

**LITTLE COLORADO RIVER FISH MONITORING  
2003 ANNUAL REPORT**



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## TABLE OF CONTENTS

<b>INTRODUCTION.....</b>	<b>4</b>
<b>STUDY SITE.....</b>	<b>4</b>
<b>METHODS.....</b>	<b>4</b>
<b>RESULTS.....</b>	<b>5</b>
<i>Native species.....</i>	<i>6</i>
Humpback chub.....	6
Flannelmouth sucker.....	6
Speckled dace.....	7
<i>Nonnative species.....</i>	<i>7</i>
<b>DISCUSSION.....</b>	<b>7</b>
<i>Native species.....</i>	<i>7</i>
<i>Nonnative species.....</i>	<i>8</i>
<i>Trends in LCR spring stream flow.....</i>	<i>8</i>
<i>Elastomer dye evaluation.....</i>	<i>9</i>
<i>Evaluation of new 134.2 Khz PIT tag readers.....</i>	<i>9</i>
<i>Value of long-term catch trends.....</i>	<i>9</i>
<b>LITERATURE CITED.....</b>	<b>10</b>
<i>Table 1. Little Colorado River hoop netting effort by year, 1987 – 2003. ....</i>	<i>11</i>
<i>Table 2. Catch by species, lower 1200 m hoop net monitoring, Little Colorado River, April 11 - May 9, 2003. Total effort = 7,800 net hours. ....</i>	<i>11</i>
<i>Table 3. Numbers of fish scanned, tagged, and recaptured by species during LCR lower 1200 meter hoopnet monitoring, 2003.....</i>	<i>11</i>
<i>Table 4. Catch of species by year, LCR standardized hoop net monitoring 1987 – 2003.....</i>	<i>12</i>
<i>Table 5. Catch per 24 hours of hoop net effort in the LCR by year, 1987-2003. ....</i>	<i>12</i>
<i>Table 6. Catch of predators and stomach contents examined during 2003 LCR sampling.....</i>	<i>13</i>
<i>Table 7. Length frequency distributions of fish collected during LCR sampling, April 11 – May 9, 2003. ....</i>	<i>13</i>
<i>Table 8. Sexual condition of fish caught in the LCR in 2003. ....</i>	<i>15</i>
<i>Table 9. Sexual characteristics of fishes collected by all gear types, LCR 2003. ....</i>	<i>15</i>

<b>FIGURES.....</b>	<b>16</b>
<i>Figure 1. Length frequency distributions of humpback chub (HBC), flannemouth sucker (FMS) and bluehead sucker (BHS), LCR monitoring 2003.....</i>	<i>16</i>
<i>Figure 2. Mean daily turbidity and catch per hour of humpback chub, LCR 2003.....</i>	<i>17</i>
<i>Figure 3. Species composition in standardized hoop net monitoring, 1987 - 2003. ....</i>	<i>17</i>
<i>Figure 4. Daily water and air temperature (°C), at Boulder camp, LCR 2003. ....</i>	<i>17</i>
<i>Figure 5. Mean catch/hr of native fish in the LCR, 1987 – 2003. ....</i>	<i>18</i>
<i>Figure 6. Mean catch/hr of nonnative fishes in the LCR, 1987-2003.....</i>	<i>19</i>
<i>Figure 7. Mean April and May stream flow, Little Colorado River near Cameron.....</i>	<i>20</i>
<i>Figure 8. Palmer Drought Severity Index for the United States, 2003.....</i>	<i>20</i>
<i>Figure 9. Initial tagging dates of HBC recaptured in 2003 in the LCR. ....</i>	<i>21</i>
<i>Figure 10. Initial tagging dates of FMS recaptured in 2003 in the LCR. ....</i>	<i>21</i>
<b>APPENDIX.....</b>	<b>22</b>
<i>2003 Humpback chub recapture summary .....</i>	<i>22</i>
<i>2003 Flannemouth sucker recapture summary .....</i>	<i>26</i>
<i>2003 Bluehead sucker recapture summary.....</i>	<i>29</i>

## INTRODUCTION

In 1987, the Arizona Game and Fish Department (AGFD) began to monitor fish in the Little Colorado River (LCR) to assess the population trends and status of endangered humpback chub (*Gila cypha*)(HBC) (Robinson and Clarkson 1992). Annual standardized hoop net sampling is conducted for 30 – 40 days to capture humpback chub during the spring spawning period (Table 1). This program was discontinued in 2000 but then reinstated in 2002 at the advice of the Grand Canyon Monitoring and Research Center Protocol Evaluation Panel (Anders et al. 2001). Catch-per-unit-effort (CPUE) indices derived from this monitoring program are useful as independent validation for mark-recapture population models of humpback chub developed by Coggins and Walters (2001). With the exception of the period 2000-2001, the lower 1200 meter sampling represents one of the most consistent, long-term sampling methods in use for Grand Canyon fishes.

## STUDY SITE

The study site is the lower LCR, 1200 m upstream from its confluence with the Colorado River. The LCR in the study area is a deeply entrenched channel located in a vertical-walled canyon that in places narrows to less than 50 m. The LCR channel contains runs, riffles, deep pools and small rapids. Substrates are primarily silt and sand with scattered large boulders. The LCR is the primary spawning site for endangered HBC in Grand Canyon. It is the only known HBC aggregate in the Colorado River Ecosystem (CRE) from which fish are recruited into the adult population (Valdez and Ryel 1995; Coggins and Walters 2001). Other native fishes, bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*Catostomus latipinnis*), and speckled dace (*Rhinichthys osculus*) spawn in the LCR (Robinson et al. 1998) as do exotic species including channel catfish (*Ictalurus punctatus*), fathead minnow (*Pimephales promelas*), red shiner (*Cyprinella lutrensis*), and common carp (*Cyprinus carpio*).

## METHODS

Thirteen standardized AGFD hoop nets were fished continuously from April 13 to May 5, 2003, and checked once daily. Hoop nets measured 5 m long and 1m diameter with 6.3 mm mesh, 7 hoops and two throats. Nets were set at 100, 119, 137, 165, 420, 480, 500, 577, 675, 1045, 1110, 1160, and 1195 m upstream from the confluence. Net locations were set as close as possible to those used in previous sampling efforts (Brouder and Hoffnagle 1998). Catch per unit effort was calculated as number of fish caught per hour or 24 hours.

All fish caught (1,999) were handled following protocols in Ward (2002). All fish collected were identified to species and measured for total length (TL; mm). Fork length was also measured for humpback chub, flannelmouth sucker, and bluehead sucker. Weights were not measured because scales did not yield accurate weights in high winds common during the study period. Native fish were sexed when possible based on extrudable gametes and sexual condition (not ripe, ripe, spent) was recorded. Examination of sexual characteristics (none, color, tuberculate) were also noted. Number and type of external parasites were recorded. Native fish  $\geq 100$  mm TL were scanned for the presence of a PIT tag with both new 134.2 KHz tag reader and an old 400 KHz tag reader to evaluate the new PIT tag readers and verify that no tags were missed. If a tag was not found and the fish was  $\geq 150$  mm TL, a 134.2 KHz PIT tag was inserted into the abdominal cavity. Tag presence or absence and PIT tag number were recorded. Fish were also checked for fin clips. PIT tag information was downloaded to electronically and checked for errors. Flannelmouth and bluehead sucker over 150 mm TL were injected with a pink elastomer dye in the head. These marks were used to evaluate the use of injectible elastomer dye as a secondary mark to estimate tag loss.

## **RESULTS**

A total of 1,999 fish representing 11 species were captured in the LCR during standardized monitoring in 2003. Native species dominated the catch and comprised more than 90% of total fish caught (Table 2). Flannelmouth sucker, speckled dace, bluehead sucker and humpback chub were the predominant species caught (Table 2 & 3). Catch rates of native fishes were generally higher than those seen during the previous three years of sampling efforts (1997-2002) (Table 4 & 5).

The LCR was above base flow during the 2003 sampling until May 1<sup>st</sup> after which it returned to base flow (approximately 222 cfs, Robinson et al. 1998) and remained there for the duration of the sampling period. Turbidity was over 500 NTU's at the beginning of the sampling and gradually decreased to less than 10 NTU's. Turbidity did not appear related to overall CPUE in 2003 (Figure 2). Water temperature ranged from 15 – 18 °C during the sampling period (Figure 4).

## **Native species**

### *Humpback chub*

A total of 322 humpback chub were collected in standardized hoop net sets during the spring monitoring period. Approximately half of the fish were juveniles (< 150 mm TL) (Tables 3 & 7). Large chub appeared to be mostly spent adults.

We examined 247 humpback chub  $\geq$  100 mm TL for the presence of a PIT tag. No fish between 100 and 150 mm TL had tags. We examined 172 humpback chub  $\geq$  150 mm TL for presence of a PIT tag and 91 (53%) were PIT tag recaptures ( Table 3).

Forty-seven young-of-the-year humpback chub (<100 mm) were caught; the smallest was 31 mm TL. We found one ripe male HBC, one tuberculate HBC and one HBC reported with color. No ripe female chub were observed (Table 8). Four HBC had a single parasite *Lernea*. Average total length of HBC with *Lernea* was 176.8 mm. *Lernea* was found in only one other fish (SPD) in 2003.

### *Flannelmouth sucker*

Flannelmouth sucker were the most abundant species captured (590, 29.5%) in 2003 (Table 2). Flannelmouth sucker caught in 2003 had a mean length of 263 mm and ranged in size from 65 to 581 mm TL (Table 7). Most flannelmouth suckers were presumed to be Age II fish (Figure 1). A total of 522 flannelmouth suckers were scanned for the presence of a PIT tag and 184 (35%) were recaptured fish (Table 3). The number of flannelmouth suckers recaptured in 2003 was more than double the number of flannelmouth suckers recaptured in 2002. The percent of recaptures did not change. This may be because of additional tagging efforts taking place in the mainstem Colorado River in conjunction with trout removal projects near the LCR. Two ripe male flannelmouth suckers were captured, 6 tuberculate fish, and 3 recorded as females “with color” (Tables 8-9). Many small flannelmouth suckers were observed at the end of the sampling period which were too small to be captured with the mesh size of the nets. Based on the abundance of larval and post larval juveniles seen in shallow near-shore areas, we assume that flannelmouth sucker had spawned in late March or early April in 2003.

### *Bluehead sucker*

Bluehead suckers caught in 2003 had a mean TL of 97 mm and ranged in size from 45 to 379 mm (Table 7). Bluehead suckers captured were primarily comprised of fish presumed to be Age-0 (Figure 2). A total of 64 bluehead suckers were scanned for presence of a PIT tag, only

one was a recapture. This fish was initially tagged during the 2002 sampling effort and grew 41 mm in 1 year (Appendix).

Five ripe male bluehead suckers were collected between 13 April and 5 May (Table 8). One ripe female was recorded and young-of-the-year (< 80 mm) bluehead sucker were common in catches (Figure 1, Table 7). We assume bluehead suckers spawned prior to our sampling in 2003, likely in February or March.

#### *Speckled dace*

Five hundred and twenty speckled dace were caught in 2003 and were the second most abundant species caught (Table 2). Ten ripe females were collected toward the end of the sampling period indicating speckled dace spawn in the LCR in late April and early May (Table 8).

#### **Nonnative species**

Nonnative species made up only 8 % of the total catch in 2003 with fathead minnow and red shiner being the most abundant species caught (Table 2 & Figure 3). Adult fathead minnows between 54 – 82 mm were relatively common in catches and fish were near spawning condition. Stomachs from 9 large bodied predators were examined. Four stomachs were empty, 4 contained fish remains, and one contained invertebrates (Table 6).

## **DISCUSSION**

#### **Native species**

In 2003, mean CPUE of flannelmouth sucker and bluehead sucker  $\geq 150$  mm TL were the highest recorded since monitoring began in 1987 (Figure 5). Large numbers of age 2 and 3 flannelmouth suckers were caught indicating survival and recruitment was high in 2000 (Figure 1). High recruitment of flannelmouth suckers may have been caused by the low summer steady flows in 2000 which increased mainstem water temperature by approximately 2 °C in the lower river. Subsequent warmer mainstem water temperatures caused by drought conditions and lowered water levels in Lake Powell (Susan Hueftle, USGS unpublished data) may have also led to increase survival of suckers. Flannelmouth suckers recaptured in 2003 in the LCR were originally tagged in areas very distant from the Little Colorado River. One flannelmouth sucker was originally tagged at RMI (-2.5 mile) in the Lee's Ferry area and two other fish were originally tagged in the Paria River. Flannelmouth suckers were also recaptured from as far

downstream as RMI 192.4 with several others originally being tagged in Havasu Creek and Kanab Creek (Appendix).

Mean CPUE of humpback chub  $\geq 150$  mm in 2003 was also higher than any observed since 1990 (Figure 5). High catch rates of humpback chub appear to be comprised largely of fish previously tagged in 2001 (Figure 9). Recaptures of HBC are exclusively from fish initially tagged in or near (within 5 miles) the LCR confluence (Appendix). HBC recaptured ranged from 1-14 years of age (Appendix) with most of the recaptured fish tagged in 1991 – 1995 or in 2002 (Figure 9). Catch of SPD is highly variable among years with no significant trends in CPUE of SPD from 1987 to 2003 (Figure 5).

### **Nonnative species**

There is some indication that the number of fathead minnows in the system has increased since 1994 although differences are not statistically significant (Figure 6). Catch rate of red shiner also appears to have increased since 1996 (Figure 6). Black bullhead have shown higher variability in catch since 1995 (Figure 6). Channel catfish show no significant increase in CPUE since monitoring began in 1987 (Figure 6). No trends are evident in catch rate of common carp although 1997 and 2003 catch rates appear to be higher than in previous years (Figure 6). There is some indication that catch of small-bodied exotic fishes is correlated with low spring (April and May) stream flow in the LCR (Figures 6, 7). The percentage of nonnative fish in the catch, although low, appears to be increasing since monitoring began in 1987 (Figure 3).

### **Trends in LCR spring stream flow**

The Palmer Drought Severity Index indicates much of Arizona and the watershed of the Little Colorado River is in a period of extreme drought (Figure 8). Since 1979 there has been a decline in the mean stream flow of the LCR during the months of April and May (Figure 7). Reduced peak stream flow in April and May could have long-term consequences for the survival of humpback chub in the Little Colorado River. In the Verde River, CPUE of age-1 roundtail chub were found to increase following large floods in late winter or early spring of the previous year (Brouder 2001). We speculate that the scouring effects of a large spring flood, while destructive to successful recruitment in that year, may create conditions that favor survival of fish in the following year. If large spring flood events are important to the survival and recruitment of strong cohorts of humpback chub, then the reduction in the frequency and magnitude of spring flood events since 1979 in the LCR may have detrimental impacts on the



long-term survival of humpback chub. There are only 4 years of record for the stream gauge located near the mouth of the LCR (USGS gauge 09402300) so evaluation of long term changes in LCR base flow and how they may impact humpback chub can not be done at this time.

### **Elastomer dye evaluation**

Many flannelmouth and bluehead suckers marked in the head with elastomer dye were recaptured a short time later during the same trip (40/142) and marks were highly visible. Initial assessment indicates that this tagging method can be done in the field with adequate preparation but does require additional handling of fish. Long-term assessment of mark retention is needed. Recent information from elastomer tag recoveries in humpback chub translocated above Chute Falls indicate these marks may fade and become undetectable as fish grow (Stone and Sponholtz 2003). Two flannelmouth suckers with elastomer marks were recaptured without PIT tags (5%). This PIT tag loss rate is similar to that observed in laboratory tag retention studies using bonytail chub during a 30-day period (4 %) (Childs 2002).

### **Evaluation of new 134.2 Khz PIT tag readers**

Both the old (400 KHz) and new (134.2 KHz) pit tag readers were used to scan all native fish over 150 mm TL. There were 19 fish out of a total of 192 old (400 KHz) tags scanned that the new scanner would not pick up but the old scanner did, indicating a failure rate of 9.8 % for the new scanners. The problem may be because of fish with multiple 400 KHz tags in them. Trials with two 400 KHz tags indicate that two 400 KHz tags in a fish with the same orientation confuse the new scanners. This appears to be a problem caused by the unreliability of the old scanners that may be perpetuated by the new scanners. Both scanner types must continue to be used to avoid these errors.

### **Value of long-term catch trends**

Catch-per-unit-effort (CPUE) indices derived from the lower 1200-meter monitoring show dramatic declines in CPUE of adult humpback chub and validate mark-recapture population estimates. This index of catch rate is also valuable as an independent method to confirm output of age structured mark recapture (ASMR) open population models and demonstrates the importance of long-term monitoring programs. Standardized monitoring should be continued to compare catch rate data with population estimates from the USFWS and validate ASMR stock assessment models produced by GCMRC.

## LITERATURE CITED

- Anders, P., M. Bradford, P. Higgins, K.H. Nislow, C. Rabeni, and C. Tate. 2001. Protocols Evaluation programs, Final Report, Grand Canyon Monitoring and Research Center, Flagstaff, Arizona.
- Brouder, M. J. 2001. Effects of flooding on recruitment of roundtail chub, *Gila robusta*, in a southwestern river. *Southwestern Naturalist*, 46 (3): 302-310.
- Brouder, M. J. and T.L. Hoffnagle. 1998. Little Colorado River native fish monitoring 1996 annual report. Final report submitted to Bureau of Reclamation, Cooperative Agreement 9-FC-40-07950.
- Childs, M. 2002. Evaluation of tagging mortality and retention in juvenile humpback chub: Bonytail chub as a surrogate species. Draft report submitted to Grand Canyon Monitoring and Research Center. September 2002.
- Coggins, L. G. and C. Walters. 2001. Trends in the Recruitment and Abundance of the Little Colorado River Population of Humpback Chub. Powerpoint presentation to Glen Canyon Dam Adaptive Management Program Technical Work Group, November 2001. ([ftp://ftp.gcmrc.gov/pub/TWG/Coggins\\_HBC\\_11-01.ppt](ftp://ftp.gcmrc.gov/pub/TWG/Coggins_HBC_11-01.ppt)).
- Robinson, A.T. and R.W. Clarkson. 1992. Annual spring monitoring of humpback chub, *Gila cypha*, populations in the Little Colorado River, Grand Canyon, Arizona, 1987-1992. Final report submitted to U.S. Fish and Wildlife Service, Endangered Species Office, Albuquerque, NM. Arizona Game and Fish Department, Phoenix.
- Robinson, A.T., R.W. Clarkson and R.E. Forrest. 1998. Dispersal of larval fishes in a regulated river tributary. *Transactions of the American Fisheries Society* 127: 772-786.
- Stone, D. and P. Sponholtz. 2003. Translocation of young-of-the-year humpback chub above Chute Falls in the Little Colorado River, AZ 2003. Report submitted to Grand Canyon Monitoring and Research Center. Document number USFWS-AZFRO-FL-04-006.
- Valdez, R.A. and R.J. Ryel. 1995. Life history and ecology of the humpback chub (*Gila cypha*) in the Colorado River, Grand Canyon, Arizona. Final Report to Bureau of Reclamation, Salt Lake City, Utah. Contract No. 0-CS-40-09110. BIO/WEST Report No. TR-250-08. 256 pp.
- Ward, D. 2002. Sampling protocols and fish handling. Arizona Game and Fish Department, Flagstaff.

## TABLES

Table 1. Little Colorado River hoop netting effort by year, 1987 – 2003.

Year	Effort (Hours)	Days	Year	Effort (Hours)	Days	Year	Effort (Hours)	Days
1987	3050.14	21	1993	12001.29	31	1999	93725.55	25
1988	7829.10	26	1994	12679.32	32	2000	0.00	0
1989	6722.05	25	1995	10688.84	30	2001	0.00	0
1990	9178.27	27	1996	13192.12	30	2002	9057.58	30
1991	22849.02	58	1997	12089.22	31	2003	7152.27	25
1992	19931.53	55	1998	8182.49	21			

Table 2. Catch by species, lower 1200 m hoop net monitoring, Little Colorado River, April 11 - May 9, 2003. Total effort = 7,800 net hours.

Species	Catch	%
Bluehead sucker (BHS)	400	20.0
Flannemouth sucker (FMS)	590	29.5
Humpback chub (HBC)	322	16.1
Speckled dace (SPD)	520	26.0
Total Native	1832	91.6
Black bullhead (BBH)	5	0.3
Channel catfish (CCF)	4	0.2
Common carp (CRP)	19	1.0
Fathead minnow (FHM)	79	4.0
Plains killifish (PKF)	2	0.1
Rainbow trout (RBT)	2	0.1
Red shiner (RSH)	56	2.8
Yellow bullhead (YBH)	0	0.0
Total Non-native	167	8.4
Total	1999	100.0

Table 3. Numbers of fish scanned, tagged, and recaptured by species during LCR lower 1200 meter hoopnet monitoring, 2003.

Species	≤ 150 mm TL	≥ 150 mm TL	Total Catch	New tags inserted	PIT tag recaptures
BBH	2	3	5		
BHS	336	64	400	60	1
CCF	3	1	4		
CRP	7	12	19	10	2
FHM	79		79		
FMS	67	523	590	336	184
HBC	150	172	322	82	90
PKF	2		2		
RBT		2	2		
RSH	56		56		
SPD	520		520		

Table 4. Catch of species by year, LCR standardized hoop net monitoring 1987 – 2003.

Species	Year															Total
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2002	2003	
BBH					1				1		1	2		5	5	15
BHS	48	87	121	37	150	102	49	64	32	413	45	82	61	299	400	1990
CCF	9	9	53	10	8	19		5	1	1	12	20	10	9	4	170
CRP	2	1				1			1	8	60	2	5	2	19	101
FHM	1	12	22	10	8	8	1	265	19	237	726	161	14	92	79	1655
FMS	83	137	53	47	171	126	51	88	65	237	97	17	21	540	590	2323
HBC	483	880	897	612	772	912	475	657	243	359	123	348	155	430	322	7668
PKF						1					97	3		4	2	107
RBT			1		4	1	2		1	8	1	11	6	5	2	42
RDS			2													2
RSH										14	74	26	70	14	56	254
SPD	141	271	261	126	1683	1236	468	1022	488	741	417	268	187	763	520	8592
Total	767	1397	1410	842	2797	2406	1046	2101	851	2018	1653	940	529	2163	1999	22919

Table 5. Catch per 24 hours of hoop net effort in the LCR by year, 1987-2003.

Species	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2002	2003
Black bulhead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02
Bluehead sucker	0.82	0.48	0.85	0.17	0.26	0.16	0.11	0.16	0.08	1.64	0.1	0.09	0.16	0.41	1.23
Channel catfish	0.14	0.05	0.38	0.05	0.01	0.03	0.00	0.01	0.00	0.00	0.03	0.02	0.03	0.01	0.01
Common carp	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.14	0.00	0.01	0.00	0.06
Fathead minnow	0.00	0.07	0.13	0.09	0.01	0.01	0.00	0.67	0.05	0.91	1.84	0.14	0.04	0.13	0.24
Flannelmouth sucker	0.85	0.73	0.36	0.22	0.26	0.21	0.12	0.20	0.17	0.37	0.22	0.03	0.05	0.75	1.82
Humpback chub	7.99	4.73	5.98	3.01	1.23	1.54	1.11	1.66	0.61	0.87	0.31	0.41	0.40	0.60	0.99
Plains killifish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.25	0.00	0.00	0.01	0.01
Rainbow trout	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.02	0.00	0.01	0.02	0.01	0.01
Redside shiner	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Red shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.05	0.2	0.02	0.18	0.02	0.17
Speckled dace	2.45	1.61	1.81	0.71	3.09	2.00	1.33	2.65	1.27	2.63	1.00	0.29	0.48	1.05	1.60

Table 6. Catch of predators and stomach contents examined during 2003 LCR sampling.

Species	Total Length	Stomach Contents
BBH	181	RED SHINER
BBH	121	STOMACH EMPTY
BBH	135	STOMACH EMPTY
BBH	172	STOMACH EMPTY
BBH	166	SPECKLED DACE IN GUT APPROX 50 MM
CCF	100	SIMULIDS
CCF	386	1 SPD IN GUT APPROX 65 MM
RBT	384	SPD IN GUT 57 MM
RBT	177	STOMACH EMPTY

Table 7. Length frequency distributions of fish collected during LCR sampling, April 11 – May 9, 2003.

Length	Species										
	BBH	BHS	CCF	CRP	FHM	FMS	HBC	PKF	RBT	RSH	SPD
30 - 39							6				1
40 - 49		1					13			4	10
50 - 59		29			8		6			38	49
60 - 69		165			38	3	2	2		13	175
70 - 79		75			26	3				1	141
80 - 89		19			7	2	13				74
90 - 99		4	2			1	8				49
100 - 109		3	1			1	22				18
110 - 119		9				3	25				2
120 - 129	1	4				7	18				1
130 - 139	1	13		3		18	19				
140 - 149		14		4		29	18				
150 - 159		7		3		20	18				
160 - 169	1	7		2		28	22				
170 - 179	1	3		1		34	19		1		
180 - 189	1	7		1		29	21				
190 - 199		6		1		31	15				
200 - 209		8				25	7				
210 - 219		8		2		21	4				
220 - 229		3				19	8				
230 - 239		4				21	2				
240 - 249		3				26	1				
250 - 259		2		2		31	2				
260 - 269		1				12	1				
270 - 279		1				16					
280 - 289		1				15	1				
290 - 299		1				18	2				

Length	Species										
	BBH	BHS	CCF	CRP	FHM	FMS	HBC	PKF	RBT	RSH	SPD
300 - 309						12	3				
310 - 319						12					
320 - 329		1				17					
330 - 339						18	1				
340 - 349						9	5				
350 - 359						10	9				
360 - 369						4	3				
370 - 379		1				2	1				
380 - 389			1			8	3		1		
390 - 399						5	6				
400 - 409						5	8				
410 - 419						2	4				
420 - 429						1	2				
430 - 439						3	4				
440 - 449						6					
450 - 459						7					
460 - 469						5					
470 - 479						6					
480 - 489						8					
490 - 499						7					
500 - 509						3					
510 - 519						8					
520 - 529						6					
530 - 539						6					
540 - 549						1					
550 - 559						2					
560 - 569						1					
570 - 579						1					
580 - 589						1					

Table 8. Sexual condition of fish caught in the LCR in 2003.

SEXUAL CONDITION								
	Female				Male			Unknown
	Not Ripe	Ripe	Spent	Undetermined	Not Ripe	Ripe	Undetermined	
BBH				1				4
BHS		1				5	2	392
CCF								4
CRP								19
FHM		12					13	54
FMS	2		1	3	1	3	2	578
HBC				3		1	2	316
PKF								2
RBT								2
RSH		2						54
SPD		6				4		510

Table 9. Sexual characteristics of fishes collected by all gear types, LCR 2003.

	Female SEXUAL CHARACTERISTIC		Male SEXUAL CHARACTERISTIC		Undetermined SEXUAL CHARACTERISTIC		
	Colored	None	None	Tuberculate	Colored	None	Tuberculate
	Black bullhead		1				4
Bluehead sucker		1	1	6		384	8
Channel catfish						4	
Common Carp						19	
Fathead minnow		12		13		53	1
Flannelmouth sucker	3	3		6	5	568	5
Humpback chub	1	2	3		5	310	1
Plains killifish						2	
Rainbow trout						2	
Red shiner		2			4	50	
Speckled dace		6	4		11	499	

## FIGURES

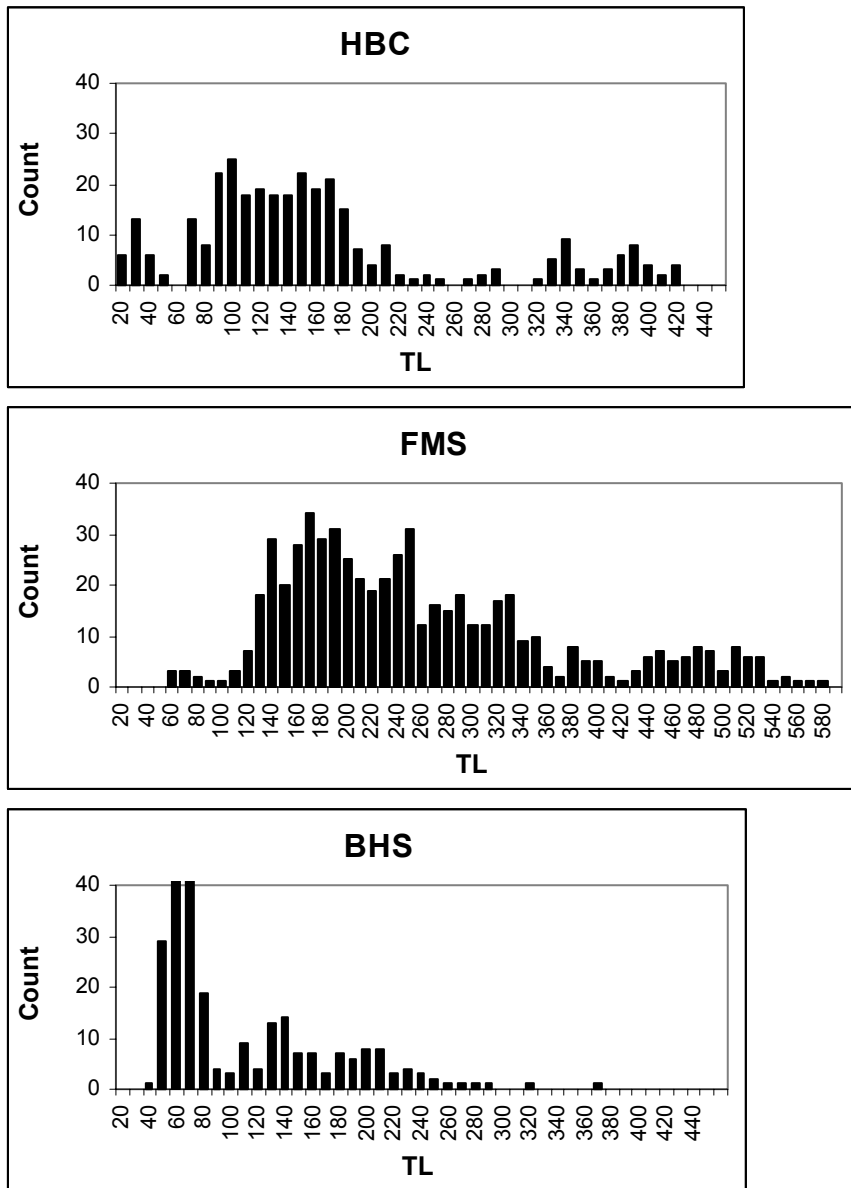


Figure 1. Length frequency distributions of humpback chub (HBC), flannelmouth sucker (FMS) and bluehead sucker (BHS), LCR monitoring 2003.



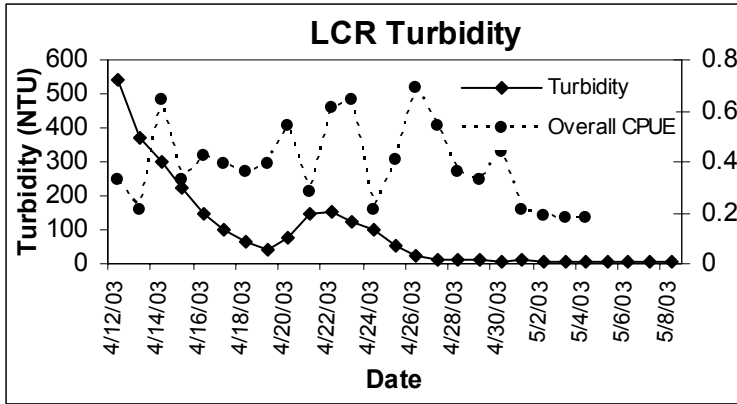


Figure 2. Mean daily turbidity and catch per hour of humpback chub, LCR 2003.

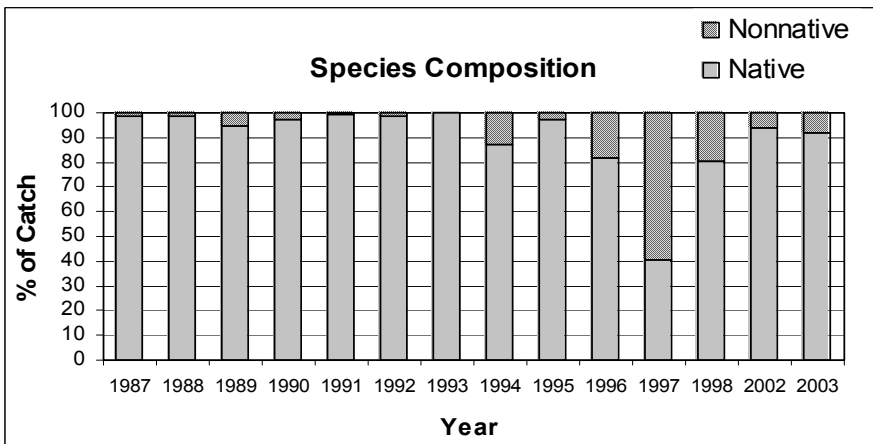


Figure 3. Species composition in standardized hoop net monitoring, 1987 - 2003.

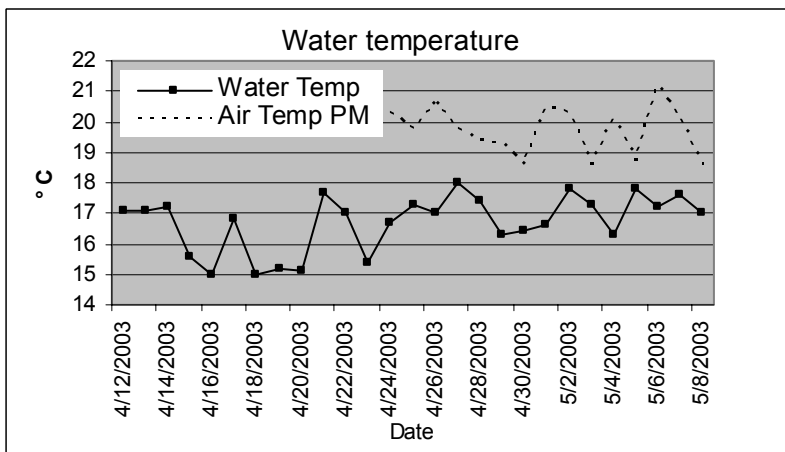


Figure 4. Daily water and air temperature (°C), at Boulder camp, LCR 2003.

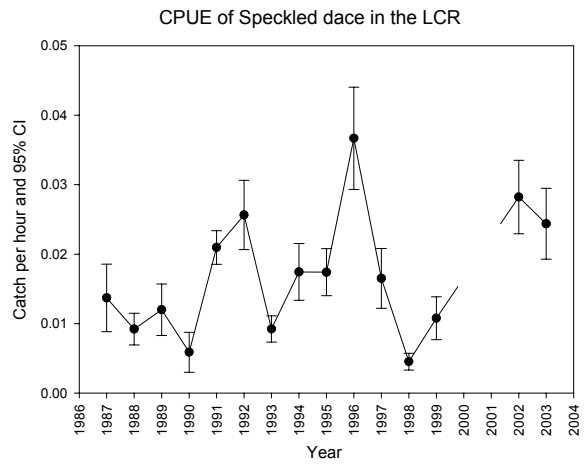
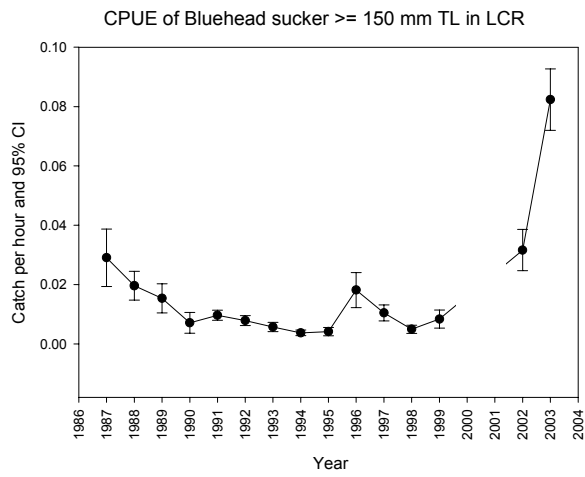
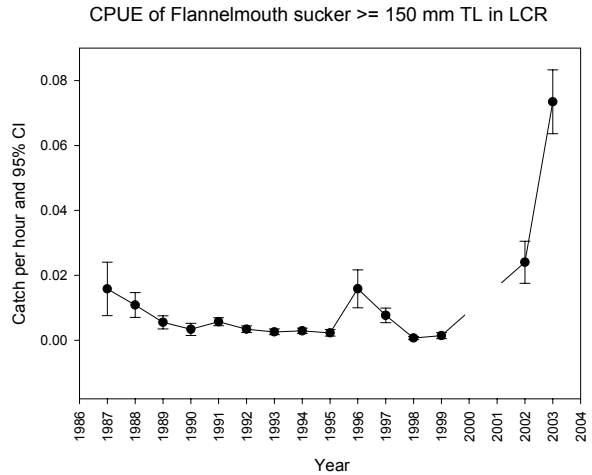
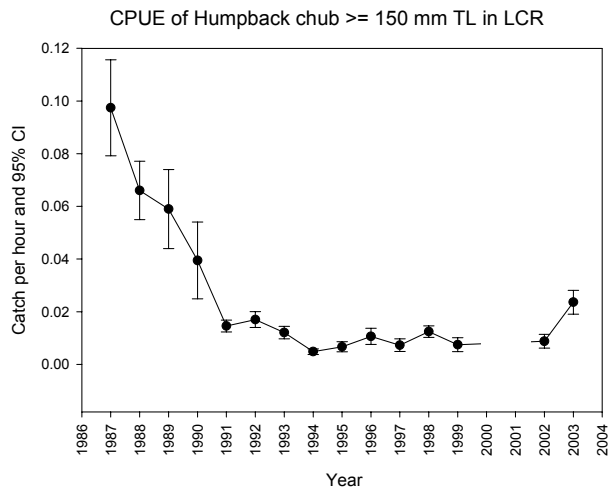


Figure 5. Mean catch/hr of native fish in the LCR, 1987 – 2003.

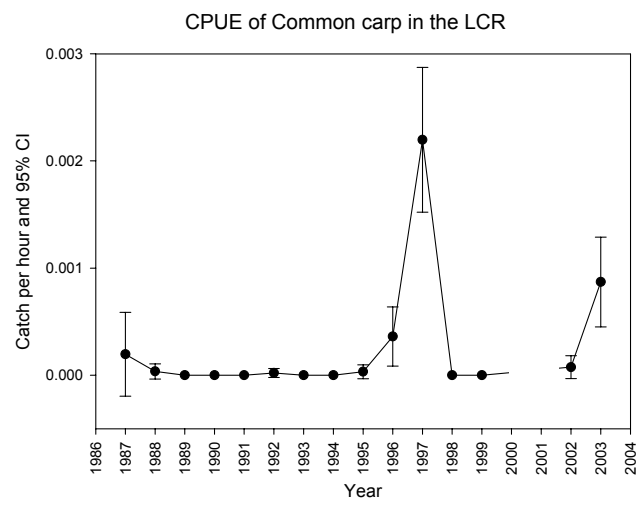
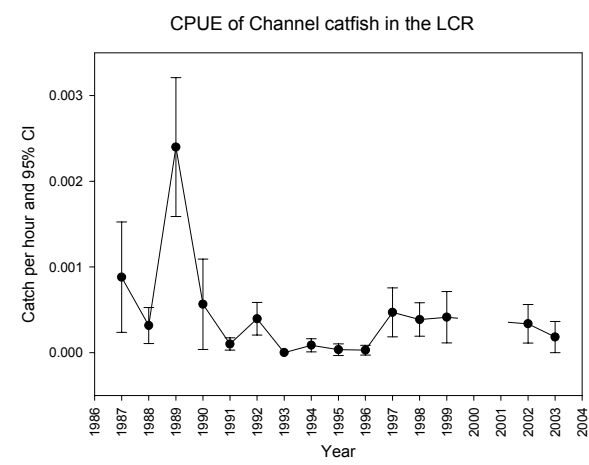
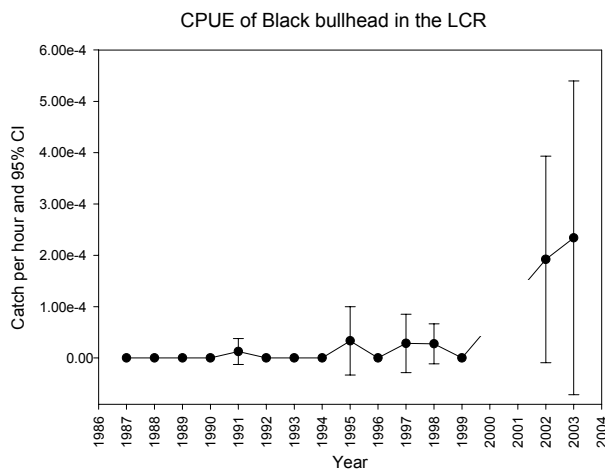
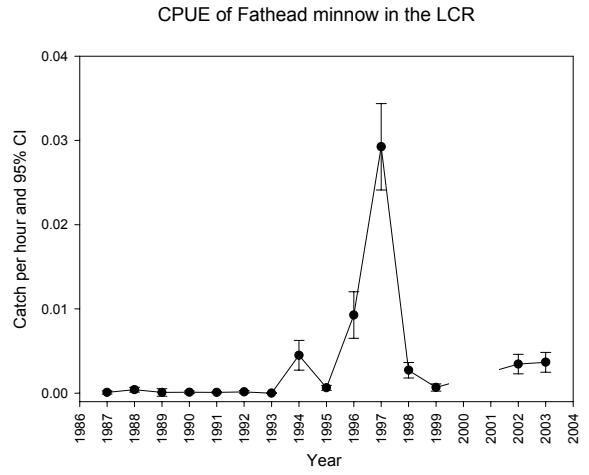
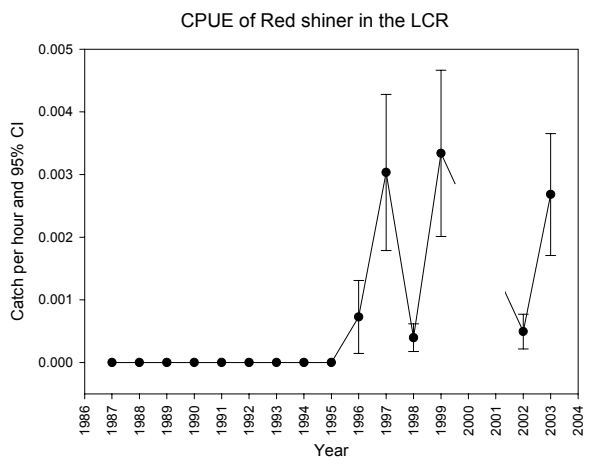


Figure 6. Mean catch/hr of nonnative fishes in the LCR, 1987-2003.

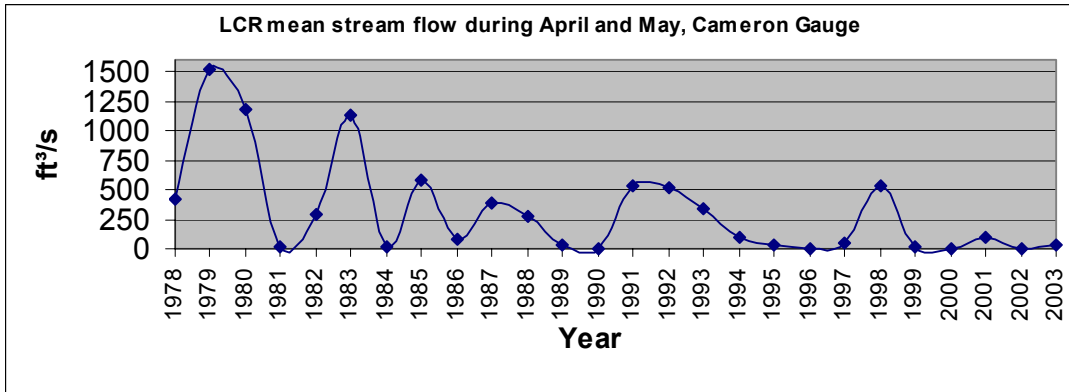


Figure 7. Mean April and May stream flow, Little Colorado River near Cameron.

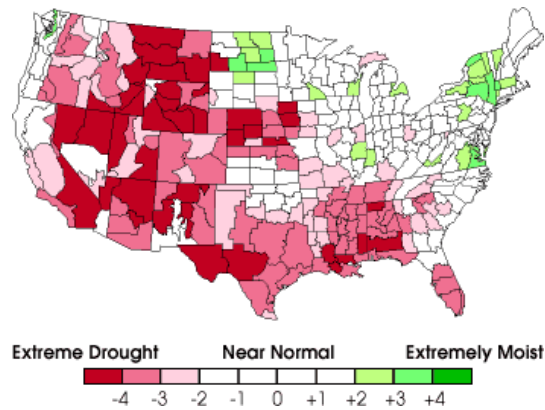


Figure 8. Palmer Drought Severity Index for the United States, 2003.

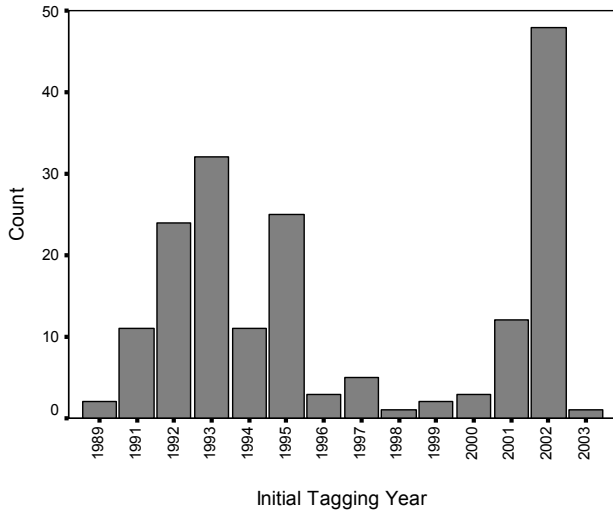


Figure 9. Initial tagging dates of HBC recaptured in 2003 in the LCR.

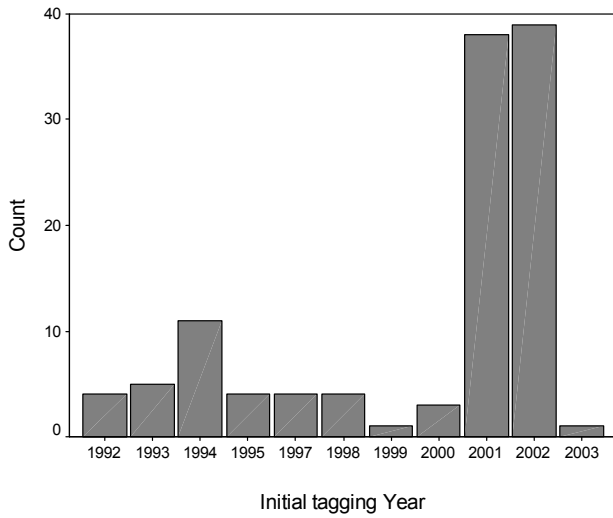


Figure 10. Initial tagging dates of FMS recaptured in 2003 in the LCR.

## APPENDIX

### 2003 Humpback chub recapture summary

Tag Number	TL	Recapture Date	Initial Tag Date	TL	RIVER	River Mile	RKM	Delta TL	Years out
1F0C740958	396	4/21/2003	3/16/1994	355	LCR		0.08	41	9
1F0C740958	396	4/21/2003	3/29/1995	356	LCR		2.56	40	8
1F0C740958	396	4/21/2003	3/28/1995	360	LCR		2.58	36	8
1F0C740958	396	4/21/2003	4/13/1995	350	LCR		2.52	46	8
1F0C740958	396	4/21/2003	4/19/1995	355	LCR		2.86	41	8
1F0C740958	393	4/24/2003	3/16/1994	355	LCR		0.08	38	9
1F0C740958	393	4/24/2003	3/29/1995	356	LCR		2.56	37	8
1F0C740958	393	4/24/2003	3/28/1995	360	LCR		2.58	33	8
1F0C740958	393	4/24/2003	4/13/1995	350	LCR		2.52	43	8
1F0C740958	393	4/24/2003	4/19/1995	355	LCR		2.86	38	8
1F20361A71	380	4/16/2003	3/16/1994	354	LCR		1.56	26	9
1F20361A71	380	4/16/2003	5/8/2001	385	LCR		0.08	-5	2
1F3E564D00	350	4/26/2003	3/23/1995	297	LCR		0.44	53	8
1F46614575	354	4/17/2003	2/10/1995	269	LCR		6.52	85	8
1F46614575	354	4/17/2003	12/11/199	264	LCR			90	10
1F4667062E	387	4/24/2003	1/18/1995	384	LCR		2.32	3	8
1F46675262	380	4/26/2003	3/16/1994	340	LCR		6.82	40	9
1F7826043F	416	4/16/2003	5/9/1997	400	LCR		0.1	16	6
1F7826043F	416	4/16/2003	4/19/1995	393	LCR		2.86	23	8
1F782F7842	305	4/27/2003	4/27/1999	276	LCR		0.48	29	4
1F782F7842	305	4/27/2003	3/5/1995	220	LCR		1.14	85	8
1F7A371A16	354	4/17/2003	4/13/1995	336	LCR		2.5	18	8
416B46540C	197	4/26/2003	6/10/2001	168	LCR		1.3	29	2
423C724B17	226	4/18/2003	10/2/2001	172	LCR		3.65	54	2
423C724B17	226	4/18/2003	9/23/2002	211	LCR		2	15	1
423C724B17	228	4/22/2003	10/2/2001	172	LCR		3.65	56	2
423C724B17	228	4/22/2003	9/23/2002	211	LCR		2	17	1
423F043945	230	4/21/2003	6/10/2001	186	LCR		1.3	44	2
423F043945	230	4/21/2003	5/4/2002	195	LCR		1.16	35	1
423F043945	230	4/21/2003	5/5/2002	192	LCR		1.195	38	1
423F043945	230	4/21/2003	4/15/2002	196	LCR		1.35	34	1
423F043945	230	4/21/2003	5/19/2002	200	LCR		1.3	30	1
423F043945	230	4/21/2003	5/20/2002	200	LCR		1.3	30	1
423F043945	230	4/21/2003	10/28/200	230	LCR		1.22	0	1
423F043945	236	4/24/2003	6/10/2001	186	LCR		1.3	50	2
423F043945	236	4/24/2003	5/4/2002	195	LCR		1.16	41	1
423F043945	236	4/24/2003	5/5/2002	192	LCR		1.195	44	1
423F043945	236	4/24/2003	4/15/2002	196	LCR		1.35	40	1
423F043945	236	4/24/2003	5/19/2002	200	LCR		1.3	36	1
423F043945	236	4/24/2003	5/20/2002	200	LCR		1.3	36	1
423F043945	236	4/24/2003	10/28/200	230	LCR		1.22	6	1
42401F7C04	152	4/24/2003	5/4/2002	105	LCR		1.16	47	1
42401F7C04	152	4/24/2003	5/3/2002	105	LCR		1.195	47	1
42401F7C04	152	4/24/2003	4/14/2002	105	LCR		1.13	47	1
4240330C4C	180	4/17/2003	4/14/2002	105	LCR		1.25	75	1
4240330C4C	180	4/17/2003	5/19/2002	123	LCR		1.25	57	1

Tag Number	TL	Recapture Date	Initial Tag Date	TL	RIVER	River Mile	RKM	Delta TL	Years out
4240330C4C	180	4/17/2003	10/29/200	150	LCR		1.25	30	1
424053322F	182	4/16/2003	4/14/2002	107	LCR		1.13	75	1
424053322F	183	4/20/2003	4/14/2002	107	LCR		1.13	76	1
4242351468	197	4/13/2003	5/20/2002	171	LCR		1.3	26	1
4242351468	195	4/16/2003	5/20/2002	171	LCR		1.3	24	1
42423D3C7A	351	5/5/2003	4/16/2002	366	LCR		1.23	-15	1
42423D3C7A	351	5/5/2003	4/17/2002	364	LCR		1.23	-13	1
424244770B	191	4/15/2003	4/16/2002	134	LCR		1.23	57	1
424244770B	191	4/15/2003	10/27/200	184	LCR		1.22	7	1
424252762F	289	4/16/2003	8/31/2001	276	COR	62.1		13	2
424252762F	289	4/16/2003	4/10/2002	273	LCR		7.9	16	1
4345080C4B	204	4/24/2003	9/25/2002	172	LCR		1.2	32	1
4347176F15	342	4/23/2003	4/11/2002	337	LCR		12.16	5	1
4347395D77	197	4/28/2003	10/7/2001	170	LCR		1.21	27	2
4362133D61	212	4/28/2003	9/20/2002	181	LCR		3.2	31	1
4362133D61	212	4/28/2003	10/29/200	194	LCR		1.35	18	1
4362133D61	210	4/29/2003	9/20/2002	181	LCR		3.2	29	1
4362133D61	210	4/29/2003	10/29/200	194	LCR		1.35	16	1
4362405139	202	4/24/2003	9/23/2002	177	LCR		1	25	1
4362405139	202	4/24/2003	10/29/200	178	LCR		1.04	24	1
4363070C3B	204	4/13/2003	9/24/2002	193	LCR		5.65	11	1
4363070C3B	204	4/13/2003	10/23/200	198	LCR		4.03	6	1
4363070C3B	204	4/18/2003	9/24/2002	193	LCR		5.65	11	1
4363070C3B	204	4/18/2003	10/23/200	198	LCR		4.03	6	1
4363070C3B	204	4/21/2003	9/24/2002	193	LCR		5.65	11	1
4363070C3B	204	4/21/2003	10/23/200	198	LCR		4.03	6	1
43630B4748	193	5/1/2003	9/25/2002	157	LCR		1.2	36	1
43630B4748	193	5/1/2003	10/29/200	155	LCR		1.22	38	1
510A7A0937	186	4/14/2003	6/4/2001	118	LCR		3.15	68	2
510A7A0937	186	4/14/2003	5/3/2002	145	LCR		0.1	41	1
53207B7C19	295	4/28/2003	4/17/2000	277	LCR		14.53	18	3
7F7A1A5714	369	4/29/2003	5/18/1993	330	LCR			39	10
7F7A1A5714	369	4/29/2003	4/19/1995	330	LCR		8.36	39	8
7F7B02160C	422	4/30/2003	7/15/1993	385	COR	61.15		37	10
7F7B032E18	356	4/19/2003	5/14/1993	325	COR	61.4		31	10
7F7B032E18	356	4/19/2003	8/14/1993	328	COR	60.18		28	10
7F7B032E18	356	4/19/2003	9/16/1997	339	COR	60.06		17	6
7F7B185A6D	430	4/22/2003	2/10/1995	418	LCR		11.52	12	8
7F7B1A0B7C	404	4/19/2003	9/16/1997	406	COR	60.69		-2	6
7F7B1A0B7C	404	4/19/2003	4/20/1994	402	LCR		3.05	2	9
7F7B1A0B7C	404	4/19/2003	4/13/1995	400	LCR		2.2	4	8
7F7B1A0B7C	404	4/19/2003	4/11/2002	412	LCR		2.6	-8	1
7F7D07645B	408	4/19/2003	4/17/1991	411	COR	61.4		-3	12
7F7D07645B	408	4/19/2003	6/13/2000	411	LCR		0	-3	3
7F7D07645B	408	4/19/2003	3/4/1995	415	LCR		0.04	-7	8
7F7D07645B	408	4/19/2003	4/12/1995	409	LCR		1.36	-1	8
7F7D07645B	408	4/19/2003	4/24/1992	415	LCR		5.21	-7	11
7F7D07645B	408	4/19/2003	5/21/1992	410	LCR		12.147	-2	11
7F7D07645B	408	4/19/2003	5/2/2001	405	LCR		7.35	3	2

Tag Number	TL	Recapture Date	Initial Tag Date	TL	RIVER	River Mile	RKM	Delta TL	Years out
7F7D077871	400	2003	7/13/1992	374	COR	60.9		26	11
7F7D077871	400	2003	2/10/1995	380	LCR		6.56	20	8
7F7D077871	400	2003	5/17/1993	378	LCR		2.26	22	10
7F7D077871	400	2003	6/3/2000	395	LCR		10.8	5	3
7F7D170956	405	4/27/2003	5/10/1991	355	LCR		0.137	50	12
7F7D170956	405	4/27/2003	5/8/1993	378	LCR		0.1	27	10
7F7D170956	405	4/27/2003	8/15/1994	383	LCR		0	22	9
7F7D170956	405	4/27/2003	9/15/1992	369	LCR			36	11
7F7D170956	405	4/27/2003	5/8/2001	404	LCR		0.08	1	2
7F7D17345F	435	4/23/2003	6/12/1993	440	COR	60.5		-5	10
7F7D17345F	435	4/23/2003	7/25/1991	444	LCR			-9	12
7F7D17345F	435	4/23/2003	1/12/1995	435	LCR		0	0	8
7F7D17345F	435	4/23/2003	12/14/199	446	LCR		0.72	-11	10
7F7D17345F	435	4/23/2003	3/9/1993	445	LCR			-10	10
7F7D180977	412	4/30/2003	6/21/1991	370	LCR		0.119	42	12
7F7D180977	412	4/30/2003	6/24/1991	373	LCR		0.119	39	12
7F7D1B7A50	350	4/21/2003	2/16/1993	337	LCR		1.26	13	10
7F7D1B7A50	350	4/21/2003	1/15/1995	334	LCR		4.26	16	8
7F7D1B7A50	350	4/21/2003	7/5/1991	330	LCR		10.4	20	12
7F7D1B7A50	350	4/21/2003	7/26/1991	328	LCR		10.8	22	12
7F7D240E09	430	4/21/2003	8/28/1998	411	COR	60.68		19	5
7F7D240E09	430	4/21/2003	5/14/1993	380	LCR		1.22	50	10
7F7D240E09	430	4/21/2003	4/28/1992	365	LCR		2.78	65	11
7F7D240E09	430	4/21/2003	8/19/1991	360	LCR		11.54	70	12
7F7D240E09	430	4/21/2003	8/14/1991	372	LCR		12.9	58	12
7F7D241C35	403	4/23/2003	1/14/1993	310	COR	61.15		93	10
7F7D241C35	403	4/23/2003	3/24/1993	306	LCR		0.476	97	10
7F7D241C35	403	4/23/2003	4/15/1995	357	LCR		12.46	46	8
7F7D241C35	403	4/23/2003	5/19/1992	276	LCR		13.647	127	11
7F7D243775	412	4/30/2003	5/17/1993	360	LCR		2.55	52	10
7F7D243775	412	4/30/2003	4/26/1992	345	LCR		3	67	11
7F7D2B0C6F	400	4/26/2003	5/14/1993	387	COR	61.35		13	10
7F7D2B0C6F	400	4/26/2003	3/8/1992	383	LCR		0.95	17	11
7F7D2B0C6F	400	4/26/2003	4/18/1995	388	LCR		0.62	12	8
7F7D2C2651	362	4/24/2003	2/13/1992	357	LCR			5	11
7F7D2C2651	362	4/24/2003	4/28/1992	356	LCR			6	11
7F7D2C3624	375	4/19/2003	4/21/1996	283	COR	60.82		92	7
7F7D2C3624	375	4/19/2003	2/12/1992	152	LCR			223	11
7F7D2C3624	375	4/19/2003	3/27/1995	259	LCR		3.03	116	8
7F7D2C3624	375	4/19/2003	5/13/1993	218	LCR		5.12	157	10
7F7D2C3624	375	4/19/2003	6/12/1993	222	LCR		2.92	153	10
7F7D2C3624	375	4/19/2003	6/12/1993	224	LCR		3.36	151	10
7F7D2C3624	375	4/19/2003	12/12/199	150	LCR		3.35	225	12
7F7D2C3624	375	4/19/2003	4/14/2002	373	LCR		6.5	2	1
7F7D404804	352	4/17/2003	5/4/1993	301	LCR		0.2	51	10
7F7D404804	352	4/17/2003	9/16/1997	314	COR	60.06		38	6
7F7D404804	352	4/17/2003	5/15/1993	306	LCR		0.61	46	10
7F7D7C2F62	393	4/24/2003	9/17/1994	401	LCR		0.04	-8	9
7F7D7C2F62	393	4/24/2003	4/18/1993	402	LCR			-9	10



Tag Number	TL	Recapture Date	Initial Tag Date	TL	RIVER	River Mile	RKM	Delta TL	Years out
7F7D7C2F62	393	4/24/2003	4/17/1994	393	LCR			0	9
7F7D7C2F62	393	4/24/2003	5/12/1993	397	LCR			-4	10
7F7F037F44	340	4/16/2003	5/24/1989	151	LCR		0.18	189	14
7F7F037F44	340	4/16/2003	4/18/1993	230	LCR		3.3	110	10
7F7F050E06	402	4/30/2003	3/9/1991	325	COR	60.8		77	12
7F7F050E06	402	4/30/2003	5/22/1992	338	LCR		0.165	64	11
7F7F050E06	402	4/30/2003	5/22/1989	304	LCR		0.192	98	14
7F7F050E06	402	4/30/2003	3/9/1993	348	LCR		0.37	54	10
7F7F182D13	354	4/27/2003	4/16/1993	322	LCR		2.718	32	10
7F7F182D13	354	4/27/2003	4/25/1992	315	LCR		0.1	39	11
7F7F182D13	354	4/27/2003	5/13/1993	330	LCR		5.12	24	10
7F7F19043E	410	4/26/2003	6/16/1992	374	COR	62.7		36	11
7F7F19043E	410	4/26/2003	2/17/1993	346	COR	61.5		64	10
7F7F19043E	410	4/26/2003	3/30/1992	368	LCR		6.8	42	11
7F7F21726D	392	4/23/2003	5/11/1996	368	LCR		0.119	24	7
7F7F21726D	392	4/23/2003	2/15/1994	375	LCR		0.08	17	9
7F7F21726D	392	4/23/2003	3/9/1993	274	LCR		1.63	118	10
7F7F256F01	360	4/16/2003	1/10/1992	313	LCR		1.1	47	11
7F7F256F01	360	4/16/2003	3/7/1992	315	LCR		6.37	45	11
7F7F256F01	360	4/16/2003	3/18/1994	335	LCR		5.16	25	9
7F7F256F01	360	4/16/2003	5/11/1993	334	LCR		6.21	26	10
7F7F271D6F	343	4/19/2003	4/23/1992	316	LCR		6.12	27	11
7F7F271D6F	343	4/19/2003	5/20/1992	321	LCR		6.81	22	11
7F7F271D6F	343	4/19/2003	8/5/2001	345	COR	64.2		-2	2
7F7F271D6F	343	4/19/2003	4/9/2002	349	LCR		6.8	-6	1
7F7F271D6F	343	4/19/2003	4/14/2002	351	LCR		6.5	-8	1
7F7F395437	407	4/20/2003	5/10/1993	354	LCR		11.524	53	10
7F7F395437	407	4/20/2003	5/11/1993	350	LCR		11.549	57	10
7F7F395437	407	4/20/2003	5/12/1993	343	LCR		11.657	64	10
7F7F395437	407	4/20/2003	4/27/1999	393	LCR		10.827	14	4
7F7F395437	407	4/20/2003	4/24/1996	373	LCR		1.07	34	7
7F7F395437	407	4/20/2003	5/10/1997	383	LCR		0.1	24	6
7F7F395437	407	4/20/2003	3/12/1992	345	LCR		2.62	62	11
7F7F395437	407	4/20/2003	4/16/1994	350	LCR			57	9
7F7F395437	407	4/20/2003	4/25/1992	344	LCR		10.451	63	11
7F7F3F4A56	354	4/26/2003	3/11/1991	284	COR	61.4		70	12
7F7F3F4A56	354	4/26/2003	3/11/1992	313	LCR		1.25	41	11
7F7F3F4A56	354	4/26/2003	3/24/1993	305	LCR		0.06	49	10
7F7F3F4A56	354	4/26/2003	5/5/2002	350	LCR		0.1	4	1
7F7F485978	336	4/14/2003	5/19/1992	212	LCR		0.5	124	11
7F7F485978	336	4/14/2003	5/21/1992	211	LCR		1.16	125	11
43470C2F24	175	4/27/2003	Not in database						
433F0F713E	180	4/24/2003	Not in database						
1F783F1C03	421	4/24/2003	Not in database						Not found in GCMRC 13.8 database
433F0F713E	181	4/25/2003	Not in database						
4362695660	164	5/3/2003	Not in database						

## 2003 Flannelmouth sucker recapture summary

Tag Number	TL	Recapture Date	Initial Tag Date	TL	RIVER	start_RM	start_RKM	Delta TL	Years out
7F7D074054	581	4/19/2003	7/16/1994	539	COR	61.7		42	9
7F7D074054	581	4/19/2003	4/10/1993	515	PAR		0	66	10
7F7F1F153F	486	4/25/2003	4/9/1993	445	PAR		6	41	10
1F77714930	533	4/16/2003	5/10/1997	516	COR	-2.5		17	6
1F7B074916	510	5/5/2003	4/12/1995	355	COR	174		155	8
7F7D081607	551	5/2/2003	6/15/1992	312	COR	61.3		239	11
7F7D074054	581	4/19/2003	6/16/1992	494	COR	61.4		87	11
7F7D074054	581	4/19/2003	7/16/1994	539	COR	61.7		42	9
7F7F1F153F	486	4/25/2003	9/11/1992	445	COR	59.25		41	11
5327093D71	442	4/25/2003	6/17/2000	233	COR	143.2		209	3
416B123B3C	380	4/26/2003	9/20/2000	227	COR	126		153	3
41277F4C03	480	4/21/2003	9/8/1998	364	HAV		0.035	116	5
1F7B5C5F2B	513	4/25/2003	4/28/1998	483	LCR		0	30	5
7F7F47652E	527	5/1/2003	5/2/1998	528	LCR		3.06	-1	5
5116185C68	493	4/20/2003	5/1/1999	270	LCR		-0.06	223	4
1F78006405	522	4/25/2003	5/9/1997	477	LCR		0.1	45	6
7F7D074054	581	4/19/2003	5/14/1997	565	LCR		0.05	16	6
7F7B196D29	543	4/14/2003	7/9/1994	371	KAN		0	172	9
1F6B3E7D3B	462	5/4/2003	6/24/1997	152	KAN		0	310	6
1F465F3507	530	4/21/2003	2/10/1994	435	LCR		0.08	95	9
7F7F200C5A	535	4/17/2003	1/17/1995	490	LCR		0	45	8
1F0F686703	570	4/25/2003	3/15/1994	470	LCR			100	9
7F7F200C5A	535	4/17/2003	6/10/1993	420	LCR			115	10
7F7F47652E	527	5/1/2003	6/16/1992	513	LCR			14	11
7F7D401440	552	4/26/2003	7/13/1993	470	LCR			82	10
7F7B1A0161	532	4/14/2003	10/12/199	435	LCR		0.04	97	9
7F7F47652E	527	5/1/2003	4/15/1994	520	LCR		4.94	7	9
7F7F47652E	527	5/1/2003	4/14/1995	515	LCR		2.98	12	8
7F7B185649	483	4/23/2003	11/4/1994	287	LCR		7.1	196	9
7F7B185649	483	4/23/2003	6/22/1994	252	LCR		8.22	231	9
7F7B185649	483	4/23/2003	7/19/1994	262	LCR			221	9
7F7B185649	483	4/23/2003	11/8/1994	288	LCR		8.32	195	9
424039626E	485	4/16/2003	5/1/2001	442	LCR		-0.04	43	2
416B450F29	460	4/23/2003	5/9/2001	411	LCR		0.1	49	2
4242295C60	331	4/17/2003	6/8/2001	110	LCR		2.82	221	2
423D3B0657	383	4/20/2003	6/10/2001	226	LCR		8.6	157	2
423E2C4B51	379	4/24/2003	10/4/2001	269	LCR		2.31	110	2
423C64711F	285	4/20/2003	10/3/2001	180	LCR		4.05	105	2
423E410D3F	331	4/18/2003	10/6/2001	227	LCR		2.06	104	2
423D141A4A	357	5/3/2003	10/6/2001	287	LCR		2.06	70	2
423D112269	355	4/24/2003	10/7/2001	241	LCR		1.91	114	2
423E28065B	352	5/2/2003	10/2/2001	186	LCR		3.5	166	2
43473F0250	298	4/24/2003	10/5/2001	200	LCR		8.2	98	2

Tag Number	TL	Recapture Date	Initial Tag Date	TL	RIVER	River Mile	RKM	Delta TL	Years out
43473F0250	303	5/1/2003	10/5/2001	200	LCR		8.2	103	2
43473F0250	298	4/24/2003	10/4/2001	201	LCR		8.2	97	2
43473F0250	303	5/1/2003	10/4/2001	201	LCR		8.2	102	2
4347250A4A	295	4/13/2003	10/4/2001	170	LCR		8	125	2
43472B5B52	317	4/20/2003	10/5/2001	209	LCR		9.6	108	2
43470C5A19	325	4/13/2003	10/3/2001	183	LCR		7.8	142	2
43470F0526	336	4/13/2003	10/7/2001	210	LCR		6.5	126	2
4347232935	300	5/1/2003	10/7/2001	170	LCR		6	130	2
430F3A202C	300	4/22/2003	10/7/2001	165	LCR		10.54	135	2
426B5B151C	333	4/25/2003	11/7/2001	214	LCR		3.95	119	2
426A75563D	332	4/16/2003	11/12/200	200	LCR		1.6	132	2
43470F0526	336	4/13/2003	11/13/200	224	LCR		1.45	112	2
426C047E5D	276	4/16/2003	11/10/200	181	LCR		2.1	95	2
426E204941	183	4/19/2003	11/11/200	125	LCR		1	58	2
4347250A4A	295	4/13/2003	11/9/2001	180	LCR		8	115	2
43470C5552	397	4/14/2003	11/8/2001	206	LCR		6.9	191	2
430F3A202C	300	4/22/2003	11/11/200	186	LCR		10.55	114	2
7F7D1A3957	510	4/14/2003	8/3/2001	503	COR	60.25		7	2
42421D792D	521	4/23/2003	8/2/2001	514	COR	61.2		7	2
423F016D40	400	4/16/2003	8/3/2001	249	COR	60.75		151	2
423F016D40	400	4/23/2003	8/3/2001	249	COR	60.75		151	2
42422F494C	485	5/1/2003	8/31/2001	475	COR	60.19		10	2
4242394434	330	4/16/2003	8/30/2001	189	COR	60.3		141	2
4242450A64	321	4/19/2003	8/30/2001	220	COR	60.67		101	2
423F0D1254	334	4/13/2003	8/31/2001	234	COR	61.7		100	2
423F0D1254	334	4/13/2003	9/1/2001	232	COR	61.7		102	2
4242462066	285	4/18/2003	8/31/2001	197	COR	61.8		88	2
7F7D1A3957	510	4/14/2003	5/28/1993	219	COR	192.42		291	10
4152622F79	539	5/2/2003	6/6/2000	509	COR	60.5		30	3
1F7A1C1734	526	4/25/2003	4/14/1995	322	COR	182.5		204	8
417538335A	497	4/23/2003	9/9/1998	305	COR	157.5		192	5
426D533B0B	290	4/14/2003	2/17/2002	192	COR	61.2		98	1
426D533B0B	294	4/22/2003	2/17/2002	192	COR	61.2		102	1
426A7A203F	491	5/3/2003	3/3/2002	478	HAV		0.01	13	1
426A75563D	332	4/16/2003	4/28/2002	243	LCR		0.1	89	1
423D421753	291	4/17/2003	4/22/2002	207	LCR		0.119	84	1
423D304E4C	314	4/25/2003	4/23/2002	230	LCR		0.119	84	1
423D304E4C	320	4/20/2003	4/23/2002	230	LCR		0.119	90	1
423D370947	300	4/20/2003	4/25/2002	215	LCR		0.119	85	1
423D297A04	369	4/19/2003	4/25/2002	258	LCR		0.119	111	1
42403B1B68	348	4/13/2003	4/27/2002	235	LCR		0.119	113	1
426A75563D	332	4/16/2003	4/27/2002	244	LCR		0.119	88	1
425B4C1F28	291	4/23/2003	5/5/2002	228	LCR		0.119	63	1
425B4C1F28	301	5/2/2003	5/5/2002	228	LCR		0.119	73	1

Tag Number	TL	Recapture Date	Initial Tag Date	TL	RIVER	River Mile	RKM	Delta TL	Years out
426C4E1A6C	291	4/16/2003	5/8/2002	211	LCR		0.137	80	1
423D263609	300	4/19/2003	4/28/2002	190	LCR		1.11	110	1
426D040C09	322	5/2/2003	5/10/2002	257	LCR		1.045	65	1
423D263609	300	4/19/2003	5/11/2002	192	LCR		1.045	108	1
4242394434	330	4/16/2003	5/5/2002	230	LCR		0.1	100	1
423F016D40	400	4/16/2003	4/30/2002	296	LCR		0.119	104	1
423F016D40	400	4/23/2003	4/30/2002	296	LCR		0.119	104	1
423D44642B	262	4/21/2003	5/2/2002	155	LCR		0.119	107	1
426D0C4F30	276	5/1/2003	5/7/2002	175	LCR		0.48	101	1
426D0C4F30	276	4/30/2003	5/7/2002	175	LCR		0.48	101	1
423D215947	219	4/24/2003	4/30/2002	120	LCR		1.16	99	1
423D215947	221	4/27/2003	4/30/2002	120	LCR		1.16	101	1
423D215947	226	4/22/2003	4/30/2002	120	LCR		1.16	106	1
53263C1E62	444	4/16/2003	5/1/2002	421	LCR		1.195	23	1
4242500A10	275	4/19/2003	5/4/2002	191	LCR		1.195	84	1
4242500A10	275	4/19/2003	5/7/2002	190	LCR		1.195	85	1
426B4A2C7C	335	4/19/2003	5/12/2002	226	LCR		0.119	109	1
43470F0526	336	4/13/2003	4/12/2002	241	LCR		2.73	95	1
43470F0526	336	4/13/2003	4/11/2002	226	LCR		2.05	110	1
423D44642B	262	4/21/2003	4/14/2002	163	LCR		1.1	99	1
4242500A10	275	4/19/2003	4/17/2002	197	LCR		1.06	78	1
43470F0526	336	4/13/2003	5/19/2002	258	LCR		2.01	78	1
5327086229	261	4/28/2003	5/21/2002	172	LCR		1.8	89	1
53264D4A71	315	5/5/2003	5/19/2002	241	LCR		1.3	74	1
5327013560	294	4/30/2003	5/21/2002	194	LCR		1.3	100	1
426D040C09	322	5/2/2003	10/29/200	295	LCR		1.3	27	1
7F7D7F465B	332	4/15/2003	Not in Database						
4362673E60	328	4/23/2003	Not in Database						
5325136101	479	4/20/2003	Not in Database						
430F404466	184	4/20/2003	Not in Database						
4363670132	451	4/23/2003	Not in Database						
43621B4F06	169	4/21/2003	Not in Database						
43624A4B05	247	4/15/2003	Not in Database						
4362344365	296	4/17/2003	Not in Database						
4362422540	232	4/13/2003	Not in Database						
4347344617	250	4/13/2003	Not in Database						
4362657638	169	4/20/2003	Not in Database						
4363715132	282	4/21/2003	Not in Database						
4347344617	252	4/23/2003	Not in Database						
4242176F4D	254	4/16/2003	Not in Database						
4345004D46	203	4/17/2003	Not in Database						
4347411F77	333	4/19/2003	Not in Database						
43624A4B05	250	4/19/2003	Not in Database						
4362673E60	333	4/13/2003	Not in Database						

Not in GCMRC 13.8 database

Many of these fish may have been tagged during the trout removal project and the tag numbers are not currently in the GCMRC fish database

Tag Number	TL	Recapture Date	Initial Tag Date	TL	RIVER	River Mile	RKM	Delta TL	Years out
43637F4053	251	4/16/2003	Not in Database						
43637F4053	250	4/17/2003	Not in Database						
433F051263	246	4/18/2003	Not in Database						
4364184970	347	4/20/2003	Not in Database						
43622E2177	241	4/14/2003	Not in Database						
4365345E2B	485	4/27/2003	Not in Database						
4362730015	220	4/30/2003	Not in Database						
4347406E44	255	4/27/2003	Not in Database						
43447D2365	197	5/1/2003	Not in Database						
43446A1979	332	4/24/2003	Not in Database						
43635A1E33	390	4/30/2003	Not in Database						
4362422540	245	5/5/2003	Not in Database						
4364184970	344	5/2/2003	Not in Database						
5110533A52	456	5/3/2003	Not in Database						
4362657638	167	4/24/2003	Not in Database						
43630D4C72	246	4/24/2003	Not in Database						
4362667A17	177	4/28/2003	Not in Database						
426A4C0949	274	4/29/2003	Not in Database						
43627F142A	216	4/29/2003	Not in Database						
43624F2618	347	4/29/2003	Not in Database						

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### 2003 Bluehead sucker recapture summary

Tag Number	TL	Recapture Date	Initial Tag Date	TL	RIVER	start_RM	start_RKM	Delta TL	Years out
423D28397E	196	4/21/2003	4/25/2002	155	LCR		1.16	41	1