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In Reply Refer to:
AESO/SE
22410-2009-F-0108

January 14, 2009

Ms. Annette Chavez
District Ranger
Sierra Vista Ranger District
Coronado National Forest
5990 S. Highway 92
Hereford, Arizona 85615

Dear Ms. Chavez:

This letter constitutes our biological opinion (BO) for the Peterson Ranch Pond Maintenance Project in the Huachuca Mountains, Cochise County, Arizona. We received your January 9, 2009 request for formal consultation on January 9, 2009. In that request, and in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.), you determined that the proposed action may adversely affect:

- the endangered Sonoran tiger salamander (*Ambystoma mavortium stebbinsi*)
- and the Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurva*) and its critical habitat.

You also requested our concurrence that the proposed action may affect, but is not likely to adversely affect, the threatened Chiricahua leopard frog (*Lithobates chiricahuensis*). Our concurrence with that determination is provided in Appendix A.

This BO is based on information provided in the December 2008, biological assessment (BA), discussions with your staff, and information in our files. Literature cited in this BO is not a complete bibliography of all literature available on the species of concern, pond maintenance projects and their effects, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at this office.

CONSULTATION HISTORY

-June 19, 2007: We issued the BO for the Scotia Canyon Riparian Restoration Project, Huachuca Mountains, Cochise County, Arizona (22410-2007-F-0324). This project involved modification of four existing water impoundments in Scotia Canyon to eliminate habitat for non-native American bullfrogs (*Lithobates catesbeianus*) and to restore more natural ciénega and riparian function. Road work was also

proposed to halt erosion and gullying that is occurring along the Scotia Canyon access road; bullfrog control within the canyon was also proposed. That project set the stage for further work to reestablish Chiricahua leopard frogs, Mexican gartersnakes (*Thamnophis eques*), Sonoran tiger salamanders, and other sensitive ciénega and wetland species.

-April , 2008: We issued the BO for proposed project: Bullfrog Removal at Four Stock Tanks in the Huachuca Mountains, Cochise County, Arizona; which complemented the Scotia Canyon Restoration Project by eliminating bullfrog populations near Scotia Canyon, which reduces the likelihood that this invasive, non-native predator will reinvade Scotia Canyon and compromise recovery of listed and sensitive amphibians and reptiles.

-January 9, 2009 We received your request for consultation on the Peterson Ranch Pond Maintenance Project.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Coronado National Forest (Forest), in cooperation with the Arizona Game and Fish Department (AGFD) and U.S. Fish and Wildlife Service (USFWS), proposes to clean out Peterson Ranch Pond in upper Scotia Canyon and to construct a gate valve on the pond for managing water levels. These measures are needed to improve water quality for wildlife and to facilitate non-native bullfrog or fish monitoring and removal. Eliminating bullfrogs or other non-native vertebrates would improve recovery and conservation opportunities for the Sonoran tiger salamander (endangered), Chiricahua leopard frog (threatened), Mexican gartersnake (candidate), and Arizona treefrog (candidate).

The proposed action consists of three main elements (described below). The project would commence in late-January or early-February 2009 and be completed by the end of June 2009.

1) **Drain and clean out the pond.** The existing spring diversion would be activated. Siphons and pumps would be used to draw down the water level to a minimum depth (~1 foot). Before further siphoning would occur, salamanders would be captured using dipnets and seines and held temporarily in buckets and portable "kiddy pools." When no salamanders have been found after 30 minutes of searching, the salvaged salamanders would be transported to holding ponds. Two options are available for holding the salamanders until the pond is cleaned out and refilled. The Arizona-Sonora Desert Museum has agreed to hold up to 36 large salamanders or 50 smaller salamanders until they can be returned to Peterson Ranch Pond. Secondly, there are two ponds in Scotia Canyon that can hold them, including lower Scotia Canyon pond where salamanders occurred historically, and a spring-fed pond just upstream of Peterson Ranch Pond (see Figure 1 of the BA). Both sites were modified in 2007 to eliminate bullfrog reproduction; however, they continue to hold up to a foot of water, which should be adequate for temporarily holding the salamanders. If necessary, the ponds may be deepened or otherwise modified in minor ways with hand tools to create better salamander habitat. Decisions about where and how many salamanders will go into these facilities will be made on-site with the AGFD and USFWS, and will be based on capacity of the sites and which option or combination of options are likely to result in the least mortality and harm to the salamanders. After the salamanders have been removed from Peterson Ranch Pond, any remaining water would be siphoned. Then, a notch would be cut at the west end of the dirt embankment of the pond (see Figure 2 of the BA). The pond bottom sediments would be allowed to dry

out for several weeks or until the surface is stable enough to support a backhoe. The backhoe would be driven into the basin or operated from the banks of the pond. Excavated sediments would be deposited on the down slope side of the earthen embankment.

2) **Construct a gate valve.** From the deepest point of the pond, a 100 foot long by 1 foot wide trench (1 foot bucket on machine) would be constructed, which would terminate on the western end of the berm. One hundred feet of 6 to12 inch diameter metal pipe would be installed from the deep end of the pond west to the gate valve location. Discharge will be to the existing drainage. A 6 to12 inch gate valve will be installed at the end of the pipe outside the impoundment. The location will be beyond the berm near the discharge drainage. The valve will sit below the level of the deepest part of the pond (providing a minimum 1/8" drop per foot run) where it can be exposed for maintenance, yet disguised or hidden from public view. An open screen inlet would be attached to the pond bottom pipe (with a moveable screen for cleaning). Backfill would be placed around the pipe and compacted by hand.

3) **Refill the pond.** The spring diversion would be deactivated and the pond allowed to refill. The salamanders would be recaptured and returned to the pond within a week of refilling. Large logs removed from the pond during clean out would be returned to provide salamander cover and egg deposition sites.

CONSERVATION MEASURES

The following conservation measures are part of the proposed action. They are intended to minimize or avoid adverse impacts to the species identified in Table 1.

- All field work shall conform to amphibian disease prevention protocols as described in the Recovery Plans for the Sonoran tiger salamander and Chiricahua leopard frog. Equipment would either be disinfected between uses at different sites, or air dried.

- The pond shall be drained as early in the year as possible (January/February) to avoid the peak salamander breeding season.

- Clearing of vegetation during work at Peterson Ranch Pond shall be minimized to the extent practical.

- Prior to breaching the impoundment, salamanders shall be salvaged and placed in holding facilities as described above in "**Drain and clean out the pond**." Selection of holding facilities will be made in consultation with USFWS and AGFD personnel. Capture, movement, and holding of salamanders will be accomplished under all appropriate State and Federal permits, including permit conditions to ensure minimal harm or mortality. After Peterson Ranch Pond has refilled, the salamanders will be repatriated.

- Oil, fuel, and other equipment fluid shall be stored in secure containers at an upland site away from aquatic habitats.

STATUS OF THE SPECIES

Sonoran Tiger Salamander (*Ambystoma tigrinum stebbinsi*)

The Sonoran tiger salamander is a large salamander with a dark venter and light-colored blotches, bars, or reticulation on a dark background. Snout-vent lengths of metamorphosed individuals vary from approximately 2.6-4.9 inches (Jones *et al.* 1988, Lowe 1954). Larval salamanders are aquatic with plume-like gills and well-developed tail fins (Behler and King 1980). Larvae hatched in the spring are large enough to metamorphose into terrestrial salamanders from late July to early September, but only an estimated 17 to 40 percent metamorphose annually. Remaining larvae mature into branchiates (aquatic and larval-like, but sexually mature salamanders that remain in the breeding pond) or over-winter as larvae (Collins and Jones 1987; U.S. Fish and Wildlife Service 2002a). The Sonoran tiger salamander was listed as endangered on January 6, 1997. No critical habitat has been proposed or designated. A recovery plan was finalized in September 2002. The species was listed as the "Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*)". Common and scientific names used herein follow Crother (2008).

The Sonoran tiger salamander is known from 71 localities, although not all are currently occupied and some probably do not represent breeding sites (Collins 1996, Collins and Jones 1987, Abbate 1998, U.S. Fish and Wildlife Service 2002a and files). During intensive surveys in 1997, from one to 150 Sonoran tiger salamanders were found at 25 stock tanks (Abbate 1998). 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 1993-1996 (Collins and Jones 1987; Collins 1996; James Collins, pers. comm. 1996). In 1999, the lab of Dr. James Collins, Arizona State University, found Sonoran tiger salamanders at 17 localities (Collins 1999). During surveys by AGFD from 2001-2006, Sonoran tiger salamanders were found at 37 of 139 stock tanks, which were sampled from 1-7 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 Sonoran tiger salamanders have been found in Arizona are located 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 ciénegas within 19 miles of Lochiel, Arizona. Salamanders collected from a ciénega at Rancho Los Fresnos in the San Rafael Valley, Sonora, were likely *A. m. stebbinsi* (Varela-Romero *et al.* 1992, Rorabaugh 2008). However, surveys during 2006 and 2007 failed to locate additional salamanders, and most waters on the ranch are now occupied by non-native bullfrogs, crayfish, green sunfish, and/or black bullhead (trip reports, USFWS files).

Historically, the Sonoran tiger salamander probably inhabited springs, ciénegas, and possibly backwater pools of the Santa Cruz River and streams in the San Rafael Valley where permanent or nearly permanent water allowed survival of mature branchiates. The grassland community of the San Rafael Valley and adjacent montane slopes, where all extant populations of Sonoran tiger salamander occur, may represent a relictual grassland and a refugium for grassland species. Tiger salamanders in this area became isolated and, over time, genetically distinct from ancestral *A. m. mavortium* and *A. m. nebulosum* (Jones *et al*. 1995, Storfer *et al.* 2004). The Sonoran tiger salamander apparently has opportunistically taken advantage of available stock tank habitats as natural habitats disappeared (Hendrickson and Minckley 1984) or were invaded by non-native predators with which the salamander cannot coexist (U.S. Fish and Wildlife Service 2002a).

Although most records for Sonoran tiger salamanders occur at stock tanks where breeding occurs, terrestrial metamorphs potentially may wander considerable distances from these aquatic habitats, and are occasionally encountered in upland habitats. A Sonoran tiger salamander was captured in a pit fall trap at Oak Spring in Copper Canyon, Huachuca Mountains by AGFD personnel. The nearest known breeding site is approximately 0.6 mile to the south, suggesting the salamander may have moved at least that far. Capture in a pit fall trap also confirms that the individual was surface active. In other subspecies of *Ambystoma mavortium* and the closely related *A. tigrinum*, metamorphs may disperse hundreds of yards from the breeding pond, or may remain nearby (Petranka 1998, Gehlbach *et al.* 1969). Of hundreds of marked *Ambystoma m. nebulosum* in northern Arizona, two were found to move from 0.9-1.2 miles to new ponds (J. Collins, pers. comm. 1998). On Fort Huachuca, Sheridan Stone (pers. comm. 1998) reported finding terrestrial tiger salamanders (*A. m. mavortium*) 1.9-2.5 miles from the nearest known breeding pond. Referring to conservation of the California tiger salamander, *A. californiense*, Petranka (1998) found that based on studies of movements of other *Ambystoma* species, conservation of a 650-1,650 foot radius of natural vegetation around a breeding pond would protect the habitat of most of the adult terrestrial population. Adults of *A. mavortium* subspecies typically live in or about mammal burrows (Petranka 1998), although metamorphs may construct their own burrows, as well (Gruberg and Stirling 1972, Semlitsch 1983). Some species of salamanders exhibit seasonal migrations of up to several miles each way from breeding sites to upland habitats (Stebbins and Cohen 1995). If such migrations occur in the Sonoran tiger salamander, we have no information about migration corridors or non-breeding habitat. Because of the arid nature of the environments in the region where the subspecies occurs, if salamanders move very far from breeding ponds, they may use wet canyon bottoms as movement corridors.

Primary threats to the salamander include predation by non-native fish and bullfrogs, diseases, catastrophic floods and drought, illegal collecting, introduction of other subspecies of salamanders that could genetically swamp *A. m. stebbinsi* populations, and stochastic extirpations or extinction characteristic of small populations. Predation by catfish, bass, mosquito fish, and sunfish can eliminate stock tank populations of the Sonoran tiger salamander (Jonathan Snyder, Arizona State University, pers. comm. 1996; Collins *et al.* 1988). The salamanders can apparently coexist with bullfrogs, but bullfrogs prey on salamanders (J, Snyder, pers. comm. 1996) and perhaps if they are present in sufficient densities could reduce or eliminate salamander populations. Tadpoles of wood frogs (*Lithobates sylvatica*), are known to feed on spotted salamander (*Ambystoma maculatum*) eggs (Petranka *et al*. 1998), but under experimental conditions bullfrog tadpoles do not feed on viable salamander eggs or hatchlings (Collins 1996, J. Collins, pers. comm. 1996). Recent genetic analysis confirmed that barred salamanders (*A. m. mavortium*) or hybrids between barred salamanders and Sonoran tiger salamanders are present at seven stock tanks along Highway 83 and near Parker Canyon Lake in the San Rafael Valley (Ziemba *et al.* 1998, Storfer *et al.* 2004). A salamander population in Garden Canyon, Fort Huachuca, near the crest of the Huachuca Mountains, also contained hybrids, but this population has apparently disappeared (Storfer *et al.* 1999, S. Stone, Fort Huachuca, pers. comm., 2008). Barred salamanders are likely present due to their use as fish bait in and around Parker Canyon Lake.

Tiger salamander populations in the western United States and Canada, including populations of the Sonoran tiger salamander, exhibit frequent epizootics (Collins *et al.* 2001). Sonoran tiger salamander populations experience frequent disease-related die-offs (approximately eight percent of populations are affected each year) in which almost all salamanders and larvae in the pond die. *Ambystoma tigrinum* virus (ATV) is the pathogen believed to be primarily responsible for these die-offs (Jancovich *et al.* 1997). This, and possibly other iridoviruses, are also apparently the proximate cause of die-offs observed in other *Ambystoma* salamander populations in the United States and Canada (Collins *et al.*

2000, Docherty *et al.* 2003). 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). In the laboratory, Sonoran tiger salamanders exhibited lower survival and growth rates when exposed to the disease as compared to *Ambystoma mavortium nebulosum* from the White Mountains of Arizona (Collins *et al.* 2003). Animals that survive ATV exposure may harbor transmissable infection for more than six months. Dispersing metamorphosed salamanders have been found carrying ATV, and when they return to a pond to breed, they may reinfect the aquatic population (Collins *et al.* 2003). 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 is an emerging pathogen (Storfer 2003), and genetic analysis suggests a single introduction and recent spread over a large geographic area from Arizona to Saskatchewan (Jancovich *et al.* 2005). ATV may have switched from sport fishes to salamanders or was introduced with water dogs (*A. m. 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.

Some die-offs might occur as a result of low pH (M. Pruss, AGFD, pers. comm.). A copper smelter at Cananea, Sonora, about 24 miles south of the border, may have released sulfur plumes resulting in acid precipitation (Platz 1993, Blanchard and Stromberg 1987), but currently there is no evidence to connect salamander die-offs with the copper smelter, and the smelter has not operated since 1999.

Sonoran 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). In the laboratory, infected Sonoran tiger salamanders did not die from the disease and are capable of ridding themselves or much reducing chytrid infections by frequent sloughing of the skin (Davidson *et al.* 2003). The effects of the disease on salamander populations need further study.

With the exception of Bog Hole in the San Rafael Valley, a site on Fort Huachuca, and Rancho Los Fresnos, cattle grazing occurs throughout the range of the Sonoran tiger salamander. Cattle can degrade habitat at stock tank breeding sites and overgrazing can cause loss of cover and erosion that can threaten the integrity of stock tanks used by the salamander. However, the salamander has coexisted for about 250 years with grazing, and because of its current use of livestock tanks for breeding, it is now dependent upon maintenance of cattle waters by ranchers (U.S. Fish and Wildlife Service 2002a).

For further information on the ecology, taxonomy, range, and threats to this subspecies, refer to Lowe (1954), Gehlbach (1967), Collins and Jones (1987), Collins *et al.* (1988, 2003), Jones *et al.* (1995, 1988), Collins (1996, 1981), Jancovich *et al.* (1997, 1998, 2005), Snyder *et al.* (1998, 1996), U.S. Fish and Wildlife Service (2002a), Storfer (2003), and Storfer *et al.* (2004), and Crother (2008).

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions that are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

The action area consists of the Peterson Ranch Pond in Scotia Canyon, where most of the work will occur, as well as the access road into the canyon and the holding facilities, which include two ponds in Scotia Canyon and facilities at the Arizona-Sonora Desert Museum. The dominant plant community in the project area is oak and pine-oak woodland.

Peterson Ranch Pond occurs at 6150 feet elevation, and is located within a parcel that was private land until the Lone Mountain Land Exchange. This parcel was the former Peterson Homestead, patented in 1919. The pond is shown on the homestead map and dates back to at least that date. The pond is fed by a perennial spring (Sylvania Spring). A private easement exists for the spring and a 10-foot square area surrounding the spring. A diversion structure was built outside the easement in 2008 to route the spring flow around the pond while it is being drained. When the pond is not being drained, the diversion is turned off and the spring water is allowed to flow into the pond. There is no spillway. At certain times of the year, the pond overtops the dam, while at other times, water seeps through the dam to form a permanently wet area.

Several large trees grow near the pond, including willows, cottonwoods, and junipers. Some trees, including a very large cottonwood, are partly dead or declining with age. Between the spring and pond are several yards of open ciénega with deep organic sediments that are permanently saturated. Vegetation associated with the ciénega consists of spike rush, sedge, bulrush, cattail, watercress, and some willow and cottonwood. Dense mats of Huachuca water umbel also occur in the spring flow channel. No records of native fishes exist for Peterson Ranch Pond or Scotia Canyon, although introduced trout were present at Peterson Ranch Pond in the 1960s (T. Beatty, pers. comm. 2007).

The pond supports a dense cover of spring wort (*Chara* sp.), which is a macro algae. Over many years, the plant deposited a thick layer of decomposing plant material at the bottom of the pond. While the pond was partially drained in 2008, workers attempted to capture bullfrogs, tadpoles and salamanders that hid in the sediments. Wading through the waste-deep muck was exceedingly difficult and hazardous. Despite a concerted effort to remove the *Chara* by hand, mud and suspended sediments hampered the control effort. When the pond was refilled, dense mats of dead *Chara* floated on the surface. Water clarity decreased significantly and gas bubbles were seen rising to the surface.

Status of the Species in the Action Area

Tiger salamanders (*Ambystoma mavortium stebbinsi* or *A.m. mavortium*) occurred at the lower Scotia Canyon impoundment until about 1995. No salamanders were recorded in the canyon again until 2007 when there was an unconfirmed report from Peterson Ranch Pond (P. Rosen, pers. comm. 2008). During draining and bullfrog control at the Peterson Ranch Pond in 2008, 43 large branchiate salamanders were netted. These salamanders were held for several days in kiddie pools near the pond and then repatriated after most netting and seining was completed. One salamander died during holding of the salamanders. The nearest source population is the upper Garden Canyon Pond at Fort Huachuca (about a mile away). Although the site no longer supports salamanders, they were confirmed as *mavortium*X*stebbinsi* hybrids. So the potential exists that the Peterson Ranch Pond salamanders are also hybrids. As discussed above in the Status of the Species, hybrid salamanders pose a threat to recovery due to genetic swamping. Genetic testing of the salamanders will occur, but may not be completed until after the pond maintenance project is completed.

EFFECTS OF THE ACTION

The proposed action is anticipated to have short-term direct and indirect adverse effects to the tiger salamander; however, in the long term, the species is expected to benefit. Conservation measures that are part of the proposed action will minimize adverse effects, speed recovery of habitat, and reduce the time until benefits are realized.

Direct Effects

Capture and temporary holding of salamanders during pumping, removal of *Chara* and sediment, and construction of the gate valve could result in injury or death of some salamanders. These direct effects would be limited; however, because only appropriately trained and permitted individuals will be allowed to capture and handle salamanders. The capture and holding of salamanders will be permitted by a Federal Endangered Species Act 10(a)(1)(A) permit, as well as applicable State permits (fourth conservation measure). The number of salamanders likely to be killed or injured will likely depend on the size and number of animals captured and held. In two recent cases with relatively small numbers of salamanders, mortality was low. In an experimental non-native species control program at Dan Tank in the San Rafael Valley in July 2006, 22 large branchiate Sonoran tiger salamanders were captured and held in kiddie pools for six days. Two salamanders died, but they had been exposed to rotenone (a fish toxin) and probably died from toxicity poisoning rather than conditions of captivity. In late May 2008, 43 large branchiates were held for several days in kiddie pools. One of those animals died. In the current project, salamanders would be held for up to five months. Tiger salamanders generally do well in captivity. The Collins Lab at Arizona State University has successfully maintained Sonoran tiger salamanders for years in captivity. As a result, we do not expect excessive mortality in large salamanders due to the extended holding period. However, the situation is likely to be different for small larval salamanders. In 2008, 1,536 salamanders were seined from Lone Mountain Tank on the western edge of the San Rafael Valley as part of the Bullfrog Removal at Four Stock Tanks project. These animals were held overnight in kiddie pools onsite. Unfortunately, 527 of them died, all of which were larval salamanders from 1.18 to 4.33 inches total length.

The 43 salamanders collected from Peterson Ranch Pond in May of 2008 were probably all the salamanders in the pond at that time, because nearly all surface water was removed and the pond was intensively seined. Sonoran tiger salamanders breed primarily from January to early May; breeding in the late summer occurs infrequently, but potentially larval salamanders from a late summer 2008 breeding event could be present during pond drying in January or February 2009. Very small larval salamanders and eggs could also be present as a result of breeding in January or February 2009; however, reproduction is less likely this early at relatively high elevations (T. Jones, AGFD, pers. comm. 2008). Peterson Ranch Pond is the highest known, currently occupied, Sonoran tiger salamander locality. The mesh of the seines (3 mm) used to capture salamanders will allow detection and removal of relatively small larvae; however, some small larvae that escape capture and any eggs present are likely to die as a result of mechanical processes during pumping and seining, or due to desiccation as the pond dries out. Eggs as well as some small larvae, which are not powerful swimmers, could also be drawn into the pump and be killed during draining of the pond. Based on the experience at Lone Mountain Tank in 2008, if larval salamanders are present, there could be relatively high mortality during the capture and holding process. In addition, smaller salamanders held with larger salamanders may be predated. Mortality, including cannibalism, may be minimized if small salamanders (<4.3 inches total length) are readily moved to one of the two ponds in Scotia Canyon. These sites would have food and cover for small salamanders. Based on prior experience, larger salamanders should be able to be captured and held for extended periods in holding facilities with low mortality.

In no case is the project expected to result in extirpation of salamanders from Peterson Ranch Pond. Although some mortality is expected, even in the worst case, there should be numerous salvaged branchiate salamanders that will survive and then be repatriated to the pond. There are also likely terrestrial adults outside of Peterson Ranch Pond that will be unaffected by the project. These animals are expected to return to the pond, where they will contribute to future breeding and population growth.

Indirect Effects

Indirect effects from drawing-down Peterson Ranch Pond and intensive seining will include increased turbidity and stirring up of pond sediments that contain hydrogen sulfide and other compounds that can be injurious or toxic to salamanders. Some salamanders may succumb to these water quality problems. However, as animals are seined and moved out of the pond, their exposure to these compounds will be minimized.

The holding ponds in Scotia Canyon are relatively shallow (~1 foot at the deepest). In such shallow waters, salamanders, especially larger salamanders, may be readily detectable by predators such as raccoons, skunks, and snakes. As a result, predation of any larger salamanders placed in these ponds is likely to be higher than in the deeper waters of Peterson Ranch Pond. Smaller salamanders would probably be less detectable and not as susceptible to predators.

Adverse effects due to spread of disease is not anticipated due to the first bullet in the conservation measures, which will ensure that all field work conforms to amphibian disease prevention protocols as described in the Recovery Plans for the Sonoran tiger salamander and Chiricahua leopard frog. These protocols have been shown to be effective at eliminating disease organisms and minimizing the likelihood that disease could be spread among aquatic sites by field personnel or projects such as that proposed here.

In the longer term, removal of the *Chara* and sediment will provide better water quality, and the gate valve will allow for easy draining of the pond and removal of non-native predators (e.g. fishes, bullfrogs) if they are illegally introduced or colonize the pond in the future. As a result, salamander habitat quality and manageability will be improved.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Lands within the action area are owned and managed by the Forest Service, thus most activities likely to occur will have some Federal nexus. The effects of such activities are subject to section 7 consultation, and are not cumulative effects. Illegal immigration and smuggling also occur in the action area. Individuals involved in these activities create trails, camp sites, and may start fires. The latter could have catastrophic effects to watersheds with potential for ash and sediment flow into salamander aquatic habitats, and associated erosion of channels. Effects of these illegal activities are cumulative effects. Some Border Patrol infrastructure projects (vehicle and pedestrian fences) to the south of Scotia Canyon may redirect or change illegal immigration and smuggling patterns. In accordance with provisions of the Real ID Act of 2005, these projects have been waived from compliance with the ESA, and will not be subject to section 7 consultations.

Although no consultations will occur, we have been working with Border Patrol to develop mitigation for these activities; hence the potential effects of these activities on the Sonoran tiger salamander will be reduced to some extent.

CONCLUSION

After reviewing the current status of the Sonoran tiger salamander, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is our biological opinion that the action, as described, is not likely to jeopardize the continued existence of the Sonoran tiger salamander. No critical habitat has been designated, thus none will be affected.

Our findings are based on the following:

- Although some short-term adverse effects are anticipated to individual salamanders and habitat at Peterson Ranch Pond, these effects are 1) limited in extent, 2) are largely temporary, 3) the salamander population at Peterson Ranch Pond will not be extirpated, and 4) conservation measures proposed as part of the proposed action will much reduce the extent and permanency of adverse effects.

- In the longer term, the Sonoran tiger salamander population at Peterson Ranch Pond will benefit through improved habitat quality and manageability.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the Coronado National Forest so that they become binding conditions of any grant or permit issued to any applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Forest has a continuing duty to regulate the activity covered by this incidental take statement. If the Forest (1) fails to assume and implement the terms and conditions or (2) fails to require any applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Forest must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE ANTICIPATED

Small salamanders and salamander eggs that are harmed or killed incidental to the proposed action will be difficult to detect. Any eggs present and some small, larval salamanders may be drawn through the pump and destroyed in the process. Other small salamanders may become trapped in sediment or *Chara* removed from the pond, and could die via mechanical injury or desiccation. All eggs and a high percentage (>90%) of small (<1.18 inches total length) salamanders are expected to die during the project. However, depending on breeding chronology at Peterson Ranch Pond, no eggs or salamanders of this size may be present. Larger salamanders (≥1.18 inches total length) will likely be detected via seining. Based on experience at Lone Mountain Tank, mortality of salamanders from 1.18-4.33 inches total length could reach 50%, but again, there were no salamanders of that size in the pond in June 2008; if there are salamanders of that size, they resulted from a late summer breeding event, and such events are rare. Salamanders over 4.33 inches total length are expected to experience low mortality (<10%), because based on prior experience, they can be successfully salvaged and held in captivity or holding ponds. In no case is the salamander population at Peterson Ranch Pond expected to be extirpated due to the project. Direct take of salamanders via seining and other capture methods, as well as temporary holding of salamanders, will be authorized by a 10(a)(1)(A) recovery permit.

EFFECT OF THE TAKE

In the accompanying biological opinion, we have determined that this level of anticipated take is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES/TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Coronado National Forest must comply with the following terms and conditions and reasonable and prudent measures. Terms and conditions are non-discretionary.

The following reasonable and prudent measures and terms and conditions are necessary and appropriate to minimize take of Sonoran tiger salamander:

1) The Coronado National Forest shall minimize incidental take due to holding of Sonoran tiger salamanders.

a. Small salamanders shall not be placed in buckets, kiddie pools, or other holding facilities with larger salamanders capable of preying upon them.

b. If smaller salamanders (≤4.33 inches total length) are found at Peterson Ranch Pond, one or both of the holding ponds in Scotia Canyon shall be reserved solely for these smaller salamanders, and no larger salamanders shall be placed in ponds with smaller salamanders.

c. Larger salamanders (>4.33 inches total length) shall be placed at the Arizona-Sonora Desert Museum, up to the capacity of their facilities. Excess animals shall be placed in one or both of the two Scotia Canyon ponds, but not in the same pond with smaller salamanders.

Note: decisions on where to place salamanders (Arizona-Sonora Desert Museum or Scotia Canyon ponds) can be modified on-site based on site conditions at the time, and in coordination with USFWS and AGFD representatives.

2) The Coronado National Forest shall monitor and report incidental take.

a. The Coronado National Forest shall look for and quantify dead, dying, or injured salamanders during pond renovation activities and at the holding ponds in Scotia Canyon.

b. The Coronado National Forest shall monitor conditions at holding ponds in Scotia Canyon while salamanders are present. If water levels decline, unexpected numbers of dead salamanders are found, or other conditions exist suggesting the salvaged salamanders will perish, the Forest will coordinate with USFWS and AGFD to move the salamanders to an alternate site or provide other contingencies to ensure minimal mortality.

c. In a document (which may be an email to Jim Rorabaugh [Jim_Rorabaugh@fws.gov]), the Coronado National Forest shall report results of monitoring described in parts a and b. This document shall be submitted within 90 days after the conclusion of proposed activities.

STATUS OF THE SPECIES

Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurva*)

The Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurva*) is an herbaceous, semi-aquatic to occasionally fully aquatic, perennial plant with slender, erect leaves that grow from creeping rhizomes. The leaves are cylindrical, hollow with no pith, and have septa (thin partitions) at regular intervals. The yellow/green or bright green leaves are generally 0.04 to 0.12 inch in diameter and often 1 to 2 inches tall, but can reach up to 8 inches tall under favorable conditions. Three to ten very small flowers are borne on an umbel that is always shorter than the leaves. The fruits are globose, 0.06 to 0.08 inch in diameter, and usually slightly longer than wide (Affolter 1985).

On January 6, 1997, we listed the Huachuca water umbel as an endangered species (U.S. Fish and Wildlife Service 1997). Critical habitat was designated on the upper San Pedro River, Garden Canyon on Fort Huachuca, Scotia Canyon and other areas of the Huachuca Mountains, the San Rafael Valley, and Sonoita Creek on July 12, 1999 (U.S. Fish and Wildlife Service 1999). No recovery plan has been developed.

Distribution/Abundance
Huachuca water umbel has been documented from sites in Santa Cruz, Cochise, and Pima counties, Arizona, and in adjacent Sonora, Mexico, west of the continental divide (Haas and Frye 1997, Saucedo-Monarque 1990, Warren *et al.* 1989, Warren *et al.* 1991, Warren and Reichenbacher 1991). The plant has been extirpated from six sites. The extant sites occur primarily in five major watersheds - San Pedro River, Santa Cruz River, Río Yaqui/Bavispe, Río Sonora, and Río Magdalena. All sites are between 3,500 and 7,250 feet in elevation.

Habitat
The Huachuca water umbel grows in ciénegas (marshy wetlands), and along streams, rivers, and springs in southeastern Arizona and northeastern Sonora, Mexico, typically in mid-elevation wetland communities often surrounded by relatively arid environments (U.S. Fish and Wildlife Service 1997).

These wetland communities are usually associated with perennial springs and stream headwaters, have permanently or seasonally saturated highly organic soils, and have a low probability of flooding or scouring (Hendrickson and Minckley 1984). The water umbel can grow in saturated soils or as an emergent in water depths up to about 10 inches. Ciénegas support diverse assemblages of animals and plants, of which many species are of limited distribution, such as the Huachuca water umbel (Hendrickson and Minckley 1984). The surrounding non-wetland vegetation can be desert scrub, grassland, oak woodland, or conifer forest (Arizona Game and Fish Department 1997).

Lilaeopsis has an opportunistic strategy that ensures its survival in healthy riverine systems, ciénegas, and springs. In upper watersheds that generally do not experience scouring floods, *Lilaeopsis* occurs in microsites where interspecific plant competition is low. At these sites, *Lilaeopsis* occurs on wetted soils interspersed with other plants at low density, along the periphery of the wetted channel, or in small openings in the understory. In stream and river habitats, *Lilaeopsis* can occur in backwaters, side channels, and nearby springs. The upper Santa Cruz River and associated springs in the San Rafael Valley, where a population of *Lilaeopsis* occurs, is an example of a site that meets these conditions. The types of microsites required by *Lilaeopsis* were generally lost from the main stems of the San Pedro and Santa Cruz rivers when channel entrenchment occurred in the late 1800s. Habitat on the upper San Pedro River is recovering, and *Lilaeopsis* has recently recolonized small reaches of the main channel.

Ciénegas, perennial streams, and rivers in the desert southwest are extremely rare. The Arizona Game and Fish Department (1993) estimated that riparian vegetation associated with perennial streams comprises about 0.4 percent of the total land area of Arizona, with present riparian areas being remnants of what once existed. The State of Arizona (1990) estimated that up to 90 percent of the riparian habitat along Arizona's major desert watercourses has been lost, degraded, or altered.

The physical and biological habitat features essential to the conservation of *Lilaeopsis* include a riparian plant community that is fairly stable over time and not dominated by non-native plant species, a stream channel that is relatively stable but subject to periodic, non-scouring flooding, refugial sites (sites safe from catastrophic flooding), and a substrate (soil) that is permanently wet or nearly so, for growth and reproduction of the plant.

Life History

The Huachuca water umbel flowers from March through October with most flowering in June through August (Arizona Game and Fish Department 1997). The species reproduces sexually through flowering and asexually from rhizomes, the latter probably being the primary reproductive mode. The Huachuca water umbel is also suspected of self-pollination (Johnson *et al.* 1992). An additional dispersal opportunity occurs as a result of the dislodging of clumps of plants, which then may re-root in a different site along aquatic systems (U.S. Fish and Wildlife Service 1997). Fruits develop from July through September and water disperses the seeds (Arizona Game and Fish Department 1997). Seeds from plants grown in an aquarium have been seen sticking to the aquarium sides and germinating 1-2 weeks after falling from the parent plant (Johnson *et al.* 1992).

After a flood, *Lilaeopsis* can rapidly expand its population and occupy disturbed habitat until interspecific competition exceeds its tolerance. This response was recorded at Sonoita Creek in August 1988, when a scouring flood removed about 95 percent of the *Lilaeopsis* population (Gori *et al.* 1990). One year later, the umbel had recolonized the stream and was again codominant with watercress (*Rorippa nasturtium-aquaticum*, Warren *et al.* 1991). However, two patches of *Lilaeopsis* on the San Pedro River were lost during a winter flood in 1994, and the species had still not recolonized that area as of May 1995, demonstrating the dynamic and often precarious nature of occurrences within a riparian

system (Al Anderson, Grey Hawk Ranch, *in litt.* 1995). The expansion and contraction of Huachuca water umbel populations appear to depend on the presence of "refugia" where the species can escape the effects of scouring floods, a watershed that has an unaltered hydrograph, and a healthy riparian community that stabilizes the channel.

Density of umbel plants and size of populations fluctuate in response to both flood cycles and site characteristics. Some sites, such as Black Draw, have a few sparsely distributed clones, possibly due to the dense shade of the even-aged overstory of trees, dense non-native herbaceous layer beneath the canopy, and deeply entrenched channel. The Sonoita Creek population occupies 14.5 percent of a 5,385 square foot patch of habitat (Gori *et al.* 1990). Some populations are as small as 11 to 22 square feet. The Scotia Canyon population, by contrast, has dense mats of leaves. Scotia Canyon contains one of the larger Huachuca water umbel populations, occupying about 57 percent of the 4,756 foot perennial reach (Gori *et al.* 1990, Falk and Warren 1994).

While the extent of occupied habitat can be estimated, the number of individuals in each population is difficult to determine because of the intermeshing nature of the creeping rhizomes and the predominantly asexual mode of reproduction. A "population" of Huachuca water umbel may be composed of one or many genetically distinct individuals.

Threats

Overgrazing, mining, hay harvesting, timber harvest, fire suppression, and other activities in the nineteenth century led to widespread erosion and channel entrenchment in southeastern Arizona streams and ciénegas when above-average precipitation and flooding occurred in the late 1800s and early 1900s (Bryan 1925, Martin 1975, Hastings and Turner 1980, Dobyns 1981, Hendrickson and Minckley 1984, Sheridan 1986, Bahre 1991, Webb and Betancourt 1992, Hereford 1993). A major earthquake near Batepito, Sonora, approximately 40 miles south of the upper San Pedro Valley, resulted in land fissures, changes in groundwater elevation, and spring flow, and may have preconditioned the San Pedro River channel for rapid flood-induced entrenchment (Hereford 1993, Geraghty and Miller, Inc. 1995). These events contributed to long-term or permanent degradation and loss of ciénega and riparian habitat on the San Pedro River and throughout southeastern Arizona and northeastern Sonora. Much habitat of the Huachuca water umbel and other ciénega-dependent species was presumably lost at that time.

Wetland degradation and loss continues today. Human activities such as groundwater overdrafts, surface water diversions, impoundments, channelization, improper livestock grazing, chaining, agriculture, mining, sand and gravel operations, road building, non-native species introductions, urbanization, wood cutting, and recreation all contribute to riparian and ciénega habitat loss and degradation in southern Arizona. The local and regional effects of these activities are expected to increase with the increasing human population.

Limited numbers of populations and the small size of populations make the Huachuca water umbel vulnerable to extinction as a result of stochastic events that are often exacerbated by habitat disturbance. For instance, the restriction of this taxon to a relatively small area in southeastern Arizona and adjacent areas of Mexico increases the chance that a single environmental catastrophe, such as a severe tropical storm or drought, could eliminate populations or cause extinction. Populations are in most cases isolated, as well, which makes the chance of natural recolonization after extirpation less likely. Small populations are also subject to demographic and genetic stochasticity, which increases the probability of population extirpation (Shafer 1990, Wilcox and Murphy 1985).

Critical Habitat

Seven Critical Habitat units have been designated for Huachuca water umbel; all are in Santa Cruz and Cochise counties, Arizona, and include stream courses and adjacent areas out to the beginning of upland vegetation. The Scotia, Sunnyside, and Bear canyon units (3, 4, and 6) are within the Coronado National Forest. The remaining Units are in lands adjacent to Forest lands. The following general areas are designated as critical habitat (see legal descriptions for exact critical habitat boundaries):

Unit 1-approximately 1.25 mile of Sonoita Creek southwest of Sonoita;

Unit 2-approximately 2.7 miles of the Santa Cruz River on both sides of Forest Road 61, plus approximately 1.9 miles of an unnamed tributary to the east of the river;

Unit 3-approximately 3.4 miles of Scotia Canyon upstream from near Forest Road 48;

Unit 4-approximately 0.7 mile of Sunnyside Canyon near Forest Road 117 in the Huachuca Mountains;

Unit 5- approximately 3.8 miles of Garden Canyon near its confluence with Sawmill Canyon;

Unit 6- approximately 1.0 mile of Rattlesnake Canyon and 0.6 mile of an unnamed canyon, both of which are tributaries to Lone Mountain Canyon; approximately 1.0 mile of Lone Mountain Canyon; and approximately 1.0 mile of Bear Canyon; an approximate 0.6-mile reach of an unnamed tributary to Bear Canyon; and

Unit 7- approximately 33.7 miles of the San Pedro River from the perennial flow reach north of Fairbank (Arizona Department of Water Resources 1991) to 0.13 mile south of Hereford, San Pedro Riparian National Conservation Area.

The primary constituent elements of critical habitat for *Lilaeopsis* include, but are not limited to, the habitat components that provide:

(1) Sufficient perennial base flows to provide a permanently or nearly permanently wetted substrate for growth and reproduction of *Lilaeopsis*;

(2) A stream channel that is relatively stable, but subject to periodic flooding that provides for rejuvenation of the riparian plant community and produces open microsites for *Lilaeopsis* expansion;

(3) A riparian plant community that is relatively stable over time and in which non-native species do not exist or are at a density that has little or no adverse effect on resources available for *Lilaeopsis* growth and reproduction; and

(4) In streams and rivers, refugial sites in each watershed and in each reach, including but not limited to springs or backwaters of mainstem rivers, that allow each population to survive catastrophic floods and recolonize larger areas.

Activities that may destroy or adversely modify critical habitat include those that alter the primary constituent elements to the extent that the value of critical habitat for both the survival and recovery of *Lilaeopsis* is appreciably diminished. Such activities are also likely jeopardize the continued existence of the species.

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions that are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

The action area consists of the Peterson Ranch Pond in Scotia Canyon, where most of the work will occur, as well as the access road into the canyon and the on-site holding facilities, which include two ponds in Scotia Canyon. See the Environmental Baseline for the Sonoran tiger salamander for descriptions of general vegetation communities and other environmental aspects of the action area.

Status of the Species in the Action Area

Scotia Canyon has been surveyed for water umbel at least once every three years beginning in 1995. Most wet reaches of the canyon bottom through the action area support the species. Distribution appears to vary with the availability of moist substrate. The extent of moist substrate is dependent on seasonal and yearly precipitation patterns, changes in riparian vegetation and stream morphology, and frequency and intensity of flooding. Thus, even if an entire stretch of drainage is mapped to contain Huachuca water umbel, the plant probably does not occur continuously throughout the drainage or at the same frequency every year.

The Scotia Canyon population is most dense and continuous from immediately below the first stream crossing on Forest Road 4759 upstream through the project area for about 0.5 mile. The species has consistently occurred in the stream channel below and above Peterson Ranch Pond. The species is also found in the narrow channel between the spring and the inlet to the pond, as well as at the pond's perimeter. Occupied habitat at Peterson Ranch Pond consists of approximately 0.02 acres. The operation of the spring diversion box constructed in 2007 to facilitate draw-down of Peterson Ranch Pond for bullfrog control affects water umbel by partially drying the spring-fed channel. Water umbel quickly repopulates the channel once the diversion is turned off (G. Frederick, Sierra Vista Ranger District, personal observation).

The entire section of stream bottom adjacent to Peterson Ranch Pond and through which the access road crosses is mapped as critical habitat; however, some sections are not perennial and do not support water umbel. Off-channel springs and impoundments, including Peterson Ranch Pond and the proposed holding pond upstream of Peterson Ranch Pond, are not designated critical habitat.

Activities in Scotia Canyon that affect water umbel and its habitat include recreation, livestock grazing, Border Patrol activities (primarily vehicle patrols), and illegal immigration and smuggling. In regard to recreation and Border Patrol activities, use of the road, which crosses the wetted canyon bottom in several places, directly affects water umbel. The road is also a source of sediment to the stream. Livestock grazing has been the subject of section 7 consultation, and several modifications to the grazing regime in the canyon have been made to improve conditions for water umbel (see U.S. Fish and Wildlife Service 2002b and amendments to that BO).

EFFECTS OF THE ACTION

The proposed action is anticipated to have short-term direct and indirect adverse effects to the water umbel and its critical habitat. Conservation measures that are part of the proposed action will minimize adverse effects and speed recovery of habitat.

Direct Effects

Loss of individual plants is anticipated from operation of a backhoe or other equipment to remove sediment and *Chara* at Peterson Ranch Pond, and from construction of the gate valve. An estimated 0.01 acre of occupied habitat is anticipated to be directly affected. Minor direct impacts to water umbel could also occur at two road crossings of the creek when equipment is driven to Peterson Ranch Pond. Additional minor impacts may occur if hand tools are needed to deepen or otherwise make small improvements to the salamander holding ponds in Scotia Canyon. The conservation measures, which include minimizing vegetation clearing at Peterson Ranch Pond and to store oil, fuel, and other equipment fluid in secure containers at an upland site away from aquatic habitats, act to reduce potential direct adverse effects.

Indirect Effects

Indirect effects may occur to the species and its habitat during drawdown of water levels at the Peterson Ranch Pond, with resulting desiccation of water umbel habitat in the spring channel and on the edge of the pond. Although water umbel may disappear or decline adjacent to the spring flow, in 2008, water umbel colonized the spring flow channel after the water was diverted. The habitat in the spring run will likely remain moist because of subsurface flow from the spring. The areas around the edge of the pond are more likely to dry out completely, perhaps killing umbel plants; these areas are the same as those that will be directly impacted by heavy equipment use on the edge of the pond. Water umbel populations on the edge of the pond are likely depleted due to last year's work, which included use of heavy equipment on the berm, and partial draining of the pond.

Diverting the spring flow to downstream of Peterson Ranch Pond is not expected to have adverse effects to umbel habitat or critical habitat. During drying of the pond in 2008, flow was diverted to the dry side channel of Scotia Canyon that runs just north of Peterson Ranch Pond. None of the diverted water reached the main channel of Scotia Canyon, where umbel and critical habitat occurs, and there was no noticeable erosion associated with diverted flows. The sediment and *Chara* removed from the pond will be deposited just below the pond, which is about 600 feet from the main channel of Scotia Canyon. Because of the distance, the likelihood of sediment or decaying *Chara* reaching the main channel where water umbel occurs is low.

Minor impacts to critical habitat could occur if the lower holding pond is modified in any way with hand tools (e.g. deepened); however, such activities are not expected to impact more than 100 square feet. The same is true for the upper holding pond, which although supports water umbel, is not critical habitat. No measurable impacts to critical habitat are expected from vehicle use and equipment transport to Peterson Ranch Pond, which will include travel through two road crossings across the wetted main channel of Scotia Canyon.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Only Forest Service lands occur within the action area, thus most activities likely to occur will have some Federal nexus. The effects of such activities are subject to section 7 consultation, and are not cumulative effects. Exceptions include possible private activities in the easement around Sylvania Spring above Peterson Ranch Pond and illegal immigration and smuggling. No private actions are currently anticipated or known at Sylvania Spring, except that the spring has been and will continue to be used as a water source for cattle. Cumulative effects will continue from illegal immigration and smuggling (see Cumulative Effects for Sonoran tiger salamander). Fires that may be started by illegal immigrants or smugglers could have catastrophic effects to water umbel and its habitat through ash and sediment flow, and associated erosion of the channel.

CONCLUSION

After reviewing the current status of the Huachuca water umbel and its critical habitat, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is our biological opinion that the action, as described, is neither likely to jeopardize the continued existence of the water umbel, nor likely to result in destruction or adverse modification of water umbel critical habitat.

Our findings are based on the following:

- Although some adverse effects are anticipated to water umbel and its critical habitat, these effects are 1) limited in extent, 2) are largely temporary, and 3) conservation measures proposed as part of the proposed action will reduce the extent and permanency of those adverse effects.

This opinion does not rely on the regulatory definition of “destruction or adverse modification” of critical habitat at 50 C.F.R. 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

INCIDENTAL TAKE STATEMENT

Note that in regard to “take” of listed species in sections 7(b)(4) and 7(o)(2) of the Act, these sections generally do not apply to listed plant species, thus no incidental take statement is included here for the Huachuca water umbel. Nonetheless, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of Federally listed endangered plants and malicious damage of such plants on areas under Federal jurisdiction, or the destruction of endangered plants on non-Federal areas in violation of State law or regulation or during any violation of a State criminal trespass law.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. As part of the email reporting in term and condition 2.c. for the Sonoran tiger salamander, we recommend that you summarize the work accomplished, effects to water umbel and its critical habitat, as well as an assessment of how well the conservation measures worked and whether adjustments should be considered for similar, future projects.

2. We recommend that you continue to develop long-term resource management planning for the Scotia Canyon area that would comprehensively address the suite of resource issues in the area, including wildfires and fuels management.

3. When we begin the recovery planning process for water umbel, we invite you to actively participate in plan development, as well as subsequent plan implementation.

4. We recommend that you work with us on reestablishment of the Chiricahua leopard frog and Sonoran tiger salamander, as well as conservation of Huachuca water umbel, Mexican gartersnake, Arizona treefrog, and Huachuca springsnail in Scotia Canyon.

In order to keep us informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitat, we request notification of the implementation of any conservation recommendations.

Disposition of Dead or Injured Listed Species
Upon locating a dead, injured, or sick listed species initial notification must be made to the FWS's Law Enforcement Office, 2450 W. Broadway Rd, Suite 113, Mesa, Arizona, 85202, telephone: 480/967-7900) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state.

REINITIATION NOTICE

This concludes formal consultation on the Peterson Ranch Pond Maintenance Project outlined in your request for consultation. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The proposed action is part of a pro-active, multi-species, multi-party recovery project that will yield many benefits for listed and sensitive species in Scotia Canyon and adjacent portions of the San Rafael Valley and Huachuca Mountains. We very much appreciate the Coronado's leadership role in this important project. For further information please contact Jim Rorabaugh (520) 670-6150 (x230) or Sherry Barrett (520) 670-6150 (x223).

Sincerely,

/ s / Sherry Barrett for
Steven L. Spangle
Field Supervisor

cc: Assistant Field Supervisor, Fish and Wildlife Service, Tucson, AZ (Attn: Sherry Barrett)
Forest Supervisor, Coronado National Forest, Tucson, AZ

Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Regional Supervisor, Arizona Game and Fish Department, Tucson, AZ

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REFERENCES CITED

Abbate, D. 1998. Arizona Game and Fish Department 1997 Sonora tiger salamander surveys. Presentation to the Fourth Annual Meeting of the Southwestern Working Group of the Declining Amphibian Populations Task Force, Phoenix, AZ.

Affolter, J.M. 1985. A Monograph of the Genus *Lilaeopsis* (Umbelliferae). Systematic Botany Monographs Volume 6: 1-140.

Arizona Department of Water Resources. 1991. Preliminary hydrographic survey report for the San Pedro River watershed. Volume 1: General Assessment. Phoenix, Arizona. 548 pp.

Arizona Game and Fish Department 1993. Arizona Riparian Inventory and Mapping Project. Phoenix, Arizona.

Arizona Game and Fish Department. 1997. Lilaeopsis schaffneriana var. recurva. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona.

Bahre, C.J. 1991. A legacy of change: Historic human impact on vegetation of the Arizona borderlands. University of Arizona Press, Tucson, Arizona. 231pp.

Behler, J.L., and F.W. King. 1980. The Audubon Society field guide to North American reptiles and amphibians. Alfred A. Knopf, New York, N.Y. 719pp.

Berger L., R. Speare, P. Daszak, D.E. Green, A.A. Cunningham, C.L. Goggins, R. Slocombe, M.A. Ragan, A.D. Hyatt, K.R. McDonald, H.B. Hines, K.R. Lips, G. Marantelli, and H. Parkes. 1998. Chytridiomycosis causes amphibian mortality associated with population declines in the rain forests of Australia and Central America. Proceedings of the National Academy of Science, USA 95:9031-9036.

Blanchard, C.L., and M. Stromberg. 1987. Acidic precipitation in southeastern Arizona: sulfate, nitrate, and trace-metal deposition. Atmospheric Environment 21(11):2375-2381.

Bryan, K. 1925. Date of channel trenching (arroyo cutting) in the arid southwest. Science 62:338-344.

Collins, J.P., J.L. Brunner, V. Miera, M.J. Parris, D.M. Schock, and A. Storfer. 2003. Ecology and evolution of infectious disease. Pages 137-151 *in* R.D. Semlitsch, Amphibian Conservation. Smithsonian Books, Washington D.C.

Collins, J.P., J.K. Jancovich, E.W. Davidson, V.G. Chinchar, and collaborators. 2000. The current status of salamander ranaviruses in Western North America. Abstract for Scientific Conference - Getting the Jump! On Amphibian Diseases, Cairns, Australia, 26-30 August 2000.

Collins, J.P. 1999. J.P. Collins Lab, 1999 Sonoran tiger salamander report. Report to the U.S. Fish and Wildlife Service, Albuquerque.

Collins, J.P. 1996. Final report: A status survey of three species of endangered/sensitive amphibians in Arizona. Report to Arizona Game and Fish Department, Phoenix, AZ. Heritage Fund - IIPAM #I92014.

Collins, J.P., E.W. Davidson, J.E. Loncore, A.P. Pessier, M.J. Perris, and A.T. Storfer. 2001. Viral and fungal pathogens in tiger salamanders in the Western United States and Canada. Pages 20-21 in Abstracts of the Annual Conference of The Western Section of The Wildlife Society, Sacramento, California, 22-24 February 2001.

Collins, J.P., and T.R. Jones. 1987. Report on the status of the Sonora tiger salamander, *Ambystoma tigrinum stebbinsi* Lowe. Department of Zoology, Arizona State University, Tempe, Arizona. 66 pp.

Collins, J.P., T.R. Jones, and H.J. Berna. 1988. Conserving genetically distinctive populations: the case of the Huachuca tiger salamander (*Ambystoma tigrinum stebbinsi* Lowe). Pages 45-53 In R.C. Szaro, K.E. Severson, and D.R. Patton (tech. coords.). Management of amphibians, reptiles and small mammals in North America. USDA Forest Service General Technical Report RM-166.

Crother, B.I. (ed.). 2008. Scientific and Common Names for Amphibians and Reptiles of North America North of México. Society for the Study of Amphibians and Reptiles, Herpetological Circular No. 37:1-84.

Davidson, E.W., M. Parris, J.P. Collins, J.E. Longcore, A.P. Pessier, and J. Brunner. 2003. Pathogenicity and transmission of chytridiomycosis in tiger salamanders (*Ambystoma tigrinum*). Copeia 2003(3):601-607.

Davidson, E.W., A.P. Pessier, J.E. Longcore, M. Perris, J. Jancovich, D. Schock, and J.P. Collins. 2000. Chytridiomycosis in Arizona (USA) tiger salamanders. Abstract for Scientific Conference - Getting the Jump! On Amphibian Diseases, Cairns, Australia, 26-30 August 2000.

Dobyns, H.F. 1981. From fire to flood: historic human destruction of Sonoran Desert riverine oases. Ballena Press, Socorro, New Mexico. 222pp.

Docherty, D.E., C.U. Meteyer, J. Wang, J. Mao, S.T. Case, and V.G. Chinchar. 2003. Diagnostic and molecular evaluation of three iridovirus-associated salamander mortality events. Journal of Wildlife Diseases 39(3):556-566.

Falk, D. and P.L. Warren. 1994. Rare plants of the Coronado National Forest: Population studies and monitoring recommendations. Report to the Coronado National Forest, Tucson, Arizona.

Gehlbach, E.R. 1967. *Ambystoma tigrinum* (Green). Catalogue of American Amphibians and Reptiles, 52.1-52.4.

Gelhbach, F.R., Kimmel, J.R., and W.A. Weems. 1969. Aggregations and body water relationships in tiger salamanders (*Ambystoma tigrinum*) from the Grand Canyon rims, Arizona. Physiological Zoology 42:173-182.

Geraghty and Miller, Inc. 1995. Historical flows and conditions in the San Pedro River. Report to the Water Action Task Force, Sierra Vista Economic Development Foundation, Project No. AZ0473.001. 33pp +figures.

Gori, D.F., P.L. Warren, and L.S. Anderson. 1990. Population studies of sensitive plants of the Huachuca, Patagonia, and Atascosa Mountains, Arizona. Unpublished report. Coronado National Forest, Tucson. 114pp.

Gruberg, E.R., and R.V. Stirling. 1972. Observations on the burrowing habits of the tiger salamander (*Ambystoma tigrinum*). Herpetological Review 4:85-89.

Haas, S.K, and R.J. Frye. 1997. Hydrology and water quality effects on *Lilaeopsis schafffneriana* ssp. *recurva*. Report to Arizona Dept. of Agriculture and Fort Huachuca.

Hastings, J.R.and R.M. Turner. 1980. The changing mile. University of Arizona Press, Tucson. 327pp.

Hendrickson, D.A., and W.L. Minckley. 1984. Cienagas - vanishing climax communities of the American Southwest. Desert Plants 6(3):131-175.

Hereford, R. 1993. Geomorphic evolution of the San Pedro River channel since 1900 in the San Pedro Riparian National Conservation Area, southeast Arizona. US Geological Survey, Open File Report 92-339. 71pp.

Jancovich, J.K., E.W. Davidson, J.F. Morado, B.L. Jacobs, and J.P. Collins. 1997. Isolation of a lethal virus from the endangered tiger salamander, *Ambystoma tigrinum stebbinsi*. Diseases of Aquatic Organisms 31:161-167.

Jancovich, J.K., E.W. Davidson, N. Parameswaran, J. Mao, G. Chinchar, J.P. Collins, B.L. Jacobs, and A. Storfer. 2005. Evidence for emergence of an amphibian iridioviral disease because of human-enhanced spread. Molecular Ecology 14:213-224.

Jancovich, J.K., E.W. Davidson, A. Seiler, B.L. Jacobs, and J.P. Collins. 2001. Transmission of the *Ambystoma tigrinum* virus to alternate hosts. Diseases of Aquatic Organisms 46:159-163.

Jancovich, J.K., E.W. Davidson, J.F. Morado, B.L. Jacobs, and J.P. Collins. 1998. Isolation of a lethal virus from the endangered tiger salamander, *Ambystoma tigrinum stebbinsi* Lowe. Abstract in programs and abstracts, Fourth Annual Meetings of the Southwestern United States Working Group of the Declining Amphibian Populations Task Force. Phoenix, AZ.

Johnson, K., P.L. Warren, D.F. Gori, and E.S. Monarque. 1992. Species management evaluation, cienega false rush (*Lilaeopsis schaffneriana* ssp. *recurva*). Unpublished report. The Nature Conservancy, Tucson, Arizona.

Jones, T.R., E.J. Routman, D.J. Begun, and J.P. Collins. 1995. Ancestry of an isolated subspecies of salamander, *Ambystoma tigrinum stebbinsi* Lowe: the evolutionary significance of hybridization. Molecular Phylogenetics and Evolution 4(2):194-202.

Jones, T.R., J.P. Collins, T.D. Kocher, and J.B. Mitton. 1988. Systematic status and distribution of *Ambystoma tigrinum stebbinsi* Lowe (Amphibia:Caudata). Copeia 1988(3):621-635.

Lowe, C.H. 1954. A new salamander (genus *Ambystoma*) from Arizona. Proceedings of the Biological Society of Washington 67:243-246.

Martin, S.C. 1975. Ecology and management of southwestern semidesert grass-shrub ranges: the status of our knowledge. US Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. 39pp.

Petranka, J.W. 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington D.C. 587 pp.

Petranka, J.W., A.W. Rushlow, and M.E. Hopey. 1998. Predation by tadpoles of *Rana sylvatica* on embryos of *Ambystoma maculatum*: implications of ecological role reversals by *Rana* (predation) and *Ambystoma* (prey). Herpetologica 54(1):1-13.

Platz, J.E. 1993. *Rana subaquavocalis*: Conservation Assessment/Conservation Strategy. Report to the U.S. Forest Service, Coronado National Forest, Tucson, AZ.

Rorabaugh, J.C. 2008. An introduction to the herpetofauna of mainland Sonora, México, with comments on conservation and management. Journal of the Arizona-Nevada Academy of Science 40(1):20-65.

Saucedo-Monarque, E. 1990. Proyecto: Prospeccion de plantas raras en el Norte de Sonora. Centro Ecologico de Sonora, Subdireccion de Investigacion, Area de Ecologia Terrestre, Hermosillo, Sonora, Mexico. 65pp.

Semlitsch, R.D. 1983. Burrowing ability and behavior of salamanders in the genus *Ambystoma*. Canadian Journal of Zoology 61:616-620.

Shafer, C.L. 1990. Nature reserves, island theory and conservation practice. Smithsonian Institution Press, Washington D.C. 189pp.

Sheridan, T.E. 1986. Los Tucsonenses: the Mexican community in Tucson, 1854-1941. University of Arizona Press, Tucson. 327pp.

Snyder, J.D., T.J. Maret, and J.P. Collins. 1998. Species' interactions and drying frequency determine extinction and colonization rates in metapopulations of the Huachuca tiger salamander, introduced fish, and introduced bullfrogs in the San Rafael Valley, AZ. Abstract in program and abstracts, Fourth Annual Meeting of the Southwestern United States Working Group of the Declining Amphibian Populations Task Force, Phoenix, AZ.

Snyder, J.T., T.J. Maret, and J.P. Collins. 1996. Exotic species and the distribution of native amphibians in the San Rafael Valley, AZ. Abstract in program and abstracts, Second Annual Meetings of the Southwestern United States Working Group of the Declining Amphibians Populations Task Force, Tucson, AZ.

Speare, R., and L. Berger. 2000. Global distribution of chytridiomycosis in amphibians.

Http://www.jcu.edu.au/school/phtm/PHTM/frogs/chyglob.htm.

State of Arizona. 1990. Final report and recommendations of the Govenor's riparian habitat task force. Executive Order 89-16. Streams and riparian resources. Phoenix, Arizona. October 1990. 28 pp.

Stebbins, R.C., and N.W. Cohen. 1995. A natural history of amphibians. Princeton University Press. Princeton, New Jersey. 316pp.

Storfer, A. 2003. Emerging disease and amphibian declines. Pages 42-43 *in* of Program Book for the 2003 Joint Meeting of Icthyologists and Herpetologists, Manaus, Amazonas, Brazil (abstract).

Storfer, A., J.P. Collins, and J. Snyder. 1999. Molecular genetic status of tiger salamanders on the Fort Huachuca Military Reservation. Report to Fort Huachuca, Arizona, contract #DABT63-99-P-0087.

Storfer, A., S.G. Mech, M.W. Reudink, R.E. Ziemba, J. Warren, and J.P. Collins. 2004. Evidence for introgression in the endangered tiger salamander, *Ambystoma tigrinum stebbinsi* (Lowe). Copeia (2004)4:783-796.

U.S. Fish and Wildlife Service. 1997. Endangered and threatened wildlife and plants; determination of endangered status for three wetland species found in southern Arizona and northern Sonora, Mexico. Federal Register 62(3):665-689.

U.S. Fish and Wildlife Service. 1999. Endangered and threatened wildlife and plants; designation of critical habitat for the Huachuca water umbel, a plant. Federal Register 64 (132); 37441-37453.

U.S. Fish and Wildlife Service. 2002a. Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*) recovery plan. U.S. Fish and Wildlife Service, Region 2, Albuquerque, NM.

U.S. Fish and Wildlife Service. 2002b. Final Biological and Conference Opinion: Continuation of Livestock Grazing on the Coronado National Forest. U.S. Fish and Wildlife Service, Arizona Ecological Services Office, Phoenix, Arizona.

U.S. Fish and Wildlife Service. 2007. Chiricahua leopard frog recovery plan. U.S. Fish and Wildlife Service, Region 2, Albuquerque, New Mexico.

Varela-Romero, A., C. Galindo-Duarte, E. Saucedo-Monarque, L.S. Anderson, P. Warren, S. Stefferud, J. Stefferud, S. Rutman, T. Tibbits, and J. Malusa. 1992. Re-discovery of *Gila intermedia* and *G. purpurea* in northern Sonora, Mexico. In D.A. Hendrickson, Ed. "Proceedings of the Desert Fishes Council. Volumes XXII and XXIII, 1990 and 1991 Annual Symposia, and Index for Volumes XVI Through XXIII" p. 33, Desert Fishes Council, Bishop, CA.

Warren, P.L., D.F. Gori, L.S. Anderson, and B.S. Gebow. 1991. Status report for *Lilaeopsis schaffneriana* ssp. *recurva*. U.S. Fish and Wildlife Service, Arizona Ecological Services State Office, Phoenix, Arizona. 30 pp.

Warren, P.L., and F.W. Reichenbacher. 1991. Sensitive plant survey of Fort Huachuca, Arizona. Report to U.S. Army, Fort Huachuca, AZ. Purchase Order DAEA1889P4546.

Warren, P.L., L.S. Anderson, and P.B. Shaffroth. 1989. Population studies of sensitive plants of the Huachuca and Patagonia Mountains, Arizona. Unpublished Report, Coronado National Forest, Tucson. 99pp.

Webb, R.H. and J.L. Betancourt. 1992. Climatic variability and flood frequency of the Santa Cruz River, Pima County, Arizona. U.S. Geological Survey Water-supply Paper 2379.

Wilcox, B.A., and D.D. Murphy. 1985. Conservation strategy: the effects of fragmentation on extinction. American Naturalist 125:879-887.

Ziemba, R.E., A.T. Storfer, J. Warren, and J.P. Collins. 1998. Genetic variation among populations of the Sonora tiger salamander (*Ambystoma tigrinum stebbinsi* Lowe). Report to Arizona Game and Fish Department, Arizona Game and Fish Department Heritage Fund Program Grant #196046.

Appendix A

CONCURRENCE

This appendix contains our concurrence with your determination that the proposed Peterson Ranch Pond Maintenance Project in the Huachuca Mountains Project may affect, but is not likely to adversely affect, the Chiricahua leopard frog.

Chiricahua Leopard Frog

The Chiricahua leopard frog (*Lithobates chiricahuensi*s) was listed as a threatened species without critical habitat in a Federal Register notice dated June 13, 2002. Included was a special rule to exempt operation and maintenance of livestock tanks on non-Federal lands from the section 9 take prohibitions of the Act. Threats to this species include predation by non-native organisms, especially bullfrogs, fish, and crayfish; disease; drought; floods; degradation and loss of habitat as a result of water diversions and groundwater pumping, poor livestock management, altered fire regimes due to fire suppression and livestock grazing, mining, development, and other human activities; disruption of metapopulation dynamics; increased chance of extirpation or extinction resulting from small numbers of populations and individuals; and environmental contamination. A recovery plan has been completed (U.S. Fish and Wildlife Service 2007).

We concur with your finding for the Chiricahua leopard frog based on the following reasons:

- Although the frog occurred historically in the action area (last record was 1986 in Scotia Canyon), none have been found there since, despite numerous surveys. They were likely eliminated by bullfrog predation and/or other factors.

- The project will improve recovery potential for the species through enhancement of habitat quality and manageability at Peterson Ranch Pond. The project is expected to set the stage for future reestablishment of the Chiricahua leopard frog into renovated habitats in Scotia Canyon.