COLORADO RIVER RECOVERY PROGRAM **Project No.: 158**
FY-2011 PROPOSED SCOPE OF WORK for:
Assessment of larval Colorado pikeminnow presence and survival in low velocity habitats in the middle Green River

Lead Agency: UDWR

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Category:
X Ongoing project
_ Ongoing-revised project
_ Requested new project
_ Unsolicited proposal

Expected Funding Source:
x Annual funds
_ Capital funds
_ Other- Carryover funds

I. Title of Proposal:

Assessment of larval Colorado pikeminnow presence and survival in low velocity habitats in the middle Green River

II. Relationship to RIPRAP:

GENERAL RECOVERY PROGRAM SUPPORT ACTION PLAN

III. Reduce negative impacts of nonnative fishes and sportfish management activities (nonnative and sportfish management).
III.A. Reduce negative interactions between nonnative and endangered fishes.
III.A.2. Identify and implement viable active control measures.
III.A.2.c. Implement and evaluate the effectiveness of viable active control measures.
III.A.2.f. Develop control program for removal of small nonnative

cyprindids in backwaters and other low velocity habitats.

GREEN RIVER ACTION PLAN: MAINSTEM

III. Reduce impacts of nonnative fishes and sportfish management activities (nonnative and sportfish management).
III.A.4. Develop and implement control programs for nonnative fishes in river reaches occupied by the endangered fishes to identify required levels of control.
III.A.4.b. Nonnative cyprinids and centrarchids in nursery habitats.
III.A.4.b.(1) Small nonnative cyprinids from backwaters and other low velocity Habitats in the lower Green River

III. Study Background/Rationale and Hypotheses:

Fall Interagency Standardized Monitoring Program (ISMP) sampling of age-0 Colorado pikeminnow (CPM) has been conducted annually since the mid-1980s to assess the abundance and distribution of young fish. Since 1994, these surveys have shown a drastic reduction in the abundance of age-0 CPM in the alluvial section of the Green River between Split Mountain and Desolation Canyon (Utah Division of Wildlife Resources, unpublished data). Other studies monitoring the upstream abundance of larval CPM drifting from the Yampa Canyon spawning site during the same time suggest that larval fish production has not decreased from previous levels when age-0 CPM were more abundant in this reach (K. Bestgen, pers. comm., Bestgen et al. 1998). Several possibilities exist for why age-0 CPM are not being caught as frequently as they once were, including an increase in nonnative predatory fishes, nonnative competitors, and habitat changes. Other researchers have been or are currently working on issues such as changes in habitat related to flow and temperature. This study seeks to address the possible influence nonnative fishes may have on age-0 pikeminnow as they arrive and grow in backwater habitats. A second focus is to confirm the arrival and entrainment of larval pikeminnow into backwaters in this reach.

IV. Study Goals, Objectives, End Product**:**

Goal: Increase abundance of larval pikeminnow in middle Green River backwaters during the YOY pikeminnow backwater study and reduce the impacts of nonnative fishes in those backwaters.

Objectives:
-Verify that larval pikeminnow are arriving in nursery habitat
-Document abundance of larval CPM in backwaters as the season progresses
-Reduce densities of nonnative fish, particularly cyprinids, in backwater habitats before and after arrival of pikeminnow
-Determine success of manipulating backwaters to increase pikeminnow survival in backwaters from Red Wash to the Ouray Refuge by removing and excluding nonnative fish using various blocking techniques and depletion treatments

-Assess small-bodied fish community effects from removing nonnative fishes from backwaters

End Product: (1) Documentation of whether larval pikeminnow spawned in the Yampa River still arrive in summer at the Ouray reach of the middle Green River in similar numbers as in 1992 (the last time this was researched). (2) Expected persistence time of these pikeminnow without any treatment. (3) Determination of whether blocking backwaters is a successful method for increasing the survival and growth of larval pikeminnow in the Ouray reach of the middle Green River.

V. Study Area:

The study area encompasses the middle Green River from Red Wash boat ramp (RM 298.1) to the Duchesne River confluence (RM 247.9).

VI. Study Methods/Approach:

Our first focus will be to determine the abundance of larval pikeminnow drifting into the study reach and arriving in those backwater habitats. This will be accomplished by drift netting above the Jensen area and seining all backwaters along the Ouray National Wildlife Refuge and selected backwaters from Red Wash to the White River. We will not sample backwaters selected for manipulation (see below), as they will be intensively sampled during nonnative control and monitoring. Drift net sampling will be initiated at the Split Mountain boat ramp/campground area within twenty-four hours after CSU Larval Fish Lab field sampling indicates a pulse of larval drift at Echo Park. Previous work indicated that there is approximately a one day lag time between pulses of larvae at Echo Park and Split Mountain in low discharge years (Bestgen et al. 1998). Sampling will be targeted at times of higher drift and coordinated with LFL personnel. Previous work showed that samples collected in the two sites were most consistent with one another when more larvae were available and the sites were sampled during the same pulse event (Bestgen et al. 1998). We will also attempt to coordinate drift net activities with turbidity events detected by the LFL site upstream. We propose more limited drift net collections than the Echo Park site because our objective is only to confirm arrival of larval drift at Split Mountain in similar numbers as in Echo Park. The Echo Park site will still document extent and timing of the entire drift period, whereas the Split Mountain site will confirm that those drift events are continuing downstream and in similar numbers. One drawback to the methodology proposed for Split Mountain will be the possibility of missing drift events if the larvae are present at lower densities over a longer time. This has been observed in years with lower flow and less turbidity. The sampling design will duplicate that of LFL, namely three nets will be set near shore for 1-2 hours daily at dawn. Nets will be attached to steel frames and deployed in water 0.5-1 meter in depth. Flow meters in the net mouth and deployment times will be used to compute the volume of water sampled. Samples will be preserved in ethanol and placed in containers for later sample identification, measurement for length, and enumeration, by both USFWS and LFL.

The other aspect of monitoring will be seining backwaters at Ouray National Wildlife Refuge during late July and early August. This will be done to gather data comparable to that collected from 1990-1996 (Day et al. 1999). All backwaters will be seined on Ouray National Wildlife Refuge, along with reference backwaters used in Argonne National Laboratory's ongoing work, and selected backwaters from Red Wash to the confluence with the White River, as feasible. The goal of the Ouray sampling is to collect data that can be used to compare larval densities to previous studies conducted during years with higher pikeminnow recruitment. The Argonne backwaters will be sampled to further refine and verify backwater models as they relate to pikeminnow entrainment, and the other backwaters will be sampled to increase the odds in detecting the presence of larvae. As mentioned previously, backwaters targeted for nonnative depletions will not be sampled during this portion of the work. Six backwaters within the Red Wash to White River reach have been identified for this purpose. Seine hauls will be taken at three transects perpendicular to the axis of the backwater, similar to ISMP sampling. For small backwaters, the entire backwater will be seined. Deep backwaters will be seined parallel to shore. The work by Day et al. (1999) sampled as many as 84 backwaters on the Ouray NWR using this methodology. Depending on overall total length and ability to verify species at sampling time, pikeminnow will be identified and released, if possible, or preserved in ethanol for identification in Vernal, and subsequently sent to the Larval Fish Lab for verification. Backwater habitat measurements and metrics for catch per effort will also be collected after seining to prevent disturbing fish. The objective of this sampling regime is to verify larval CPM are arriving in nursery habitats in numbers comparable to past data from the 1980s-early 1990s and comparable to drift samples upstream in Echo Park. Data currently being collected involves the early stages of drift and fall juvenile counts, and these data indicate there continues to be low recruitment of individuals from the time of drift into fall. If numbers of larvae arriving have declined, determining the point of loss will involve investigating mortality upstream during drift from Echo Park to Split Mountain. Comparable numbers of larvae in this study reach to numbers observed in upper study reaches will allow us to focus efforts on mortality in nursery habitats, after the drift.

The second component of this project is to reduce nonnative fish abundance in nursery habitats to determine the effect on larval pikeminnow survival. Several key results were apparent from our 2010 data that warrant changes to this portion of our study in FY 2011. First, fish community composition was similar for each of three backwater treatment types, primarily consisting of red shiners, sand shiners, and fathead minnows. Second, we observed more carp in control backwaters, suggesting that we were successful at excluding larger fish with blocking treatments. Third, small-bodied nonnative cyprinids were more abundant in blocked backwaters than controls. Following initial depletions, control backwaters contained a total of 1100 fishes, the backwaters blocked by the ½ inch mesh size block nets had 1,761 fish and the backwaters blocked by the ¼ inch mesh size block nets had 5,065 fish. Three hypotheses may explain an increase in nonnatives with increased exclusion: (1) our initial depletion efforts were not 100% effective at removing cyprinids, (2) immigration of nonnative fish into blocked backwaters occurred through our nets, and (3) smaller cyprinids that passed through our nets were more successful

with the exclusion of larger predators. It appears that smaller fish are surviving in the backwaters blocked by the smallest mesh size because there is a lack of predation in these backwaters. Finally, as the level of exclusion increases, larval pikeminnow abundance also increased. In the control backwaters, mean pikeminnow abundance was 0.8 ± 0.37, in the backwaters blocked by the ½ inch mesh block nets, mean pikeminnow abundance was 1.4 ± 1.4, and in the backwaters blocked by the ¼ inch mesh block nets, mean pikeminnow abundance was 9.2 ± 4.04. This suggests that by blocking backwaters, we are increasing YOY pikeminnow survival by decreasing predation from larger fish. Competition for resources is still a threat because of the immigration of nonnative cyprinids, but predation may be a more important factor effecting pikeminnow survival.

Based on our recent findings, backwaters for this portion of the study will include four control backwaters that will be blocked with a block net, depleted, and then the block net will be removed, and four backwaters that are blocked by a 1/4 inch mesh seine, depleted, leaving the block up allowing some movement of small fish into the backwater. Blocking will be accomplished using 1/4 inch mesh nets reinforced with chicken wire to protect them from beaver damage. Depletions will initially occur before arrival of pikeminnow. We will sample all backwaters following the young of year pikeminnow sampling protocol every two weeks after initial depletions to determine levels of nonnative fish encroachment through time. However, we will monitor backwaters weekly to ensure that the blocks remain intact.

During this investigation, habitat information collected during ISMP sampling will be collected, as well as information on backwater temperature recorded by temperature loggers. Biomass of nonnative fish removed, overall length and width of the backwaters and seine hauls will also be collected in addition to numbers and total lengths of native fish collected.

We will also prepare for the occurrence of beavers, storm events and vandalism to the blocked backwaters.

VII. Task Description and Schedule:

Task 1. Determine abundance of larval pikeminnow present in drift at Split Mountain and arriving in backwaters in the Ouray reach

Task 2. Deplete nonnative fish in backwaters prior to larval pikeminnow drift and experiment with a blocking scenario to keep backwaters free of nonnative fish

Task 3. Determine fish community in manipulated and control backwaters

VIII. FY 2011 Work:
Deliverables/Due Dates
Annual report due each November.
Summary Report due April 2012.

FY2011 Budget:

Task 1. Determine abundance of larval pikeminnow drifting into and arriving in middle Green River nursery habitat by drift net and seining backwaters.

a) drift net sampling

	Rate ($/h)	Hours	Total
Technician	$17.48	200	$3,496.00
Biologist	$40.58	80	$3,246.40
2 drift nets x $585			$1,170.00
2 flow meters x $400			$800.00
Ethanol x 25 gallons x $12.50/gal			$313.00
Sample containers x 200 x $0.25			$50.00
Travel			
Vehicle			
-1 trucks/day x 50 mi/truck x $0.505/mi x 25 days			$631.25
	Subtotal	Task 1a	$9,706.65

b) seining backwaters

	Rate ($/h)	Hours	Total
Technicians (4)	$17.48	320	$5,593.60
Biologist	$40.58	160	$6,492.80
Leader	$71.70	40	$2,868.00
GS-08 Fish Technician	$35.83	120	$4,299.60
GS-09 Administrative Officer	$35.26	80	$2,820.80
Travel			
Vehicles			
-3 trucks/day x 80 mi/truck x $0.505/mi x 10 days			$1,212.00
-maintenance (oil, tires, cleaning)			$1,371.00
Boats			
-12 gal gas/boat x 2 boats/day x $3.50/gal x 10 days			$840.00
-2 qts boat oil/boat x 2 boats/day x $3.00/qt x 10 days			$120.00
2 outboard motors			$5,000.00
Ethanol x 25 gallons x $12.50/gal			$313.00
Sample containers x 200 x $0.25			$50.00
	Subtotal	Task 1b	$30,980.00
	Task 1	Total	$40,687.45

NOTE: LFL's associated costs for larval drift sample processing and seine sample verification will be accounted for under Project 15.

Task 2. Deplete nonnative fish in backwaters prior to larval pikeminnow drift and experiment with a blocking scenario to keep backwaters free of nonnative fish.

	Work Days	UDWR Vernal Cost

Deplete backwaters		
Technician II ($271/day)	20	$5,420.00
Biologist ($340/day)	6	$2,040.00
Leader ($400/day)	6	$2,400.00
Shuttle Drivers ($14.87/hr)		$ 119.00
Travel, Boat gas, Equipment, etc.		
(Truck #10573; 5% of annual use)		$340.00
(Truck #11204; 5% of annual use)		$340.00
Maintenance and replacement of gear, sampling nets, etc.		$1,752.00
Boat gas and oil		
Per Diem (3 people/day x $16/person x 6 days)		$288.00
Task 2 Total		$12,699.00

Task 3. Determine fish community in manipulated and control backwaters.

	Work Days	UDWR Vernal Cost
Determine fish community		
Technician II ($271/day)	30	$8,130.00
Biologist ($340/day)	24	$8,160.00
Leader ($400/day)	20	$8,000.00
Shuttle Drivers ($14.87/hr)		$ 714.00
Travel, Boat gas, equipment, etc.		
(Truck #10573; 10% of annual use)		$680.00
(Truck #11204; 10% of annual use)		$680.00
Maintenance and replacement of gear, sampling nets, etc.		$1,758.00
Boat gas and oil		
Per Diem (3 people/day x $16/person x 24 days)		$1,152.00
Task 3 Total		$29,274.00

Task 4. Data entry, analysis and reporting.

	Work days	UDWR-Vernal Cost	CRFP Vernal Cost
Data Entry, analysis			
Technician II ($222/day)	20	$4440.00	
Biologist ($340/day)	15	$5100.00	
Leader ($400/day)	5	$2000.00	
Final Report Preparation			
Biologist ($340 or $325/day)	26	$4,420.00	$4,220.32
Leader ($400/day)	4	$1,600.00	
Task 4 Total		$17,560.00	$4,220.32

IX. Program Budget Summary

FY2011

	CRFP – Vernal
FY 2011	$44,907.77
	UDWR – Vernal
FY 2011	$59,533.00
TOTAL	$104,440.77

X. Reviewers

XI. References:

Bestgen, K.R., R.T. Muth, and M.A. Trammell. 1998. Downstream transport of Colorado squawfish larvae in the Green River drainage: temporal and spatial variation in abundance and relationships with juvenile recruitment. Colorado State University Larval Fish Laboratory, Final Report to the Recovery Implementation Program for Endangered Fishes in the Upper Colorado River Basin, U.S. Fish and Wildlife Service, Denver, CO.

Bestgen, K.R., D.W. Beyers, J.A. Rice, and G.B. Haines. 2006. Factors affecting recruitment of young Colorado pikeminnow: synthesis of predation experiments, field studies, and individual-based modeling. Transactions of the American Fisheries Society 135: 1722-1742.

Day, K.S., K.D. Christopherson, and C. Crosby. 1999. An assessment of young-of-the-year Colorado pikeminnow (Ptychocheilus lucius) use of backwater habitats in the Green River, Utah. *In*: Utah Division of Wildlife Resources. 1999. Flaming Gorge studies: assessment of Colorado pikeminnow nursery habitat in the Green River. Publication 99-30.

Tyus, H.M. and G.B Haines. 1991. Distribution, habitat use, and growth of age-0 Colorado squawfish in the Green River basin, Colorado and Utah. Transactions of the American Fisheries Society 120: 79-89.