ENVIRONMENTAL ASSESSMENT

for the

ARIZONA GAME & FISH DEPARTMENT SAFE HARBOR AGREEMENT for topminnow and pupfish in Arizona

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COVER SHEET

Title for Proposed Action: Environmental Assessment for the Arizona Game & Fish Department Safe Harbor Agreement for topminnow and pupfish in Arizona.

Unit of the US Fish and Wildlife Service Proposing the Action: Regional Director, Region 2, U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

Legal Mandate for Proposed Action: Endangered Species Act of 1973, as amended, Section 10(a)(1)(A), as implemented by 50 CFR 17.22.

Applicants: State of Arizona

Permit Number: TE-083686-0

Duration: 30 years

Funding Plan:

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1.0 INTRODUCTION

On February 10, 2004, the Arizona Game and Fish Department (Department) submitted an application for an Enhancement of Survival Permit and Safe Harbor Agreement under section 10(a)(1)(A) of the Endangered Species Act (Act). The Safe Harbor Agreement (Agreement) seeks to allow non-federal landowners to reestablish Gila topminnow (*Poeciliopsis occidentalis*), Yaqui topminnow (*Poeciliopsis sonoriensis*), desert pupfish (*Cyprinodon macularius*), and Quitobaquito pupfish (*Cyprinodon eremus*)(topminnow and pupfish) on non-federal lands in Arizona. The Agreement covers all potential habitat in Arizona (on non-federal lands), within the historical ranges of the species. The historical range for desert pupfish and Gila topminnow is basically the Gila River basin, below 1,600 meters (4,850 ft). The Quitobaquito pupfish occurs in the Rio Sonoyta basin in Sonora and Arizona. The Yaqui topminnow can be found in the Rio Yaqui basin, also in Sonora and Arizona. The draft Safe Harbor Agreement is incorporated here by reference.

2.0 PURPOSE AND NEED FOR ACTION

The scope of the analysis in this environmental assessment covers the direct, indirect, and cumulative environmental effects of issuing a 10(a)(1)(A) enhancement of survival permit and anticipated future effects of implementation of the Agreement (including the take authorized). The purpose and need for the proposed Safe Harbor Agreement is to provide suitable aquatic habitats where populations of topminnow and pupfish may be reestablished and to encourage the use of native fish for mosquito control. It is likely that many sites with perennial water are available for conservation purposes. Past efforts by the Department, the Service, the Bureau of Land Management, and the U.S. Forest Service to reestablish populations of Gila topminnow and desert pupfish have met with varying degrees of success, possibly due to poor site selection (Weedman and Young 1996). Not more than two species would be released at any one site.

Topminnow and pupfish have historically occupied a variety of habitat types (Weedman and Young 1997). In general, suitable habitat consists of relatively shallow (<1m in depth), slow moving water along stream or river margins, ponds, cienegas, and springs associated with aquatic or streamside vegetation, algal mats, and organic debris (USFWS 1993, Minckley 1973, Weedman 1999). These fish prefer shallow, warm, fairly quiet waters and tolerate pH values between 6.6 and 8.9, temperatures to 43° C for brief periods, and salinities from dilute to sea water (Heath 1962, Schoenherr 1974, Meffe et al. 1983, USFWS 1993, 1995, Weedman 1999).

Although once common throughout most of the Gila River basin, the Gila topminnow and desert pupfish now naturally occurs in only a fraction of their historical range (USFWS 1993, 1995, Weedman 1999). Both species are federally listed under the Act as endangered throughout their ranges in the United States (USFWS 1967 and USFWS 1986c, respectively). Habitat loss and alteration, as well as the introduction of nonnative fishes have contributed to declines in natural populations of these two species (Weedman and Young 1997). The location of natural and reestablished populations of topminnow and pupfish, along with life history information, can be

found in the Desert Pupfish Recovery Plan (USFWS 1993) and the Draft Gila Topminnow Recovery Plan for public review (Weedman 1999).

In Arizona, the historical range for Gila topminnow is the Gila River basin below 1,600 m (4,850 ft) in elevation (Minckley 1999). The historical range in Arizona for desert pupfish is the Gila River basin below 1,500 m (4,550ft) in elevation including the "Gila, Santa Cruz, San Pedro, and Salt Rivers; and the lower Colorado River downstream from the vicinity of Needles" (USFWS 1993). However, Minckley et al. (2002) suggested that the Santa Cruz River drainage was historically occupied by the extinct Santa Cruz (=Monkey Spring) pupfish, recently described as *Cyprinodon arcuatus*. This has led to discussion among experts as to whether desert pupfish (*C. macularius*) should be established in the Santa Cruz drainage, since it has been proposed that *C. arcuatus* was the species of pupfish historically found in the Santa Cruz drainage (Minckley et al. 2002). Though consensus has not been achieved, it is generally accepted that available suitable habitats in the Santa Cruz drainage should be used for desert pupfish (*C. macularius*) recovery purposes. Both species of pupfish (*C. arcuatus* and *C. macularius*) were extremely similar to each other, and likely completely ecologically equivalent. Minckley et al. (2002) suggested that the "species are similar enough that they were long confounded under *C. macularius*" and the "biogeographic considerations suggest that its affinities lie with *C. macularius* or *C. eremus*." Regardless of the ultimate origins of *C. macularius* and *C. arcuatus*, the Santa Cruz drainage is historical habitat for the genus *Cyprinodon*, and potential recovery habitats for *C. macularius* in the Santa Cruz should be pursued.

The Quitobaquito pupfish occurs in the Rio Sonoyta drainage of Sonora and southwestern Arizona. The only naturally occurring population in Arizona is at Quitobaquito Spring and Pond, on Organ Pipe Cactus National Monument. Originally considered a subspecies of the desert pupfish, it was described as a separate species in 1987 (Miller and Fuiman). Additional information can be found in the desert pupfish listing rule (USFWS 1986c) and recovery plan (1986), and other references (Miller and Fuiman 1987, Weedman and Young 1997, Echelle et al. 2000, Minckley et al. 2002).

The Yaqui topminnow (*P. o. sonoriensis*) and Gila topminnow (*P. o. occidentalis*) were long considered subspecies under the Sonoran topminnow (*Poeciliopsis occidentalis*), until Minckley (1999) presented the case for specific status for both species (*P. sonoriensis* and *P. occidentalis*). Other researchers make the same argument (Quattro et al. 1996, Hedrick et al. 2002). The Yaqui topminnow occurs in the Rio Yaqui basin of Sonora and Arizona (USFWS 1995). In Arizona, it presently occurs only in the waters of San Bernardino National Wildlife Refuge.

One limiting factor in the recovery of topminnow and pupfish is availability of suitable habitat. Permanent water sources, free of nonindigenous predaceous fishes and within the species' historical ranges, are necessary for the successful establishment of topminnow and pupfish populations. Task 2 in the Desert Pupfish Recovery Plan states that habitat types similar to those occupied historically should be used in the effort to reestablish pupfish (USFWS 1993). Criteria necessary for downlisting the Gila topminnow, as listed in the first draft revised Gila Topminnow Recovery Plan for public review, include maintenance of refuge populations (Task 1.1) and reestablishment of Gila topminnow in suitable habitats (Task 2) following geographic

guidelines (Weedman 1999). Many non-federal sites have not been used in the effort to reestablish populations of topminnow and pupfish due to the difficulty in acquiring permits and gaining approval for use of those sites.

Historic events permanently altered much of the aquatic habitat in the arid Southwest, but current and future land-use activities also present a risk. Livestock overgrazing, mining, timber cutting, road maintenance, urban and suburban development, and recreation can pose threats to topminnow and pupfish and their habitat through increased erosion, intensified flood events, stream and river channelizations, increased water pollution, and groundwater pumping and diversions that decrease groundwater storage to both existing populations and habitats proposed for reestablishment (USFWS 1993, 1995; Weedman 1999).

Some populations are also at risk because they are supported in artificially constructed or modified habitats and require periodic maintenance to maintain the habitat. Maintenance of these habitats may be limited by budgetary restrictions within the various agencies responsible for management, making protection of remaining natural populations and reestablished populations in natural habitats all the more important. In addition, habitats identified for future reestablishment of topminnow and pupfish do not receive statutory protection and may be altered or destroyed, thereby precluding successful reestablishment of topminnow and pupfish populations and further reducing the recovery potential of the species.

A need also exists to provide mosquito control for public health and safety. Every summer, natural and manmade water sources act as breeding grounds for mosquitoes, which are vectors for the transmission of encephalitis, West Nile Fever, and other diseases. Although nonnative mosquitofish (*Gambusia affinis*) have traditionally been stocked into these habitats for mosquito control, the Gila topminnow has been shown to be as effective for mosquito control as mosquitofish (Childs 2001). Desert pupfish have also demonstrated effectiveness at mosquito control (Walters and Legner 1980). Establishing populations of topminnow and pupfish in these types of habitats would serve to protect public health while assisting in the conservation and recovery of these two endangered fishes.

3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

The Agreement proposes to cover habitats within the historical ranges of the topminnow and pupfish. The programmatic nature of the proposed Agreement – it covers many sites over a large area – makes it impossible to characterize each site that may be used. Although it is unknown at this time which particular sites may be covered by the Agreement, and the discussion of the affected environment and the environmental consequences must be broad, where possible, site-specific resources and impacts will be addressed. Sites may include, but are not limited to:

- Retention basins;
- Water treatment facilities;
- Groundwater recharge basins;
- Natural or artificial wetlands;

- Springs, marshes, or streams;
- Natural or artificial ponds, lakes, or other catchments; and
- Golf course ponds or other artificial water features.

The vast majority of these sites will be isolated from all other waters, and may occur in urban to wilderness locations. If fish have the potential to naturally spread to adjacent landowners properties, the sites will not be used. This will eliminate potential conflicts with adjacent landowners that do not wish to participate in this voluntary Agreement. However, if adjacent landowners are willing to participate, these habitats will be used. In certain cases, coordination and compliance with federal land management agencies may also be necessary if fish have the potential to naturally disperse from habitats covered under this Agreement onto federal lands.

Southeastern Arizona has been influenced by Europeans for hundreds of years and by Native Americans for much longer (Hastings and Turner 1965, Bahre and Hutchinson 1985, Bahre 1991, Tellman et al. 1997). Often cited human impacts in the area include vegetation type conversion, dewatering surface waters and aquifers, erosion and channel downcutting, loss or reduction of native species, introduction and spread of nonnative species, and habitat loss. As with many of the river basins in the southwest, aquatic habitats and fish communities in the Gila basin have changed from historic conditions (Miller 1961, de la Torre 1970, Naiman and Soltz 1981, Miller et al. 1989, Minckley and Deacon 1991, Rinne and Minckley 1991). Aquatic habitats have been fragmented and reduced in quantity and quality due to diversion, groundwater mining, and natural and human-caused changes in the watershed and hydrologic regime (de la Torre 1970, Davis 1982, Tellman et al. 1997). These and other factors may be leading to the collapse of entire western aquatic faunas (Williams et al. 1988, Minckley and Douglas 1991).

With the arrival of Europeans, major alterations began in the Gila River basin. Beaver, which were a major influence on the structure of the Gila basin aquatic ecosystem were diminished almost to extirpation (McNamee 1994). The introduction of livestock began very early and has resulted in substantial alteration of the watershed and its soil and vegetation (York and Dick Peddie 1969, Humphrey 1987, Bahre 1991). Croplands increased, often along river terraces, resulting in destabilization and erosion of floodplains (Leopold 1946, Rea 1983). Roads and trails caused extensive erosion and caused substantial destruction of river channels (Leopold 1921, Dobyns 1981, Rutman 1997). Diversion of water, which was already practiced by Native Americans in some areas, increased in those areas and was initiated in others (Tellman et al. 1997). As diversion and irrigation increased, the demand for water storage increased, resulting in a variety of large and small dams and impoundments (Haddock 1980). By the mid 1900's, large stretches of river in the Gila basin no longer had perennial flow, and the remaining areas were separated by long dry stretches, dams, and impounded water (Brown et al. 1978, Rea 1983, Hendrickson and Minckley 1984, Tellman et al. 1997). As a result of these changes, the riverine habitats of the Gila basin became fragmented, and connectivity was substantially reduced. Populations of fish or other aquatic species eradicated by perturbation were not replaced by colonization. Habitat fragmentation contributes to the genetic isolation of populations. Population fragmentation can reduce genetic variation and viability. This, in turn, can increase the risk of extinction by reducing survival, reproduction, and dispersal. Isolation also precludes re-colonization should one or more populations be eliminated. When an inhospitable

environment that imposes a high degree of threat on the remnant habitat surrounds isolated populations, these risks are compounded. This fragmentation has been a major factor in the decline of almost all of Arizona's native aquatic fauna and has resulted in the existing pattern, where native aquatic species, particularly rarer ones, tend to be isolated in small headwater areas scattered across the tributaries of the basin (Hendrickson and Minckley 1984, Minckley 1985).

Fragmentation has also provided some benefits to native aquatic species. While they were no longer able to move into other areas, the same impediments also inhibited the movement of nonnative fish and other aquatic species. These nonnative species were imported by humans, starting with common carp in 1885 (Gilbert and Scofield 1898). Since that time, at least 50 species of nonnative fish have been introduced (AZ State Univ., Geographic Information Systems database of fish records 2001) into the Gila River basin, and there are other records of incidental occurrences of another 10 to 15 species. Many nonnative aquatic invertebrates, amphibians, reptiles, plants, and disease organisms have also been introduced. These species have been purposefully introduced through sport, bait, biocontrol, and ornamental fish use and releases through aquaculture, aquarium, and generalized "bait bucket" activities. They have also been accidentally introduced through interbasin water transfers (Davies et al. 1992, Meador 1992, 1996; Stefferud and Meador 1998, Claudi and Leach 2000), aquarium and pet releases (Welcomme 1988, Courtenay 1993, FAO 1998), and inclusion with other species being purposefully stocked (Marsh and Minckley 1983, (Platz et al. 1990)). Nonnative aquatic species have had major detrimental impacts on native aquatic fauna and have been a major factor in the listing of topminnow and pupfish, as well as many other fishes native to the Gila basin (Stefferud 1984, USFWS 1975, 1985, 1986a, 1986b, 1986c, 1987, 1991).

Introduction of nonnative pathogens, parasites (Wilson et al. 1966, Robinson et al. 1996, Weedman et al. 1996), plants, invertebrates, amphibians, and fish negatively affects the native fishes of the Southwest. The primary biological threat to the Gila topminnow is the nonnative western mosquitofish, introduced to streams in the Southwest in the 1920's (Hubbs and Miller 1941, Miller 1961). Large scale reductions of Gila topminnow correspond strongly with the spread of mosquitofish, which were first collected from Arizona in 1926 (Miller and Lowe 1964).

One mechanism of replacement of Gila topminnow by mosquitofish is by direct predation (Schoenherr 1974). Gila topminnow evolved with a naturally depauperate fish fauna that had few predators. Although fish predators such as the Colorado River pikeminnow (*Ptychocheilus lucius*) and fishes of the genus *Gila* were present, these fish occupied different habitats and probably had little impact on Gila topminnow (Miller 1961, Minckley and Deacon 1991). In contrast, mosquitofish occupy similar habitats as Gila topminnow and are able to tolerate similar environmental extremes (Meffe et al. 1983). Mosquitofish are carnivorous, and have been observed to prey directly on young topminnow (Schoenherr 1974). Adult Gila topminnow mortality has also been linked to infections following the shredding or removal of fins by mosquitofish (Meffe 1985).

3.1 VEGETATION

Sites chosen for the establishment of topminnow and pupfish will likely be within warm temperate and subtropical wetland vegetation communities. Common species include bulrush (*Scirpus* spp.), cattail (*Typha* spp.), and Fremont cottonwood (*Populus fremontii*). Sites are likely to be surrounded by upland Sonoran desertscrub, semi-desert grassland, Sonoran savannah, or interior chaparral vegetation communities (Brown 1994). However, some sites are likely to be in areas that have been changed and disturbed and no longer harbor native vegetation. Although topminnow and pupfish can tolerate a variety of habitat conditions, algal mats or debris in the water and some shade over the water is desirable.

3.2 WILDLIFE

The amount of wildlife use at each site will be highly variable and will depend on location within the human development continuum (urban to wilderness), the vegetation community, proximity to other wetland areas and undisturbed vegetation, as well as many other important factors. Since each site will have open water, wildlife use is likely to be far greater than in the surrounding areas. Common wildlife species expected at the sites may include: great blue heron (*Ardea herodias*), mourning dove (*Zenaida macroura*), coyote (*Canis latrans*), various bat species, house sparrow (*Passer domesticus*), and various toad species.

3.3 LISTED, PROPOSED, AND CANDIDATE SPECIES

The information in section 2.0 describes the baseline situation for the Gila topminnow, Quitobaquito pupfish, Yaqui topminnow, and the desert pupfish. Additional information can be found in the recovery plans and other documents referenced there (USFWS 1993, 1995; Weedman 1999).

It is possible that other listed, proposed, or candidate species may occur at potential Agreement sites. The more urban and disturbed the site is, the less likely it is that listed species will occur there; the likelihood is greater for rural and less disturbed sites. However, if listed, proposed, or candidate species are present at a site, management actions designed to benefit topminnow and pupfish would likely benefit those species. Sites will probably be managed more intensively and maintained longer, open water will be developed, and landowner awareness of species (including listed species) present on Agreement sites will be increased. Management actions may include, but are not limited to, removal of nonnative species such as mosquitofish or bullfrogs (*Rana catesbeiana*) and vegetation control. Although mosquitofish are carnivorous, and have been observed preying directly on young topminnows, they and other nonnative predators also adversely affect native frog populations by preying on tadpoles, metamorphs, young frogs, and, possibly, egg masses. Vegetation removal may attract birds that prefer open aquatic habitat and additional open water is likely to attract other animals.

Species that would have the greatest potential for occurring at an Agreement site would be mobile riparian and aquatic species including: the threatened Chiricahua leopard frog (*Rana chiricahuensis*), the endangered southwestern willow flycatcher (*Empidonax traillii extimus*) and

Yuma clapper rail (*Rallus longirostris yumanensis*), and the candidate yellow-billed cuckoo (*Coccyzus americanus*). The endangered Huachuca water umbel (*Lilaeopsis schaffneriana* ssp. *recurva*) and Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*), as well as the proposed endangered Gila chub (*Gila intermedia*) are other species that may occur at Agreement sites. Although the Gila chub is mobile, it has limited dispersal probability because of its restricted distribution. The endangered lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*) may water at Agreement locations and the endangered cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) may also occur at Agreement sites, but is unlikely to do so because of its rarity. If federally protected species other than topminnow and pupfish occur at a site, an amendment to the Agreement, additional permitting, or section 7 consultation may be required.

3.4 CULTURAL RESOURCES

Cultural resources are site specific. Since no individual properties have been identified as likely to be enrolled, it is difficult to determine what, if any cultural resources could be present. The more urban and modified a particular site is, the less likely there will be cultural resources of significant value present. Sites that are associated with natural wetlands would have a much higher probability of containing cultural resources. No ground disturbance that may affect cultural resources is anticipated as a result of this Agreement.

3.5 SOCIOECONOMIC ENVIRONMENT

The socioeconomic environment at Agreement sites will vary with their locations. Sites may range from unused springs to ponds at sewage treatment plants. The most common potential sites are stock ponds for watering livestock associated with grazing operations. Any waters within the range of these two species that have been created and used to water livestock are likely to provide suitable habitat.

Other possible sites include, but are not limited to, private ponds, springs, streams, industrial ponds, retention basins, water features, and recharge facilities. Private ponds are not likely to be economically beneficial, but are likely to be socially important to their owners. If fish have the potential to naturally spread to adjacent landowners properties, the sites will not be used. This will eliminate potential conflicts with adjacent landowners that do not wish to participate in this voluntary Agreement. However, if adjacent landowners are willing to participate, these habitats will be used. In certain cases, coordination and compliance with federal land management agencies may also be necessary if fish have the potential to naturally disperse from habitats covered under this Agreement onto federal lands.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, mandates that federal agencies identify and address, as appropriate, disproportionally high and adverse human health or environmental effects of programs on minority or low-income populations. Releases of topminnow and pupfish are not expected to displace minority or low-income individuals.

Arizona is one of the fastest growing states in the country, and the trend is expected to continue. Continued rampant growth will place great demands on water resources, likely drying many natural waters. However, artificial ponds may increase in numbers with increasing development.

3.6 WETLANDS

Most Agreement sites will be devoid of fish before releases of topminnow and pupfish. Many non-native fish prey on native fish in early lifestages.

Wetland size and location, water quality, vertebrate and invertebrate species present, and vegetation present at Agreement sites are likely to vary greatly. Smaller, artificial, isolated, and newer wetlands will have less biotic and abiotic diversity when compared to natural, larger, or older sites that are not isolated.

3.7 LAND USE

A wide variety of land uses may occur at Agreement sites. Uses may range from preservation and conservation only to industrial sites and wastewater treatment facilities. If existing uses at potential sites are determined to be incompatible with maintaining a Gila topminnow or desert pupfish population, those sites would not be used.

3.8 WATER RESOURCES

All sites will have perennial water. The water source may be natural rivers, creeks, springs, and other wetlands or it may be an artificial source such as a well or water delivered through a potable or reclaimed water system or canal. Any sites considered must be available as fish habitat and their use cannot preclude the water rights of any entity. If fish have the potential to naturally spread to adjacent landowners properties, the sites will not be used. This will eliminate potential conflicts with adjacent landowners that do not wish to participate in this voluntary Agreement. However, if adjacent landowners are willing to participate, these habitats will be used. In certain cases, coordination and compliance with federal land management agencies may also be necessary if fish have the potential to naturally disperse from habitats covered under this Agreement onto federal lands.

4.0 ALTERNATIVES

This section presents details of the preferred alternative and other alternatives that have been considered. The National Environmental Policy Act (NEPA) requires that federal agencies consider a range of alternatives that could reduce the environmental impacts of the particular projects under consideration. In addition, if wetlands or archeological sites or other resources protected under laws other than the Endangered Species Act are to be impacted, we will recommend to the Applicant that they apply for additional specific permitting under those other federal agencies and programs which have jurisdiction over permits, other than endangered species permits.

4.1 ALTERNATIVE 1 – PREFERRED ALTERNATIVE

The preferred alternative is intended to contribute to the conservation and recovery of the Gila topminnow, Yaqui topminnow, Quitobaquito pupfish, and desert pupfish. Future incidental take of both species is anticipated to occur from issuing a 10(a)(1)(A) Enhancement of Survival permit to the Department. We also anticipate that topminnow and pupfish will always occur on a property covered by the permit, regardless of how many populations covered by the Agreement may be lost during the course of the agreement.

The duration of most individual landowner agreements covered by the Agreement will be relatively short (a few years). Although it appears that the benefits of the Agreement may be temporary, we anticipate that there will always be properties that are enrolled, that some of the properties may never be taken back to the baseline condition, and that some landowners may agree to an elevated baseline. A secondary benefit of the Agreement is the educational benefit that will be derived from it. Education is a task identified in the recovery plans for all four species and is crucial for recovery. Landowners will learn more about the pupfish and topminnow and the conservation of native fish, and the Agreement program will provide plentiful opportunities for additional education.

If at any time during the permit we determine that the Cooperative Agreements covered by the proposed Agreement are not yielding a net conservation benefit for the species, we may terminate the Department's authority to enter into additional Agreements. Such termination will not affect existing landowner agreements. Should we determine that the status of the species declines to the point where continuation of the permitted activity would jeopardize the continued existence of either species, we may revoke the Department's 10 (a)(1)(A) permit and its associated Safe Harbor Agreement.

4.2 ALTERNATIVE 2 – NO ACTION

In the No Action Alternative, there would not be a coordinated effort to reestablish topminnow and pupfish on non-federal properties using an enhancement of survival permit and Safe Harbor Agreement. Individual landowners could still seek individual Agreements or a Habitat Conservation Plan (HCP). More of the costs would be transferred to the landowner, and completing multiple agreements would take more time and consume more of our resources. Given these limited resources, it is likely that fewer conservation actions would be taken to benefit the endangered species.

Since it would be more difficult for landowners to have these native fish on their property, they will be more likely to use nonnative species, including species that have negative impacts to the pupfish and topminnow.

Also, without the native fish and without the regulatory assurances provided by an Agreement, additional aquatic habitats may be lost. Conservation actions that may have been taken under the Agreement that could benefit other species will also not occur.

4.3 OTHER ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

A rangewide Habitat Conservation Plan for both species has been discussed. Other alternatives include doing individual Agreements or HCPs for each interested landowner. The release of fish can be covered by a section 7 consultation, but for many sites there would be no federal nexus. Some sites can be covered under the Department's or Service's Section 10(a)(1)(A) Scientific Collection Permit, as has been done for some populations being held at schools. However, these permits were not intended for covering widespread activities for the recovery of a species. Landowners do not receive assurances when section 7 or Scientific Collection Permits are used. The individual approach would add significant workload to Department and Service staff.

4.3.1 RANGEWIDE HABITAT CONSERVATION PLAN

One alternative discussed and rejected by the Department is a rangewide Habitat Conservation Plan for the four species. However, because the Department received funding to do an Agreement, a rangewide HCP has not been pursued. The environmental consequences of an HCP would be similar to those of an Agreement. The main difference would be that a HCP can allow incidental take to occur below the baseline and a SHA does not.

4.3.2 INDIVIDUAL AGREEMENTS OR HCPs

Another alternative is doing individual Agreements or HCPs for each interested landowner. If landowners decide to develop individual Agreements or HCPs and obtain endangered species permits to contribute to the conservation and recovery of the pupfish and topminnow, they often become discouraged with the complexity of the permitting process and the time delays associated with issuance of these traditional endangered species permits. Individual Agreements require less processing time than HCPs, but may take several weeks to several months to complete. Even with our template HCP, the projected timeframe to customize each individual HCP before review, approval, and permit issuance may take from 4 to 6 months. These time delays and such a piecemeal approach also delay implementing conservation measures for pupfish and topminnow, which are urgently needed for these imperiled species. Landowners who do not have a zero baseline and choose to proceed without an endangered species permit run the risk of non-compliance with the Act, which can result in fines and imprisonment. This latter situation places both the individual land owners and us at considerable risk of litigation, while resulting in the ultimate demise of the pupfish and topminnow and their habitat. The individual approach would add significant workload to the Department and Service staff, with no appreciable benefit above the preferred alternative to the environment or the public.

4.3.3 RELEASES UNDER SECTION 7

Releasing fish as a federal action covered by a section 7 consultation is possible, but for many sites there would be no federal nexus, which is necessary for section 7 to apply. Some sites can be covered under the Department's or the Service's Section 10(a)(1)(A) Scientific Collection Permit, as has been done for some populations being held at schools. However, these permits

Table 1. Alternatives Compared		
ISSUES	PREFERRED ALTERNATIVE	NO ACTION ALTERNATIVE
Effects of the alternative on topminnow and pupfish habitat	Provides suitable habitat for reestablishment of topminnow and pupfish on non-federal lands	No provision for additional habitat for topminnow and pupfish beyond that currently occupied
Effects of the alternative on conservation of topminnow and pupfish	Provides refuge populations of topminnow and pupfish as insurance against catastrophic loss of natural populations and as source of fish for reestablishment efforts	No effects
Effects of the alternative on human health	Provides mosquito control by predation of mosquito larvae by topminnow and pupfish	Mosquito control by predation of mosquito larvae by nonnative fish in some aquatic habitats
Effects of stocking aquatic habitats with nonnative fish species	Reduces the need for stocking nonnative fishes as mosquito control. Non-native fishes have contributed to the decline of topminnow and pupfish	No effect
Effects of the alternative on non-target wildlife species	The addition and protection of open water will attract and benefit multiple species of wildlife	No effect
Effects of the alternative on water quality	Protection of aquatic sites for the benefit of topminnow and pupfish will prevent adverse effects on water quality	No effect
Monitoring of topminnow and pupfish	Allows for biological monitoring that will address the status and distribution of topminnow and pupfish	None
Adaptive management	Allows the conservation program to be modified in light of new scientific information	None

were not intended for covering widespread activities for the recovery of a species. Landowners do not receive regulatory assurances when section 7 or Scientific Collection Permits are used.

5.0 ENVIRONMENTAL CONSEQUENCES

Refer to Table 1 for a comparison of the effects of the preferred alternative and the no action alternative.

5.1 ALTERNATIVE 1 – PREFERRED ALTERNATIVE

5.1.1 VEGETATION

Sites where topminnow and pupfish could be released may have problems with encroachment by vegetation. In extreme cases, vegetation management may be required before fish could be released at the site. Sites may also need periodic vegetation management to maintain suitable habitat and a viable population. The amount of vegetation control at a site will be highly variable and require landowner agreement.

Managing vegetation at sites will decrease the amount of aquatic vegetation within the action area. However, the change is likely to be small because only a small proportion of wetlands are expected to be enrolled in the Agreement, vegetation management is not likely to be permanent, and not all sites will require such management. In addition, open aquatic habitat is less common than vegetated aquatic habitat, since the natural progression of wetlands is to become vegetated and to fill. Removing vegetation will assist the fish in preying on mosquito larvae.

5.1.2 WILDLIFE

Wildlife use at a site may increase with the addition of fish. Fish-eating birds are likely to use the sites once fish are established. Birds that prefer open aquatic habitat may increase, while birds that prefer aquatic vegetation may decrease. Additional open water may attract other animals to water.

For a variety of reasons, including mosquito control and aesthetics, non-federal landowners want fish in waters they control. If native fish such as topminnow and pupfish are not available, they are likely to stock a nonnative species. Many nonnative species have negative impacts on topminnow and pupfish and their introduction, reintroduction, and spread are recognized factors in the declines of these native species (Meffe et al. 1983, Marsh and Minckley 1990, USFWS 1993, Weedman 1999). *Gambusia* is an especially problematic species for topminnow and pupfish (Schoenherr 1974, Meffe et al. 1983, USFWS 1993, Weedman 1999), and any actions to reduce its use and spread will be beneficial to the recovery of the two native fish (USFWS 1993, Weedman 1999).

5.1.3 LISTED, PROPOSED, AND CANDIDATE SPECIES

Because of the programmatic, range-wide nature of the proposed Agreement, a large number of sensitive species could be impacted. Table 2 lists those species that occur within the historical range of the pupfish and topminnow, their status, and whether or not the Preferred Alternative has the potential to impact them positively or negatively. Most species will not be affected at all by the proposed action for the following reasons:

- they have limited distributions and are unlikely to occur at any sites;
- many species do not occur in or near wetlands; and
- some species do not occur or occur very rarely within the action area.

Most of the species expected to occur within release sites will be positively impacted because sites included in the Agreement are likely to be managed more intensively, be maintained longer, create open water, and increase landowner knowledge about endangered species. Some of the species to be positively affected may also be negatively affected. How these species are affected will mostly depend on whether they are already present. Take of listed animal species in addition to pupfish and topminnow is not authorized by the proposed Agreement. At sites where a listed animal species other than the species covered by the safe harbor occurs or is expected to occur, and incidental take is expected, additional permitting will be required. The Agreement

Table 2. List of sensitive species within the historical ranges of the topminnow and pupfish in Arizona, listing status, and likelihood of effect from the preferred alternative.

Species	Listing status[1]	Potential effect[2]
Acuna cactus (*Echinomastus erectocentrus* var. *acunensis*)	C	none
Arizona agave (*Agave arizonica*)	E	none
Arizona hedgehog (*Echinocereus triglochidiatus* var. *arizonicus*)	E	none
Arizona cliffrose (*Purshia subintegra*)	E	none
bald eagle (*Haliaeetus leucocephalus*)	T	none
black-tailed prairie dog (*Cynomys ludovicianus*)	C	none
bonytail chub (*Gila elegans*)	E	none
brown pelican (*Pelecanus occidentalis californicus*)	E	none
cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*)	E	none
Canelo Hills ladies'-tresses (*Spiranthes delitescens*)	E	positive/ negative
Chiricahua leopard frog (*Rana chiricahuensis*)	T	positive
Colorado white salmon (*Ptychocheilus lucius*)	E	none
Gila chub (*Gila intermedia*)	PE	positive
Huachuca springsnail (*Pyrgulopsis thompsoni*)	C	positive
Huachuca water umbel (*Lilaeopsis schaffneriana* ssp. *recurva*)	E	positive/ negative
jaguar (*Panther onca*)	E	none
Kearney blue star (*Amsonia kearneyana*)	E	none
loach minnow (*Tiaroga cobitis*)	T	none
masked bobwhite (*Colinus virginianus ridgewayi*)	E	none
Mexican gray wolf (*Canis lupus baileyi*)	E	none
Mexican spotted owl (*Strix occidentalis lucida*)	T	none
Nichol Turk's head cactus (*Echinocactus horizonthalonius* var. *nicholii*)	E	none
northern aplomado falcon (*Falco femoralis septentrionalis*)	E	none
ocelot (*Leopardus (=Felis) pardalis*)	E	none
Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*)	E	none
razorback sucker (*Xyrauchen texanus*)	E	positive
Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*)	E	positive/ negative
Sonora chub (*Gila ditaenia*)	T	positive
Sonoran pronghorn (*Antilocapra americana sonoriensis*)	E	none
southwestern willow flycatcher (*Empidonax trailli extimus*)	E	positive
spikedace (*Meda fulgida*)	T	none
woundfin (*Plagopterus argentissimus*)	E	none
yellow-billed cuckoo (*Coccyzus americanus*)	C	positive

Table 2. List of sensitive species within the historical ranges of the topminnow and pupfish in Arizona, listing status, and likelihood of effect from the preferred alternative.		
Species	Listing status[1]	Potential effect[2]
Yuma clapper rail (*Rallus longirostris yumanensis*)	E	positive/ negative
[1] E = endangered, T = threatened, PE = proposed endangered, C = candidate [2] either 1) positive, 2) negative, or 3) none, neutral, or highly unlikely		

and its associated 10(a)(1)(A) permit only allows incidental take for desert pupfish, Quitobaquito pupfish, Yaqui topminnow, and Gila topminnow.

Species that may benefit include Chiricahua leopard frog, Canelo Hills ladies tresses, Gila chub, Huachuca springsnail, Huachuca water umbel, razorback sucker, Sonora tiger salamander, Sonora chub, southwestern willow flycatcher, yellow-billed cuckoo, and the Yuma clapper rail. The Yuma clapper rail is the species most likely to be negatively impacted from activities associated with the Agreement. Releasing topminnow and pupfish will have no effect on the Yuma clapper rail, but vegetation management may remove emergent aquatic vegetation, which is the preferred habitat for the clapper rail. However, clapper rails prefer larger stands of emergent vegetation so many of the Agreement sites, which are likely to be small, may not contain suitable Yuma clapper rail habitat (USFWS 1983). Sites with emergent vegetation within the proposed action area may need to be surveyed for Yuma clapper rails, especially if vegetation management is expected.

5.1.4 CULTURAL RESOURCES

Release of topminnow or pupfish and vegetation management are not expected to affect cultural resources because no surface disturbance would occur. The 10(a)(1)(A) permit and its associated Agreement authorizes incidental take and does not specifically authorize actions that can affect cultural resources. Although actions causing take may impact cultural resources, compliance with laws affecting cultural resources would be the responsibility of the landowner, except when the Department or the Service are responsible for the action. Many potential sites are likely to have been highly disturbed, and not contain any cultural resources.

5.1.5 SOCIOECONOMIC ENVIRONMENT

Implementing the Agreement and releasing the fish is unlikely to preclude or inhibit economic uses of Agreement properties. Fish will only be reestablished on properties where their presence is compatible with current and expected uses during the life of an individual agreement. The Agreement allows for early termination of each individual landowners' agreement.

If vegetation management is done at a site, resources will be expended to do the management. The source of the resources (money, labor) may be the landowner, the Department, the Service, or any other entity and is subject to negotiation.

The reestablishment of topminnow and pupfish may reduce costs for mosquito control. Both Gila topminnow and desert pupfish are known to prey on mosquito larvae (Walters and Legner 1980, Childs 2001), and their presence may reduce or negate the need for other control measures such as larvicide, pesticide, and water level management.

5.1.6 WETLANDS

Some wetlands may be maintained longer than they would have been without the release of topminnow and pupfish.

5.1.7 LAND USE

Under the Preferred Alternative, there could be a delay when landowners want to do something with an Agreement property, due to the requirement that they provide at least 30 days notice before actions that could cause the loss of the fish population. Also, because landowners must commit to a minimum of three years; uses may have to be precluded for that length of time. However, the landowner and the Department should consider expected land uses when deciding to enroll a particular property.

5.1.8 WATER RESOURCES

Implementation of the Preferred Alternative does not imply any interest in water rights associated with any property. Though landowners may preclude using water for something other than wetland conservation during their agreement, that is a choice they will make voluntarily. However, water use will not take populations of topminnow or pupfish below baseline.

5.2 NO ACTION ALTERNATIVE

5.2.1 VEGETATION

Under this alternative aquatic areas would remain in their natural vegetative state and there would be no impacts to upland vegetation. It is possible that more vegetation could be lost at sites without the fish, since the sites could be seen to have less value by the landowner and could be developed.

5.2.2 WILDLIFE

Since no changes will be made to potential sites under this alternative, there would be no impacts on or benefits to wildlife.

5.2.3 LISTED, PROPOSED, AND CANDIDATE SPECIES

Any sensitive (listed, proposed, candidate) species that may occur at a site would not likely be discovered under the no action alternative. Discovering additional populations is important to the conservation and recovery of sensitive species. Aquatic habitats are more likely to be lost under the No Action Alternative, because if the site is being used for listed fish recovery, there is a reason to maintain the site that may not have existed before.

5.2.4 CULTURAL RESOURCES

The No Action Alternative will maintain the status quo at the sites, so no impacts would be expected. Landowners would need to comply with existing laws, whether or not there is an Agreement.

5.2.5 SOCIOECONOMIC ENVIRONMENT

Under the No Action Alternative, a programmatic Agreement would not be done and there would be no socioeconomic impacts.

5.2.6 WETLANDS

The choice of the No Action Alternative may allow some wetlands to be lost, since they would not be afforded protection by the Agreement.

5.2.7 LAND USE

Land use will not be affected by the No Action alternative.

5.2.8 WATER RESOURCES

There will be no impacts to water resources under this alternative.

6.0 ADDITIONAL INFORMATION

Additional information related to this Environmental Assessment can be found in the Department's Application for a Section 10(a)(1)(A) Enhancement of Survival Permit and Agreement, which are incorporated here by reference. Additional information on the Gila and Yaqui topminnow and Quitobaquito and desert pupfish can also be found in the draft revised recovery plan (Weedman 1999) and recovery plan (USFWS 1993).

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Appendix 1. Figure of the geographic coverage of this Agreement.