APPENDIX 1. CONCURRENCES

SONORA TIGER SALAMANDER (*Ambystoma tigrinum stebbensi*)

Status of the Species in the Action Area

The Sonora tiger salamander is known from about 53 breeding localities, although not all are currently occupied (Collins and Jones 1987, Collins 1996, Abbate 1998, USFWS 2002b and files). Populations and habitats are dynamic, thus the number and location of extant aquatic populations change over time, as exhibited by the differences between survey results in 1985 and 1993 to 1996 (Collins and Jones 1987; Collins 1996; James Collins, ASU, pers. comm. 1996). During surveys by the AGFD from 2001 to 2006, Sonora tiger salamanders were found at 37 of 139 stock tanks, which were sampled from 1 to 7 times each. At 23 of 29 tanks where salamanders were found, and which were sampled more than once, salamanders were not found on at least one visit.

All sites where Sonora tiger salamanders have been found are located in Arizona in the Santa Cruz and San Pedro River drainages, including sites in the San Rafael Valley and adjacent portions of the Patagonia and Huachuca mountains in Santa Cruz and Cochise counties. All confirmed historical and extant aquatic populations are found in cattle tanks or impounded cienegas within 19 miles of Lochiel, Arizona. Salamanders collected from a cienega at Rancho Los Fresnos in the San Rafael Valley, Sonora, may be *A. t. stebbinsi* (Varela-Romero et al., 1992). However, surveys during 2006 failed to locate additional salamanders, and most waters on the ranch are now occupied by nonindigenous bullfrogs, crayfish, green sunfish, or black bullhead (trip reports, USFWS files).

For further information on the ecology, taxonomy, range, and threats to this subspecies, refer to U.S. Fish and Wildlife Service (2002b), Collins (1981, 1996), Collins and Jones (1987), Collins et al. (1988, 2003), Gehlbach (1967), Jancovich et al. (1997, 1998, 2005), Jones et al. (1988, 1995), Lowe (1954), Snyder et al. (1996, 1998), Storfer (2003), and Storfer et al. (2004).

Analysis Of Effects

Impacts of nonindigenous fishes and conspecific salamanders to Sonora tiger salamander are potentially the greatest among species considered here. Sonora tiger salamander evolved in systems that may have been devoid of fishes, and populations typically succumb when nonindigenous fishes invade their habitats. However, Sonora tiger salamander now breeds almost exclusively in artificial stock watering tanks in ephemeral drainages that are least accessible to fishes, and thus the threat of nonindigenous species introductions to those habitats is low unless aided by direct bait bucket transfers.

Tiger salamander populations in the western United States and Canada, including populations of the Sonora tiger salamander, exhibit frequent epizootics (Collins et al. 2001). Sonora tiger salamander populations experience frequent disease-related die-offs (about 8% of populations are affected each year) in which almost all salamanders and larvae in the pond die. *A. tigrinum* virus (ATV) is the pathogen believed to be primarily responsible for these die-offs (Jancovich et

al. 1997). ATV may be spread by bullfrogs, birds, cattle, or other animals that move among tanks (Jancovich et al. 1997); however, the viral life cycle appears to be restricted to tiger salamanders - no other syntopic hosts have been identified (Jancovich et al. 2001). The disease could be spread by researchers or anglers if equipment such as waders, nets, or fishing tackle used at a salamander tank are not allowed to dry or are not disinfected before use at another tank. ATV may have switched from sport fishes to salamanders or was introduced with water dogs (*A. t. mavortium*) imported for use as fish bait in Arizona and elsewhere (Jancovich et al. 2005). Collins et al. (2003) identified ATV in waterdogs obtained from a Phoenix bait shop.

Sonora tiger salamanders also contract chytridiomycosis, a fungal disease associated with global declines of frogs and toads (Berger et al. 1998, Longcore et al. 1999, Speare and Berger 2000, Davidson et al. 2003). However, compared to anurans, infected salamanders exhibit only minimal symptoms (Davidson et al. 2000).

Conclusion

We concur with Reclamations's determination that the proposed action may affect, but is not likely to adversely affect, the Sonora tiger salamander for the following reasons:

- The San Rafael Valley is more isolated from CAP than other sites in the SCR subbasin, therefore the likelihood that nonindigenous species transported through the CAP will reach these populations is discountable.

- Problematic nonindigenous fish would have to be moved by people to get into the habitats that Sonora tiger salamanders occupy.

DESERT PUPFISH (*Cyprinodon macularius*)

Status of the Species in the Action Area

In Arizona, the family Cyprinodontidae was historically represented by two recognized subspecies, (*Cyprinodon m. macularius*) and (*C. m. eremus*), and an undescribed species, the Monkey Spring pupfish. Echelle et al. (2000) and Minckley et al. (2002) raised *C. m. eremus* to a species, *C. eremus*. Also, Minckley et al. (2002) suggested that the SCR drainage was historically occupied by the extinct Santa Cruz (=Monkey Spring) pupfish, described as *Cyprinodon arcuatus*. This has led to discussion among experts as to whether desert pupfish (*C. macularius*) should be reestablished 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). There is general agreement 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 ecologically equivalent. Minckley et al. (2002) suggest that the species are similar enough that they were long confounded under *C. macularius*, and the biogeographic considerations suggest that the affinities of *C. arcuatus* 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 in the Santa Cruz should be pursued for *C. macularius*.

There are 13 natural populations that persist; nine of these are in Mexico, and none are in the Gila basin. About 20 transplanted populations exist in the wild (USFWS 1993b). One of the existing populations is semi-captive and is located in a small impoundment at Boyce-Thompson Arboretum, near the town of Superior. Both are small habitats. The Boyce-Thompson site is contaminated with fathead minnow, a nonindigenous fish. The oldest reestablished population is in Cold Spring Seep, a modified spring complex along the northern Gila River escarpment, just west of the town of Safford. Red shiner have been found in Cold Spring Seep, apparently a bait bucket introduction, but appear to have been successfully removed. Desert pupfish have been recently released into two streams in the Agua Fria drainage, three sites in the Aravaipa drainage, Fossil Creek, and streams on the Muleshoe. Only the Agua Fria populations appear to be self-sustaining. The success of the Aravaipa stockings is unclear, as pupfish have not been found post-stocking. Additional stocking of desert pupfish for recovery in the Gila basin is expected over the 100-year project life of CAP.

Analysis Of Effects

No natural populations of desert pupfish are located within the action area. Most areas in which repatriation is likely to occur are isolated, although some may be connected to other surface waters. Although the existing repatriated populations are the sole representatives of this species in the entire Gila basin, the potential for adverse effects from CAP-mediated nonindigenous aquatic species is expected to be very small because there are so few occupied sites. However, some aquatic species dispersing via CAP, such as giant salvinia, might have a substantially increased likelihood of reaching these habitats once introduced into the Gila basin through the CAP aqueduct. The potential impacts from CAP-mediated movement of nonindigenous species to the desert pupfish will be similar to those described for the Gila topminnow, but much smaller in scope and in potential to occur.

Conclusion

We concur with Reclamation's determination that the proposed action may affect, but is not likely to adversely affect, the desert pupfish for the following reasons:

- There are no natural populations, and few reestablished populations in the action area.
- The reestablished populations are isolated, and the likelihood that nonindigenous species transported through the CAP will reach these populations is discountable.
- No barriers are planned at any extant desert pupfish populations.
- The conservation measures should enhance the status of the species.

APACHE TROUT (*Oncorhynchus apache*)

Status of the Species in the Action Area

Historically, Apache trout inhabited most of the streams occurring greater than about one mile in elevation (1,609 meters) in east-central Arizona's White Mountains. By 1950, the only known populations of Apache trout were located on the Fort Apache Indian Reservation (FAIR). Streams occupied today by this trout species within its former historical range are located on the FAIR and the Apache-Sitgreaves National Forest. Apache trout within the action area occur in headwaters of the Salt River system. This includes 12 natural populations and 9 replicate populations. These populations are at the uppermost ends of the action area with a number of intervening dams along the Salt River that separate them from direct influence from CAP mediated nonindigenous aquatic species. Their status in the action area is equivalent to their range-wide status, which is good and improving.

Analysis Of Effects

Apache trout is not expected to sustain significant impacts. Their populations and recovery areas are distant from the CAP aqueduct and above the mainstem dams on the Gila, Salt, and Verde rivers. In addition, there are small fish barriers near the downstream end of most of the Apache trout occupied habitats. The higher, colder waters of the trout habitats are substantially less likely to be successfully colonized by species moving out of the warmwater CAP aqueduct or its related facilities.

Conclusion

We concur with Reclamation's determination that the proposed action may affect, but is not likely to adversely affect, the Apache trout for the following reasons:

- Apache trout habitats are distant from CAP and associated waters, and are above numerous dams and barriers. Therefore, the likelihood that nonindigenous species transported through the CAP will reach these populations is discountable.

- The nonindigenous aquatic species likely to be spread by CAP are likely to be most adapted to warm water, and not the colder water occupied by Apache trout. Therefore, effects of the CAP should be insignificant.

GILA TROUT (*Oncorhynchus gilae*)

Status of the Species in the Action Area

The range of Gila trout is entirely contained within the Gila River basin, so that its status range-wide is equivalent to that in the action area. The Gila trout is endemic to mountain streams in the Gila, San Francisco, Agua Fria, and Verde river drainages in Arizona and New Mexico (Miller 1950, Minckley 1973, Behnke 1992). In 1975, the known distribution of the species consisted of only five relict populations restricted to headwater stream habitats in the upper Gila River

drainage in New Mexico (Main Diamond Creek, South Diamond Creek, McKenna Creek, Spruce Creek, Iron Creek). Before 1900, Gila trout were found in Arizona in the Agua Fria River, Verde River, Eagle Creek, Blue River, and San Francisco River, but the species was extirpated from the state around the turn of the century. The species remained extirpated from Arizona until fish from Main Diamond Creek were translocated into Gap Creek, a tributary of the Verde River, in 1974. This population is believed to be extirpated.

Dude Creek, a tributary of the East Verde River near Payson, was stocked with Gila trout in 1999. In November 2000, Raspberry Creek, a tributary to the Blue River, was stocked with 113 age 0 Gila trout, creating a second Arizona population. Gila trout was also stocked into Strayhorse Creek in the Blue River basin. These fish are considered the representative native trout for the San Francisco and Blue river drainages (David 1998). Within the action area, the status of Gila trout is good and improving, due to extensive recovery efforts that are primarily removal and prevention of invasion of nonindigenous fish.

Analysis Of Effects

Natural and repatriated populations in the tributaries of the upper Gila and San Francisco rivers are near the top of the watershed, but have only one intervening large dam between them and the CAP. All of the others have natural or constructed barriers near their downstream limits. Repatriated populations in Arizona are located in Dude Creek, a tributary of the East Verde River and Raspberry Creek, a tributary of the Blue River. Additional repatriation efforts are expected in headwater streams in the Verde, Blue, and Eagle drainages.

Conclusion

We concur with Reclamation's determination that the proposed action may affect, but is not likely to adversely affect, the Gila trout for the following reasons:

- Gila trout habitats are distant from CAP and associated waters, and are above numerous dams and barriers. Therefore, the likelihood that nonindigenous species transported through the CAP will reach these populations is discountable.

- The nonindigenous aquatic species likely to be spread by CAP are likely to be most adapted to warm water, and not the colder water occupied by Gila trout. Therefore, effects of the CAP should be insignificant.

APPENDIX 2. Central Arizona Project – section 7 consultations in Arizona.

Consultation Number	Project	Formal(F) Informal(I) Conference(C)	Biological Opinion Concurrence Date	Finding	Species
2-21-83-F-10	Central Arizona Water Control Study - Plan 6	F	3/8/83 amended 4/7/83	jeopardy nonjeopardy	bald eagle Yuma clapper rail, Gila topminnow, peregrine falcon
	- Waddell Dam	F	11/15/84 amended 7/2/97	jeopardy	bald eagle
	- Cliff Dam	F	8/15/85	jeopardy	bald eagle
	- Cliff Dam	F	3/10/87	nonjeopardy	Arizona cliffrose
	- Roosevelt Dam (see also 2-21-95-F-462)	F	3/30/90	jeopardy	bald eagle
2-21-83-I-24	New Waddell Pumped Storage Hydroelectric Plant	I		file missing	
2-21-83-I-50	Pump below Granite Reef Dam	I			bald eagle Yuma clapper rail
2-21-83-I-55	CAP upstream water exchange (converted to 2-21-86-F-87)	I	see 2-21-86-F-87		spikedace loach minnow bald eagle
2-22-83-F-74	Upper Gila Water Supply Study (Hooker/Connor Dam)	F	draft 3/9/87	nonjeopardy	Spikedace, loach minnow, bald eagle
2-21-84-F-49	Ft. McDowell Indian Reservation – Rehabilitation and Betterment Irrigation System	F	3/21/85	jeopardy	bald eagle
2-21-84-I-56	Tucson Aqueduct Phase B (CAP)	C F	11/18/85 6/27/86	jeopardy jeopardy	Tumamoc globeberry Thornber's fishhook cactus
2-21-84-I-92	Tonopah Irrigation District CAP water delivery system	I			none

APPENDIX 2 cont'd. Central Arizona Project – section 7 consultations in Arizona.

Consultation Number	Project	Formal(F) Informal(I) Conference(C)	Biological Opinion Concurrence Date	Finding	Species
2-21-84-F-96	Papago and San Xavier Indian Reservations (SAWRSA) and Schuk Toak	F	11/2/87	nonjeopardy	Tumamoc globeberry
2-21-84-I-97	Granite Reef aqueduct wildlife water catchments	I		no effect	peregrine falcon
2-21-84-I-98	Avra Valley Irrigation and Drainage District delivery system (CAP)	I			Thornber's fishhook cactus
2-21-85-I-03	Farmers Investment Coop. - CAP water system	I			bald eagle, peregrine falcon Thornber's fishhook cactus
2-2185-I-38	Cave Creek Water Co. storage facility	I			none
2-21-85-I-40	Salt River Indian Community Plan - CAP	I			peregrine falcon Yuma clapper rail
2-21-85-I-41	Papago Chui Chu on-reserva-tion delivery system – CAP	I			Thornber's fishhook cactus
2-21-85-I-66	Castle Hot Springs right-of-way rerouting	I			none
2-21-85-I-106	San Tan Irrigation, Chandler Heights, Queen Creek Districts delivery systems - CAP	I			none
2-21-86-I-22	Ft. McDowell Irrigation Project	I			bald eagle, peregrine falcon Yuma clapper rail

APPENDIX 2 cont'd. Central Arizona Project – Section 7 Consultation History

Consultation Number	Project	Formal(F) Informal(I) Conference(C)	Biological Opinion Concurrence Date	Finding	Species
2-21-86-I-35	Delivery system CAP - Community Water Company of Green Valley, Green Valley Water Company, and New Pueblo Water Company	I			bald eagle peregrine falcon Tumamoc globeberry Thornber's fishhook cactus
2-21-86-I-66	Relocation & reconstruction of US 88 near Government Camp on Lake Roosevelt	I		file missing	
2-21-86-I-73	Gila River Indian Community water and soil conservation study (CAP)	I			Thornber's fishhook cactus Tumamoc globeberry
2-21-86-C-87 2-21-86-F-87	Upper Gila Water Supply Study and Verde River diversions	C F	4/14/86 5/30/90 amended 3/18/94	jeopardy & adverse modification jeopardy & adverse modification of proposed critical habitat	spikedace loach minnow spikedace
2-21-87-I-52	Pan Quemado communication site and road (CAP)	I			Tumamoc globeberry Thornber's fishhook cactus Nichol's turkshead cactus
2-21-87-I-56	High Plains States groundwater recharge demonstration project in Arizona	I			Tumamoc globeberry

APPENDIX 2 cont'd. Central Arizona Project – Section 7 Consultation History

Consultation Number	Project	Formal(F) Informal(I) Conference(C)	Biological Opinion Concurrence Date	Finding	Species
2-21-87-I-79	Temporary 69KV line and substation, New Waddell Dam	I			bald eagle peregrine falcon
2-21-87-I-90	Water resources core hole drilling, Tohono O'odham	I			Tumamoc globeberry Nichol's turkshead cactus Thornber's fishhook cactus
2-21-87-I-124	Tucson Aqueduct Reach 6 or Tucson Pipeline/Tunnel	I			Tumamoc globeberry
2-21-88-I-71	New powerplant road and Apache Trail relocation, Roosevelt Dam	I			none
2-21-88-I-72	Proposed wildlife water catchments, New Waddell Dam	I			none
2-21-88-I-113	Los Reales transmission line, CAP	I		no effect	Tumamoc globeberry
2-21-88-I-125	Doe Peak water catchments, New Waddell Dam	I			none
2-21-89-I-34	Wildlife water catchments, Tucson aqueduct	I			Tumamoc globeberry
2-21-89-I-36	Wildlife water catchments, Salt-Gila aqueduct	I			none
2-21-89-I-101	Wildlife water catchments, Pinal County	I			none
2-21-90-I-41	Tucson water treatment plant spoil site	I		no effect	Tumamoc globeberry
2-21-90-I-51	Pasqua Yaqui Reservation	I			Tumamoc globeberry, Gila topminnow, Sanborn's bat

APPENDIX 2 cont'd. Central Arizona Project – Section 7 Consultation History

Consultation Number	Project	Formal(F) Informal(I) Conference(C)	Biological Opinion Concurrence Date	Finding	Species
2-21-90-F-119	Pima Lateral Feeder Canal/ Introduction and Spread of nonnative species into Gila River Basin (excluding the Santa Cruz) via CAP	F F (reinitiation)	4/20/94 amended 6/22/95 5/6/98 7/15/98 1/13/00 6/30/00 4/17/01	jeopardy & adverse modification jeopardy nonjeopardy	Spikedace, loach minnow, razorback sucker, Gila topminnow, bald eagle, Colorado squawfish, desert pupfish
2-21-90-I-151	Carefree Water Company upgrade	I			none
2-21-91-I-238	CAP - Salt River Pima-Maricopa Indian Community water use	I		no effect	bald eagle Yuma clapper rail
2-21-91-F-248	Federal Loan Application, Fort McDowell Indian Reservation	F	2/28/92	jeopardy	bald eagle
2-21-91-I-406	Tucson Aqueduct System Reliability (TASRI) - Construction and Filling of reservoir CAP - Nonnative Introduction and Spread in Santa Cruz River subbasin	F I F I	2/11/98 draft 6/11/99 12/6/94 6/5/97	jeopardy is not likely to adversely affect jeopardy no effect is not likely to adversely affect	Pima pineapple cactus Gila topminnow, lesser long-nosed bat, desert pupfish, cactus ferrug. pygmy owl Gila topminnow Spikedace, loach minnow, razorback sucker Colorado squawfish, Sonora tiger salamander, Chiricahua leopard frog
2-21-92-I-41	Salt River siphon, Granite Reef Dam	I		not likely to adversely affect	bald eagle, Yuma clapper rail, razorback sucker, bonytail chub
2-21-92-I-226	Pima Mine Road pilot recharge project	I			lesser long-nosed bat Tumamoc globeberry

APPENDIX 2 cont'd. Central Arizona Project – Section 7 Consultation History					
Consultation Number	Project	Formal(F) Informal(I) Conference(C)	Biological Opinion Concurrence Date	Finding	Species
2-21-92-I-709	Cacti salvage at Lake Pleasant	F	formal withdrawn 12/3/92		bald eagle
2-21-92-I-722	San Carlos Irrigation District Rehabilitation for CAP	I			none
2-21-93-I-86	Gila River Indian Community on-farm development	I			bald eagle, SW willow flycatcher, peregrine falcon, Yuma clapper rail, cactus ferrug. pygmy owl, lesser long-nosed bat
2-21-93-I-124	Sierra Vista wastewater wetlands (converted to 2-21-99-I-097)	I	see 2-21-99-I-097		
2-21-93-I-339	Cortaro-Marana Irrigation District indirect recharge project	I		no effect/ proposed mitigation and time limit, renewed for 1995	Spikedace loach minnow Gila topminnow desert pupfish razorback sucker Colorado squawfish bald eagle
2-21-93-I-412	New River siphon repairs	I			bald eagle peregrine falcon
2-21-95-I-247	Agua Fria siphon repairs	I			peregrine falcon cactus ferrug. pygmy owl
2-21-95-F-462	Roosevelt Lake, water level changes	F	7/17/96 Amended 6/7/99	jeopardy	SW willow flycatcher
2-21-96-I-136	City of Surprise recharge project	I			unknown

APPENDIX 2 cont'd. Central Arizona Project – Section 7 Consultation History

Consultation Number	Project	Formal(F) Informal(I) Conference(C)	Biological Opinion Concurrence Date	Finding	Species
2-21-97-214	Marana High Plains Effluent Recharge Project	I		no effect	SW willow flycatcher cactus ferrug. pygmy owl
2-21-97-F-314	CAP water assignment Camp Verde and Cottonwood	F	3/30/98 Amended 4/28/98	nonjeopardy	razorback sucker SW willow flycatcher Arizona cliffrose
2-21-99-I-097	San Pedro River watershed effluent recharge project	I	1/25/99	is not likely to adversely affect	Huachuca water umbel peregrine falcon SW willow flycatcher
2-21-99-I-190	Construction of San Xavier CAP-Link pipeline	F	5/13/99 Amended 5/26/99	nonjeopardy	Pima pineapple cactus
2-21-99-F-360	Central Avra Valley storage and recharge project	F	12/12/2000	nonjeopardy	cactus ferrug. pygmy owl
2-21-00-I-115	Water exchange agreement between BHP Copper and Tonto Hills Utility Company	I		no effect	AZ hedgehog cactus cactus ferrug. pygmy owl

Appendix 3. Types of actions and their effects considered under section 7 consultation.			
ACTION NAME	ACTION ENTITY	EFFECT TYPES	BIOLOGICAL OPINION SECTION
Past actions	Federal, State, Tribal, or private	direct Indirect	description and effects analysis are in *Environmental Baseline*
Interrelated and interdependent	State, Tribal, or private	direct indirect cumulative	description in *Description of the Proposed Action;* effects analysis in *Effects of the Action* and *Cumulative Effects*
Proposed action	Federal	direct Indirect	description in *Description of the Proposed Action;* effects analysis in *Effects of the Action*
Future non-Federal	State, Tribal, or private	Cumulative	description and effects analysis are in *Cumulative Effects*

Past actions are any actions in the action area that occurred before the date of this consultation. Interrelated actions are those non-Federal actions that are part of a larger action and depend upon that action for their justification. Interdependent actions are those non-Federal actions that have no independent utility apart from the action under consultation. Proposed action is the Federal action under consultation. Future non-Federal actions are any actions in the action area that are reasonably foreseeable to occur. Direct effects are those effects that are a direct result of some action. The term "direct effects" in a section 7 context normally refers to those of the proposed Federal action. However, other related action (past, interrelated, interdependent, future non-Federal) may all have effects that are a direct result of those actions. Indirect effects are those that are caused by some action, but are later in time. The term "indirect effects" in a section 7 context normally refers to those of the proposed Federal action. However, other related actions (past, interrelated, interdependent, future non-Federal) may all have indirect effects. Indirect effects of the proposed Federal action usually refer to those that result from that specific action and do not have an intervening State, Tribal or private action. However, an interdependent and interrelated State, Tribal, or private action may occur as an indirect effect of the Federal action. Cumulative effects result from future non-Federal actions that are reasonably certain to occur.

Appendix 4. Expenditures for the conservation measure funds.

Dollars expended as of May, 2007 by species for each conservation measure fund.									
	Loach minnow	Gila topminnow	spikedace	razorback sucker	Gila chub	Colorado pikeminnow	Desert pupfish	Gila & Apache trouts	Total
Management against nonindigenous species fund									
Dollars	289,729	99,987	148,027	33,990	143,194	7,500	92,240	30,000	844,668
Percent	34	12	18	4	17	1	11	4	
Recovery in lieu of threat removal fund									
Dollars	182,277	65,000	172,277	85,900	36,377	0	0	0	541833
Percent	22	8	20	10	4	0	0	0	
TOTAL									
Dollars	472,006	164,987	320,304	119,890	179,571	7,500	92,240	30,000	1386501
Percent	34	12	23	9	13	1	7	2	

Agreement No. 1425-97-AA-32-00420 (Recovery of Natives, RPA 3) as of May 11, 2007			
Year	Task	Description	Notes
1997	1	**Aravaipa Creek geohydrology**	**Completed**
	2	**NM spikedace/loach minnow monitoring**	**Completed**
	3	**Maintain Gila topminnow stocks**	**Completed**
	4	Bylas Springs geohydrology	Deleted by Mod. 2
	5	Bonita Creek monitoring wells	Deleted by Mod. 2
	6	Klondyke mine tailings	Deleted by Mod. 2
	7	Water rights survey	Pending
	8	Verde River fish study	Deleted by Mod. 6
	9	**Augment Gila topminnow populations**	**Completed**
	10	**Roundtail chub status survey**	**Completed**
	11	Aravaipa Creek fish monitoring	Deleted by Mod. 5
	12	**Achii-Hanyo growout enhancement**	**Completed**
	13	Middle Gila River spikedace survey	Deleted by Mod. 7
1999	14	Spikedace/loach minnow stockings	Deleted by Mod. 7
	15	Status of Rio Rico topminnow	Deleted by Mod. 5
	16	**Razorback/squawfish assessment**	**Completed**
	17	**Verde River loach minnow survey**	**Completed**
	18	Database integration	Deleted by Mod. 5
	19	Spikedace/loach minnow declines	Moved to task 76
	20	Razorback sucker skeletal deformities	Deleted by Mod. 5
	21	**Larval fish key (yr 1 of 2)**	**Completed**
	22	Achii-Hanyo growout enhancement	Deleted by Mod. 6
	23	San Juan growout ponds	Deleted by Mod. 6
	24	**Spikedace propagation (yr 1 of 2)**	**Completed**
	25	**FWS coordination**	**Completed**
2000	26	Artificial stream design/construction	Deleted by Mod. 7
	27	**Fish database workshop and manual**	**Completed**
	28	Redrock Canyon stock tank renovations	Deleted by Mod. 7
	29	**Larval fish key (yr 2 of 2)**	**Completed**
	30	**Spikedace propagation (yr 2 of 2)**	**Completed**
	31	Redrock Ranch acquisition	Deleted by Mod. 10
2001	32	Blue River hatchery easement	Deleted by Mod. 10
	33	Artificial stream construction	Deleted by Mod. 7
	34	**Maintain Gila topminnow stocks**	**Completed**
	35	**Technical monitor**	**Completed**
2002	36	**Loach minnow progagation**	**Completed**
	37	Gila topminnow stockings	Moved to task 75
	38	AZ trout stream repatriations	Moved to task 75
	39	NM trout stream repatriations	Moved to task 76
	40	Redrock Canyon repatriations	Moved to task 75
	41	Arnett Creek repatriations	Moved to task 75
	42	Blue River repatriations	Moved to task 75

	43	Miscellaneous support expenses	Ongoing
	44	**Maintain Gila topminnow stocks**	**Completed**
	45	Hatchery facilities needs	Deleted by Mod. 11
	46	**Gila basin chub genetics**	**Completed**
2003	47	Hot Springs Canyon repatriations	Moved to task 75
	48	Acquire rare populations (yr 1 of 2)	Moved to task 75
	49	Identify native-only streams (yr 1 of 2)	Pending
	50	**Chub propagation techniques (yr 1 of 3)**	**Completed**
	51	**Aravaipa topminnow helicopter support**	**Completed**
	52	GIS database development	Deleted by Mod. 10
	53	**Acquisition of renovation chemicals**	**Completed**
	54	Romero and Paige Creek renovations	Ongoing
2004	55	Salt River repatriations	Deleted by Mod. 11
	56	**Maintain Gila topminnow stocks**	**Completed**
	57	Acquire rare populations (yr 2 of 2)	Moved to task 75
	58	Identify native-only streams (yr 2 of 2)	Pending
	59	**Chub propagation techniques (yr 2 of 3)**	**Completed**
	60	**Turkey Creek repatriations**	**Completed**
	61	Post/Welch repatriations	Moved to task 75
	62	Ash Creek repatriations	Moved to task 75
	63	**Acquisition of fish transport gear**	**Completed**
	64	San Pedro Pond stockings	Moved to task 75
	65	**Pupfish genetics (yr 1 of 3)**	**Completed**
	66	Post repatriation evaluations	Pending
2005	67	Chub propagation techniques (yr 3 of 3)	Ongoing
	68	**Pupfish genetics (yr 2 of 3)**	**Completed**
	69	**Bubbling Ponds Hatchery development**	**Completed**
2006	70	Pupfish genetics (yr 3 of 3)	Ongoing
	71	**San Pedro pond reconstruction**	**Completed**
	72	Bubbling Ponds O&M (yr 1 of 5)	Ongoing
	73	Miscellaneous helicopter support	Ongoing
	74	Topminnow stock maintenance	Ongoing
	75	AZGFD recovery actions (yr 1 of n)	Ongoing
		Gila topminnow stockings (37)	
		AZ trout stream repatriations (38)	
		Redrock Canyon repatriations (40)	
		Arnett Creek repatriations (41)	
		Blue River repatriations (42)	
		Redfield/Hot Springs repatriations (47)	
		Acquire rare populations (48, 57)	
		Post/Welch repatriations (61)	
		Ash Creek repatriations (62)	
		San Pedro Pond stockings (64)	
		Meda/Tiaroga data assembly-AZ	

		Fossil Creek repatriations	
	76	NMDGFD recovery actions (yr 1 of n)	Ongoing
		Spikedace/loach minnow declines (19)	
		NM trout stream repatriations (39)	
		Meda/Tiaroga data assembly-NM	
		Gila forks inventory (yr 1 of 2)	
	77	USFS Gila forks inventory (yr 1 of 2)	Ongoing
2007	78	AZGFD recovery actions (yr 2 of n)	Pending
		Repatriate chub to Mineral Creek	
	79	NMDGFD recovery actions (yr 2 of n)	Pending
		Gila forks inventory (yr 2 of 2)	
		Spikedace repatriation (yr 1 of 5)	
		Gila forks community isotopes (yr 1 of 3)	
		Red Rock cienega restoration (yr 1 of 2)	
	80	USFS Gila forks inventory (yr 2 of 2)	Pending
	81	Bubbling Ponds O&M (yr 2 of 5)	Pending
	82	Additional cost for yr 2 of task 74	Pending
	83	Additional cost for task 67	Pending

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Year	Task	Description	Notes
1997	1	Removal of mosquitofish	Deleted by Mod. 2
	2	Down Under Tank	Deleted by Mod. 13
	3	**Diseases and pathogens**	**Completed**
	4	Kingfisher ponds	Deleted by Mod. 7
	5	**E Fk White River barrier feasibility**	**Completed**
	6	NM fish stocking records	Deleted by Mod. 14
	7	**Piscicide development**	**Completed**
	8	**Cottonwood Spring barrier**	**Completed**
	9	**FWS coordination**	**Completed**
	10	Contingency management fund	Deleted by Mod. 2
	11	**Ichthyocide acquisition**	**Completed**
1999	12	Flathead suppression	Deleted by Mod. 7
	13	Stock tank easements	Pending
	14	**Ichthyocide acquisition**	**Completed**
	15	Blue River barrier design	Ongoing
	16	White River barrier design	Deleted by Mod. 7
	17	O'Donnell Cienega renovation	Deleted by Mod. 7
	18	Verde River barrier feasibility	Deleted by Mod. 11
2000	19	**Crayfish control technology**	**Completed**
	20	**Fossil Creek renovation**	**Completed**
	21	**Fossil Creek barrier feasibility**	**Completed**
	22	**Granite Creek barrier feasibility**	**Completed**
	23	Boyce-Thompson renovation	Moved to task 64

	24	Ichthyocide acquisition	Completed
	25	Verde River barrier design	Deleted by Mod. 8
	26	Piscicide susceptibility	Deleted by Mod. 7
	27	FWS coordination	Completed
2001	28	Transgenic fish feasibility	Completed
	29	Blue River hatchery water rights	Deleted by Mod. 11
	30	Fossil Creek stock tank survey	Completed
	31	Fossil Creek barrier design	Completed
2002	32	Redfield/Hot Springs barrier feasibility	Ongoing
	33	Redfield/Hot Springs barrier design	Ongoing
	34	Bonita Creek barrier feasibility	Completed
	35	NM barriers feasibiltiy	Completed
	36	FWS coordination	Completed
	37	Redrock Canyon barrier design	Ongoing
	38	Crayfish removal from Fossil Creek	Completed
	39	Production of SW fishes book	Ongoing
	40	Independent technical monitor	Completed
2003	41	Tonto Creek barrier feasibility	Ongoing
	42	Acquisition of renovation supplies	Completed
	43	Acquisition of renovation chemicals	Completed
	44	Cottonwood Spring barrier construction	Deleted by Mod. 11
	45	Technical monitor	Completed
2004	46	O'Donnell Canyon barrier feasibility	Completed
	47	Fossil Creek stock tank renovations	Completed
	48	AZ oversight of renovations	Ongoing
	49	Lewis Springs barrier feasibility	Completed
	50	Stillman Lake renovation NEPA	Ongoing
	51	Miscellaneous stock tank surveys	Pending
	52	Barrier and renovation effectiveness	Completed
	53	Fund Transfer Program effectiveness	Completed
2005	54	Travel costs for transgenic fish briefing	Completed
	55	Helicopter support for Fossil Creek	Completed
	56	Additional funding for prior tasks	Completed
	57	Antimycin purchase for Fossil Creek	Completed
	58	Rotenone purchase for Fossil Creek	Completed
2006	59	USFS Gila mechanical removal (1 of 4)	Ongoing
	60	FWS Gila mechanical removal (1 of 4)	Ongoing
	61	Stillman Lake renovation	Ongoing
	62	Additional BPH construction funds	Completed
	63	Little Creek barrier design	Ongoing
	64	AZGFD nonnative control actions (yr 1 of n)	Ongoing
		Boyce-Thompson renovation (23)	
		Fresno Canyon renovation	
	65	NMDGFD nonnative control actions (yr 1 of n)	Ongoing

		NM mechanical removal (yr 1 of 4)	
	66	Emergency salvage facility needs	Completed
2007	67	West Fork Oak Creek fish barrier design	Pending
	68	USFS Gila mechanical removal (yr 2 of 4)	Pending
	69	FWS Gila mechanical removal (yr 2 of 4)	Pending
	70	AZGFD nonnative control actions (yr 2 of n)	Pending
		Redrock Canyon renovation	
		Bonita Creek renovation	
	71	NMDGFD nonnative control actions (yr 2 of n)	Pending
		Gila mechanical removal (yr 2 of 4)	
	72	Genetic biocontrol symposium	
	73	Rotenone purchase (new formulation)	Pending
	74	Additional O&M costs for Bubbling Ponds Hatchery	Pending

APPENDIX 5.
Gila topminnow recovery plan (Weedman 1999) population levels

The three-level approach recommended for reestablishing Gila topminnow populations is similar to that used in the Desert Pupfish Recovery Plan (U.S. Fish and Wildlife Service 1993b). Natural populations in the Gila River Basin represent the only genomes available for recovery of this species in the U.S. These populations are designated as *Level 1* and should receive the highest priority for protection. Populations reestablished in wild sites with natural habitats capable of sustaining a viable population with minor human intervention and persisting a minimum of 10 years will be considered *Level 2* populations. These Level 2 populations may inhabit naturally occurring sites that have been artificially enhanced, but don't require routine maintenance for their survival. Captive populations will not be considered as Level 2 populations. Populations reestablished in the wild or captive natural, semi-natural, or artificial habitats that do not sustain a viable population for at least 10 years without human intervention will be classified as *Level 3* populations. Level 3 populations may require extensive human intervention and may be lost during recovery actions if additional populations are reestablished, either in the same locale or elsewhere.