COLORADO RIVER RECOVERY PROGRAM
FY 2010 ANNUAL REPORT

RECOVERY PROGRAM
PROJECT NUMBER: 110

I. Project Title: Smallmouth bass and channel catfish control in the lower Yampa River

II. Principal Investigator(s):
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III. Project Summary: This project is a continuation of work that began in 2001 to reduce the impacts of increasing smallmouth bass densities and channel catfish on native and endangered fish in the lower Yampa River. The methods and objectives for a specific year can be reviewed in the annual reports and a synthesis report for this project (Fuller, 2009). Study objectives included estimating the smallmouth bass population of the lower Yampa River in Yampa Canyon, reducing the abundance of smallmouth bass, analyzing catch rates to assess efficacy, determining native and nonnative fish composition, and locating possible "hotspots" of spawning activity. This year a marking pass for smallmouth bass population estimation was conducted, in addition to five removal passes for smallmouth bass and channel catfish >400mm total length (TL). The size composition and relative abundance of both nonnative and native species was also determined for five one-mile sub-reaches in order to monitor the fish community response to removal. In 2009 an extensive *Gila spp*. tagging component was introduced to the study in order to monitor populations of humpback and roundtail chubs. *Gila spp.* were captured and tagged this year, but at a reduced level of effort.

IV. Study Schedule: To be continued as needed

V. Relationship to RIPRAP:
General Recovery Program Support Action Plan
III.A.2.c Evaluate the effectiveness and develop and implement an integrated, viable active control program.

Green River Action Plan: Yampa and Little Snake Rivers
III.A.1. Implement Yampa Basin aquatic wildlife management plan…

VI. Accomplishment of FY 2010 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Six passes were completed this year. The smallmouth bass population estimate and fish community composition monitoring were also completed. All *Gila spp.* were tagged during pass 2.
Smallmouth Bass Population Estimate and Exploitation

In order to increase the number of adults removed and to insure sufficient numbers of marked fish, smallmouth bass were tagged during pass 3. Therefore two removal passes were conducted before the population was estimated, and all estimates were generated following the removal of 99 sub-adult and 109 adult fish. During pass 3, 172 sub-adult (100-199mm) and 76 adult (≥200mm) smallmouth bass were marked with blue USFWS Floy® tags. Of those fish, ten sub-adults and nine adults were recaptured in the fourth pass. The population of adult smallmouth bass was estimated at 732 (314-1,149, 95% C.I.) and for sub-adult bass at 2,611 (1,154-4,067, 95% C.I.; Table 1). For 2010, the number of bass per river mile was estimated at sixteen adult bass/mile and 57 sub-adults/mile. These estimates suggest a possible decrease in sub-adults since 2008, and a relatively stable or slightly increasing number of adults since 2008. Based on the point estimates for sub-adults and adults, 16% of sub-adults and 31% of adults were removed in three passes (passes 4-6). If tag returns are used to calculate exploitation rates, 15% of sub-adult and 24% of adult fish were removed. The decrease in sub-adult fish is a result of sub-adult fish from 2009 recruiting into adult sizes, with little replacement through reproduction in 2008-2009. A large cohort of bass was produced in 2007, and the length distribution of those fish centered around 200mm this year. These fish entering the adult population may have raised the point estimate slightly, but the difference is not statistically significant based on 95% confidence intervals.

Smallmouth Bass Removal

The number of bass removed in each pass is shown in Table 2. Marked sub-adult fish were observed growing into the adult size class by pass 6, and the average growth between marking and the last pass was ~6mm for sub-adults. Age categories were adjusted for within study growth to reflect average growth rates, which changed exploitation values only slightly. No fish captured appeared to be age-0.

For all passes, the catch rate was 6.4 bass/hour (h), with 2.3 adult fish/h and 3.8 sub-adults/h. In order to compare the catch rate with previous years, the catch rate for smallmouth bass ≥100mm was calculated at 6.2 fish/hr, a marked decrease from the past two years, and similar to 2007 (Figure 2). Catch rates for bass ≥100mm by pass showed a variable trend (Figure 3). Adult catch rates were relatively stable across all passes (2-3 fish/h), and the catch rate of sub-adults influenced the trend seen for fish >100mm. The variability in sub-adult catch rates is likely due to high flows in passes 1 and 2, and increased turbidity during pass 5. Length frequencies show the most abundant length category was fish 175-199mm (Figure 4). This appears to be a cohort produced in 2007 which was comprised of fish <125mm in 2008 and 126-175mm in 2009 (Figure 5).

Only six passes were completed despite starting sampling at higher flows. Average daily discharge at Deerlodge Park at the beginning of pass 1 was 13,500 cfs. Pass 2 was delayed a week because flows were above 14,900 cfs. Pass 2 was initiated at an average discharge of 15,500 cfs, which resulted from heavy rainstorms and was immediately followed by rapidly decreasing flows. The remaining passes were conducted until flows precluded sampling via rafts. The catch rates for adults during the earlier passes were comparable to those when flows decreased. Sub-adult catch rates increased substantially

after flows decreased below 10,000 cfs. Despite only three removal passes after the population estimate, 20% of the estimated bass ≥100mm were removed.

Adult bass were distributed throughout the canyon in similar numbers (Figure 6), but sub-adult bass were more abundant in reaches 1-3. The proportion of adults caught in reaches 3 and 7 showed an increase compared to 2008 and 2009. Reaches 1-3 showed an increase in the proportion of sub-adults caught in the last three years. Tag return data showed sub-adult bass predominantly either remaining within the reach of original capture, or moving downstream (see below). Also, the study reach above Yampa Canyon in Lily Park consists of a large percentage of smaller-sized fish at higher densities than those found in this study (Hawkins 2007, 2008; Hawkins *et al*. 2009). Sub-adult fish appear to be moving into the canyon from high density areas upstream. Crews noted congregation areas and the presence of bass expressing gametes that may indicate spawning activity throughout the season. Larger adults were observed in close proximity near Mantle Ranch in Laddie Park, and higher densities of sub-adults were seen in the canyon section of reach 1. No spawning pairs or nests were observed, and fish observed expressing gametes were larger fish (>200mm TL).

Channel Catfish Removal

Forty-nine channel catfish >399mm TL were removed during the six passes, with a catch rate of 0.27 fish/h. In 2009, the CPUE for the same size of catfish was 0.18 fish/h. Catfish captures increased in the last two passes as flows decreased.

Ancillary Captures

Ancillary fish captures are listed in Table 3. Nonnative fish captures were typical compared to previous years, with perhaps fewer of each species caught. Ten of the sixty-three individual Colorado pikeminnow captured during this study were less than 500mm TL.

Monitoring Reaches

Five monitoring reaches were sampled during pass 5. When the monitoring reaches were established in 2001 to correspond with data collected by Miller et al. (1982), a fifth reach between river miles 2 and 3 was established. This reach was sampled beginning in 2009 and again this year, although fewer fish were captured in the last reach compared to upstream reaches. For all the monitoring reaches combined, flannelmouth sucker and bluehead sucker were the most abundant species caught, followed by channel catfish, smallmouth bass, and speckled dace (Figure 7). The most abundant four species have remained the same during monitoring over the last four years (Figure 8), with the proportion of the two sucker species fluctuating. The increase of smallmouth bass in 2009, followed by the decrease this year likely reflects the growth of a large cohort of sub-adult bass into catchable size last year and their subsequent reduction this year.

Movement of Marked Smallmouth Bass

Eighteen of 76 adult (TL ≥200mm) bass were recaptured during the three removal passes. Of those bass recaptured, eleven (61%) were caught in the same reach where they were

marked. Four bass (22%) moved into the next reach downstream, and three (17%) moved upstream. One adult fish marked in 2009 during the Whirlpool/Split Mountain study (SOW #123) was caught in reach 10 of Yampa Canyon this year. Four adults marked in upstream study reaches with gray tags were caught.

Twenty-six of 172 marked sub-adult (TL 100-199mm) bass were recaptured during removal passes. Fifteen (58%) of these sub-adult recaptures were found in the same reach where they were marked, ten (38%) were caught one reach downstream, and one (17%) was caught upstream. Fifteen sub-adult bass were caught from the CSU study reach upstream.

Twenty-five bass marked in 2008 and 2009 were recaptured this year, including 12 adults and 13 sub-adults. Bass marked as sub-adults in 2009 grew an average of 53mm in the following year. Upstream movement was observed mostly in fish marked in 2008 and at large for two years. Fish marked in 2009 were found primarily in the same reach or downstream.

Gila spp. *Results*

Pass 2 was used as a survey pass for chubs, since bass catch rates were generally low. During this pass, 112 chubs (*Gila spp.*) were caught (TL=87-466mm). The length frequency distribution of these fish can be seen in Figure 9, which shows multiple size classes were captured. Seventy-three percent of the chubs caught were adults (TL$\geq$200mm), and 27% were sub-adults. The distribution of chubs by reach is shown in Figure 10. Adults were distributed evenly throughout the canyon, and sub-adults were mainly found in the lower reaches of the canyon. In general, roundtail chubs were common throughout the study. Nine chub tagged in 2009 were caught this year. One was an individual captured in the Green River and tagged at river mile 342. This fish was recaptured at river mile 12 in the Yampa.

VII. Recommendations:

1) Continue with smallmouth bass removal, and maximize the number of removal passes during post-peak run-off. Sampling should begin when water temperatures are suitable (>10ºC) and flows allow for effective sampling. Catch rates can be high during higher flows, particularly for adults. Mark-recapture population estimates should also be continued for bass, in order to assess exploitation. Catch rates have not decreased during the sampling season to make depletion estimates reliable.

2) Consider implementing study plans to assess the level of reproduction within Yampa Canyon, in order to determine factors that influence bass densities in the canyon. This may be accomplished through sampling later in the summer when age-0 fish are present. Bass densities within this study reach and tag data suggest downstream movement of fish may be contributing to the densities seen in the canyon. It is important to understand the relative contribution of bass movement compared to localized reproduction in order to devise effective control strategies.

3) Continue chub monitoring, and focus chub sampling earlier in the season. Adult chubs appear to be more accessible to electrofishing during higher flows in early summer. Conducting at least one full pass where all chubs are sampled will provide data for survival and growth on a yearly basis. In 2009, within year recaptures were low, making it difficult to estimate the population for the year. If more detailed information is needed for chubs, particularly humpback chub, a separate study should be designed to address those data gaps specifically.

VIII. Project Status: On track and ongoing pending approval

IX. FY 2010 Budget Status
- A. Funds Provided: $129,163
- B. Funds Expended: $129,163
- C. Difference: -0-
- D. Percent of the FY 2010 work completed, and projected costs to complete: 100%
- E. Recovery Program funds spent for publication charges: -0-

X. Status of Data Submission: Data are in Microsoft Excel format, and after minor revisions to standardize formatting, will be submitted to the database manager (submission expected by 31 Dec. 2010)

XI. Signed: *M. Tildon Jones* 11/15/2010 Submitted electronically
Principal Investigator Date

Fuller, M. 2007. Development of a smallmouth bass and channel catfish control program in the lower Yampa River. 2007 Annual Report. Recovery Implementation Program for the Recovery of Endangered Fishes in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver, CO.

Fuller, M. 2009. Lower Yampa River channel catfish and smallmouth bass control program, Colorado, 2001-2006. Final Report, Recovery Implementation Program for the Recovery of Endangered Fishes in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver, CO.

Hawkins, J. 2007. Yampa River northern pike and smallmouth bass removal and translocation. 2007 Annual Report. Recovery Implementation Program for the Recovery of Endangered Fishes in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver, CO.

Hawkins, J. 2008. Evaluation of smallmouth bass and northern pike management in the middle Yampa River. 2008 Annual Report. Recovery Implementation Program for the Recovery of Endangered Fishes in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver, CO.

Hawkins, J., Walford, C., Wright, B., Logan, J., and Hill, A. 2009. Evaluation of smallmouth bass and northern pike management in the middle Yampa River. 2009 Annual Report. Recovery

Implementation Program for the Recovery of Endangered Fishes in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver, CO.

Miller, W.H., D.L. Archer, H.M. Tyus, and R.M. McNatt. 1982. Yampa River fishes study. Final report. U.S. Fish and Wildlife Service, Salt Lake City, UT.

Table 1. Lincoln-Petersen estimates of smallmouth bass in Yampa canyon, 2010, after two removal passes.

Size class	Abundance	95% CI	SE	CV (%)
Sub-adult (100-199mm TL)	2,611	1,154-4,067	728	28
Adult (>200mm TL)	732	314-1,149	209	29
All bass >100mm	3,237	1,880-4,594	679	21

Table 2. Smallmouth bass captured by pass, 2010. Numbers in parentheses are tagged fish removed. Pass 3 involved marking and releasing fish. All other passes were removal passes.

Pass	Date	<100mm	100-199mm		>200mm	
1	June 1-4	1	48		59	
2	June 15-18	0	51		50	
3	June 22-25	3	177		80	
4	June 29-July 2	17	165	(10)	94	(9)
5	July 6-9	7	95	(8)	59	(4)
6	July 13-16	11	147	(8)	76	(5)
Total		39	683		418	

Table 3. Ancillary fish captures.

Species	Number removed
Northern pike	4
Walleye	1
Bluegill	1
Black crappie	1
White sucker	22
Black bullhead	1
Colorado pikeminnow	63
Roundtail chub	151
Humpback chub	4
Small *Gila spp.* (<150mm)	6

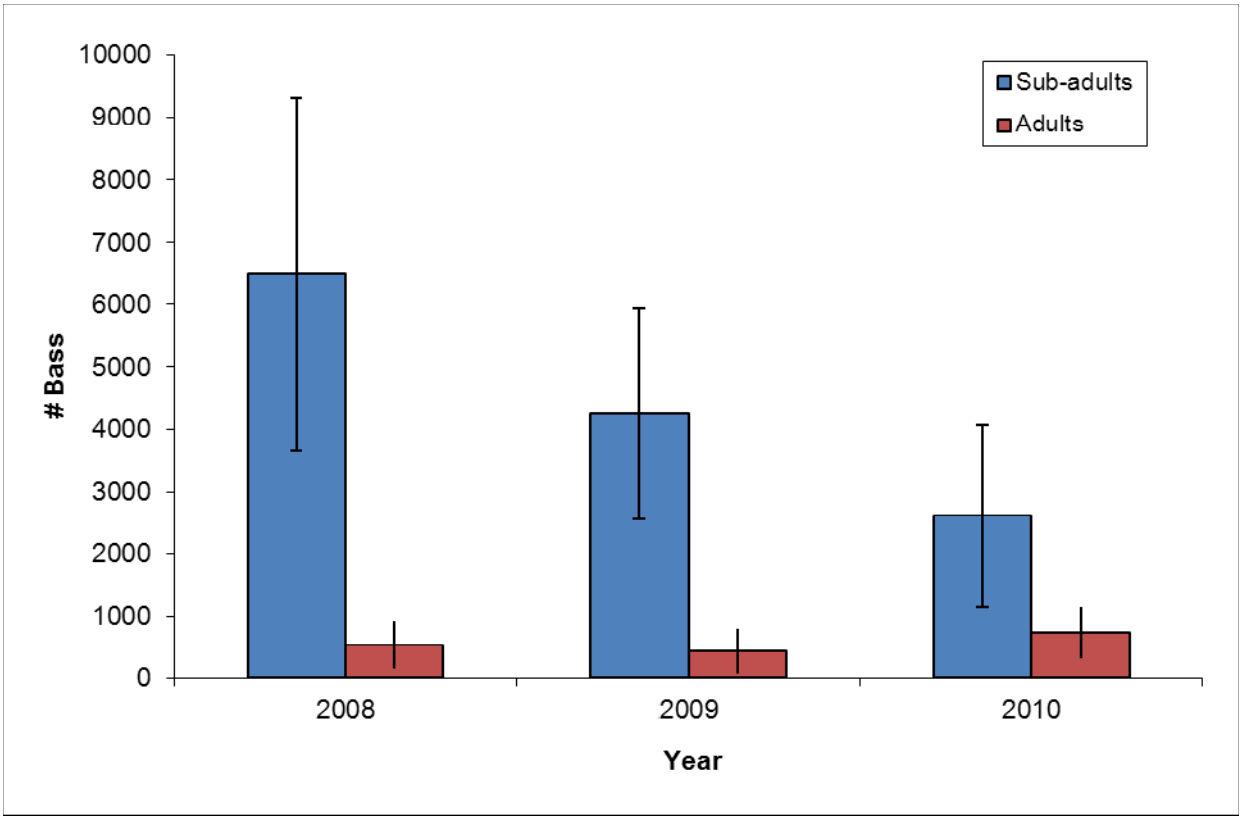

Figure 1. Population estimates with 95% confidence intervals for sub-adult and adult bass, 2008-2010.

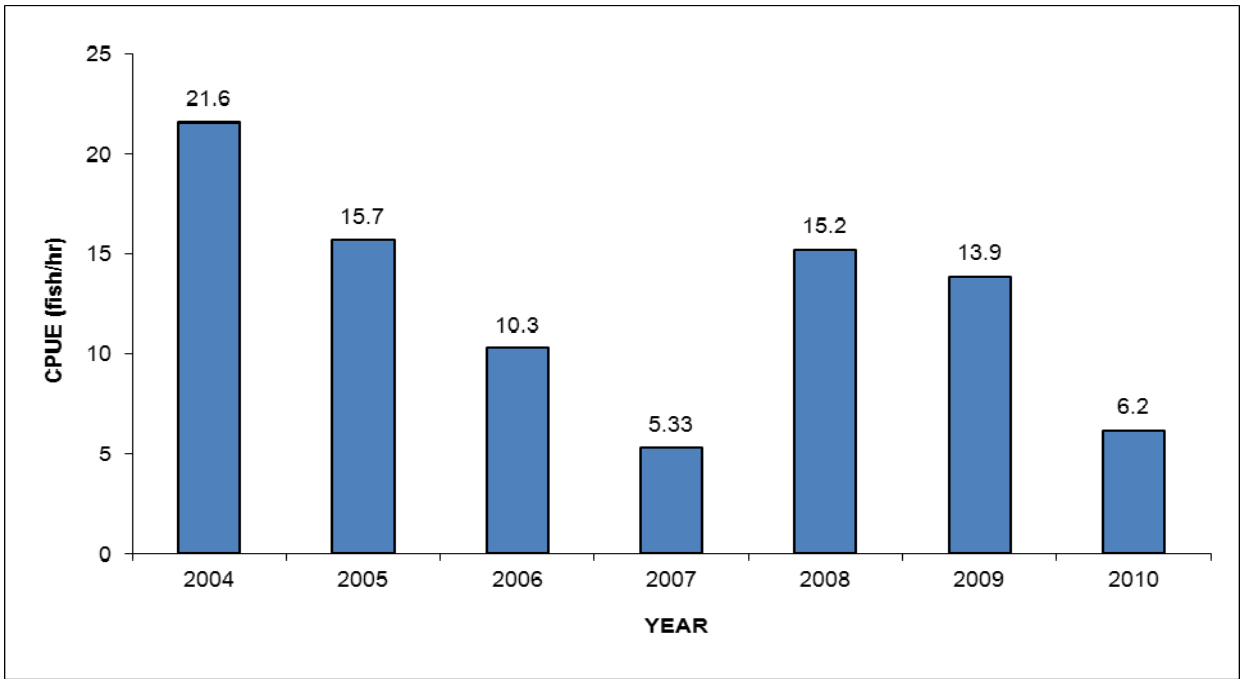

Figure 2. Catch per unit effort for smallmouth bass >100mm total length, all passes combined, 2004-2010.

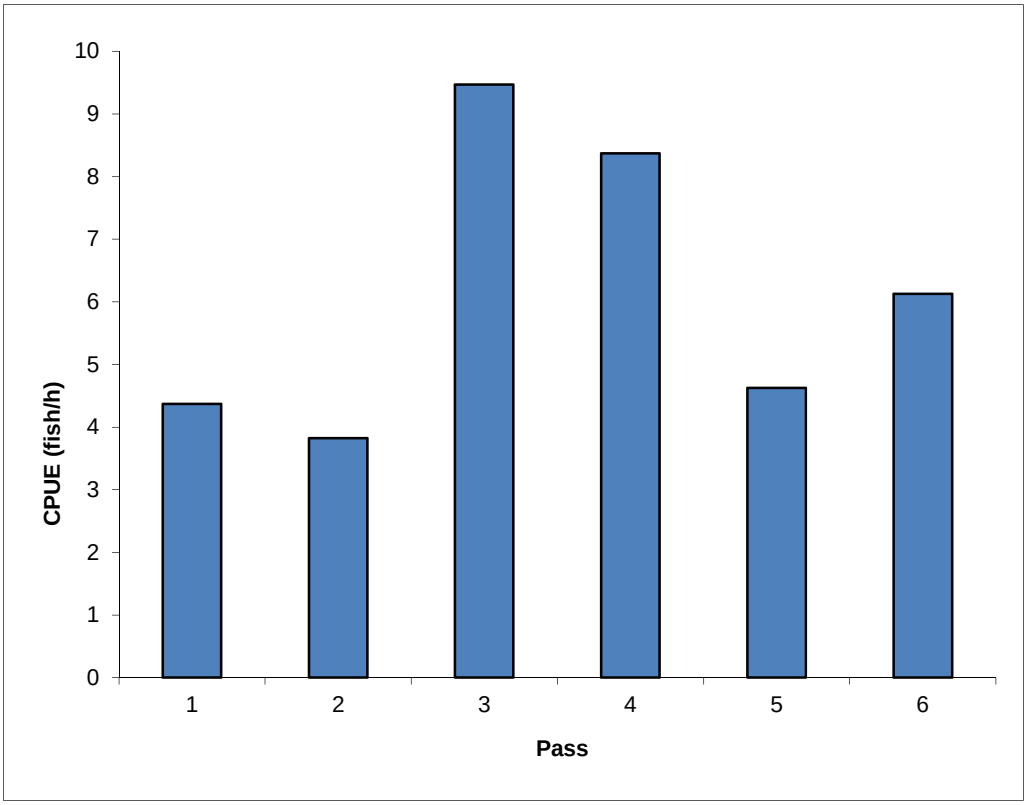

Figure 3. Catch per unit effort, all smallmouth bass >100mm by pass, 2010.

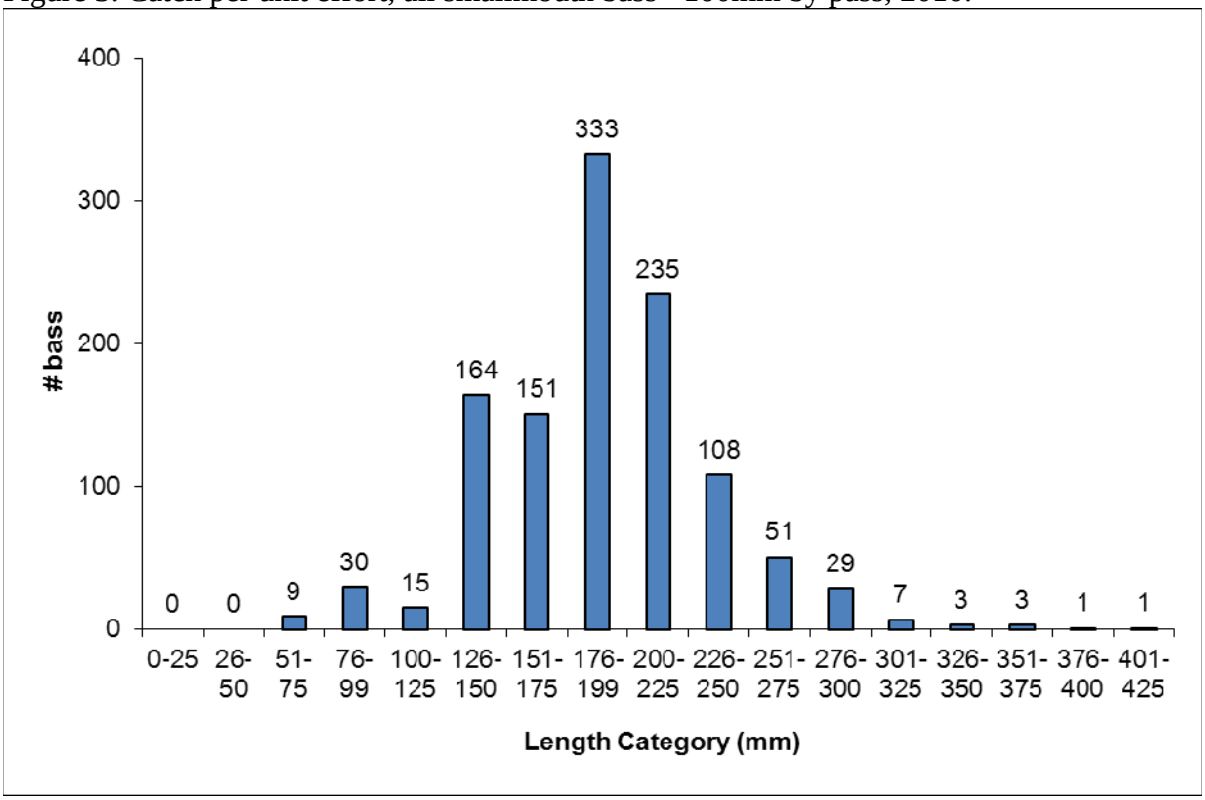

Figure 4. Length frequency of smallmouth bass caught in all passes, 2010.

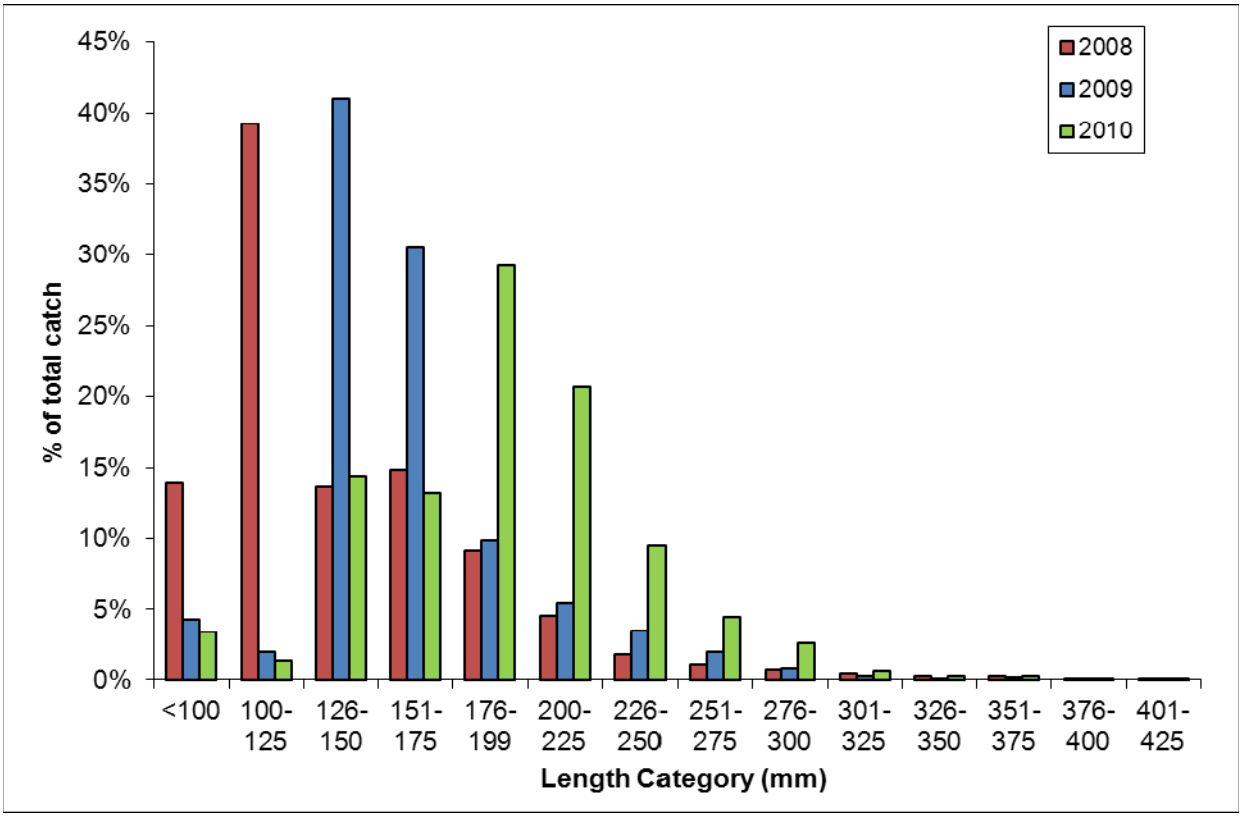

Figure 5. Length frequency of smallmouth bass, 2008-2010.

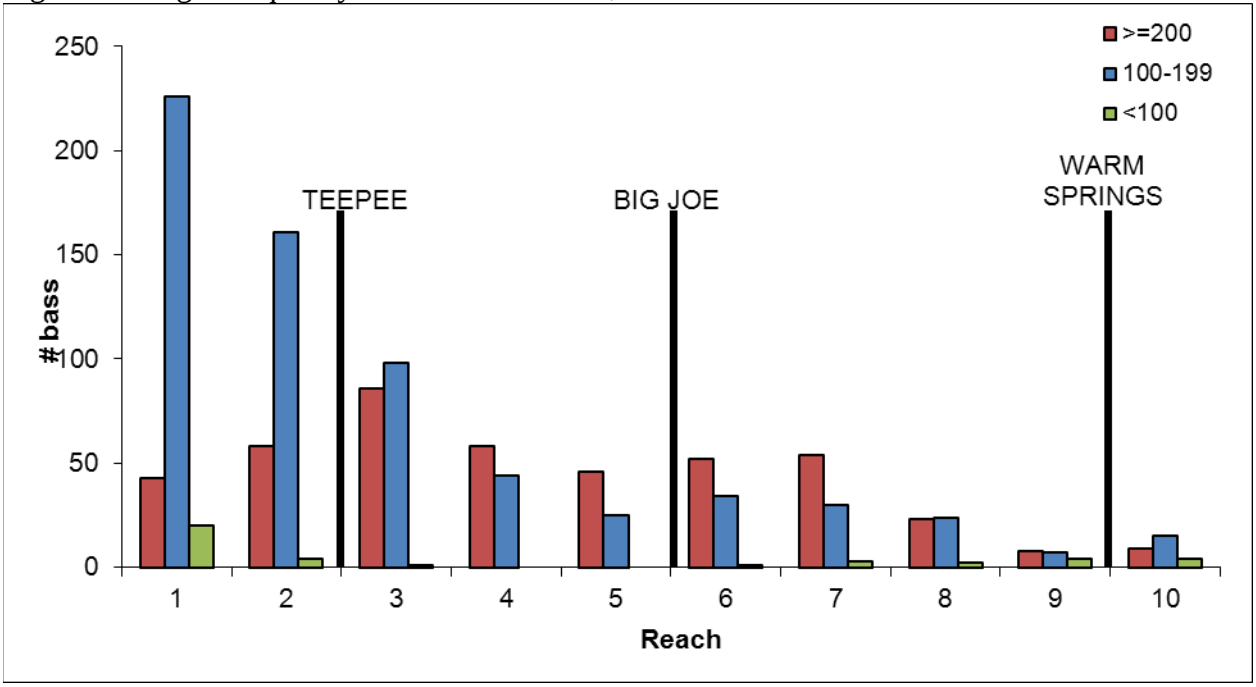

Figure 6. Total bass caught in each reach by length group, all passes, 2010. The approximate locations of prominent rapids are noted.

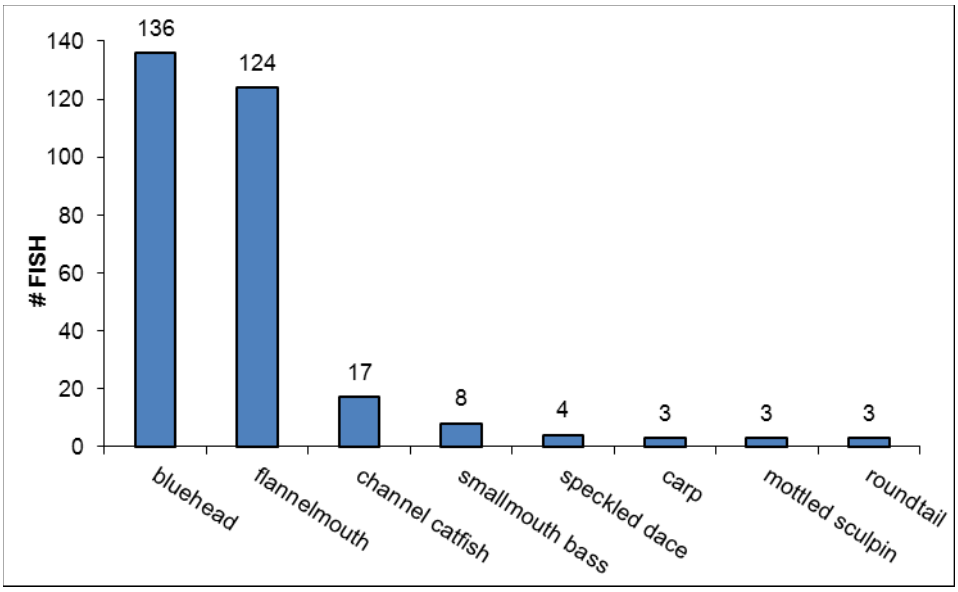

Figure 7. Total fish caught in five one-mile monitoring reaches, 2010.

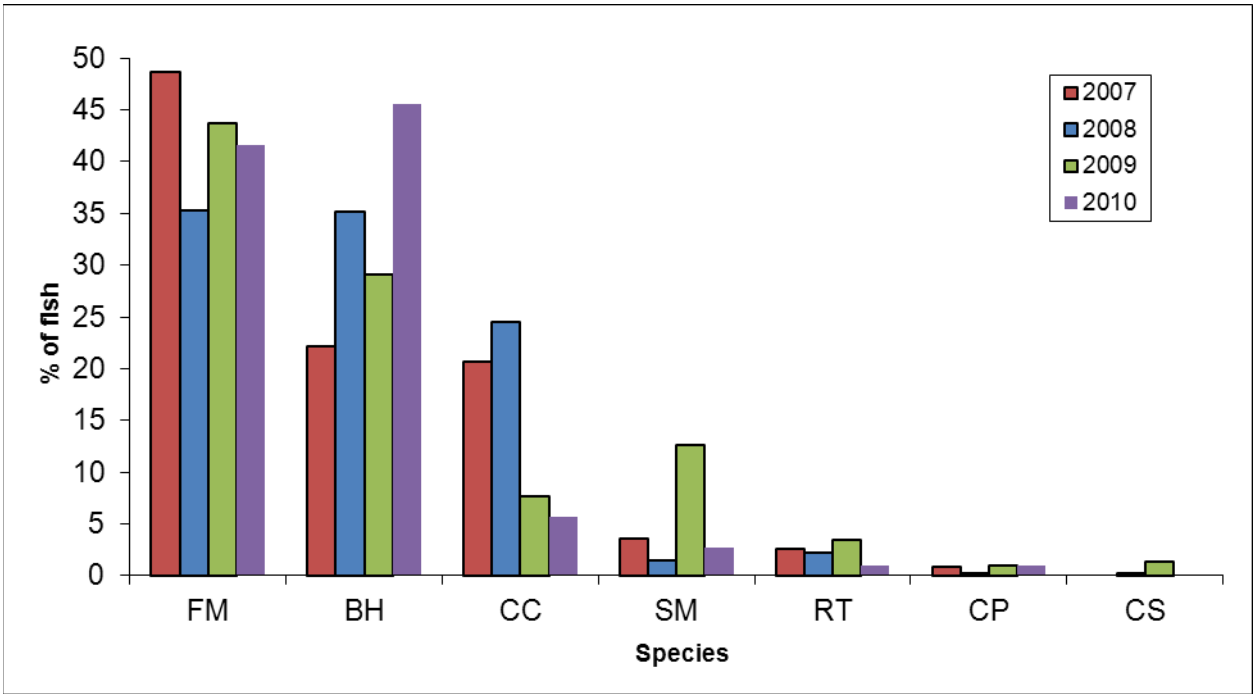

Figure 8. Species composition for all monitoring reaches combined, 2007-2010.

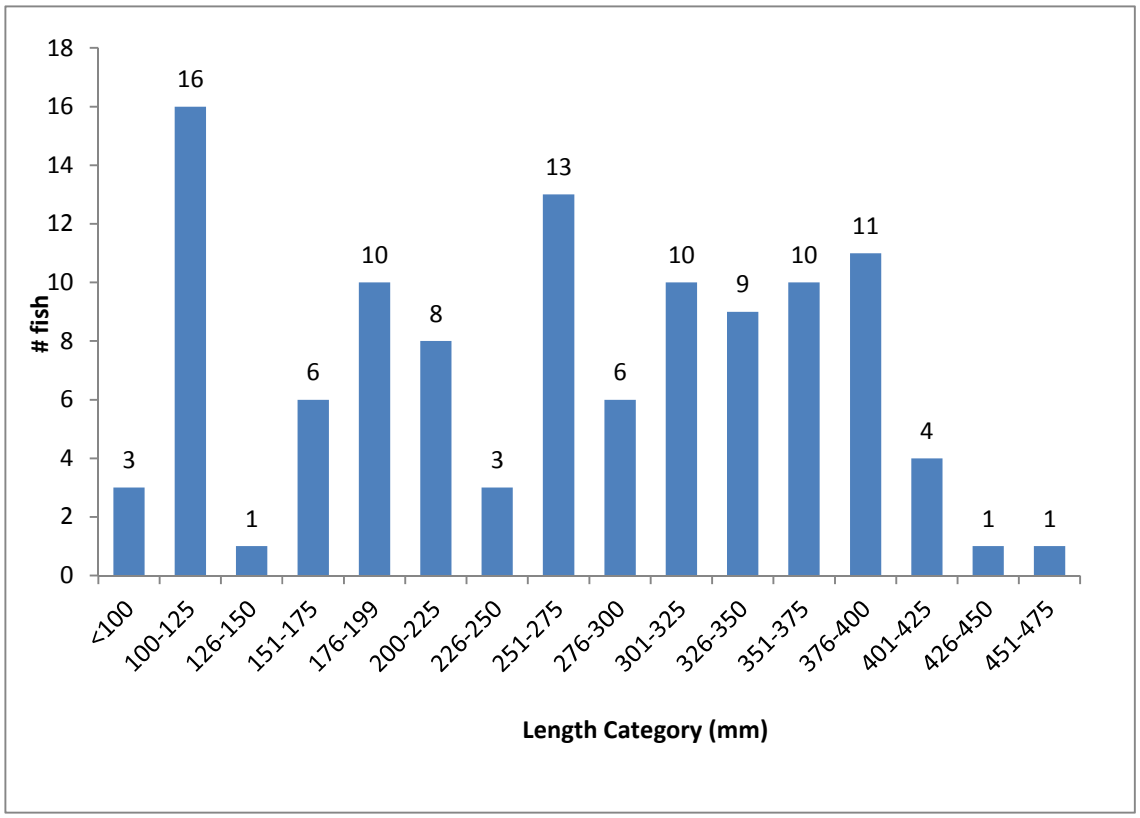

Figure 9. Total number of *Gila spp*. caught by length category, pass 2, 2010.

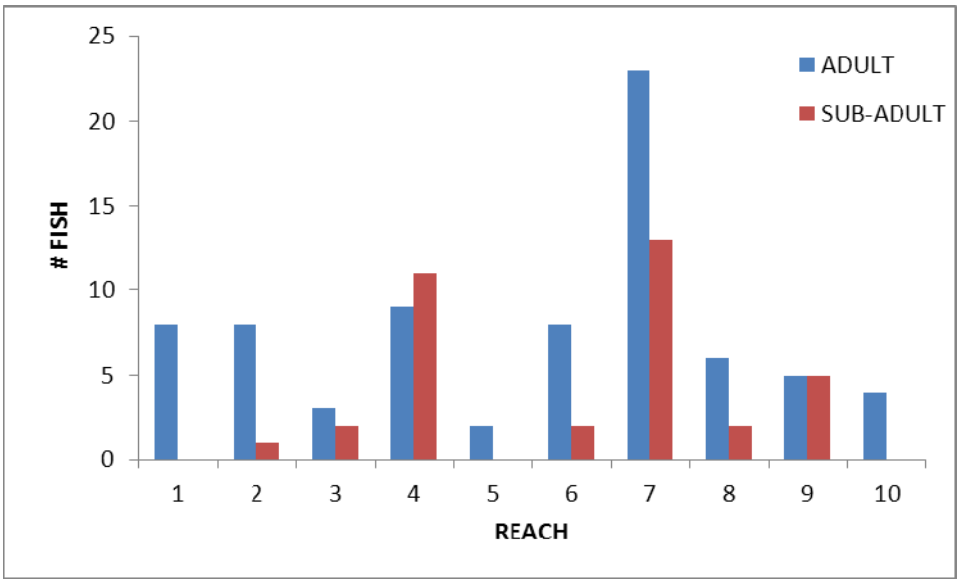

Figure 10. Distribution of *Gila spp*. by reach and length group, pass 2, 2010.