



Project Summary

Quitobaquito Pond Water Supplementation

March 23 – 27, 2009

Overview

From March 23 through March 27 2009, the Organ Pipe Cactus National Monument (ORPI) made large-scale water supplementation to Quitobaquito Pond, with the assistance of cooperators. There were two main objectives:

1) To raise the pond to a level sufficient to inhibit further bulrush encroachment in spring-summer 2009, and to establish a depth that should be sufficient to maintain the pond until summer 2009 rains, without substantial loss of pupfish and mud turtle habitat and without the need for additional large-scale intervention.

2) To test the capability of the pond to hold water, following two earlier efforts to correct suspected leaks in the system. In April-May 2008, a diaphragm wall was installed in the retaining berm. In March 2009, a fence T-post was removed from the pond bottom and a bentonite patch placed over the location. Determining the integrity of the pond is necessary to develop the next phase of managing the acute low-water situation that has prevailed since 2006.

Methods

We hauled water to Quitobaquito using 5 water trucks: 1) ORPI's 2000-gallon truck; 2) a 2000-gallon truck from Imperial National Wildlife Refuge; 3) a 1500-gallon truck from Cabeza Prieta National Wildlife Refuge, and; 4) Two 4000-gallon rental trucks. Water source was the ORPI headquarters/campground system, approximately 19 road miles from Quitobaquito.

Results and Discussion

We delivered a total of 190,200 gallons of water to Quitobaquito in this project (Table 1). This resulted in a net rise of seven inches in the pond surface level, from the morning of March 23 to late afternoon March 27. The response of the pond to daily pulses of water input were measured manually as inches below the outflow pipe (Table 1) and continuously by a pressure transducer recording depth of water above the sensor (Figure 1). On March 23, 24, and 25, all water trucks unloaded into the pond simultaneously, three times per day. The pressure transducer clearly recorded these pulses as distinct, small spikes or steps in the overall gain for each of those days. These spikes correspond with each delivery of 10,000 to 13,500 gallons of water. On March 26 and 27, water deliveries were slightly less synchronized, with 4 trucks delivering within a 45-minute period, three to four times per day. The small spikes were still measured. These short spikes indicate pond level rose quickly with each water delivery (about 0.5"), then fell back a small fraction. Similarly, pond elevation peaked each day in the afternoon after delivery of the last water, then fell back somewhat overnight. Manual measurements placed this nightly lowering at about 0.25", with the greatest being 0.75" the night of March 24. The pressure transducer indicated this nightly subsidence was never greater than about 0.25" on any night, and that March 24 was not distinctly greater. While those apparent "losses" of water level might suggest a leak, we hoped otherwise. We suspected the apparent loss was caused by water briefly mounding up in the open pond after each delivery, and each day, then bleeding off and re-saturating old, dried mats of bulrush and soil around the pond perimeter. Nearly 50% of the pond perimeter (the northeast half) consists of this matrix of dried bulrush and soil, in places more than 15 to 20 feet wide. The new saturation of these mats was easily observed by walking on them. What had been hard, dry "ground" on March 23 was boggy and/or soft in many areas by March 27. The close tracking between overnight

pond level “losses” and nighttime water temperature lows (Figure 1) might suggest some portion of the nightly loss of water level may have been due to thermal contraction of the water column. However, this pattern appears inconsistently in the sensor data from other time periods having comparable water depths and temperature regimes.

The March 27 ending level of minus 14.5" was the highest pond level since mid-September, 2007. At that time in 2007, the pond was in the middle of a rapid loss of water, with the pond level falling 15 inches in 45 days (from – 8.1" to – 23.25"). The project succeeded in establishing a pond level (– 14.5") adequate to determine whether the large leak of autumn 2007 still exists. Unfortunately, on April 2 the pond surface had fallen to – 17.5". That loss of 3" in 6 days, an average loss of 0.5" per day, equates to approximately 12,000 gallons per day (8.3 gallons/minute). That average daily rate of loss is approximately the same as that of September-October 2007. This water-supplementation project tested and confirmed that, at water levels even 14" below the historical normal (the outflow pipe), Quitobaquito Pond continues to leak. Between project completion on the afternoon of Friday March 27, 2009 and the morning of April 2, 2009, water loss outpaced water input by an estimated 8.3 gallons per minute resulting in a net 3 inch decline in water elevation in the pond. The rate of loss appears to be less when the pond is at extremely low levels, i.e. – 21" and lower.

ORPI staff anticipated this possible outcome. Confirmation of persistent leakage will be a driving force for near-term and long-term management of Quitobaquito and dependent organisms such as the pupfish and mud turtle. ORPI staff are now summarizing and re-analyzing all management efforts over the past 3 years, and finalizing near- and long-term management alternatives for consideration. The NPS will be in contact with cooperating agencies and interested parties during this process.

It is unknown at this point whether the supplemental water provided in this project will be adequate to preserve the pond until summer 2009 rains provide additional supplement. The April 2 level of – 17.5" is about 6" higher than the level of April 1 a year ago, when the pond stood at - 23.8." However, based on past trends, we suspect the pond may fall rapidly until it reaches – 21" to – 23". It seems likely that by May 1, 2009, the level may be approaching the 2008 value for that date, - 26". It also seems likely that by June through August, the pond will be near the – 28" level, losing half or more of its surface area, existing only as isolated pools 1" to 3" deep (Figure 2). Extensive bulrush encroachment can be expected, along with substantial (if temporary) loss of habitat for pupfish and mud turtles.

The appearances of the pond at its lowest level, - 28.0" (July 26, 2008) is illustrated in Figure 2. The condition on March 27 is illustrated in Figure 3. The net increase of 13.5" between the two views is the result of hauling 83,500 gallons of water between July and December 2008, rainfall input (4.76" from July 2008 through March 2009), reduced winter evaporation loss, 28,000 gallons added in early 2009, and the 190,200 gallons added during this project.

In winter 2008-2009, ORPI staff also manually removed extensive growths of bulrush (*Schoenoplectus americana*), with assistance from Southwest Conservation Corps crews. With the low water levels of 2006-2009, bulrush had encroached up to 25 feet from the former pond edge, toward the pond center. Encroachment was most extensive at the shallow north side of the pond. In that area, the combination of extreme low water and dense bulrush stands had created "new" land so substantial that seedlings of mesquite and tamarisk were abundant within the bulrush, in what was recently open pond. In winter 2008 and early 2009, we manually cleared approximately 1,400 square feet of bulrush stands, down to and including the root masses (Figure 3). An increasing island of bulrush beneath the cottonwood tree could not be removed due to presence of Africanized honeybees in the cottonwood.

Acknowledgements

The people listed below accomplished this project. People are ORPI staff except where otherwise noted. Water truck drivers are noted by *.

Hunter Bailey, Lee Baiza, Margot Bissell (Cabeza Prieta NWR), Derald Bond* (Imperial NWR), Ian Brooker* (Volunteer, Cabeza Prieta NWR), Bob Bryant, Matt Foscue* (DHS/CBP Border Patrol), Kyle Greene, Susannah Henry (Kofa NWR), Connie Herrera, Peter Holm, Wayne Lackner (DHS/CBP Border Patrol), Curt McCasland (Cabeza Prieta NWR), Christine Moscatiello, Ami Pate*, Kenny Richardson*, Frank Sanora, Sid Slone (Cabeza Prieta NWR), Mark Sturm, Dane Tantay, Tim Tibbitts*.

Additional thanks to the ORPI Resource Protection Rangers, and NPS Special Event Tactical Team members (March 26-27), for providing security.

Special thanks to: Kofa/Imperial National Wildlife Refuges, for providing their water truck and driver Derald Bond; Cabeza Prieta NWR for providing their water truck and Volunteer driver Ian Brooker, and; U.S. Border Patrol - Tucson Sector for providing driver Matt Foscue.

Champion Driver: Auto Mechanic Kenny Richardson drove from ORPI headquarters to Quitobaquito 16 times in 5 days. There's no record of anybody ever doing that before, and definitely not in a 4000-gallon water truck. All the other drivers had a few trips or whole days off, but Mr. Richardson drove every run. He was also at work by 0600 hr every day, to service and triple-check vehicles, and solve problems.

Table 1. Summary, Quitobaquito Pond Water Supplementation Project, March 23 – 27, 2009. Organ Pipe Cactus National Monument, Arizona. Pond surface levels are manual measurement of distance below the outflow pipe.				
Date	Beginning Level (inches)	Water Added (gallons)	Ending Level (inches)	Notes
March 12	- 21.75	-	-21.75	Bentonite patch placed over fence post site
March 23	- 21.5	32,000	- 20.1	0.25" rise since March 12 is first warm-season rise without rainfall.
March 24	- 20.0	36,000	- 18.25	1.75" rise
March 25	- 19.00	40,200	- 17.25	1.75" rise, after 0.75" drop preceding night
March 26	- 17.5	36,000	- 16.0	1.5" rise, after 0.25" drop preceding night
March 27	- 16.25	46,000	- 14.5	1.75" rise, after 0.25" drop preceding night
April 2	-17.5"	-		Loss of 3" in 6 days, average 0.5" or about 12,000 gallons per day.

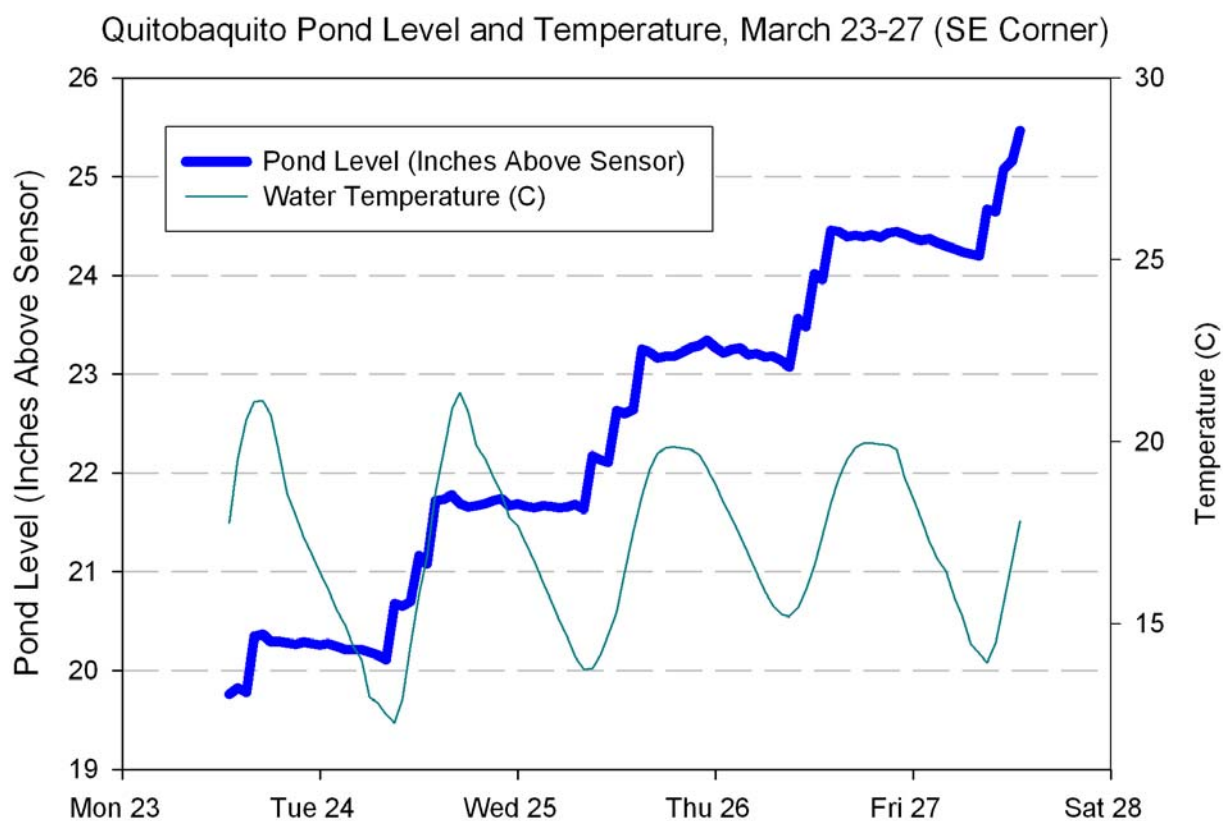


Figure 1. Quitobaquito Pond level as recorded by data logger in pond, March 23 (1300 hrs) to March 27 (1300 hrs), 2009. Organ Pipe Cactus National Monument, Arizona. Data do not include the first water deliveries of March 23 or the last deliveries on March 27.



Figure 2. Quitobaquito Pond, view east from west bench, July 26, 2008. Pond level is minus 28.0 inches. Photograph is prior to major bulrush encroachment in August-September along north (left) and east (opposite) shores. Note exposed mudflats in all areas of pond except far right.



Figure 3. Quitobaquito Pond, elevated view east from west bench, March 27, 2009. Pond level is minus 14.5 inches. Line of black dots at northeast shore (left rear) indicates area of bulrush removed in winter 2008-2009. Note enlarging bulrush island under cottonwood tree, in comparison with Figure 1.