National Park Service
U.S. Department of the Interior

Organ Pipe Cactus
National Monument

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THREATENED AND ENDANGERED SPECIES
Annual Summary of Activities - 2007
USFWS Permit # TE819458-0

I. INTRODUCTION

Organ Pipe Cactus National Monument is located in southwestern Arizona, in Pima County. The Monument preserves and protects a large tract of Sonoran Desert valley floors, bajadas, and rugged mountains, and is recognized as an International Biosphere Reserve by the United Nations Man and the Biosphere program. Ninety-five percent of the Monument's 330,689 acres are designated as wilderness. Organ Pipe Cactus National Monument is bordered on the west and northwest by Cabeza Prieta National Wildlife Refuge (also wilderness), on the north by Bureau of Land Management public lands, and on the east and northeast by the Tohono O'odham Nation. To the south lies Mexico, including the nearby El Pinacate Biosphere Reserve. Recognizing its legal mandates and the regional importance of the Monument, the National Park Service strives to protect, conserve, recover, and monitor threatened and endangered species, in cooperation with Monument neighbors, other agencies, and interested parties. The following is a summary of the Monument's threatened and endangered species related activities in 2007 and conducted under U.S. Fish and Wildlife Service (USFWS) endangered species permit #TE819458-0.

II. THREATENED AND ENDANGERED SPECIES

QUITOBAQUITO PUPFISH
(Cyprinodon eremus)

BACKGROUND

The Quitobaquito pupfish inhabits the springs, stream, and pond at Quitobaquito in the southwestern portion of Organ Pipe Cactus National Monument, and isolated pools and ephemeral reaches of the Rio Sonoyta in adjacent Mexico. Until 1999, this pupfish was considered an endangered endemic subspecies of the desert pupfish; *Cyprinodon macularius eremus*. Echelle et al. (2000) examined mitochondrial DNA of *Cyprinodon macularius*, and found pupfish at Quitobaquito and in the adjacent Rio Sonoyta to be sufficiently distinct to be considered a unique species, *Cyprinodon eremus*. The U.S. Fish and Wildlife Service designated "Quitobaquito Spring . . . and a 100-foot riparian buffer zone around the spring" as critical habitat for this species (USFWS 1986).

The Quitobaquito area, which includes the springs, stream and pond, lies on the international border and within the Rio Sonoyta watershed. Quitobaquito springs originate from the Aguajita Wash aquifer and rise from the fractured granite and gneiss of the Quitobaquito Hills. The two largest springs are captured and conducted into a manmade (gunnite) stream channel, which flows south approximately 800 feet (244 m) to the pond. Other spring lines in the immediate area result in small natural seeps with no significant pooled water. During heavy rain events, outflow from the pond joining with adjacent arroyos and surface sheet flow may temporarily establish a surface water link between Quitobaquito pond and the Rio Sonoyta, one mile to the south. Although Quitobaquito lies mostly within designated wilderness, Mexico Highway 2 also lies approximately 100 meters (328 ft) to the south and is primary land transportation link between mainland Mexico and the Baja California peninsula. The Quitobaquito area has traditionally been used by American Indian tribes, park visitors, researchers, and as an illegal border crossing point. The latter use currently ranges from serving as a *de facto* rest stop along Highway 2, to functioning as a staging point for smuggling and illegal immigration. Currently, the Quitobaquito area is closed to the general public, due to safety concerns.

Besides home of the Quitobaquito pupfish, the area is also rich in archaeological features, cultural values, and as a rare freshwater desert wetland. As a site that has been intensively used and manipulated by humans for perhaps thousands of years, the Quitobaquito area presents unique management challenges. The goals of the National Park Service for this area are to preserve, protect, and promote the recovery of the endangered Quitobaquito pupfish, and provide shallow water habitat for the Rio Sonoyta mud turtle (*Kinosternon sonoriense longifemorale*), a federal candidate species. The Monument also seeks to conserve habitat for all other native aquatic and riparian species, as well as protecting cultural resources and providing for visitor enjoyment.

MONITORING AND MANAGEMENT

Resources Management staff visually inspected the Quitobaquito area approximately twice per month through 2007. Inspections involved visually examining the channel, the springheads, pond perimeter, pond outflow, trails, and the historic fig and pomegranate orchard. Emphasis on observations of pupfish included visually inspecting for presence/absence along the stream channel, springs, and pond perimeter. A primary objective of the inspections was looking for the presence of non-native fish, such as mosquito fish (*Gambusia affinis*) and catfish (*Ictalurus melas*). Pupfish were not trapped or handled on these inspections. However, aquatic and emergent vegetation was selectively removed from varying sections of the channel for purpose of opening up shallow-water breeding habitat and ensuring that pupfish were free to travel along the length of the channel from the pond to the springhead. Removing vegetation from the channel is also necessary to maintain water flow to the pond. If left unattended the vegetation would occlude the channel and result in overflow and a reduction in the amount of water delivered to the pond. Sufficient vegetation is left and maintained in the channel to provide cover. This clearing effort is completed in such a manner as to maintain the original intent of the 1989 construction of the stream channel; which is to provide a variety of habitat features including stillwater, riffles, vegetative cover, and areas open to full sun.

Pupfish numbers at Quitobaquito pond, channel, and springs have been monitored over approximately the last 25 years. Monitoring efforts were sporadic prior to 1989, but have been carried out annually since 1989. The current annual census has two primary objectives. The first is to provide information on the status of *C. eremus* in the pond and channel. The second objective is to thoroughly examine and sample the pond and channel for the presence of non-native fish that may detrimentally affect pupfish. Several monitoring protocols have been used over the years. Changes in methods have been the result of the Monument's continuing desire to minimize impacts to pupfish from trapping and handling, while at the same time applying the most current and/or appropriate methods in population sampling. In particular, the Monument has sought to determine what specificity of population estimate is needed for effective management, and then sample accordingly. For example, is it important to be able to detect a 5% change in the population, or a 25% change – or perhaps only a 50% change? Based on advice from regional ichthyologists, the Monument's current approach is to generate general population indices which would alert management to serious population reductions. Intensive sampling methods that would produce highly accurate estimates are deemed inappropriate for the annual monitoring at this time because they tend to be intrusive to pupfish and require a large amount of staff time. Further, the information gained from this venture may be of little management relevance for a species whose life history normally includes substantial fluctuations in population levels. The Monument's management goal for the Quitobaquito pupfish population is to detect any changes in overall demographics, such as a precipitous drop to extremely low numbers or the absence of reproduction, or changes in the physical environment which might constitute a threat to the population.

Methods:

Sampling methods have varied over the years, from fin-clipping mark-recapture techniques to a depletion sampling method used by Monument staff 1990-1996. A mark-recapture technique using a temporary fluorescent powder dye was evaluated in the late 1990s (Douglas and Douglas 2000). While all techniques used over the last 25 years have had positive aspects, all have also had drawbacks. Early fin-clipping mark/recapture methods required intensive handling of numerous individual fish. Fin-clipping had the potential to also injure individuals. The depletion sampling method involved holding large numbers of pupfish in holding tanks for over 24 hours, creating conditions for antagonistic interactions. Mortalities resulting from overcrowding were frequently observed with this method and often approached the level of "incidental take" allowed under the Monument's USFWS ESA permit. After capture and holding, all fish were re-released en masse at selected locations and often in areas where the least number were generally caught (e.g., under the pond's cottonwood tree). This practice may have caused disorientation and relocation stress for this highly territorial species (Douglas and Douglas 2000). The temporary fluorescent powder dye mark-recapture technique also appeared to stress the fish and presented other logistical difficulties. For example, equipment used only once was permanently contaminated with small amounts of dye residue. This issue confounded future marking or mark-reading procedures. Also, some dye marks appeared to persist for well over a year on fish, complicating long-term annual census by this technique. In a given year, if marked fish remained from previous years, they might be mistakenly read as "recaptures" in the current-year census. Extended time spent examining individual fish for marks under ultraviolet light also raised health concerns.

Beginning in 2000, the Monument began doing a census modeled after the depletion sampling methods, but revised as an index based on fish trapped per unit of effort. This was undertaken to minimize impacts and stress on pupfish, develop an adequate index of population size, and allow comparison of data with the years when the depletion sampling method was used.

On September 11, 2007, we carried out the annual Quitobaquito pupfish census. We set 47 minnow traps in the pond and moat and completed three trapping runs of two hours each. Fish caught in the first two runs were held in mesh holding tanks placed in the pond (Figure 1.). These fish were released as the fish from the final run were being counted. Normally, these holding tanks are not emptied until after the third trapping run has been counted. In 2007, fish from the third trapping run were counted and released directly back in the pond at the point of capture. Normally, fish from the third trapping run are also held in a single container, and a subset measured for length. However during this census, a thunderstorm approached Quitobaquito at the end of the third trapping run, so those fish were released as they were counted, for the sake of expediency and staff safety. We measured 65 randomly selected fish from the first two trapping runs, to get an indication of age/size distribution. All fish captured in the pond were released back into the pond. We also set 12 traps in the channel and southwest springpool, which were counted after a single 4-hour trapping run. Fifteen randomly selected fish were measured for length, from each trap that contained at least 15 fish. All pupfish captured in the channel and springhead were re-released at their points of capture.

Comparison of the 2007 census with other years is possible, on a basis of numbers of fish trapped per unit of effort. This is possible because the current method uses the same number and locations of traps that were established in the depletion sampling protocol of 1992-1996. To compare 2007 with those previous years on a basis of fish trapped per unit of effort, we totaled fish caught in previous years and 2007 only for the minimum number of traps used in any one of those years, and for only the first three 2-hour trapping runs in the pond, and first 4-hour trapping run in the channel. This comparison was not possible for census activities in 1997 through 1999, because those efforts used numbers and locations of traps, and trapping durations that were not comparable to other years. The Quitobaquito pupfish census is intended to determine a population index and not a precise population estimate.

Figure 1. In-pond pupfish holding tanks. Organ Pipe Cactus National Monument, Arizona.

Results:

Total captures in 2007 were substantially greater than the average and mean for 1992-2007, in fact were the highest for any of those years (Table 1 and Figure 2). This population index suggests that in 2007 total pupfish numbers were at a high level not documented since 1995 and 1996. Pupfish captures in the channel system and the pond were both more than one standard deviation higher than the mean for 1992-2007. Although this survey is intended to be a general index of population size, it usually also allows a rough estimate of the total population. This estimate is based on the total pupfish captures for the survey, plus our subjective observations of the number and distribution of pupfish remaining free at the survey's end, before the captured fish are released back into the system. On this 2007 survey however, the pond water was opaque with algae, detritus, and other matter, resulting in poor visibility into the water. Observation of free-swimming adults was not possible in the pond. However, water in the channel was clear, with numerous free-swimming pupfish observed just before the channel traps were emptied. Considering the total captures (5,361), plus the abundant fish left uncaptured in the channel, and our experience from previous years' surveys, we estimate the 2007 population is in the range of 8,000 to 12,000 or more, or somewhat in excess of the approximate long-term average of 6,000 to 9,000.

Captures in the channel in 2007 (1,200) were twice the mean for 1992-2007, suggesting a substantial increase in pupfish there. In April through August, considerable emergent vegetation

was cleared from the southwest springhead and channel, to address concerns with water delivery to the pond (see discussion below), and to increase water volume in the channel itself. As a result of clearing more than the routine amount of vegetation, more open-water habitat was created along the channel. This may account for the large increase in captures there. However, it is also possible that in midsummer, as the pond surface area and total volume reached very low levels, pupfish from the pond may have moved up into the channel in search of more stable water conditions, resulting in greater numbers in the channel. However, the fact that September captures in the pond and moat were also very high suggests that pupfish numbers increased throughout the system in 2007.

The 2007 census resulted in 14 incidental mortalities. No non-native fish were trapped or observed.

Over the last 30 years, the estimated number of pupfish at Quitobaquito ranged from approximately 3,500 to 15,000. Estimates include: 7,986 in 1975, 3,592 and 4,558 in 1976 (Kynard and Garrtt 1979, *in* Miller and Fuiman 1987). Monument depletion sampling efforts in the early 1990s also yielded results in the range of 6,000 – 8,000. Using a mark-recapture census (fluorescent dye method) in 1996-1997, Douglas et al. (2001) estimated the population at 9,556. In 1998, using the Douglas et al (2001) method, the Monument census yielded an estimate of 8,823 fish (±3,500). Population extremes are represented by highs in 1995-1996, when a depletion sampling method yielded an estimated population of over 15,000. The 2007 capture rates indicate a total population comparable to 1995 and 1996. Population low points of approximately 3,500 to 5,000 occurred in 1992, 1994, and 2005.

We measured length on a total of 279 of the 5,361 fish captured, or approximately 5%. The size distribution of pupfish in 2007 was similar to previous years (Figure 3). In 2007 as in most years, the size distribution shows two peaks, one around 22-24mm, and another at 35-40mm.

Table 1. Captures of *Cyprinodon eremus* at Quitobaquito, by standardized trapping effort. Organ Pipe Cactus National Monument, Arizona, 1992 – 2007.			
	Pond & Moat	Channel	Total
1992	929	504	1,433
1993	2,785	663	3,448
1994	668	604	1,272
1995	3,559	642	4,201
1996	4,619	633	5,252
1997-1999[1]	-	-	-
2000	1,598	496	2,094
2001	1,678	414	1,992
2002	2,109	377	2,486
2003	2,949	660	3,609
2004	3,301	504	3,805
2005	684	674	1,358
2006	2,211	771	2,982
2007	**4,161**	**1,200**	**5,361**
Average	2,333	626	2,971
Mean	1,946	600	2,584
Standard Deviation	1,328	206	1,474

[1] No census was done in 1997. The 1998 and 1999 censuses used trap numbers, locations, and trap-session durations that were not comparable to other years.

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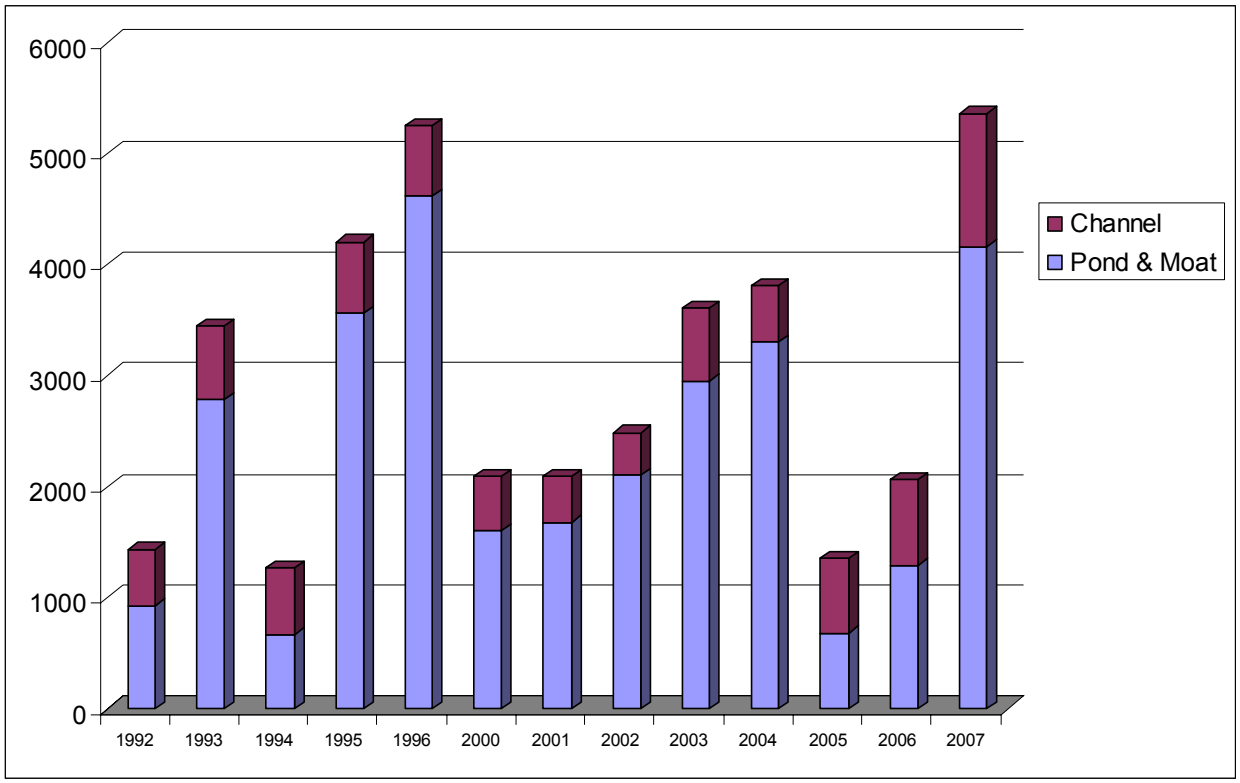

Figure 2. Captures of *Cyprinodon eremus* at Quitobaquito, by standardized trapping effort. Organ Pipe Cactus National Monument, Arizona, 1992 – 2007. No census was done in 1997. The 1998 and 1999 censuses used trap numbers, locations, and trap-session durations that were not comparable to other years.

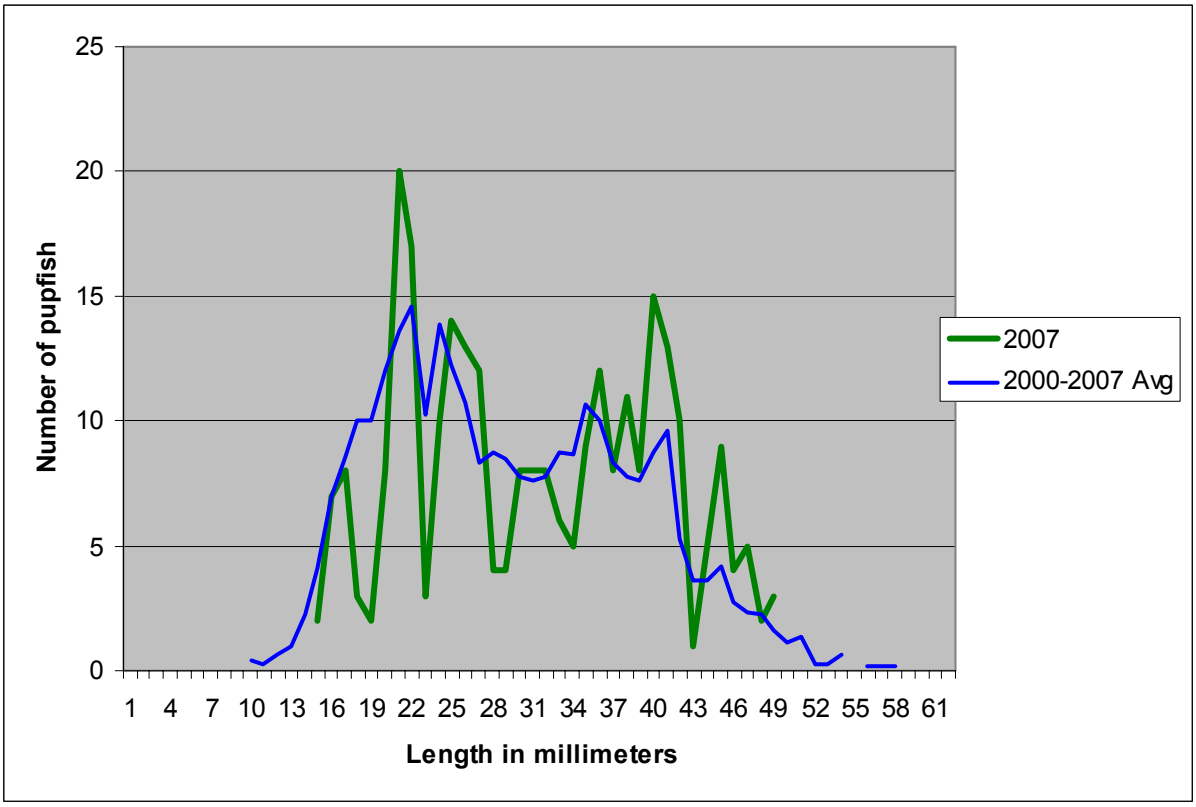

Figure 3. Size distributions of random samples of Quitobaquito pupfish at Quitobaquito Springs, for the 2007 survey and the average of the 2000 through 2007 surveys.

Management Issues

In 2007 as in 2006, extensive monitoring and management efforts were directed at Quitobaquito, concerning the water level in the pond. Every year, the water level lowers through the spring dry season (April-June), as increasing air temperature and aridity result in greater losses to evaporation and plant evapotranspiration. In 2006 and 2007, this normal fluctuation took place to extreme degrees, with the pond reaching low levels never observed before. In midsummer 2006, the surface of the pond had reached the lowest level ever documented up to then; 18" below the outflow pipe. At this low level, the bottom of the pond was exposed in the shallowest areas (e.g. northwest shore), possibly resulting in a net loss of pupfish habitat. The low water was believed to be due to several likely factors, including: 1) Two extremely dry winters; 2) Long-term decreases in spring discharge; 3) Vegetation overgrowth in the springheads and along the channel; 4) Unknown losses; 5) Other potential factors.

In 2006, a number of management actions were carried out, including: 1) Clearing vegetation from the northeast and southwest springheads to increase discharge; 2) Clearing vegetation from the channel to reduce evapotranspiration loss and increase volume available to pupfish; 3) Inspecting the channel and pond for leaks and making repairs. In consultation with the U.S. Fish and Wildlife Service and Arizona Game and Fish Department, we also considered: 1) Supplementing water input by trucking water to the pond; 2) Clearing woody perennial

vegetation from the dam and pond perimeter to reduce evapotranspiration loss; 3) Evacuating pupfish to temporary holding facilities in the event of critically low water levels. Fortunately, our management actions combined with monsoon rain input into the system resulted in increased pond depth, and a crisis was averted.

Anticipating a repeat of the 2006 water-level situation in 2007, we began efforts to enhance water delivery to the pond early in the year. Under guidance from an NPS hydrologist, in April we renovated the northeast spring collecting system. The latest collecting system had been installed in 1989, and was believed to be potentially occluded by plant roots and/or sediment. We excavated the old collecting pipe and surrounding gravels, and installed a new collecting pipe, encased in new gravels and a sediment-barrier fabric. Unfortunately, these efforts did not result in any appreciable increase in spring discharge collection. Discharge from the northeast spring continued to fluctuate between 4.8 to 5.7 gallons per minute (gpm). However, efforts to reduce loss of water along the length of the channel were more successful. In 2006, 4 to 5 gpm were typically lost along the channel, of the 17 to 20 gpm combined flow from the northeast and southwest springs. After considerable vegetation thinning, and patching the concrete channel where leaks were noted, the loss between the springheads and the pond was reduced to 1 to 1.7 gpm through most of the summer of 2007. Despite this success, in July the pond again reached a new low record, of 20.2" below the outflow pipe. At that level, the pond bottom was exposed around much of the perimeter, and bulrush (*Scirpus americana*) began to quickly advance into the newly-shallow water. Also at this level, the moat became an exposed mud flat. We took the opportunity to dredge sediment and organic deposits from the moat, a maintenance operation that was overdue and difficult to accomplish when water is in the moat. Dredging was done with buckets and shovels. In August, the pond level again began to recover, from decreased evaporation (due to increased humidity) and some rainfall input.

On September 6, the pond had recovered to a level of only minus 8.1", a rise of one foot since the low point of mid-July. However 5 days later, on September 11 during the annual population survey, the pond had dropped again to minus 10.2". The loss of 2" in 5 days was noteworthy, but was attributed to continuing hot, dry conditions. For a variety of reasons, the pond was not visited again until October 10, when the level was minus 19". This loss of water in the post-monsoon season appeared to be excessive. Monument staff recognized that a critical and unusual loss of water was underway, at a rate that could result in large losses of pupfish and mud turtles within 2 to 3 weeks. Emergency response actions were initiated, beginning with consultations with partner wildlife agencies, the U.S. Fish and Wildlife Service and the Arizona Game and Fish Department. The Monument, AGFD, and USFWS mutually developed plans to evacuate Quitobaquito pupfish and Rio Sonoyta mud turtles.

October 22, the pond reached a record low of minus 23.25". At that level, the pond was reduced to approximately 70% of its normal surface area, and averaged 4.5" deep (Figure 4). October 25, NPS and AGFD biologists trapped 1,048 pupfish which were then transported by AGFD (under their ESA permit) to the Arizona-Sonora Desert Museum for temporary safekeeping. October 29-30, 13 adult mud turtles were also trapped and evacuated to ASDM. Throughout late October and November, ORPI staff and NPS geohydrologists made repeated examinations of the Quitobaquito system, attempting to locate areas of water loss. A water budget estimate, based on known input and losses (evaporation rate) strongly indicated a direct loss of water from the pond

(not the channel), in the range of 8 to 14 gpm. No discrete points of loss were ever located. By late 2007 a leak in the retaining berm was suspected as the most likely source of loss. Trees and shrubs had become established on the berm, which is a known risk to earthen impoundments. It is possible water is leaking out along tree roots or a subsurface crack, leaving no evidence on the ground surface. Ultimately, the minus 23.25" pond level proved to be a constant as the lowest level reached. The pond held at that level from October 22 through November. That steady level further suggested a likely leak in the berm, which was controlling the surface elevation at that level.

Also through October and November, ORPI staff also maintained communication with NPS geohydrologists, cooperating agency biologists, other NPS staff, and other interested parties regarding the situation at Quitobaquito. Short- and long-term contingency plans were developed and evaluated. As of December 2007, the Monument is close to selecting short-term actions plans. The general short-term goals are to maintain Quitobaquito Pond through 2008 at least at a level that maintains pupfish and mud turtle habitat, i.e. no less than approximately minus 20". At the same time, longer-term management plans will determine what volume and configuration of impoundment to maintain at Quitobaquito, and how to provide that impoundment.

Figure 4. Northwest shore of Quitobaquito Pond, November, 2007. Pond surface elevation is 23.25" below outflow pipe. Note exposed pond bottom and algae mats along shoreline.

REFUGE POND

The Quitobaquito pupfish refuge pond was completed in 2005. Named La Cienega, it was constructed as a cooperative educational program with Ajo Middle School and supported in part by funding from Earth Friends. La Cienega is located just off the east patio of the Kris Eggle Visitor Center (Figure 5). During winter 2004-2005, the pond was excavated to an approximate capacity of 1000 gallons. It has an extensive shallow area (6" to 9") and deep end (26"). Aquatic plants, algae, organic detritus, inorganic sediment, and water were brought to the pond from Quitobaquito pond. In April and May 2005, a total of 235 pupfish relocated from Quitobaquito pond to La Cienega.

Figure 5. La Cienega refuge pond for Quitobaquito pupfish, located at the Kris Eggle Visitor Center, Organ Pipe Cactus National Monument, Arizona.

Population censuses of La Cienega pupfish were completed on June 4 and September 24, 2007. Population estimates were obtained using a standardized trapping effort, intended to capture at least 90% of the pupfish. Nine minnow traps placed in the pond for one trapping run of 3 hours. On June 4, 591 pupfish were captured, with no incidental mortalities. An estimated 80 to 100 pupfish were observed swimming free at the end of the trapping run, resulting in a total estimated population of 670 to 690. On September 24, 697 pupfish were captured, with no incidental mortalities. An estimated 50 to 75 pupfish were observed swimming free at the end of the trapping run, resulting in an estimate of approximately 747 to 772 pupfish in the refugium. On September 24, we also measured 88 randomly-selected pupfish for length. Size distribution of La Cienega pupfish (Figure 6) roughly follows the typical pattern at Quitobaquito (Figure 3),

with distribution peaks at approximately 24 and 37 mm. This distribution was better defined in 2005 and 2007 at La Cienega, and less so in 2006. Most importantly, pupfish were present in all sizes, from very small fry to large adults.

La Cienega was originally intended to support approximately 500 to 700 Quitobaquito pupfish. The population has been near or above 500 since May 2006, one year after the refuge was originally stocked (Figure 7). With the population sustaining within the original target range, the size distribution of La Cienega pupfish approximating that observed at Quitobaquito, and with nearly continual reproduction evidenced by presence of small fry, La Cienega appears to be a successful, fairly stable, self-sustaining refuge population.

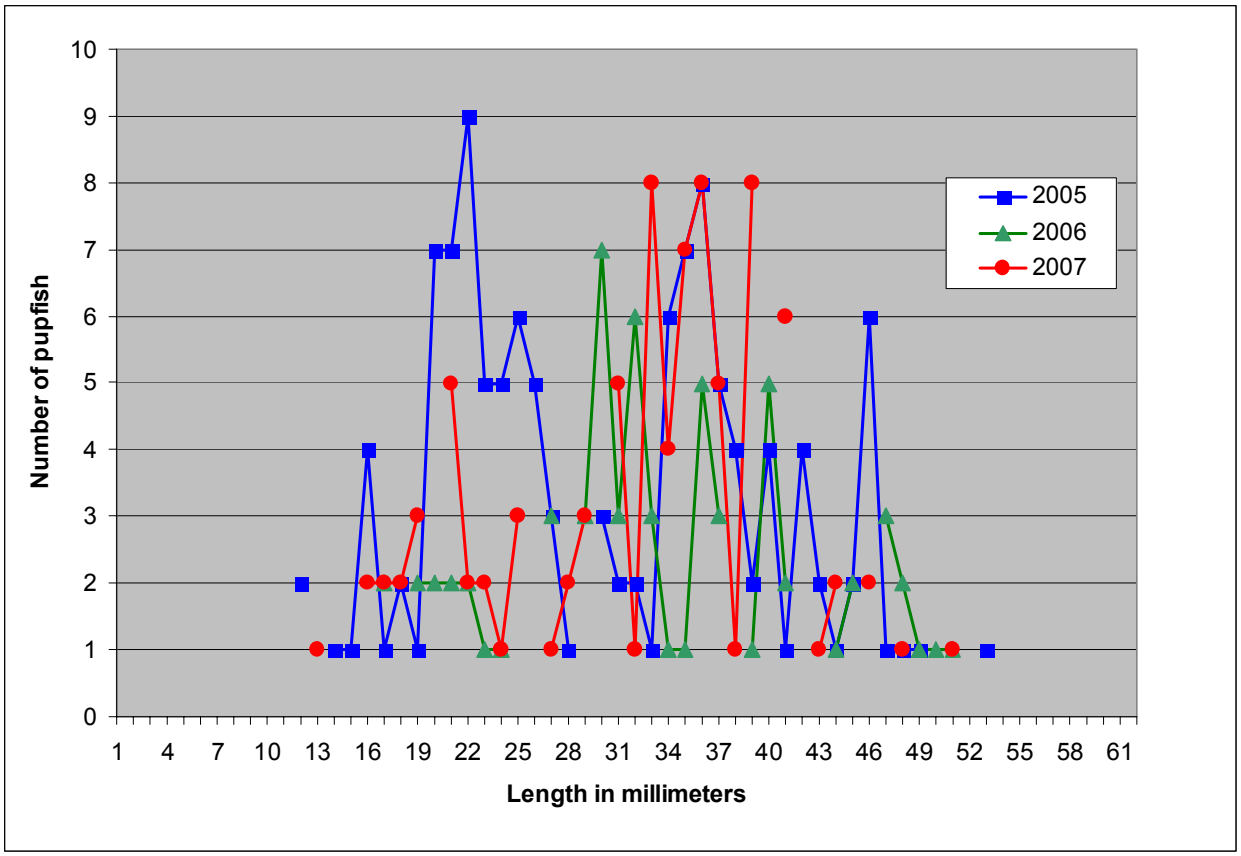

Figure 6. Size distribution of random samples of Quitobaquito pupfish from La Cienega refuge pond, in September of 2005, 2006, and 2007.

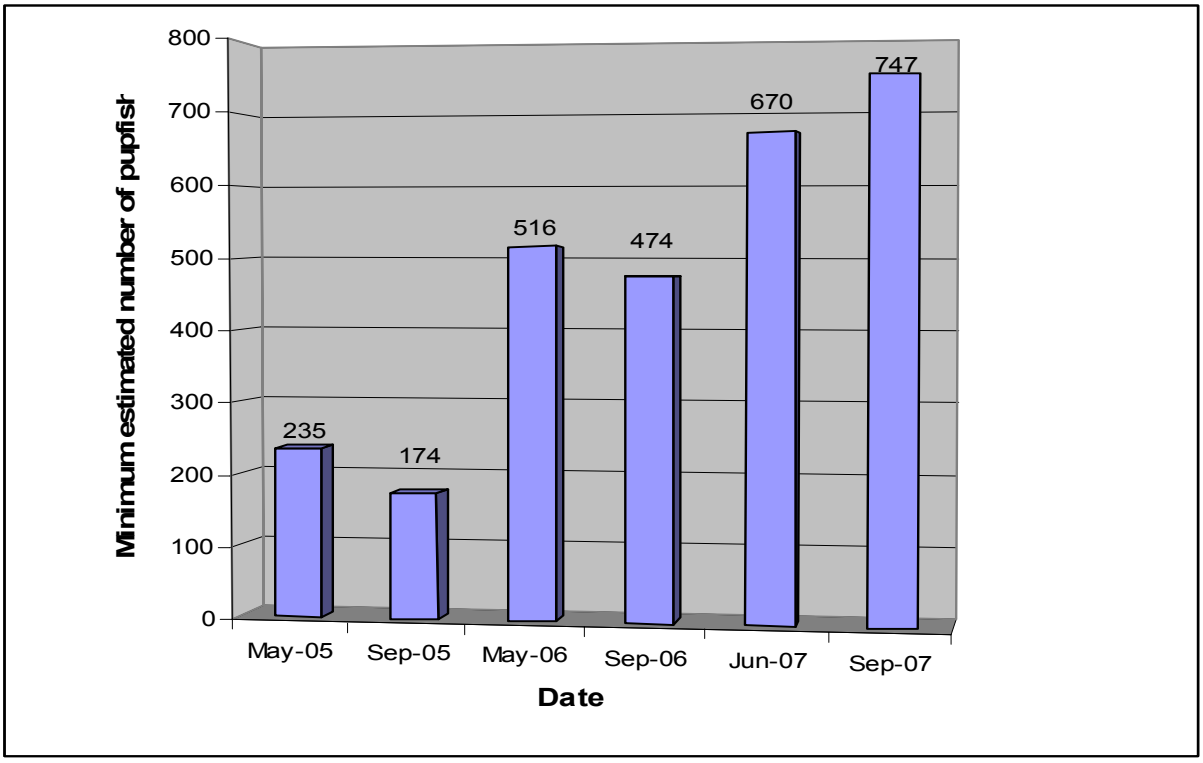

Figure 7. Minimum estimated population of La Cienega refuge pond for Quitobaquito pupfish, 2005-2007, Organ Pipe Cactus National Monument, Arizona.

FUTURE PLANS

Quitobaquito pupfish population monitoring will continue at the Monument. Weekly to bimonthly inspections of Quitobaquito, coupled with periodic trapping for non-natives, will be used to monitor the pupfish population and examine the pond for the presence of non-native fish. Water input to, and retention in Quitobaquito Pond are long-term issues involving maintenance of the collecting, delivery, and impoundment systems; the Monument continues to seek funding sources to address these issues. La Cienega pond will be monitored for any problems and maintained throughout the year. The annual September census will be carried out at Quitobaquito; May and September censuses will be done at La Cienega.

LESSER LONG-NOSED BAT
(*Leptonycteris curasoae*)

BACKGROUND

Organ Pipe Cactus contains the largest known maternity colony of the endangered lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*) in the United States. The colony was established by 1969 (Pat Brown, in litt.) and has a current estimated base colony size of approximately 25,000 to 30,000 adult female bats. The bats use an abandoned mine tunnel which passes completely through Copper Mountain; the tunnel is fenced off as a hazardous mine feature and signed with English/Spanish "Danger/Peligro" and "Radiation Area" signs. The tunnel is unsafe for human entry. Adult female bats begin arriving in mid-April of each year. In mid to late June young begin flying and contribute to the nightly emergence flight. The colony usually reaches its peak size in late June and early July, when most adult females and their offspring are present. In July and August numbers decrease, as adults and young disperse to other local roosts and/or move eastward and to higher elevations to feed on agaves. Most bats are typically gone from the Copper Mountain colony by late September.

MONITORING AND MANAGEMENT

The objectives of the Monument's lesser long-nosed bat monitoring effort are 1) to determine the number of bats using the Copper Mountain roost and 2) assess the general security of the roost. In 2007, monitoring efforts consisted of periodic nighttime emergence flight estimates and daytime inspections of the general Copper Mountain area to evaluate potential threats from human intrusion and followed those developed by Petryszyn, Dalton, and Dalton (1994). Both real-time "live" and videotaped estimates are used for estimating population size. For live estimates, two observers (one at each entrance) use ambient light, dimmed flashlights and/or night-vision equipment to estimate bat numbers as they emerge. Numbers are recorded by an assistant. For videotape estimates, emergence flights are taped using night-vision technology and the tapes are counted later at approximately 1/5 speed. Both methods are valuable for management purposes. Live counts essentially provide an immediate estimate of colony size, and require less staff time. Videotape estimates take substantially longer to produce, but provide a permanent record and are slightly more accurate. Because bats remaining inside Copper Mountain after emergence are not counted, exit-flight counts at Copper Mountain under-represent the true colony size. Typically, hundreds to several thousand bats remain inside the mine tunnel. In most previous years, emergence flight estimates were done every 2 to 3 weeks from early May to late August. One to two of these estimates annually are in conjunction with regionwide simultaneous counts carried out at other roosts in southern Arizona and northern Sonora. In 2007, border-related security restrictions precluded carrying out the normal number of estimates. Only three estimates were done in 2007; one each in June, July, and August.

Results:

In 2007, the bat colony in Copper Mountain apparently remained at the high numbers it has sustained since 2000 (Figure 8). To compare colony size among years, the average of all June counts per year is used as the best measure of the base colony size in each year. June counts census the base colony of adult females before juveniles are volant. Mid-June counts are best,

because not all females may have arrived by June 1 and volant juveniles may contribute to the count as early as June 22. In most years, two estimates are done in June; one early and one late in the month. In 2007, only one estimate was completed, on the 29th. The average June counts from 1989-2007 for years where data were available, indicate that the Copper Mountain colony has increased since 1990 (Figure 8). (In June 1998, bats appeared to be disturbed during the one estimate made. Most bats did not emerge from the tunnel. This aberrant exit flight was bracketed by more typical estimates of 19,700 on May 26, and 15,850 on July 28.) Average June exit counts for 1989-1992 ranged from 7,529 to 13,841 bats. Other investigators also placed the colony size at about 7,000-12,000 at that time (Cockrum and Petryszyn 1991, Fleming et al. 1998). From 1995 to 1999, the June base colony size gradually increased to approximately 17,000 – 18,000. This increase coincided with the opening of the south portal and its subsequent use by bats. From 2000 through 2004, the average June estimate was 25,141, essentially doubling the colony size observed in 1989-1992. In 2005, the average of the two June estimates was 36,865, an increase of nearly 47% over the preceding 5 years, and roughly triple the colony size in 1989-1992. The single June 2007 estimate was 27,180. This number is comparable to the June averages for 2000-2004, and 2006 (Figure 8).

The cause for the increase in the Copper Mountain colony over the past 13 years is not known. The increase may reflect an overall increase in the species in the geographic area. Another possibility is that bats from other colonies in the area have abandoned those roosts and moved to Copper Mountain. Increased human presence in other areas of Organ Pipe Cactus National Monument and surrounding areas may be disturbing bats at roosts and causing them to move to Copper Mountain. A colony of approximately 5,000 lesser long-nosed bats largely abandoned a roost on Cabeza Prieta National Wildlife Refuge for several years, due to repeated disturbance by drug smugglers and illegal immigrants (C. McCasland, CPNWR, pers. comm.) The large lesser long-nosed bat colony (>125,000) at neighboring El Pinacate Biosphere Reserve is well within dispersal distance for this species. It is possible that 10,000 or more bats moved from El Pinacate to the Copper Mountain colony. Climatic factors may also be at work. The increase at Copper Mountain spans two El Nino events (1992-1993 and 1997-1998), which may have had beneficial effects on food resources due to above-average rainfall. Ironically, bat numbers were even higher than those years, through the extreme drought of 2001-2002 and through the failed saguaro/organ pipe cactus bloom of 2004 (Organ Pipe Cactus National Monument 2004). In 2006 and 2007, rainfall continued to be below average (Organ Pipe Cactus National Monument, unpubl. data), and the saguaro/organ pipe cactus bloom was below normal.

Table 2. 2007 Emergence flight estimates of *Leptonycteris curasoae* at Copper Mountain, Organ Pipe Cactus National Monument, Arizona (Note: Emergence only. Hundreds to thousands of bats remained inside after most emergences.)		
Date	Estimate	Comments
June 29	27,180	18,128 South portal (67%) 9,052 North portal (33%) 27,180 Total Infra-red videotaped estimate. No evidence of disturbance or other problems.
July 28	13,699	1,884 South portal (14%) 11,815 North Portal (86%) 13,699 Total Live count under ambient light, dimmed flashlight, and with night vision. No evidence of disturbance or other problems.
August 25	8,497	4,412 South portal (52%) 4,085 North Portal (48%) 8,497 Total Live count under ambient light, dimmed flashlight, and with night vision. No evidence of disturbance or other problems.
October 3	300 to 1000?	At least a few hundred present in center of mine at dynamite room. Possibly over a thousand.

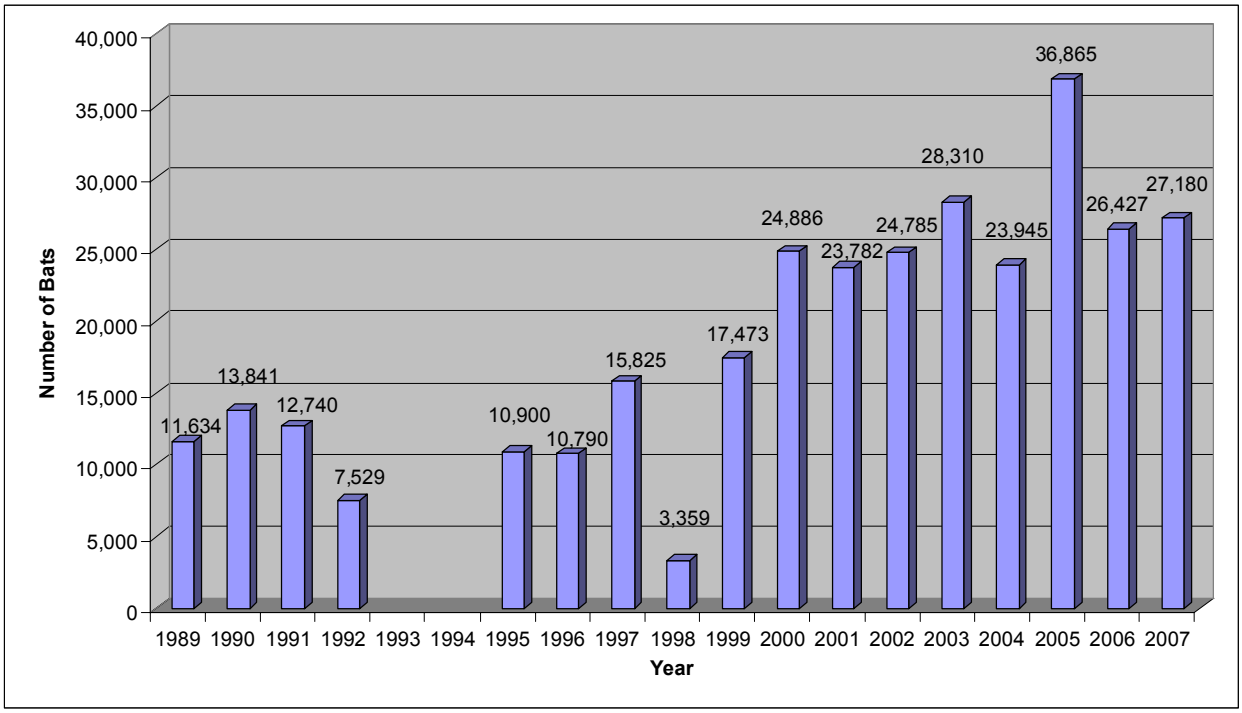

Figure 8. Average of June exit flight estimates of *Leptonycteris curasoa yerbabuenae* at Copper Mountain, Organ Pipe Cactus National Monument, Arizona. Data for 1989-1992 are from Dalton and Dalton (1994). Data for 1995-2007 are from Organ Pipe Cactus National Monument annual endangered species reports. No June estimates were made in 1993-1994.

In 2007, no human disturbance appeared to take place within the Copper Mountain roost site. Trails associated with illegal migration and drug smuggling became established in the area in 2005, but these appeared to be used lightly in 2007. Small quantities of trash left by illegal

migrants or smugglers was found within 30m of the south portal, but repeated close inspections revealed no evidence of human entry inside the fences or the tunnel itself.

In 2001, Monument staff modified the safety closure on a mine adit in the Victoria Mine complex. Observations in previous years indicated that lesser long-nosed bats were roosting day and possibly night in a horizontal adit sealed imperfectly with chain link fence. In 2001, after consultation with the U.S. Fish and Wildlife Service, the chain-link was cut down to about 1-meter height, leaving a 1 meter square free opening above the top of the fence. A barbed-wire human enclosure fence was constructed around the adit opening at about a 15-meter distance. Follow-up inspections indicated that bats used the adit in small numbers early in the summer and in larger numbers after juveniles started flying. This conclusion is based on making daytime visits to the adit late in the season, inspecting the volume of guano present on the adit floor. Total numbers using this Victoria Mine adit appeared to be small in 2001 through 2005. This adit was not visited in 2007, due to border-related safety concerns and restrictions.

GENERAL BAT INVENTORY AND MONITORING

A component of the Monument's Ecological Monitoring Program is to census bats Monument-wide using a protocol by Petryszyn (1994). This effort involves mist netting at various water sources throughout the Monument in midsummer and early autumn. Sites included the South Fork of Alamo Canyon and Bull Pasture in the Ajo Mts, Wild Horse Tank in the Diablo Mts, and Tinaja Estufa in the Bates Mts. Lesser long-nosed bats are commonly caught at these sites. In 2007 however, this bat monitoring program was not carried out, due to border-related security restrictions.

FUTURE PLANS

Evaluations of the lesser long-nosed bat maternity colony at Copper Mountain will continue via roost monitoring, census, and area inspections. Proposals for research, including foraging ecology studies and remote sensing of the maternity colony, will be evaluated. Options for protecting the colony from barn owl predation and human intrusion will be evaluated, possibly implemented. Monument staff plan to inspect natural caves in Ajo and Puerto Blanco Mountains for unknown roost sites.

SONORAN PRONGHORN
(Antilocapra americana sonoriensis)

BACKGROUND
The endangered Sonoran pronghorn (*Antilocapra americana sonoriensis*) occurs in Organ Pipe Cactus National Monument, chiefly in the western two-thirds of the Monument west of Highway 85. The current range of this species in the United States lies in the Monument, in Cabeza Prieta National Wildlife Refuge west of the Monument, and on lands managed by the Bureau of Land Management and Barry M. Goldwater Bombing Range north and northwest of Organ Pipe. The Sonoran pronghorn also occurs in northwestern Sonora, Mexico. The Mexican and United States populations appear to be physically separated by international boundary fences and Mexican Highway 2, which parallels the border from Lukeville/Sonoyta west to San Luis/Yuma. Radio telemetry data developed by the Arizona Game and Fish Department indicate that Sonoran pronghorn in the United States move east and upslope during the summer months of peak stress from heat and drought. By midsummer, a substantial portion of the population may be in the Monument or near its border. From this it is apparent that Organ Pipe Cactus National Monument serves as important habitat for the United States Sonoran pronghorn population during this critical time of the year. The Monument also provides winter habitat for the pronghorn, generally in valley floor habitat west of Highway 85. The Monument strives to conserve and recover the Sonoran pronghorn through cooperative management activities with other agencies and interested parties.

MONITORING AND MANAGEMENT
In 2007, Sonoran pronghorn continued to recover from the crisis year of 2002, although recovery in 2007 may have been tentative. In 2002, the United States population was reduced to 21 to 25 animals. The 2002 population crash is believed to have been caused by the combined stresses of extreme drought and persistent human disturbance, chiefly in the form of illegal immigration, smuggling, and associated interdiction effects. The estimated trend in the U.S. population from 1992 to 2006 is presented in Figure 9. Rainfall in the area improved since 2002, although it remained generally below long-term average values. The winters of 2005-2006, and 2006-2007 were unusually dry. This, combined with late-arriving and meager summer rains, may have had adverse effects on pronghorn survival, inhibiting recovery from the 2002 low point.

In addition to somewhat improved rainfall in 2003-2007, some active management projects are likely to have benefited pronghorn. Member agencies of the Sonoran Pronghorn Recovery Team have provided supplemental emergency water sources and forage enhancement. In the Monument, supplemental water was provided in the summers of 2003, 2004, 2006, and 2007, but not in 2005 due to budget limitations and adequate rainfall that year. Forage enhancement plots, located CPNWR and the Barry M. Goldwater Range, are placed in conjunction with supplemental water. Pronghorn have been confirmed repeatedly using these features (AGFD unpubl. data and photographs.)

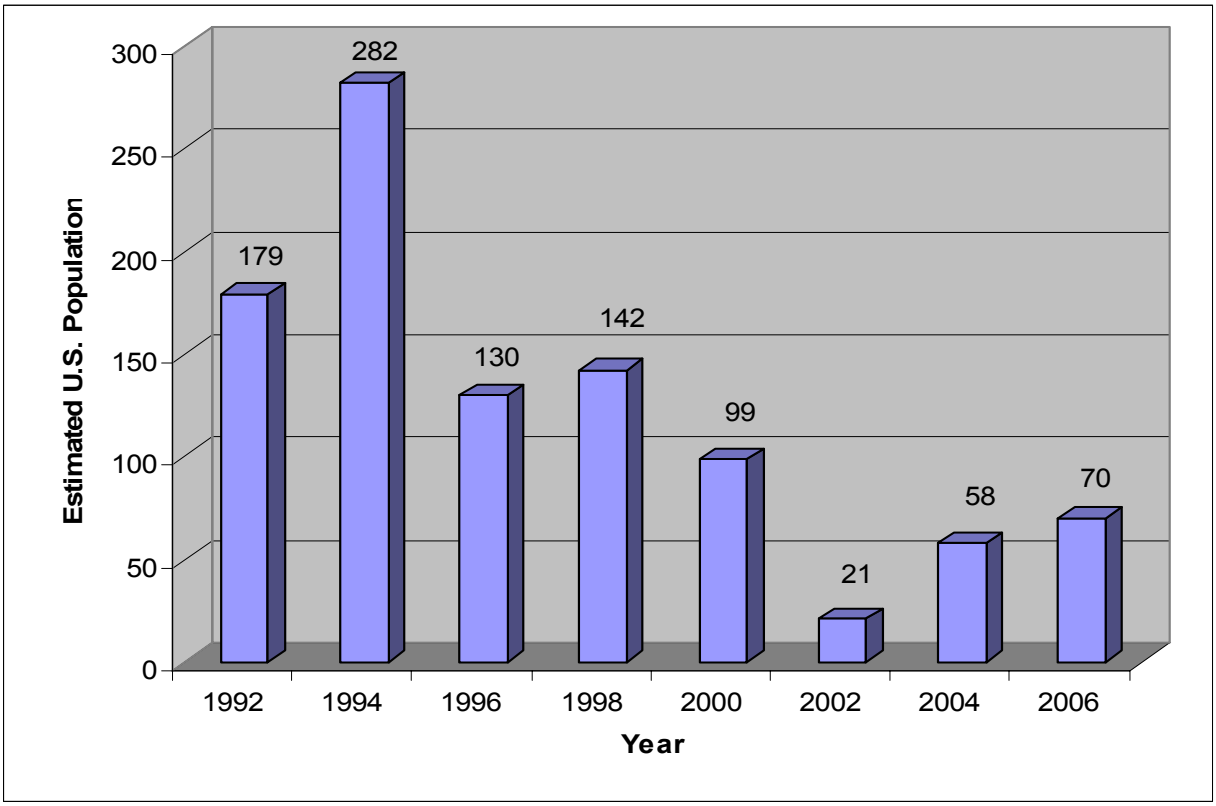

Figure 9. Estimated U.S. population of Sonoran pronghorn, 1992-2006. Figures are derived from aerial surveys, Arizona Game and Fish Department (e.g. Bright and Hervert 2003, Bright 2005).

Methods:

By 2007, the number of Sonoran pronghorn with radio collars in the United States population was increased from two to ten. All animals with radio-collars were captured and outfitted with collars on Cabeza Prieta National Wildlife Refuge and the Barry M. Goldwater Range, north and west of the Monument. Capture of pronghorn in the Monument was planned as a contingency. However, it was a second-choice area due to the rockier ground and more dense vegetation constituting a riskier capture environment. As it turned out, none of the 10 collared animals ranged onto Organ Pipe in 2007, so it was not possible to track movements, fawn production, and survivorship of pronghorn by that method in the Monument. In past years, NPS staff carried out visual surveys to gain this information using spotting scopes (25x) and binoculars (8x to 10x) from observation points on hilltops. Surveys typically started at sunrise and lasted from 90 minutes to 3 hours, depending on activity in the area. Observation points established in recent years and known to provide strategic views of pronghorn use areas were used throughout the surveys. Unfortunately, in 2007 these visual surveys were not carried out, due to border-related safety restrictions. A single survey was carried out at Pozo Nuevo on September 6, with no pronghorn sighted.

In 2007, the Monument also implemented a number of additional "conservation measures" directed at pronghorn. These measures arose out of consultation under Section 7 of the Endangered Species Act, for a number of large construction and management projects. Among the most notable conservation actions are:

1. The Pozo Nuevo Road will be closed to public use annually from March 15 to July 15.
2. The Bates Well Road will be closed to public use annually from March 15 to July 15. Closure will be coordinated with Cabeza Prieta National Wildlife Refuge.
3. The North Puerto Blanco Drive was reconfigured to provide two-way traffic for the first five miles and would be closed to public use from March 31 to July 15, annually.
4. The Monument maintains a pronghorn monitoring program, with monitoring starting no later than March 1. An area 5 miles in diameter will be closed to public use around known pronghorn locations and administrative use will be reduced to a minimum in these areas. When this area of closure includes any portion of the North Puerto Blanco Drive, the road will be closed to public use at the end of the two-way section.
5. Gates and signage will be installed at the points of road closures and other appropriate points.
6. Backcountry permits will be limited to areas south of North Puerto Blanco Drive and east of State Route 85 from March 15 to July 15.
7. Removing the north boundary fence if the Bureau of Land Management agrees to remove livestock from the Cameron and Coyote Flat allotments for a period of at least 20 years, including at least a 2-year advance notice of BLM's intention to return livestock to these areas.
8. Maintaining and expanding a non-native species removal program including removal of buffelgrass and Sahara mustard.

Portions of the barbed wire fence between the Monument's north boundary and the former BLM Cameron Allotment were removed in 2005 following retirement of the Cameron Allotment in 2004. This fence extended approximately 6 miles (9.6 km) or 31,680 feet (9,600 m) in length. All fence wire was removed for approximately 3 miles (15,840 feet), the two highest wires were left in place for approximately 2 miles (10, 560 feet) and all 4 wires were left in place for approximately 0.7 mile (3,696 feet). Approximately 0.3 mile (1,484 feet) of the boundary traverses steep and rocky terrain; this section was never fenced in the past and was left unfenced. All four strands were left in various sections along the boundary due to dense vegetation thickets, removing the fence wire would have been very difficult, and pronghorn would be unlikely to move through these thickets. The highest two fence wires were left in other sections in order to continue marking the boundary between BLM and NPS lands. This action was taken due to the increased number of vehicle tracks observed crossing onto NPS from BLM lands. The management of off-road vehicle travel between BLM and NPS lands and possible replacement of the Monument's north boundary fence is being addressed in cooperation with the BLM and USFWS. Preliminary steps are to address the issue by increased signing, public education, and law enforcement patrols.

In 2007 Monument staff continued to assist the USFWS and AGFD, with operation and continued development of the Sonoran Pronghorn Semi-Captive Breeding Facility (SPSCBF) on CPNWR. The NPS contributed another $50,000 in FY07, bringing total funding contributions to $92,300. A total of $150,000 will be contributed by the end of FY08 to AGFD to help support the SPSCBF. Monument staff assisted with the biennial rangewide surveys of Sonoran

pronghorn in the U.S. (December 2006) and Mexico (December 2007). Finally, Monument staff have actively worked with the U.S. Border Patrol and other law agencies to limit the impact of their activities on Sonoran pronghorn. These efforts included notifying the U.S. Border Patrol of pronghorn locations.

FUTURE PLANS

Monument staff will continue to participate in the Sonoran Pronghorn Recovery Team. In 2008 we anticipate transferring the third of three years of NPS funding to the AGFD, to support the SPSCBF. Monument staff will participate in aerial surveys, radio telemetry tracking flights, and assisting with operation of the SPSCBF. The Monument will also continue to work with the ADOT to reduce traffic speed on Highway 85, conduct observations of pronghorn distribution, monitor maintenance activities in the northwest corner of the Monument, and work with law enforcement agencies to minimize their impacts on pronghorn. The Monument will also explore methods for educating motorists about the vulnerability of Sonoran pronghorn.

CACTUS FERRUGINOUS PYGMY-OWL
(Glaucidium brasilianum cactorum)

BACKGROUND

In April 1997, the USFWS listed the cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) as an endangered species in Arizona and proposed removing Arizona pygmy-owls from the list of endangered species in August 2005. In April 2006, the USFWS published a final rule removing the pygmy-owl from the list of endangered, species. The Monument is known to be one of the few locations in the United States where cactus ferruginous pygmy-owl may still be reliably found.

MONITORING AND MANAGEMENT

From 1995 through 2006, Monument staff carried out pygmy-owl surveys in areas known to have previously supported pygmy-owls, and in some areas of high-quality habitat not previously surveyed. Occupied sites were monitored to varying degrees from year to year. Surveys were performed according to the protocol developed jointly by the USFWS and AGFD (2000).

In 2007, Monument staff completed only three surveys. Surveys were limited to this scope due in part to the de-listing of the species, and also due to staffing shortages, illegal border-related activities, and associated restrictions on staff activities.

Results and Discussion:

A summary of survey and monitoring results are presented in Table 5. The status and trend of pygmy-owls in the Monument were not known in 2007. Of 14 sites known to have been occupied in the last 10 years, 3 were visited (once each) and one was occupied.

Data collected by Monument staff 1995 to 2007 indicate the cactus ferruginous pygmy-owl is uncommon to rare in Organ Pipe Cactus National Monument. Pygmy-owls generally occur in arborescent middle-to upper bajada associations of Sonoran Desertscrub having relatively dense, diverse shrub and tree components. Major xeroriparian associations are not part of all territories, but no doubt contribute to the high quality of others. In areas of high-quality habitat, typically found in the northern portion of the Monument and composed of middle-upper bajada desert scrub with a relatively high density of large trees, owls are usually located every year and are probable resident breeders. The Alamo, Arch, and Estes sites are representative of this high-quality habitat. At each, a major canyon drainage of the Ajo Mts opens out onto upper-bajada Sonoran Desertscrub. Each site provides dense xeroriparian thickets framed by relatively dense, brushy Sonoran Desertscrub that is diverse in structure and plant species composition. Elsewhere in the Monument, sites are occupied less frequently, approximately every 4 to 10 years. This more sporadic occupancy appears to be due to a combination of lower habitat quality, possible human disturbance, or both. The Monument's combination of sites that are occupied annually and others erratically may be expected for a species at the edge of its range and/or at reduced population levels. Based on observed occupancy patterns, habitat use, and availability of suitable habitat, we estimate Organ Pipe may support 8 to 16 occupied territories

each year. Geographic location data for territories occupied in recent years has been provided to the USFWS under separate cover.

FUTURE PLANS

Removal of the pygmy-owl from the list of endangered species resulted in lowering the priorities for surveys and monitoring by Monument staff. Furthermore, pygmy-owl surveys require working in remote parts of the Monument and in crepuscular and night-time hours – i.e. in places and at times when illegal border-related activities often take place. As a result, surveys and monitoring now entail substantial logistical complications to assure employee safety. All these factors combine to make future surveys and monitoring uncertain. Ideally, Monument staff may continue to determine occupancy rates of known nest territories, determining productivity at selected pygmy-owl sites, and if possible, surveying for previously unknown territories in areas that have not been surveyed before.

Table 5. Historic and present (2007) status of cactus ferruginous pygmy-detections in Organ Pipe Cactus National Monument, Arizona.				
Survey Area	Surveyed 2007?	Route Length	Status 2007	Comments
Alamo	Yes	1200m	No detections.	No response February 7. CFPOs present here in 2006, 2005, 2004, 2003, sporadically in 1980s – 1990s, and 1949.
Arch	Yes	1000m	Occupied	Pair copulating, using saguaro cavity March 6. Not checked in 2005, due to border-related safety issues. Pair present in 2003, nesting not confirmed. Immigrant/smuggler trails through territory.
Armenta Southeast	No	1000m	Unknown	No detections in 2006. Not checked in 2005, due to border-related safety issues. Site occupied 2001 and 2002. Heavy traffic by smugglers, immigrants, and interdiction.
Boundary Bird	No	1000m	Unknown	Occupied in 2006, not checked in 2005, due to border-related safety issues. Site discovered occupied in 2001, nest. Heavy smuggler/immigrant traffic through area in 2002, unoccupied 2002-2004.
Diablo	No	700m	Unknown	Only known occupancy 2004, unoccupied 2005 and 2006.
East Armenta #5	No	1000m	Unknown	Unoccupied in 2006. Not checked in 2005, due to border-related safety issues. Last occupied 2000. Extensive traffic by smugglers, immigrants, and interdiction.
Growler	No	1600m	Unknown	Occupied 2006, last previous known occupancy Feb 2002. Site occupied many years since 1992, nests confirmed in 1998 and 2001. Heavy activity by smugglers, immigrants, and interdiction since then.
Hwy85 aprox Mile 59.4	No	500m	Unknown	Nest in 1999; last known occupancy was single detection in 2000.
Kuakatch 7100	No	200m	Unknown	No detections 2006. Approximately 8 acres of territory center burned in June 2005. First occupancy 2003, re-occupied 2004 and 2005. This location part of general avian surveys, 1995-2004.
Kuakatch 7778	No	1000m	Unknown	Occupied annually 1995-2006. Immigrant/smuggler trail through territory, also large illegal camps.
Kuakatch 8384	No	1000m	Unknown	Occupied intermittently since 1995-2006. Immigrant/smuggler trail and very large immigrant camp in territory.
Lomitas	No	1200m	Unknown	Only known occupancy in 2004, possible pair.
Residence/HQ Area	No	1500m	Unknown	Last occupied 1997. Numerous reports 1949 to 1980s, some with fledglings observed.
Estes	Yes	2500m	No detections.	Site occupied 2005 -2006, although unconfirmed reports from mid-90s. Site is within standard bird survey area, no CFPO detected 1997-2004.
Ajo Mt Drive, Estes Canyon to west of #19	No	3200m	Unknown	Unconfirmed reports from 1990s. High-quality habitat, contiguous with territories at Estes, Arch, Alamo.

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