COLORADO RIVER RECOVERY PROGRAM **Project No.: FR-165**
FY 2012-2013 PROPOSED SCOPE-OF-WORK for:

Use of the Stewart Lake floodplain by larval and adult endangered fishes

Lead Agency: Utah Division of Wildlife Resources

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Category:
__Ongoing project
__Ongoing-revised project
_X_ Requested new project
__Unsolicited proposal

Expected Funding Sources:
X Annual funds
__Capital funds
__Other (explain)

I. Title of Proposal:

Use of the Stewart Lake floodplain by larval and adult endangered fishes

II. Relationship to RIPRAP:

GENERAL RECOVERY PROGRAM SUPPORT ACTION PLAN

II.A.1. Conduct inventory of flooded bottomlands habitat for potential restoration.
V. Monitor populations and habitat and conduct research to support recovery actions (research, monitoring, and data management).

GREEN RIVER ACTION PLAN

I.A.3.d.1. Conduct real-time larval razorback and Colorado pikeminnow sampling to guide Flaming Gorge operations.
I.D.1. Develop study plan to evaluate flow recommendations.
I.D.1.a. Evaluate survival of young and movement of sub-adult razorback suckers from floodplains into the mainstem in response to flows.
II.A.2. Acquire interest in high-priority flooded bottomland habitats between Ouray NWR and Jensen to benefit endangered fish.
II.A.2.a. Identify and evaluate sites.

V. Monitor populations and habitat and conduct research to support recovery actions (research, monitoring, and data management).

V.A. Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions.

III. Study Background/Rationale and Hypotheses:

Floodplain wetlands are recognized as important habitats for early life-stages of razorback sucker (*Xyrauchen texanus*; Wydoski and Wick 1998; Muth et al. 1998; Lentsch et al. 1996; Modde 1996; Tyus and Karp 1990). Reproduction by razorback suckers occurs on the ascending limb of the spring hydrograph allowing enough time between hatching and swim up for larvae to enter main channel drift when highly productive floodplain habitats are accessible (Muth et al. 1998). Seasonal timing of razorback sucker reproduction indicates possible adaptation for entrainment and use of floodplain habitats for rearing purposes (Muth et al. 1998). However, it is unclear how long young razorback sucker stay in floodplains before moving into riverine habitats. In addition, other endangered fishes have been documented using floodplain habitat, but enumeration is limited.

The Green River Floodplain Management Plan identifies Stewart Lake wetland as a priority habitat for endangered fishes. Stewart Lake is the third largest of 16 identified priority wetlands, thus providing greater area and depth for potential nursery habitat for larval razorback sucker (i.e., overwinter survival) and other native and endangered fishes (Valdez and Nelson 2004). Additionally, it is approximately 11 miles downstream of a known razorback sucker spawning bar, allowing for potential entrainment (Valdez and Nelson 2004). In comparison to other floodplains, Stewart Lake is an ideal study area given that the structural design provides flexibility in water management; this feature allows for: (1) management of inlet and outlet structures to maximize entrainment during floodplain connectivity, (2) timing and control of outlet releases to monitor escapement, and (3) complete draw down to control nonnative abundance and reset the system any given year. Moreover, previous findings show that entrainment greatly increases in this system when operated as a flow-thru wetland (Hedrick et al. 2009), which is something that can be manipulated to answer questions regarding wetland habitat use. Stewart Lake has never been adequately sampled to determine its use as larval or adult native fish habitat. However, 42 bonytail (*Gila elegans*) and three Colorado pikeminnow (*Ptychocheilus lucius*) were documented leaving the floodplain in August 2009 when a stationary PIT-antenna was installed at the outlet canal (UDWR, unpublished data). Likewise, stationary PIT antennas used in other single-breach monitoring efforts have provided a wealth of information on wetland habitat use by several endangered species (Breen 2011).

Recent findings by Bestgen et al. (2011) indicate that further investigations are needed regarding the timing of Flaming Gorge Dam releases and larval razorback sucker entrainment. Therefore, a study plan to examine larval razorback sucker

occurrence in the Green River as a trigger for Flaming Gorge operations is currently being developed. In response to this effort, we are proposing that the Stewart lake wetland, a floodplain we have the ability to manipulate, is an ideal setting to conduct a comprehensive study of fishes that immigrate into the wetland habitat during floodplain connection, utilize the habitat post connection, and emigrate from the wetland during draw down. Using various sampling techniques during different stages of floodplain use (i.e. entrainment, retention, escapement), we will greatly increase our chances of characterizing use of floodplain wetlands by wild-spawned razorback sucker and other endangered fishes. However, information compiled from a single sampling season may limit our ability to draw final conclusions due to confounding environmental factors (i.e., annual peak flows), thus a multi-year study will provide a more complete evaluation for guiding future floodplain management decisions.

IV. Study Goals, Objectives, End Product:

Goal: Characterize use of a controlled flow-thru floodplain wetland by larval and adult endangered fishes, emphasizing razorback sucker.

Objectives: 1) Monitor entrainment of larval and adult endangered fishes during high-flow connection of riverine and wetland habitats. 2) Examine fish community composition and habitat characteristics in the Stewart Lake wetland following floodplain connection to assess summer survival. 3) Monitor escapement (fish moving out of the wetland) of native and nonnative fishes entrained in Stewart Lake during a controlled release.

End Product: An annual report describing how Stewart Lake functions as habitat for larval and adult endangered fishes. We will provide information on: (1) larval razorback sucker entrainment, (2) PIT-tagged endangered fishes entering the floodplain during high-flow connection, (3) fish community composition, water quality parameters, and wetland habitat characteristics thru time following the connection period, and (4) species-specific information on emigration of fishes during the draw down period, including additional information on PIT-tagged fishes emigrating from the floodplain. In addition, multiple captures/detections of the same fish from more than one component of our study with allow us to investigate overall use and survival during the course of a single season of entrainment.

V. Study Area:

Stewart Lake, which is located in the middle Green River at river mile 300, begins flooding at 7,500 cfs and inundates approximately 570 acres (Valdez and Nelson 2004). Low flow connection relative to other wetland habitats allows for research opportunities across a range of flow conditions. Water enters the wetland through a single breach inlet and exits through a single outlet canal. Timing and extent of

floodplain inundation and draw down can be manipulated via floodgate operations which can be regulated to meet multiple research objectives.

VI. Study Methods/Approach:

Topics of interest in the upcoming larval trigger study plan to assess Flaming Gorge Dam releases will be addressed in accordance with our proposed Stewart Lake study. Specifically, razorback sucker larval entrainment and nonnative fish diversity and abundance in floodplain wetlands. In addition to the larval trigger topics, information on adult endangered species (immigration, entrainment and emigration) using the floodplain habitat will be evaluated. Below we have outlined our proposed plans to systematically examine the Stewart Lake inlet, wetland, and outlet from the point of floodplain connection to draw-down.

To monitor larval and adult fishes entering the Stewart Lake wetland we will sample with stationary PIT-antennas and light traps at the inlet structure. We will monitor PIT-tagged endangered fishes using the floodplain with stationary antennas located in the Stewart Lake inlet. Multiple antennas (one on each side of the inlet culvert) will allow for determination of directional movement and increase our probability of detection. This will determine if adult fish are immigrating into Stewart Lake or only utilizing the habitat for the duration of floodplain connection. We will install a stationary PIT antenna system (Digital Angel FS1001M Reader–MUX) prior to spring connection (2013 only), fine-tune the antennas upon connection, and monitor fish movement for the entire duration that the floodplain is breached. Antennas will be powered by two solar panels and four batteries, which will give us 24V and 200 amp-hours. The MUX with antennas uses about 1 amp per hour, which allows us to leave the system unattended without having to recharge the batteries. Twenty to 25 light-traps will be positioned in the inlet and in the main body of the wetland at the point of floodplain connection. Daily sampling will initiate following larval detection in the main channel (project 22f), and continue for the duration of larval drift (approximately 3-6 weeks) or conclude due to floodplain disconnect from the main channel. All larval fish present in the traps will be collected and preserved for later identification by the Larval Fish Lab (costs included in project #15 budget). Habitat parameters, mainly discharge measurements, will be recorded at the inlet structure during floodplain inundation (not feasible at extreme flow).

We will utilize various sampling techniques to evaluate fish community composition and we will monitor water quality and habitat parameters in the Stewart Lake wetland following floodplain connection. Following floodplain inundation and disconnection, the wetland will be systematically sampled biweekly via boat electrofishing, fyke-netting, trammel netting, and minnow traps to evaluate fish community composition through time (until wetland is drained–4 sample periods maximum). Nonnative fish will be removed and untagged endangered fishes will be PIT-tagged. Once the wetland is completely drained (see below), we will conduct a final sweep to determine what fishes did not

escape during water release. During bi-weekly fish sampling, cross-sectional profiles and area estimates will be conducted using a hand-held GPS, depth finder and range finder. We will also monitor dissolved oxygen concentrations and temperature at various locations (three data loggers) throughout the wetland during the entire period of inundation.

To monitor the escapement of native and nonnative fishes retained in the Stewart Lake wetland following high flow connection we will use a combination of stationary PIT antennas and passive sampling. Prior to wetland draw down, which we will coordinate with the UDWR habitat manager (timing and duration of release), we will set up a block net in a portion of the outlet canal and conduct barge electrofishing to remove all fishes. This will allow us to specifically assess fish leaving the wetland (tagged and untagged) following releases when we will set up a series of fyke-nets/trammel nets that will be monitored during the release. In preparation for this release we will install stationary PIT-antennas to monitor PIT-tagged fishes leaving the wetland. During netting, nonnative fish will be removed and untagged fish will be PIT-tagged.

VII. Task Description and Schedule:

Our timeline is subject to change for tasks 1-3 based on the timing and duration of peak flows.

Task 1: Install, operate and maintain stationary PIT-tag antennas and reader in the Stewart Lake inlet; April–June (2013)

Task 2: Sample fish community in Stewart Lake wetland and monitor post-connection water quality and habitat parameters; June–August (2012 and 2013)

Task 3: Install, operate and maintain stationary PIT-tag antennas and reader in the Stewart Lake drain; September (2012 and 2013)

Task 4: Sample the fish community in the Stewart Lake drain during the draw-down; September (2012 and 2013)

Task 5: Data entry, analysis and reporting; October–November (2012 and 2013)

VIII. FY 2012 Work:

Deliverables/Due Dates: Complete annual report in November 2012.

Budget:

Task 1: PIT-reader operation (inlet)	Work days	Cost
Labor		
Project Leader ($354/day)	0	$0
Tech II ($271/day)	4	$1,084
Travel		
[a] Mileage (#12995; 10% of annual usage)		$0
Equipment		
[b] Antenna repairs		$5,000
TOTAL		**$6,084**

[a] The State of Utah uses Automotive Resources Inc. for motor pool operations; calculation = percent of total annual usage multiplied by total annual cost.
[b] Task 1 will not be completed in 2012; UDWR–Vernal only possesses one antenna system which will be operated at the Stirrup floodplain during peak flow connection in 2012 (Project #RZ-Recr) then shifted to Stewart Lake to complete task 3. PIT arrays require rebuilds and repairs each season, which will be necessary following work conducted under Project #RZ-Recr in the spring of 2012 (prior to task 3). This includes additional labor costs (Tech II); only listed under task 1.

Task 2: Wetland sampling	Work days	Cost
Labor		
Project Leader ($354/day)	6	$2,124
Biologist ($342/day)	10	$3,420
Tech II ($271/day)	16	$4,336
Tech I ($195/day)	24	$4,680
Travel		$1,360
[a] Mileage (#11204; 20% of annual usage)		
Supplies		$4,000
[c] Gas/oil, repairs, alcohol, sample jars, batteries, spare bulbs		
[d] Temperature-DO meters/software		$5,349
TOTAL		**$25,269**

[c] Sample jars will be an initial cost @ ~$3/jar.
[d] One time purchase of water quality monitoring equipment.

Task 3: PIT-reader operation (outlet)	Work days	Cost
Labor		
Project Leader ($354/day)	6	$2,124
Tech II ($271/day)	8	$2,168
Travel		
[a] Mileage (#12995; 5% of annual usage)		$340
TOTAL		**$4,632**

Task 4: Outlet sampling	Work days	Cost
Labor		
Leader ($354/day)	2	$708
Biologist ($342/day)	2	$684
Tech II ($271/day)	4	$1,084
Tech I ($195/day)	8	$1,560
Travel		
[a] Mileage (#11204; 5% of annual usage)		$340
TOTAL		**$4,376**

Task 5: Summarize results	Work days	Cost
Labor		
Project Leader ($354/day)	8	$2,832
Biologist ($342/day)	2	$684
Tech II ($250/day)	8	$2,000
Travel		
Meeting/conference costs		$300
TOTAL		**$5,816**

IX. FY 2013 Work:

Deliverables/Due Dates: Complete annual report in November 2013.

Budget:

Task 1: PIT-reader operation (inlet)	Work days	Cost
Labor		
Project Leader ($354/day)	8	$2,832
Tech II ($271/day)	8	$2,168
Travel		
[a] Mileage (#12995; 10% of annual usage)		$680
Equipment		$5,000
[b] Antenna repairs		
TOTAL		**$10,680**

[a] The State of Utah uses Automotive Resources Inc. for motor pool operations; calculation = percent of total annual usage multiplied by total annual cost.
[b] PIT arrays require rebuilds and repairs each season, which includes additional labor costs (Tech II); only listed under task 1.

Task 2: Wetland sampling	Work days	Cost
Labor		
Project Leader ($354/day)	6	$2,124
Biologist ($342/day)	10	$3,420
Tech II ($271/day)	16	$4,336
Tech I ($195/day)	24	$4,680
Travel		$1,360
[a] Mileage (#11204; 20% of annual usage)		
Supplies		$2,000
Gas/oil, repairs, alcohol, sample jars, batteries, spare bulbs		
TOTAL		**$17,920**

Task 3: PIT-reader operation (outlet)	Work days	Cost
Labor		
Project Leader ($354/day)	6	$2,124
Tech II ($271/day)	8	$2,168
Travel		
[a] Mileage (#12995; 5% of annual usage)		$340
TOTAL		**$4,632**

Task 4: Outlet sampling	Work days	Cost
Labor		
Leader ($354/day)	2	$708
Biologist ($342/day)	2	$684
Tech II ($271/day)	4	$1,084
Tech I ($195/day)	8	$1,560
Travel		
[a] Mileage (#11204; 5% of annual usage)		$340
TOTAL		**$4,376**

Task 5: Summarize results	Work days	Cost
Labor		
Project Leader ($354/day)	8	$2,832
Biologist ($342/day)	2	$684
Tech II ($250/day)	8	$2,000
Travel		
Meeting/conference costs		$300
TOTAL		**$5,816**

X: Program Budget Summary:

FY 2012: $46,177
FY 2013: $43,424

XI: Reviewers:

XII: References:

Bestgen, K. R., G. B. Haines, and A. A. Hill. 2011. Synthesis of flood plain wetland information: timing of razorback sucker reproduction in the Green River, Utah, related to stream flow, water temperature, and flood plain wetland availability. Final Report to the Upper Colorado River Endangered Fish Recovery Program, Denver, CO. Larval Fish Laboratory Contribution 163.

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