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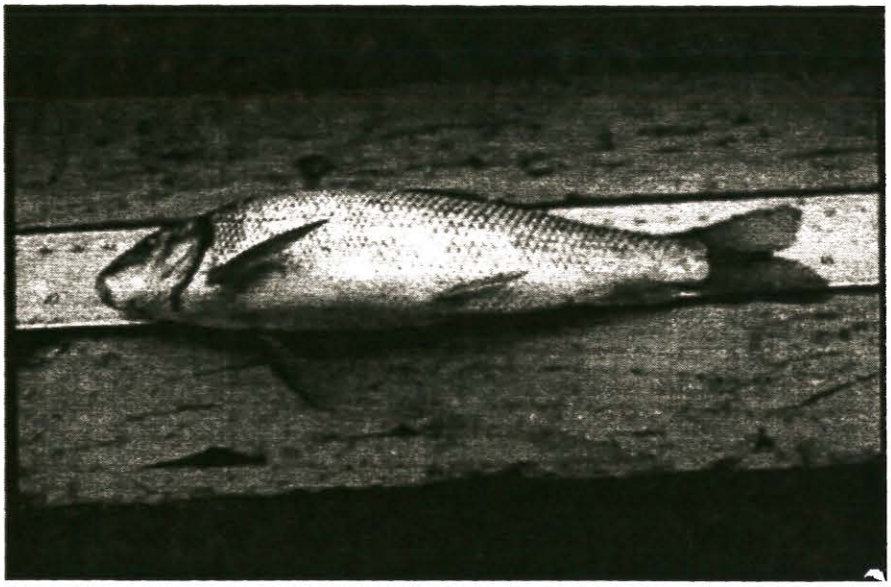
DEPARTMENT OF NATURAL RESOURCES
Division of Wildlife Resources

June Sucker (*Chasmistes liorus*) Monitoring and Transfer Activities in the Northern Region, 2001



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Utah Division of Wildlife Resources
1594 West North Temple
Salt Lake City, Utah
John F. Kimball, Director

June Sucker (*Chasmistes liorus*) Monitoring and Transfer Activities in the Northern Region, 2001

by

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Utah Division of Wildlife Resources
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An Equal Opportunity Employer

John F. Kimball, Director

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BACKGROUND

The Utah Division of Wildlife Resources (UDWR) has noted a decline in the numbers of June sucker, *Chasmistes liorus*, in Utah Lake since the 1950s (UDWR 1984). Few captures of June sucker during 1978-79 (Radant and Sakaguchi 1981) helped prompt the U.S. Fish and Wildlife Service (USFWS) to list June sucker as an endangered species with full production under the Endangered Species Act in 1986 (USFWS 1986). Because of the tenuous state of June sucker in Utah Lake, establishing refuge populations of June sucker outside Utah Lake became a high priority for UDWR (UDWR 1984). These populations would provide a safeguard against extinction of the species and provide fish for management programs (e.g., stocking efforts) and research. To date, two refuge populations, Ogden Nature Center and Camp Creek Reservoir, have been established in the Northern Region.

Camp Creek Reservoir

Camp Creek Reservoir is located in West Box Elder County, near the town of Etna, Utah. The reservoir is located on Camp Creek, which originates in Nevada and flows primarily from West to East into Utah. Camp Creek Reservoir has a maximum depth of 16 feet (5 acres) and is used for irrigation by the landowner, Boyd Warr.

June sucker fry captured in the Provo River in 1985 were introduced into Camp Creek Reservoir. In 1986, however, these sucker fry were discovered to be mountain sucker *(Catostomus platyrhychus*). In 1987, another attempt was made at establishing a June sucker population in Camp Creek Reservoir with the introduction of 204 juvenile June sucker. These fish were progeny of June sucker caught in the Provo River during 1985 and spawned at the Springville Hatchery. Due to early unknown spawning practices and the unknown genetic integrity of these fish, their primary use was deemed for research until such time that their genetic integrity becomes known (USFWS 1999). An additional 770 PIT tagged June sucker and approximately 1,000-1,200 non-PIT tagged June sucker (year class/lot - 990531SKJNFE01, approximate length - 30-50 mm TL) were transported from the Millville Ponds near Logan, Utah and released into Camp Creek Reservoir on June 27, 2000. Of the PIT tagged June sucker, most were from the 1994 year class and some were from the 1991, 1995, and 1996 year classes. Approximately 200 June sucker appeared to be wild fish produced in the Millville ponds.

Camp Creek Reservoir has been monitored annually since 1988, however, methods and effort have varied between years (Table 1) until a standardized sampling regime was initiated in 1997 (Table 4).

Ogden Nature Center

Ogden Nature Center is located at 966 West 1200 South in Ogden, Utah. Two ponds were chosen for June sucker introduction, Arrowhead Pond and Teal Pond. Both ponds have a maximum depth of 5-6 feet (0.5 acres) and are filled year round by ground water, preventing complete winter freezing. Arrowhead Pond was stocked first (May 20, 1993) with 13 PIT-tagged June sucker from the Utah State Prison in Draper, Utah (Table 2). Arrowhead Pond again was stocked on March 28, 1994 with 120 June sucker from the Prison (Table 2). On April 26, 1994, both ponds at the Ogden Nature Center were stocked with approximately 500 June sucker (250

fish from both the 1989 and 1991 year classes (D. Routledge 1997, UDWR, personal communication; Table 2). All June sucker stocked in April were marked with a right-pelvic clip. Arrowhead pond has been monitored yearly since 1995, but Teal Pond has not been sampled since 1995 (Table 3). When June sucker were not caught in Teal Pond during 1995 sampling efforts, dissolved oxygen (DO) readings were taken to determine if adequate levels existed. On June 21, 1995, 0615 hours, the following low oxygen levels were recorded in Teal Pond:

Depth (m)	DO (ppm)	Temperature (°C)
0.3	4.7	18.5
1.0	2.3	19
2.0	0.6	14

Because of low summer oxygen levels and likely low winter levels, Northern Region biologists felt that Teal Pond no longer held June sucker and therefore it was not sampled in 1996. In addition, Northern Region biologists completed a boat electrofishing demonstration on Teal Pond on July 18, 1997 and no June sucker were encountered (Table 3).

MONITORING

Introduction

The Northern Region Office's (NRO) primary objective in past years has been to sample Arrowhead Pond and Camp Creek Reservoir yearly to determine if June sucker still persist. The goal of sampling efforts beginning in 1997 was expanded in order to obtain more information on these two June sucker populations. Objectives since 1997 have included:

1) a standardized sampling protocol (e.g., time of year sampled, gear types, and location of net sets) so that future trend data on the populations will be available, and

2) PIT-tagging June sucker to obtain population estimates and growth statistics through time.

The months of October/November were chosen to sample both populations because water/air temperatures are cooler, thereby reducing stress to the fish. Trammel nets were chosen as the primary sampling gear to reduce injury to June sucker.

Methods

Camp Creek Reservoir

Only 22 June sucker were caught in three sampling trips during 1995 and 1996 (Table 1), so two 100' experimental gill nets, in conjunction with one trammel net (1" inner mesh), were set in order to encounter more fish beginning in 1997. Both gill nets have been old nets and therefore June sucker were cut out of the nets when needed. A 75' trammel net was used during 1997 sampling, however, a 100' trammel net was used in 1998-2001 and will be used in future years.

Camp Creek Reservoir was sampled earlier in 2001 in order to obtain fish to sacrifice for disease certification. Camp Creek Reservoir was sampled on 13 August 2001. One gill net was set for 1 hour and 35 minutes and the other gill net for 1 hour and 40 minutes. The trammel net was set for 2 hours. All nets were bottom sets. The trammel net was set from the dam (East shore) to the South shore. Gill net #1 was set from the dam to the North shore and gill net #2 was set from the North shore across the inflow to Camp Creek Reservoir to the South shore. Sixty June sucker were sacrificed for disease certification at the Fisheries Experiment Station (FES) in Logan, UT, five were released without being PIT-tagged and the remaining June sucker were PIT-tagged and released. All fish caught were measured to the nearest millimeter (mm) TL and weighed to the nearest gram (g).

Population estimates were calculated using a multiple census (running Schnabel) population estimate (see Krebs 1989; Schnabel 1938). The Schnabel population estimation formula is:

the estimate of $N = \sum(C_tM_t)/\sum r_t$

If the total number of recaptures $\sum r_t$ is >50, then 95% confidence intervals (CI) are calculated at:

$V(1/N) = \sum r_t/(C_tM_t)^2$

95%CI for $(1/N) = (1/N) \pm 1.96(V(1/N))^{1/2}$

the inverse of these limits will provide the 95% confidence intervals.

If the total number of recaptures $\sum r_t$ is <50, then the $\sum r_t$ is treated as a Poisson variable and Appendix II of Ricker (1975) is used to obtain 95% CI. The 95% CI are calculated as follows:

the estimate of $N \pm \sum r_t$/the value provided in Appendix II for the $\sum r_t$.

For all formulas, C_t = captures at time t,
M_t = total marks at time t, and
r_t = total recaptures at time t.

Ogden Nature Center

Only Arrowhead Pond was sampled in 1997-2001. Sampling in Teal Pond has proven sufficient to determine that June sucker no longer persist in this pond (Table 3). A 75' trammel net was used during 1997 sampling, however, a 100' trammel net (1" inner mesh) was used in 1998-2001 and will be used during the following years. Arrowhead Pond was sampled on 22 October 2001 with a 2 hour net set from the West shore to the East shore. All fish caught were PIT tagged, measured to the nearest mm TL, and weighed to the nearest g. Surface water temperature was recorded. Population estimates were calculated as described above.

Results

Camp Creek Reservoir

The one trammel net and two gill net sets resulted in the capture of 135 June sucker (Table 4) and no rainbow trout. The landowner, Boyd Warr, stocked approximately 95 rainbow trout in the spring of 1998; 10 were caught in 1998, none were caught in 1999, and one was caught in 2000. Three distinctive size groups of June sucker were caught (Figure 1). Gill net #1 caught 64 June sucker (40.4/net hour) of all three size groups. Gill net #2 caught 31 June sucker (18.6/net hour) of all three size groups. The trammel net caught 40 June sucker (20/net hour) of the largest size group. Sixty June sucker were sacrificed for disease certification at the Fisheries Experiment Station in Logan, UT; five were released without being PIT-tagged; one June sucker escaped before it was weighed, measured, or PIT-tagged; and the remaining 69 June sucker were released with a PIT-tag. Eight of the 134 June sucker caught were recaptures with four recaptures being hatchery fish from the 2000 stocking and four being wild fish (Appendix A). Of the four wild fish recaptures, two were initially tagged in 2000, one was initially tagged in 1999, and one was initially tagged in 1998 (Appendix A).

Because Camp Creek Reservoir has a naturally reproducing population of June sucker, a population estimate is difficult to obtain with one sampling event per year. Population estimates were attempted in the past by obtaining an estimate for certain size groups of June sucker. The following population estimate only includes the number of June sucker caught and marked in 2000 and the recaptures of these marked fish in 2001. The main population estimate assumptions likely violated were: 1) no mortalities during the sampling period and 2) no immigration or recruitment during the sampling period. The smallest size group caught in 2001 may not have been of a sufficient size to have been effectively sampled in 2000. The running Schnabel population estimate and 95% CIs for wild June sucker in Camp Creek Reservoir during 2001 was 1679<6045<60450 individuals (Table 6). Water temperature was 22°C at 1250 hours.

Ogden Nature Center

In 2001, eight June sucker (4.0/net hour) were caught in the two hour trammel net set (Table 5). Six of these fish were determined to be a result of natural reproduction in Arrowhead Pond. Naturally reproduced fish are evident because they do not have missing fins, scoliosis, fin clip(s), etc. of which is evident in all stocked fish. The naturally reproduced June sucker averaged 393 mm TL (370mm-415mm), whereas the mean length of the two stocked June sucker was 448 mm TL (417mm-478mm) (Table 3). Both of the stocked June sucker were recaptures. One fish was originally caught and tagged in 1998 and the other fish was originally caught and tagged in 1997 and again caught in 1999 (Appendix A).

The naturally produced June sucker caught in 1999-2001 were not included in the population estimate for stocked June sucker. The running Schnabel population estimate and 95% CIs for stocked June sucker in Arrowhead Pond was 95<155<269 individuals (Table 6). This population estimate assumes no mortality of stocked fish since 1997, consequently, the estimate may be high. Water temperature was 14°C at 1315 hours.

Discussion

Camp Creek Reservoir

The population of June sucker in Camp Creek Reservoir appears to be healthy based on the number of captures in 1997 (n=120) , 1998 (n=54), 1999 (n=134), 2000 (n=97 wild fish), and 2001 (n=131 wild fish) and evidence of natural recruitment. All of the June sucker caught in 1997-2001 (excluding the six hatchery fish caught during 2000 and 2001 monitoring efforts) appear to be the result from natural recruitment, since adult fish captures were all >387 mm TL in 1995 and >474 mm TL in 1996. Natural reproduction has been documented since 1991 with juvenile June sucker captures in 1991, 1994, and 1996-2001 (Tables 1 and 4). Although gear types and sampling methods have varied through the sampling history of Camp Creek Reservoir, more June sucker were captured with similar to less effort in 1997-2001 than years previous (see Table 1). Trammel net catch between 1997 (11.5/net hour), 1998 (11.2/net hour), and 1999 (11.7/net hour) was similar. More June sucker were caught by trammel net in 2000 (35.0/net hour) and 2001 (20.0/net hour), however, water levels were significantly lower during these years due to drought conditions and the larger June sucker were likely congregated. Gill net catch was lower in 1998 (4.8/net hour) and 2000 (7.3/net hour) as compared to 1997 (22.2/net hour), 1999 (21.8/net hour) and 2001 (29.5/net hour), but this was likely a function of the missing smaller age groups in 1998 and 2000 (Figure 1). The smaller age group that was missing in 1998 was present in 1999 (Figure 1) and the smaller age group present in 2000 had recruited into the larger age group in 2001 (Figure 1).

No June sucker from the original 1987 stocking were encountered during monitoring efforts in 1997-2001. Several hypotheses alone or in combination may explain the lack of captures. One hypothesis is the location of the net sets; larger June sucker may be in the deepest part of the reservoir and therefore were not susceptible to the sampling gear. A second hypothesis is that the original population is in low numbers, which prevented any captures. In the early 1990s, Camp Creek Reservoir was drained almost entirely (B. Nielson 1997, UDWR, personal communication), which may have reduced the number of June sucker present from the original plant. Boyd Warr, the present landowner of Camp Creek, informed the UDWR that he currently maintains a conservation pool in Camp Creek Reservoir for June sucker.

Thirty-five of the 120 June sucker caught in 1997 were PIT-tagged. Because catch in 1997 was larger than in previous years (Table 1), enough PIT-tags were not available to tag each individual June sucker. In 1998, 51 of the 54 June sucker caught were PIT-tagged. One June sucker (87 mm TL) was too small to tag and two June sucker were recaptures. In 1999, 129 of the 134 June sucker caught were PIT-tagged. Four fish were recaptures and one fish escaped before being tagged. Three of the recaptures had been originally tagged in 1997 (Appendix A). In 2000, 92 of the 100 June sucker caught were PIT-tagged. Seven fish were recaptures and one fish escaped before being tagged. Three of the June sucker were recaptures from the stocking of hatchery fish in June 2000. Two of the recaptured wild June sucker in 2000 had been originally tagged in 1998 and the other two recaptured June sucker had been originally tagged in 1999 (Appendix A). In 2001, 62 of 135 June sucker caught were PIT-tagged. Sixty June sucker were sacrificed for disease certification at the Fisheries Experiment Station. Seven June sucker were recaptures with 4 being wild fish and 3 recaptures of hatchery fish from the stocking in June 2000. Five June

sucker were released after being weighed and measured and one fish escaped before a PIT tag could be administered. All of the wild June sucker recaptures through time have been older, larger fish (Appendix A), consequently, growth was minimal through time. The June sucker recaptures in 2001 had lost weight (Appendix A), which may indicate that the drought has lowered the condition of the fish in Camp Creek Reservoir.

A Schnabel (1938) population estimate was obtained in 2001 for wild June sucker (1679<6045<60450). Because Camp Creek Reservoir has a naturally reproducing population of June sucker, the assumption of no immigration or recruitment into a population creates a problem when calculating a population estimate. The population estimate for 2001 only included the number of June sucker caught and marked in 2000 and the number of recaptured June sucker in 2001. Because only two wild June sucker were recaptures from the tagging in 2000, the population estimate may not be close to the true population. Evidence of this is the broad 95% confidence intervals (Table 6).

Sampling in subsequent years will continue to follow the protocol used in 1997-2001. Gill nets were not an original component in the sampling design, however, the differences in age class catch between the two gear types (trammel versus experimental gill nets), in conjunction with zero sampling mortality from 1997-2000, warrants continued use of gill nets. A few June sucker mortalities were experienced in gill nets during 2001, however, these fish were included as part of the 60 fish needed for disease certification. These mortalities were likely a function of the warmer water/air temperatures experienced with the earlier sampling period of August. The gill nets tend to catch smaller age classes than the trammel net. In 1997, the trammel net caught all but two of the larger June sucker age group, which was the largest age group caught that year. In 1998, the trammel net caught all of the larger age group of June sucker, which again was the largest age group caught that year. In 1999, the trammel net caught only the larger age group of June sucker, while the gill nets caught the smaller two age groups of June sucker. Again in 2000 and 2001, the trammel net caught most of the larger age group.

Ogden Nature Center

June sucker persist in Arrowhead Pond at the Ogden Nature Center. Although gear types have varied through the sampling history of Arrowhead Pond, more June sucker were caught in 1997 (n=16), 1998 (n=36), 1999 (n=33), 2000 (n=16), and 2001 (n=8) than in 1996 (n=4) and 1995 (n=6). Catch-per-effort data collected in 1997-2001 is difficult to compare to previous years data because of the difference in gear types used. Catch-per-effort between 1997-2000 was similar with estimates between 7.7/net hour and 18.0/net hour. Catch-per-effort was lower in 2001 (4.0/net hour) (Table 5). Arrowhead Pond is a small pond and the one trammel net extends almost entirely across the pond, making sampling of this pond extremely effective.

Ninety-one June sucker have been PIT-tagged in Arrowhead Pond between 1997-2001. Seventy-three of these tagged fish were stocked June sucker, while 18 fish were naturally produced in the pond. Growth data obtained from PIT tagging has varied between individual fish (Appendix A).

Assuming no mortality, a Schnabel (1938) population estimate was obtained in 2001 for stocked June sucker (95<155<269). Because sampling Arrowhead Pond with a trammel net is effective,

a population estimate with relatively tight 95% CIs is possible. Until 1999, no natural reproduction of June sucker was observed in Arrowhead Pond. Reproduction was not thought possible in Arrowhead Pond because the substrate is mud and there is no inflow or outflow (Thompson 1998). In addition, green sunfish are in high densities in Arrowhead Pond (1997 sampling produced 372/trap net hour; Table 3) and likely would consume any June sucker larvae if June sucker are reproducing. In spite of this, two naturally reproduced June sucker were caught in 1999, 11 in 2000, and five untagged fish in 2001. One wild June sucker caught in 2001 was a recapture from 2000. These fish were not included in the population estimate for stocked June sucker. These fish were determined to be naturally reproduced because they did not have missing fins, scoliosis, fin clip(s), etc. of which is evident in all stocked fish. Upon further investigation in 1999 and 2000, gravels are present in parts of Arrowhead Pond and ground water upwelling evidently keeps the gravels oxygenated and clear of silt, however marginal this may be. The potential exists that additional year classes of naturally produced June sucker occur in Arrowhead Pond. The sampling technique used (trammel net) targets larger fish, consequently, until smaller June sucker recruit into the gear type, they would not be sampled. Eleven of the 16 June sucker caught in 2000 and six of the eight caught in 2001 were naturally reproduced and the ratio of hatchery versus wild fish in the future will likely continue to favor the naturally reproduced fish.

Sampling in subsequent years will follow the protocol established in 1997. If additional year classes of June sucker are present in Arrowhead Pond, they will eventually be caught by the trammel net. With a standardized sampling protocol, trend data will become available on the June sucker population in Arrowhead Pond. June sucker will continue to be PIT-tagged in subsequent years, allowing a more precise population estimate through the Schnabel (1938) multiple-census mark-recapture estimate.

Recommendations

Camp Creek Reservoir

1) PIT-tag all June sucker encountered during sampling in order to obtain a tighter population estimate for this reservoir.

2) If the genetic background of the Camp Creek Reservoir June sucker is not known, conduct genetic testing so that these fish could be used for broodstock, in accordance with the June Sucker Recovery Plan (USFWS 1999), if so desired. Eight fin clips collected in 1992 and nine clips in 1994 (Table 1) should provide background data. Additional tissue can be collected.

Ogden Nature Center

Arrowhead Pond

1) PIT-tag all June sucker encountered during sampling in order to obtain a tighter population estimate for this reservoir.

TRANSFER TO UTAH LAKE

Introduction

The June sucker technical team approved a scope-of-work to capture and move between 500-1,000 June sucker from Camp Creek Reservoir to Utah Lake during the calendar year 2001.

Methods

Camp Creek Reservoir was netted on October 9-10, 2001. Two gill nets and between 2-4 trammel nets (interior mesh size 1 inch and ½ inch) were set and pulled hourly. The trammel nets with 1 inch interior mesh were 100 feet in length, the trammel nets with ½ inch interior mesh were 200 feet in length, and the gill nets were 100 feet in length. Following ½ day of netting, the smallest mesh size was removed from the gill nets. June sucker caught were placed in large garbage cans that were filled with water. The garbage cans were located within a boat from where the June sucker were transported to live cages or moved directly to a processing table following the pulling of each net.

All June sucker (>180 mm TL) were measured to the nearest millimeter (mm) TL, weighed to the nearest gram (g), and scanned to determine if they had been PIT-tagged previously. If no PIT-tag existed, the June sucker was PIT-tagged and placed into a hatchery truck. If the June sucker had been previously PIT-tagged, the PIT-tag number was used to determine if the June sucker was a wild fish previously tagged during monitoring efforts or if the June sucker was a hatchery reared fish. All hatchery reared June sucker were placed in a live cage located within Camp Creek Reservoir and released back into the reservoir following the netting. If the PIT-tagged June sucker were wild fish, they were placed in the hatchery truck for transport to Utah Lake. Any June sucker mortality was placed in a zip lock bag, placed on ice, and frozen at the earliest time possible.

Results and Discussion

Nine hundred and twenty-seven wild June sucker were processed and placed into the hatchery truck for transport to Utah Lake. Some June sucker between 160-179 mm TL were processed (Figure 2) because the net catch of June sucker on October 10th declined to the point where few fish were being caught/net. Two June sucker died before the transport to Utah Lake and the PIT-tags were removed from these fish. During the netting effort, 35 June sucker were recaptures with 12 fish being hatchery June sucker and 23 being wild June sucker (Appendix A). The twelve hatchery June sucker were released back into Camp Creek Reservoir. One hatchery June sucker had a PIT-tag number that indicated that it was a fish from the original June sucker plant in 1987 in Camp Creek Reservoir. Apparently, a few original June sucker remain in the reservoir. Of the 23 wild June sucker, 18 were moved to Utah Lake and five were released back into Camp Creek Reservoir (Appendix A).

An additional five June sucker died during netting efforts. These seven June sucker in addition to one young-of-year June sucker that was observed on the shoreline of Camp Creek Reservoir were frozen and will be transported to the BYU museum. Nine hundred twenty five June sucker were transported to Utah Lake where they were stocked during the evening of October 10, 2001. Following stocking, five June sucker were observed dead and collected. On October 11, 2001, an additional three June sucker were found dead and collected. These eight fish are currently being held at the BYU museum. A total of 917 live June sucker were released into Utah Lake.

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Table 1. June sucker monitoring efforts, Camp Creek Reservoir 1988-1996 (NR = not recorded).

Date	Sampling method	Number Caught	Age-class	Avg. Length (range) mm TL	Catch-Per-Unit-Effort	Notes
05/18-19/88	trap nets	2	NR	NR	NR	
04/25/90	exp. gill nets	5	adult	403 (384-421)	NR	
05/01/90	seine	8	adult	416 (382-436)	NR	
04/18/91	3, exp. gill nets	23	21 adult 2 juv	413 (362-437) 182, 193	7.5/net hr	
06/06-06/91	75' trammel nets 150' exp. gill nets	55	37 adult 18 juv	(367-457) (183-235)	0.5/net hr	
04/92	exp. gill nets	NR	NR	NR	NR	"Significant" #'s of June sucker caught while netting for cutthroat
08/31/92	2, 75' trammel nets	19	adult	400 (350-460)	6.3/net hr	8 fish were fin clipped for genetics, clips sent to BYU
06/15-16/94	2, overnight exp. gill nets	25	14 adult 11 juv	398 (359-427) 245 (226-258)	NR	9 fish were fin clipped for genetics
11/03-04/94	1 trammel net	0	NA	NA	0/net hr	
06/21-22/95	1 exp. gill net	12	adult	457 (387-478)	0.79/net hr	
10/25-26/95	1 exp. gill net	1	adult	446	0.07/net hr	June sucker was fin clipped
09/23-24/96	exp. gill net(s)	9	2 adult 5 juv 2 juv	494, 474 226 (210-241) 104, 106	NR	One adult June sucker mortality

Table 2. June sucker stocked into Ogden Nature Center ponds.

Year class	Date stocked	Pond stocked	Lot Number	Fish /kg	Number stocked	Total Length (mm)	FES tank #
1987	5/20/93	Arrowhead	????	0.38	12	324	N/A
1989	5/20/93	Arrowhead	????	0.25	1	302	N/A
????	3/28/94	Arrowhead	????	????	120	????	N/A
1989	4/29/94	Arrowhead & Teal	89SKJN-USU*	2.01	544	190	JS-7
1989	4/29/94	Arrowhead & Teal	89SKJN-USU*	1.99	76	191	JS-5
1991	4/29/94	Arrowhead & Teal	910523SKJNUL01**	4.27	707	147	JS-3

* Eggs were collected from the Provo River during the 1989 spawning run from Utah Lake. The eggs were hatched at Utah State University and the fish were transferred to FES on August 6, 1991. The June sucker averaged 77 mm on the date of transfer.

** Eggs were collected from the Provo River during the 1991 spawning run from Utah Lake. The eggs were hatched at Utah State University and the fish were transferred to FES on June 8, 1992.

Table 3. June sucker monitoring efforts, Ogden Nature Center 1995-1996.

Date	Sampling method	Number Caught	Age-class	Avg. Length (range) mm	Catch-Per-Unit-Effort	Right pelvic fin clip	Notes
Arrowhead Pond							
06/20/95	1 exp. gill net	6	adult	357 (238-399)	4.8/net hr	5 of 6	
09/25/96	1 exp. gill net	4	adult	368 (335-388)	1.45/net hr	4 of 4	1 painted turtle and 17 green sunfish caught in the gill net. Mosquitofish observed.
07/18/97*	2 trap/fyke nets (4'x3' opening)	0	N/A	N/A	N/A	N/A	2 painted turtles and 1117 green sunfish were caught in 3 trap hours. Mosquitofish observed.
Teal Pond							
06/20/95	1 exp. gill net	0	N/A	N/A	N/A	N/A	29 green sunfish were caught in the gill net.
07/18/97*	boat electrofishing	0	N/A	N/A	N/A	N/A	40-50 green sunfish and bluegill were caught in 1-1/2 hours of electrofishing. Mosquitofish observed.

* Sampling was part of a demonstration for the Ogden Nature Center.

Table 4. Standardized Monitoring of Camp Creek Reservoir, 1997-2001.

Date	Sampling method	Number Caught	Probable age-class	Avg. Length (range) mm	Catch-Per-Unit-Effort	fin clips	Notes
Camp Creek Reservoir							
Trammel Net							
10/28/97	1 75' trammel net	31	≥age-3+	340 (309-362)	11.5/net hr*	no clips	
11/04/98	1 100' trammel net	33	≥age-3+	350 (290-406)	11.2/net hr	no clips	
10/11/99	1 100' trammel net	46	≥age-3+	354 (300-461)	11.7/net hr	no clips	
10/23/00	1 100' trammel net	74	≥age-3+	338 (280-420)	35.0/net hr	no clips	
08/13/01	1 100' trammel net	40	≥age-3+	350 (316-416)	20.0/net hr	no clips	
Gill Nets							
10/28/97	2, 100' exp. gill net	89	≥age-2+	214 (157-340)	22.2/net hr	no clips	
11/04/98	2, 100' exp. gill net	21	≥age-1+	276 (87-317)	4.8/net hr	no clips	
10/11/99	2, 100' exp. gill net	91	≥age-2+	247 (142-460)	21.8/net hr	no clips	
10/23/00	2, 100' exp. gill net	26	≥age-2+	288 (203-433)	7.3/net hr	no clips	
08/13/01	2, 100' exp. gill net	95	≥age-2+	209 (145-358)	29.5/net hr	no clips	

* Catch-Per-Unit-Effort was adjusted for a 100' trammel net since a 75' net was used in 1997.

Table 5. Standardized Monitoring of Arrowhead Pond (Ogden Nature Center), 1997-2001.

Date	Sampling method	Number Caught	Probable age-class	Avg. Length (range) mm	Catch-Per-Unit-Effort	fin clips	Notes
Arrowhead Pond, Ogden Nature Center							
10/27/97	1 75' trammel net	16	stocked	437 (401-495)	10.7/net hr*	16 of 16	9 June sucker became immediately entangled in the initial net set. These fish were removed and an additional 7 were caught in a 2 hour set. CPUE was calculated for all fish for a 2 hour set.
11/02/98	1 100' trammel net	36	stocked	444 (394-497)	18/net hr	33 of 36	
10/28/99	1 100' trammel net	31 2	stocked wild	441 (389-498) 285 (278-291)	16.5/net hr	29 of 31	
10/20/00	1 100' trammel net	5 11	stocked wild	432 (401-481) 356 (291-389)	7.7/net hour	5 of 16	
10/22/01	1 100' trammel net	2 6	stocked wild	448 (417-478) 393 (370-415)	4.0/net hour	2 of 8	

* Catch-Per-Unit-Effort was adjusted for a 100' trammel net since a 75' net was used in 1997.

Table 6. Population estimates for wild June sucker in Camp Creek Reservoir and stocked June sucker in Arrowhead Pond.

Camp Creek Reservoir

t	C_t	M_t	$C_t M_t$	r_t	% recap	N	95% CI
2000	93	0	0	0	0	-	-
2001	130	93	12090	2	2.2	6045	1679-60450
		221					

Arrowhead Pond

t	C_t	M_t	$C_t M_t$	r_t	% recap	N	95% CI
1997	16	0	0	0	0	-	-
1998	36	16	576	5	31.3	115	49-360
1999	30	47	1410	8	17.0	153	89-288
2000	5	69	1104	1	20.0	167	99-303
2001	2	73	146	2	100.0	155	95-269
		73					

t = time (year sampled)
C_t = captures at time t
M_t = total marks at time t
r_t = total recaptures at time t
N = population estimate

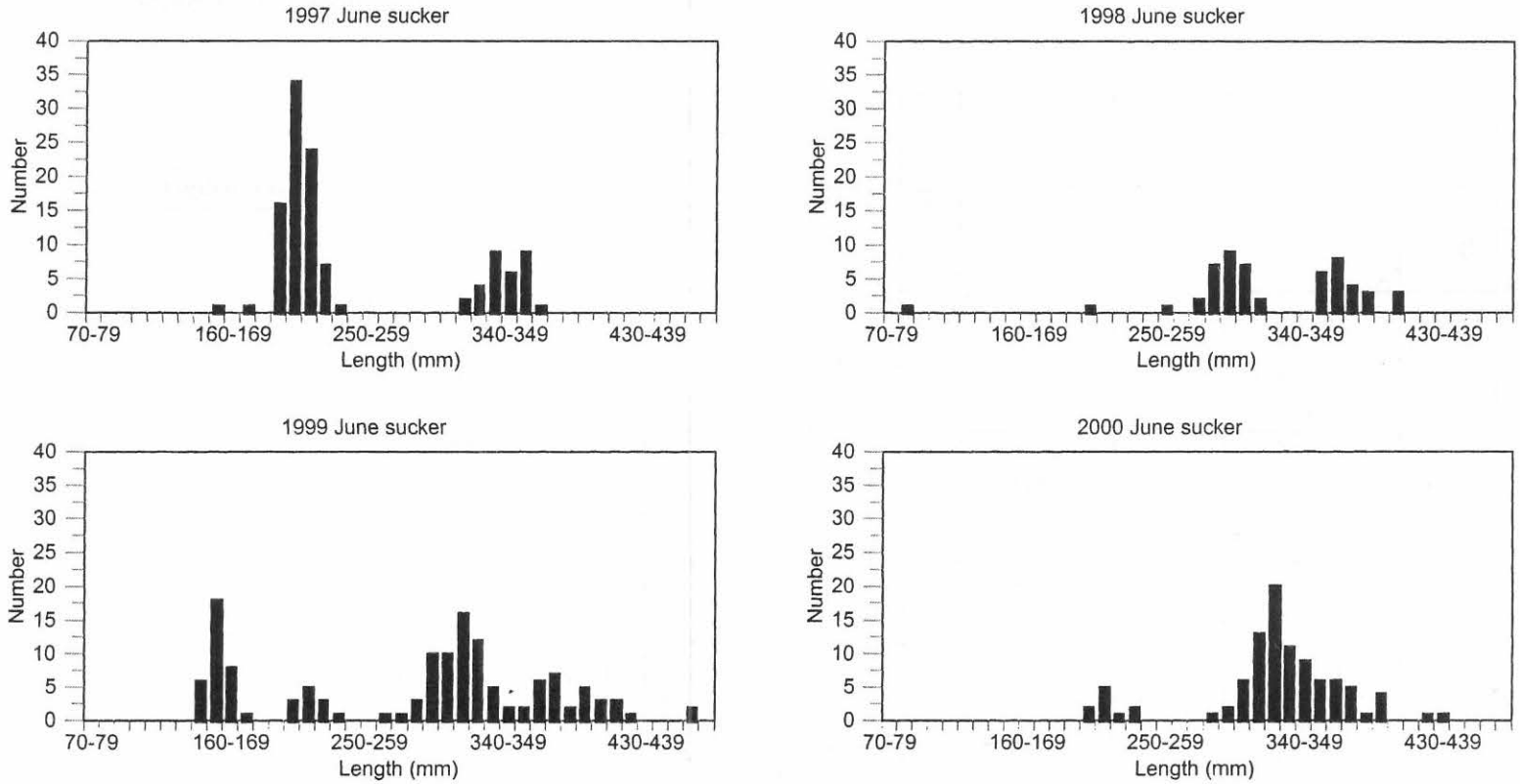

Figure 1. Length-frequency distribution for June sucker caught in Camp Creek Reservoir in 1997-2001.

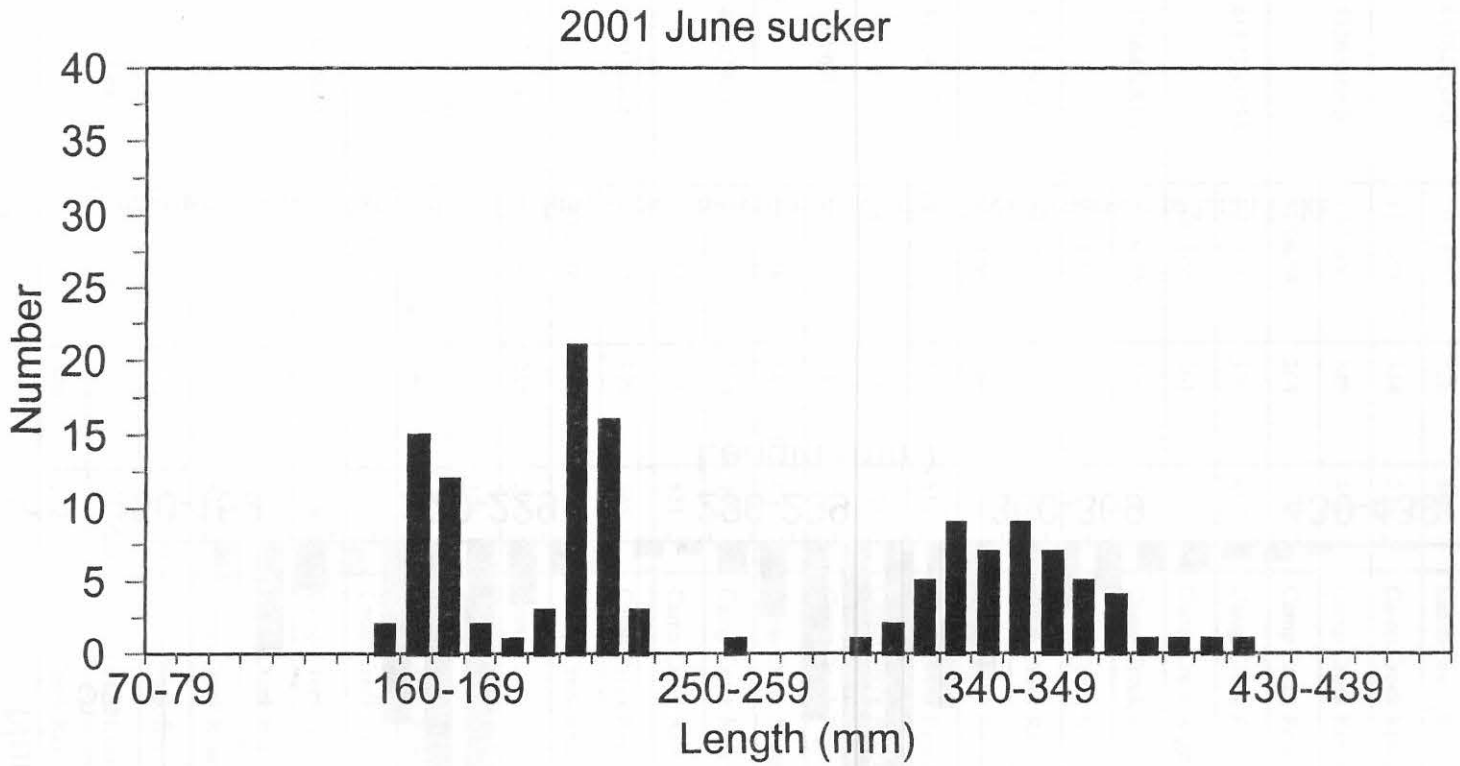

Figure 1. continued.

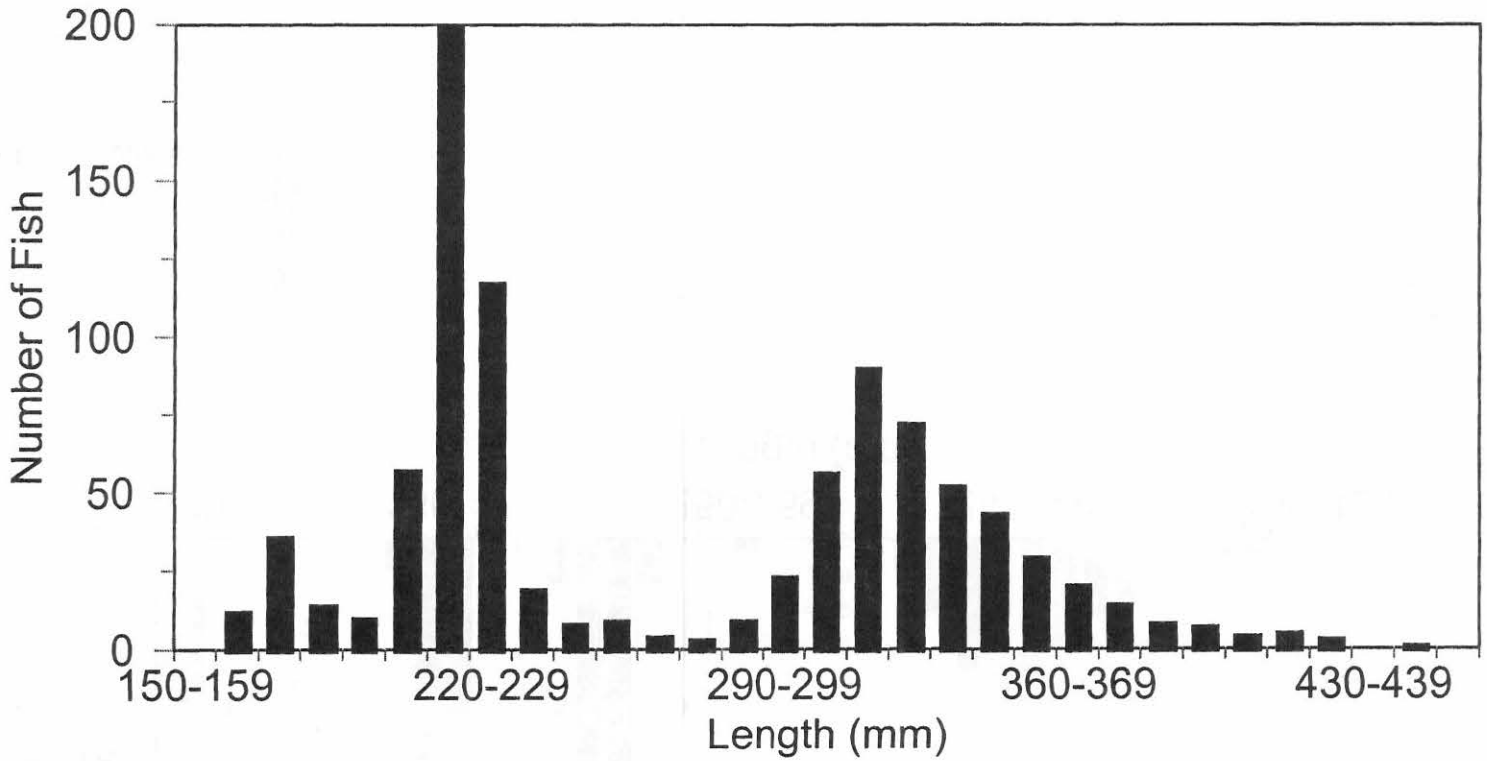

Figure 2. Length-frequency distribution for June sucker moved from Camp Creek Reservoir to Utah Lake.

Appendix A. PIT-tag recaptures at Camp Creek Reservoir and Ogden Nature Center.

PIT-tag #	Date	Length	Weight	Location/Disposition
Camp Creek Reservoir - Wild June sucker				
41364A3460	10/18/97	316	380	Camp Creek Reservoir
	11/04/98	354	520	Camp Creek Reservoir
4136536A20	10/18/97	349	486	Camp Creek Reservoir
	11/04/98	364	542	Camp Creek Reservoir
41175B3853	11/04/98	350	487	Camp Creek Reservoir
	10/11/99	361	467	Camp Creek Reservoir
413646081A	11/04/98	329	416	Camp Creek Reservoir
	10/11/99	371	511	Camp Creek Reservoir
413710660A	11/04/98	348	494	Camp Creek Reservoir
	10/11/99	366	510	Camp Creek Reservoir
413646372C	11/04/98	340	514	Camp Creek Reservoir
	10/11/99	390	631	Camp Creek Reservoir
50306B1711	10/11/99	332	345	Camp Creek Reservoir
	10/23/00	340	407	Camp Creek Reservoir
41173A3F3C	11/04/98	354	482	Camp Creek Reservoir
	10/23/00	355	521	Camp Creek Reservoir
5030746446	10/11/99	379	545	Camp Creek Reservoir
	10/23/00	376	658	Camp Creek Reservoir
41171D4A69	11/04/98	285	236	Camp Creek Reservoir
	10/23/00	329	395	Camp Creek Reservoir
5020172628	10/23/00	342	356	Camp Creek Reservoir
	08/13/01	336	329	Camp Creek Reservoir
5030766615	10/11/99	421	819	Camp Creek Reservoir
	08/13/01	416	645	Camp Creek Reservoir
50201C3F17	10/23/00	322	413	Camp Creek Reservoir
	08/13/01	332	297	Camp Creek Reservoir
411744002C	11/04/98	317	346	Camp Creek Reservoir
	08/13/01	346	362	Camp Creek Reservoir

Appendix A. continued.

PIT-tag #	Date	Length	Weight	Location/Disposition
Camp Creek Reservoir - Wild June sucker				
4136630344	10/18/97	340	476	Camp Creek Reservoir
	10/09/01	350	360	moved to Utah Lake on 10/10/01
413658654F	10/18/97	357	552	Camp Creek Reservoir
	10/10/01	396	572	moved to Utah Lake on 10/10/01
4136640E44	10/18/97	339	472	Camp Creek Reservoir
	10/10/01	371	486	moved to Utah Lake on 10/10/01
411748600D	11/04/98	279	213	Camp Creek Reservoir
	10/09/01	316	296	moved to Utah Lake on 10/10/01
41173A6B21	11/04/98	293	260	Camp Creek Reservoir
	10/10/01	346	421	moved to Utah Lake on 10/10/01
41172A264B	11/04/98	355	511	Camp Creek Reservoir
	10/09/01	355	380	moved to Utah Lake on 10/10/01
41171D3F54	11/04/98	290	269	Camp Creek Reservoir
	10/09/01	355	378	moved to Utah Lake on 10/10/01
503075073F	10/11/99	310	301	Camp Creek Reservoir
	10/10/01	309	252	moved to Utah Lake on 10/10/01
5030635F79	10/11/99	298	252	Camp Creek Reservoir
	10/10/01	323	303	moved to Utah Lake on 10/10/01
503068606B	10/11/99	365	502	Camp Creek Reservoir
	10/09/01	360	400	moved to Utah Lake on 10/10/01
50307A0400	10/11/99	381	515	Camp Creek Reservoir
	10/09/01	372	425	moved to Utah Lake on 10/10/01
5030766502	10/11/99	328	343	Camp Creek Reservoir
	10/10/01	338	317	moved to Utah Lake on 10/10/01
501F6E3122	10/23/00	385	485	Camp Creek Reservoir
	10/09/01	420	370	moved to Utah Lake on 10/10/01
5020236655	10/23/00	307	286	Camp Creek Reservoir
	10/09/01	310	280	moved to Utah Lake on 10/10/01

Appendix A. continued.

PIT-tag #	Date	Length	Weight	Location/Disposition
Camp Creek Reservoir - Wild June sucker				
50306A5914	10/11/99	328	399	Camp Creek Reservoir
	10/09/01	337	376	Camp Creek Reservoir
50306F2760	10/11/99	370	572	Camp Creek Reservoir
	10/09/01	362	420	Camp Creek Reservoir
50202B0728	10/23/00	433	832	Camp Creek Reservoir
	10/09/01	421	700	Camp Creek Reservoir
5020146416	10/23/00	370	536	Camp Creek Reservoir
	10/09/01	376	430	Camp Creek Reservoir
5020183569	10/23/00	361	464	Camp Creek Reservoir
	10/09/01	358	410	moved to Utah Lake on 10/10/01
5020172628	10/23/00	342	356	Camp Creek Reservoir
	08/13/01	336	329	Camp Creek Reservoir
	10/10/01	351	330	moved to Utah Lake on 10/10/01
5030653D5C	10/23/00	319	344	Camp Creek Reservoir
	10/09/01	322	288	moved to Utah Lake on 10/10/01
426376465E	08/13/01	370	497	Camp Creek Reservoir
	10/09/01	365	550	moved to Utah Lake on 10/10/01
50202B272B	10/23/00	296	370	Camp Creek Reservoir
	10/10/01	302	268	Camp Creek Reservoir
Camp Creek Reservoir - Hatchery June sucker				
50306B1632	06/27/00	210	76	stocked into Camp Creek Reservoir
	08/13/01	227	99	Camp Creek Reservoir
502013731A	06/27/00	220	128	stocked into Camp Creek Reservoir
	10/10/01	266	148	Camp Creek Reservoir
502026671D	06/27/00	190	71	stocked into Camp Creek Reservoir
	10/10/01	229	112	Camp Creek Reservoir
5020291B6D	06/27/00	305	301	stocked into Camp Creek Reservoir
	10/09/01	327	320	Camp Creek Reservoir

Appendix A. continued.

PIT-tag #	Date	Length	Weight	Location/Disposition
Camp Creek Reservoir - Hatchery June sucker				
502015613B	06/27/00	195	68	stocked into Camp Creek Reservoir
	10/09/01	233	130	Camp Creek Reservoir
5020277E12	06/27/00	210	90	stocked into Camp Creek Reservoir
	10/10/01	241	140	Camp Creek Reservoir
5020230F39	06/27/00	220	84	stocked into Camp Creek Reservoir
	10/09/01	247	105	Camp Creek Reservoir
501F6A7921	06/27/00	200	80	stocked into Camp Creek Reservoir
	10/10/01	236	105	Camp Creek Reservoir
411E4E5833	06/26/00	329	312	Millville ponds; stocked into Camp Creek Reservoir on 06/27/00
	10/23/00	327	304	Camp Creek Reservoir
414946325C	06/26/00	no information		Millville ponds; stocked into Camp Creek Reservoir on 06/27/00
	10/09/01	200	60	Camp Creek Reservoir
414A296C7E	06/26/00	no information		Millville ponds; stocked into Camp Creek Reservoir on 06/27/00
	08/13/01	151	40	Camp Creek Reservoir
4147691833	06/26/00	no information		Millville ponds; stocked into Camp Creek Reservoir on 06/27/00
	10/10/01	193	45	Camp Creek Reservoir
411E6F2468	06/26/00	no information		Millville ponds; stocked into Camp Creek Reservoir on 06/27/00
	10/23/00	348	351	Camp Creek Reservoir
411E6F7E1D	06/26/00	no information		Millville ponds; stocked into Camp Creek Reservoir on 06/27/00
	10/23/00	325	291	Camp Creek Reservoir
41495A3445	06/26/00	no information		Millville ponds; stocked into Camp Creek Reservoir on 06/27/00
	10/09/01	208	88	Camp Creek Reservoir
41472D7062	06/26/00	no information		Millville ponds; stocked into Camp Creek Reservoir on 06/27/00
	08/13/01	172	52	Camp Creek Reservoir
4149030E04	06/26/00	no information		Millville ponds; stocked into Camp Creek Reservoir on 06/27/00
	08/13/01	169	42	Camp Creek Reservoir
414857346B	06/26/00	no information		Millville ponds; stocked into Camp Creek Reservoir on 06/27/00
	10/10/01	186	50	Camp Creek Reservoir

Appendix A. continued.

PIT-tag #	Date	Length	Weight	Location/Disposition
Camp Creek Reservoir - Hatchery June sucker				
7F7D3D5D65	1987	no information		initial stocking into Camp Creek Reservoir
	10/09/01	406	574	Camp Creek Reservoir
Arrowhead Pond - Hatchery June sucker				
7F7D04336F	05/20/93	350	500	released into Arrowhead Pond
	11/02/98	446	1035	Arrowhead Pond
7F7D056232	05/20/93	287	250	released into Arrowhead Pond
	11/02/98	462	704	Arrowhead Pond
4137145758	10/27/97	448	876	Arrowhead Pond
	11/02/98	468	921	Arrowhead Pond
41355B6850	10/27/97	416	656	Arrowhead Pond
	11/02/98	418	696	Arrowhead Pond
4136577D5F	10/27/97	470	1212	Arrowhead Pond
	10/28/99	487	1172	Arrowhead Pond
	10/22/01	478	1038	Arrowhead Pond
41366D6221	10/27/97	406	708	Arrowhead Pond
	10/28/99	412	750	Arrowhead Pond
4136705C17	10/27/97	445	1026	Arrowhead Pond
	10/28/99	455	1048	Arrowhead Pond
41367C3B3B	10/27/97	427	630	Arrowhead Pond
	11/02/98	444	774	Arrowhead Pond
41370A6D07	10/27/97	462	972	Arrowhead Pond
	11/02/98	477	1046	Arrowhead Pond
4137153A49	10/27/97	441	918	Arrowhead Pond
	11/02/98	456	904	Arrowhead Pond
	10/28/99	465	948	Arrowhead Pond
4136711331	10/27/97	412	606	Arrowhead Pond
	10/28/99	418	623	Arrowhead Pond

Appendix A. continued.

PIT-tag #	Date	Length	Weight	Location/Disposition
Arrowhead Pond - Hatchery June sucker				
4117654175	11/02/98	444	770	Arrowhead Pond
	10/28/99	448	793	Arrowhead Pond
41176B1E05	11/02/98	406	650	Arrowhead Pond
	10/22/01	417	610	Arrowhead Pond
41171B2B5B	11/02/98	474	983	Arrowhead Pond
	10/28/99	471	1035	Arrowhead Pond
41172D3F2F	11/02/98	476	1131	Arrowhead Pond
	10/28/99	490	1133	Arrowhead Pond
503078507A	10/28/99	389	620	Arrowhead Pond
	10/20/00	401	829	Arrowhead Pond
Arrowhead Pond - Wild June sucker				
501F752233	10/20/00	389	583	Arrowhead Pond
	10/22/01	415	728	Arrowhead Pond