

GILA TOPMINNOW AND DESERT PUPFISH MANAGEMENT ACTIVITIES ON BLM LANDS IN ARIZONA: 2007-2008 REPORT

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GILA TOPMINNOW AND DESERT PUPFISH MANAGEMENT ACTIVITIES ON BLM LANDS IN ARIZONA – 2007-2008 REPORT

INTRODUCTION

The Arizona Game and Fish Department (AGFD) manages Gila topminnow (*Poeciliopsis occidentalis*) and desert pupfish (*Cyprinodon macularius*) under funding provided by AGFD, the Bureau of Land Management (BLM), the U.S. Fish and Wildlife Service (USFWS), and other agencies. In October 2007, the U.S. Bureau of Land Management (BLM) and AGFD extended a Task Order providing funds to AGFD to monitor and manage topminnow and pupfish populations on BLM lands through September 2008.

This report covers management activities relating to Gila topminnow and desert pupfish on BLM lands from October 2007 through September 2008, and a summary of the status of populations of both species on BLM lands, and on lands cooperatively managed by BLM. Background information about the species and the 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 comprise the first 2 letters of the genus and first 2 letters of the specific epithet (Table 1).

Table 1. Species abbreviations.		
Abbreviation	Scientific Name	Common Name
AGCH	<i>Agosia chrysogaster</i>	longfin dace
AMNA	<i>Ameiurus natalis</i>	yellow bullhead
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

Management activities for Gila topminnow and desert pupfish populations covered in this report occurred on BLM lands in Arizona between the beginning of October 2007 and the end of September 2008. Monitoring efforts for these two species usually occurs between the months of April and November, in an effort to maximize the probability of detecting topminnow and pupfish at localities with few individuals present in complex habitats. Sampling was done by qualified biologists using dipnets, seines, minnow traps, or backpack electrofishing units, as determined appropriate for the habitat being sampled. Mesh size for seines and dipnets was typically 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.

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. Activities occurred during 2007 and 2008, as collaborative efforts between AGFD, BLM and other cooperators. Data collected included identification of fish species present, general description of the site, qualitative estimate of vulnerability to flooding, identification of other entities or individuals to be included into the process, estimated size of available habitat, evidence of human activities, qualitative description of the condition of the aquatic and riparian communities, potential threats to topminnow 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 2007 through September 2008 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 natural populations of Gila topminnow remaining 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).

Topminnow 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. There are no natural populations of Sonoyta pupfish (*Cyprinodon eremus*) on BLM lands.

STATUS OF REESTABLISHED POPULATIONS ON BLM LANDS IN ARIZONA

Gila Topminnow. A total of 28 sites on BLM land in Arizona have been stocked with Gila topminnow (Voeltz 2006; AGFD files; Appendix A). Seven extant reestablished localities and one extant natural locality were monitored from October 2007 through September 2008 on BLM lands in Arizona (see Appendices A-C for summary of results). Of the 10 extant sites (1 natural, 9 reestablished) considered to support Gila topminnow on BLM lands in Arizona, the Yerba Mansa site is outside of the historic range for the species.

Desert Pupfish. A total of 17 sites on BLM land in Arizona have been stocked with desert pupfish (Voeltz 2006; AGFD files). Six confirmed extant reestablished localities on BLM land were monitored from October 2007 to September 2008. Four sites were stocked between September of 2007 and October of 2008, however the status of these stockings remains undetermined at this time (see Appendix C for summary of results).

Sonoyta Pupfish. Antelope Tank (T21S, R18E, Sec. 16, NE4), a site on BLM-administered lands within the boundary of the Appleton-Whittell Research Ranch (managed by the National Audubon Society) contains Sonoyta pupfish, stocked in the recent past with fish originally from nearby Finley Tank. Once thought to be hybrids between Sonoyta and desert pupfishes, results from genetic studies by Echelle et al. (2007) indicate this population is comprised entirely of Sonoyta pupfish from the Rio Sonoyta in Sonora, Mexico. A cooperative effort between the Research Ranch management, BLM, USFWS, and AGFD is underway to remove Sonoyta pupfish from the property, and replace them with desert pupfish.

An illegal stocking of Sonoyta pupfish in a tinaja at Darby Wash near Ajo, Arizona was reported by Organ Pipe National Monument staff to AGFD, BLM, and USFWS on April 22, 2005. The source of the stocking is unknown, but genetic examination identified them as *Cyprinodon eremus* of the Quitobaquito lineage, and severely bottlenecked. The site had dried and all pupfish had perished by June 23, 2005; due to the sites ephemeral nature, no attempt will be made to reestablish a population there.

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, 2006 and 2007. Where appropriate, coordination to stock topminnow and pupfish at sites identified as suitable is continuing.

Table 2. Locations to be 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. NEPA process currently underway. Stock CYMA when compliance is complete.
Buckhorn Spring #2	BLM, Phoenix Office	T8N R2W Sec 28	2004. Reevaluate. As of 2007, Section 7 consultation and NEPA are still in progress. The area has been fenced to protect the riparian area. This stream may be too high-gradient and narrow for either POOC or CYMA, and should be reevaluated (J. Simms, Pers. Comm.).
Don Levy Artesian #2	BLM, Tucson Office	T18S R21E Sec 21	2005. 2006. Currently unsuitable. Shallow habitat needs pond development. Deepen pond, stock with POOC and CYMA when NEPA and Section 7 complete.
Don Levy Artesian #3	BLM, Tucson Office	T18S R21E Sec 21, 28	2005. 2006. Currently unsuitable. Shallow habitat needs pond development. Deepen pond, stock with POOC and CYMA when NEPA and Section 7 complete.
Don Levy Artesian #4	BLM, Tucson Office	T18S R21E Sec 21, 28	2005. 2006. Currently unsuitable. Shallow habitat needs pond development. Deepen pond, stock with POOC and CYMA when NEPA and Section 7 complete.
Frog Spring	BLM, Tucson Office	T19S R21E Sec 20	2005. Suitable; but in actively eroding arroyo. NEPA process currently underway.
Horse Thief Spring	BLM, Tucson Office	T21S R21E Sec 36	2005. 2007. Suitable. Semi-stable erosive arroyo. NEPA process currently underway.
Kolbe Artesian	BLM, Tucson Office	T23S R22E Sec 22	2006. Currently unsuitable. Shallow habitat needs pond development. Develop aquatic habitats, stock with POOC and CYMA when NEPA and Section 7 complete.
Lewis Seeps and Spring B	BLM, Tucson Office	T21S R22E Sec 30	2005. Habitat currently unsuitable; open water needs to be developed. Suitability for development under review.
Lewis Seeps and Spring C	BLM, Tucson Office	T21S R22E Sec 30	2005. Habitat currently unsuitable; open water needs to be developed. Suitability for development under review.
Lewis Seeps and Spring D	BLM, Tucson Office	T21S R22E Sec 30	2005. Habitat currently unsuitable; open water needs to be developed. Suitability for development under review.
Lewis Seeps and Spring D(2)	BLM, Tucson Office	T21S R22E Sec 30	2005. 2006. Currently unsuitable; open water needs to be developed. Suitability for development under review.
Lewis Seeps and Spring G(1)	BLM, Tucson Office	T21S R22E Sec 29	2005. Habitat currently unsuitable; open water needs to be developed. Suitability for development under review.
Lewis Seeps and Spring G(2)	BLM, Tucson Office	T21S R22E Sec 29	2005. Habitat currently unsuitable; open water needs to be developed. Suitability for development under review.

Table 2. Locations to be 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 Spring G(3)	BLM, Tucson Office	T21S R22E Sec 29	2005. Habitat currently unsuitable; open water needs to be developed. Suitability for development under review.
Lewis Seeps and Spring H	BLM, Tucson Office	T21S R22E Sec 29	2005. Habitat currently unsuitable; open water needs to be developed. Suitability for development under review.
Lewis Seeps and Spring J (Katie Spring)	BLM, Tucson Office	T21S R22E Sec 29	2005. Habitat currently unsuitable; open water needs to be developed. Suitability for development under review.
Lewis Seeps and Springs K(1)	BLM, Tucson Office	T21S R22E Sec 29	2005. Habitat currently unsuitable; open water needs to be developed. Suitability for development under review.
Lewis Seeps and Springs K(2)	BLM, Tucson Office	T21S R22E Sec 29	2005. Habitat currently unsuitable; open water needs to be developed. Suitability for development under review.
Lewis Seeps and Spring South	BLM, Tucson Office	T21S R22E Sec 29	2005. Reevaluate. Small habitat in wash bottom previously considered suitable. According to BLM personnel, high likelihood of periodic drying. Reevaluate prior to summer rains.
Lewis Spring North (aka Government Draw)	BLM, Tucson Office	T21S R22E Sec 29, 30	2005. Reevaluate. Previously considered unsuitable, spring is on steep slope. Conversations with BLM personnel suggest a reevaluation of site is appropriate.
Little Joe Spring	BLM, Tucson Office	T18S R21E Sec 29	2007. Complete NEPA process and Sec. 7 compliance. Survey species composition and determine feasibility of renovating adjacent St. David Cienega. Install cattle-proof fence and frog fence, eradicate bullfrogs from enclosure. Install public information kiosk re: native species. Stock POOC and CYMA, perhaps GIIN.
Little Nogales Spring	BLM, Tucson Office	T18S R18E Sec 11	2007. Prohibitively high CO ₂ at source, and through additional portions of the wetted reach; evaluate water quality farther downstream, and if suitable, complete NEPA compliance and Sec. 7 consultation.
McDowell-Craig Pond	BLM, Tucson Office	T23S R22E Sec 22	2005. 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. 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	2007. High CO ₂ at source; evaluate water quality further downstream, and if suitable, complete NEPA process and Sec. 7 consultation.
Posey Well	BLM, Safford Office	T12S R29E Sec 1	2007. Currently unsuitable. Enlarge pool size, maintain and/or improve (deepen) well at Posey to increase flow. Monitor water flow and fence. Sec. 7 consultation initiated in early 2007, with BO issued in November 2007. Complete improvements and stock with POOC and/or CYMA if sufficient habitat available for both spp.

Table 2. Locations to be evaluated for Gila topminnow or desert pupfish reestablishment on BLM lands in Arizona.			
Site Name	Management Agency	Location	Date evaluated, recommendations, and comments
Post Canyon	BLM, Tucson Office	T21S R18E Sec 28	2005. Site is a slot canyon with limited water. Reevaluate for suitability for topminnow and pupfish. Renovate to remove non-natives. Initiate NEPA and Section 7 processes. If site is found suitable, stock POOC and CYMA.
Road Canyon Tank	BLM, Tucson Office	T19S R17E Sec 36	2005. On State Land leased to BLM. Ponds used regularly by Pronghorn. Current plans are to deepen pools, install fencing to control cattle access. NEPA process and Sec. 7 consultation underway. Stock CYMA, then follow-up in 1 – 1.5 years with CYMA augmentation and POOC stocking (Cienega Creek lineage).
Silver Creek	BLM, Phoenix Field Office	T10N R3E Sec 11 & 12	2007. Examined lower reach of stream (below natural barrier to confluence of Agua Fria River) as potential site for fish barrier and habitat for pupfish and Gila chub. Currently unsuitable.
Tule Creek	BLM, Phoenix Field Office	T8N R1E Sec 28	2005. 2007. Stock CYMA. Tule Creek has supported a large population of POOC since their restocking in 1981. NEPA process and Section 7 consultation completed. CYMA stocked on Sep. 19, 2007.
Virgus Canyon at Sycamore Canyon Confluence	BLM, Safford Office	T7S R18E Sec 10	2002. Stock POOC and CYMA. Paperwork is complete for stocking. Reevaluate this site for stocking POOC and CYMA. If site is deemed suitable for these species, stock using fish from nearby TNC Lower San Pedro River Preserve at Dudleyville.
Whitehouse Well	BLM, Tucson Office	T23S R22E Sec 16	2006. 2007. Currently unsuitable. Initial planning for pond development and NEPA compliance are underway for pond development and future stocking.

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 habitats, 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 can only succeed through reestablishing populations in the wild.

Arizona Game and Fish Department proposes to pursue reestablishment and management activities on BLM lands at sites previously identified as suitable, and at other sites identified as suitable in the future. AGFD will assist BLM in completing 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 sites 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. Consultations may be done on a site-by-site basis, watershed basis, allotment or management unit basis, or any other basis deemed practical.

Planning for downlisting of the species requires more sites be stocked than are required by the respective Recovery Plans, to allow for unanticipated disappearance of one or more populations. Potential reestablishment sites should continue to be identified and critically evaluated (from the perspective of species habitat requirements) in the future, in the event that reestablished populations fail, or do not maintain suitably large numbers to count towards recovery. Potential sites should be evaluated during the driest period of the year to determine whether water supplies are perennial, and if suitable habitat persists throughout the year.

OTHER GRANT-RELATED ACTIVITIES

As a non-federal match for BLM funding under this agreement, the AGFD Native Fish and Invertebrate Program Manager, Jeff Sorensen (salary funded by hunting and fishing license revenues), provided administrative support, coordination, and project planning for topminnow and pupfish activities on BLM lands. Specifically, Jeff reviewed and commented on environmental assessments, NEPA and ESA compliance documents, project implementation and monitoring plans, project reports, and correspondence on topminnow and pupfish projects for the Muleshoe Ecosystem Cooperative Management Area, Bonita Creek, Cienega Creek (including Clyne Pond/Northwest Reservoir renovation needs), Tule Creek, and Howard and Posey wells. Jeff participated in Gila River Basin Native Fish Conservation Program committee meetings which involved most of the above mentioned topminnow and pupfish project sites. He also helped with the pupfish collections, transport, and stocking of Howard Well in July 2008. Some of the field supplies for the planned October 2008 Bonita Creek chemical renovation were also purchased with funds under this agreement.

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APPENDICES

Appendix A. Summary of reestablishment efforts for Gila topminnow and desert pupfish on BLM lands in Arizona.

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Howard Well Site #83 18

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Lousy Canyon Site #306 20

Oak Grove Canyon Site #363 22

Parsons Grove Spring Site #382 23

Swamp Springs Canyon Site #406 24

Tule Creek Site #75 25

Yerba Mansa Site #44 27

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Little Nogales Spring Site #12 34

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Reestablished localities that Support Gila Topminnow or Desert Pupfish on BLM lands in Arizona

Cherry Spring Canyon Site #405

Cochise County, Bureau of Land Management, Safford Field Office, T12S R20E S3 NW4

STOCKED: October 04, 2007 with 264 Gila topminnow from the Arizona State University Animal Care Facility (Bylas Spring lineage); October 04, 2007 with 246 desert pupfish, from TNC Lower San Pedro River Preserve (LSPRP) at Dudleyville. Augmentation stocking on September 17, 2008 with 275 Gila topminnow and 246 desert pupfish, both from LSPRP.

Dates	Surveyor	Methods	Fish
Oct 04, 2007	Timmons, Ehret, Bacorn	stocking	POOC (n=264), CYMA (n=246)
Nov 05, 2007	Blasius, Richardson	dipnet	POOC (n=4), CYMA (n=2)
Apr 08, 2008	Robinson	seine, dipnet, minnow traps	POOC (n=1) CYMA (n=5)
Sept 16, 2008	Timmons, McDonough	visual, seine, minnow traps	POOC (n=8)
Sept 17, 2008	Timmons, Haberstich	stocking	POOC (n=275) CYMA(n=275)

Cherry Springs Canyon is located on the western slope of the Galiuro Mountains, with the perennial portion located in the upper 1/3 of the drainage, within the boundaries of the Muleshoe Ranch Cooperative Management Area. Cherry Springs Canyon is a tributary of Soza Wash, which in turn is tributary to the San Pedro River. The stocking site is the only location in the drainage with a dependable water supply during the driest times, and is comprised of two adjacent spring pools, one immediately upstream of the other. Both pools are heavily shaded; the upper pool receives little to no direct sunlight during most of the day, and substrates are comprised almost entirely of decayed organic materials. The lower pool receives varying amounts of broken sunlight throughout the day, with substrates comprised largely of gravel and decayed organic materials. While the water supply appears dependable in both pools, low productivity and large amounts of decaying organic materials may be insufficient to sustain a viable population of either topminnow or pupfish for a prolonged period of time.

Cherry Spring Canyon (cont.)

On October 4, 2007, 264 topminnow and 246 pupfish were stocked into the pools at Cherry Springs Canyon. The upper pool (the more heavily shaded of the two) received 134 topminnow and 98 pupfish, while the lower pool, which was perceived to be the better habitat, received 130 topminnow and 148 pupfish. The lower pool is the larger of the two and appears to have the greater chance of sustaining a population. Monitoring 6 months after stocking found only two desert pupfish in the upper pool, and one Gila topminnow and three desert pupfish in the lower pool. On September 16, 2008 during the one year monitoring, no fish were seen or sampled in the upper pool, while a total of eight topminnow were sampled in the lower pool; seven of the eight topminnow sampled in the lower pool were juveniles. No pupfish were seen or sampled in either pool. On September 17, 2008 topminnow (n=275) and pupfish (n=275) were again stocked at this location, all of the fishes being stocked in the lower pool. All fishes were tempered for approximately 45 minutes prior to release, with both topminnow and pupfish appearing to behave normally during the 30 minutes following their release. Consideration should be given to removing some of the vegetation surrounding the lower pool, allowing greater light penetration and higher productivity within its waters.

Cold Springs Site #85

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

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

Dates	Surveyor	Methods	Fish
Aug 07, 1990	S. Stefferud	unknown	POOC, CYMA
Feb 10, 1991	Brown	dipnet	POOC
Feb 12, 1993	Robles	visual	POOC, CYMA
May 14, 1993	Robles	visual	POOC, CYMA
Jul 13, 1993	Weedman	dipnet	POOC, CYMA
Aug 05, 1993	Robles	visual	POOC, CYMA
Nov 18, 1993	Robles	visual	POOC, CYMA
May 15, 1996	Zalaznik, Voeltz	dipnet	POOC, CYMA
Jun 17, 1998	Timmons	dipnet, seine	POOC, CYMA, CYLU
Oct 07, 1998	Timmons, Weedman	dipnet	POOC, CYMA, CYLU
Jun 17, 1999	Weedman, Robles	seine	POOC, CYMA
Jul 13, 2000	Jontz, R. Billingsley	dipnet	POOC, CYMA
Mar 21, 2001	Blasius	visual	POOC, CYMA
Apr 29, 2002	Blasius	visual	POOC, CYMA
Apr 02, 2003	Voeltz, Bettaso	dipnet	POOC, CMYA
Apr 16, 2004	Billingsley	visual	POOC, CYMA
Mar 11, 2005	Blasius	dipnet	POOC, CYMA
May 16, 2005	Blasius	dipnet	POOC, CYMA
May 18, 2006	Blasius	dipnet, minnow trap	POOC, CYMA
May 04, 2007	Timmons, Blasius	dipnet, visual	POOC (n=93), CYMA (n=5)
Mar 04, 2008	Blasius	visual	POOC, CYMA

Cold Springs Site #85 (cont.)

Cold Springs consists of 2 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. Topminnow were originally stocked only in the upper pool, which appeared to provide more reliable and suitable habitat. By 1989, topminnow were present in both pools. Pupfish were then stocked into both pools in 1990. In 1998, red shiners were collected (their origin is unknown). Mechanical removal via seines and electroshocking in autumn 1998 appears to have eliminated the red shiners, as they have not been observed since. Bullfrogs and mud turtles have also been recorded at the site. During 2003, the lower pool was completely shaded by salt cedar, contained only topminnow, and appeared less productive than the upper pool. By 2004, the lower pool was fishless and nearly dry. Bureau of Land Management personnel removed salt cedar and mesquite that bordered both ponds during 2005. Aquatic vegetation and overhanging salt cedar were also removed from the upper pond during May of 2007.

Sampling since 2006 has verified the persistence of both topminnow and pupfish in the upper pond, and only topminnow in the lower pond. Recommend regular periodic maintenance of the site to remove excess sediments and aquatic vegetation from the pools and to control adjacent vegetation especially tamarisk.

Empire Gulch Site #339

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

STOCKED: Oct 27 2001 with 689 Gila topminnow from Cienega Creek; augmented with 70 topminnow from Cienega Creek on May 19 2003, and with 475 topminnow from Cienega Creek on Oct 20 2003. Augmented with 52 topminnow from Cienega Creek on Apr 11 2006.

Dates	Surveyor	Methods	Fish
Oct 27, 2001	Davidson, Voeltz, Simms	stocking	AGCH, POOC
Feb 15, 2002	Davidson, Voeltz, Duncan	dipnet	AGCH, POOC
Jul 10, 2002	Voeltz	dipnet	AGCH, POOC
May 19, 2003	Voeltz, Duncan	dipnet/stocking	AGCH, POOC
Oct 20, 2003	Voeltz, Duncan, Simms, et al.	dipnet/stocking	AGCH, POOC
May 17, 2004	Voeltz	dipnet	AGCH
Sept 02, 2004	Simms, Rosen	seine/dipnet	AGCH, POOC (n=1)
Nov 08, 2004	Simms	seine	AGCH, POOC (n=6)
May 18, 2005	Voeltz, Foster, Duncan, Kileen	dipnet	AGCH
Apr 11, 2006	Voeltz, Tighe, Simms, Simms	stocked, visual	POOC (n=52), AGCH
Oct 13, 2006	Simms	seine	POOC (n=11), AGCH
May 09, 2007	Simms, Timmons, Ehret	dipnet, visual	AGCH
Oct 27, 2007	Simms, et al.	-----	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 topminnow. During surveys conducted by personnel in September 2004, only one topminnow was collected. In 2005, no topminnow were collected.

Empire Gulch Site #339 (cont.)

On April 11, 2006, Empire Gulch was stocked with an additional 52 topminnow from Cienega Creek. Sampling of the site in October of 2006 found topminnow still present, though numbers were low. Sampling during May of 2007 found longfin dace still present but no topminnow. It is possible that prevalence of watercress and duckweed, and abundance of predaceous insects may negatively impact the topminnow at Empire Gulch, precluding the establishment of a stable local population.

Howard Well Site #83

Graham County, Bureau of Land Management, Safford Field Office, T11S R29E S36 NW4

STOCKED: Jul 01 2008 with 243 desert pupfish, with 233 desert pupfish from The Nature Conservancy's Lower San Pedro River Preserve at Dudleyville (El Doctor Marsh lineage) and 10 from Boyce Thompson Arboretum's Ayer Lake (Santa Clara Slough lineage).

Dates	Surveyor	Methods	Fish
28 Dec. 1983	AGFD	Stocking	CYMA
22 Jul 1985	AGFD	Stocking	POOC (n=500)
2005	Blasius	Visual	none
01 Jul, 2008	Blasius, Conn Timmons, Robinson, Sorensen, Bailey	Stocking	CYMA (n=243)
02 Aug, 2008	Blasius	1 Mo. Monitoring	CYMA (n~8)

Howard Well, in the San Simon Valley, had previously been stocked with desert pupfish in 1983 and with Gila topminnow in 1985. While pupfish survived at the site, by 1987 Gila topminnow had apparently disappeared. Cattails eventually covered the pond area causing it to dry entirely. The habitat was renovated by BLM in 2006. The site was again stocked with desert pupfish on July 1, 2008. Pupfish were collected by AGFD personnel at the TNC Lower San Pedro River Preserve at Dudleyville (n=233), and from Ayer Lake at the Boyce Thompson Arboretum (n=10) near Superior. Fish were transported to the site the same day as collected in water treated with marine salt and Stresscoat®. Once on site, pupfish were tempered for 30 minutes using several partial water exchanges. Pupfish were transferred from the transport containers to 5 gallon buckets containing pond water, carried to the pond and stocked. Transfer of fish to the buckets and subsequent disposal of the transport water was conducted away from the pond, to avoid any unintentional contamination. There were no pupfish mortalities during transport or stocking.

This site needs to be regularly monitored to ensure constant water flow, fence maintenance, and prevent encroachment and degradation of the habitats by aquatic vegetation, and should be augmented periodically with additional pupfish. For additional information regarding management efforts at Howard Well, see Timmons (2009).

Larry Creek Site #307

Yavapai County, Bureau of Land Management, Phoenix Field Office, T9N R3E S9 NW4

STOCKED: Oct 26 2005 with 600 Gila topminnow from Coal Mine Spring. Mar 31 2006 with 200 desert pupfish from TNC's Lower San Pedro River Preserve (El Doctor Marsh lineage).

Dates	Surveyor	Methods	Fish
Oct 26, 2005	Hervatin, Cooper, Sponholtz, Smith	stocking, visual	POOC(n ~600), GIIN
Dec 08, 2005	Voeltz, Hervatin, Goforth, Fulmer	dipnet, visual	POOC, GIIN
Mar 31, 2006	Spencer, Young, Young	stocking, visual	CYMA (n=200), GIIN, POOC
Oct 05, 2006	Knowles, Timmons, Vacca	dipnet, visual	POOC, GIIN, CYMA
May 08, 2007	Timmons, Vacca	dipnet, minnow traps, visual	POOC, GIIN

Contained within a short, unnamed tributary to Larry Creek, this site is a spring-fed perennial stream that flows through a steep, narrow, boulder-strewn canyon. The site is located on the BLM-administered Agua Fria National Monument. Gila chub were stocked into the stream in 1995. In 2005, Gila topminnow from Coal Mine Spring were stocked into several pools. Two hundred desert pupfish were stocked into the system during March of 2006; Gila topminnow and Gila chub were observed at the time of the pupfish stocking. Monitoring of the system in October 2006 by AGFD, BLM and USFWS personnel found topminnow and chub common throughout the stream reach sampled. It is believed that desert pupfish (n=4) were observed in the uppermost reach of the system, but attempts to capture them for positive identification were unsuccessful. Sampling during May of 2007 found topminnow abundant in the upper reach of the stream, but uncommon or absent in lower reaches. Gila chub were common throughout the middle and lower wetted reach of the stream, with numerous smaller chub observed, indicating continued reproduction by chub in these portions of the stream. No pupfish were captured or observed throughout the stream. Juvenile and adult leopard frogs remain common throughout wetted portions of the stream.

Lousy Canyon Site #306

Yavapai County, Bureau of Land Management, Phoenix Field Office, T9N R3E S5 NW4

STOCKED: Sept 9 2000 with 650 Gila topminnow from Coal Mine Spring. Oct 10 2001 with 71 desert pupfish from the Cibola and Imperial National Wildlife Refuges (originally from El Doctor Marsh, Sonora, Mexico). Mar 31 2006 with 200 desert pupfish from The Nature Conservancy's San Pedro Preserve (El Doctor Marsh lineage).

Date	Surveyor	Methods	Fish
Sept 12, 2000	Davidson, Bettaso, L. Young, K. Young, Weedman, Duncan	stocking	POOC
Oct 18, 2000	Davidson, Weedman	dipnet, visual	None
Jan 03, 2001	Davidson, Voeltz, Sorensen	dipnet, seine	POOC, GIIN
Mar 27, 2001	Davidson, Weedman, Sorensen	visual	POOC, GIIN
Oct 17, 2001	K. Young, L. Young, Bettaso	stocking	POOC, CYMA
Nov 26, 2001	Davidson, Voeltz, Duncan	dipnet, visual	POOC, CYMA
Apr 10, 2002	Voeltz, Dockens	dipnet, visual	POOC, CYMA
Oct 22, 2002	Voeltz, Lutz, L. Young	dipnet, visual	POOC, CYMA
Apr 29, 2003	Lutz, Sorensen, Hughes	dipnet	POOC, CYMA, GIIN
Apr 12, 2004	Voeltz, Billingsley, Burger	dipnet	POOC, CYMA, GIIN
Mar 24, 2005	Voeltz, Jester	dipnet	POOC
Oct 17, 2005	Voeltz, Sorensen, Simms, L. Young	dipnet	POOC, GIIN
Mar 31, 2006	Brown, Carveth, Fousek, Humphrey, Vacca, Voeltz	stocking, visual	CYMA, POOC
May 15, 2006	Hennigar, Spencer, Sorensen, Tighe, Vacca, Voeltz	visual	CYMA, POOC, GIIN
Oct 05, 2006	Knowles, Timmons, Vacca	dipnet, visual	POOC

Lousy Canyon is a spring-fed perennial stream located on the BLM-administered Agua Fria National Monument. It flows through a steep, boulder-strewn, narrow canyon with a series of waterfalls throughout its length. Gila chub were stocked into the stream in 1995 below the second large waterfall from the top (~9-m tall). Gila topminnow from Coal Mine Spring were stocked above the uppermost waterfall in 2000, and have subsequently become established throughout the upper portion of the stream. Desert pupfish from Cibola and Imperial National Wildlife Refuges (originally from El Doctor Marsh, Mexico) were stocked in 2001. Pupfish were

documented as present for several years following the initial stocking, but not observed in 2005. It is possible that extreme flooding in January 2005 may have eliminated pupfish from the system.

An additional stocking of two hundred desert pupfish was completed on March 31, 2006. Gila topminnow, lowland leopard frogs and Sonora mud turtles were observed at the time of the stocking. Monitoring of the system was conducted on May 15, 2006. Gila topminnow were common throughout the upper reach. Desert pupfish were observed in the spring pool and the pool below the upper waterfall, and Gila chub were common below the large waterfall. Monitoring of the system was again conducted on October 05, 2006. Gila topminnow were abundant throughout the upper spring pool and in the pool below the uppermost large waterfall, but no desert pupfish were observed or captured; one Sonora mud turtle was observed in the pool below the upper waterfall, and lowland leopard frogs were abundant. Recommend that monitoring and augmentation of pupfish and topminnow should continue in Lousy Canyon to ensure their reestablishment and maintain genetic integrity of both species.

Oak Grove Canyon Site #363

Pinal County, Bureau of Land Management, Safford Field Office; TNC Aravaipa Canyon Preserve, T7S R18E Sec13

STOCKED: September 18, 2008 with 275 Gila topminnow (Bylas Springs lineage) and 275 desert pupfish (El Doctor Marsh lineage), both from TNC Lower San Pedro River Preserve ponds at Dudleyville.

Dates	Surveyor	Methods	Fish
Sept 18,2008	Haberstich, Blasius, Timmons	Stocking	POOC (n=275), CYMA (n=275)

Located along the south rim of the Aravaipa Creek watershed, Oak Grove Canyon, is a tributary to Turkey Creek. The stream has 3 separate perennial reaches, the uppermost of which is the location of the topminnow and pupfish stockings in 2008. This portion of stream flows for approximately ½ mile across private (TNC) land and then onto BLM administered land.

On September 18, 2008, 275 Gila topminnow (Bylas lineage) and 275 desert pupfish (El Doctor lineage) were collected from refuge ponds at TNC Lower San Pedro River Preserve at Dudleyville, transported by BOR helicopter and stocked in Oak Grove Canyon. To reduce potential mortality during transport, all topminnow selected for stocking were adults, and all pupfish were greater than 20mm TL. Pupfish and topminnow were collected by minnow trap over the previous two days, and held in suspended live-cars in the pond from which they were collected. Transfer of fishes to a helicopter transport container began at 0930h, within 15 minutes of transport, at which time it was observed that some of the fish were infected with *Lernaea* sp. Fishes with visibly apparent *Lernaea* were culled and returned to the pond and those without transferred to the transport container. Fishes were flown to Oak Grove Canyon for stocking at 0945h. The site will continue to be monitored cooperatively by AGFD, BLM, and TNC personnel. It is recommended that both topminnow and pupfish be augmented periodically to maintain the genetic integrity of the stocks.

Parsons Grove Spring Site #382

Pinal County, Bureau of Land Management, Safford Field Office; TNC Aravaipa Canyon Preserve, T7S R18E S14

STOCKED: Oct 13, 2005 with 50 Gila topminnow from Bylas Spring. Oct 13, 2005 with 50 desert pupfish from TNC San Pedro Preserve (El Doctor Marsh lineage).

Dates	Surveyor	Methods	Fish
Oct 13, 2005	Voeltz, Blasius, McRae	stocking	POOC, CYMA
Nov 01, 2005	Haberstich, Blasius	visual	None
Apr 26, 2006	Blasius, Haberstich, Holloran	dipnet, seine	POOC (n=1)
May 23, 2007	Haberstich	dipnet	POOC
June 13, 2008	Blasius	Dipnet, seine	None

Parsons Grove is a small spring located along the south rim of the Aravaipa Creek watershed. The site is shallow, heavily shaded and subject to sedimentation; it also contains an unusually high concentration of predatory aquatic insects. An extensive sampling effort during 2008 found neither topminnow or pupfish remaining at Parson Grove Spring. No pupfish have ever been found at this site since their stocking in 2005, but this is the first year that no topminnow have been found. Both pupfish and topminnow persist at Bleak Spring and Cement Tank on nearby TNC property. Invertebrate predators remain abundant at Parsons Grove. and are presumed to have had a negative impact on both topminnow and pupfish. Due to poor quality habitat and heavy predator load, the elimination of this site from future management efforts is being considered.

Swamp Springs Canyon Site #406

Graham County, Bureau of Land Management, Phoenix Field Office, T11S R20E S33 NW4

STOCKED: October 04, 2007 with 249 Gila topminnow from the Arizona State University Animal Care Facility (Bylas Spring lineage); October 04, 2007 with 248 desert pupfish from TNC Lower San Pedro River Preserve (LSPRP) at Dudleyville. Augmentation stocking on September 17, 2008 with 250 Gila topminnow and 250 desert pupfish, both from LSPRP.

Dates	Surveyor	Methods	Fish
Oct 04, 2007	Wiley, Rogers, Ohrel	stocking	POOC (n=249) CYMA (n=248)
Nov 29, 2007	Blasius, Wiley, Rogers	visual, dipnet	POOC (n=5) CYMA (n=2)
Apr 08, 2008	Carter, Bahm	seine, dipnet, minnow trap	POOC (n=1)
Sept 16, 2008	Robinson	seine, dipnet, minnow trap	POOC (n=69) CYMA (n=14)
Sept 17, 2008	Blasius, Rogers, Conn, Wiley	stocking	POOC (n=275) CYMA(n=274)

Swamp Springs Canyon is a northwesterly-flowing tributary of Redfield Canyon within the boundaries of the Muleshoe Ranch Cooperative Management Area. Swamp Spring Canyon was originally stocked on October 4, 2007 with 249 Gila topminnow (Bylas lineage from ASU) and 248 desert pupfish (El Doctor Marsh lineage from TNC Lower San Pedro River Preserve) approximately 1.3 km upstream from the confluence with Redfield Canyon. Monitoring throughout the following year found that topminnow and pupfish continued to be present, though lower in numbers than expected. The site was stocked a second time on September 17, 2008 with 275 Gila topminnow and 274 desert pupfish. Both topminnow and pupfish were collected from stocks maintained at LSPRP, flown to the site by BOR helicopter, and stocked.

Tule Creek Site #75

Yavapai County, Bureau of Land Management, Phoenix Field Office, T8N R1E S28 NW4 SW4
 STOCKED: Sept 30 1981 with 1000 Gila topminnow from BTA. Sept 19 2007 with 233 desert
 pupfish from The Nature Conservancy (TNC) San Pedro River Preserve (El Doctor
 Marsh lineage).

Dates	Surveyor	Methods	Fish
1988-1997	BLM, AGFD, USFWS biologists	varied	POOC
May 15, 1998	Timmons	dipnet	POOC
May 18, 1999	Weedman, Duncan, Watson	dipnet	POOC
May 30, 2000	Weedman, L. Young	dipnet	POOC
Apr 18, 2001	Davidson, Voeltz, L. Young	dipnet	POOC
Oct 11, 2002	Voeltz, Lutz	dipnet	POOC
May 07, 2003	L. Young, T. Hughes	dipnet	POOC
Oct 22, 2003	Voeltz, Hurst	dipnet	POOC
Jan 09, 2004	Billingsley	dipnet	None
Feb 17, 2005	Voeltz, Bettaso	dipnet	POOC
Nov 01, 2005	Hughes	dipnet	POOC
Mar 13, 2006	Hughes, Vacca	visual	POOC
May 07, 2007	Timmons, Vacca	dipnet, visual	POOC
Sep 19, 2007	Timmons, Hughes, Robinson, Vacca, Carter, Hurst, L. Young, Bernau, Gill, Kern	stocking	CYMA (n=233)
Nov 08, 2007	Gill, Kern	dipnet, seine, visual	POOC
July 29, 2008	Hughes	visual	POOC, CYMA

Tule Creek Site #75 (cont.)

Tule Creek was originally stocked with Gila topminnow in 1968 (Minckley and Brooks 1985). They persisted until eliminated by flooding in 1978 (Collins et al. 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. A fish barrier was constructed in 1992 on lower Tule Creek approximately 0.25 mi (0.4-km) upstream from the new high water elevation of Lake Pleasant, which resulted from the construction 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. The timely construction of the barrier apparently prevented nonnative fishes invading Tule Creek from the Agua Fria River and Lake Pleasant. Tule Creek was again hit by a major flood event in January 1993 that scoured the stream channel and removed most of the aquatic vegetation within the enclosure (D. Langhorst pers. comm. *in* Weedman and Young [1997]). Flows were estimated to be 50-ft (15-m) wide and up to 8-ft (2.4-m) deep and Gila topminnow numbers were greatly reduced from previous visits. Efforts following the event found roughly 100 fish. Later in 1993, numbers apparently rebounded, with topminnow found throughout the enclosure. A survey was conducted downstream of the enclosure in 2004 to determine if topminnow were established in that reach of stream. Suitable habitat was present, but no fish were found. Gila topminnow remained abundant in the main pool through 2005 and 2006, but heavy emergent vegetation covered much of the previous habitat downstream, making additional open water scarce. Tule Creek was stocked with 233 desert pupfish (El doctor Marsh lineage) on 19 September 2007, with pupfish from TNC's San Pedro River Preserve at Dudleyville, Arizona. The fish were collected from the Preserve, transported to and held overnight at AGFD Headquarters on 18 September, and stocked in the main pool at Tule Creek the following day. Monitoring conducted approximately 1.5 months post-stocking was unable to detect any pupfish at the site. At approximately 10 months post-stocking, monitoring efforts found pupfish still present at the spring pool, the site of their original stocking. BLM personnel observed between 20 and 30 male pupfish present along the shallow margins of the pool, clearly visible and displaying territorial behavior, with females moving into and out of the shallow areas. Juvenile fishes numbering in the thousands were also seen, but were not identified to species. Topminnow continue to be abundant in the main bedrock pool. Supplemental stockings to maintain the genetic integrity of both topminnow and pupfish should occur on a regular basis in upcoming years. The majority of the stream section below the spring pool has become overgrown with cattails.

Yerba Mansa Site #44

La Paz County, Bureau of Land Management, Phoenix Field Office, T11N R11W S21 NW4
 STOCKED: Dec 20 1984 with 250 Gila topminnow; May 29 1985 with 600 Gila topminnow,
 both from Tule Creek. Aug 9 1988 with 250 Gila topminnow from Dexter originally
 from Sharp Spring; 250 desert pupfish from Dexter originally from Santa Clara Slough.

Dates	Surveyor	Methods	Fish
Apr 19, 1990	Jakubos	visual	POOC
Sept 04, 1990	S. Stefferud, Jakubos	dipnet	CYMA, POOC
Jan 27, 1991	Brown	dipnet	POOC
Apr 24, 1992	L. Young, Langhorst	dipnet	POOC
May 26, 1992	Weedman	dipnet	POOC
Nov 21, 1992	L. Young	visual	POOC
Feb 24, 1993	L. Young	visual	POOC
May08, 1996	Weedman, Zalaznik	dipnet	POOC
May 13, 1998	Timmons	dipnet	POOC
May 27, 1999	Weedman, Timmons	dipnet	POOC
Jul 11, 2000	Allen, R. Billingsley	dipnet	POOC
Jul 25, 2001	Davidson	dipnet	POOC
Oct 10, 2002	Voeltz, Lutz	dipnet	POOC
Oct 28, 2003	Voeltz	dipnet	POOC
Mar 22, 2005	Voeltz	dipnet	None

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 topminnow 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. Topminnow 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. Yerba Mansa has not been monitored since 2005. Monitoring of this population should continue.

Failed Sites on BLM Lands in Arizona

Aravaipa Creek Site #177

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.

Minckley (1969) reported the fish stocked during 1967 in Pinal County were reproducing and established by 1968, and those stocked in Graham County, near Klondyke, were reproducing and possibly established. According to Minckley and Brooks (1985), all 3 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 et al. 1995). Surveys were conducted at 9 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. In October 1993 an exhaustive seining effort by biologists and student volunteers was conducted to search for red shiners; no topminnow were collected during these efforts. This stream continues to support seven native fish species and likely provides the best example of an intact native fish community remaining in Arizona. Monitoring during 2007 found natives and nonnatives still present in the system, with CYLU, AMNA, and LECY occurring in stream reaches above the fish barrier. Monitoring during 2007 of Turkey Creek, a tributary to Aravaipa Creek, detected the presence of "rosey minnows" (*Pimephales promelas*), a color variant of fathead minnow, in the lower portion of Turkey Creek. 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 southern rim of Aravaipa Canyon were stocked with topminnow and pupfish in 2005. Efforts to identify suitable habitat for the reestablishment of topminnow and pupfish in Aravaipa Creek and its tributaries should continue.

Big Spring Site #84

Graham County, Bureau of Land Management, Safford District, T6S R25E S5 NE4 SE4
 STOCKED: Jul 22 1985 with 500 Gila topminnow from Dexter originating from Monkey Spring.

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

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 August 1990 removed most topminnow 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. Topminnow 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 should be reevaluated.

Cow Creek Site #72

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

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

Darby Wash Tinaja Site #399

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

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

Dates	Surveyor	Methods	Fish
Apr 17, 2005	Tibbitts	visual	CYER
Apr 29, 2005	Voeltz, Duncan, Hughes	seine	CYER
May 05, 2005	Hughes	visual	CYER
May 18, 2005	Tibbitts	visual	CYER
May 26, 2005	Jester	visual	CYER
June 02, 2005	Voeltz, Hervatin, Jester	seine	CYER
June 23, 2005	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 2 captive locations in Phoenix. On June 2, 2005, 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 June 23, 2005, 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.

Green Tanks (Rattlesnake Spring) Site #81

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

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

Humbug Creek Site #95

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

Humbug Creek is deeply incised in places with good riparian cover present in less incised areas. 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 were taken in August 1991. BLM, Phoenix Resource Area, Endangered Species Subpermit Report for 1993 reported "extreme flooding" occurred in the area in January 1993. Presence of exotic fish and conflicting land ownership and uses may reduce this sites potential for reintroduction of Gila topminnow or desert pupfish. This site should be reevaluated.

Little Nogales Spring Site #125

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

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

Dates	Surveyor	Methods	Fish
Sept 12, 1989	Bagley	dipnet	POOC
Apr 01, 1991	Brown	dipnet	None
Jun 18, 1992	Weedman, J. Young, S. Stefferud	dipnet	None
Jul 21, 1994	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 topminnow were collected. The NEPA process is currently underway for the reintroduction of Gila topminnow into lower portions of Little Nogales Spring, but due to high CO₂ levels in waters at the spring source of the upper system, the stream section below the springs should be tested to ensure that dissolved CO₂ is sufficiently low and dissolved O₂ sufficiently high to allow the survival of topminnow prior to any restocking effort.

Martin Well Site #132

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

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

Dates	Surveyor	Methods	Vouchers	Fish
Sept 26, 1986	Simons	unknown	ASU 10694	GAAF
Jul 03, 1989	Bagley	seine	Yes	POOC, GAAF, LECY
Feb 08, 1991	Brown	seine	ASU 12835 & 12834	GAAF, LECY
Jul 14, 1993	Weedman, Paradzick	dipnet	ASU 14217	GAAF, LECY
Jul 19, 1994	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 September 29 1986 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]) 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. Currently, this site is used as a source of water for livestock. This site needs to be reevaluated.

Mescal Warm Spring Site #82

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

Dates	Surveyor	Methods	Fish
1987	Simons	unknown	POOC
Jul 08, 1989	Bagley	dipnet	POOC
May 22, 1991	Brown	dipnet	POOC
Feb, 1992	BLM Biologists	unknown	None
Aug, 1992	BLM Biologists	unknown	None
Jul 18, 1994	J. Young	dipnet/visual	POOC
Sept 05, 1996	Weedman	dipnet	POOC (n=1)
Jun 28, 2001	Davidson	dipnet	None
Apr 28, 2003	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 2 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. Shallow water (< 4 in.) and thick brush make sampling very difficult; no pools were found during the site visit in 2003. Topminnow were either very rare or too difficult to sample, with few caught in 1994, only one collected in 1996, and none 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. Excavation of small pools at this locality may provide additional suitable habitat for topminnow. This site was not visited during 2007.

Mesquite Spring Site #129

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

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

Nogales Spring Site #124

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

STOCKED: August 19, 1988 with 258 Gila topminnow from Cienega Creek.

Dates	Surveyor	Methods	Fish
Sept 12, 1989	Bagley	dipnet	POOC
Apr 01, 1991	Brown	dipnet	None
Jun 18, 1992	Weedman, J. Young, S. Stefferud	dipnet	None
Jul 21, 1994	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 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. Topminnow were stocked into the pools below 2 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. Topminnow may have been eliminated by flooding or temperature extremes. Construction of pools should be investigated and consideration given to restocking topminnow from Cienega Creek.

Pupfish Spring (aka Garfias Wash) Site #120

Yavapai County, Bureau of Land Management, Phoenix District, T7N R1W S18 NE4 NE4

STOCKED: November 2, 1977 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 topminnow or pupfish. On a visit to the site on 2005 January 20, BLM personnel found no fish present and considered the site unsuitable for either desert pupfish or Gila topminnow. This site should be surveyed again to meet the requirements for extirpation under the established criteria.

Tule Creek (Unnamed Spring 1E) Site #74

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

In 1985-1987, topminnow 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. According to BLM personnel, this site is subject to drying during periods of drought.

Tule Creek Seep (2E) Site #73

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

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

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

In 1985, topminnow 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. According to BLM personnel, this site is subject to drying during periods of drought.

Watson Wash Site #134

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

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

Dates	Surveyor	Methods	Fish
Jul 06, 1989	Bagley	seine	POOC, CYLU, PORE
Aug 08, 1990	Abarca, S. Stefferud	unknown	POOC plus others
Jan 07, 1991	Brown	dipnet	POOC, CYLU, PORE
Jul 13, 1993	Weedman	dipnet	POOC, PORE
Jul 19, 1994	J. Young	dipnet	POOC, PORE
1995	J. Simms	unknown	POOC, PORE
Sept 04, 1996	Weedman	dipnet	POOC, PORE
Jul 31, 1997	AGFD interns	dipnet	POOC, PORE
Jun 17, 1998	Timmons	dipnet	POOC, PORE
Oct 28, 1998	Weedman, Duncan, Simms	dipnet, seine	POOC, CYLU, GAAF, PORE
Jul 17, 1999	Weedman, Robles	dipnet, seine	GAAF, PORE
Jul 13, 2000	Jontz, R. Billingsley	dipnet	GAAF, PORE
Apr 02, 2003	Voeltz, Bettaso	dipnet, seine	GAAF, PORE
Apr 16, 2004	Billingsley	dipnet	GAAF, PORE
May 18, 23, 25, 2006	Blasius	dipnet, minnow traps	GAAF, PORE
May 04, 2007	Timmons, Blasius	visual	None

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 topminnow were not detected until 1989, as were red shiners. Their origins were unknown. This well was the focus of intensive recreational use. In 1993 a masonry tub was illegally constructed for recreational use. Sampling at Watson Wash between 1999 and 2003 found no topminnow; guppies and mosquitofish were common in available habitat.

Watson Wash Site #134 (cont.)

Extensive sampling of available habitat was conducted by BLM personnel on 18, 23, and 25 May, 2006. No topminnow were detected. Two nonnative fishes, mosquitofish and common guppy were present, as well as the nonnative bullfrog (*Rana catesbeiana*). BLM considered a variety of management options for the Watson Wash area, including capping the well and drying the habitat. The well at Watson wash was capped under an Emergency Closure ruling by BLM on 25 May, 2006. Currently, water seepage from the capped well-head provides limited water for resident wildlife, but not in sufficient quantity to support any fish.

Appendix B. Results of monitoring of natural populations of Gila topminnow from October 2007 through September 2008 on BLM lands in Arizona

Site # and Site Name	Date Sampled	Fish species present	Comments on sampling effort, abundance, and habitat conditions
Cienega Creek upstream of Mattie Canyon	Oct 10-11, 2007	POOC, AGCH, GIIN	POOC (n=37), AGCH (n=6) and GIIN (n=132) sampled. (Data from J. Simms, BLM Tucson)
Cienega Cr. below Mattie Canyon	Oct 12, 2007	AGCH, GIIN	POOC (n=0); AGCH (n=141); GIIN (n=40). (Data from J. Simms, BLM Tucson)
Cienega Cr. below Sanford Canyon	Oct 12, 2007	GIIN	POOC (n=0); GIIN (n=18). (Data from J. Simms, BLM Tucson)
Cienega Cr. above Pump Canyon	Oct 12, 2007	POOC, AGCH	POOC (n=18); AGCH (n=164) were common. (Data from J. Simms, BLM Tucson)
Cienega Cr. above Sanford Canyon	Oct 19, 2007	GIIN	POOC (n=0); GIIN (n=6). (Data from J. Simms, BLM Tucson)
Cienega Cr. below Sanford Canyon	Oct 19, 2007	POOC, AGCH	POOC (n=2); GIIN (n=6); AGCH (n=131). (Data from J. Simms, BLM Tucson)
Cienega Cr. above Pump Canyon	Oct 19, 2007	POOC, AGCH, GIIN	POOC (n=15); GIIN (n=3); AGCH (n=8). (Data from J. Simms, BLM Tucson)
Cienega Cr. below Pump Canyon	Oct 18-19, 2007	POOC, AGCH, GIIN	POOC (n=131); AGCH (n=85); GIIN (n=25). (Data from J. Simms, BLM Tucson)
Cienega Cr. below Falls	Oct. 19-23 2007	POOC, AGCH, GIIN	POOC (n=258); AGCH (n=329); GIIN (n=26). (Data from J. Simms, BLM Tucson)

Appendix B (cont.)

Cienega Cr. below Fresno Canyon	Oct 23, 2007	POOC, AGCH	POOC (n=1134); AGCH (n=93). (Data from J. Simms, BLM Tucson)
Cienega Creek above Fresno Canyon	Oct 23, 2007	POOC, AGCH	POOC (n=44); AGCH (n=28). (Data from J. Simms, BLM Tucson)

Appendix C. Results of monitoring of reestablished populations of Gila topminnow and desert pupfish on BLM lands in Arizona during October 2007 through September 2008.

Site #, Site Name, Category, and Species Stocked (Origin)	Date Sampled	Fish species present	Comments on sampling effort, abundance, and habitat conditions
Cherry Spring Canyon #405 POOC (Bylas Spring) CYMA (El Doctor Marsh)	Oct 04, 2007	POOC, CYMA	Stocked 264 POOC (Bylas lineage) from ASU Animal Care Facility and 246 CYMA (El Doctor lineage) from TNC Lower San Pedro River Preserve (LSPRP) at Dudleyville
	Nov 05, 2007	POOC, CYMA	Both species present and sampled using dipnets
	Apr 08, 2008	POOC, CYMA	Both species present: sampled with seine, minnow trap and dipnet
	Sept 16, 2008	POOC	Only POOC sampled: visual, seine, dipnet
	Sept 17, 2008	POOC, CYMA	Stocked POOC (n=275), CYMA (n=275): both species from TNC LSPRP at Dudleyville
Cold Springs #85, POOC (Monkey Spring) and CYMA (Santa Clara Slough)	May 04, 2007	POOC, CYMA	Both species common in upper pool; topminnow only common in lower pool.
Empire Gulch #339, POOC (Cienega Creek)	Apr 11, 2006	POOC	Stocked 52 topminnow collected from Cienega Creek @ Pump Canyon
	Oct 13, 2006	AGCH, POOC	POOC (n=11) were rare but widespread; AGCH (n=66) were found in only a few discrete locations, including the headspring.
	Oct 27, 2007	AGCH	AGCH (n=2); no topminnow were found at Empire Gulch in 2007.
Howard Well #83 CYMA (El Doctor Marsh)	Jul 01, 2008	CYMA	Stocked 243 CYMA [233 from TNC LSPRP at Dudleyville (El doctor Marsh lineage) and 10 from BTA (Santa Clara Slough lineage)]
	Aug 02, 2008	CYMA	Visual monitoring 1 month post-stocking confirmed persistence of CYMA.
Larry Creek tributary #307, POOC (Coal Mine Spring)	Oct 26, 2005	POOC, GIIN	Stocked 600 Gila topminnow from Coal Mine Spring
	Dec 08, 2005	POOC, GIIN	Gila topminnow present in many pools
	Mar 31, 2006	CYMA	Stocked 200 desert pupfish from TNC San Pedro River Preserve
	Oct 05, 2006	CYMA, POOC, GIIN	4 CYMA observed in uppermost pool, POOC and GIIN common throughout reach sampled

Appendix C (continued).

Site #, Site Name, Category, and Species Stocked (Origin)	Date Sampled	Fish species present	Comments on sampling effort, abundance, and habitat conditions
Larry Creek (cont.)	May 08, 2007	GIIN, POOC	POOC and GIIN common throughout reach sampled; no CYMA observed or sampled.
Lousy Canyon #306, POOC (Coal Mine Spring) and CYMA (Imperial and Cibola NWR, TNC San Pedro River Preserve)	Mar 24, 2005	POOC	Topminnow numbers reduced; pupfish appear to be absent, possibly due to extreme winter floods; did not hike below falls to look for GIIN
	Oct 17, 2005	POOC, GIIN	Topminnow abundant; GIIN common below falls
	Mar 31, 2006	CYMA	Stocked 200 desert pupfish from TNC San Pedro River Preserve
	May 15, 2006	CYMA, GIIN, POOC	Topminnow common throughout upper reach, with Gila chub common below waterfalls. Pupfish present in spring pool and pool below 1 st waterfall.
	Oct 05, 2006	POOC	Topminnow common throughout spring pool and reach above and below 1 st falls in pool, no pupfish seen or sampled
Oak Grove Canyon #363 POOC (Bylas) and CYMA (El Doctor Marsh)	Sept 18, 2008	POOC, CYMA	Stocked POOC (n=275) and CYMA (n=275), both spp. from TNC LSPRP at Dudleyville.
Parsons Grove Spring #382, POOC (Bylas Spring) and CYMA (TNC San Pedro Preserve)	Oct 13, 2005	POOC, CYMA	Stocked 50 Gila topminnow from Bylas Spring and 50 desert pupfish from TNC's Lower San Pedro River Preserve
	Nov 01, 2005	None	Visual survey, cold weather; no fish observed
	Apr 26, 2006	POOC	Only 1 topminnow sampled, no pupfish. Predaceous invertebrates abundant
	May 23, 2007	POOC	Only topminnow sampled, no pupfish. Predaceous invertebrates remain abundant.
	Jun 13, 2008	None	Due to poor quality habitat and abundant invertebrate predators, this site may not be suitable for future management actions.
Swamp Springs Canyon #406 POOC (Bylas Springs) and CYMA (El Doctor Marsh)	Oct 04, 2007	POOC, CYMA	Stocked POOC (n=249; Bylas lineage) and CYMA (n=248; El Doctor Marsh lineage) both spp. from TNC LSPRP.
	Nov 29, 2007	POOC, CYMA	Monitoring by visual and dipnet.
	Apr 08, 2008	POOC	Monitoring by seine, dipnet, minnow traps; only one topminnow captured.
	Sept 16, 2008	POOC, CYMA	Monitoring by seine, dipnet, minnow traps. POOC (n=69), CYMA (n=14).
	Sept 17, 2008	POOC, CYMA	Stocked POOC (n=275), CYMA (n=274), both species from TNC LSPRP.

Appendix C (continued).

Site #, Site Name, Category, and Species Stocked (Origin)	Date Sampled	Fish species present	Comments on sampling effort, abundance, and habitat conditions
Tule Creek #75, POOC (BTA)	May 07, 2007	POOC	Gila topminnow remain abundant in main pool, but other suitable habitat within the enclosure remains scarce due to heavy emergent aquatic vegetation growth.
	Sep 19, 2007	CYMA (n=233)	Stocked 233 CYMA (El Doctor Marsh lineage) into the main pool of this site on September 19, 2007, collected from the TNC San Pedro River Preserve at Dudleyville, AZ. Adult and juvenile POOC were abundant at the time of stocking.
	Nov 08, 2007	POOC	Monitoring by seine, dipnet, and visual detected no pupfish at this time.
	Jul 29, 2008	POOC, CYMA	Monitoring by visual observed adult male pupfish (~30) in shallow waters around pool margin, displaying territorial behavior and an unknown number of females. POOC were abundant throughout pool.
Yerba Mansa #44, POOC (BTA, Sharp Spring) and CYMA (Santa Clara Slough)	Mar 22, 2005	---	Monitoring of this site has not occurred since March 2005. During 2005, <i>Typha</i> covered 100% of shoreline, which prevented sampling, leaving only open water available in the central area of the pond. Monitoring of this site should continue.
	2008	POOC (?)	Discussions with Rebecca Peck (BLM Kingman) report observation of fish believed to be topminnow at this site during 2008, however none were sampled to verify they were topminnow.