report will review and discuss the role of floodplain habitats to the recovery of bonytail. Recommendations and a strategy will be provided to implement bonytail reintroduction into low gradient reaches of the Upper Colorado River Basin.

An annual summary report including the summary of the first year will be submitted in December 2002. A list of PIT-tagged fish released into the Green River will be submitted to the database manager at the end of each year.

V. Study Area:

The study area lies within the alluvial reach of the middle Green River between Jensen, (rmi 306) and the downstream boundary of the Ouray National Wildlife Refuge (rmi 245). Specific study sites consist of a total of five floodplain wetlands, including three seasonal floodplains (Old Charley Wash, Stirrup and Baeser Bend), and two sites that retain water through most years (Johnson Bottom and Above Brennan wetland). Johnson Bottom (~150 ac) and Old Charley Wash (~105 ac) are large natural floodplain wetlands on the Ouray National Wildlife Refuge whose dikes have been fortified and water inlet and outlet structures added to manage water delivery and draining. Spring flood waters in the Green River can access Johnson Bottom at approximately 10,000 cfs and Old Charley Wash at approximately 8,000 cfs. Johnson Bottom retains sufficient water in most years to support fish life through the winter, whereas Old Charley Wash is a shallow impoundment that in most years is too shallow to support fish through the winter. During this study Old Charley Wash will be drained each summer/fall. The remaining three sites are administered by the B.M. Of the three, Above Brennan is a 41 ac wetland that exceeds 15 feet in depth when full and can support fish through the winter in most years. The remaining two wetlands, Baeser bend and Stirrup wetlands are 38.2 and 19.2 ac respectively, and have overwintered fish in past, but during low flow years water quality declines and fish kills occur. Connection to the river for all B.M. wetlands occurs at approximately 13,500 cfs (levee removal breeches) and they do not have a drainage capability.

VI. Study Methods/Approach:

Data collection:
The first objective, determining growth and survival of stocked bonytail, will be addressed by monitoring larvae stocked into three seasonal floodplain wetlands (Old Charley Wash, Stirrup and Baeser Bend) at a stocking rate of approximately 3,000 fish/acre or 490,000 total larvae (if sufficient larvae are not available, 750 larvae per acre, or 79,000 larvae, will be stocked into Old Charley Wash only). These study sites have breeched levees and connect to the river when it reaches flows of approximately 13,500 cfs. Previous studies in these impoundments indicate that nonnative fishes readily access these sites from the Green River. Larval bonytail will be stocked into wetlands in the

spring prior to high flow connection by the river, or if ponds are dry, shortly after inundation. Water quality (diel dissolved oxygen and temperature) and relative fish abundance will be monitored at monthly intervals beginning in May and June, respectively, through the summer. Relative abundance and growth rates will be estimated by sampling fish and recording length and weight of fish at monthly intervals between stocking and the fall. Fish will be initially sampled with seines, fyke nets, trammel nets, and electroshocking to determine the most effective sampling gear. The most effective gear will be used in subsequent sampling efforts and will be consistent with the ongoing razorback sucker larval survival study in the same wetlands. In September and October, abundance of juvenile bonytail will be determined. During the retrieval process length and weight of the fish at the end of the growing season will be determined, and the total number of bonytail in each impoundment will be estimated using a removal based estimator or census by draining. All fish captured from seasonal wetlands will be PIT tagged and stocked into the Green River.

In addition to the evaluation of bonytail growth and survival in Old Charley Wash, all fish present during the draining process will be recorded and nonnative fish will be removed from the river system as was initially proposed in the Old Charley Wash scope of work.

Adult survival and reproduction will be monitored in two larger impoundments in which fish survival through the winter occurs in most years (Johnson bottom and Above Brennan). Mature, prespawned adults will be stocked into both wetlands in the spring (prior to spring peak flows) or previous fall, depending on availability of fish and water conditions. Preferred stocking rates are 30 fish/acre, 5,700 total fish. If sufficient number of prespawned adults are not available, only Above Brennan will be stocked with adults (i.e, 1,271 fish). Monitoring for presence of age-0 fish will be conducted monthly during the summer to determine if, and when, bonytail spawn and survive in the two study ponds, and to monitor growth and relative abundance of age-0 bonytail in impoundments. Monitoring age-0 fish will be conducted monthly using seines, minnow traps and small mesh fyke nets. The most effective method of collection will be incorporated. Abundance of adults and juveniles will be estimated with a mark recapture methodology in the fall of the first year of the study using fyke nets and electroshocking. The same monitoring protocol will be followed during the second year of the study except that in the fall of the second year, total abundance of age-0, age-1 and adults will be determined by draining and all fish will be released into the Green River in the fall of the second year of study. As with Old Charley Wash, all fish removed from Johnson bottom will be recorded and nonnative fishes will be removed from the wetland.

Coordination with other studies

This study will be coordinated with a similar evaluation of razorback sucker larval growth and survival being directed by the Division of Wildlife Resources. Study wetlands on the ONWR will be sampled by FWS and B.M. study wetlands will be sampled by UDWR. Sampling will be coordinated such that identical sampling regimes will be conducted and data will be exchanged between the two agencies for analysis.

VII. Task Description and Schedule

Task 1. Determination of growth and survival of larval bonytail stocked into seasonal floodplain wetlands.

Task 2. Contrast growth and survival of stocked and naturally reproduced bonytail, and evaluate reproductive success of adult bonytail stocked into wetlands.

Task 3. Data entry, data analysis, and completion of annual reports.

Task 4. Preparation of a final report.

Study Schedule:

Task Description and Schedule FY-2002	
Task 1	April 1- September 30 (Table 1)
Task 2	May 1- September 30 (Table 1)
Task 3	September 1-30
Task Description and Schedule FY-2003	
Task 1	April 1-September 30
Task 2	May 1-September 30
Task 3	September 1-30
Task 4	September 1-30

Task Description and Schedule FY-2004	
Task 4	Submit draft report to coordinator April 1, 2004; to peer review and BC May 1; back to BC July 15.

VIII. FY-2002 Work:

-Budget:

Task 1-2.	FWS	
Labor	42,800	CRFP:Monitoring = 45 staff (GS-5. GS-5, GS-7, GS-11) days, draining =5 staff (same as above) days. ONWR: Cleaning drainage canal and assisting with kettle dredging (i.e., labor and equipment)= $13K.
Supplies	3,000	
Transportation	8,400	
Task 3.		
Labor	6,150	(GS-13 3 wks)
Supplies	500	
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Total	$ 60,850

FY-2003 Work:

1. Deliverables/due dates: Annual Report 15 December 2002
2. Budget:

Task 1-2.	FWS
Labor	45,000 Same as above
Supplies	3,000
Transportation	9,000
Task 3.	
Labor	6,500
Supplies	500
Task 4.	
Labor	2,500
Travel	
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Total	66,500

FY-2004 Work:

1. Deliverables/due dates:
   Annual Report 15 December 2003
   Submit draft report to coordinator April 1, 2004; to peer review and BC May 1; back to BC July 15.
2. Budget:

Task 4.	FWS
Labor	10,000

IX. Budget Summary:

FY-2002	60,850*
FY-2003	66,500
FY-2004	10,000

* Does not include BR-FWS transfer overhead costs.

X. Reviewers:

XI. References:

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McDonald, D.B. and R.A. Dotson. 1960. Fishery investigations of the Glenn Canyon and Flaming Gorge impoundment areas. Utah Department of Fish and Game Information Bulletin 60-3:1-70.

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Quartarone. F. 1993. Historical accounts of upper Colorado River Basin endangered fish. Final Report submitted to the Recovery Implementation Program for Endangered Fish in the Upper Colorado River Basin. U.S. Fish and Wildlife Service. Denver, CO.

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Valdez, R.A., R.J. Ryel, S.W. Carothers. 2001. Recovery goals for the bonytail (*Gila elegans*) of the Colorado River Basin. Draft Final Report submitted to the Recovery Implementation Program for Endangered Fish in the Upper Colorado River Basin. U.S. Fish and Wildlife Service. Denver, CO.

Table 1. Proposed sampling schedule for floodplain evaluation as a tool in bonytail restoration.

	April	May	June	July	August	September
Stock fish	------					
Monitor water quality		----------	----------	----------	----------	-------
Monitor fish growth and abundance			----------	----------	----------	
Estimate population size						----------