

I. Project Title: MONITORING THE COLORADO PIKEMINNOW
POPULATION IN THE MAINSTEM COLORADO RIVER VIA PERIODIC
POPULATION ESTIMATES

II. Principal Investigator(s):

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III. Project Summary:

The Interagency Standardized Monitoring Program (ISMP) was developed in 1986 to monitor population trends of Colorado pikeminnow and humpback chub in the Colorado River Basin using catch per effort (CPE) indices. ISMP was expanded in 1998 to include mark-recapture population estimates of the major Colorado pikeminnow and humpback chub populations. For Colorado pikeminnow in the upper Colorado River, population estimates were conducted annually during 1991-1994, 1998-2000, and 2003-2005. A fourth such three-year field effort began in 2008 and continued through 2009 and 2010.

In **2008**, four complete passes were made through the upper and lower reaches of the Colorado River study area (12-mile-long Westwater Canyon, separating the two reaches, was not sampled) using a combination of electrofishing and backwater trammel-netting. Crews had just enough time to squeeze in an extra, or fifth, pass through the upper reach. Sampling was conducted from April 3 through June 19. Although the field effort went very well, the number of Colorado pikeminnow captured was fairly low relative to previous years. In the upper reach, there was a mean of 17 fish captured per pass (85 total) compared to 14 in 2003, 20 in 2004, and 31 in 2005 (Table 1). In the lower reach, there was a mean of 25 fish captured per pass (100 total) compared to 28 in 2003, 30 in 2004, and 39 in 2005. The number of fish marked in the first passes that were subsequently recaptured in later passes was also low compared to previous years, especially in the upper reach: there, only five within-year recaptures were made compared to three in 2003, 10 in 2004, and 22 in 2005. In the lower reach, the within-year recapture rate was somewhat better: there were 10 in 2008 compared to two in 2003, three in 2004, and 27 in 2005.

In **2009**, four complete passes were made through the upper and lower reaches as planned; in addition, a fifth pass was completed in the upper reach. Sampling was conducted from April 1 through June 24. Numbers of fish captured were similar to 2008. In the upper reach, there was a mean of 19 Colorado pikeminnow captured per pass (93 total); in the lower reach, a mean of 24 pikeminnow were captured per pass (95 total). Total within-year recaptures in the upper reach were higher in 2009 (11) than in 2008 (five), but in the lower reach, total within-year recaptures were fewer in

2009 (seven) than in 2008 (10).

In **2010**, four complete passes were made through the upper and lower reaches as planned, but a fifth pass planned for the upper reach (because of low capture numbers there) was not able to be completed prior to the initiation of the spawning season so capture data collected during the first two weeks of the smallmouth bass removal project (Project 126) were used to assemble a fifth pass. Sampling for the first four passes was conducted from April 7 through June 18. A fifth upper reach pass was conducted immediately after the estimated Colorado pikeminnow spawning season from August 2 through August 16. Three Colorado pikeminnow captured in the Redlands Fish Trap during July 22 and 29 were also included in the fifth pass. Numbers of fish captured were similar to 2008 and 2009. In the upper reach, there was a mean of 17 Colorado pikeminnow captured per pass (87 total); in the lower reach, a mean of 27 pikeminnow were captured per pass (106 total). Total within-year recaptures in the upper reach were higher in 2010 (7) than in 2008 (five), but lower than in 2009 (11). In the lower reach, total within-year recaptures were higher in 2010 (12) than in 2009 (seven) and 2008 (10).

In both 2008 and 2009, the duration of spring runoff was especially long and made for good electrofishing and backwater netting conditions. The period of runoff that allows backwater trammel-netting was shorter in 2010. In 2008, there were 41 boat-days expended on trammel-netting compared to 37 in 2003, three in 2004, and 41 in 2005. In 2009, there were 37 trammel-netting boat days, and in 2010, 24 such boat days. Considering this, lack of backwaters would not explain the lower numbers of captures in recent years. Subtracting the number of captures attributable to the bass removal effort (Project No. 126), the total number of pikeminnow captured in 2005 was 319 (four passes in upper reach; five passes in lower reach). In contrast, the total captured in 2008 was 185 (five passes in upper reach; four passes in lower reach), or 42% less than in 2005. Similarly, in 2009 there was a total of 188 pikeminnow captured (five passes in upper reach; four passes in lower reach), or 41% lower than in 2005. Similarly, in 2010 there was a total of 176 pikeminnow captured when the fifth upper-reach pass is subtracted (four passes in each reach), or 45% lower than in 2005. During 2003-2005, there was a large group of young Colorado pikeminnow detected that was attributed to a strong year class produced in 1998 (see Osmundson and White 2009). No such strong year class was detected in 2008, 2009 or 2010. In addition, probability of capture was found to vary fairly substantially among years, in part explaining the higher numbers of fish captured in 2005 than in 2003 or 2004.

Table 1. Total number of Colorado pikeminnow ≥ 250 mm TL captured in each sampling pass and year in the Colorado River study area, Colorado and Utah, 1991-2010. Totals include recaptures of the same fish caught in previous passes of the same year (parentheses). Captures are partitioned by upper and lower reach.

Year	Lower reach passes					Upper reach passes				
	1	2	3	4	5	1	2	3	4	5
1991	37	-	-	-	-	23	17 (4)	25 (2)	-	-
1992	18	15 (1)	-	-	-	21	24 (2)	23 (2)	-	-
1993	51	41 (4)	-	-	-	31	31 (6)	33 (11)	-	-
1994	47	22 (3)	-	-	-	28	37 (3)	38 (6)	-	-

1998	31	56 (6)	-	-	-	47	73 (8)	55 (16)	-	-
1999	38	24 (2)	-	-	-	52	65 (8)	54 (18)	-	-
2000	31	19 (1)	-	-	-	51	52 (8)	28 (6)	-	-
2003	11	16 (0)	44 (0)	40 (2)	-	11	15 (0)	16 (2)	11 (1)	-
2004	28	36 (1)	27 (0)	-	-	19	16 (2)	48 (8)	-	-
2005	26	50 (3)	46 (7)	36 (6)	34 (5)	22	30 (4)	26 (4)	46 (5)	38 (9)
2008	13	29 (0)	35 (3)	23 (7)	-	17	15 (0)	17 (1)	20 (2)	16 (2)
2009	11	35 (0)	28 (3)	21 (4)	-	10	13 (0)	32 (0)	15 (2)	23 (9)
2010	19	14 (1)	36 (5)	37 (6)	-	14	19 (1)	15 (1)	22 (3)	17 (2)

Unlike in 2004 and 2005, when pikeminnow handled in July during the subsequent bass removal effort were added to the third pass of the upper reach (2004) or provided a fifth upper-reach pass (2005), no such pikeminnow were captured during the bass removal project in 2008 and 2009 that might have been used here to supplement captures. Pikeminnow seen during bass electrofishing were allowed to escape without capture or handling in an effort to minimize stress following the spawning season. In 2010, we again used the pikeminnow captured during August to produce a fifth pass. This was suspended after two weeks and subsequent pikeminnow that were shocked were not netted.

To date, data from 2008, 2009 and 2010 have been entered into Excel, checked for errors, and a new capture history matrix for these three years has been developed. Unfortunately, these new captures could not be appended to the 1991-2005 capture history matrix because PIT tags and associated readers have changed and the earliest tags cannot be detected by the new readers. Undetected pit-tagged fish would cause survival rates to be underestimated (erroneously low). Hence, a new matrix had to be started from scratch that includes only captures of fish containing the new tags.

IV. Study Schedule: 2008-2011.

V. Relationship to RIPRAP:

Colorado River Action Plan: Colorado River Mainstem

V. Monitor populations and habitat and conduct research to support recovery actions.

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

VI. Accomplishment of FY 2011 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Tasks

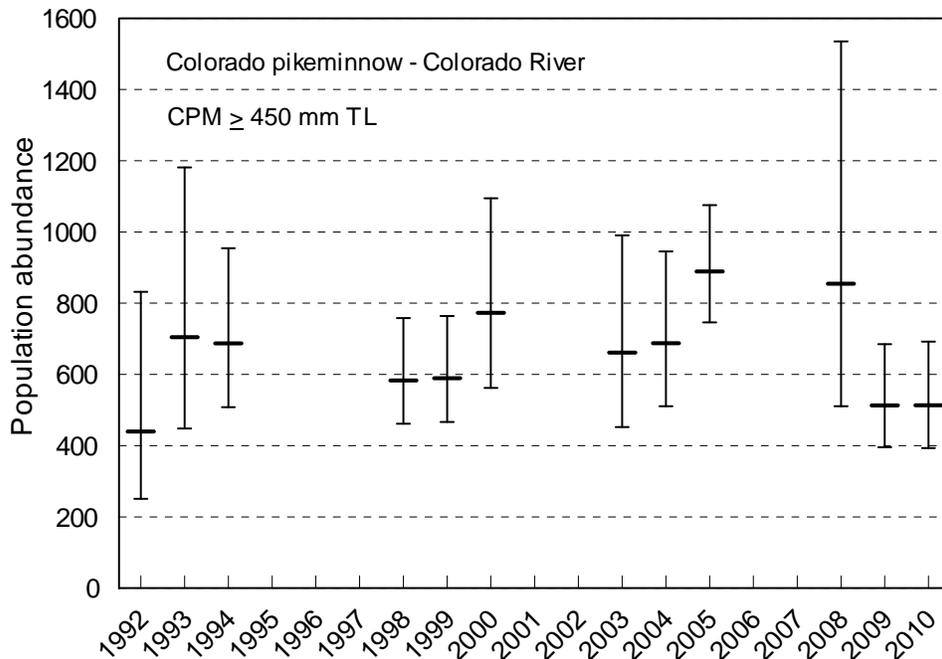
Task 2. Analyze data

Task 3. Write annual report (deliverable)

Task 4. Prepare final report (deliverable)

Initial Findings

Preliminary estimates from Program MARK using the new 2008-2010 matrix indicate the population of Colorado pikeminnow (≥ 450 mm TL) declined since the last estimate (2005) was made (Fig. 1). In 2008, the combined upper and lower reach estimate was not significantly different from the 2005 estimate; however, the 95% confidence interval in 2008 was the widest in all the years that estimates have been made. In contrast, the 2009 and 2010 estimates had some of the narrowest confidence intervals, similar to those in 1998, 1999 and 2005. Combined upper and lower reach estimates in 2009 ($N\text{-hat} = 513$) and 2010 ($N\text{-hat} = 514$) were significantly lower than the 2005 estimate ($N\text{-hat} = 889$). Because of the wide confidence interval associated with the 2008 estimate ($N\text{-hat} = 855$), it cannot be discerned whether population abundance declined between 2005 and 2008 or between 2008 and 2009. Osmundson and White (2009) reported a positive trend (significantly differing from zero) in the population estimates of 1992-2005, indicating a significant increase in the adult population size over that 13-year period. Our recent preliminary results indicate the population has now significantly declined within a four-year time frame (2005 to 2009). Such a decline in adults may be related to a small number of recruits if a strong year class has not been produced since 1998, and/or a decreased adult survival rate.



Shortcomings

Capture data was inputted and error checked and the capture history matrix for 2008-2010 was developed. Initial analyses were run in 2011. Currently, the matrix is being expanded to include 2004-2010 captures (use of new PIT tags began in 2004) to refine abundance estimates and produce current survival estimates. Preparation of the draft and final report is behind schedule and will continue through the 2011-2012 winter.

VII. Recommendations: Continue analyzing data and deliver draft and final reports in 2012. For future monitoring, the current schedule of three years of active sampling followed by a two-year rest period is recommended. Four passes per year continues to be the sampling goal with a fifth pass recommended when capture-recapture rates are low and runoff conditions or bass removal sampling allow a fifth pass.

VIII. Project Status: Field effort for the three years was performed on schedule; data input was on schedule but data analyses and report writing is behind schedule.

IX. FY 2011 Budget

A. Funds Provided:	64,121
B. Funds Expended:	64,121
C. Difference:	0
D. N/A (BR projects)	0
E. Publication Charges	0

X. Status of Data Submission: Capture data for Colorado pikeminnow, razorback sucker and bonytail, as well as predacious non-natives, encountered during this project are submitted to the database manager as inputting and error-checking is completed. The data from 2008 and 2009 has been submitted; the 2010 Colorado pikeminnow capture data is completed and will be submitted as soon as the PI can complete inputting and error checking the razorback sucker, bonytail, and NNF capture data collected during 2010.

XI. Signed: *Doug Osmundson*, November 13, 2011.

Literature cited:

Osmundson, D. B, and G. C. White. 2009. Population status and trends of Colorado pikeminnow of the upper Colorado River, 1991-2005.