

# **GILA TOPMINNOW AND DESERT PUFFISH MONITORING AND MANAGEMENT ACTIVITIES ON BLM LANDS IN ARIZONA – OCTOBER 2004 THROUGH DECEMBER 2005**

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Jeremy B. Voeltz

## INTRODUCTION

The Arizona Game and Fish Department (AGFD) manages Gila topminnow (*Poeciliopsis occidentalis*) and desert pupfish (*Cyprinodon macularius*) as a project funded by AGFD, the U.S. Fish and Wildlife Service (USFWS), and other agencies. In October 2004, the U.S. Bureau of Land Management (BLM) and AGFD extended a Task Order where BLM provided funds to AGFD to monitor and manage topminnow and pupfish populations on BLM lands through October 2005.

This report provides background on management of these species, information collected from October 2004 through December 2005, and a summary of the status of populations of both species. We included information from November and December 2005 because of recent stockings that occurred in October and the need for follow-up monitoring in November and December. Background information about the species and AGFD's management history of Gila topminnow and desert pupfish is summarized in Weedman and Young (1997) and Voeltz and Bettaso (2003).

## METHODS

Abbreviations for species are used throughout this report. They are comprised of the first two letters of the genus and first two letters of the specific epithet (Table 1).

We monitored Gila topminnow and desert pupfish populations on BLM lands in Arizona between October 2004 and December 2005, normally between the months of April and November. Sampling during these times was intended to maximize the probability of detecting topminnows at localities with few individuals present in complex habitats. All sampling was done by qualified biologists using dipnets, seines, minnow traps, or backpack electrofishers, as determined appropriate for the habitat being sampled. Mesh sizes for all seines and dipnets was 1/8-in (3.2-mm). Basic water quality parameters were recorded at all sites, including dissolved oxygen, pH, temperature, and conductivity. General notes were taken on habitat condition, riparian condition, impacts to fish or habitat, and potential threats to the fish population. Voucher specimens of fishes were collected wherever appropriate, positively identified, and accessioned into the Arizona State University (ASU) Vertebrate Museum. Digital photographs were taken at all sites during each monitoring event and, wherever possible, replicated earlier photographs. These photos are maintained by AGFD, and representative reprints were supplied to USFWS Arizona Ecological Services Field Office.

Table 1. Definitions for species abbreviations.		
Abbreviation	Scientific Name	Common Name
AGCH	<i>Agosia chrysogaster</i>	longfin dace
CYCA	<i>Cyprinus carpio</i>	common carp
CYLU	<i>Cyprinella lutrensis</i>	red shiner
CYER	<i>Cyprinodon eremus</i>	Sonoyta pupfish
CYMA	<i>Cyprinodon macularius</i>	desert pupfish
GAAF	<i>Gambusia affinis</i>	mosquitofish
GIIN	<i>Gila intermedia</i>	Gila chub
LECY	<i>Lepomis cyanellus</i>	green sunfish
POOC	<i>Poeciliopsis occidentalis</i>	Gila topminnow
PORE	<i>Poecilia reticulata</i>	guppy

Potential reestablishment sites on BLM lands were visited and evaluated to determine suitability for topminnow or pupfish reestablishment. In addition, several sites were identified by BLM for future habitat assessments. These surveys took place during 2005 collaboratively between AGFD and BLM. Data collected included identification of all fish species present, general description of the site, qualitative estimate of vulnerability to flooding, estimated size of available habitat, evidence of human activities, qualitative description of the condition of the aquatic and riparian communities, potential threats to topminnows or pupfish, recommended management actions to improve the site, and other information as appropriate to determine suitability for reestablishment of Gila topminnow or desert pupfish.

## RESULTS AND DISCUSSION

An overview of the Gila topminnow and desert pupfish reestablishment and monitoring project on BLM lands from October 2004 through December 2005 is presented below. Appendix A identifies all Gila topminnow and desert pupfish populations reestablished on BLM lands and summarizes the management and survey history at each site.

### STATUS OF NATURAL POPULATIONS ON BLM LANDS IN ARIZONA

#### Gila Topminnow

Of the 13 natural populations of Gila topminnow in Arizona, one is located on BLM land: Cienega Creek. Cienega Creek contains around 13-km of topminnow habitat, making it the

largest remaining natural topminnow habitat in Arizona (Weedman 1999). Topminnows co-exist with longfin dace and Gila chub, with no nonnative fishes present (see Appendix B for summary of monitoring results).

#### Desert Pupfish

No natural populations of desert pupfish (*Cyprinodon macularius*) remain in Arizona (USFWS 1993).

#### Sonoyta Pupfish

No natural populations of Sonoyta pupfish (*Cyprinodon eremus*) remain on BLM lands in Arizona (USFWS), and Quitobaquito Spring on National Park Service Land contains the only natural population of Sonoyta pupfish in Arizona.

#### STATUS OF REESTABLISHED POPULATIONS ON BLM LANDS IN ARIZONA

#### Gila Topminnow

A total of 25 sites on BLM land in Arizona have been stocked with Gila topminnow (Voeltz and Bettaso 2003; AGFD files). Seven extant and four failed reestablished localities were monitored from October 2004 to December 2005 on BLM lands in Arizona (see Appendix C for summary of results). Of the eight sites (one natural, seven reestablished) known to support Gila topminnow on BLM lands in Arizona, one, Yerba Mansa, is outside of historic range.

#### Desert Pupfish

A total of ten sites on BLM land in Arizona have been stocked with desert pupfish (Voeltz and Bettaso 2003; AGFD files). The two extant reestablished localities on BLM land were monitored from October 2004 to December 2005 (see Appendix C for summary of results). A third site was stocked 2005 Oct 13, and the status of that stocking is not known at this time.

#### Sonoyta Pupfish

A population of pupfish at a tinaja near Ajo, Arizona was reported by Organ Pipe National Monument staff to AGFD, BLM, and USFWS on 2005 Apr 22. Follow-up surveys confirmed the presence of pupfish. Since their species or origin was unknown, we collected 45 fish (all adults) on 2005 Apr 29 and housed them in two captive locations in Phoenix. On 2005 June 2, we returned and collected 50 additional fish, mostly juveniles. This likely indicated a successful spawn between the April and June visits. 20 specimens were sent to Oklahoma State University for genetic analysis. The results indicated the specimens closely resembled Sonoyta pupfish, albeit with significantly reduced allele diversity indicating that they probably resulted from a small founder population (T. Echelle, pers. comm. 2005). By 2005 June 23, the site was dry.

Locals familiar with the site do not believe that this site consistently holds water; therefore it is unlikely to contribute to pupfish recovery.

LOCALITIES IDENTIFIED AND EVALUATED FOR FUTURE REESTABLISHMENT

Federal and state agencies have identified several new localities that potentially could support Gila topminnow or desert pupfish. A list of sites evaluated during this project with recommendations and comments is provided in Table 2. BLM identified several sites that were evaluated by BLM or jointly by AGFD and BLM in 2005. Where appropriate, coordination to stock topminnow and pupfish at the suitable sites is continuing.

Table 2. Locations evaluated for Gila topminnow or desert pupfish reestablishment on BLM lands in Arizona.			
Site Name	Management Agency	Location	Date evaluated, recommendations, and comments
Ben Spring	BLM, Tucson Office	T20S R21E Sec 4	2005. Suitable. Large bedrock plunge pool may need periodic augmentation.
Buckhorn Spring #2	BLM, Phoenix Office	T8N R2W Sec 28	2004 Dec 20. Stock POOC and CYMA. The area has been fenced to protect the riparian area. Section 7 consultation and NEPA in progress.
Don Levy Artesian #2	BLM, Tucson Office	T18S R21E Sec 21	2005. Unsuitable. Shallow habitat needs pond development.
Don Levy Artesian #3	BLM, Tucson Office	T18S R21E Sec 21, 28	2005. Unsuitable. Shallow habitat needs pond development.
Don Levy Artesian #4	BLM, Tucson Office	T18S R21E Sec 21, 28	2005. Unsuitable. Shallow habitat needs pond development.
Frog Spring	BLM, Tucson Office	T19S R21E Sec 20	2005. Suitable; but in active eroding arroyo.
Horse Thief Spring	BLM, Tucson Office	T21S R21E Sec 36	2005. Suitable. Semi-stable erosive arroyo.
Lewis Seeps and Spring B	BLM, Tucson Office	T21S R22E Sec 30	2005. Unsuitable; open water needs to be developed.
Lewis Seeps and Spring C	BLM, Tucson Office	T21S R22E Sec 30	2005. Unsuitable; open water needs to be developed.
Lewis Seeps and Spring Da	BLM, Tucson Office	T21S R22E Sec 30	2005. Unsuitable; open water needs to be developed.
Lewis Seeps and Spring D(2)	BLM, Tucson Office	T21S R22E Sec 30	2005. Unsuitable; open water needs to be developed.
Lewis Seeps and Spring G(1)	BLM, Tucson Office	T21S R22E Sec 29	2005. Unsuitable; open water needs to be developed.
Lewis Seeps and Spring G(2)	BLM, Tucson Office	T21S R22E Sec 29	2005. Unsuitable; open water needs to be developed.
Lewis Seeps and Spring G(3)	BLM, Tucson Office	T21S R22E Sec 29	2005. Unsuitable; open water needs to be developed.
Lewis Seeps and Spring H	BLM, Tucson Office	T21S R22E Sec 29	2005. Unsuitable; open water needs to be developed.
Lewis Seeps and Spring J (Katie Spring)	BLM, Tucson Office	T21S R22E Sec 29	2005. Unsuitable; open water needs to be developed.

Table 2. Locations evaluated for Gila topminnow or desert pupfish reestablishment on BLM lands in Arizona.			
Site Name	Management Agency	Location	Date evaluated, recommendations, and comments
Lewis Seeps and Springs K(1)	BLM, Tucson Office	T21S R22E Sec 29	2005. Unsuitable; open water needs to be developed.
Lewis Seeps and Springs K(2)	BLM, Tucson Office	T21S R22E Sec 29	2005. Unsuitable; open water needs to be developed.
Lewis Seeps and Spring South	BLM, Tucson Office	T21S R22E Sec 29	2005. Suitable. Small, stable habitat in wash bottom.
Lewis Spring North	BLM, Tucson Office	T21S R22E Sec 29, 30	2005. Unsuitable. Spring is on steep slope
Little Joe Spring	BLM, Tucson Office	T18S R21E Sec 29	2005. Stock topminnow and pupfish.
Little Nogales Spring	BLM, Tucson Office	T18S R18E Sec 11	2005. High CO <sub>2</sub> at source; evaluate water quality further downstream
McDowell-Craig Pond	BLM, Tucson Office	T23S R22E Sec 22	2005 June. Dry. Viable well could be used to fill pond.
Meusel Spring	BLM, Tucson Office	T21S R22E Sec 31	2005. Unsuitable. Narrow, deeply incised arroyo.
Moson Spring	BLM, Tucson Office	T21S R21E Sec 13	2005 June. Dry.
Murray Spring	BLM, Tucson Office	T21S R21E Sec 26	2005. Suitable. Large stable stream reach.
Nogales Spring	BLM, Tucson Office	T18S R18E Sec 11	2005. High CO <sub>2</sub> at source; evaluate water quality further downstream
Oak Grove Canyon	TNC, Aravaipa Preserve & BLM, Safford Office	T7S R18E Sec 13	2002 Jan 17. Stock POOC and CYMA. Paperwork is complete for stocking. Recommend using fish recently stocked into three springs near this site.
Post Canyon	BLM, Tucson Office	T21S R18E Sec 28	2005. Stock POOC and CYMA. Site is a slot canyon with limited water.
Road Canyon Tank	BLM, Tucson Office	T19S R17E Sec 36	2005. Both ponds may need to be depended. On State Land leased to BLM.
Tule Creek	BLM, Phoenix Field Office	T8N R1E Sec 28	2005 Feb 17. Stock CYMA. Tule Creek has supported a large population of POOC since their stocking in 1981. We recommend stocking desert pupfish into the creek.
Virgus Canyon at Sycamore Canyon Confluence	BLM, Safford Office	T7S R18E Sec 10	2002 Jan 17. Stock POOC and CYMA. Paperwork is complete for stocking. Recommend using fish recently stocked into three springs near this site.

### MANAGEMENT OPTIONS

Recovery of Gila topminnow and desert pupfish in Arizona is a continually evolving process through which we are attempting to reduce threats, stabilize, and reestablish populations of two of Arizona's endangered fishes.

### FUTURE REESTABLISHMENT AND MANAGEMENT

As identified in the draft revised Gila Topminnow Recovery Plan (USFWS *in prep.*) and the Desert Pupfish Recovery Plan (USFWS 1993), progress toward recovery and downlisting will include: protecting natural populations and their habitats through whatever means are available (State or Federal ownership, conservation agreements, etc.); reestablishing populations into

historic range to meet each of the respective Recovery Plan requirements; and developing and implementing plans to monitor populations and their habitats. Recovery of Gila topminnow and desert pupfish should proceed primarily through reestablishment of these species to the wild.

AGFD proposes to pursue reestablishment and management activities on BLM lands at the sites previously identified or other suitable site identified in the future. AGFD will work with BLM in completing all NEPA and ESA compliance procedures prior to restocking. These consultations will identify all known current and future land use practices and actions, and evaluate those uses for their effects on the reestablished fishes and other listed species. Gila topminnow or desert pupfish may then be reestablished to the site following consultation with USFWS. This approach should allow BLM to implement any and all practices identified in the consultation without the need for further consultation. These consultations may be done on a site-by-site basis, watershed basis, allotment or management unit basis, or any other basis.

More sites should be stocked than are required by the respective Recovery Plans to allow for unanticipated disappearance of one or more populations. Additional potential reestablishment sites should continue to be identified in the future in the event that attempts to reestablish wild populations at these known sites fail to maintain the numbers of reestablished populations needed.

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LITERATURE CITED

- Bettaso, R.H., D.B. Dorum, and K.L. Young. 1995. Results of the 1992-1994 Aravaipa Creek fish monitoring project. Nongame and Endangered Wildlife Program Technical Report 73. Arizona Game and Fish Department, Phoenix, Arizona.
- Brooks, J.E. 1986. Status of natural and introduced Sonoran topminnow (*Poeciliopsis o. occidentalis*) populations in Arizona through 1985. Report to U.S. Fish and Wildlife Service, Office of Endangered Species, Albuquerque, New Mexico. Arizona Game and Fish Department, Phoenix, Arizona.
- Brown, M. and F.J. Abarca. 1992. An update status report of the Sonoran topminnow (*Poeciliopsis occidentalis*) and desert pupfish (*Cyprinodon macularius*) in Arizona. Project E5-2 Job 9. Arizona Game and Fish Department, Phoenix, Arizona.
- Collins, J.P., C. Young, J. Howell, and W.L. Minckley. 1981. Impact of flooding in a Sonoran desert stream, including elimination of an endangered fish population (*Poeciliopsis o. occidentalis*, Poeciliidae). *The Southwestern Naturalist* 26(4):415-423.
- Hedrick, P.W., K.M. Parker, and R.H. Lee. 2001. Using microsatellite and MHC variation to identify species, ESUs, and MUs in the endangered Sonoran topminnow. *Molecular Ecology* 10:1399-1412.
- Minckley, W.L. 1969. Attempted re-establishment of the Gila topminnow within its former range. *Copeia* (1) 193-194.
- \_\_\_\_\_. and J.E Brooks. 1985. Transplantations of native Arizona fishes: Records through 1980. *Journal of the Arizona-Nevada Academy of Science* 20(2): 73-89.
- U.S. Fish and Wildlife Service. 1993. Desert pupfish Recovery Plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico.
- \_\_\_\_\_. In prep. Gila topminnow, *Poeciliopsis occidentalis occidentalis*, revised Recovery Plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico.
- Voeltz, J.B. and R.H Bettaso. 2003. 2003 Status of the Gila Topminnow and Desert Pupfish in Arizona. Nongame and Endangered Wildlife Program Technical Report 226. Arizona Game and Fish Department, Phoenix, Arizona.
- Weedman, D.A. and K.L. Young. 1997. Status of the Gila topminnow and desert pupfish in Arizona. Nongame and Endangered Wildlife Program Technical Report 118. Arizona Game and Fish Department, Phoenix, Arizona.

Appendix A. Index to reestablished populations of Gila topminnow and desert pupfish on BLM lands in Arizona (information primarily from Weedman and Young [1997]; Voeltz and Bettaso [2003]; and AGFD files).

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**Reestablished Localities Supporting Gila Topminnow or Desert Pupfish on BLM lands in Arizona**

**Cold Springs Site #85 (Category 2)**

Graham County, Bureau of Land Management, Safford Field Office, T5S R24E S17 NE4

STOCKED: 1985 Jul 22 with 500 Gila topminnows from Dexter originally from Monkey Spring.  
 1990 Apr 21 with 200 desert pupfish, 50 from Flowing Wells Jr. High School and 150 from Dexter, both originally from Santa Clara Slough.

<b>Dates</b>	<b>Surveyor</b>	<b>Methods</b>	<b>Fish</b>
1986 Mar 31	Parker	unknown	POOC
1986 Aug 22	Parker	unknown	POOC
1986 Sept 05	Bamman	unknown	POOC
1987 Jul 23	Simons	unknown	POOC
1987 Oct 22	Parker	unknown	POOC
1988 Sept 09	Bamman	unknown	POOC
1989 Jul 04	Bagley	dipnet	POOC
1989 Oct 23	S. Stefferud	unknown	POOC
1990 Aug 07	S. Stefferud	unknown	POOC, CYMA
1991 Feb 10	Brown	dipnet	POOC
1993 Feb 12	Robles	visual	POOC, CYMA
1993 May 14	Robles	visual	POOC, CYMA
1993 Jul 13	Weedman	dipnet	POOC, CYMA
1993 Aug 05	Robles	visual	POOC, CYMA
1993 Nov 18	Robles	visual	POOC, CYMA
1996 May 15	Zalaznik, Voeltz	dipnet	POOC, CYMA
1998 Jun 17	Timmons	dipnet, seine	POOC, CYMA, CYLU
1998 Oct 07	Timmons, Weedman	dipnet	POOC, CYMA, CYLU
1999 Jun 17	Weedman, Robles	seine	POOC, CYMA
2000 Jul 13	Jontz, R. Billingsley	dipnet	POOC, CYMA
2001 Mar 21	Blasius	visual	POOC, CYMA

**Reestablished Localities Supporting Gila Topminnow or Desert Pupfish on BLM lands in Arizona (continued)**

**Cold Springs Site #85 (continued)**

Dates	Surveyor	Methods	Fish
2002 Apr 29	Blasius	visual	POOC, CYMA
2003 Apr 02	Voeltz, Bettaso	dipnet	POOC, CMYA
2004 Apr 16	Billingsley	visual	POOC, CYMA
2005 Mar 11	Blasius	dipnet	POOC, CYMA
2005 May 16	Blasius	dipnet	POOC, CYMA

Cold Springs consists of two spring-fed pools, an upper and a lower pool, each approximately 15-ft (4.6-m) in diameter. The upper pond was constructed in 1983 and the lower pond in 1985. Topminnows were originally stocked only in the upper pool, which appeared to provide more reliable and suitable habitat. By 1989, topminnows were present in both pools. Pupfish were then stocked into both pools in 1990. In 1998, red shiners were collected (their origin was unknown). Mechanical removal via seines and electroshocking in autumn 1998 appears to have eliminated the red shiners, as they have not been observed since. In 2003, the lower pool contained only topminnows. Bullfrogs and mud turtles have also been observed in the area. In 2004, the lower pool was fishless and nearly dry. In 2005, BLM removed *Tamarisk* and mesquite that bordered both ponds. The second pond was completely shaded by *Tamarisk* and appeared to be less productive than the first pond and will likely benefit by having some of the *Tamarisk* removed. In the first pond aquatic vegetation and sediment was also removed.

**Empire Gulch Site #339 (Category 1)**

Pima County, Bureau of Land Management, Tucson Field Office, Las Cienegas National Conservation Area, T19S R17E S17 NE4

STOCKED: 2001 Oct 27 with 689 Gila topminnows from Cienega Creek; augmented with 70 topminnows from Cienega Creek on 2003 May 19, and with 475 topminnows from Cienega Creek on 2003 Oct 20.

Dates	Surveyor	Methods	Fish
2001 Oct 27	Davidson, Voeltz, Simms	stocking	AGCH, POOC
2002 Feb 15	Davidson, Voeltz, Duncan	dipnet	AGCH, POOC
2002 Jul 10	Voeltz	dipnet	AGCH, POOC
2003 May 19	Voeltz, Duncan	dipnet/stocking	AGCH, POOC
2003 Oct 20	Voeltz, Duncan, Simms, et al.	dipnet/stocking	AGCH, POOC

**Reestablished Localities Supporting Gila Topminnow or Desert Pupfish on BLM lands in Arizona (continued)**

**Empire Gulch Site #339 (continued)**

<b>Dates</b>	<b>Surveyor</b>	<b>Methods</b>	<b>Fish</b>
2004 May 17	Voeltz	dipnet	AGCH
2004 Sept 02	Simms, Rosen	seine/dipnet	AGCH, POOC (n=1)
2004 Nov 8	Simms	seine	AGCH, POOC (n=6)
2005 May 18	Voeltz, Foster, Duncan, Kileen	dipnet	AGCH

Empire Gulch, tributary to Cienega Creek, was stocked with Gila topminnow and longfin dace during the dedication of BLM’s Las Cienegas National Conservation Area. Empire Gulch flows for approximately 3600-ft (1100-m) from the spring source before going subsurface. The surface flow originates at the base of a 10-ft (3-m) deep head cut that is held by roots from mature cottonwoods found upstream. The habitat consists mainly of shallow marshland, with some small pools and some flowing runs. In 2002 duckweed covered nearly 100% of all surface water. Flooding during the summer of 2003 removed much of the duckweed and improved the habitat by scouring some of the thicker vegetation and creating open pool habitat. In May of 2004, thick mats of duckweed and watercress made sampling the pools difficult, although when vegetation was removed, careful observation failed to detect topminnows. During Chiricahua leopard frog surveys conducted by BLM and UofA in September of 2004, only one topminnow was collected. In 2005, no topminnows were collected. It is possible that the abundance of watercress and duckweed mats, and abundance of predaceous insects may be negatively impacting the topminnow population in Empire Gulch. BLM, AGFD, and USFWS are currently planning to amend the biological opinion to allow for subsequent topminnow stockings in Empire Gulch.

**Larry Creek tributary Site #307 (Category 1)**

Yavapai County, Bureau of Land Management, Phoenix Field Office, T9N R3E S9 NW4  
 STOCKED: 2005 Oct 26 with 600 Gila topminnows from Coal Mine Spring.

<b>Dates</b>	<b>Surveyor</b>	<b>Methods</b>	<b>Fish</b>
2005 Oct 26	Hervatin, Cooper, Sponholtz, Smith	stocking	POOC, GIIN
2005 Dec 8	Voeltz, Hervatin, Goforth, Fulmer	dipnet, visual	POOC, GIIN

An unnamed tributary to Larry Creek is a spring-fed perennial stream that flows through a steep, narrow boulder-strewn gorge. The habitat is located on the BLM-administered Agua Fria National Monument. Gila chub were stocked into the stream in 1995. In 2005, Gila topminnows from Coal Mine Spring were stocked into several pools. The stream also contains an abundance of lowland leopard frogs. We recommend stocking desert pupfish into this system in 2006.

**Reestablished Localities Supporting Gila Topminnow or Desert Pupfish on BLM lands in Arizona (continued)**

**Lousy Canyon Site #306 (Category 1)**

Yavapai County, Bureau of Land Management, Phoenix Field Office, T9N R3E S5 NW4  
 STOCKED: 2000 Sept 9 with 650 Gila topminnows from Coal Mine Spring. 2001 Oct 10 with 71 desert pupfish from the Cibola and Imperial National Wildlife Refuges (originally from El Doctor Marsh, Mexico).

<b>Dates</b>	<b>Surveyor</b>	<b>Methods</b>	<b>Fish</b>
2000 Sept 12	Bettaso, L. Young, K. Young, Weedman, Davidson, Duncan	stocking	POOC
2000 Oct 18	Davidson, Weedman	dipnet, visual	None
2001 Jan 03	Davidson, Voeltz, Sorensen	dipnet, seine	POOC, GIIN
2001 Mar 27	Davidson, Weedman, Sorensen	visual	POOC, GIIN
2001 Oct 17	K. Young, L. Young, Bettaso	stocking	POOC, CYMA
2001 Nov 26	Davidson, Voeltz, Duncan	dipnet, visual	POOC, CYMA
2002 Apr 10	Voeltz, Dockens	dipnet, visual	POOC, CYMA
2002 Oct 22	Voeltz, Lutz, L. Young	dipnet, visual	POOC, CYMA
2003 Apr 29	Lutz, Sorensen, Hughes	dipnet	POOC, CYMA, GIIN
2004 Apr 12	Voeltz, Billingsley, Burger	dipnet	POOC, CYMA, GIIN
2005 Mar 24	Voeltz, Jester	dipnet	POOC
2005 Oct 17	Voeltz, Sorensen, Simms, L. Young	dipnet	POOC, GIIN

Lousy Canyon is a spring-fed perennial stream that flows through a steep, narrow boulder-strewn gorge with several waterfalls. The habitat is located on the BLM-administered Agua Fria National Monument. Gila chub were stocked into the stream in 1995 below the large ~30-ft (9-m) waterfall. In 2000, Gila topminnow from Coal Mine Spring were stocked above the waterfall and have subsequently become established throughout the creek. Desert pupfish from Cibola and Imperial National Wildlife Refuges (originally from El Doctor Marsh, Mexico) were stocked in 2001. Pupfish were not observed during the two surveys in 2005. It is possible that extreme flooding in January 2005 may have eliminated the population. We recommend augmenting pupfish in spring 2006.

**Reestablished Localities Supporting Gila Topminnow or Desert Pupfish on BLM lands in Arizona (continued)**

**Parsons Grove Spring Site #382 (Category 2)**

Pinal County, Bureau of Land Management, Safford Field Office; The Nature Conservancy, Aravaipa Canyon Preserve, T7S R18E S4C

STOCKED: 2005 Oct 13 with 50 Gila topminnows from Bylas Spring. 2005 Oct 13 with 50 desert pupfish from TNC San Pedro Preserve.

<b>Dates</b>	<b>Surveyor</b>	<b>Methods</b>	<b>Fish</b>
2005 Oct 13	Voeltz, Blasius, McRae	stocking	POOC, CYMA
2005 Nov 1	Haberstich, Blasius	visual	None

Parsons Grove is a small spring located along the south rim of the Aravaipa Creek watershed. The site will continue to be monitoring by AGFD, BLM, and TNC staff. If necessary, the site should be augmented with topminnow from the Bylas Spring lineage and pupfish from the El Doctor Marsh lineage.

**Tule Creek Site #75 (Category 1)**

Yavapai County, Bureau of Land Management, Phoenix Field Office, T8N R1E S28 NW4 SW4

STOCKED: 1981 Sept 30 with 1000 Gila topminnows from BTA.

<b>Dates</b>	<b>Surveyor</b>	<b>Methods</b>	<b>Fish</b>
1982 Aug 17	Brooks	unknown	POOC
1983 Jun 01	Kepner	unknown	POOC
1985 Jun 06	Brooks	unknown	POOC
1986 Aug 28	Simons	unknown	POOC
1987 Mar 06	Simons	unknown	POOC
1988-1997	BLM, AGFD, USFWS biologists	varied	POOC
1998 May 15	Timmons	dipnet	POOC
1999 May 18	Weedman, Duncan, Watson	dipnet	POOC
2000 May 30	Weedman, L. Young	dipnet	POOC
2001 Apr 18	Davidson, Voeltz, L. Young	dipnet	POOC
2002 Oct 11	Voeltz, Lutz	dipnet	POOC
2003 May 07	L. Young, T. Hughes	dipnet	POOC

**Reestablished Localities Supporting Gila Topminnow or Desert Pupfish on BLM lands in Arizona (continued)**

**Tule Creek Site #75 (continued)**

<b>Dates</b>	<b>Surveyor</b>	<b>Methods</b>	<b>Fish</b>
2003 Oct 22	Voeltz, Hurst	dipnet	POOC
2004 Jan 09	Billingsley	dipnet	None
2005 Feb 17	Voeltz, Bettaso	dipnet	POOC

Tule Creek was originally stocked with Gila topminnow in 1968 (Minckley and Brooks 1985). They persisted until eliminated by flooding in 1978 (Collins and others 1981). Gila topminnow has persisted since restocking in 1981. In 1991 an enclosure fence was constructed around a portion of the creek to control grazing. The enclosure resulted in an immediate increase in emergent vegetation. Later in 1991 a pipeline was constructed to deliver water outside the enclosure for cattle use. In 1992 a fish barrier was also constructed on lower Tule Creek about 0.25 mi (0.4-km) upstream from the high water elevation of Lake Pleasant, which increased in size as a result of the New Waddell Dam. Surveys in June 1992 reported Gila topminnow and longfin dace distributed throughout Tule Creek and several tributaries from the enclosure downstream to the barrier. Immediately below the barrier green sunfish were collected. It appears that the timely construction of the barrier will protect Tule Creek from nonnative fishes invading from the Agua Fria River and Lake Pleasant. Tule Creek was again hit by a major flood event in January 1993 that scoured and removed the vegetation within the enclosure (D. Langhorst pers. comm. *in* Weedman and Young [1997]). Langhorst estimated the flow was 50-ft (15-m) wide and up to 8-ft (2.4-m) deep and reported that Gila topminnow were much reduced from previous visits, only about 100 could be found. Later in 1993 topminnows were distributed throughout the enclosure and appeared to successfully rebound from this flood. The area within the enclosure continues to support thick growths of aquatic and emergent vegetation and topminnows continue to be abundant. Pupfish and Gila chub should also be stocked into Tule Creek. The 2004 survey was conducted downstream of the enclosure to determine if topminnow are established in that stretch of the creek. There was suitable habitat, but no fish were present.

**Reestablished Localities Supporting Gila Topminnow or Desert Pupfish on BLM lands in Arizona (continued)**

**Yerba Mansa Site #44 (Not Categorized)**

La Paz County, Bureau of Land Management, Phoenix Field Office, T11N R11W S21 NW4

STOCKED: 1984 Dec 20 with 250 Gila topminnows and 1985 May 29 with 600 Gila topminnows, both from Tule Creek, which originated from BTA. Also stocked 1988 Aug 9 with 250 Gila topminnows from Dexter originally from Sharp Spring and 250 desert pupfish from Dexter originally from Santa Clara Slough.

<b>Dates</b>	<b>Surveyor</b>	<b>Methods</b>	<b>Fish</b>
1984 Dec 20	Brooks, Fredlake	stocking	POOC
1985 May 29	Jacobson	stocking	POOC
1985 Aug 10	Brooks	unknown	POOC
1988 Aug 9	Kepner	stocking	CYMA
1988 Sept 22	Hughes	unknown	POOC
1989 Jan 3	Bagley, Hughes	unknown	POOC
1989 Jun 27	Bagley, Jakubos	snorkel & dipnet	POOC
1990 Apr 19	Jakubos	visual	POOC
1990 Sept 4	S. Stefferud, Jakubos	dipnet	CYMA, POOC
1991 Jan 27	Brown	dipnet	POOC
1992 Apr 24	L. Young, Langhorst	dipnet	POOC
1992 May 26	Weedman	dipnet	POOC
1992 Nov 21	L. Young	visual	POOC
1993 Feb 24	L. Young	visual	POOC
1996 May 8	Weedman, Zalaznik	dipnet	POOC
1998 May 13	Timmons	dipnet	POOC
1999 May 27	Weedman, Timmons	dipnet	POOC
2000 Jul 11	Allen, R. Billingsley	dipnet	POOC
2001 Jul 25	Davidson	dipnet	POOC
2002 Oct 10	Voeltz, Lutz	dipnet	POOC
2003 Oct 28	Voeltz	dipnet	POOC
2005 Mar 22	Voeltz	dipnet	None

**Reestablished Localities Supporting Gila Topminnow or Desert Pupfish on BLM lands in Arizona (continued)**

Yerba Mansa Spring is located in the Bill Williams River drainage upstream of Alamo Lake. It lies outside of historic range for the Gila topminnow. Habitat consists of a large man-made, spring-fed pond with extensive cattail growth around it. The thick vegetation makes sampling difficult, but topminnows continue to persist. Desert pupfish were reported as extirpated (USFWS 1993). In 2005, the *Typha* was so thick that it was not possible to sample the habitat. Topminnows are presumably still present in the center where there is open water; a follow-up survey is needed to confirm. This population does not contribute as a Level-2 Gila topminnow population, because it is outside of historic range.

**Failed Sites on BLM Lands in Arizona**

**Aravaipa Creek Site #177 (Category 1)**

Graham and Pinal Counties, Bureau of Land Management and Private  
 T7S R20E; Tributary to the San Pedro River

STOCKED: Gila topminnow were stocked 3 times; in 1967 at a marsh near the creek in Pinal County and directly into the creek in Graham County both from Monkey Spring, and in 1977 at the upper Klondyke area of Aravaipa Creek from BTA.

According to Minckley (1969), the fish stocked during 1967 in Pinal County were established in 1968 and reproducing with some topminnows collected from the creek channel and those stocked in Graham County, near Klondyke, were reproducing and possibly established. According to Minckley and Brooks (1985) all three introductions failed and Gila topminnow were extirpated from Aravaipa Creek. Monthly monitoring was conducted by AGFD, TNC, and BLM biologists and ASU students from August 1992 through April of 1994 (Bettaso and others 1995). Surveys were conducted at nine stations located throughout the perennial portions of Aravaipa Creek and involved extensive seining and electroshocking efforts along 650-ft (200-m) at each station and included all habitats. Also, in October 1993 an exhaustive seining effort by biologists and student volunteers was conducted to search for red shiners. No topminnows were collected during any of these efforts. This stream continues to support 7 other native fish species. Most of the perennial stream is protected as wilderness area by the BLM or is in private ownership by The Nature Conservancy. Three springs along the south rim of Aravaipa Canyon were stocked in 2005. Additional attempts at reestablishment in the mainstem should be pursued.

**Big Spring Site #84 (Category 2)**

Graham County, Bureau of Land Management, Safford District, T6S R25E S5 NE4 SE4

STOCKED: 1985 Jul 22 with 500 Gila topminnows from Dexter originating from Monkey Spring.

Dates	Surveyor	Methods	Vouchers	Fish
1986 Sept 26	Simons	unknown	ASU 10700	POOC
1987 Jul 23	Simons, Bagley	unknown	No	POOC
1989 Jul 03	Bagley	seine	No	POOC
1989 Oct 23	S. Stefferud	unknown	No	POOC
1991 Jan 07	Brown	seine, dipnet	No	POOC
1993 Jul 13	Weedman, J. Young	dipnet	No	None
1994 Jul 19	J. Young, S. Johnson	dipnet, visual	No	None
1996 May 15	Zalaznik, Voeltz	dipnet	No	None

**Failed Sites on BLM Lands in Arizona (continued)**

The spring drainage is a very narrow steep-walled gully that occasionally floods. At the time of stocking, habitat consisted of a short reach of spring-fed stream flow in which a 5-ft (1.5-m) dam had been re-constructed in 1984. A small pool was present above the dam and a plunge pool had formed below the dam. Brown and Abarca (1992) reported that severe flooding in 1990 Aug removed most topminnows from the pool above the dam. Only one topminnow was collected in January 1991. The pool above the dam had silted in, and the only significant pool habitat was in the plunge pool below the dam. The pool above the dam was dredged in spring 1991 to remove accumulated sediment. Topminnows were present in May (BLM data) and August 1991 (M. Sredl pers. comm. *in* Weedman and Young [1997]). In May 1996, the only suitable topminnow habitat was the plunge pool below the dam. The drainage above the dam upstream to the caliche ledge and downstream from the dam for only a few tens of meters consisted of very shallow, muddy pools and trickles. Recent drought conditions eliminated all but one small pool. This site needs to be reevaluated.

**Cow Creek Site #72 (Category 1)**

Yavapai County, Bureau of Land Management, Phoenix Field Office and Private, T7N R1E S6  
 STOCKED: September 1981 with an unknown number of Gila topminnow from Tule Creek originating from Monkey, Cocio, and Bylas springs.

Dates	Surveyor	Methods	Fish
1985 Aug 21	Stringer, Brooks	unknown	POOC, AGCH
1986 Aug 28	Simons	unknown	POOC, AGCH
1989 Jun 25	Bagley	dipnet	POOC, AGCH, LECY
1991 Apr 29	Brown	seine	AGCH
1991 Aug 22	Brown	dipnet, seine	POOC, AGCH, LECY
1992 May 27	Weedman	seine	None
1992 Jun 23	Langhorst	unknown	POOC (above dam)
1993 Mar 25; 1993 May 05; 1993 Jul 16; 1993 Jul 28	(BLM Endangered Species Annual Report 1993)	unknown	No POOC, but likely other species that were unreported
1993 Jul 28	Weedman	dipnet	AGCH
1997 Jun 03	Weedman	seine, dipnet	AGCH, LECY

Cow Creek consists of many miles of stream that has reaches of interrupted perennial water. Topminnows were found downstream in Humbug Creek as a result of dispersal from Cow Creek. Topminnows persisted in Cow Creek possibly until severe flooding in January 1993. The 1993 surveys included all areas formerly occupied by topminnow. The presence of topminnows above

**Failed Sites on BLM Lands in Arizona (continued)**

the dam on 1992 Jun 23 invalidates the previous negative survey result; therefore, this population was resampled in 1997. In 1997, 2.5 miles (4-km) of Cow Creek was sampled. The habitat contained several areas of isolated water that appeared perennial and supported fish. Longfin dace were very abundant in isolated reaches from an old dam near the Crown King Road downstream about one mile (1.6-km). At this point a boulder-formed waterfall creates a fish barrier. Below that, green sunfish were very abundant and longfin dace were less abundant than above. This site needs to be reevaluated.

**Darby Wash Tinaja Site #399 (Category 4)**

Pima County, BLM, Phoenix Field Office, T12S R6W S33 NE4

STOCKED: Discovered 2005 Apr 22. Likely the result of an unauthorized stocking.

Dates	Surveyor	Methods	Fish
2005 Apr 17	Tibbitts	visual	CYER
2005 Apr 29	Voeltz, Duncan, Hughes	seine	CYER
2005 May 5	Hughes	visual	CYER
2005 May 18	Tibbitts	visual	CYER
2005 May 26	Jester	visual	CYER
2005 June 2	Voeltz, Hervatin, Jester	seine	CYER
2005 June 23	Hughes	visual	None (dry)

Organ Pipe National Monument staff reported an observance of pupfish in a tinaja near Ajo, Arizona during April of 2005. This habitat is restricted to one small (5-m x 3-m) pool that does not appear to be perennial. Follow-up surveys confirmed the presence of pupfish. Since their species or origin was unknown, we collected 45 fish (all adults) on 2005 Apr 29 and housed them in two captive locations in Phoenix. On 2005 June 2, we returned and collected 50 additional fish, mostly juveniles. This likely indicated a successful spawn between the April and June visits. 20 specimens were sent to Oklahoma State University for genetic analysis. The results indicated the specimens closely resembled *Sonoyta* pupfish, albeit with significantly reduced allele diversity indicating that they probably resulted from a small founder population. By 2005 June 23, the site was dry. Locals familiar with the site do not believe that this site consistently holds water; therefore it is unlikely to contribute to pupfish recovery.

**Failed Sites on BLM Lands in Arizona (continued)**

**Green Tanks (Rattlesnake Spring) Site #81 (Category 1)**

Gila County, BLM, Safford Field Office and Arizona State Land Department, T3S R15E S7 NE4  
 STOCKED: 1985 Jul 22 with 500 Gila topminnows from Dexter originating from Monkey Spring.

Dates	Surveyor	Methods	Vouchers	Fish
1986	Bamman	unknown	No	"small fish" reported
1987 Mar 18	Simons	unknown	ASU 11411	POOC
1988	Escobedo	visual	No	None
1988 Dec 05	Bagley, Escobedo	visual	No	None
1993 Aug 12	Weedman, Paradzick	dipnet, visual	No	None
1994 Jul 18	J. Young, Johnson	dipnet, visual	No	None

This site consists of 2 pools located below a large dirt stock tank with a high dirt dam. Monitoring conducted in 1986 indicated only "small fish" were present. Topminnows were abundant in 1987. Surveyors in 1988 concluded that the stock tank and both lower pools dried in summer 1987. Discussions were initiated in 1988 with the local rancher to pipe water from Sheep Spring. It is unknown why the project was discontinued. In December 1988, the pools were very shallow. Abundant water and apparently suitable topminnow habitat was observed in 1993 and 1994. Desiccation of the pools is believed to have eliminated topminnow. This site needs to be reevaluated.

**Howard Well Site #83 (Category 2)**

Graham County, Bureau of Land Management, San Simon Resource Area, T11S R29E S36 NW4  
 STOCKED: 1983 Dec 28 with 150 desert pupfish from BTA originating from Santa Clara Slough, and 1985 Jul 22 with 500 Gila topminnows from Dexter originating from Monkey Springs.

Dates	Surveyor	Methods	Vouchers	Fish
1984 Feb 17	Brooks, Kepner	water quality testing	No	No report
1987 Jul 24	Simons, Bagley	dipnet	No	CYMA
1987 Aug	unknown	unknown	No	CYMA
1988 Jan 06	Kepner (reported by Gacey, Simons)	unknown	No	POOC
1988	Gacey	unknown	No	CYMA
1989 Jul 03	Bagley, Gacey	seine	No	CYMA

**Failed Sites on BLM Lands in Arizona (continued)**

**Howard Well Site #83 (continued)**

Dates	Surveyor	Methods	Vouchers	Fish
1990 Nov	Brown	dipnet or seine	No	CYMA
1990 Nov	Dunham	unknown	ASU (no #)	CYMA
1991 Feb 08	Brown	dipnet	No	CYMA
1991 Aug 07	Gacey, J. Simms	water quality testing	No	CYMA
1992 Mar 13	Weedman, J. Simms, S. Stefferud	unknown	No	None collected
1993 Jul 14	Weedman	dipnet	No	None
1994 Dec	J. Simms	unknown	No	unknown
1996 May 15	Zalaznik, Voeltz	visual	No	None

The 1984 survey was conducted to evaluate the habitat for potential topminnow stocking, and to monitor introduced desert pupfish. In 1987, desert pupfish were scarce. Low water or desiccation was the probable reason for failure around 1992. The well was almost completely overgrown with tules, and almost no water was present. Water flow was restored in late 1987. Monitoring efforts in 1988 remain questionable. J. Gacey (BLM biologist, Safford) told Simons a field crew reported topminnows abundant and pupfish absent. Simons suggested mosquitofish may have invaded Howard Well from nearby, heavily infested Martin Well, and the field crew may have misidentified the topminnows (Simons memo, 1988 Jan 7). However, no subsequent topminnow or mosquitofish collections were made. The field crew most likely went to Martin Well, which is located in the vicinity of Howard Well.

BLM dredged Howard Well in 1988 to reduce cattail growth (J. Gacey pers. comm. in Weedman and Young [1997]). In 1989, pupfish were abundant (mostly juveniles), and more than 20 bullfrogs were observed. Vegetation was thick and a constant maintenance concern. In 1990, moderate numbers of pupfish were reported. In 1991, small pupfish were present in low numbers, but concentrated at the southern end of the well in an area with no bullfrogs. Bullfrogs and tadpoles were numerous. AGFD, BLM, and USFWS met at Howard Well in 1992 to discuss habitat management and sample for pupfish. The well was overgrown with cattails, very shallow, and bullfrogs were very abundant. Jeff Simms (BLM Tucson) reported that in December 1994 artesian flow was diminishing. All ponds fed by artesian wells in that area were having the same problem, possibly due to water table depletion by deep agricultural wells near Bowie. In 1996, leopard frogs (probably misidentified bullfrogs) were abundant and the water was very shallow.

Howard Well has a documented history of cattail growth problems coupled with often low water levels. Also, most local aquatic areas contain illegally stocked nonnative fishes. If Howard Well

**Failed Sites on BLM Lands in Arizona (continued)**

is completely renovated, it is possible that this area would also be illegally stocked. This site needs to be reevaluated.

**Humbug Creek Site #95 (Category 4)**

Yavapai County, Bureau of Land Management, Phoenix District, T7N R1E S6, 7, 8, & 17

STOCKED: The site became populated by Gila topminnow after 1982 when they dispersed from Cow Creek, which was stocked with Gila topminnow from BTA.

Dates	Surveyor	Methods	Vouchers	Fish
1987 Mar 06	Simons, Schwalbe	unknown	No	POOC, GAAF, LECY
1989 Jun 25	Bagley, Clark	seine	No	POOC, AGCH, LECY, CYLU
1991 Mar 18	Brown, Williams	seine, dipnet	No	LECY
1991 Apr 30	Brown	unknown	ASU 12831-33	AGCH, CYCA, LECY, GAAF, CYLU
1991 Aug 22	Brown, Williams	dipnet	No	LECY
1992 May 27	Weedman, J. Young	seine	No	AGCH, LECY
1993 Jul 28	Weedman, Paradzick	dipnet	No	AGCH, LECY

Humbug Creek is deeply incised in places with good riparian cover present in others. Substrates were mostly bedrock and cobble with sand, gravel, and silts in pool habitats. Water is perennial for an unknown distance before reaching Lake Pleasant. Some perennial water must be present throughout the year in either Cow or Humbug creeks to maintain longfin dace. Only one green sunfish was found in March 1991, and only small sunfish was taken in August 1991. BLM, Phoenix Resource Area, Endangered Species Subpermit Report for 1993 reported "extreme flooding" occurred in the area in January 1993. This site needs to be reevaluated.

**Little Nogales Spring Site #125 (Category 3)**

Pima County, BLM, Tucson Field Office, T18S R18E S11

STOCKED: 1988 Aug 19 with 172 Gila topminnows from Cienega Creek, near Sanford Canyon.

Dates	Surveyor	Methods	Fish
1989 Sept 12	Bagley	dipnet	POOC
1991 Apr 01	Brown	dipnet	None
1992 Jun 18	Weedman, J. Young, S. Stefferud	dipnet	None

**Failed Sites on BLM Lands in Arizona (continued)**

**Little Nogales Spring Site #125 (continued)**

Dates	Surveyor	Methods	Fish
1994 Jul 21	J. Young, Johnson	dipnet	None
2005	Simms, Foster	dipnet	None

The spring is a tributary to Wakefield Canyon that then drains into Cienega Creek. The drainage is steep, fairly narrow, and overgrown with vegetation. Surface water is present at least 650-ft (200-m) below the source, and a 10-ft (3-m) drop is present about 330-ft (100-m) below the source. Some travertine formations were present. A waterfall prohibits fish movement above the stocking site. The aquatic habitat is mostly swift, shallow riffles with few pools present. In 1989, surface water flowed for at least 3/4 mile (1.2-km) below the windmill, but only 30 adult topminnows were collected. The spring should be restocked with topminnows from Cienega Creek.

**Martin Well Site #132 (Category 4)**

Graham County, BLM, Safford Field Office, T11S R29E S36 NW4 SW4

STOCKED: Topminnows were discovered in 1989, their origin is unknown.

Dates	Surveyor	Methods	Vouchers	Fish
1986 Sept 26	Simons	unknown	ASU 10694	GAAF
1989 Jul 03	Bagley	seine	Yes	POOC, GAAF, LECY
1991 Feb 08	Brown	seine	ASU 12835 & 12834	GAAF, LECY
1993 Jul 14	Weedman, Paradzick	dipnet	ASU 14217	GAAF, LECY
1994 Jul 19	J. Young, Johnson	dipnet	No	GAAF

Martin Well is a large pond fed by an artesian well. There is no apparent natural outflow from the pond, but the well feeds several cattle drinkers. Aquatic vegetation and cattails were dense. The ASU Museum of Fishes catalog contains mosquitofish specimens collected on 1986 Sept 29 by Simons. However, neither Simons field notes, nor AGFD files contain any further information. One topminnow was found when preserved fish were identified in a lab in 1989. It is unknown where the topminnow came from, but it is likely that some individuals were illegally moved from Howard Well, 1/2 mile (800-m) to the north, before 1989. About 500 mosquitofish and no topminnow were identified in 1991. In 1993, 112 mosquitofish were preserved along with one green sunfish. In 1994, 153 mosquitofish were identified. In 1993, the pond was reported as being 160-ft by 100-ft (50-m by 30-m), and in 1994 as 130-ft by 80-ft (40-m by 25-m) with noted cattail removal. In 1990, Al Bamman (pers. comm. *in* Weedman and Young [1997])

**Failed Sites on BLM Lands in Arizona (continued)**

indicated that illegal nonnative fish stockings into the pond were a constant concern. Martin Well became a topminnow site based on the discovery of one specimen. This site needs to be reevaluated.

**Mescal Warm Spring Site #82 (Category 2)**

Gila County, Bureau of Land Management, Phoenix District, T3S R17E S20 NW4 SW4  
 STOCKED: 1985 Jul 22 with 500 Gila topminnows from Dexter National Fish Hatchery originally from Monkey Spring.

<b>Dates</b>	<b>Surveyor</b>	<b>Methods</b>	<b>Fish</b>
1987	Simons	unknown	POOC
1989 Jul 08	Bagley	dipnet	POOC
1991 May 22	Brown	dipnet	POOC
1992 Feb	BLM Biologists	unknown	None
1992 Aug	BLM Biologists	unknown	None
1994 Jul 18	J. Young	dipnet/visual	POOC
1996 Sept 05	Weedman	dipnet	POOC (n=1)
2001 Jun 28	Davidson	dipnet	None
2003 Apr 28	Voeltz, Brouder	dipnet	None

Mescal Warm Spring is located on a small mesa located above Mescal Creek near the Gila River. The spring surfaces near two large cottonwoods inside a cattle enclosure and flows through thick grass and riparian vegetation before going subsurface near the edge of the mesa where it drops into Mescal Creek. Sampling is very difficult in the thick brush, the water is very shallow, less than 4 inches (10-cm) deep and no pools were found. Topminnows were either very rare or too difficult to sample because few were captured in 1994, only one was collected in 1996, and none were captured in 2001 or 2003. There is a perennial stream east of the mesa that, although rather steep, could provide better habitat. It has several plunge pools and small travertine dams present and also flows into Mescal Creek, which should also be evaluated for reestablishment. Digging of small pools may provide additional habitat for topminnow.

**Failed Sites on BLM Lands in Arizona (continued)**

**Mesquite Spring Site #129 (Never Categorized)**

Pinal County, Bureau of Land Management, Phoenix Field Office, T3S R11E S21 SE4 SW4  
 STOCKED: 1983 Dec 28 with 200 desert pupfish from BTA originally from Santa Clara Slough.  
 Failed and attempted restocking on 1991 Oct 10 with 100 pupfish from BTA.

Dates	Surveyor	Methods	Fish
1984 Oct	BLM Phoenix Field Office biologist	unknown	CYMA
1989 Jul 02	Bagley	seine	None
1991 Aug	Pool dredged and enclosure fencing repaired and replaced		
1992	BLM	unknown	None
1993 Jul 12	Weedman	dipnet	None
1993 Nov 24	BLM	unknown	None
1994 Jul 05	Weedman	dipnet	None

Cause of the failure of this site between 1984 and 1989 is unknown. In 1991 the pond was dredged, vegetation removed and enclosure fencing removed. Following this work, desert pupfish were again stocked. Two hundred pupfish were transported to the spring but when the first 100 were stocked they immediately began exhibiting stress. The other 100 were returned to the arboretum pond. Low oxygen levels were believed responsible for loss of all 100 pupfish stocked. This site needs to be reevaluated.

**Nogales Spring Site #124 (Category 3)**

Pima County, BLM, Tucson Field Office, T18S R18E S11  
 STOCKED: 1988 Aug 19 with 258 Gila topminnows from Cienega Creek.

Dates	Surveyor	Methods	Fish
1989 Sept 12	Bagley	dipnet	POOC
1991 Apr 01	Brown	dipnet	None
1992 Jun 18	Weedman, J. Young, S. Stefferud	dipnet	None
1994 Jul 21	J. Young, Johnson	dipnet	None
2005	Simms, Foster	dipnet	None

The spring drains into Wakefield Canyon and then into Cienega Creek. The watershed above the spring is relatively small. The drainage is steep, narrow, and completely overgrown, primarily

**Failed Sites on BLM Lands in Arizona (continued)**

with thick acacia-mesquite. The substrate is mostly bedrock and stream flow is swift and shallow. Dense vegetation precludes intensive downstream surveying, thus surface water flows for an unknown distance downstream. Topminnows were stocked into the pools below two different travertine falls below the springhead. A small dense population was present in 1989 at the 13-ft by 10-ft by 2-ft (4-m by 3-m by 0.6-m) and 10-ft by 10-ft by 16-in (3-m by 3-m by 0.4-m) stocking sites. Topminnows may have been eliminated by flooding or temperature extremes. Construction of pools should be investigated and topminnows from Cienega Creek restocked.

**Pupfish Spring Site #120 (Never Categorized)**

Yavapai County, Bureau of Land Management, Phoenix District, T7N R1W S18 NE4 NE4  
 STOCKED: 1977 Nov 2 with 15 desert pupfish from BTA originating from Santa Clara Slough

This site was also known as Garfias Wash and is located northwest of Lake Pleasant. Minutes from the September 1979 desert pupfish working group meeting indicate that flooding eliminated pupfish. A survey was conducted on 1997 May 28 and included about 3-mi (5-km) of dry wash and narrow bedrock canyons with isolated pools and little surface flow. No fish were collected and the wash appeared to be very flood prone and unsuitable for either topminnows or pupfish. This spring will be resurveyed again and evaluated for extirpation under the established criteria.

**Tule Creek (Unnamed Spring 1E) Site #74 (Category 3)**

Yavapai County, Bureau of Land Management, Phoenix Resource Area, T8N R1E S28 SW4  
 STOCKED: 1982 with Gila topminnow from Tule Creek (Site #75) that came from BTA.

Dates	Surveyor	Methods	Vouchers	Fish
1985 Jun 06	Brooks, Stringer	unknown	No	POOC
1986 Aug 28	Simons	unknown	ASU 10665	POOC
1987 Mar 06	Simons	unknown	No	POOC
1989 Jun 24	Bagley	dipnet	No	None
1991 Apr 30	Brown	dipnet	No	None
1993 Jul 28	Weedman	dipnet	No	None
1998 May 15	Timmons	dipnet, visual	No	None
2004 Feb 17	Voeltz, Bettaso	Visual	No	None

In 1985-1987, topminnows were found in a small 3-ft by 3-ft (1-m by 1-m) pool in a small drainage to Tule Creek. Additional water upstream does not have topminnow. In 1998, perennial habitat was limited and cattle impacts were heavy. In 2004, there was very limited surface flow; this site should not be pursued as a reestablishment site at this time.

**Failed Sites on BLM Lands in Arizona (continued)**

**Tule Creek Seep (2E) Site #73 (Category 3)**

Yavapai County, Bureau of Land Management and Private, T8N R1E S28 SW4 SE4

STOCKED: 1982 with an unknown number of Gila topminnow from Tule Creek originally from BTA.

Dates	Surveyor	Methods	Fish
1985 Jun 06	Brooks, Stringer	unknown	POOC
1986 Aug 28	Simons	dipnet	None (almost dry)
1987 Mar 06	Simons	dipnet	None (almost dry)
1989 Jun 24	Bagley, Clark	visual	None (dry)
1991 Apr 30	Brown	dipnet	None
1993 Jul 28	Weedman	dipnet	None
1998 May 15	Timmons	dipnet	None
2004 Feb 17	Voeltz, Bettaso	visual	None (dry)

In 1985, topminnows occupied 2 pools in Tule Creek Seep (2E). Heavy cattle use was observed. In 1993, the grazing seepage area was muddy with no pools present. This site does not maintain sufficient water to support fish in dry years (Brown and Abarca 1992; Voeltz and Bettaso 2003), and should not be pursued as a reestablishment site at this time.

**Watson Wash Site #134 (Category 4)**

Graham County, Bureau of Land Management, Safford Field Office, T6S R25E S23 NW4

STOCKED: Gila topminnow were discovered here on 1989 Jul 6 as a result of an undocumented stocking although their origin is likely from BTA (Hedrick and others 2001). In addition, Jim Brooks (pers. comm. *in* Hedrick and others [2001]) thought that BLM personnel stocked Watson Wash in the late 1980s using fish from BTA.

Dates	Surveyor	Methods	Fish
1989 Jul 06	Bagley	seine	POOC, CYLU, PORE
1990 Aug 08	Abarca, S. Stefferud	unknown	POOC plus others
1991 Jan 07	Brown	dipnet	POOC, CYLU, PORE
1993 Jul 13	Weedman	dipnet	POOC, PORE
1994 Jul 19	J. Young	dipnet	POOC, PORE
1995	J. Simms	unknown	POOC, PORE

**Failed Sites on BLM Lands in Arizona (continued)**

**Watson Wash Site #134 (continued)**

<b>Dates</b>	<b>Surveyor</b>	<b>Methods</b>	<b>Fish</b>
1996 Sept 04	Weedman	dipnet	POOC, PORE
1997 Jul 31	AGFD interns	dipnet	POOC, PORE
1998 Jun 17	Timmons	dipnet	POOC, PORE
1998 Oct 28	Weedman, Duncan, Simms	dipnet, seine	POOC, CYLU, GAAF, PORE
1999 Jul 17	Weedman, Robles	dipnet, seine	GAAF, PORE
2000 Jul 13	Jontz, R. Billingsley	dipnet	GAAF, PORE
2003 Apr 02	Voeltz, Bettaso	dipnet, seine	GAAF, PORE
2004 Apr 16	Billingsley	dipnet	GAAF, PORE

Watson Wash is a thermal artesian well with surface flow for several hundred meters before drying. The well was drilled illegally in the 1950s. Guppies were first found in 1984 but topminnows were not detected until 1989, as were red shiners. Their origins were unknown. This well is the focus of intensive recreational use. In 1993 a masonry tub was illegally constructed for recreational use. Between 1999 and 2003 only guppies and mosquitofish have been collected. BLM has discussed a variety of management options for the Watson Wash area, including capping the well and drying the habitat.

Appendix B. Results of monitoring of natural populations of Gila topminnow from October 2004 through December 2005 on BLM lands in Arizona.

Site # and Site Name	Date Sampled	Fish species present	Comments on sampling effort, abundance, and habitat conditions
#5 Cienega Creek	2005 May 18	AGCH, POOC, GIIN	POOC common at Mattie Canyon; AGCH and GIIN observed in deeper pools

Appendix C. Results of monitoring of reestablished populations of Gila topminnow and desert pupfish on BLM lands in Arizona during October 2003 through October 2004.

Site #, Site Name, Category, and Species Stocked (Origin)	Date Sampled	Fish species present	Comments on sampling effort, abundance, and habitat conditions
Cold Springs (#85), Category 2, POOC (Monkey Spring) and CYMA (Santa Clara Slough)	2005 Mar 11	POOC, CYMA	Both species abundant
	2005 May 16	POOC, CYMA	BLM recently removed <i>Tamarisk</i> and dredged the upper pond to improve the habitat
Darby Wash Tinaja (#399), Category 4, CYER (unknown)	2005 Apr 17	CYER	Pupfish documented based on report from general public
	2005 Apr 29	CYER	Approximately 45 pupfish taken to two captive sites in Phoenix
	2005 May 5	CYER	Water levels beginning to drop
	2005 May 18	CYER	Water levels continuing to drop
	2005 May 26	CYER	Water levels continuing to drop
	2005 June 2	CYER	Approximately 50 pupfish taken into captivity – 20 sent to Oklahoma State University for genetic tests; results resemble Sonoyta pupfish
	2005 June 23	None (dry)	Only damp sand remains
Empire Gulch (#339), Category 2, POOC (Cienega Creek)	2004 Nov 8	POOC, AGCH	Habitat covered with duckweed, only 6 topminnows collected
	2005 May 18	AGCH	Pools covered with duckweed and watercress; topminnows not collected
Larry Creek tributary (#307), Category 1, POOC (Coal Mine Spring)	2005 Oct 26	POOC, GIIN	Stocked 600 Gila topminnows from Coal Mine Spring
	2005 Dec 8	POOC, GIIN	Topminnows present in many pools
Lousy Canyon (#306), Category 1, POOC (Coal Mine Spring) and CYMA (Imperial and Cibola NWR)	2005 Mar 24	POOC	Topminnow numbers reduced; pupfish appear to be absent, possibly due to extreme winter floods; did not hike below falls to look for GIIN
	2005 Oct 17	POOC, GIIN	Topminnow abundant; GIIN common below falls

Appendix C (continued).

Site #, Site Name, Category, and Species Stocked (Origin)	Date Sampled	Fish species present	Comments on sampling effort, abundance, and habitat conditions
Parsons Grove Spring (#382), Category 2, POOC (Bylas Spring) and CYMA (TNC San Pedro Preserve)	2005 Oct 13	POOC, CYMA	Stocked 50 Gila topminnows from Bylas Spring and 50 desert pupfish from TNC's San Pedro Preserve
	2005 Nov 1	None	Visual survey, cold weather; not surprising that no fish observed
Tule Creek (#75), Category 1, POOC (BTA)	2005 Feb 17	POOC	Site looks good after wet winter and subsequent floods
Yerba Mansa (#44), Not categorized, POOC (BTA, Sharp Spring) and CYMA (Santa Clara Slough)	2005 Mar 22	None	<i>Typha</i> covering 100% of shoreline; no way to sample; need to resurvey and get to inner area of pond with open water