

Survey of Verde River Drainage, Arizona for
Loach Minnow (*Tiaroga cobitis*)

Final Report to

U. S. Fish and Wildlife Service
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INTRODUCTION

Endemic to the Gila River Basin of New Mexico and Arizona, USA, and Sonora, Mexico, the loach minnow (*Tiaroga cobitis*) was Federally listed as a threatened species in 1986 (USFWS 1986). Its future is in jeopardy due to human-caused habitat changes and competition and predation by non-native fishes. The species has been reduced to about a dozen remaining populations (USFWS 1991, Marsh et al. in press). The last time it was recorded from the Verde River system was in 1938 (University of Michigan Museum of Zoology, UMMZ). The purpose of this study was to survey tributaries of the Verde River searching for loach minnow.

Loach minnow is a member of the minnow family (Cyprinidae) and its description is summarized from Minckley (1973) and USFWS (1991):

A small stream-dwelling fish, reaching standard lengths of 68mm, with elongated body, little compressed, and flattened ventrally. The mouth is small, terminal, and highly oblique. The body has an olivaceous background, highly blotched with darker pigment. Whitish spots are present at the base of the anterior and posterior portions of the dorsal fin, and the dorsal and ventral portions of the caudal fin base. Breeding males are darker and have bright red-orange coloration at the bases of the pelvic, pectoral, and caudal fins as well as the mouth.

Habitat preferred by loach minnow is characterized as shallow, turbulent, riffles in smaller to moderately large creeks and rivers with gravel-to-cobble substrates. (Minckley 1973, Propst and Bestgen 1991, USFWS 1991,). However, I have seen loach minnow survive, for extended periods of time in pools, such as found in Pace Creek, New Mexico.

The Verde River, encompassing a watershed of approximately 16,900 km² (6525 mi²), is one of the larger drainages in Arizona (Fig. 1a). The headwaters originate at an elevation of nearly 2135 m (7,000 ft) and the mainstem flows southeasterly for more than 301 km (187 mi) before merging with the Salt River (Girmendonk and Young 1997). The Verde River basin is home to 12 species of native fishes including; roundtail chub (*Gila robusta*), Gila chub (*Gila intermedia*), headwater chub (*Gila nigra*), spikedace (*Meda fulgida*), longfin dace (*Agosia chrysogaster*), speckled dace (*Rhinichthys osculus*), Sonora sucker (*Catostomus insignis*), desert sucker (*Pantosteus clarki*), as well as reestablished populations of Gila trout (*Oncorhynchus gilae*), Colorado squawfish (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), and Gila topminnow (*Poeciliopsis occidentalis occ.*). Historically it supported populations of loach minnow.

Twenty-eight non-native fish species have been recorded from the Verde River drainage, including; threadfin shad (*Dorosoma petenense*), rainbow trout (*Oncorhynchus mykiss*) cutthroat trout (*Oncorhynchus clarki*) brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), common carp (*Cyprinus carpio*), goldfish (*Carassius auratus*), red shiner (*Cyprinella lutrensis*), fathead minnow (*Pimephales promelas*), smallmouth buffalo (*Ictiobus bubalus*), flathead catfish (*Pylodictis olivaris*), channel catfish (*Ictalurus punctatus*), blue catfish (*Ictalurus furcatus*), black bullhead (*Ameiurus melas*), yellow bullhead (*Ameiurus natalis*), mosquitofish (*Gambusia affinis*), smallmouth bass (*Micropterus dolomieu*), spotted bass (*Micropterus punctulatus*), largemouth bass (*Micropterus salmoides*), warmouth (*Chaenobryttus gulosus*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*),

rockbass (*Ambloplites rupestris*), white crappie (*Pomoxis annularis*), black crappie (*Pomoxis nigromaculatus*), walleye (*Stizostedion vitreum*), and Mozambique tilapia (*Oreochromis mossambica*) (Minckley 1973, Girmendonk and Young 1997).

METHODS

The primary objective of this study was to conduct a fisheries survey of Verde River tributaries, specifically looking for loach minnow. At each site visited, typical loach minnow riffles were extensively sampled. In addition, runs and pools were also sampled in an effort to collect all fish species inhabiting an area. Since many other native fishes are facing similar population declines; a variety of sampling gear was used in an effort to document their presence. Documenting the presence of non-native fishes also was deemed important since they are implicated in the demise of Arizona's indigenous fishes and impact recovery efforts.

Fishes were captured by backpack electrofishing, dip nets, block (kick) seines, and gill nets (Appendix A). All fishes were identified to species and counted in categories of young of year and those greater than 1 year of age. Fishes were returned to the stream except for representative voucher specimens that were fixed in 10% formalin, later transferred to 70% ethanol, and deposited at the Arizona State University (ASU) Museum. Field studies started in August of 2000 and continued through July, 2002.

RESULTS

The contract for this project specified surveying 57 locations on 36 streams within the Verde River drainage. Fish collections were made at 130 locations on 44 streams (Fig. 1a). A total of 23 fish species was captured, including 8 natives and 15 non-natives (Table 1, Appendix A). No loach minnow were encountered during this study. Of special interest was the discovery of a new population of Gila chub in Wet Bottom Creek.

Gila chub are known to exist at 5 locations within the Verde River basin (Weedman et al. 1996). We found an additional population of Gila chub to be present, but uncommon, in Wet Bottom Creek. The upper portion of Wet Bottom Creek was not surveyed, but may have a larger population of chubs provided that there is a natural fish barrier precluding invasion from downstream by green sunfish. Five chubs were brought back to ASU for genetic studies. We also confirmed the continued presence of Gila chubs at Walker Creek, Spring Creek, and Williamson Valley Wash (Table 1, Appendix A).

Roundtail chub were collected from Deadman Creek, South Fork Deadman Creek, Weber Spring, and West Clear Creek (Table 1, Appendix A). The taxonomy and identification of chubs remains problematic and lacks universal acceptance. For the purposes of this report, headwater chub was included with roundtail chub.

A reestablished population of federally threatened Gila trout was encountered at Dude Creek. The Dude fire of 1990 eliminated the non-native trout that had existed in Dude Creek. It remained fishless for eight years before being stocked with Gila trout. Although the creek

appeared excellent for supporting trout, in autumn of 2000 only a small part of it was occupied by Gila trout. Fish caught ranged in length from 10-25 cm (4-10 inches) (Table 1, Appendix A).

Longfin dace was the most commonly occurring native fish, having been collected at 29 locations. Speckled dace was also frequently encountered. It was found at 20 locations (Table 1, Appendix A).

Within the Verde River basin, loach minnow historically occurred in at least the Verde River mainstem near Beaver Creek, Beaver Creek, and a Verde River tributary near Chino (Table 2.). All of these locations have been impacted by the actions of humans. Beaver Creek was treated with a fish poison in 1962 (Bassett 1962). Houses and agricultural fields now surround the area and its fish community is dominated by non-native species (Table 1). Tributaries of the Verde River near Chino also have been invaded by non-native fish, and have suffered aquatic habitat changes and losses (Hendrickson & Minckley 1984, Weedman 1996). No loach minnow were encountered during this survey.

Two native suckers, Sonora sucker and desert sucker, were locally abundant at several locations throughout the study area (Table 1, Appendix A).

Reestablished populations of Gila topminnow, stocked in 1982, continued to maintain large numbers of individuals at Walnut Spring and Lime Creek (Table 1). Upper Lime Creek had naturally occurring fish barriers, lacked non-native fish, and seemed ideal for the reestablishment of topminnow. (Table 1, Appendix A).

Green sunfish was the most commonly occurring non-native fish. It was found at 28 locations. It was most abundant in lower elevation tributaries (Table 1, Appendix A).

At higher elevations, brown and rainbow trout were common (Table 1, Appendix A). These fishes were stocked in the Verde system as early as 1942 and continue to be augmented by seasonal stocking by the Arizona Game and Fish Department (AZGFD files, Girmendonk and Young 1997).

Other non-native fishes that were commonly encountered included: red shiner, fathead minnow, yellow bullhead, mosquitofish, and smallmouth bass (Table 1, Appendix A).

Infrequently encountered non-native fishes included: common carp, flathead catfish, channel catfish, black bullhead, largemouth bass, bluegill, and rockbass (Table 1, Appendix A). Rockbass has always been uncommon in Arizona (Minckley 1973). The other species are likely more abundant than this study indicates because they favor deeper pools that were not extensively surveyed.

DISCUSSION

Since historically loach minnow has only been collected from three locations within the Verde River drainage, it may never have been widespread (Table 2). By the nature of its natural history, it is linked to specialized areas and rarely is caught in large numbers. Even in streams

with large concentrations, it can be difficult to encounter and its presence can easily go undetected. For example, in Eagle Creek, AZ loach minnow was collected in the 1950's and then was absent from collections for the next 40 years. In 1994 it was again encountered in Eagle Creek, but only in a small portion of that stream (Marsh et al. in press). The North Fork of East Fork Black River loach minnow population was not detected until 1996, despite frequent visits by fisheries biologists (Bagley et al. 1997). Thus, it is quite possible that loach minnow still occurs in the Verde River drainage, even though it was not encountered during this study. Continued monitoring and surveys of additional stream reaches may reveal loach minnow or new populations of other fishes.

The Verde River system encompasses a significant portion of Arizona's remaining riparian community. It is home to 12 species of native fishes and remains a cornerstone to their survival. The impacts of humans and non-native species on Arizona's native fishes are well documented. If these fishes are to exist in the future, it is essential that portions of the Verde River drainage be protected from these insults.

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Table 1. Fish survey of Verde River tributaries during 2000-2002. Listed below are the fish species that were collected at various locations within the Verde River drainage, Arizona. Streams are identified from south to north along the east side of the Verde drainage, then north to south along the west side. Locations within one stream are listed from downstream to upstream. Fish are listed by the first three letters of the genus and the first three letters of the species name. Native species are indicated by *.

Location	Fish Species																							
	Onc gil *	Onc myk	Sal tru	Cyp car	Gil rob *	Gil int *	Ago chr *	Rhi osc *	Cyp lut	Pim pro	Cat ins *	Pan cla *	Pyl oli	Ict pun	Ame mel	Ame nat	Gam aff	Poe occ *	Mic dol	Mic sal	Lep cya	Lep mac	Amb rup	no fish
Sycamore Creek @ Sugarloaf Mtn							X		X	X														
Sycamore Creek @ Mesquite Wash							X		X		X						X							
Sycamore Creek 2 mi below 87 bridge							X		X	X	X						X				X			
Log Corral Canyon (Sycamore Creek)																								X
Sycamore Creek @ Sunflower							X		X															
Sycamore Creek, East Fork																								X
Sycamore Creek, West Fork																								X
Alder Creek near China Spring							X																	
Walnut Spring (Alder Creek)																		X						
Alder Creek, Upper Alder Crk Spr																								X
Alder Creek, Alder Crk Spring																								X
Davenport Wash JM Spring																								X
Davenport Wash unnamed spr. T7NR7Esec 6																	X							
Davenport Wash @ Andrea Spring							X														X			
Deadman Creek @ Table Mtn											X								X		X			
Deadman Creek @ South Fork					X						X	X									X			
Wet Bottom Creek 1mi above Verde R.																					X			
Wet Bottom Creek 3 mi above Verde R.						X	X					X									X			

Table 1. Fish survey of Verde River tributaries, 2000-2002

Location	Fish Species																						
	Onc gil *	Onc myk	Sal tru	Cyp car	Gil rob *	Gil int *	Ago chr *	Rhi osc *	Cyp lut	Pim pro	Cat ins *	Pan cla *	Pyl oli	Ict pun	Ame mel	Ame nat	Gam aff	Poe occ *	Mic dol	Mic sal	Lep cya	Lep mac	Amb rup
East Verde R. ½ mi above Verde River								X							X	X		X	X	X			
East Verde River 2 mi above Verde R.								X				X	X		X	X		X	X	X	X		
East Verde River @ Pine Creek							X	X			X				X			X		X			
East Verde R ½ mi above Doll Baby R.										X					X					X			
East Verde R 1mi above Doll Baby R.								X	X						X			X		X			
East Verde River @ FS rd 209																				X			
East Verde River @ FS rd 199		X	X				X					X											
East Verde River @ Verde Glen Village		X					X																
East Verde River @ Pieper Hatchery Spr		X																					
Pine Creek @ East Verde River							X	X	X											X			
Pine Creek @ Parsnip Spring		X																					
Weber Creek @ Weber Spring		X			X		X	X			X												
Weber Creek @ Camp Geronimo		X					X													X			
Chase Creek @ Highline Trail		X																					
Dude Creek @ Highline Trail	X																						
Perley Creek @ Highline Trail																							X
Moore Creek @ FS rd 64																							X
Lewis Creek @ FS rd 64																							X
Ellison Creek @ East Verde River							X																
Ellison Creek above Cold Springs																							X
Ellison Creek @ FS rd 64																							X
Ellison Creek @ Highline Trail		X																					

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Location	Fish Species																							
	Onc gil *	Onc myk	Sal tru	Cyp car	Gil rob *	Gil int *	Ago chr *	Rhi osc *	Cyp lut	Pim pro	Cat ins *	Pan cla *	Pyl oli	Ict pun	Ame mel	Ame nat	Gam aff	Poe occ *	Mic dol	Mic sal	Lep cya	Lep mac	Amb rup	no fish
W. Clear Creek @ WCC campground					X		X	X	X		X	X				X					X			
W. Clear Creek @ Bull Pen Campgrnd								X	X			X									X			
W. Clear Creek @ Maxwell Trail		X						X				X												
W. Clear Creek- lower Clover Creek		X						X																
W. Clear Creek- lower Willow valley								X		X														
Toms Creek (W. Clear Creek)																								X
Hicks--Duncan Cyn (W. Clear Creek)																								X
Pivot Rock Canyon (W. Clear Creek)																								X
upper Clover Creek (W. Clear Creek)																								X
Fourty-four Cyn. (W. Clear Creek)																								X
Beaver Creek @ Verde River				X					X			X				X	X			X	X	X	X	
Red Tank Draw (Wet Beaver Crk)							X								X	X			X		X			
Walker Creek (Wet Beaver Crk)						X		X				X												
Wet Beaver Creek- @ FS rd 618		X									X								X					
Wet Beaver Creek @ USGS Gauge		X									X	X							X					
Wet Beaver Creek- below Brady Cyn																								X
Jacks Canyon (Wet Beaver Crk)																					X			
Brady Canyon (Wet Beaver Crk)										X					X						X			
Dry Beaver Creek rd 119- rd 179									X							X	X			X		X		
Oak Creek @ Verde River*		X							X										X	X				
Oak Creek @ rd 134A		X																	X		X		X	
Oak Creek @ Half Way picnic area		X	X					X				X												

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Location	Fish Species																							
	Onc gil *	Onc myk	Sal tru	Cyp car	Gil rob *	Gil int *	Ago chr *	Rhi osc *	Cyp lut	Pim pro	Cat ins *	Pan cla *	Pyl oli	Ict pun	Ame mel	Ame nat	Gam aff	Poe occ *	Mic dol	Mic sal	Lep cya	Lep mac	Amb rup	no fish
Oak Creek @ Cave Spring Campground			X				X																	
W. Frk Oak Creek ½ mi above Oak Ck			X				X				X													
W. Frk Oak Creek @ FS rd 231																								X
Lockwood Spring (West Frk Oak Crk)																								X
W. Frk Oak Creek @ Flag Tank																								X
Spring Creek @ Willow Pt. road						X	X	X			X	X												
Sycamore Creek Verde- Parsons Spr											X	X				X			X		X			
Grindstone Wash T20NR1Esec34																								X
Bear Canyon @ rd.71																								X
Bear Canyon @ rd. 354																								X
Bear Canyon @ Bear Springs																								X
Williamson Valley Wash, Simmons						X	X			X							X							
Apache Creek @ Walnut Creek								X																
Apache Creek @ 4 mi from Walnut crk								X																
Apache Creek @ Apache Springs																								X
N. Frk Walnut Crk @ Apache Crk								X																
N Frk Walnut Crk @ S. Frk Walnut								X																
N. Frk Walnut Crk above S. Fork																								X
S. Fork Walnut Crk ½ mi above N. Fork								X																
Mint Wash @ Mint Spring																								X
Mint Wash below Granite Basin Lake																								X
Granite Creek 1 mi above Verde River							X		X	X	X						X				X			

Table 1. Fish survey of Verde River tributaries, 2000-2002

Location	Fish Species																							
	Onc gil *	Onc myk	Sal tru	Cyp car	Gil rob *	Gil int *	Ago chr *	Rhi osc *	Cyp lut	Pim pro	Cat ins *	Pan cla *	Pyl oli	Ict pun	Ame mel	Ame nat	Gam aff	Poe occ *	Mic dol	Mic sal	Lep cya	Lep mac	Amb rup	no fish
Black Canyon Creek																								X
Gap Creek @ FS rd 574							X																	
Gap Creek @ Government Spring																								X
Houston Creek ½ mi above Verde R.							X																	
Red Creek 3.5 mi above Verde River							X				X													
Red Creek @ rd 16A							X																	
Middle Red Creek below North Red C.																								X
North Red Crk ½ mi above Middle							X																	
Tangle Creek @ last crossing w/269							X																	
Tangle Creek @LX Spring							X																	
Tangle Creek @ Picnic Spring																								X
Peet Spring (Tangle Creek)																								X
Cockleburr Spring (Tangle Creek)																								X
Mud Spring (Tangle Creek)																								X
Roundtree Canyon - (Tangle Creek)							X																	
Lime Creek 0-6 mi above Horseshoe R.							X										X			X				
Lime Creek near Cougar Canyon							X																	
Camp Creek @ FS rd 24F							X	X																
Sycamore Canyon (Camp Creek)																								X
Areas not specified in contract																								
Sheep Creek 1mi. above Verde R.							X		X												X			
Sheep Creek, South Fork							X														X			

Table 1. Fish survey of Verde River tributaries, 2000-2002

Location	Fish Species																							
	Onc gil *	Onc myk	Sal tru	Cyp car	Gil rob *	Gil int *	Ago chr *	Rhi osc *	Cyp lut	Pim pro	Cat ins *	Pan cla *	Pyl oli	Ict pun	Ame mel	Ame nat	Gam aff	Poe occ *	Mic dol	Mic sal	Lep cya	Lep mac	Amb rup	no fish
Unnamed Springs T7NR7E sec.17 SW																								X
Unnamed Springs T7NR7E sec.17NW																								X
Unnamed Springs T7NR7E sec. 9 N½																								X
Horse Creek near Sheep Bridge																								X
Sycamore Creek near Sheep Bridge																			X		X			
Sycamore Creek 4mi above Verde R.															X			X		X				
Lower Bull Spring																								X
Upper Bull Spring																								X
Bullfrog Spring																								X
Gaddes Canyon																								X
Cherry Creek @ Cherry, AZ																								X
Log Springs (Cherry Creek)																								X
Chasm Creek @ spring near rd 574																								X

Table 2. Museum collection records for loach minnow from the Verde River drainage, AZ.

Year	Location	Collector	Museum
1890	Chino Arizona from a tributary of the Rio Verde	Gilbert & Scofield	United States National Museum
1938	Verde River just above Camp Verde near mouth Beaver Creek	C.L. Hubbs & family	Univ. of Michigan Museum of Zoology
1938	Beaver Creek near mouth at Verde R. near Camp Verde	C. L. Hubbs & family	Univ. of Michigan Museum of Zoology

Appendix A

Listed below are site descriptions, methods, and collecting results for areas sampled during a survey of the Verde River drainage, Arizona for loach minnow during 2000-2002. Numbers in parentheses following the stream name reflect the number of sampling locations specified in the project contract.

Sycamore Creek-(3)

#1 Sycamore Creek near Sugarloaf Mountain- Maricopa Co. T4N R8E sec. 9, 16, 17, at F.S. rd. 402.

Sampled from ¼ mile downstream from USGS gauge and upstream to 1 mile above gauge. All water was found in intermittent pools. Most of survey area was dry. Area had poor potential for loach minnow due to limited habitat, absence of flowing water and presence of non-native fishes. Sept. 12, 2000. (Fig. 1b)

Habitat types- pool- 100%, largest pool measured 5m x 3m x 1.3m deep, most of water < 0.1m deep

Substrate character cobble 60% boulder 20% sand 20%

Current velocity shallow gradient, little to no flow

Bank shallow, rocky

Riparian sparse mesquite and desert broom, moderate cattle use

Sample gear shocker- 342 seconds (collectors B. Bagley, B. Kesner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	23	41 (infested with black spot parasite)
red shiner	0	3
fathead minnow	0	1
leopard frog	0	1
crayfish		abundant

#2 Sycamore Creek near Mesquite Wash- Maricopa Co. T5N R8E sec. 34 S.½ . Sampled from Mesquite Wash and downstream for ½ mile. Stream was dry upstream of sample area and dry for lowest 200m of sample area. Area characterized by narrow, shallow, sandy stream. Area had fair potential for loach minnow but, it lacked "classic" habitat features. Jan. 16, 2002. (Fig. 1b)

Habitat types riffle 60%, shallow pool 40% (avg. width 2m, avg. depth <0.1m)

Substrate character sand 60%, silt 30%, cobble 10%

Current velocity shallow gradient, slow flow

Bank shallow, sandy bank

Riparian mesquite, sycamore, desert broom

Sample gear shocker- 800 seconds (collectors B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	248	310
fathead minnow	0	1
desert sucker	0	2
mosquitofish	178	198
crayfish		present
leopard frog		1

#3 Sycamore Creek near Round Valley- Maricopa Co. T5N R8E sec11, 14. Sampled from Hwy. 87 bridge below Round Valley and downstream for 2 miles. Upper 1 mile dry. Water began below Log Corral Canyon. Water was continuous for 1 mile downstream from Log Corral Canyon and then became intermittent. Area was characterized by a shallow gradient stream flowing through a narrow, steep walled

canyon. Area had fair potential for loach minnow, however, area lacked significant riffle habitats. Jan. 25, 2002. (Fig.2)

Habitat types pool 80% (max. depth 2m)(avg. 2m wide x 0.2m deep), riffle 20%
 Substrate character sand 60%, boulder 20%, cobble 10%, gravel 10%
 Current velocity shallow gradient, little flow
 Bank steep, narrow canyon
 Riparian sycamore, seep willow, cottonwood
 Sample gear shocker- 1500 seconds (collectors B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	54	68
red shiner	200	310
fathead minnow	42	56
Sonora sucker	0	2
desert sucker	1	6
mosquitofish	65	80
bluegill	0	8
crayfish		common

#4 Log Corral Canyon upstream from Sycamore Creek-Maricopa Co. T5N R8E sec. 10, 11. Sampled from the confluence with Sycamore Creek and up Log Corral Canyon for 1 mile. Downstream ¼ mi. dry. Upper area had approximately 300 m of shallow, narrow stream. Area had poor potential for loach minnow due to very little water. Jan. 25, 2002. (Fig.2)

Habitat types shallow pools connected by shallow runs, avg.<0.1 m deep
 Substrate character sand 70%, boulder 10%, cobble 10%, gravel 10%
 Current velocity shallow gradient, little flow
 Bank narrow, steep, canyon
 Riparian sycamore, seep willow
 Sample gear shocker- 200 seconds (collectors B. Bagley, S. Rowland)

Species captured
 fishless

#5 Sycamore Creek near Sunflower- Maricopa Co. T6N R9E sec. 20, at F.S. rd. 22. Sampled from ½ mile downstream from USGS gage and upstream to ¼ mile above gage. Upper portion was nearly dry. Lower portion consisted of connected pools of muddy water. Area had poor potential for loach minnow due to absence of flowing water and presence of non-native fishes. Sept. 12, 2000. (Fig.3)

Habitat types- pool 100%, (max. 20m x 10m x 2 m deep, most of water < 0.5m deep)
 Substrate character boulder 60%, bedrock 20%, cobble/mud 20%
 Current velocity shallow gradient, little flow
 Bank steep, rocky
 Riparian mesquite, desert broom; heavy cattle use, heavy human use
 sample gear seine- 3m x 2m (3mm mesh), 13 seine hauls, (collectors B. Bagley, B. Kesner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	35	83 (infested with black spot parasite)
red shiner	210	455
crayfish		abundant

#6 East Fork Sycamore Creek- Maricopa Co. T7N R9E sec. 19. Sampled from West Fork confluence and upstream for ¾ mile. Jan. 16, 2002. Collectors- B. Bagley, S. Rowland. Dry, no fish. (Fig.4)

#7 West Fork Sycamore Creek- Maricopa Co. T7N R8E sec. 13, 24. Sampled from East Fork and upstream for 2 miles. Lowest 1.5 miles dry. Upper end had intermittent water within a narrow canyon. Jan. 16, 2002. (Fig.4)

Habitat types pool 80%, riffle 20%. avg. 0.2 m wide x 0.1m deep, greatest depth 1 m
 Substrate character boulder 80%, cobble/gravel 20%
 Current velocity moderate gradient, little flow
 Bank steep canyon walls
 Riparian sycamore, mesquite, juniper
 Sample gear shocker- 300 seconds (collectors B. Bagley, S. Rowland)

Species captured
 fishless

Alder Creek -(1)

#8 Alder Creek near China Spring- Maricopa Co. T6N R8E sec17, 18. Sampled from China Spring (also listed as Chinatown Spring) and downstream for 1 ¼ miles. A continuous shallow stream flowed through a steep banked canyon. Most of the fish were concentrated near China Spring and the lowest ¾ mile surveyed. Area had poor loach minnow potential due to limited water. Jan. 15, 2002. (Fig.5)

Habitat types riffle 80%, pool 20% (avg. 1 m wide x 0.1 m deep)
 Substrate character 60% gravel, 30% silt, 10% cobble
 Current velocity shallow gradient, little flow
 Bank steep banked canyon
 Riparian seep willow, mesquite
 Sample gear shocker- 780 seconds (collectors B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	80	127
leopard frog	0	3

#9 Walnut Spring- tributary of Alder Creek- Maricopa Co. T7N R8E sec. 3 N ½. Sampled stock tank located on side of steep drainage. Originally stocked with Gila topminnow in 1982, Walnut Spring continued to support a large topminnow population numbering in the thousands. Area had poor potential for loach minnow due to 100% pool habitat. Jan. 16, 2002. (Fig.6)

Habitat types pool 100% tank approx. 10m x 5m x 0.5m deep
 Substrate character silt 100%
 Current velocity none
 Bank dirt tank on side of steep drainage
 Riparian juniper, mesquite
 Sample gear shocker- 100 sec.(collectors B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
Gila topminnow	160	200

#10 Upper Alder Creek Spring- Maricopa Co. T7N R8E sec. 35. Sampled approximately 200m of drainage upstream from F.S. rd.393. Shallow water was present for 50m, the remainder was dry. This spring had poor potential for loach minnow due to limited habitat. Jan. 15, 2002. (Fig. 6)

Habitat types pool 80%, riffle 20% (avg. width 0.5m, avg. depth 0.1m)
 Substrate character cobble 70%, gravel 20%, sand 10%
 Current velocity shallow gradient, little flow
 Bank steep walls
 Riparian cottonwood, mesquite

Sample gear shocker- 200 seconds.(collectors B. Bagley, S. Rowland)

Species captured

fishless

#11 Alder Creek Spring- Maricopa Co. T6N R8E sec. 2 N ½ . Spring was comprised of a cement trough and a small muddy area created by trough overflow. This spring had poor potential for loach minnow because of limited habitat. Jan. 15, 2002. (Fig.6)

Habitat types pool 100%, trough 2.3m x 1m x 0.6m deep

Substrate character cement trough, mud outside of trough

Current velocity none

Bank dirt

Riparian mesquite

Sample gear visual inspection, dip net-5 sweeps (collectors B. Bagley, S. Rowland)

Species captured

fishless

Davenport Wash-(1)

#12 Davenport Wash at JM Spring- Maricopa Co. T7N R6E sec.12. Spring originated from a cement box, traveled 4m down F.S. rd. 479 and dried up before reaching the earthen tank on the south side of the road. Area had poor potential for loach minnow because of limited habitat. Jan. 18, 2002. (Fig.7)

Habitat types pool 100% (1m x 4m x <0.1m deep)

Substrate character mud

Current velocity none

Bank dirt road

Riparian mesquite

Sample gear dip net, visual (collector B. Bagley)

Species captured

fishless

#13 Davenport Wash- Unnamed Spring T7N R7E sec. 6- Maricopa Co. Spring originated on south side of F.S. rd. 87 and ran down the road for 20m (sometime prior to Jan. 2002 the road was rerouted away from the spring). Spring had poor potential for loach minnow due to predominately pool habitat and presence of non-native fish. Feb. 16, 2001. (Fig.7)

Habitat types pool 70% (10m x 3m x 0.2m deep-only 2cm of free water above muddy bottom), riffle 30% (20m long x 10cm wide x 1cm deep)

Substrate character pool-100% silt, riffle- cobble/mud on road

Current velocity shallow gradient, slow flow

Bank shallow, dirt/rock

Riparian cattail, mesquite, desert broom, heavy cattle use

Sample gear seine- 1m x 1m (3mm mesh), 8 hauls (collectors B. Bagley, K. Karschner)

Species captured

mosquitofish

Young of year

10

Total

15

#14 Davenport Wash at Andrea Spring- Yavapai & Maricopa Co. T8N R7E sec. 28, 33, 32. Davenport Wash was dry ½ mile above Andrea Spring. Water was present from ½ mile above Andrea Spring to 1 mile below spring. Except for the two unnamed springs mentioned above, the remainder of Davenport Wash was dry all the way to Verde River. Fish were present from ¼ mile above Andrea Spring to 1/8 mile below. Most of the fish encountered were found above the spring. Area had fair habitat for loach

minnow but the presence of non-native fish limits its potential. Absence of barriers to fish migration suggest that the Verde River would supply non-native fish during periods of high water flow. Jan. 18, 2002. (Fig.7,8)

Habitat types riffle 60%, pool 40% (avg. 1m wide x 0.1m deep, max. depth 0.5m)
 Substrate character cobble 60%, sand 20%, boulder 10%, gravel 10%
 Current velocity moderate gradient, moderate flow
 Bank steep walled canyon
 Riparian cottonwood, mesquite, desert broom
 Sample gear shocker- 1001 seconds (collectors B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	6	20
green sunfish	51	73
leopard frog		3

Deadman Creek (2)

Deadman Creek- Table Mountain to South Fork of Deadman Creek- Yavapai Co., T8N R7E NE1/4, T8N R8E NW1/4, T9N R8E SW1/4. Sampled from 1 mile downstream of Table Mountain and upstream to South Fork Deadman Creek. Deadman Creek had fair habitat for loach minnow, however it had a large number of non-native fish. South Fork also had fair habitat but is likely subjected to more severe flooding. Sept. 8,9,10, 2000. (Fig.9)

#15 Deadman Creek- ½-1 mile downstream from Table Mountain (Fig. 9)
 dry, fishless.

#16 Deadman Creek- ½ mile to 0 mile downstream from Table Mountain (Fig.9)

Habitat types pool 100%, stagnant, intermittent with little flow, <1m deep
 Substrate character cobble, boulder, sand
 Current velocity little to none
 Bank steep rocky
 Riparian mesquite, sycamore
 Sample gear seine- 3.3m x 2m (3mm mesh) 10 hauls (collectors-B, T, & K. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
green sunfish	20	45

#17 Deadman Creek- 0-1 mile upstream from Table Mountain (Fig.9)
 dry, fishless

#18 Deadman Creek- 1 mile upstream from Table Mountain (Fig.9)

Habitat types pools up to 3m deep
 Substrate character cobble 70%, boulder 20%, sand 10%
 Current velocity slow
 Bank steep, rocky
 Riparian mesquite, sycamore
 Sample gear seine- 3.3m x 2m (3mm mesh), 12 hauls (collectors B, T, & K. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
Sonora sucker	0	4
smallmouth bass	4	7
green sunfish	33	50

#19 Deadman Creek 2 miles upstream from Table Mountain (Fig.9)

Habitat types pool 80% (up to 2m deep), riffle 20%
Substrate character cobble 70%, boulder 20%, sand 10%
Current velocity moderate gradient, slow flow, clear water
Bank steep, rocky
Riparian mesquite, cottonwood, sycamore; heavy cattle use
Sample gear gill net- 10m long, 2m deep (mesh size 1-3cm), set for 1 hour (collector B. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
roundtail chub	0	4 (all adults)
Sonora sucker	0	5 (all large adults)
green sunfish	0	30

#20 Deadman Creek 3 miles downstream from South Fork Deadman Creek up to confluence with South Fork (Fig.9)

Habitat types pools 70%, shallow riffle 30%
Substrate character boulder 50%, bedrock 20%, cobble 20%, sand 10%
Current velocity moderate gradient, slow flow
Bank steep, rocky
Riparian mesquite, sycamore
Sample gear seine- 3.3m x 2m (3mm mesh), visual observation (B, T, & K. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
roundtail chub		common
Sonora sucker		present, not common
green sunfish		abundant

#21 South Fork Deadman Creek at confluence with Deadman Creek (Fig.9)

Habitat types pool 100%, 5m wide, 20m long, 2m deep, 1.3m tall falls at upper end may limit upstream movement of fish
Substrate character cobble 70%, boulder 30%
Current velocity slow
Bank steep canyon
Riparian mesquite, cottonwood
Sample gear seine- 3.3m x 2m (3mm mesh), 4 hauls (B, T, & K. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
roundtail chub	25	30
Sonora sucker	0	1
desert sucker	6	6
green sunfish	2	5

Wet Bottom Creek (1)

#22 Wet Bottom Creek 0-2 miles upstream from Verde River- Gila Co. T9N R6E sec. 2, T9.5N R6E sec.36. Sampled from Verde River to just above USGS gauging station. Lowest 1mile was almost completely dry. Upper mile had intermittent pools. Wet Bottom Creek had limited potential for loach minnow due to limited riffle habitat, large substrate size, and presence of non-native fish. Oct. 31, 2001. (Fig. 10)

Habitat types pool 100%
Substrate character boulder 70%, cobble 20%, bedrock 10%
Current velocity shallow gradient, little flow

Bank shallow, rocky
 Riparian sycamore, willow, cottonwood
 Sample gear shocker- 800 seconds (collector- B. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
green sunfish	60	80

#23 Wet Bottom Creek 2 ½ -3 ½ miles upstream from Verde River- Gila Co. T10N R7E sec. 31, 32, 29.

Wet Bottom Creek had limited potential for loach minnow due to limited riffle habitat, large substrate size, and presence of non-native fish. Oct. 31, 2001. (Fig.10)

Habitat types pool 80%, riffle 20%
 Substrate character boulder 70%, cobble 20%, gravel 10%
 Current velocity moderate gradient, slow flow, clear water
 Bank steep, rocky walls
 Riparian sycamore, mesquite, willow, common reed

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
Gila chub	0	1 adult seen, unable to capture
green sunfish	abundant	abundant

Nov. 28, 2001.

Sample gear shocker- 4200 seconds (collector- B. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
Gila chub	5	5 (brought back for genetic analysis)
longfin dace	15	30
desert sucker	0	2 (1male, 1female both with gametes)
green sunfish	>300	>500

East Verde River (5)

#24 East Verde River near Verde River- Gila Co., T11N R7E sec. 20, 21. Sampled from ¼ -¾ mile upstream from Verde River. The East Verde River was running muddy on this visit, so further collections were postponed until this area was revisited in October 2001. Although East Verde had many riffle habitats that appeared suitable for loach minnow, the abundance of non-native fishes limits its potential for loach minnow. Aug. 9, 2001. (Fig.11)

Habitat types continuous water, riffle 60%, pool 20%, run 20% (avg. 3m wide x 0.5m deep; max. depth 2.5m.)

Substrate character cobble 60%, boulder 20%, gravel 10%, silt 10%

Current velocity shallow gradient, moderate flow

Bank wide, shallow floodplain

Riparian seep willow, cattail, cottonwood, alder, sycamore,

Sample gear shocker-1033 seconds (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
red shiner	1	1
yellow bullhead	1	3
mosquitofish	1	1
smallmouth bass	2	2
largemouth bass	3	3
green sunfish	65	90
crayfish		common

Sample gear gill net- 33m long x 2 m deep(1-3 cm mesh) set for 1.5 hours in large pool ½ mile above Verde River 0 fish captured.

#25 East Verde River 1-2 miles above Verde River- Gila Co. T11N R7E sec. 21, 22. Sampled from 1-2 miles upstream from Verde River. On this visit, the East Verde had good water clarity (>2m). This stretch of river had more pool habitat than downstream, but still had some riffle habitat suitable for loach minnow. However, the presence of large numbers of non-native fishes limits its potential for loach minnow. Oct. 30, 2001. (Fig.11)

Habitat types pool 80%(avg. 0.5 m deep, max. > 2m), riffle 20%(avg.2m wide x 0.1m deep).

Substrate character cobble 60%, boulder 20%, gravel 20%

Current velocity moderate gradient, steady flow

Bank wide floodplain, steep, rocky bank

Riparian cottonwood, alder, sycamore, willow

Sample gear shocker- 1618 seconds (collector- B. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
red shiner	4	4
flathead catfish	1	1
channel catfish	1	1
yellow bullhead	4	5
mosquitofish	5	10
smallmouth bass	30	40
largemouth bass	6	8
green sunfish	50	70
bluegill	3	6

Sample gear gill net- 10m long x 2m deep (1-3cm mesh) set for 1 hour in large pool 2 miles above Verde River. (collector- B. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
smallmouth bass	0	12
largemouth bass	0	3

#26 East Verde River at Pine Creek- Gila Co. T10N R8E sec. 12, 13. Sampled from Pine Creek and upstream for ¾ mile. Area had fair habitat for loach minnow, despite silty substrates and non-native fishes. Sept. 12, 2000. (Fig.12)

Habitat types pool 70%, riffle 30%

Substrate character sand 60%, cobble 20%, silt 20%

Current velocity shallow gradient, slow flow

Bank wide flood plain, shallow bank

Riparian cottonwood, sycamore

Sample gear shocker- 1107 seconds (collectors- B. Bagley, B. Kesner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	30	49
red shiner	86	132
desert sucker	4	13
yellow bullhead	3	3
smallmouth bass	3	3
green sunfish	5	13
crayfish and bullfrog		common

Sample gear gill net- 10m long x 1.2m deep (1-3cm mesh) set for 2.5 hours at Pine Creek confluence in 1.2m deep pool. (collector- B. Bagley, B. Kesner)

Species captured

green sunfish 4 adults

#27 East Verde River near Doll Baby Ranch- Gila Co. T10N R9E sec. 8, 5. Sampled from ½-1½ mi. upstream from Doll Baby Ranch. Area had poor potential for loach minnow due to habitat being dominated by pools and non-native fishes. Sept. 13, 2000. (Fig.12)

Habitat types pool 90% (max. depth > 2m), riffle 10%

Substrate character bedrock 40%, cobble 40%, sand 20%

Current velocity moderately steep gradient, slow flow

Bank steep, rocky

Riparian seep willow

Sample gear shocker-668 seconds (collectors- B. Bagley, B. Kesner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
red shiner	120	229
fathead minnow	41	88
yellow bullhead	8	14
smallmouth bass	6	10
green sunfish	84	102

Sample gear gill net 10m long x 1.2m deep (1-3cm mesh) set for 2 hours, ½ mi upstream from Doll Baby Ranch in large pool. (collectors B. Bagley, B. Kesner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
Sonora sucker	0	3
yellow bullhead	0	13
green sunfish	0	1

#28 East Verde River @ F.S. rd. 209- Gila Co. T11N R10E sec. 19, T11N R9E sec. 24. Sampled from rd 209 and downstream for ¾ mile. Area had poor potential for loach minnow due to predominately pool habitat and non-native fish. Sept. 13, 2000. (Fig.13)

Habitat types pool 99%, riffle 1%

Substrate character boulder 60%, silt 20%, bedrock 10%, cobble 10%

Current velocity shallow gradient, slow flow

Bank moderately steep, boulder/cobble substrate

Riparian sycamore, alder

Sample gear shocker- 1019 seconds (collectors- B. Bagley, B. Kesner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
green sunfish	20	87

#29 East Verde River @ F.S. rd 199- Gila Co. T11.5N R10E sec.36. Sampled from "1st crossing" of East Verde River and F.S. rd. 199 and upstream for ½ mile. Area had poor potential for loach minnow due to predominately pool habitat. Sept. 15, 2000. (Fig.14)

Habitat types pool 90%, riffle 10%

Substrate character cobble 60%, silt 20%, gravel 20%

Current velocity shallow gradient, slow flow

Bank shallow, rocky

Riparian sparse sycamore, juniper

Sample gear shocker- 1987 seconds (collectors- B. Kesner, S. Logan)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	0	1
brown trout	0	1
longfin dace	26	48
desert sucker	10	18

#30 East Verde River @ Verde Glen Village- Gila Co. T12N R10E sec.35, 26. Sampled from Verde Glen Village and downstream for 1 mile. Lowest 1/8 mile was dry. Area had limited potential for loach minnow due to limited water. Sept. 15, 2000. (Fig.15)

Habitat types pool 80% (less than 1m deep), riffle 20%, clear water
 Substrate character cobble/boulder 80%, silt 20%
 Current velocity shallow gradient, slow flow
 Bank shallow, rocky
 Riparian ponderosa pine
 Sample gear shocker- 1688 seconds (collectors- B. Kesner, S. Logan)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	1	7
speckled dace	0	8

#31 East Verde River near Pieper Hatchery Spring- Gila Co. T12N R10E sec. 14, 11, 12. Sampled from Highline Trail and upstream 1 mile to Pieper Hatchery Spring. Area had fair loach minnow habitat, but presence of non-native fishes limits its potential. Sept. 27, 2000. (Fig.16)

Habitat types riffle 70% (avg. 1m wide, 0.1m deep), pool 30% (less than 1m deep), clear water.
 Substrate character cobble 70%, gravel 20%, bedrock 10%
 Current velocity moderately steep gradient, steady flow
 Bank steep bank
 Riparian ponderosa pine, manzanita, oak
 Sample gear shocker- 1120 seconds (collectors- B. Bagley, K. Karschner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	68	97

Pine Creek (2)

#32 Pine Creek at East Verde River-Gila Co. T10N R8E sec. 12, 1. Sampled from East Verde River and upstream for 1 mile. Intermittent water was present in pools with small stretches of riffles. Area had poor potential for loach minnow due to limited water. Sept. 13, 2000. (Fig.12)

Habitat types pool 80% (max. less than 1m deep), riffle 20% (avg. 5cm deep)
 Substrate character silt 70%, cobble 20%, sand 10%
 Current velocity shallow gradient, slow flow
 Bank shallow, rocky
 Riparian sycamore, cottonwood, alder
 Sample gear shocker- 1444 seconds (collectors-B. Bagley, B. Kesner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	40	140
red shiner	25	36
fathead minnow	4	8
green sunfish	9	14
crayfish		present

#33 Pine Creek near Parsnip Spring- Gila Co. T12N R9E sec. 18, 17, 8. Sampled Pine Creek from LoMia Camp and upstream approximately 1 mile to Parsnip Spring. The habitat looked fair for loach minnow but presence of non-native fish limits its potential. Parsnip Spring was 100m long x 5cm deep with silt substrate and little potential to support fish. Nov. 1, 2000. (Fig.17)

Habitat types pool 50% (less than 1.5m deep), riffle/run 50% (avg. 2m wide x 0.2m deep).
 Substrate character cobble 50%, bedrock 30%, gravel/sand 20%
 Current velocity moderately steep drainage, steady flow
 Bank steep bank
 Riparian ponderosa pine, alder
 Sample gear shocker- 1624 seconds (collectors-B. Bagley, B. Kesner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	36	72

Weber Creek (2)

#34 Weber Creek near Weber Spring-Gila Co. T11N R10E sec.4, 5. Sampled from ½ mi. below Weber Spring to 1 mile above spring. The Creek was dry 100m above Weber Spring and remained dry for more than 1 mile upstream. Watered area had fair habitat for loach minnow. Surprisingly few fish were caught for the amount of habitat sampled. Sept. 14, 2000. (Fig.13)

Habitat types pool 70% (less than 1m deep), riffle 30%(avg. width 2.5m), clear water
 Substrate character silt 60%, cobble 30%, bedrock 10%
 Current velocity shallow gradient, steady flow
 Bank shallow, rocky
 Riparian alder, sycamore
 Sample gear shocker- 1877 seconds (collectors- B. Bagley, B. Kesner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	0	1
roundtail chub	0	2
longfin dace	5	18
speckled dace	20	91
desert sucker	4	7
crayfish		common

#35 Weber Creek near Camp Geronimo- Gila Co. T12N R9E sec. 26, 25. Sampled from Camp Geronimo and downstream for 1.25mi. Lowest ¼ mi. of sample area was dry. Remainder of area had poor potential for loach minnow due to predominately shallow pool habitat and non-native fishes. Sept. 14, 2000. (Fig.18)

Habitat types pool 70% (less than 0.5m deep), riffle 30%
 Substrate character cobble 70%, gravel/silt 20%, boulder 10%
 Current velocity moderately steep, steady flow
 Bank moderately steep, rocky
 Riparian ponderosa pine
 Sample gear shocker- 1678 seconds (collectors- B. Bagley, B. Kesner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	1	4
speckled dace	50	97
green sunfish	8	12

Chase Creek (1)

#36 Chase Creek near Highline Trail- Gila Co. T12N R10E sec. 22, 15, 16. Sampled from girl scout camp and upstream for approximately 1.5 miles up both tributaries to Highline Trail. Western tributary was dry for ½ mile below Highline Trail. Water was present the entire survey portion of the eastern tributary. The area had fair habitat conditions for loach minnow but non-native fish were present. Oct. 31, 2000. (Fig.15)

Habitat types pool 80% (< 1m deep), riffle 20% (avg. 1m wide, 0.15m deep), clear water
Substrate character boulder 80%, cobble 10%, sand 10%
Current velocity moderate gradient, moderate flow
Bank shallow, boulders
Riparian ponderosa pine, manzanita
Sample gear shocker- 1040 seconds (collectors- B. Bagley, B. Kesner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	0	9

Dude Creek (1)

#37 Dude Creek above Control Road- Gila Co. T12N R10E sec. 35, 26, 25, 24; R11E sec. 19. Sampled from Control Road (F.S. rd. 64) to ¼ mile upstream from Highline Trail. Lowest 1 mile was dry. Remainder of area had a steady flowing, clear water stream, with several small waterfalls. Habitat looked good for loach minnow. Sept. 15, 2000. (Fig.15,19)

Habitat types riffle 50%, pool 50% (avg.0.15m deep and <1 m wide) (greatest depth 1m)
Substrate character cobble 50%, gravel 30%, bedrock 20%
Current velocity moderate flow
Bank shallow, cobble/boulder
Riparian ponderosa pine, manzanita
Sample gear shocker- 618 seconds (collectors- B. Bagley, B. Kesner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

#38 Dude Creek above Highline Trail- Gila Co. T12N R11E sec. 19, 18. Sampled from ½ mile to 1 mile upstream from Highline Trail. This area was dominated by pools and had fair loach minnow habitat. Nov. 2, 2000. (Fig.19)

Habitat types plunge pool 70%, riffle 30%
Substrate character cobble 80%, boulder 10%, sand 10%
Current velocity steep drainage, moderate flow
Bank steep, boulder
Riparian ponderosa pine, manzanita (area was burned 10 years earlier)
Sample gear shocker- 869 seconds (collectors- B. Bagley, B. Kesner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
Gila trout	0	9 (ranging from 4-10 inches)

Perley Creek (1)

#39 Perley Creek near Highline Trail- Gila Co. T12N R11E sec. 28, 29, 32. Sampled from 1 mile downstream from Highline Trail and upstream for 1 ¾ miles. Most of drainage was dry. The area had poor loach minnow habitat. Four small pools were located near the lower portion of the survey area. Sept. 16, 2000. (Fig.19, 20)

Habitat types 4 pools ~1m x 2m x 0.2m deep
Substrate character steep cobble/ bedrock

Current velocity none
 Bank steep cobble/ bedrock canyon
 Riparian ponderosa pine, manzanita
 Sample gear dip net (collectors- B. Bagley, B. Kesner, S. Logan)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

Moore Creek (1)

#40 Moore Creek near F.S. rd. 64- Gila Co. T11.5N R11E sec. 22, 23; T12N sec.33. Sampled from F.S. rd. 64 and upstream for 1.5 miles. Most of drainage was dry. A group of small pools were found ¼ mi. upstream of rd 64. Habitat had poor potential to support loach minnow. Sept. 15, 2000. (Fig.20,21)

Habitat types pool 100% (largest was 5m x 3m x 0.25m deep), clear water
 Substrate character bedrock/boulder
 Current velocity no flow
 Bank moderately steep, cobble
 Riparian ponderosa pine, manzanita (area burned 10 years earlier)
 Sample gear dip net (collector- B. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

Lewis Creek (1)

#41 Lewis Creek near F.S. rd. 64- Gila Co. T 11.5N R11E sec. 26, 23. Sampled from F.S. rd. 64 and upstream for 1.5 miles. Most of drainage was dry. Intermittent water was present 200 yards above rd. 64 and upstream for ¼ mile. Habitat had poor potential to support loach minnow. Sept. 15, 2000. (Fig.20,21)

Habitat types pool 80% (deepest spot was 0.5m deep), run 20%, clear water
 Substrate character bedrock/boulder
 Current velocity moderate flow
 Bank moderately steep
 Riparian ponderosa pine, manzanita (area burned 10 years earlier)
 Sample gear dip net (collector- B. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

Ellison Creek (2)

#42 Ellison Creek near East Verde River- Gila Co. T11.5N R10E sec. 25. Sampled from approximately 300m above East Verde River and upstream for 300m to border of private land. Fish were found above and below 10m tall cascading waterfall. Area had fair habitat for loach minnow but non-native fish were present upstream. Sept. 27, 2000. (Fig.14)

Habitat types riffle 60% (avg. 1m wide x 0.2m deep), pool 40% (max pool size- 20m x 10m x 3m deep)
 Substrate character bedrock 60%, cobble 20%, gravel 20%
 Current velocity shallow gradient, slow flow
 Bank large substrate, scoured from previous floods, moderately steep
 Riparian juniper
 Sample gear shocker- 670 seconds (collectors- B. Bagley, K. Karschner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
speckled dace	83	135

#43 Ellison Creek above Cold Spring- Gila Co. T11.5N R11E sec. 31, 30, 29. Sampled from public land boundary above Cold Spring and upstream approximately 2 miles to the confluence with Perley Creek. Area completely dry except for one small pool. Area had poor potential for loach minnow. Sept. 16, 2000. (Fig.14, 21)

Habitat types pool 100% (1m x 5m x 0.2m deep), muddy water
 Substrate character cobble 100%
 Current velocity moderate gradient, no flow
 Bank wide cobble wash
 Riparian ponderosa pine, manzanita
 Sample gear shocker- 67 seconds (collectors- B. Bagley, B. Kesner, S. Logan)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

#44 Ellison Creek near F. S. rd. 64- Gila Co. T11.5N R11E sec. 35, 34, 33, 28. Sampled from F.S. rd. 64 and downstream approximately 3 miles to Perley Creek. No water was present. Sept. 16, 2000. (Fig.21)

Habitat types dry wash
 Substrate character cobble
 Current velocity no water
 Bank wide, scoured wash
 Riparian sycamore, juniper, ponderosa pine
 Sample gear dip net (collector- B. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

#45 Ellison Creek near Highline Trail- Gila Co. T12N R11E sec.34, 35, 26. Sampled from Highline Trail and upstream for ½ mile to spring located in sec. 26. Habitat consisted of a intermittent, small, cascading stream with poor potential for loach minnow. Sept. 27, 2000. (Fig.20)

Habitat types riffle/falls 80% (avg. 0.5m wide x 0.1m deep) pool 20% (max. 1m x 1m x 0.25m deep), clear water, surprising that habitat supported fish
 Substrate character cobble 80%, boulder20%
 Current velocity moderate flow
 Bank moderate gradient, rocky
 Riparian ponderosa pine, manzanita
 Sample gear shocker- 350 seconds (collectors- B. Bagley, K. Karschner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	2	9

West Clear Creek (3)

#46 West Clear Creek near West Clear Creek Campground- Yavapai Co. T13N R6E sec.18. Sampled from West Clear Creek Campground and upstream for ¾ mile. Riffles were common, and habitat looked good for loach minnow. Sept. 26, 2000. (Fig.22)

Habitat types riffle/run 70% (avg. 4m wide x 0.05m deep), pool 30% (max. depth > 2m)
 Substrate character cobble 60%, gravel 20%, boulder 10%, sand/silt 10%
 Current velocity moderate gradient, steady flow
 Bank shallow, wide
 Riparian sycamore, alder, seep willow
 Sample gear shocker- 2389 seconds (collectors- B. Bagley, K. Karschner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
roundtail chub	8	12
longfin dace	6	10
speckled dace	14	28
red shiner	10	20
Sonora sucker	4	8
desert sucker	15	25
yellow bullhead	1	2
green sunfish	12	15
crayfish		common

#47 West Clear Creek near Bull Pen Campground- Yavapai Co. T13N R6E sec.11. Sampled from metal fence in campground and upstream for ½ mile. In general, substrate size was large and only a limited amount of habitat appeared suitable for loach minnow. Dec. 19, 2001. (Fig.23)

Habitat types fast riffle 60% (avg. width 5m, avg. depth 0.3m), pool 30% (greatest depth 1.5m), run 10%

Substrate character cobble 70%, boulder 20%, sand 10%

Current velocity moderate gradient, fast flow

Bank steep canyon

Riparian sycamore, juniper

Sample gear shocker- 1711 seconds (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
speckled dace	5	8
red shiner	5	10
desert sucker	6	10
green sunfish	1	1
crayfish		present

#48 West Clear Creek near Maxwell Trail- Coconino Co. T14N R9E sec.33. Sampled from Maxwell Trail and upstream ~ ½ mile to Willow Valley. Habitat had many riffles and looked good for loach minnow. Oct. 25, 2001. (Fig.24)

Habitat types riffle 60% (avg. depth 0.2m, avg. width 2m), pool 40% (max. depth 2.5m), clear water

Substrate character cobble 60%, boulder 20%, gravel 10%, silt 10%

Current velocity moderate gradient, steady flow

Bank steep canyon

Riparian ponderosa pine, oak

Sample gear shocker- 992 seconds (collectors- B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	23	33
speckled dace	80	110
desert sucker	4	6

Sample gear gill net- 10m x 2m (1-3cm mesh), set for 14 hrs. overnight at crossing of Maxwell Trail in pool measuring 20m x 10m x 2m deep. (collectors- B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Total</u>
rainbow trout	12
desert sucker	2

#49 Clover Creek near West Clear Creek- Coconino Co. T14N R9E sec.33. Sampled from confluence with Willow Valley and upstream for ¼ mile. Clover creek was a small, slow flowing stream. It had limited potential for loach minnow due to a small amount of water and presence of non-native fish. Oct. 26, 2001. (Fig.24)

Habitat types riffle 70% (avg. 1m wide and 0.1m deep), pool 30% (max. depth 1.5m)
 Substrate character cobble 60%, gravel 30%, boulder 10%
 Current velocity shallow gradient, slow flow
 Bank very steep canyon walls
 Riparian ponderosa pine, oak
 Sample gear shocker- 502 seconds (collectors-B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	18	21
speckled dace	10	18

#50 Willow Valley near West Clear Creek- Coconino Co. T14N R9E sec. 33. Sampled from confluence with Clover Creek and upstream for 300m. Limited loach minnow habitat due to slow flow and fine substrates. Oct. 26, 2001. (Fig.24)

Habitat types pool 70% (max. depth 2m) riffle 30% (avg. 3m wide x 0.1m deep)
 Substrate character silt 50%, cobble 40%, boulder 10%
 Current velocity shallow gradient, slow flow
 Bank very steep canyon walls
 Riparian ponderosa pine, oak
 Sample gear shocker- 463 seconds (collectors-B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
speckled dace	84	103
fathead minnow	31	53

#51 Toms Creek near F.S. rd. 142 (tributary of West Clear Creek) - Coconino Co. T13N R9E sec. 16, 17, 20, 21. Sampled from 1/3 mi. downstream from F.S. rd. 142 to ¾ mi. upstream from rd. 142. Drainage had a shallow rocky wash, with steep banks, lined with ponderosa pine. No water. No Fish. Oct. 25, 2001. (collectors- B. Bagley, S. Rowland). (Fig.24)

#52 Hicks and Duncan Canyon near Toms Creek (tributary of West Clear Creek) - Coconino Co. T13N R9E sec. 20. Sampled from confluence with Toms Creek and upstream for ½ mi. Area had a shallow gradient wash with steep banks. No water. No fish. Oct. 25, 2001. (collectors- B. Bagley, S. Rowland). (Fig.24)

#53 Pivot Rock Canyon near Toms Creek (tributary of West Clear Creek)- Coconino Co. T13N R9E sec. 20. Sampled from confluence with Toms Creek and upstream for ½ mi. Area had a shallow gradient wash with moderately steep banks. No water. No fish. Oct. 25, 2001. (collectors- B. Bagley, S. Rowland). (Fig.24)

#54 Clover Creek near Snake Draw- Coconino Co. T13N R9E sec. 14. Sampled from Snake Draw and downstream for ¾ mi. Approximately 80% of streambed was dry. Area had poor potential for loach minnow due to limited habitat. Oct. 25, 2001. (Fig.25)

Habitat types pool 80% (max. depth 0.5m), riffle 20%
 Substrate character cobble 60%, boulder 20%, silt 20%
 Current velocity shallow gradient, little flow
 Bank steep bank

Riparian ponderosa pine
 Sample gear shocker- 267 seconds (collectors- B. Bagley, S. Rowland)
Species captured Young of year Total
 fishless

#55 Fortyfour Canyon near F.S. rd. 142 (tributary of West Clear Creek) - Coconino Co. T13N R9E sec.14. Sampled from Snake Draw and upstream approximately ½ mi. to rd. 142. Area was a shallow gradient wash with steep banks. No water. No fish. Oct. 25, 2001. (collectors- B. Bagley, S. Rowland). (Fig.25)

Wet Beaver Creek (3)

#56 Beaver Creek near Verde River- Yavapai Co. T14N R5E sec. 29, 30. Sampled Beaver Creek from its confluence with Verde River and upstream for ½ mi. In 1938 C. Hubbs collected loach minnow from this location. Although this area still has habitat suitable for loach minnow, the large number of non-native fishes limits its potential. June 7, 2001. (Fig.26)

Habitat types pool 90% (max. depth 2m), riffle/run 10% (avg. 5m wide x 0.2m deep), cloudy water
 Substrate character silt 70%, sand 20%, cobble 10%
 Current velocity shallow gradient, slow flow
 Bank shallow bank
 Riparian cottonwood, sycamore, alder
 Sample gear shocker- 1497 seconds (collectors- B. Bagley, T. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
common carp	0	1
red shiner	4	7
desert sucker	6	10
yellow bullhead	0	1
mosquitofish	0	25
smallmouth bass	0	1
largemouth bass	8	10
green sunfish	15	22
bluegill	0	1
crayfish		present

#57 Red Tank Draw near F.S. rd. 618 – Yavapai Co. T15N R6E sec. 21, 20, 29. Sampled from rd. 618 and downstream for ~ 1 mile. Water was intermittent. Area had poor potential for loach minnow. Nov. 19, 2001. (Fig.27)

Habitat types pool 90% (max. depth 0.5m), riffle 10%, clear water
 Substrate character boulder 70%, cobble 20%, gravel 10%
 Current velocity shallow gradient, little flow
 Bank steep canyon walls
 Riparian cottonwood, sycamore, juniper
 Sample gear shocker- 1900 seconds (collectors- B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	4	9
yellow bullhead	0	8
smallmouth bass	2	4
green sunfish	55	106

#58 Red Tank Draw at gaging station (tributary of Wet Beaver Creek) - Yavapai Co. T15N R6E sec. 16.
 Sampled from gaging station (located ~1.5 miles upstream from F.S. rd. 618) and upstream for ½ mi.
 50% of streambed was dry. The rest of the area had intermittent pools. Area had poor potential for loach minnow. Nov. 16, 2001. (Fig.27)

Habitat types pool 99% (max. depth 2m), riffle 1% (avg. 0.3m wide)
 Substrate character boulder 80%, cobble 10%, gravel 10%
 Current velocity shallow gradient, little flow
 Bank steep canyon walls
 Riparian sycamore, cottonwood, mesquite
 Sample gear shocker- 1273 seconds (collectors- B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
black bullhead	0	1
green sunfish	5	14
crayfish		common

#59 Walker Creek near Lander Spring – Yavapai Co. T15N R6E sec. 34. Sampled from 200m above Lander Spring and upstream for ½ mi. Area had fair habitat for loach minnow. Dec. 21, 2001. (Fig.28)

Habitat types riffle 70% (avg. 2m wide x 0.2m deep), pool 30% (max. depth 1.5m), clear water
 Substrate character cobble 80%, boulder 10%, gravel 10%
 Current velocity moderate gradient, steady flow
 Bank moderately steep bank
 Riparian alder, sycamore
 Sample gear shocker- 1219 seconds (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
Gila chub	15	22
speckled dace	50	73
desert sucker	12	22

#60 Wet Beaver Creek near F.S. rd. 618- Yavapai Co. T15N R6E sec. 28, 21, 22. Sampled from F.S. rd. 618 and upstream for 1/3 mi. Habitat looked good for loach minnow, except that non-native fish were common. Dec. 19, 2001. (Fig.27)

Habitat types pool 60% (max. 1.5m deep), riffle 40% (avg. 4m wide x 0.4m deep)
 Substrate character cobble 60%, boulder 20%, gravel 20%
 Current velocity moderate gradient, steady flow
 Bank steep canyon walls
 Riparian sycamore, mesquite
 Sample gear shocker- 1957 seconds (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	0	6
Sonora sucker	0	1
smallmouth bass	31	45

#61 Wet Beaver Creek near gaging station – Yavapai Co. T15N R6E sec. 23, 24. Sampled from ½ mi. below gage to 200m above. Habitat looked fair for loach minnow. Dec. 21, 2001. (Fig.27)

Habitat types riffle 60% (avg. 5m wide x 0.3m deep), pool 40% (max. depth 3m)
 Substrate character cobble 60%, boulder 30%, bedrock 5%, silt 5%
 Current velocity shallow gradient, steady flow
 Bank steep canyon walls

Riparian sycamore, alder, willow
 Sample gear shocker- 1106 seconds (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	0	4
Sonora sucker	0	5
desert sucker	0	30
smallmouth bass	20	34

#62 Wet Beaver Creek near Brady Canyon – Coconino Co. T15N R8E sec. 17. Sampled from confluence of Jack and Brady Canyons and downstream for 1/3 mi. In this stretch Wet Beaver Creek was a dry, boulder wash. No water. No fish. Nov. 14, 2001. (collectors- B. Bagley, S. Rowland). (Fig.29)

#63 Jacks Canyon near Brady Canyon (tributary of Wet Beaver Creek)- Coconino Co. T15N R8E sec. 5, 8, 17. Sampled Jacks Canyon from Brady Canyon and upstream ~ 2 miles to F.S. rd. 214. 95% of canyon was dry. Jacks Canyon had poor habitat for loach minnow. Nov. 14, 2001. (Fig.29)

Habitat types pool 100% (largest 5m x 2m x 0.3m deep)
 Substrate character boulder 70%, cobble 20%, bedrock 10%
 Current velocity shallow gradient, no flow
 Bank moderately steep banks
 Riparian ponderosa pine, juniper
 Sample gear shocker- 250 seconds (collectors- B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
green sunfish	25	39
leopard frog		1

#64 Brady Canyon near Jacks Canyon (tributary of Wet Beaver Creek)-Coconino Co. T15N R8E sec. 16, 17. Sampled from Jacks Canyon and upstream ~2miles to F.S. rd. 214. 90% of canyon was dry. Brady Canyon had poor habitat for loach minnow. Nov. 14, 2001. (Fig.29,30)

Habitat types pool 100% (largest 10m x 10m x 2m deep)
 Substrate character boulder 80%, cobble 20%
 Current velocity shallow gradient, no flow
 Bank steep canyon walls
 Riparian ponderosa pine, juniper
 Sample gear shocker- 1032 (collectors- B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fathead minnow	80	139
black bullhead	0	1
green sunfish	39	61

Dry Beaver Creek (1)

#65 Dry Beaver Creek from rd.119 to Hwy. 179- Yavapai Co. T15N R5E sec.28, 21, 22, 23, 14, 11, 2, 1. Sampled from rd 119 and upstream to Hwy. 179. Lowest 3.5 miles was a dry cobble wash. Uppermost 1 mile was also dry. Middle 3 miles had intermittent water- ~50%. Area had limited potential for loach minnow due to little flow and abundant non-native fishes. Nov. 20, 2001. (Fig.31)

Habitat types pool 90% (max. 20m x 10m x 2m deep), riffle 10% (avg. 1m wide x 0.1m deep), clear water
 Substrate character cobble 80%, boulder 20%
 Current velocity shallow gradient, slow flow

Bank shallow, rocky
 Riparian cottonwood, sycamore
 Sample gear shocker- 2100 seconds (collector- B. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
red shiner	310	450
yellow bullhead	0	1
mosquitofish	10	30
smallmouth bass	5	10
green sunfish	205	270
crayfish		abundant

#66 Dry Beaver Creek upstream from Hwy. 179- Yavapai Co. T15N R5E sec.1, T16N sec.36, R6E sec. 31, 30, 29. Sampled from Hwy. 179 and upstream ~3 mi. to Horse Mesa. Dry Beaver Creek was dry in this area. Nov. 20, 2001. (collectors- B. Bagley, S. Rowland). No water. No fish. (Fig.31,32)

Oak Creek (3)

#67 Oak Creek near Verde River- Yavapai Co. T15N R4E sec. 20. Sampled Oak Creek from Verde River and upstream ¼ mile. Area had fair habitat for loach minnow but had a large population of non-native fishes. Dec. 20, 2001. (Fig.33)

Habitat types pool 80% (max. 2m deep)(avg. 10m wide), riffle 20%
 Substrate character sand 60%, silt 20%, cobble 20%
 Current velocity shallow gradient, slow flow
 Bank shallow rocky bank
 Riparian sycamore, cottonwood, mesquite
 Sample gear shocker- 1047 seconds (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	0	1
red shiner	70	120
smallmouth bass	0	6
largemouth bass	0	4

#68 Oak Creek near F.S. rd. 134A- Yavapai Co. T16N R4E sec. 14. Sampled ½ mile of habitat starting ½ mile upstream from the end of rd. 134A. Pools dominated the area and large substrate size made this a habitat with poor potential to support loach minnow. Dec. 20, 2001. (Fig.34)

Habitat types pool 70% (max. depth 1.5m)(avg. 5m wide x 0.4m deep), riffle 20%, 10% run
 Substrate character boulder 80%, cobble 10%, bedrock 10%
 Current velocity moderate gradient, steady flow
 Bank steep, rocky
 Riparian sycamore, juniper
 Sample gear shocker – 920 seconds (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	0	3
smallmouth bass	2	5
green sunfish	8	12
rockbass	0	1

#69 Oak Creek near Halfway picnic area- Coconino Co. T18N R6E sec. 8. Sampled from Halfway picnic area and upstream for ¼ mile. Habitat looked fair for loach minnow but there was a large population of non-native fishes. Jul. 19, 2001. (Fig.35)

Habitat types pool 70%, riffle 30%
 Substrate character boulder 60%, cobble 30%, gravel 10%
 Current velocity steep gradient, fast flow
 Bank steep banks
 Riparian alder, cottonwood
 Sample gear shocker- 1255 seconds (collectors- B. & J. Bagley, E. Svihla)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
rainbow trout	0	2
brown trout	59	82
speckled dace	0	4
desert sucker	0	2

#70 Oak Creek near Cave Springs Campground- Coconino Co. T19N R6E sec. 27. Sampled from Cave Springs Campground and upstream for 300m. Area had habitat that looked good for loach minnow, but it had a large population of non-native fishes. Jul. 19, 2001. (Fig.36)

Habitat types riffle/run 70% (avg. 3m wide x 0.2m deep), pool 30% (max. 1.2 m deep)
 Substrate character cobble 50%, gravel 30%, boulder 20%
 Current velocity moderate gradient, steady flow
 Bank moderately steep
 Riparian alder, cottonwood
 Sample gear shocker- 1847 seconds (collectors- B. & J. Bagley, E. Svihla)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
brown trout	72	110
speckled dace	0	2

West Fork Oak Creek (1)

#71 West Fork Oak Creek near Oak Creek- Coconino Co. T 19N R6E sec.33. Sampled from Oak Creek and upstream for ½ mi. Habitat looked good for loach minnow except for the presence of non-native fish. Nov. 15, 2001. (Fig.37)

Habitat types pool 70 % (max. 1.5m deep), riffle 30%, clear water
 Substrate character cobble 50%, bedrock 30%, boulder 10%, gravel 10%
 Current velocity shallow gradient, slow flow
 Bank steep, narrow canyon
 Riparian ponderosa pine, juniper, sycamore
 Sample gear shocker- 1678 seconds (collectors- B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
brown trout	10	18
speckled dace	80	132
desert sucker	9	15

#72 West Fork Oak Creek near F.S. rd. 231- T19N R5E sec. 14, 15. Sampled from rd. 231 and downstream for 1 mi. Shallow gradient, boulder substrate, narrow canyon. No water. No fish. Nov. 15, 2001. (collectors- B. Bagley, S. Rowland). (Fig.38)

#73 Lockwood Spring (tributary of West Fork Oak Creek)- Coconino Co. T19N R5E sec.9 All water was contained in a cattle trough. Spring had poor potential for loach minnow Nov. 15, 2001. (Fig.38)

Habitat types pool 100%- all water contained in trough 5m long x 0.6m wide.
 Substrate character trough
 Current velocity none
 Bank trough
 Riparian ponderosa pine
 Sample gear dip net (collectors- B. Bagley, S. Rowland)
Species captured fishless

#74 West Fork Oak Creek near Flag Tank- Coconino Co. T19N R5E sec. 8. Sampled from Flag Tank and downstream for 1 mile. Flag Tank was a muddy pool with a silt bottom-fishless. The area 0-1mi. downstream was dry. No water. No fish. Nov. 15, 2001. (collectors- B. Bagley, S. Rowland). (Fig.39)

Spring Creek (1)

#75 Spring Creek near Willow Point Road- Yavapai Co. T16N R4E sec.22. Sampled from Willow Point Road and downstream for ¼ mile. Area gets heavy use by humans. Private land immediately upstream had a trailer next to the creek with dish washing and bathing supplies on the creek bank. Area had fair loach minnow habitat. Jul. 19, 2001. (Fig.40)

Habitat types fast run 70% (avg. 0.25m deep x 1m wide), pool 20% (max. 1.1m deep), riffle 10%
 Substrate character gravel 80%, cobble 20%,
 Current velocity shallow gradient, fast flow
 Bank shallow, lined with grass
 Riparian willow, cottonwood, mesquite, grass
 Sample gear shocker- 1360 seconds (collectors- B. & J. Bagley, E. Svihla)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
Gila chub	25	41
longfin dace	20	31
speckled dace	120	212
Sonora sucker	10	17
desert sucker	30	48
crayfish		abundant

Sycamore Creek (1)

#76 Sycamore Creek ½ mile upstream from Verde River- Yavapai Co. T17N R3E sec. 8. Sampled large pool upstream from trailhead parking area. Area dominated by pool habitat that would be unsuitable for loach minnow. Sept. 25, 2000. (Fig.41)

Habitat types pool 100% (100m long x 20m wide x 1.5 m deep)
 Substrate character cobble 80%, silt 20%
 Current velocity none
 Bank moderately steep
 Riparian sycamore, alder
 Sample gear gill net- 10m x 1.5m (1-3cm mesh), set for 6 hours (collectors- B. Bagley, K. Karschner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
Sonora sucker	0	3
smallmouth bass	0	4
green sunfish	0	1

#77 Sycamore Creek near Summers Spring- Yavapai Co. T17N R3E sec. 5. Sampled from confluence with Summers Spring and upstream for 300m. Area looked good for loach minnow except for presence of non-native fishes. Sept. 25, 2000. (Fig.41)

Habitat types pool 70%, riffle 30%
 Substrate character boulder 50%, cobble 30%, silt 20%
 Current velocity moderate gradient, slow flow
 Bank shallow, rocky
 Riparian sycamore, juniper
 Sample gear shocker- 1050 seconds (collectors-B. Bagley, K. Karschner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
desert sucker	0	2
yellow bullhead	0	2
smallmouth bass	22	27
green sunfish	5	7

#78 Summers Spring near Sycamore Creek- Yavapai Co. T17N R3E sec. 5 Sampled from Sycamore Creek and up Summers Spring for 100m. Area had poor potential for loach minnow. Sept. 25, 2000. (Fig.41)

Habitat types riffle/run 70%, pool 30%
 Substrate character dominated by cobble & tree roots
 Current velocity fast
 Bank shallow, rocky
 Riparian sycamore, juniper
 Sample gear shocker- 300 seconds (collectors- B. Bagley, K. Karschner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
smallmouth bass	2	4

#79 Sycamore Creek downstream from Parsons Spring- Yavapai Co. T18N R3E sec. 32. Sampled from Parsons Spring and downstream for ¼ mile. Area had fair loach minnow habitat. Sept. 25, 2000. (Fig.41)

Habitat types pool 80% (max. 1.5m deep), riffle 20% (avg. 4m wide)
 Substrate character cobble 60%, boulder 20%, silt 20%
 Current velocity shallow gradient, slow flow
 Bank shallow, rocky
 Riparian sycamore, alder, cottonwood, juniper
 Sample gear shocker- 1100 seconds (collectors- B. Bagley, K. Karschner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
smallmouth bass	33	49
green sunfish	0	2

#80 Sycamore Creek above Parsons Spring- Yavapai Co. T18N R3E sec.32. Sampled from Parsons Spring and upstream for 200m. 200m upstream from Parsons Spring the creek was dry. Sept. 25, 2000. (Fig.41)

Habitat types pool 100% (pool at spring was 40m x 10 m x 2m deep)
 Substrate character cobble/silt
 Current velocity little flow
 Bank shallow, rocky
 Riparian sycamore, alder, cottonwood
 Sample gear shocker- 200 seconds (collectors- B. Bagley, K. Karschner)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
smallmouth bass	4	4
crayfish		common

Bear Canyon (1)

#81 Bear Canyon near rd. 71- Yavapai Co. T 18N R1E sec.11. Sampled 200 m upstream and downstream from rd 71. No water. No fish. Jun. 28, 2001. (collectors- B. Bagley, C. Luketich). (Fig.43)

#82 Bear Canyon near rd. 354- Coconino Co. T19N R2E sec. 19. Sampled from rd. 354 access and downstream for ½ mile. Bear Canyon had large boulder substrate in a moderate gradient wash. No water. No fish. Jun. 28, 2001, (collectors- B. Bagley, C. Luketich). (Fig.43)

#83 Bear Canyon near Bear Springs- Coconino Co. T20N R2E sec. 28. Sampled from Bear Springs and upstream for 200m. Intermittent water was present for ~ 100m upstream from road 57A. Area had poor potential for loach minnow due to limited habitat. Jun. 28, 2001. (Fig.42)

Habitat types pool 60% (max. 15m x 5m x 1.5m deep), riffle 40% (avg. 0.2m wide x 5cm deep)
 Substrate character cobble 60%, silt 20%, boulder 10%, gravel 10%
 Current velocity shallow gradient, slow flow
 Bank steep bank
 Riparian ponderosa pine
 Sample gear shocker- 60 seconds (collectors- B. Bagley, C. Luketich)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

Grindstone Wash (1)

#84 Grindstone Wash near rd. 186- Coconino Co. T20N R1E sec. 34, T19N R1E sec. 3, 10, 9, 16, 21, 28. Sampled from end of road 186B and downstream for ~5 miles to private land in sec. 33. Grindstone Wash was a wide, dry, boulder substrate wash with occasional cottonwood trees. No water. No fish. Jun. 28, 2001. (collectors- B. Bagley, C. Luketich). (Fig.44,45)

Williamson Valley Wash (1)

#85 Williamson Valley Wash ~ 3mi. North of Simmons- Yavapai Co. T17N R3W sec. 7, 8, 17, 18. Sampled from 1/8th mile downstream from USGS gaging station to ½ mi. upstream from gage. Wash was dry at gage and downstream beyond 1/8th mile. Water was present a short distance upstream from gage. Although the area had many riffles, the riffle size and substrate size were smaller than that associated with classic loach minnow habitat. Jun. 28, 2001. (Fig.46)

Habitat types shallow riffle/run 70% (avg. 0.3m wide x 0.1m deep), pool 30% (max. depth 1m)
 Substrate character sand 90%, silt 10%
 Current velocity shallow gradient, slow flow
 Bank shallow grassy banks
 Riparian willow, cottonwood, juniper, grass
 Sample gear shocker- 1087 seconds (collectors- B. Bagley, C. Luketich)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
Gila chub	39	50
longfin dace	212	320
fathead minnow	31	45
mosquitofish	13	25
bullfrog		present

Apache Creek (2)

#86 Apache Creek near Walnut Creek- Yavapai Co. T18N R6W sec. 25. Sampled Apache Creek from the Walnut Creek confluence and upstream for ¼ mile. Area had poor loach minnow potential due to limited riffle habitats. June 25, 2001. (Fig.47)

Habitat types intermittent pools 95% (avg. 0.25m deep, max. 1.5m), short riffles 5%, clear water.
Substrate character sand 90%, cobble 10%
Current velocity shallow gradient, very little flow
Bank steep eroded banks
Riparian walnut, cottonwood
Sample gear shocker- 529 seconds (collectors- B. Bagley, C. Luketich)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
speckled dace	59	83

#87 Apache Creek ~ 4 mi. upstream from Walnut Creek- Yavapai Co. T17N R6W sec.3. Sampled 1/3 mi. of habitat. Area was made up of intermittent pools that had limited potential for loach minnow. Jun. 26, 2001. (Fig.48)

Habitat types intermittent pools 100% (avg. 5m long x 2m wide x 0.5m deep, max. depth 2m)
Substrate character sand 50%, cobble 50%
Current velocity shallow gradient, little flow
Bank shallow bank
Riparian ponderosa pine, juniper, walnut, bulrush
Sample gear shocker- 660 seconds (collectors- B. Bagley, C. Luketich)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
speckled dace	101	203

#88 Apache Creek near Apache Springs- Yavapai Co. T17N R6W sec. 18. Sampled from Apache Springs and downstream for ¼ mi. Water was present for ~ 70m. Most of water was found in a man made pond near springs. At the downstream end of the survey area there was a steep boulder canyon that would prevent fish from moving upstream. Area had poor potential for loach minnow due to limited habitats. Jun. 27, 2001. (Fig.49)

Habitat types pool 70% (largest was 15m wide x 15m long), riffle/run 30% (avg. 0.1m wide x 5cm deep)
Substrate character sand 90%, cobble 10%
Current velocity shallow gradient, little flow
Bank shallow bank
Riparian ponderosa pine, juniper, walnut
Sample gear shocker- 150 seconds (collectors- B. Bagley, C. Luketich)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		
leopard frog	100's	40 adults

North Fork Walnut Creek (1)

#89 North Fork Walnut Creek near Apache Creek- Yavapai Co. T18N R6W sec.25. Sampled from Apache Creek and upstream for ¼ mi. and downstream for ¼ mile. Area had poor potential for loach minnow due to limited water. Jun. 25, 2001. (Fig.47)

Habitat types intermittent pools 100%, most of area dry
Substrate character sand 100%

Current velocity no flow
 Bank steep eroded
 Riparian cottonwood, walnut
 Sample gear shocker- 269 seconds (collectors- B. Bagley, C. Luketich)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
speckled dace	28	55

#90 North Fork Walnut Creek near South Fork Walnut Creek- Yavapai Co. T18N R6W sec.21. Sampled from confluence with South Fork and downstream for ½ mi. Area had fair habitats for loach minnow. Jun. 26, 2001. (Fig.50)

Habitat types pool 60% (max depth 2m), riffle/run 40%(avg. 1m wide x 0.2m deep)
 Substrate character gravel 70%, sand 20%, bedrock 10%
 Current velocity shallow gradient, slow flow
 Bank steep eroded bank
 Riparian oak, juniper, walnut, bulrush
 Sample gear shocker- 795 seconds (collectors- B. Bagley, C. Luketich)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
speckled dace	320	550

#91 North Fork Walnut Creek upstream from South Fork Walnut Creek- Yavapai Co. T18N R6W sec.21, 20, 19, 18 T18N R7W sec. 13. Sampled from South Fork and upstream for ~3 mi. Jun. 26, 2001. (collectors- B. Bagley, C. Luketich). No water. No fish. (Fig.50)

#92 South Fork Walnut Creek ½ mi. upstream from North Fork Walnut Creek- Yavapai Co. T18N R6W sec. 28, 29. Sampled from ¼ to ½ mile upstream from North Fork. Area had poor potential for loach minnow due to limited habitat. Jun. 26, 2001. (Fig.50)

Habitat types pool 90% (max. depth 1m, avg. 0.5m wide x 0.1m deep), run 10%, clear water
 Substrate character sand 80%, cobble 20%
 Current velocity shallow gradient, slow flow
 Bank shallow bank
 Riparian ponderosa pine, walnut, juniper
 Sample gear shocker- 574 seconds (collectors- B. Bagley, C. Luketich)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
speckled dace	95	183

Mint Wash (1)

#93 Mint Wash near Mint Spring- Yavapai Co. T15N R3W sec. 36, 25. Sampled from Mint Spring and downstream for 1 mile. Mint Spring was dry. There were a few small plunge pools located downstream from Mint Spring. Most of wash was dry. Poor potential for loach minnow due to lack of habitat. Jun. 27, 2001. (Fig.51)

Habitat types pool 100% (max depth ½ m.)
 Substrate character boulder 80%, cobble 10%, sand 10%
 Current velocity shallow gradient, no flow
 Bank steep rocky bank, subject to severe flooding
 Riparian juniper, cottonwood
 Sample gear dip net (collectors- B. Bagley, C. Luketich)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

#94 Mint Wash downstream from Granite Basin Lake- Yavapai Co. T14N R3W sec. 2. Sampled wash from Granite Basin Lake and downstream for ½ mi. Poor potential for loach minnow due to limited habitat. Jun. 27, 2001. (Fig.52)

Habitat types sparse, intermittent, plunge pools 100% (largest was 2m x 2m x 1m deep)
 Substrate character boulder 90%, cobble 10%
 Current velocity steep drainage, little flow
 Bank steep, subject to severe flooding
 Riparian ponderosa pine, juniper, pinyon pine, cottonwood
 Sample gear shocker- 200 seconds (collectors- B. Bagley, C. Luketich)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

Granite Creek (1)

#95 Granite Creek ~ 1mile upstream from Verde River- Yavapai Co. T17N R2W sec. 13. Sampled Granite Creek 0- ¾ mi. downstream from high tension wires. Area above high tension wires had intermittent water. Habitat looked fair for loach minnow except for the presence of non-native fishes. Jun. 6, 2001. (Fig.53)

Habitat types pool 80% (max depth 2m), slow riffle/run 20% (avg. 0.7m wide x 0.15m deep).
 Substrate character sand/silt 90%, cobble 10%
 Current velocity shallow gradient, slow flow
 Bank shallow bank,
 Riparian dense riparian- willow, sycamore, cottonwood
 Sample gear shocker- 1260 seconds (collectors- B. Bagley, T. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	83	103
red shiner	0	1
fathead minnow	95	147
Sonora sucker	0	1
mosquitofish	8	14
green sunfish	5	8
bullfrog	abundant	abundant
crayfish	abundant	abundant

Black Canyon Creek (1)

#96 Black Canyon Creek near Black Canyon Spring- Yavapai Co. T15N R2E sec. 23, 26, 25. Sampled from ¼ mi. upstream from Black Canyon Spring to 1½ mi. downstream from Black Canyon Spring. Water was present intermittently for ~ ¾ mi. Area had limited habitat that looked inadequate for loach minnow. Jun. 6, 2001. (Fig.54)

Habitat types small pools 100% (avg. 0.2m wide x 3cm deep, max. depth 0.3m), clear water
 Substrate character bedrock/sand
 Current velocity slow flow
 Bank steep bank
 Riparian ponderosa pine, oak, manzanita
 Sample gear dip net (collectors- B. Bagley, T. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

Gap Creek (1)

#97 Gap Creek near F.S. rd. 574- Yavapai Co. T12N R5E sec. 13, 14. Sampled from F.S. rd.574 and upstream for 1 mile. Water was present 100m upstream from road and was nearly continuous for ¼ mi. upstream. The upstream ¾ mile of area sampled was dry. Area had limited potential for loach minnow due to limited water. Jun. 5, 2001. (Fig.55)

Habitat types pool 50% (max. depth 0.3m), shallow riffle 50% (avg. 0.3m wide x 0.1m deep), clear water

Substrate character bedrock/cobble

Current velocity shallow gradient, slow flow

Bank steep canyon walls

Riparian cottonwood, sycamore

Sample gear seine 1m x 1m (3mm mesh) ~ 30 hauls (collectors- B. Bagley, T. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	123	200

#98 Tributary of Gap Creek ~1/4 mi. upstream from F.S. rd. 574- Yavapai Co. T12N R5E sec. 14.

Sampled from Gap Creek and up unnamed southern tributary for ~200m. Water and fish were present for lowest 100m. A 5m tall falls apparently prevents fish movement above this area. Area had poor potential for loach minnow due to limited habitat. Jun. 5, 2001. (Fig.55)

Habitat types pool 50%, riffle 50%

Substrate character bedrock/cobble

Current velocity shallow gradient, slow flow

Bank steep canyon

Riparian cottonwood/sycamore

Sample gear seine 1m x 1m (3mm mesh) (collectors- B. Bagley, T. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	16	30

#99 Gap Creek near Government Spring- Yavapai Co. T 12N R5E sec. 29, 28. Sampled from Government Spring and downstream for ½ mi. Water was continuous a short distance downstream from Government Spring. Although water was abundant, area had several steep plunge pools with drops exceeding 3m., steep banks, and likely experiences severe flooding. It is unlikely that fish could survive in this area during flood conditions. Oct. 12, 2001. (Fig.56)

Habitat types pool 60% (avg. 0.5m wide x 0.2 m deep, max. depth 1.5m) riffle 40% clear water

Substrate character boulder 80%, cobble 10%, gravel 10%

Current velocity steep gradient, steady flow, many plunge pools

Bank steep canyon

Riparian alder, cottonwood

Sample gear shocker-200 seconds, dip net (collectors B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

Houston Creek (1)

#100 Houston Creek ~ ½ mile upstream from Verde River- Yavapai Co. T11N R6E sec. 35, 36. Sampled from 0-1 mi. upstream from Verde River. Lowest 2/3 mi. was dry. Upper 1/3 mi. had a small continuous stream. Area had poor potential for loach minnow due to limited water. Aug. 9, 2001. (Fig.57)

Habitat types shallow riffle 80% (avg. 0.3m wide x 2cm deep), pool 20% (max. 1m deep)

Substrate character cobble 70%, mud 20%, gravel 10%

Current velocity moderate gradient, slow flow
 Bank steep bank, debris piled 3m above stream level
 Riparian sycamore, cottonwood
 Sample gear shocker- 635 seconds (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	86	140

Red Creek (2)

#101 Red Creek ~3.5 miles upstream from Verde River- Yavapai Co. T9.5N R6E sec. 31, 32. Sampled from 1/3 mi. upstream from F.S. rd.18 and downstream ~3/4 mi. to Middle Red Creek. Area had limited potential for loach minnow due to limited riffle habitat, and small substrates. Aug. 8, 2001. (Fig.58)

Habitat types shallow run 90% (avg. 2m wide x 5cm deep), riffle 10%
 Substrate character sand 90%, cobble/boulder 10%
 Current velocity shallow gradient, steady flow
 Bank shallow banks
 Riparian cottonwood, juniper, mesquite
 Sample gear shocker- 560 seconds, dip net 20 hauls (collectors-B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	230	320
desert sucker	65	109

#102 Red Creek near F.S. rd. 16A.- Yavapai Co. T9.5N R5E sec. 24. Sampled from rd. 16 and downstream ~1/2 mi to rd. 16A. Red Creek was dry for ~200m downstream from rd. 16. Below this point the creek was continuous, narrow, with shifting sand. Area had poor potential for loach minnow due to limited habitat and small substrates. Aug. 8, 2001. (Fig.58)

Habitat types shallow run 90% (avg. 1m wide x 2cm deep), riffle 10%
 Substrate character sand 95%, boulder 5%
 Current velocity shallow gradient, steady flow
 Bank moderately steep
 Riparian sycamore, willow, juniper
 Sample gear shocker- 503 seconds (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	212	280

#103 Middle Red Creek near Red Creek Yavapai Co. T9.5N R6E sec.32, 29. Sampled from Red Creek and upstream for ~3/4mi. to North Red Creek. Very little water was present, and appeared to be the result of recent rains. Area had poor potential for loach minnow due to apparent ephemeral water. Aug. 8, 2001. (Fig.58)

Habitat types pool 100%-area mostly dry with a few small pools that appeared temporary
 Substrate character boulder 50%, cobble 40%, gravel 10%
 Current velocity moderately steep, no flow
 Bank shallow, rocky
 Riparian juniper, mesquite
 Sample gear dip net (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

#104 North Red Creek ~ ½ mile upstream from Middle Red Creek- Yavapai Co. T9.5N R6E sec. 29, 20. Sampled from Middle Red Creek and upstream for ~ ¾mi. Area was mostly dry and had very little fish habitat. Two ~2.5m tall barriers were present in North Red Creek ~ ¾mi. upstream from Middle Red Creek. Area had poor potential for loach minnow due to limited habitat. Aug. 8, 2001. (Fig.58)

Habitat types intermittent water, riffle 60%, plunge pool 40% (avg. 0.25m wide x 0.25m deep, max. depth 0.7m) fish only found in 3 small pools located ½ mi upstream from Middle Red Creek.

Substrate character boulder 70%, cobble 20%, sand 10%

Current velocity steep drainage, little flow

Bank steep, rocky

Riparian juniper, mesquite

Sample gear seine 3.3m x 2m (3mm mesh)- 4 hauls (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	20	28
leopard frog	1	4

Tangle Creek (1)

#105 Tangle Creek ~ 6 miles upstream from Verde River- Yavapai Co. T9N R6E sec. 7. Sampled from lowest crossing with rd.269 and upstream for ½ mile. Although Tangle Creek had continuously flowing water in this area, the remainder of the creek was mostly dry. Area had poor potential for loach minnow due to limited water and shifting sand substrate. Aug. 8, 2001. (Fig.58)

Habitat types shallow run 90% (avg. 2m wide x 2cm deep, max. depth 0.25m), riffle 10%

Substrate character shifting sand 90%, cobble/gravel 10%

Current velocity shallow gradient, steady flow

Bank shallow, wide

Riparian cottonwood, sycamore, juniper

Sample gear shocker- 574 seconds (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	84	111
leopard frog	0	1

#106 Tangle Creek near LX Spring- Yavapai Co. T9.5N R5E sec.34. Sampled from rd. 269 and upstream ~ ½mi. to LX Spring. Lowest 200m was dry. Water was present above 3m tall cement dam at LX Spring and continuous for 1/3 mile downstream. Fish were present below dam. No fish were collected above dam. However, rains created flood conditions shortly after we started sampling above the dam that limited sampling effectiveness. Limited potential for loach minnow due to shifting sand substrate and shallow habitats. Aug. 7, 2001. (Fig.59)

Habitat types riffle/run 90%(avg. 0.5m wide x 0.1m deep), pool 10%(max.1.5m deep)

Substrate character sand 80%, bedrock 10%, cobble 10%

Current velocity shallow gradient, slow flow

Bank moderately steep, heavy cattle use

Riparian juniper, catclaw, cottonwood

Sample gear seine- 3.3m x 3m (3mm mesh) (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	205	297
leopard frog	0	1

#107 Picnic Spring near Tangle Creek- Yavapai Co. T9.5N R5E sec. 34. Sampled from Tangle Creek and upstream to Picnic Spring. Tangle Creek was dry. Picnic Spring had water for ~ 40m. Drainage with spring was steep and offered poor fish habitat. Aug. 7, 2001. (Fig.59)

Habitat types plunge pool 80% (max. depth 0.2m), riffle 20% (avg. 0.2m wide)
 Substrate character bedrock 80%, sand/cobble 20%
 Current velocity steady flow
 Bank steep, heavy cattle use
 Riparian cottonwood, juniper
 Sample gear dip net- (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

#108 Peet Spring (headwater spring of Tangle Creek) - Yavapai Co. T9.5N R5E sec.28. Sampled from rd. 269 and upstream for ½ mi. to Peet Spring. Most of creek was dry. Intermittent water was present for 200m near Peet Spring. Very little water was present, most of spring area just had moist sand. Poor potential for loach minnow due to limited habitat. Aug. 7, 2001. (Fig.59)

Habitat types pool 100% (max. 0.15m deep), sparse water
 Substrate character sand 80%, boulder 10%, cobble 10%
 Current velocity none
 Bank moderately steep, moderate/heavy cattle use
 Riparian juniper, catclaw, desert broom
 Sample gear shocker, dip net (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

#109 Cockleburr Spring (headwater spring of Tangle Creek)- Yavapai Co. T9.5N R5E sec.20, 21. Sampled from Cockleburr Spring and downstream to Peet Spring. Most of creek was dry. A 50m stretch of creek near Cockleburr Spring had moist sand and water less than 3cm deep. Area had poor potential for loach minnow due to limited habitat. Aug. 7, 2001. (Fig.59)

Habitat types intermittent pools (less than 3cm deep)
 Substrate character sand/cobble
 Current velocity none
 Bank moderately steep, moderate/heavy cattle use
 Riparian juniper, catclaw, desert broom
 Sample gear dip net (collector- M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

#110 Mud Spring (headwater spring of Tangle Creek)-Yavapai Co. T9.5N R5E sec. 20. This spring formerly had mosquitofish and a reintroduced population of Gila topminnow, both of which no longer exist. Area had poor potential for loach minnow. Aug. 7, 2001. (Fig.59)

Habitat types pool 100% (15m x 10m x 0.5m deep, heavy weed growth)
 Substrate character silt 100%
 Current velocity none
 Bank shallow
 Riparian cattail, bulrush
 Sample gear dip net (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

#111 Roundtree Canyon (tributary of Tangle Creek)- Yavapai Co. T9N R5E sec. 16. Sampled 1/3 mile of habitat ~2.5 road miles upstream from the junction of rd.269 and rd. 24. Water was present in a shallow, continuous stream. Habitat looked fair for loach minnow. Aug. 7, 2001. (Fig.60)

Habitat types pool 60% (avg. 1m wide x 0.15m deep, max 0.5m deep), run 30%, riffle 10%
 Substrate character bedrock 40%, cobble 20%, gravel 10%, sand/boulder 10%
 Current velocity shallow gradient, steady flow
 Bank steep banks
 Riparian juniper, sycamore
 Sample gear shocker- 626 seconds (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	425	630
leopard frog	several	1 adult

Lime Creek (1)

#112 Lime Creek 1-6 miles upstream from Horseshoe Reservoir- Maricopa & Yavapai Co. T8N R6E sec. 33, 32, 31, 30; R5E sec.25, 24, 23, 14. Sampled from Horseshoe Reservoir and upstream ~6 miles to Lime Cabin Spring. The creek was dry near the cabin. Downstream from the cabin, Lime Cabin Spring had a small amount of water flowing in a steep side drainage, but no fish. Lime Creek was dry for 0.5mi downstream from the cabin. Below this point, water was continuous for ~4.5 mi., from 0.5mi below the cabin and downstream to 1 mi. upstream from Horseshoe Reservoir. Although green sunfish were only present in the lowest 1 mile of stream, there were no physical barriers to upstream fish movements. A large population of Gila topminnow exists as a result of a reintroduction in 1982. Habitat looked good for loach minnow. Aug. 3, 2001. (Fig.61, 62)

Habitat types riffle/run 60% (avg. 1m wide x 0.15m deep), pool 40%
 Substrate character cobble 60%, boulder 20%, sand 20%
 Current velocity moderately steep, steady flow
 Bank steep, rocky
 Riparian cottonwood, seep willow
 Sample gear seine- 1.3m x 1.3m (3mm mesh), >40 hauls (collector-B. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	180	250
Gila topminnow	105	190
green sunfish	7	12 (found in lowest 1 mi)
leopard frog	present	80 adults (found in upper 1.5mi)

#113 Lime Creek near Cougar Canyon- Yavapai Co. T9N R5E sec. 33, 34; T8N sec.3. Sampled from just downstream from 51 Ranch (near rd.24) and downstream for ~ 1.5 miles to Cougar Canyon. Water started ½ mi. upstream from Little Cougar Canyon and ran continuously for an unknown distance downstream below Cougar Canyon (sampling stopped at Cougar Canyon). A 4m tall waterfall was present just above Little Cougar Canyon and likely limits upstream fish movements. Fish were present above and below falls. This falls may be beneficial for future fish reintroduction efforts. The habitat looked excellent for chubs and for loach minnow, and decent for topminnow (a reintroduced population of topminnow already exists downstream). Due to the areas remoteness, federal land ownership, lack of non-native fish, and presence of endangered fish downstream, this seems like an ideal area for native species reintroductions. (Fig.63)

Habitat types pool 60% (avg. 1m wide x 0.2m deep; max. 2.5m deep), run 30%, riffle 10% clear water
 Substrate character boulder 50%, sand/gravel 30%, cobble 20%

Current velocity moderately steep, steady flow
 Bank moderately steep banks
 Riparian sycamore, seep willow, juniper, trees overhanging stream
 Sample gear seine-3.3m x 2m (3mm mesh) >12 hauls, kick seine, dip net >30 hauls (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	605	980

Camp Creek (1)

#114 Camp Creek at F.S. rd. 24F-Maricopa Co. T7N R5E sec. 35. Sampled from rd. 24F and upstream for ¼ mile. Area looked fair for loach minnow although water was limited. Oct. 10, 2001. (Fig.64)

Habitat types pool 70% (max. 10m x 3m x 1m deep) (avg. 1m wide x 0.2m deep), riffle 30%
 Substrate character gravel 40%, silt 40%, cobble 20%
 Current velocity shallow gradient, slow flow
 Bank steep bank, subject to flooding
 Riparian cottonwood, sycamore
 Sample gear shocker- 2085 seconds (collectors- B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	30	32
speckled dace	36	50
crayfish	abundant	abundant

#115 Sycamore Canyon (tributary of Camp Creek)- Maricopa Co. T7N R5E sec. 26, 25. Sampled from where high tension wires cross Sycamore Canyon and upstream ~ 1 mile to 2 springs shown in the NW corner of sec. 25. Area had poor potential for loach minnow due to limited habitat Aug. 6, 2001. (Fig.64)

Habitat types pool 100% ~ 10 pools (largest pool was 2m x 1m x 1m deep)
 Substrate character boulder/bedrock
 Current velocity steep canyon, limited flow
 Bank steep banks
 Riparian cottonwood, juniper, catclaw
 Sample gear dip net 20 hauls (collectors- B. Bagley, M. Schwemm)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

The following areas were sampled, but were not suggested in the original contract:

#116 Sheep Creek 0-2.5 miles upstream from Verde River- Maricopa Co. T7N R7E sec. 29, 28, 27, 22. Sampled from Verde River and upstream for 2.5 miles. Lowest ¾ mi. had only sparse water and no fish. Above this point the stream was nearly continuous. Area looked fair for loach minnow due to limited water. Apr. 21, 2002. (Fig.65)

Habitat types pool 60% (max. 1m deep) (avg. 1.5m wide x 0.2m deep), shallow riffle 40%
 Substrate character cobble 70%, gravel 20%, boulder 10%
 Current velocity shallow gradient, slow flow
 Bank steep
 Riparian cottonwood, mesquite, seep willow
 Sample gear dip net-3mm mesh- ~200 hauls, gill net-5m x 2m (1cm mesh)- set for ½ hr. (collector- B. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	205	315
red shiner	0	6
green sunfish	8	12
crayfish		present

#117 South Fork Sheep Creek- Maricopa Co. T7N R7E sec. 22. Sampled from Sheep Creek and upstream for 1/3 mi. Stream was narrow and intermittent. Apr. 21, 2002. (Fig.65)

Habitat types pool 60% (avg. 0.5m wide x 0.1m deep; max. 0.4m deep), riffle 40%
 Substrate character cobble 70%, gravel 20%, boulder 10%
 Current velocity moderate gradient, slow flow
 Bank moderately steep, rocky
 Riparian cottonwood, mesquite
 Sample gear dip net-3mm mesh-20 hauls (collector- B. Bagley)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
longfin dace	25	43
green sunfish	3	3
crayfish		present

#118 Unnamed Springs (T7N R7E sec. 17 SW ¼)-Maricopa Co. Sampled from Verde River and upstream ~1 mi. to 2 springs in SW ¼ of sec. 17. Water was present the entire length but averaged only 5cm deep, with a maximum of 20cm. Area had poor potential for fish due to limited habitat. Mar. 29, 2001. (collector- B. Bagley). Sampled with 3mm mesh dip net- Fishless. (Fig.7)

#119 Unnamed Springs (T7N R7E sec. 17 NW ¼)- Maricopa Co. Sampled for 100m around springs shown on map in NW sec. 17. Water was intermittent, averaging 5cm deep, with a maximum of 0.5m deep. Area had poor potential for fish due to limited habitat. Mar. 29, 2001. (collector- B. Bagley). Sampled with 3mm mesh dip net. Fishless. (Fig.7)

#120 Unnamed Springs (T7N R7E sec. 9 NW ¼ and NE ¼)- Maricopa Co. Sampled both springs shown on map in N ½ sec. 9. Water was continuous at both locations and flowed for less than 100m. Area had poor potential for fish due to limited habitat. Mar. 29, 2001. (collector- B. Bagley) Sampled with 3mm mesh dip net. Fishless. (Fig.7)

#121 Horse Creek near Verde River- Yavapai Co. T9N R6E sec. 35, 36; T8N sec.1. Sampled from Verde River and upstream for 2 miles. Back in 1989 this area had longfin dace, green sunfish, and a reintroduced population of Gila topminnow. Flooding may have eliminated fish from the area. Area had limited potential for loach minnow due to limited habitat and potential for flooding. Mar. 28, 2001. (Fig.66)

Habitat types riffle 80% (avg. 1m wide x 0.1m deep), pool 20%
 Substrate character sand 80%, cobble 10%, bedrock 10%
 Current velocity shallow gradient, slow flow
 Bank shallow bank, wide drainage, rocky
 Riparian cottonwood, seep willow
 Sample gear shocker- 530 seconds (collectors- B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
fishless		

#122 Sycamore Creek near Verde River (near Sheep Bridge)- Yavapai Co. T9N R6E sec.35, 36. Sampled from Verde River and upstream for ¼ mile. Habitat looked good for loach minnow, but non-native fish were present in creek and downstream in the Verde River. Mar. 27, 2001. (Fig.66)

Habitat types steep riffle 80% (avg. 2m wide x 0.2m deep), pool 20% (max. 1m deep)
 Substrate character cobble/boulder/sand
 Current velocity moderate gradient, steady flow
 Bank steep canyon walls
 Riparian cottonwood, seep willow, palo verde, thick riparian
 Sample gear shocker- 1027 seconds (collectors- B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
smallmouth bass	0	1
green sunfish	10	19

#123 Sycamore Creek ~4 miles upstream from Verde River- Yavapai Co. T9N R7E sec. 29, 20. Sampled from unnamed spring and downstream for ¾mile. Habitat looked good for loach minnow except for the presence of non-native fishes. Mar. 27, 2001. (Fig.66)

Habitat types shallow riffle 60% (avg.2m wide x 0.2m deep), pool 40%
 Substrate character cobble/gravel
 Current velocity shallow gradient, slow flow
 Bank wide canyon
 Riparian sycamore, cottonwood
 Sample gear shocker- 1300 seconds (collectors- B. Bagley, S. Rowland)

<u>Species captured</u>	<u>Young of year</u>	<u>Total</u>
yellow bullhead	8	14
smallmouth bass	0	1
green sunfish	12	23

#124 Lower Bull Spring – Gila Co. T10N R7E sec. 13. SE ¼. Water was present for ~40m near cabin and averaged 2m wide and 0.1m deep. Maximum depth was 0.2m deep. Area had shallow gradient and little flow. Area had poor potential for fish due to limited aquatic habitat. Mar. 24, 2002. (collectors- B. Bagley, S. Rowland). Sampled with 3mm mesh dip net. Fishless. (Fig.67)

#125 Upper Bull Spring- Gila Co. T10N R8E sec. 18. NW ¼. All of water was contained in a cement and a metal trough. Both troughs were full with water. Area had poor potential for fish due to all of water being contained within man-made structures. Mar. 24, 2002. (collectors- B. Bagley, S. Rowland) Sampled with 3mm mesh dip net. Fishless. (Fig.67)

#126 Bullfrog Spring- Gila Co. T10N R8E sec. 10 SW ¼. Very little water was present in this moderate gradient drainage. Water was present for 30m and was less than 0.2m deep. Area had poor potential for fish due to limited habitat. Mar. 23, 2002. (collectors- B. Bagley, S. Rowland) Sampled with 3mm mesh dip net. Fishless. (Fig.67)

#127 Gaddes Canyon –Yavapai Co. T15N R2E sec.24, 25. Sampled 0- ¼ mi. upstream from Black Canyon. Intermittent stream was present in a steep drainage. Stream averaged 0.2m wide x 5cm deep. Max. depth was 1.3m. Area had poor potential for fish due to limited habitat, and it appeared prone to severe flooding. June 6, 2001. (collectors- B. Bagley, T. Bagley). Sampled with shocker-60 seconds and dip net. Fishless. (Fig.54)

#128 Cherry Creek near town of Cherry- Yavapai Co. T14N R3E sec. 21. Sampled from 0.8mi. downstream from where rd.75 crosses Cherry Creek and downstream for ¼ mi. A moderate gradient stream was present in a moderately steep canyon. Intermittent water averaged 0.25m wide x 0.1m deep. Maximum depth was 0.3m. Water was clear. Area appeared to be prone to flooding. Sampled with dip net. Jun. 5, 2001. (collectors- B. Bagley, T. Bagley). Fishless. (Fig.68)

#129 Log Springs (tributary of Cherry Creek)- Yavapai Co. T14N R3E sec. 18- Sampled at springs shown above and below rd. 132 with a dip net. Upper spring had ~3.3m of watered area, all less than 3cm deep. Area was fishless. Lower spring had ~60m of intermittent stream. Maximum depth was 10cm. Average depth was 2cm. Jun. 5, 2001 (collectors- B. Bagley, T. Bagley). Fishless. (Fig.68)

#130 Chasm Creek-Yavapai Co. T12N R5E sec. 3. Sampled at spring located ~ ½mi. upstream from F.S. rd. 574. Creek had water for ~60m. The moderately steep stream averaged 0.2m wide x 0.1m deep with a maximum depth of 0.2m. Area had limited habitat suitable for fish and it appeared to be prone to flooding. Jun. 5, 2001. dip net. (collectors- B. Bagley, T. Bagley). Leopard frog (1 adult, 12 tadpoles). Fishless. (Fig.55)