State of Utah
DEPARTMENT OF NATURAL RESOURCES
Division of Wildlife Resources – Native Aquatic Species

LEAST CHUB

(Iotichthys phlegethontis)

MONITORING SUMMARY

Central Region
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Krissy W. Wilson, UDWR

Publication Number
XX-XX
Utah Division of Wildlife Resources
1594 W. North Temple
Salt Lake City, Utah
James F. Karpowitz, Acting Director

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1. INTRODUCTION

Least chub (*Iotichthys phlegethontis*) is a small cyprinid endemic to the Bonneville Basin. Least chub historically occupied a variety of habitats including rivers, clear streams, springs, ponds, and marshes (Sigler and Miller 1963). Current populations are restricted to isolated springs and associated marshes with cool stable temperatures, relatively low, stable dissolved oxygen values, low conductivities, with moderate to dense, emergent, floating, and submergent vegetation (Perkins et al. 1998). Wetland vegetation most commonly associated with least chub habitat include: olney threesquare (*Scirpus americanus*), clustered field sedge (*Carex praegracilis*), common cattail (*Typha domingensis*), common spikerush (*Eleocharis palustris*), duckweed (*Lemna sp.*), cutleaf water parsnip (*Berula erecta*), and waterfern (*Azolla mexicana*).

Least chub have been declining in distribution and abundance since the 1940's (Holden et al. 1974). Although information on historic distribution and habitat is scarce, least chub have been documented in Little Salt Lake, Iron County in 1936 (Hubbs and Miller 1948) and in Big Cottonwood Creek southeast of Salt Lake City in 1954 (Pendleton and Smart 1954). The historical range of least chub also included the Provo River, Utah Lake, Beaver River, Parowan Creek, and within Snake Valley (Sigler and Miller 1963, Crist 1990).

Monitoring conducted by the Utah Division of Wildlife Resources (UDWR) since 1993 indicates that least chub are currently limited to areas in Juab County including Snake Valley, Mills Valley (in the Sevier drainage below Yuba Reservoir), and the Mona Springs complex (in the Utah Lake drainage) (Perkins et al. 1998, Wilson et al. 1999, Wilson and Whiting 2002). Additionally, two populations, from previous range expansion efforts occur in Lucin Pond of western Box Elder County (Thompson 2004) and Walter Spring on the Fish Springs National Wildlife Refuge (FSNWR) in Juab County (Wilson 1999). A remnant population was recently discovered at Clear Lake in the Sevier drainage in Millard County (Wheeler, unpublished report).

Due to their declining distribution and abundance, least chub are currently classified as a conservation species by the State of Utah (UDWR 2004). As a conservation species, least chub are managed under a cooperative agreement, involving multiple agencies, which identifies a strategy for the recovery of the species. This Conservation Agreement and Strategy (Perkins et

al. 1998) identifies the following actions as necessary to enhance and protect extant populations: wetland revegetation and water quality improvements, grazing exclosure construction, surveys of suitable least chub habitat, control of nonnatives, genetic analysis, and monitoring of least chub populations. Extensive monitoring efforts are outlined in the Conservation Agreement in order to assess least chub populations, habitat, and trends in response to actions implemented by governing agencies. This report summarizes the results of the 2004 field monitoring activities in areas administered by the Central Region office of the UDWR.

2. METHODS

Least chub populations were monitored at Mills Valley (Figure 1) and FSNWR. Snake Valley was surveyed in conjunction with the UDWR Southern Region and results are reported in the Southern Region's annual report. The population at the Mona Springs complex was not monitored this year due to issues with water levels. A total of five sites were sampled in 2004: three sites at Mills Valley and two sites at FSNWR (Table 1). A variable number of mesh minnow traps were set at each site during sampling. Traps were set for 2-4 hours at a minimum depth of 12 cm. Trap location, trap depth, and total trapping time were recorded for each trap. All trapped fish were measured to the nearest millimeter and classified by species. Habitat inventories were conducted at all sites to assess physical parameters and to determine abundance of aquatic flora. Water depth, substrate depth, pool size, bank condition, water temperature, pH, dissolved oxygen, aquatic flora presence, and ungulate damage were all recorded on standardized data sheets.

3. RESULTS

During September 2004, field crews surveyed five sites within Mills Valley and FSNWR. Of the five sites sampled, least chub were found in two (40%) (Table 1). Of the total fish captured at Mills Valley, 99% were least chub, while no least chub were captured at FSNWR (Table 2).

3.1 Mills Valley Spring Complex

Two of the three sites sampled at Mills Valley contained least chub (Table 1). Least chub comprised 99.3% (N = 151) of all fish captured (Tables 2 & 3). One fathead minnow

(*Pimephales promelas*) (N = 1) comprised the remaining 0.7% of all fish captured (Table 3). Least chub mean total length was 35.0 mm (N = 151) (Figure 2). Among the three sites sampled, substrate depth ranged from 0.34 m to 0.68 m (mean = 0.54 m) and water temperature ranged from 10.1 to 17.3EC (mean = 14.5EC). Average dissolved oxygen was 10.2 mg/L, and pH ranged from 8.0 to 9.0 (mean = 8.5). Substrate throughout all sites consisted of organic silt and ungulate damage was none to moderate.

3.2 Fish Springs National Wildlife Refuge

Within FSNWR, two separate springs were monitored: Walter Spring and Deadman Spring. No least chub were captured in 2004 at FSNWR (Table 2).

3.2.1 Walter Spring

At Walter Spring western mosquitofish (*Gambusia affinis*) accounted for 98% of the fish captured (N = 51), while Utah chub (*Gila atraria*) (N = 1) accounted for the remaining 2% (Table 4). Cattle are restricted within FSNWR, therefore ungulate damage is negligible. Water depth averaged 0.35 m, substrate depth averaged 0.17 m, water temperature averaged 23.6EC, dissolved oxygen averaged 5.16 mg/L, and pH was 9.5. Substrate consisted entirely of organic silt. It is quite surprising to have captured a Utah chub during monitoring. Utah chub have not been present in Walter Spring since it was chemically treated in 1995 and 1996.

3.2.2 Deadman Spring

Western mosquitofish (N = 57) comprised 100% of all fish captured (Table 4). Deadman Spring is located within FSNWR where cattle are restricted, therefore ungulate damage is negligible. Maximum water depth was 1.5 m, substrate depth averaged 0.95 m, water temperature averaged 22.3EC, dissolved oxygen averaged 7.33 mg/L, and pH was 7.5. Substrate consisted entirely of organic silt.

3.3 Mona Springs Complex

The Mona Springs Complex was not surveyed in 2004 due to issues involving the water users within the spring complex. The water was impounded in the complex until mid November, resulting in conditions not comparable to those during past monitoring efforts. On 16 July 2004,

after noticing several young-of-the-year (YOY) fish in new pond three (Figure 3), efforts were made to verify reproduction by least chub in the pond. A total of 60 minnow traps were placed in the site for four hours. Those traps captured 56 least chub, along with western mosquitofish and plains killifish (*Fundulus zebrinis*), which were not enumerated.

4. DISCUSSION

4.1 Mills Valley Spring Complex

A complete survey of Mills Valley in 2001 revealed a thriving and abundant least chub population. However, the majority of the sites surveyed in 2001 were on private property and permission for future annual access is unlikely. As a result, we chose to annually monitor only those sites found on UDWR property, and as in 2003 only 3 of those 8 sites had suitable water levels for monitoring. Within those three sites, one non-native fish (fathead minnow) was captured (Table 3). With such low densities of non-native fish being found at Mills Valley, the likelihood of competition and predation by non-natives on least chub is less than in other populations. A slight decline in the number of least chub captured was seen in 2004 (Figure 4).

Based on recovery actions identified in the Least Chub Conservation Agreement and Strategy (Perkins et al. 1998), least chub from Mills Valley were moved to two locations to establish refuge populations. A total of 618 least chub were moved from site 11 to the Wahweap State Fish Hatchery, while 81 least chub were moved from site 7 to the Fisheries Experiment Station. Work proceeded on the West Hatchery Pond, located at the UDWR Springville Hatchery, to repair the diversion structure allowing a sufficient amount of water to enter the pond. However, due to concerns raised by hatchery personnel, efforts to move least chub into the pond have been delayed indefinitely. Although the pond at the Springville Hatchery was not established as a refuge site, an interim refuge population was established at the UDWR Fisheries Experiment Station until a suitable refuge site can be identified.

4.2 Fish Springs National Wildlife Refuge

4.2.1 Walter Spring

Walter Spring was chemically treated in 1996 and 230 least chub were reintroduced from the nearest spring complex, Leland Harris. Within two weeks of the introduction fry were

observed throughout shallow vegetated areas within the spring and by 1997 “thousands” of least chub were observed. However, in 2000, the dike on the east side of the spring eroded, allowing the spring to be re-invaded by western mosquitofish. Since that event, least chub numbers have declined and are no longer captured during monitoring surveys, while mosquitofish numbers have increased (Table 5, Figure 5). For the first time, since the spring was chemically treated, a Utah chub was captured during monitoring efforts (Table 5).

4.2.2 Deadman Spring

Deadman Spring was chemically treated in November 1995. Utah chub were reintroduced into the spring in December 1995. However, western mosquitofish were observed in April 1996, thus in June and July 1996, the spring was chemically treated again. In May 1997, UDWR again introduced Utah chub, along with least chub, into Deadman Spring (Wilson 1999). Unfortunately, within a few months western mosquitofish were again observed (Table 5). Least chub have decreased in abundance each year since the re-invasion of western mosquitofish and have not been captured during monitoring since 1999, while western mosquitofish have increased in abundance (Figure 6).

4.3 Mona Springs Complex

Monitoring within the Mona Springs complex was not conducted during 2004. However, effort was made to verify reproduction of least chub occurring in new pond 3. During 2002, approximately 400 least chub from other areas in the complex were released into the pond, which has a diversion structure blocking the outflow and serving as a fish barrier. At the time of release, the pond was thought to be unoccupied by fish. The 2004 sampling in new pond 3 verified the presence of YOY least chub, but also provided evidence of western mosquitofish and plains killifish being present in the pond.

Plans were made to mechanically remove common carp (*Cyprinus carpio*) from the Mona Springs complex, however the funding for this removal project was never received. This mechanical removal project will be conducted when funding does become available.

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Table 1. Percentage of monitoring sites containing least chub at Mona Springs, Mills Valley, Deadman Spring (FSNWR), and Walter Spring (FSNWR), 1995-2004.

Year	Mona Springs	Mills Valley	Deadman (Fish Springs)*	Walter (Fish Springs)*
1995	7/12 (58%)	-	-	-
1996	6/12 (50%)	-	-	-
1997	7/12 (58%)	-	-	-
1998	1/12 (8%)	5/8 (63%)	4/4 (100%)	4/4 (100%)
1999	1/12 (8%)	2/6 (33%)	2/4 (50%)	2/3 (67%)
2000	3/13 (23%)	1/6 (16%)	0/4 (0%)	2/4 (50%)
2001	3/12 (25%)	14/25 (56%)	0/1 (0%)	2/4 (50%)
2002	2/13 (15%)	3/3 (100%)	0/1 (0%)	0/1 (0%)
2003	1/13 (7%)	3/3 (100%)	0/1 (0%)	0/1 (0%)
2004	Not Sampled	2/3 (67%)	0/1 (0%)	0/1 (0%)

***The Fish Springs complex sites were chemically treated and least chub introduced in 1996 and 1997.**

Table 2. Proportion of least chub trapped at Mona Springs, Mills Valley, Deadman Spring (FSNWR), and Walter Spring (FSNWR), 1995-2004.

Year	Mona Springs	Mills Valley	Deadman (Fish Springs)*	Walter (Fish Springs)*
1995	256/648 (40%)	-	-	-
1996	57/339 (17%)	-	-	-
1997	44/358 (12%)	-	-	-
1998	38/172 (22%)	23/98 (23%)	11/125 (9%)	393/393 (100%)
1999	8/113 (7%)	13/45 (29%)	3/180 (0.02%)	64/64 (100%)
2000	12/357 (3%)	2/3 (66%)	0/219 (0%)	14/16 (88%)
2001	5/315 (2%)	1641/1950 (84%)	0/124 (0%)	2/194 (1%)
2002	2/172 (<1%)	496/507 (98%)	0/65 (0%)	0/181 (0%)
2003	3/236 (1.3%)	201/207 (97%)	0/183 (0%)	0/255 (0%)
2004	Not Sampled	151/152 (99%)	0/57 (0%)	0/52 (0%)

***The Fish Springs complex sites were chemically treated and least chub introduced in 1996 and 1997.**

Table 3. Species present and number of fish captured in each site at Mills Valley, September 2004.

Site	Species Present	# Captured
5	LC	99
7	No Fish Captured	0
11	LC, FM	52,1

LC=Least Chub, FM=Fathead Minnow

Table 4. Species present and number of fish captured in each site at Walter and Deadman Springs (FSNWR), September 2004.

	Species Present		
Site	**MF**	**UC**	**LC**
Walter Spring	51	**1**	**-**
Deadman Spring	57	**-**	**-**

UC=Utah Chub, MF=Western Mosquitofish, LC=Least Chub

Table 5. Fish species present from 1995 to 2004 in Deadman and Walter Spring (FSNWR).

Year	Deadman	Walter
1995	UC,MF	UC,MF
1996	MF	LC*
1997	LC*,UC	LC
1998	LC,UC,MF	LC
1999	LC,UC,MF	LC
2000	UC,MF	LC,MF
2001	UC,MF	LC,MF
2002	UC,MF	MF
2003	MF	MF
2004	MF	UC,MF

LC=Least Chub, UC=Utah Chub, MF=Western Mosquitofish
*** Indicates when spring was chemically treated and least chub were introduced.**

Figure 1. Aerial map of least chub monitoring sites at Mills Valley, Juab County.

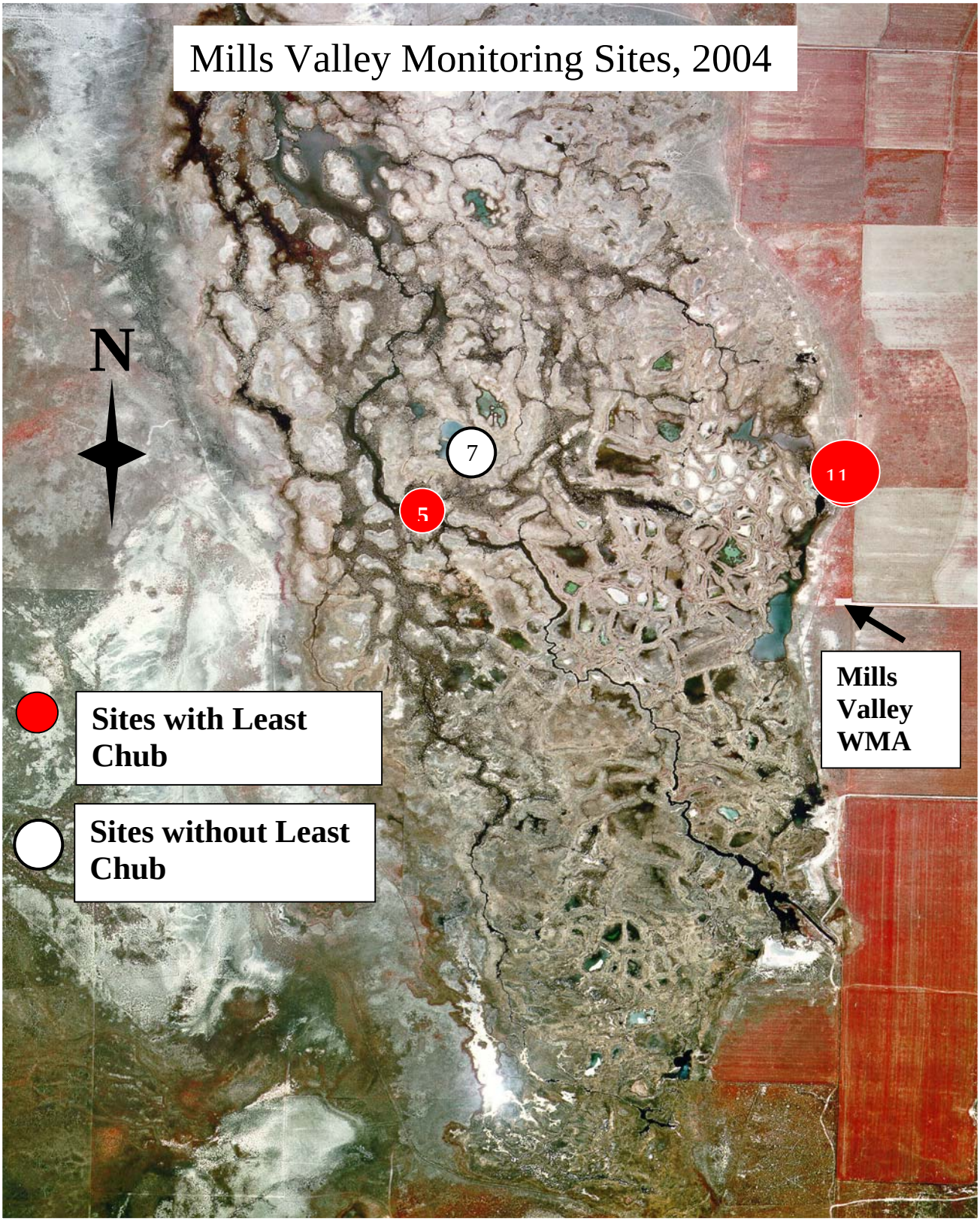


Figure 2. Least chub length frequency distribution at Mills Valley in 2004 (n = 151).

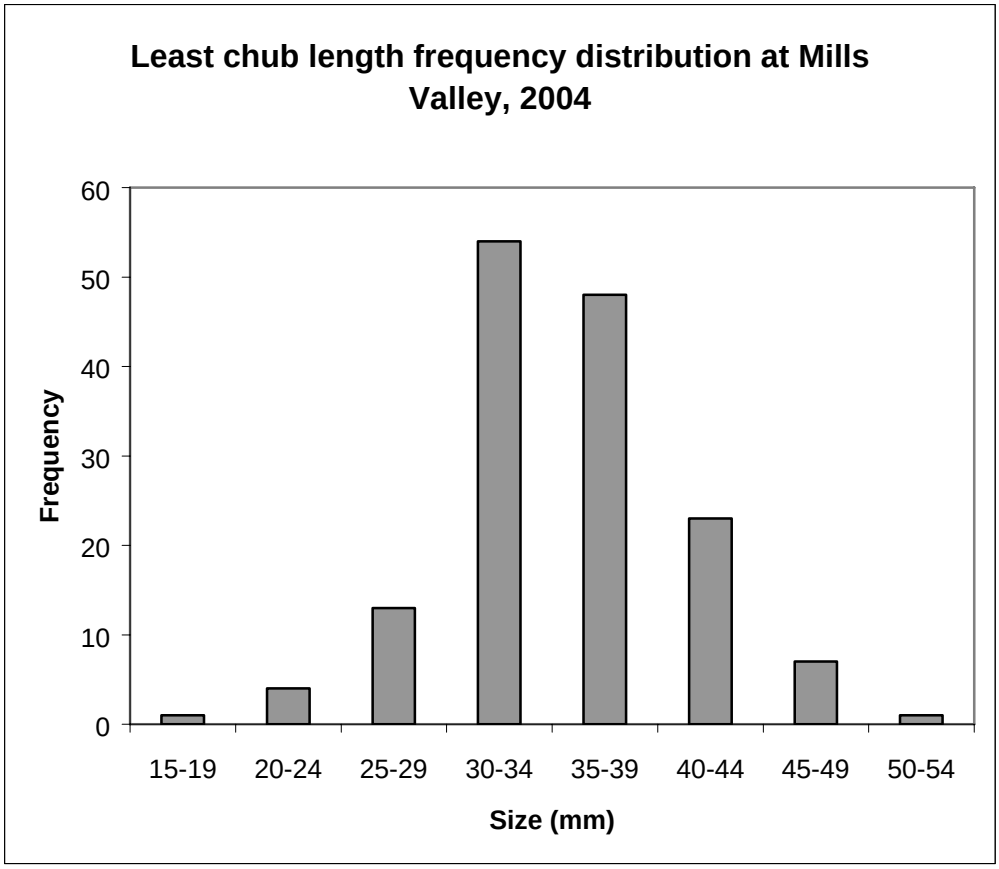


Figure 3. Aerial map of Mona Springs Complex showing location of new pond #3.

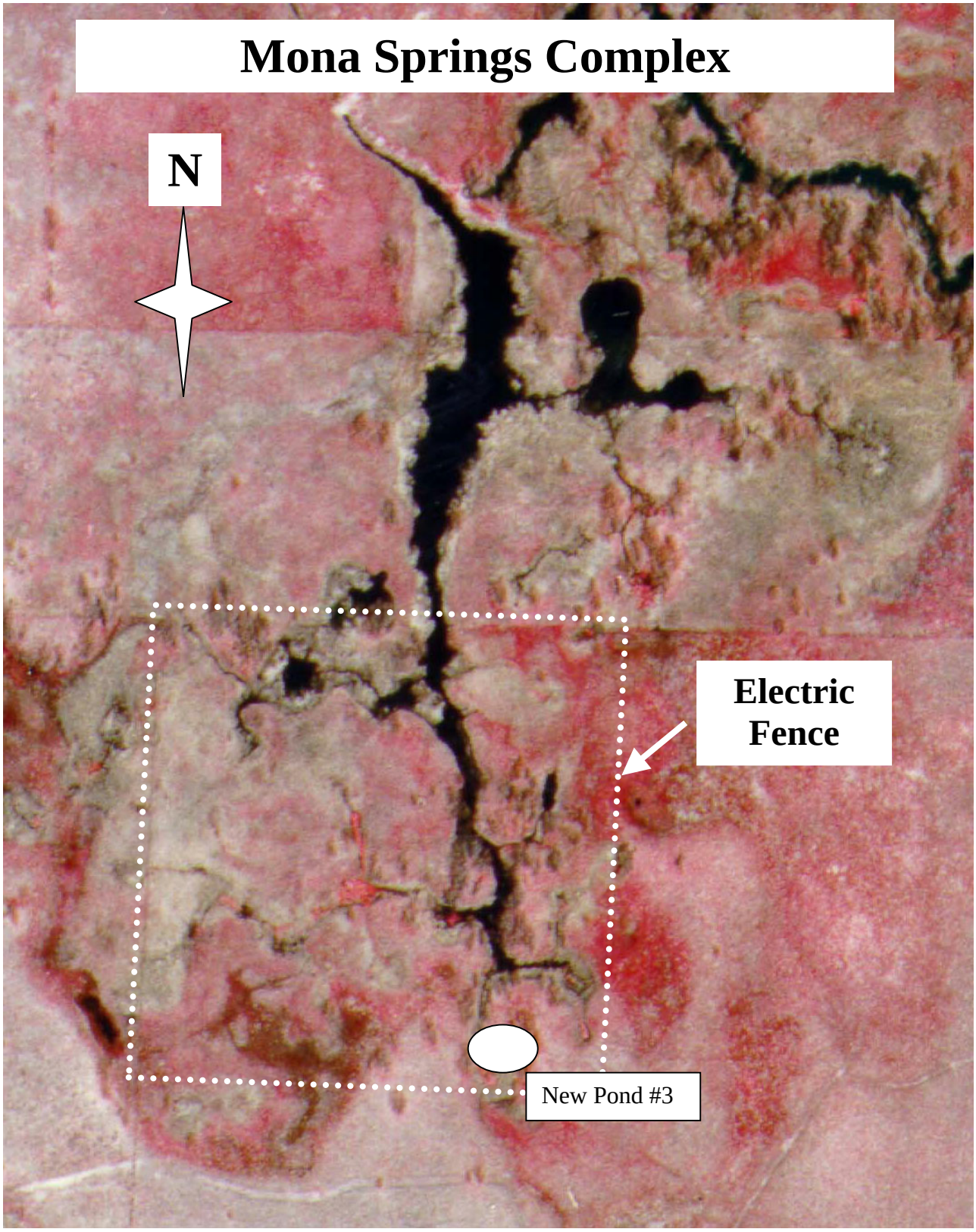
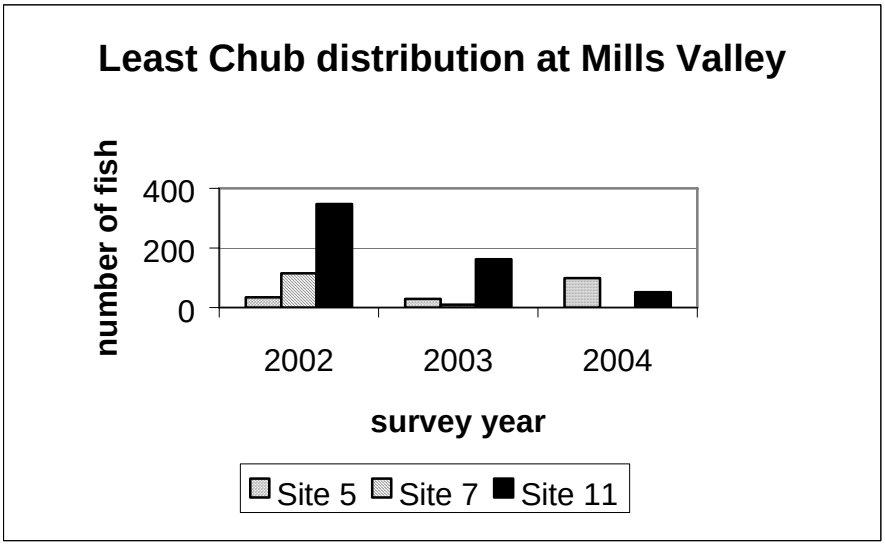
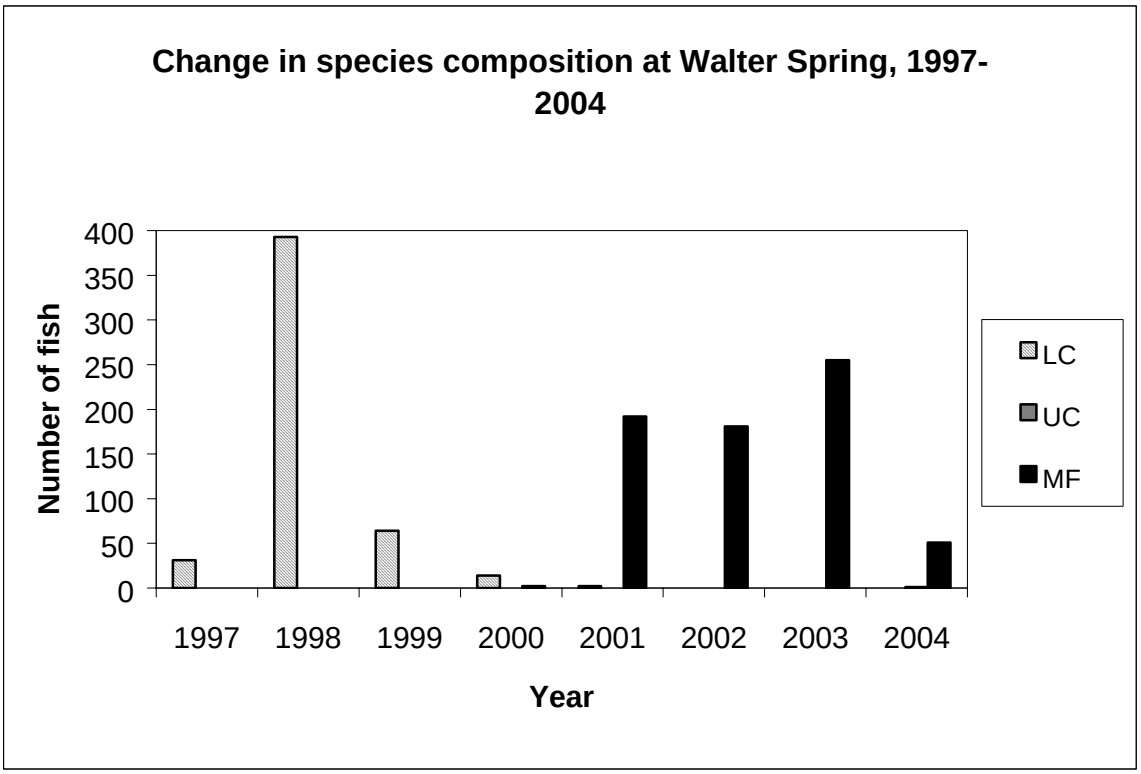


Figure 4. Least chub distribution at Mills Valley, 2002-2004.



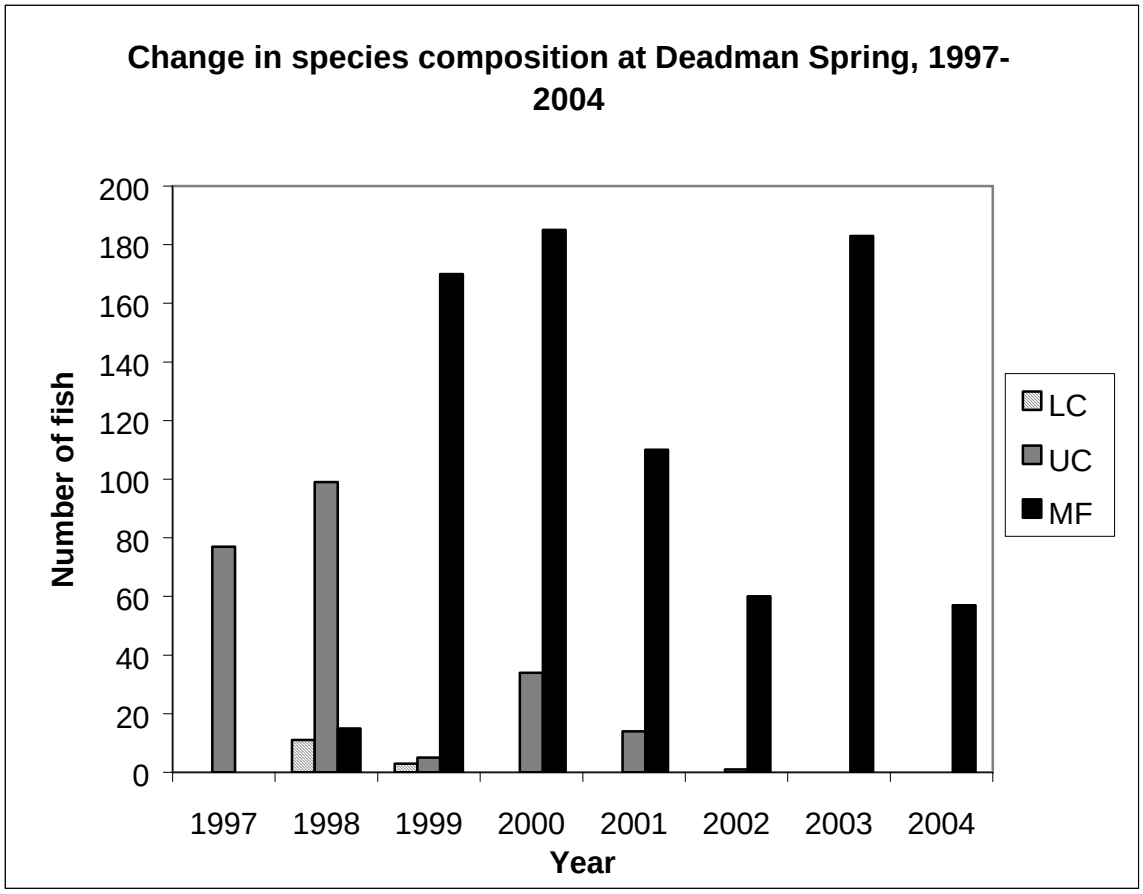
***Non-natives observed in 2004: Fathead Minnow = 1**

Figure 5. Change in species composition over time at Walter Springs (FSNWR), 1997-2004.



LC=Least Chub, UC=Utah Chub, MF=Western Mosquitofish

Figure 6. Change in species composition over time at Deadman Spring (FSNWR), 1997-2004.



LC=Least Chub, UC=Utah Chub, MF=Western Mosquitofish