

**AUGMENTATION OF
COLORADO PIKEMINNOW
IN THE SAN JUAN RIVER: 2006**

Interim Progress Report
(Final)

Submitted By:

Dale W. Ryden
Fish Biologist

29 June 2007

U. S. Fish and Wildlife Service
Colorado River Fishery Project
764 Horizon Drive, Building B
Grand Junction, Colorado 81506-3946

EXECUTIVE SUMMARY

- A total of 1,301,928 Colorado pikeminnow were stocked into the San Juan River between 2002 and 2006
 - A 151,072 fish (10.4%) shortfall versus target stocking numbers over the first five years of the Colorado pikeminnow augmentation program (2002-2006)

- A total of 326,547 Colorado pikeminnow were stocked into the San Juan River in 2006
 - A 23,547 fish (7.8%) surplus over 2006 target stocking numbers
 - Largest number of Colorado pikeminnow ever stocked into the San Juan River in any single year
 - The five different age-classes stocked in 2006 represented the largest range of age-classes of Colorado pikeminnow ever stocked into the San Juan River in any single year

- Both target stocking numbers were met in 2006
 - Age-0 Colorado pikeminnow
 - Target stocking number = 300,000
 - Number stocked = 313,854
 - Age-1 Colorado pikeminnow
 - Target stocking number = 3,000
 - Number stocked = 3,200

- A total of 9,493 opportunistically-obtained Colorado pikeminnow were also stocked in 2006
 - Age-2 Colorado pikeminnow
 - Number stocked = 7,233
 - Age-3 Colorado pikeminnow
 - Number stocked = 279
 - Age-5 Colorado pikeminnow
 - Number stocked = 1,981

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INTRODUCTION

Colorado pikeminnow is a federally-listed endangered fish native to the San Juan River (Ryden 2003). The capture of larval Colorado pikeminnow confirmed that, as late as 2004, a small, but reproducing population of Colorado pikeminnow was still extant in the San Juan River (Brandenburg et al. 2005). In 1996, experimental stocking of Colorado pikeminnow into the San Juan River was undertaken by the Utah Division of Wildlife Resources' (UDWR) Moab field station. The purpose of this effort was to evaluate dispersal and retention of stocked juvenile Colorado pikeminnow as well as determining the availability, use, and selection of habitats by early life stage Colorado pikeminnow. Between 1996 and 2000, approximately 832,449 larval and age-0 Colorado pikeminnow were stocked into the San Juan River by the UDWR (Ryden 2003). In addition, 197 adult Colorado pikeminnow were stocked into the San Juan River, 49 in 1997 and 148 in 2001 (Ryden 2003). To date, several hundred of those stocked juvenile and adult Colorado pikeminnow have been recaptured during either seining or electrofishing efforts. Nine individual Colorado pikeminnow stocked in 1996 and 1997 have been documented as having recruited into the San Juan River's adult Colorado pikeminnow population (Jackson 2003, 2004, USFWS unpublished data). Based on data collected from these experimentally stocked fish, it is apparent that stocked, hatchery-reared, juvenile Colorado pikeminnow can survive in the San Juan River and can provide a viable method of supplementing the numbers and expanding the range of the wild San Juan River Colorado pikeminnow population.

In January 2003, An *Augmentation Plan For Colorado Pikeminnow In The San Juan River* (Ryden 2003) was finalized. This augmentation plan provided the necessary guidance for an eight-year augmentation effort. The Colorado pikeminnow augmentation plan calls for age-0 Colorado pikeminnow to be stocked each fall from 2002-2009 ($\geq 250,000$ in fall 2002 and $\geq 300,000$ each fall from 2003-2009). An addendum to this augmentation plan (Ryden 2005), calls 3,000 age-1+ fish to be stocked each fall, beginning in 2006. Age-0 Colorado pikeminnow have been stocked, as scheduled, each fall since 2002. The first stocking of age-1 Colorado pikeminnow under the revised augmentation plan occurred in fall 2006.

In addition, several other lots of Colorado pikeminnow were obtained over the last four years from various sources and stocked into the San Juan River. These lots of fish became available to the San Juan River Recovery Implementation Program (SJRIP) because they were fish that were excess to augmentation efforts occurring elsewhere in the Colorado River basin. While not specified in the revised augmentation plan, the opportunistic stocking of these fish was approved by the SJRIP Biology Committee. These lots of opportunistically-stocked fish ranged from age-1 to age-5 and came from three different hatcheries: the Colorado Division of Wildlife's (CDOW) Mumma Native Species Hatchery (Mumma), near Alamosa, CO; Dexter National Fish Hatchery and Technology Center (Dexter NFH&TC), near Roswell, NM; and the Arizona Game and Fish Department's (AZG&F) Bubbling Ponds hatchery facility (Bubbling Ponds), near Sedona, AZ.

Relationship To The Recovery Program

The need for artificial propagation and augmentation of this species in the San Juan River is apparent for several reasons. Augmentation of Colorado pikeminnow increases population numbers, provides more individuals for research purposes, adds genetic diversity to the existing gene pool, and provides a riverine refugia population that will, hopefully, remain stable until further research can identify factors limiting successful recruitment of this species in the San Juan River. The San Juan River Long Range Plan (SJRIIP 1995) identified the need to assess the feasibility of, and then implement the augmentation of Colorado pikeminnow. The Long Range Plan is undergoing revision. However, the need to augment the San Juan River's Colorado pikeminnow population is specified in tasks 1.2.3, 1.2.4, 1.2.5, 1.2.6, 1.2.7, sub-element 2.2, 4.1.3, 4.1.4, and 4.1.5 of the latest draft (dated October 30, 2006).

The objectives of this workplan for Fiscal Year 2006 (FY-2006) were as follows:

Objectives:

- 1.) Coordinate with Dexter National Fish Hatchery to procure and stock fish according to guidelines set forth in *An Augmentation Plan For Colorado Pikeminnow In The San Juan River*.
- 2.) Provide a report that gathers information from various sources on fingerling production, numbers of fish stocked, subsequent recaptures during various sampling efforts (other than the intensive monitoring effort), and makes recommendations (if necessary) for modifying methods being employed for Colorado pikeminnow augmentation efforts.

At the May 2007 meeting of the SJRIIP Biology Committee, it was decided that discussion pertaining to Objective 2 of the FY-2006 workplan would be eliminated. Therefore, this report only includes information on the numbers, dates, and locations of Colorado pikeminnow that were stocked into the San Juan River in 2006.

METHODS

Age-0 Colorado pikeminnow fingerlings were produced and reared at Dexter NFH&TC under a separate workplan. These fish were delivered to the San Juan River on two stocking dates, 19 October and 2 November 2006. Stocking trucks met crews at the river and fish were tempered for several hours before being transferred to oxygenated live wells in rafts. Fish were then transported downstream via raft and stocked into numerous low-velocity habitats (e.g., backwaters, embayments, and low-velocity shorelines) within two sections of the San Juan River

-- RM 180.2-170.5 and RM 158.6-148.5. On each stocking date fish were divided into roughly equal numbers before being stocked into the two sections. None of these fish were PIT tagged.

On 3 October 2006, the first stocking of age-1 Colorado pikeminnow called for under the 2005 augmentation plan addendum occurred. These PIT-tagged fish were stocked at RM 158.6.

In addition to planned augmentation activities, groups of opportunistically-acquired Colorado pikeminnow were stocked on four dates in 2006. These opportunistic stockings were all older fish (i.e., age-2 and age-3 fish from Mumma, and age-5 fish from Bubbling Ponds). These fish were all PIT-tagged prior to release.

RESULTS

A total of 326,547 Colorado pikeminnow were stocked into the San Juan River in 2006 (Table 1 and Appendix A). Of these, 313,854 were age-0 fish (Dexter NFH&TC), 3,200 were age-1 fish (Dexter NFH&TC), 7,233 were age-2 fish (Mumma), 279 were age-3 fish (Mumma), and 1,981 were age-5 fish (Bubbling Ponds).

Stockings For Augmentation

On 3 October 2006, 3,200 age-1 Colorado pikeminnow from Dexter NFH&TC were stocked at RM 158.6. These age-1 fish averaged 163 mm TL (range = 119-199 mm TL).

On 19 October 2006, 138,640 age-0 Colorado pikeminnow from Dexter NFH&TC were stocked. Of these, 94,000 were stocked into low-velocity habitats between RM 180.2-170.5 and 44,640 were stocked into similar habitats between RM 158.6-148.5. On 2 November 2006, a second group of 175,214 age-0 Colorado pikeminnow from Dexter NFH&TC were stocked. Of these, 69,734 were stocked into low-velocity habitats between RM 180.2-170.5 and 105,480 were stocked into similar habitats between RM 158.6-148.5. Therefore, a total of 163,734 age-0 Colorado pikeminnow (52.2%) were stocked between RM 180.2-170.5 and 150,120 (47.8%) were stocked between RM 158.6-148.5. These age-0 fish averaged 57 mm TL (range = 36-111 mm TL).

The 313,854 age-0 and 3,200 age-1 Colorado pikeminnow stocked in 2006 both exceeded the target numbers specified in the revised Colorado pikeminnow augmentation plan. This is the second consecutive year that stocking targets were exceeded by Dexter NFH&TC.

Table 1. Stockings of Colorado pikeminnow into the San Juan River in 2002-2006 versus the target number of fish specified in the revised Colorado pikeminnow augmentation plan.

Year	Number Of Fish Plan Calls For Annually	Number Of Fish Actually Stocked	Shortfall (-) Or Surplus (+) For the Year
2002	250,000 age-0	210,418 age-0	(-) 39,582
2003	300,000 age-0	175,928 age-0 1,005 age-1	(-) 123,067
2004	300,000 age-0	280,000 age-0 1,219 age-2	(-) 18,781
2005	300,000 age-0	302,270 age-0 500 age-1 4,041 age-2	(+) 6,811
2006	300,000 age-0 3,000 age-1	313,854 age-0 3,200 age-1 7,233 age-2 279 age-3 1,981 age-5	(+) 23,547
2007-2009	300,000 age-0 3,000 age-1		

Opportunistic Stockings

A total of 3,526 Colorado pikeminnow from Mumma were stocked at RM 180.2 on 13 July 2006. This group included both age-2 (n = 3,247) and age-3 (n = 279) fish from Mumma. A second group of age-2 Colorado pikeminnow from Mumma (n = 3,986) were stocked at RM 180.2 on 20 July 2006. The age-2 fish averaged 207 mm TL (range = 117-297 mm TL) and the age-3 fish averaged 216 mm TL (range = 155-276 mm TL).

On 3 August 2006, 1,722 age-5 Colorado pikeminnow from Bubbling Ponds were stocked at RM 147.9. Another 259 age-5 Colorado pikeminnow from Bubbling Ponds were transferred to Dexter NFH&TC on 3 August 2006. The 259 fish were held and observed for several weeks to see if any delayed mortalities might occur, associated with the PIT-tagging, transport, and handling of these fish. There were no mortalities while these fish remained at Dexter NFH&TC. They were stocked at RM 147.9 on 6 September 2006. These age-5 fish averaged 411 mm TL (range = 333-518 mm TL).

Target Stocking Numbers Versus Actual Numbers Stocked

A total of 1,301,928 Colorado pikeminnow (1,282,470 age-0 fish, 4,705 age-1, 12,493 age-2, 279 age-3, and 1,981 age-5) were stocked between 2002 and 2006 (Table 1). Of these, all of the age-0 fish and 3,200 (68.0%) of the age-1 fish were called for in the 2003 Colorado pikeminnow augmentation plan. The rest were opportunistically-stocked fish. This constitutes an overall shortfall of 167,330 fish (i.e., a 167,530 {11.6%} fish shortfall for age-0 fish, but a 200 fish {6.7%} surplus for age-1 fish), or 11.5%, over the first five years of the current augmentation effort.

If however, you just add up the overall number of Colorado pikeminnow that the 2003 augmentation plan called for to be stocked between 2002 and 2006 ($n = 1,453,000$) and add the opportunistically-stocked fish to the totals of those fish being stocked under the auspices of the 2003 augmentation plan ($n = 1,301,928$), then the overall shortfall for the first five years of the current augmentation effort combined is reduced slightly, to 151,072 total fish, or 10.4%. Using just overall numbers of stocked fish, there have been surpluses of 6,811 fish (2.3%) stocked in 2005 and of 23,547 fish (7.8%) stocked in 2006 (Table 2).

DISCUSSION

While there was an overall stocking shortfall of 10.4% over the first five years of the eight-year augmentation effort, the stocking shortfall has been reduced somewhat over the last two years as stocking goals have been not only met, but exceeded. In 2006, both target stocking numbers (i.e., $\geq 300,000$ age-0 fish and $\geq 3,000$ age-1 fish) were exceeded. It is anticipated that the target number of age-0 and age-1 fish will continue to be met by Dexter NFH&TC for remaining three years of this augmentation effort.

In addition to being the largest number of Colorado pikeminnow ever to be stocked into the San Juan River in a single year, the five different age-classes of fish stocked in 2006 was the widest range of age-classes of Colorado pikeminnow ever to be stocked into the San Juan River in a single year. The addition of older, opportunistically-stocked Colorado pikeminnow over the last four years has helped make up, somewhat, for previous years' stocking shortfalls. It has also helped to interject fish of many differing size- and age-classes into the riverine population. If these fish survive long-term, their presence should give biologists a chance to study such things as the differences in capture probability, survival and growth, and long-term retention among varying size- and age-classes of Colorado pikeminnow in the San Juan River.

ACKNOWLEDGEMENTS

Written comments on earlier drafts of this report were provided by Dr. Paul Holden, Chuck McAda, Dr. David Propst, and Dr. Steve Ross. Verbal comments were also received from other members of the San Juan River Biology Committee in an open discussion forum at a meeting that occurred on 17-18 May 2007.

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APPENDIX A

Information on Colorado pikeminnow stocked from 1996-2006.

Table A-1. A summary of Colorado pikeminnow that were stocked into the San Juan River, 1996-2006.

Year Stocked	Number Stocked	River Mile(s) Stocked At	Mean Total Length (in mm)	Range Of Total Lengths (in mm)	Age-Class & (Year-Class) Of Fish Being Stocked	Type Of Stocking	Entity Responsible For Stocking
1996	100,000	148.0 & 52.0	55	25-85	Age-0 (1996)	Experimental	UDWR
1997	116,878	148.0 & 52.0	45	35-55	Age-0 (1997)	Experimental	UDWR
1997	49	180.2	644	550-753	Age-16 (1981)	Opportunistic	USFWS
1998	10,571	148.0	24	18-28	Age-0 (1998)	Experimental	UDWR
1999	500,000	158.6	"Larvae"	Unspecified	Age-0 (1999)	Experimental	UDWR
2000	105,000	141.9	"Larvae"	Unspecified	Age-0 (2000)	Experimental	UDWR
2001	148	180.2	540	442-641	Age-10 (1991)	Opportunistic	USFWS
2002	210,418	180.2 & 158.6	51	32-127	Age-0 (2002)	Augmentation	USFWS
2003	175,928	180.2-170.5 & 158.6-148.5 (a) 188.4-180.7 & 163.7-159.2 (b)	58	Unspecified	Age-0 (2003)	Augmentation	USFWS (a) & BIO-WEST (b)
2003	1,005	180.2	180	125-280	Age-1 (2002)	Opportunistic	CDOW
2004	280,000	180.2-170.5 & 158.6-148.5	50	35-116	Age-0 (2004)	Augmentation	USFWS & BIO-WEST
2004	1,219	180.2	218	144-278	Age-2 (2002)	Opportunistic	CDOW-Mumma
2005	302,270	180.2-170.5 & 158.6-148.5	55	32-151	Age-0 (2005)	Augmentation	USFWS & BIO-WEST
2005	500	180.2	201	114-256	Age-1 (2004)	Opportunistic	USFWS
2005	4,041	180.2	181	115-281	Age-2 (2003)	Opportunistic	CDOW
2006	313,854	180.2-170.5 & 158.6-148.5	57	36-111	Age-0 (2006)	Augmentation	USFWS
2006	3,200	158.6	163	119-199	Age-1 (2005)	Augmentation	USFWS
2006	7,233	180.2	207	117-297	Age-2 (2004)	Opportunistic	CDOW
2006	279	180.2	216	155-276	Age-3 (2003)	Opportunistic	CDOW
2006	1,981	147.9	411	333-518	Age-5 (2001)	Opportunistic	AZG&FD, USFWS, & BIA