

# Horseshoe and Bartlett Reservoirs Habitat Conservation Plan

## ANNUAL IMPLEMENTATION REPORT

2009

PUBLIC REVIEW VERSION



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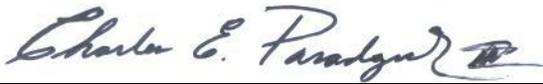
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## CERTIFICATION

Under penalty of law, I certify that, to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this report, the information submitted is true, accurate, and complete.



January 12, 2010

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Charles E. Paradzick  
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Siting and Studies  
Environmental Services Department  
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Date

## 1. Introduction

On May 30, 2008, the U.S. Fish and Wildlife Service (FWS) issued an Incidental Take Permit (ITP) pursuant to Section 10(a)(1)(B) of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended, to Salt River Project (SRP) for southwestern willow flycatcher (*Empidonax traillii extimus*) (“flycatcher”), yellow-billed cuckoo (*Coccyzus americanus*) (“cuckoo”), bald eagle (*Haliaeetus leucocephalus*), razorback sucker (*Xyrauchen texanus*), Colorado pikeminnow (*Ptychocheilus lucius*), Gila topminnow (*Peociliopsis occidentalis occidentalis*), spikedace (*Meda fulgida*), loach minnow (*Tiaroga cobitis*), roundtail chub (*Gila robusta*), longfin dace (*Agosia chrysogaster*), Sonora sucker (*Catostomus insignis*), desert sucker (*Catostomus clarki*), speckled dace (*Rhinichthys osculus*), lowland leopard frog (*Rana yavapaiensis*), Northern Mexican gartersnake (*Thamnophis eques megalops*), and narrow-headed gartersnake (*Thamnophis rufipunctatus*). The activity covered by the ITP is the continued operation by SRP of Horseshoe and Bartlett dams and reservoirs. The ITP is conditioned upon SRP’s implementation of the Horseshoe and Bartlett Reservoirs Habitat Conservation Plan (“H-B HCP”) (Salt River Project 2008).

The H-B HCP provides measures to minimize and mitigate incidental take of the 16 species listed above “to the maximum extent practicable and ensures that incidental take will not appreciably reduce the likelihood of the survival and recovery of these species in the wild” (FWS 2008). Flycatcher and cuckoo (“covered bird”) mitigation efforts include operation of Horseshoe Reservoir to support tall dense vegetation at the upper end of the reservoir, and off-site acquisition and management of suitable nesting habitat. Minimization and mitigation efforts for covered native fish, frog, and gartersnake (“aquatic species”) includes operation of Horseshoe Reservoir to minimize non-native fish production, stocking of covered native fish, and supporting stream and water supply protection projects in the Verde River watershed.

## 2. Annual Reporting Requirements

**Obligation:** SRP is required to submit an annual report to FWS, City of Phoenix, Arizona Game and Fish Department, and U.S. Forest Service describing all H-B HCP activities occurring during the past year. A draft report must be sent to FWS prior to the annual meeting in October/November of each year. The report is to be finalized by February 1<sup>st</sup> of the following year.

**Actions:** SRP submits this report to the FWS, City of Phoenix, Arizona Game and Fish, and U.S. Forest Service to fulfill the annual reporting requirement. The report covers all activities relating to the Horseshoe and Bartlett Reservoirs HCP from November 1, 2008 through October 31, 2009, including a summary of reservoir operations, management activities, monitoring results, status reports and planned future activities.

### 3. Horseshoe Lake Operation ITP Compliance

#### a. Horseshoe and Bartlett Operation Summary

*Obligation:* SRP is required in this annual report to provide a summary of reservoir operations.

*Action:* Below is a summary of reservoir operations from SRP hydrologists of the 2009 water year (October 2008 – September 2009) and a forecast for the upcoming year. The summary includes watershed conditions for both the Salt and Verde systems.

**Summary:** The largest influence on Salt and Verde reservoirs operations this past water year was actually the previous Water Year. Water Year 2008 was a productive runoff year filling both the Verde and Salt reservoir systems. Water Year 2009 produced below median runoff but Roosevelt Lake level entered Flood Control Space for the first time in its history. The seasonal river swap from the Salt System to Verde System was initiated on June 15<sup>th</sup>, 2009. Precipitation during 2009 monsoon, as defined by June 15<sup>th</sup> through September 30<sup>th</sup>, was just 56% of normal. When comparing 2009 to the entire record, this past monsoon was the second driest. Indications for this coming winter are for ocean conditions to continue at weak-to-moderate strength El Niño. While the past is no guarantee of the future, a look at watershed history over the last 110 years is encouraging. Eight of the nine years with poor monsoon summers in which an El Niño was developing resulted in wet winters. SRP's reservoir system has sufficient capacity in May allowing for a full allocation of surface water for the remainder of 2009 and 2010.

**Winter Precipitation:** During early Fall 2008, sea surface temperatures across the Equatorial Pacific were near normal suggesting the Southern Oscillation would likely have little influence on the regional weather of the Southwestern United States during the upcoming winter; however, beginning in the late Fall and early Winter, cooling began off the West Coast of South America and spread as a weak-to-moderate La Niña developed and persisted into early Spring 2009. This transition may help explain the shift from a productive weather pattern over the region that brought several "cold" storm systems to Arizona during late November and December to a much less productive pattern that persisted from January through March and allowed only one significant storm system to affect Arizona during February. As a result, there was a sharp contrast between the cumulative average precipitation across the Salt/Verde watershed for December when 4.30" or 253% of normal for the month was recorded and January through March when only 3.01" or 46% of normal for those three months occurred. Combined the 7.31" of precipitation that was recorded on average across the Salt/Verde watershed for the December-March period was 88% of normal.

**Summer Precipitation:** As quickly as the Southern Oscillation swung towards La Niña conditions during the early months of 2009, it transitioned back to a near neutral status and then weak-to-moderate El Niño conditions as Summer 2009 approached. As was the case during the preceding winter, this transition in the Southern Oscillation may have had a profound effect on the weather pattern observed across the Southwestern United States during subsequent months. Instead of gradually weakening and retreating northwards during the late spring months as is typical, the Westerlies remained much stronger than normal over the Southwestern United States from June through August. This in turn prevented a persistent monsoon circulation from developing over the region through the summer so that true “bursts” in the monsoon producing widespread, significant precipitation within Arizona were few and far between. As a result, from June 15 through September 30, 2009, the period that has been defined as the monsoon, a Salt/Verde watershed average precipitation accumulation of 3.76” was observed which is only 56% of normal and the second least amount on record for the monsoon.

For the Water Year of 2009, which covers the period from October 1, 2008, through September 30, 2009, a Salt/Verde watershed average accumulation of 15.03” was recorded which is 76% of normal making this the 32<sup>nd</sup> driest (or 78<sup>th</sup> wettest) water year on record. Breaking this down by basin, the Salt watershed, which received 17.0” on average, was favored over the Verde which received 13.2” on average.

The chart below (Fig. 1) shows how the cumulative average Salt/Verde watershed precipitation recorded during Water Year 2009 compares to that observed during recent past water years and the long-term normal; monthly totals and normal amounts appear in the boxes below the chart.

**Reservoir Status:** In December, total reservoir storage increased 161,281 acre feet which was the first positive increase in total storage since May of 2008. Total reservoir storage was 89 percent of capacity heading in to the winter runoff season. Although January 1<sup>st</sup>, 2009 snowpack on the Verde was 319% of normal and 180% of normal on the Salt; winter runoff forecasts were for below median. Ultimately, the winter runoff (January-May) produced 489,470 acre-feet which is 72% of median. Last runoff season’s total inflow to the reservoirs was 1,334,480 acre feet. Total storage at the end of the runoff season was 2,171,955 acre feet which is 94% of capacity compared to 96% the previous season. The Verde reservoirs never reached capacity this season despite an impressive December snowpack. However, Roosevelt Lake recorded the highest elevation in history this runoff season at 2151.18 feet on March 8<sup>th</sup>, 2009.

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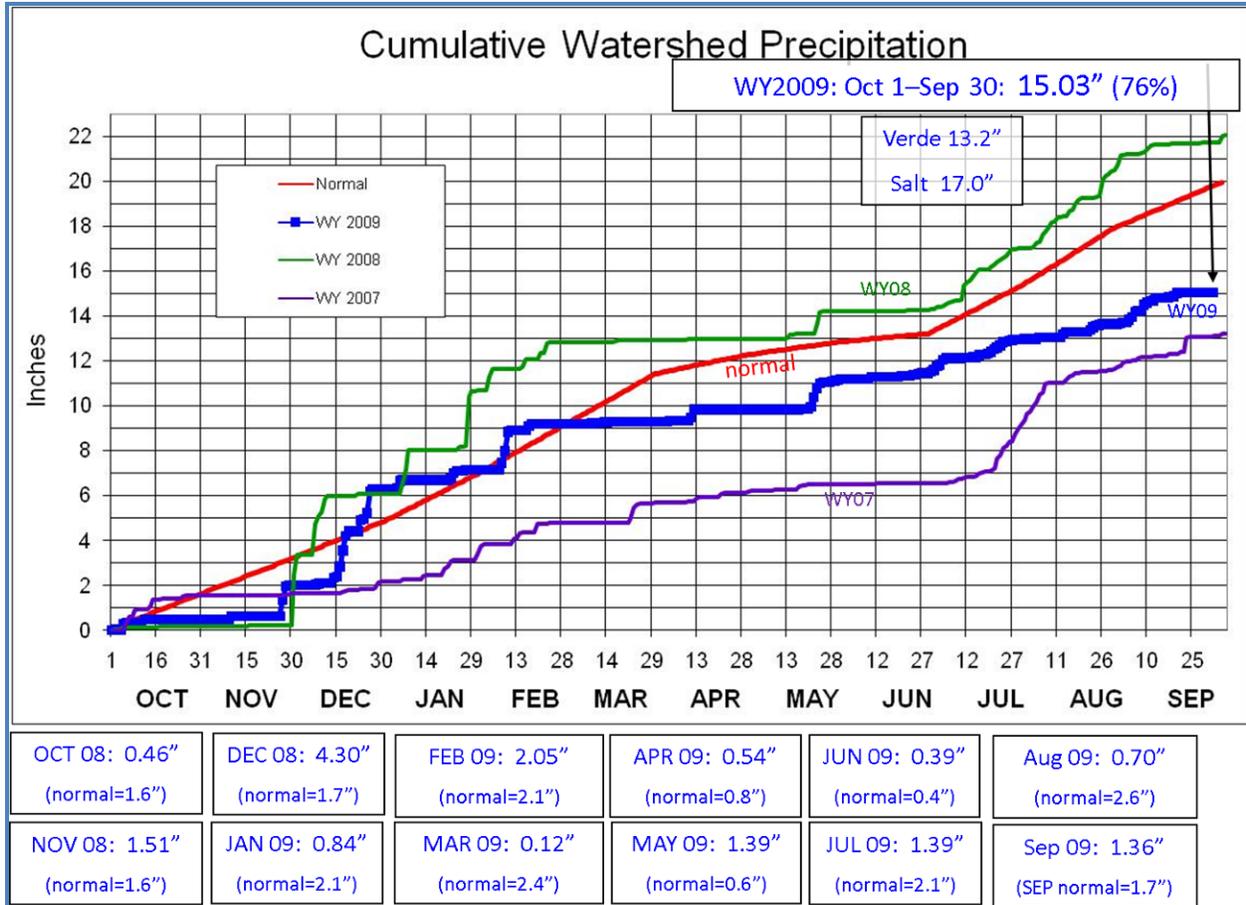


Figure 1. Cumulative watershed precipitation on the Salt River and Verde River watersheds for October 2007 – September 2008 (blue line).

**Verde Operations:** Typical operations call for the water order to be switched from the Verde system to the Salt system in April or May leaving Bartlett Reservoir release at minimum. Water stored behind Horseshoe Dam is also typically moved downstream to Bartlett Reservoir to reduce the amount of loss from seepage and evaporation. The water order may be switched sooner depending on the winter runoff. However, a deviation from typical operations was necessary and the bulk of the water order remained on the Salt system as the Salt reservoirs were near capacity from February through May. The majority of water order remained on the Salt System during these months as the Roosevelt Lake elevation slowly decreased. However, on March 12<sup>th</sup>, the Horseshoe Dam release was increased from 425 cfs to 1,650 cfs (maximum opening) to move a portion of the water stored at Horseshoe Reservoir to Bartlett Reservoir (Figs 2). The release from Horseshoe Dam was reduced to 400 cfs on Thursday, March 19<sup>th</sup> as the water was now below the Horseshoe Dam spillway crest. In May, releases from Bartlett reservoir were gradually increased to make storage capacity available for the remainder of the water stored in Horseshoe Reservoir (Figs 3). (NOTE: The Horseshoe Drum valve will not be used for releases between 450 cfs and something less than maximum opening because excessive vibration could become problematic.) Horseshoe Dam release was increased to

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maximum on May 20<sup>th</sup>. Horseshoe Lake reached empty on Thursday, June 4<sup>th</sup> with only the flow of the Verde River passing through just before noon the same day.

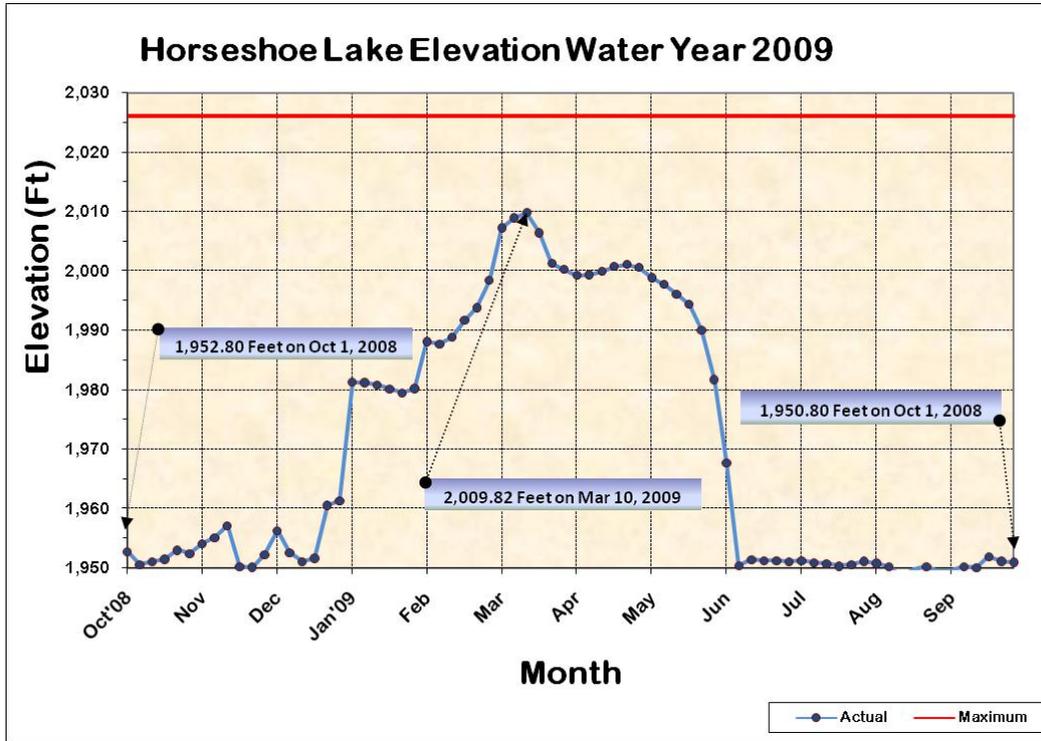


Figure 2. Horseshoe Reservoir storage for October 2008 – September 2009.

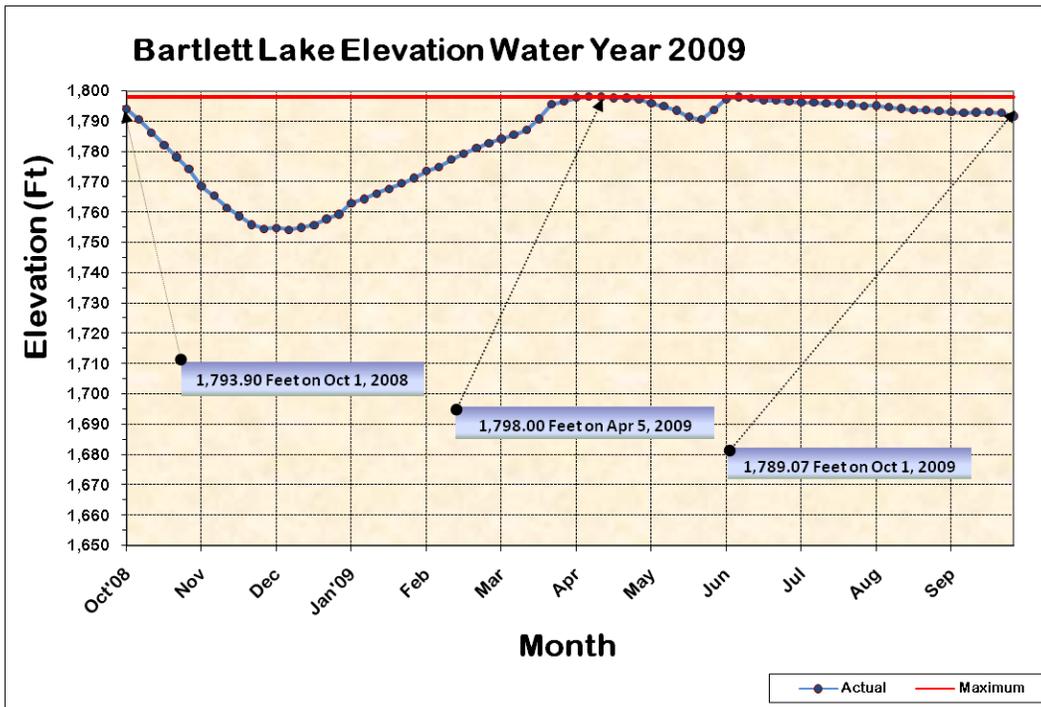


Figure 3. Bartlett Reservoir storage for October 2008 – September 2009.

**Weather Outlook:** As of this writing, El Niño continues at weak-to-moderate strength; i.e., sea surface temperatures along the equator of the eastern Pacific Ocean are between 0.5C to 1.0C warmer than normal. Consensus forecasts from several models suggest further warming is possible through the winter before cooling late this spring. An El Niño of moderate strength (1.0C to 1.5C above normal) seems most likely this winter. In the past on the watershed, many more winters than not have had normal to above normal precipitation with an El Niño in progress. The NWS' Climate Prediction Center is still following this climatology to some extent for their winter season outlooks. The November through January season is a toss-up among "above," "below" and "near-normal" precipitation for all of Arizona. However, for the winter seasons, "above normal" is slightly favored for the southern third of the state (south of the watershed and the Valley) for December through February and for all but the northeastern quarter of Arizona during January through March. The most likely category for temperatures is "above normal" for most all of Arizona this fall (Nov.-Jan.) and for the northern half of the state (north of the Valley) for the winter seasons (Dec-Feb. and Jan.-Mar.).

**b. Flycatcher and Cuckoo Operation Objective**

*Obligation:* SRP will manage water levels at Horseshoe, conditional on other operation goals, to make riparian habitat available earlier in the nesting season and to maintain riparian vegetation at upper end of the reservoir. After two successive years of low water levels due to drought, Horseshoe will be filled ahead of Bartlett, if feasible, to provide water to tall dense vegetation at upper end of Horseshoe.

*Action:* Horseshoe storage reached a maximum of 60% full (approximately elevation 2010') the first week of March and SRP Water Resource Operations (WRO) predicted that no large storms were likely, which could cause spill from system storage. On March 10, WRO coordinated drawdown with the HCP Project Manager – it was determined that rapid draw down could commence to move a portion of Horseshoe storage to Bartlett to meet covered bird and fish operation objectives (see next section). Rapid draw down was implemented by WRO on March 12<sup>th</sup> and was maintained for about 8 days before releases declined as levels in Horseshoe fell below the spillway crest and Bartlett neared capacity. Storage on May 1 was approximately 47% full (47,450 af, elevation 1997 - 1998'). Once storage capacity was available in Bartlett, Horseshoe releases were again increased on May 20<sup>th</sup>, and the reservoir was drained to minimum pool by first week of June.

*2010 Action:* Due to storage levels in 2009, the earliest spring to hold water higher after two successive years of low water could occur in 2012.

**c. Covered Aquatic Species Operation Objective**

*Obligation:* SRP will manage water levels at Horseshoe, conditional on other operation goals, to minimize the reproduction, recruitment, and survival of nonnative fish by rapidly drawing down the reservoir and minimizing carry-over storage, and in years when the reservoir is held high for flycatcher provide opportunities for razorback sucker reproduction and recruitment.

*Action:* As explained in Sections 3.a and b above, rapid drawdown was implemented on March 12<sup>th</sup>, slowed for approximately 1 month, increased on April 25<sup>th</sup>, and resumed maximum release on May 20<sup>th</sup>. The reservoir reached minimum pool during the first week of June and remained nearly empty through September 30<sup>th</sup>.

*2010 Action:* Due to the high water levels in 2009, the earliest spring to hold water higher after two successive years of low water to meet flycatcher objectives and support razorback sucker stocking could occur in 2012.

**d. Covered Bird Monitoring**

*i. Vegetation Monitoring*

*Obligation:* SRP will use vegetation monitoring at Horseshoe to identify trends in the amount and height of tall dense vegetation to assist in the evaluation of whether adaptive management thresholds or Permit limits may be exceeded. Vegetation will be monitored once every three years.

*Action:* SRP continued a pilot project (in coordination with the Roosevelt HCP program) to determine if the GIS flycatcher breeding habitat model (Hatten and Paradzick 2003) can be used as a cost effective and accurate method to delineate and forecast suitable breeding habitat within the conservation space of Horseshoe Reservoir. We explored if within-season vegetation differences could be used to delineate cells that contained herbaceous vegetation and those with trees. We ran the GIS breeding habitat model using June 2007 (Fig. 4) and September 2007 (Fig. 5) imagery and determined that the spectral contrast between the scenes would not support creating a more accurate breeding habitat map.

We next researched the cost and logistics of acquiring LIDAR (Light Detection and Ranging) data that could provide topographic and vegetation elevation data. Coupling topography, vegetation height, and the results of the GIS breeding habitat model would support a repeatable and accurate estimate of available potential breeding habitat relative to reservoir stage, and provide a consistent method of determining trends in vegetation availability. In coordination with the

Roosevelt HCP Program, we obtained a cost estimate from a LIDAR vendor and determined that compared to on-the-ground surveys the cost was reasonable. We also researched the appropriate timing of data acquisition and determined that late fall (November/early December) would reduce the interference of herbaceous vegetation and occur prior to reservoir fill. We are planning on running the satellite imagery model and acquiring LIDAR in the summer and fall, respectively (see below).

Because the methodology to map and forecast breeding habitat has not been finalized, we estimated the amount of potential breeding habitat in 2009 that may have been unavailable in 2009 and forecasted the amount for 2010. We conducted an aerial survey of the reservoir in October of 2009 to refine the GIS breeding habitat model results using June 2009 imagery (Fig. 6). We estimated that there were 73.5 acres of Class 3, 36.7 acres Class 4, and 30.5 acres of Class 5 habitat; totaling approximately 140.7 acres of higher-probability breeding habitat within the reservoir in 2009. The reservoir reached 60% full and was at approximately elevation 2000 on May 1, 2009; therefore, at most 42 acres of potentially suitable breeding habitat was unavailable. For 2010, assuming the reservoir is at full pool on May 1, approximately 87 acres of suitable habitat could be unavailable at or below elevation 2015'<sup>1</sup>.

*2010 Action:* In 2010, we will develop a bid and contract for the acquisition of LIDAR data in November/early December 2010. We will also run the GIS breeding habitat model using summer (~June) 2010 imagery. The habitat model results will be paired with the LIDAR data to generate a breeding habitat map for the 2010 reporting period. Likely, we will continue to refine and work on the methodology to map and forecast potential breeding habitat in 2011. Pending the outcome of the 2010 results, next mapping would be required in the summer of 2013.

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<sup>1</sup> Elevation 2015' was used instead of 2010' as conservative estimate for inundation impacts based on analysis and assumptions outlined in the Horseshoe – Bartlett HCP.

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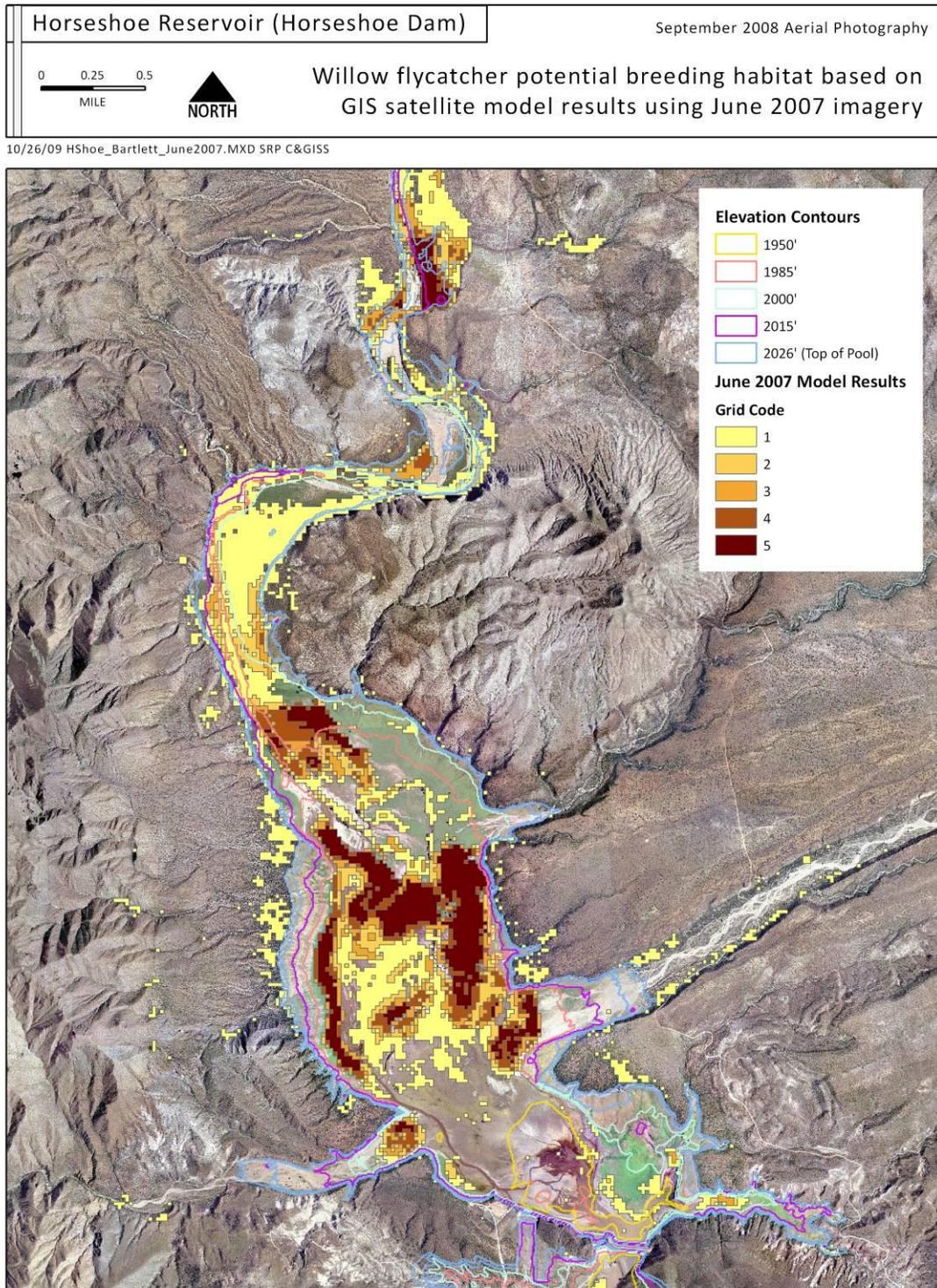


Figure 4. Willow flycatcher potential breeding habitat in Horseshoe Reservoir based on GIS satellite model results using June 2007 imagery.

[note: model grid code scale: 1 = lowest breeding probability, 5 highest breeding probability; sediment contour interval 1950'  $\approx$  0% storage; 1985'  $\approx$  25% storage; 2000'  $\approx$  50% storage; 2015'  $\approx$  75% storage; 2025'  $\approx$  98% storage.]

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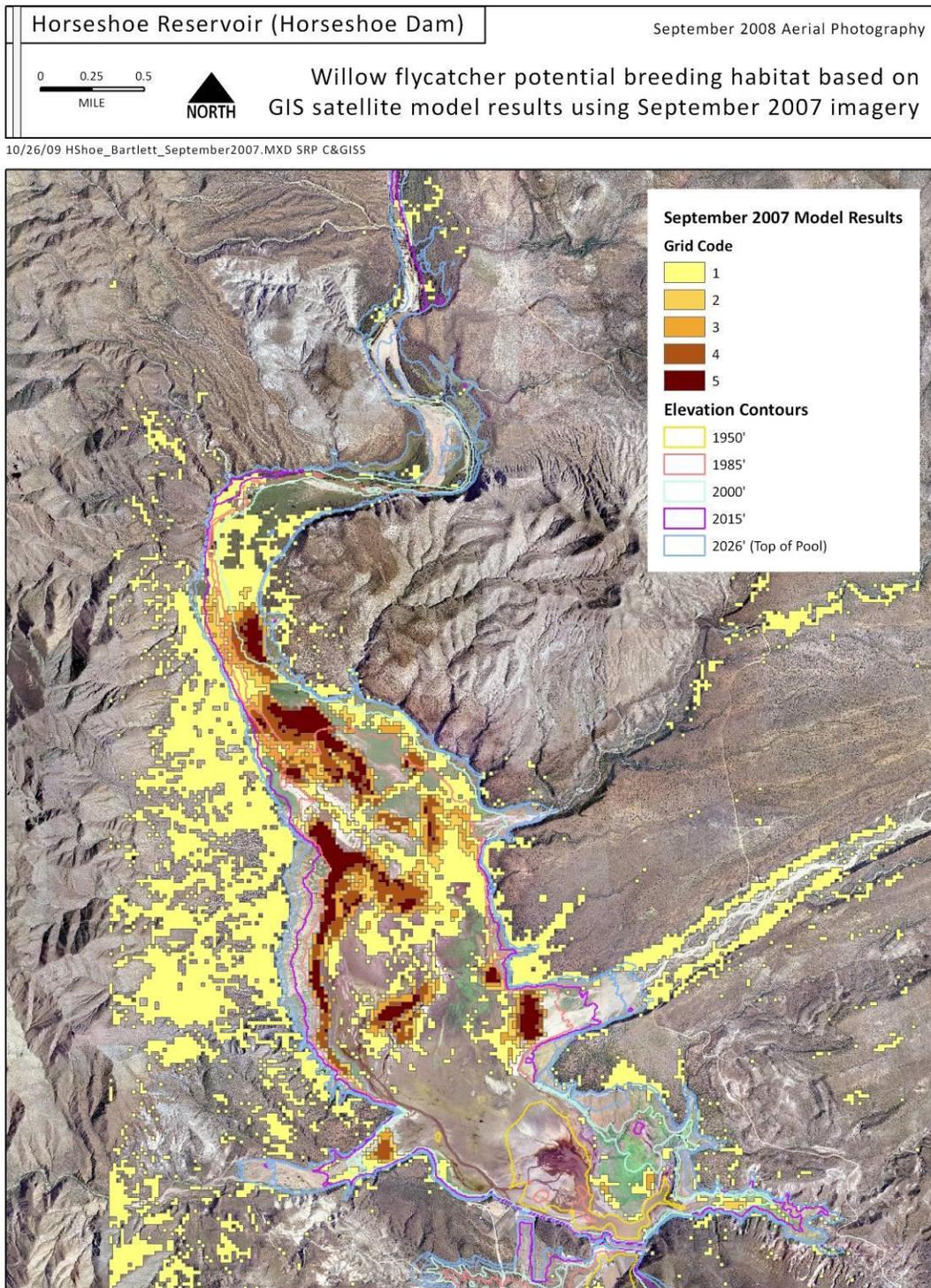


Figure 5. Willow flycatcher potential breeding habitat in Horseshoe Reservoir based on GIS satellite model results using September 2007 imagery.  
[note: model grid code scale: 1 = lowest breeding probability, 5 highest breeding probability; sediment contour interval 1950'  $\approx$  0% storage; 1985'  $\approx$  25% storage; 2000'  $\approx$  50% storage; 2015'  $\approx$  75% storage; 2025'  $\approx$  98% storage.]

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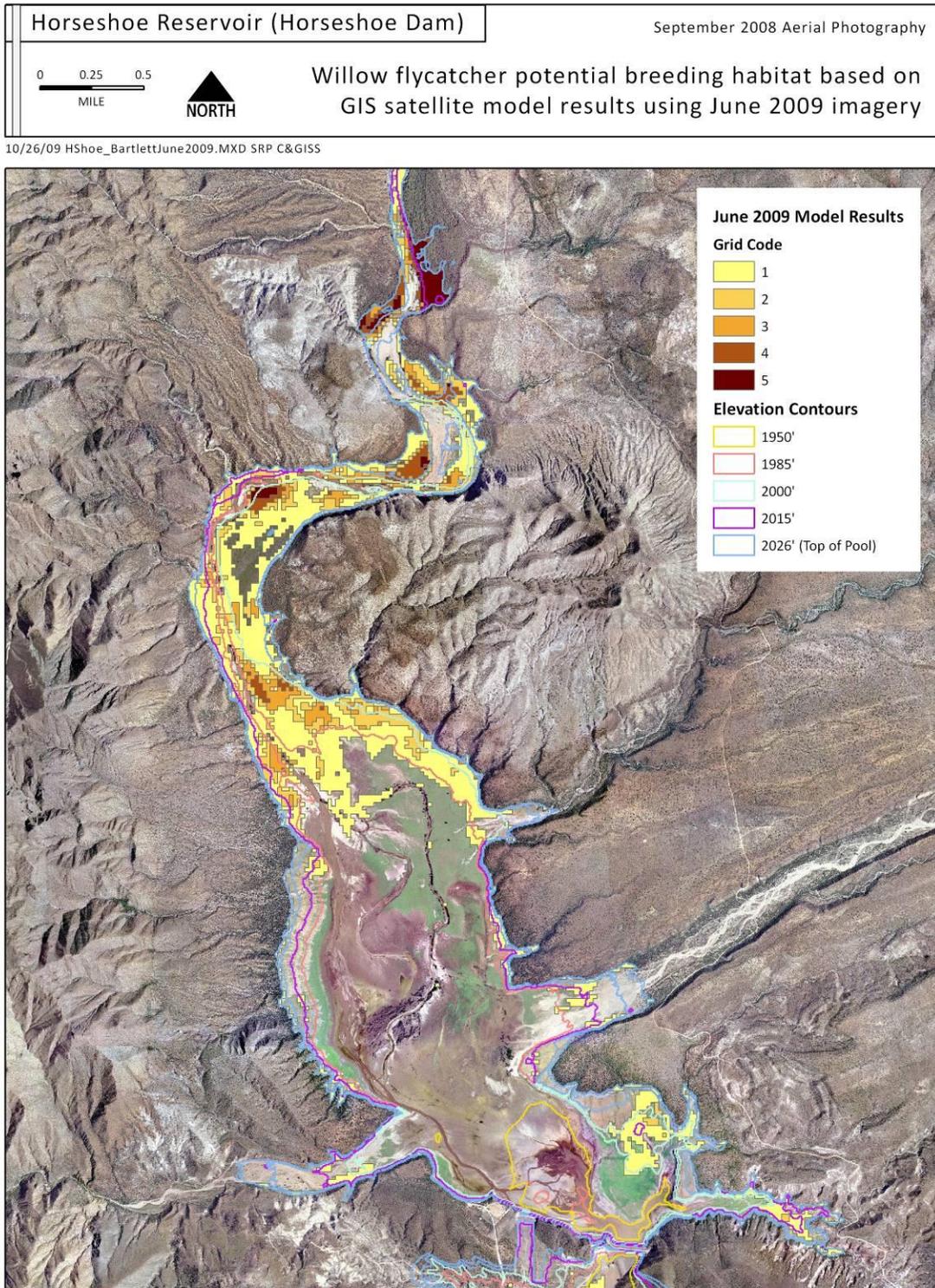


Figure 6. Willow flycatcher potential breeding habitat in Horseshoe Reservoir based on GIS satellite model results using June 2009 imagery.  
[note: model grid code scale: 1 = lowest breeding probability, 5 highest breeding probability; sediment contour interval 1950'  $\approx$  0% storage; 1985'  $\approx$  25% storage; 2000'  $\approx$  50% storage; 2015'  $\approx$  75% storage; 2025'  $\approx$  98% storage.]

*ii. Flycatcher Monitoring*

**Obligation:** SRP will monitor the flycatcher population to assist in the evaluation of ITP compliance relative to thresholds for adaptive management and the cap on harm of occupied habitat. The method used to determine occupied habitat is explained in Section IV.B.1.B of the HCP. The adaptive management threshold is an annual average of 200 acres of potentially impacted occupied habitat and the cap is 400 acres. Flycatcher surveys will be conducted every three years.

**Action:** No surveys were conducted in 2009. Based on flycatcher surveys in 2008 and habitat monitoring (Section 3.d.i), the amount of habitat that may have been unavailable was small.

**2010 Action:** No surveys will be conducted in 2010; next flycatcher survey will occur in 2011. As noted in Section 3.d.i, the amount of potential breeding habitat that could be unavailable in 2010 is below the 200 acre annual average threshold for adaptive management.

*iii. Yellow-billed Cuckoo Monitoring*

**Obligation:** SRP will monitor cuckoo at Horseshoe to identify the long-term trend in the population. The reservoir will be surveyed every three years.

**Action:** No surveys were conducted in 2009.

**2010 Action:** No cuckoo surveys will be conducted in 2010; next survey will occur in 2011.

*iv. Bald Eagle Monitoring and Emergency Rescue Protocol*

**Obligation:** SRP will develop a coordinated plan with FWS and AGFD to identify when rescue actions would be required and the process to rescue bald eagle, bald eagle eggs, or nestlings at Horseshoe or Bartlett. The Plan will include triggers for winter monitoring at appropriate effort and frequency to determine if a nest has been built in the conservation space of the reservoir and the likelihood that the nest could be impacted by spring runoff. The Plan will be completed within one year of permit issuance, and the implementation will begin within two years of Permit issuance.

**Action:** Eagles did not nest within a tree within the reservoir pool during the 2008 – 2009 nesting season. SRP developed and finalized the monitoring and rescue plan in coordination with FWS and AGFD (Appendix A).

**2010 Action:** SRP will implement the monitoring plan in late 2009 and 2010.

**e. Covered Aquatic Species Monitoring at Horseshoe and in the Verde River.**

*Obligation:* SRP will monitor native fish, frog, and snake populations and the effectiveness of minimization and mitigation measures. Periodic surveys in Horseshoe and several locations in the Verde River will be conducted. Native fish composition and age class information will be recorded, and fish will be tagged in Horseshoe to assess movements from the reservoirs. In first 5 years of implementation surveys will be focused near Horseshoe Reservoir.

*Action:* SRP initiated fish surveys in 2009 at Horseshoe Reservoir and conducted a survey of Lime Creek. As required in the HCP, the sampling effort focused on Horseshoe to assess fish composition, population structure and tagging fish to study movements during future survey efforts. SRP contracted with the Arizona Game and Fish Department (AGFD) Research Branch to complete the survey at Horseshoe (Appendix B). SRP staff and Aztec Consulting sampled Lime Creek (Appendix C).

Summary of Horseshoe Results:

AGFD sampled Horseshoe Reservoir on June 8 – 9, 2009 using canoe electroshocking equipment, seines, and minnow traps. The reservoir had recently been drawn down and was at minimum pool (12 acres of surface area, <1 mi of shoreline, and on average < 3 ft deep). A total of 4011 fish were captured with goldfish comprising 86% of the catch (Fig. 7). Bass and sunfish species were less than 3% of the overall population. Of the fish captured, 1,140 were able to be tagged (> 150 mm) using dorsal spine clipping (carp) and spaghetti tags (other species) (Fig. 8). Four tagged/marked fish were recaptured, but were thought to have been marked the day before, and were not tagged during the sampling effort in 2006 - 2007.

Primary conclusions of the survey were:

1. The timing of reservoir drawn down facilitated the sampling and capture of greater numbers of fish compared to sampling in 2006 – 2007.
2. The resident fish population continues to be dominated by goldfish and carp, which are habitat generalists (breeding in both the river and reservoir habitats).
3. Annual inundation of floodplain-like habitat within the reservoir pool likely favors spawning and recruitment of goldfish and carp.
4. Rapid drawdown and minimization of carryover storage has greatly reduced the population of centrarchids (bass and sunfish).
5. Anecdotal evidence during recent upstream surveys has noted presence of carp but few goldfish.

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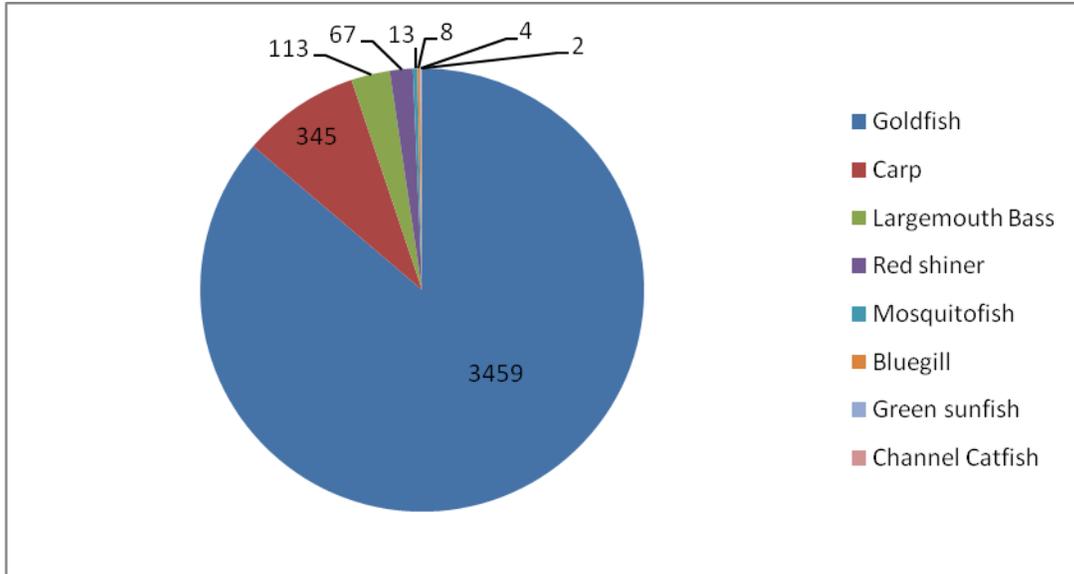


Figure 7. Composition of fish species captured in Horseshoe Reservoir, June 7 – 8, 2009. Values indicate number of fish caught using the three gear types (electroshocking equipment, seine, minnow traps).

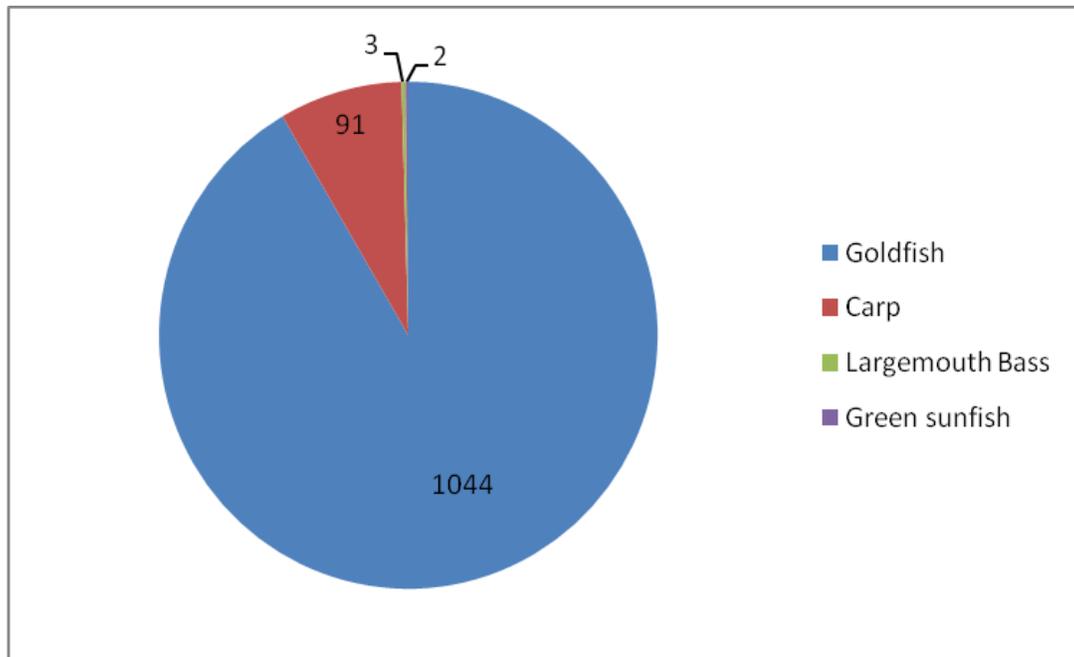


Figure 8. Number of fish tagged/marked during survey of Horseshoe Reservoir June 7 – 8, 2009.

Lime Creek Results Summary:

On September 4, 2009 Chuck Paradzick (SRP) and Alex Smith (AZTEC) performed a site visit to the proposed Lime Creek Fish barrier site. The general stream conditions were significantly drier than visits in previous years. The reach of Lime Creek from FR1530 to 0.75 miles upstream of the barrier site lacked flowing

or standing water except for one pool about 0.35 miles downstream of the barrier site. Although there was generally no surface water present, there were infrequent patches of moist sand at or slightly below the surface. The creek in the area of the barrier site lacked surface water.

The one remaining pool of water was about 25 feet long and up to 10 feet wide. We used dip net sampling and found that the pool contained a significant number of longfin dace. Single dips caught between a few to over 40 longfin dace. No other native or exotic fish (or amphibians) were captured or observed. There were a few dried remnants of crayfish in the vicinity of this pool. We observed no evidence of crayfish at or upstream of the barrier site.

*2010 Action:* SRP will continue fish sampling in 2010 with an emphasis on Horseshoe and upstream reaches. SRP plans to survey the reservoir using similar methods and timing compared to 2009. SRP is also discussing coordination and possible funding assistance for AGFD Region 6 late spring survey of the Verde River between Childs and Sheep Bridge. The effort will gather data on general fish population composition, abundance, and movements of marked fish.

#### **4. Status of Mitigation Property Acquisitions**

*Obligation:* SRP must acquire and manage in perpetuity 200 acres of riparian habitat by fee title or conservation easements. Within one year of the permit issuance date, at least 150 acres of mitigation will be in place, and within 10 years an additional 50 acres will be protected.

*Action:* The following activities were accomplished in 2009 to meet the habitat protection obligation:

Fort Thomas H-B Preserve:

- On August 11, 2009 SRP and Freeport McMoran executed three agreements to secure the protection of the 150 acre preserve near Ft Thomas: 1) deed of conservation easement; 2) memorandum of option agreement for the conservation property; and 3) fence license agreement.

Verde Valley:

- SRP HCP Project manager met with SRP Lands Department staff to develop a process to identify lands in Verde Valley. Over the next 2 - 3 years, SRP will delineate floodplain parcels from near Clarkdale downstream to Beasley Flat that are approximately 50 acres or greater. Once identified, ownership will be researched and the potential for supporting flycatcher and cuckoo habitat will be investigated. SRP will

also contact conservation organizations (e.g., The Nature Conservancy and Arizona State Parks) to discuss HCP mitigation needs and possible collaborative projects. We will also respond and consider direct inquiries from private landowners along the Verde and on the perennial tributaries in this area that could support suitable flycatcher and cuckoo breeding habitat (i.e., Oak Creek, West Clear Creek, and Wet Beaver Creek). As parcels are identified, we will contact owners to determine their interest in selling.

- SRP made initial contact with The Nature Conservancy (TNC) in October and has scheduled a field visit and meeting on November 17, 2009 to review their existing information of riparian lands in the Verde Valley and identify possible parcels that may meet requirements for HCP mitigation.
- In March, SRP was contacted by the owner of Dyke Ranch in McGuireville along Wet Beaver Creek to inquire about possible purchase or conservation easement. The HCP mitigation requirements were explained, flycatcher habitat requirements discussed, and the \$11,000 per acre price cap was noted. The owner was going consider options and follow up with SRP if they would like to continue discussions. No additional contact was made.

*2010 Action:* The following activities are planned for 2010:

Ft. Thomas H-B Preserve:

- Property is protected under a Conservation Easement - no action is needed; land management actions are discussed in Section 5 below.

Verde Valley:

- SRP will continue to identify and evaluate potential mitigation property in Verde Valley.

## **5. Mitigation Property Monitoring and Management**

### **a. Fort Thomas H-B Preserve**

#### *i. Flycatcher and Cuckoo Monitoring*

*Obligation:* SRP will conduct flycatcher and cuckoo surveys the first spring and summer following acquisition. If flycatchers are found, SRP will conduct a second year of surveys to establish a baseline. Once baseline surveys are complete, SRP will survey for flycatcher and cuckoo every other year on average but not less than every third year.

*Action:* SRP contracted with EcoPlan Associates to conduct the second year of flycatcher and cuckoo surveys on the Ft. Thomas H-B property (surveys were initiated in 2008 in order to coincide with Roosevelt HCP survey work and provide greater

information for the larger riparian area) (Appendix D). Flycatcher nest checks were performed to identify parasitism by brown-headed cowbirds and the results for both H-B and Roosevelt HCP preserves were combined to provide an estimate of the parasitism rate.

Surveyors detected 8 flycatcher territories, 6 pairs, and 5 nests on the preserve (Fig. 9), which were 2 more territories compared to 2008 survey (Table 1). Surveyors located and checked 73 nests on the H-B and Roosevelt HCP Preserves, of those 10 were parasitized (14%). On the H-B Preserve, 1 of 3 nests was parasitized. Occupied flycatcher habitat was mostly older tamarisk approximately 6-m tall and interspersed with 8 – 10 m tall willow and shrub mesquite. Most territories were located along an agricultural run-off channel located along the western boundary of the property, while two territories were located on the main Gila River channel on the northern boundary of the property. All flycatcher nests were found in tamarisk. Nest heights ranged from 4 to 6.5 meters with an average nest height of 5.2 meters.

Surveyors did not detect cuckoos on the H-B preserve during surveys in 2009.

Table 1. Southwestern willow flycatcher and yellow-billed cuckoo survey results for the Ft Thomas H-B Preserve, 2008 – 2009.

Year	Willow flycatcher				Yellow-billed cuckoo	
	Resident Adults	Territories	Pairs	Nests	Territory	Pairs
2008	10	6	4		1	1
2009	14	8	6	5	0	0

*2010 Action:* SRP completed two years of baseline surveys in 2009; no surveys will be conducted in 2010. SRP will conduct flycatcher and cuckoo surveys in 2011 and the effort will be coordinated with the Roosevelt HCP FT Thomas preserve lands to provide a more robust census of the populations in the area.

**[FIGURE REMOVED]**

**[Locations of endangered species are considered confidential by the U.S. Fish and Wildlife Service and therefore are omitted from this report. Management agencies requiring this information can contact SRP or the Arizona Ecological Services Office of the U.S. Fish and Wildlife Service to receive this information]**

Figure 9. Location of willow flycatcher territories on the H-B Ft. Thomas Preserve, 2009.

*ii. Vegetation and Habitat Monitoring*

*Obligation:* SRP will conduct field observations of habitat assessing the type, structure, and density of riparian and other vegetation, and on-the-ground photo-points from fixed points will be collected.

*Action:* Field surveys:  
EcoPlan Associates observed and reported habitat conditions during bird surveys (Appendix D). Overall, the preserve is dominated by tamarisk, though there are several individual native trees or small pockets of native trees interspersed within the stands of tamarisk. Water levels in the agricultural run-off channels ran intermittently and at various levels depending on the irrigation regime in the adjacent fields. Water levels in the Gila River fluctuated throughout the year, running high earlier in the season and slowly dropping with occasional increases in flow due to rain events upstream of the study area.

While habitat throughout the preserve varied from potentially suitable to unsuitable vegetation composition and structure for flycatcher and cuckoo, evidence of overbank flooding, old side channels, and periodic riparian tree recruitment was evident within the floodplain suggesting the dynamism of the habitat, which supports long-term maintenance of suitable nesting habitat in the preserve.

Photopoints:

Two photo points were established in October 2008 (see photos next page).

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Photo point #1 is located on a bluff looking westward onto FT Thomas H-B Preserve (UTM coordinate: NAD27 12S 598344 3656097).



Photo point #2 is located in Gila River floodplain looking east into the Ft Thomas H-B Preserve (UTM coordinate NAD27 12S 597727 3655535).

*2010 Action:* No vegetation monitoring is scheduled for 2010. In 2011, SRP will record vegetation conditions during flycatcher and cuckoo surveys and on-the-ground photos will be taken.

iii. *Management Obligations*

*Obligation:* SRP's primary goal for management of these properties is to provide ecological and conservation benefits to the flycatcher and cuckoo. Management activities are focused primarily on minimizing or eliminating identified threats to riparian habitat, such as wildfire, groundwater pumping, surface water depletion, trespass livestock grazing, cowbird parasitism and vandalism. Actions to enhance the quality of habitat on a property or reverse past damage may also be conducted.

General management activities required for each property are listed below:

1. SRP will identify a manager for all acquired properties.
2. A management plan will be developed for each property within two years of acquisition in coordination with FWS and will be updated annually.
3. Management activities identified in the management plan will be implemented.
4. Cowbird management will occur on properties that are agreed to by SRP and FWS during the annual H-BHCP meeting.
5. Conservation easements shall be placed on all appropriate mitigation lands and will be held by an agency or organization acceptable to FWS.

*Actions:* SRP completed the following major management actions on the Ft Thomas H-B Preserve in 2009:

- SRP assumed management of the property once the conservation easement agreement was executed.
- SRP and TNC entered into a contract for day-to-day management of the Ft Thomas H-B and the adjacent Roosevelt mitigation parcels. TNC will conduct periodic patrols, assess and repair fence lines, inspect and maintain access and signage, work and coordinate with adjacent landowners and local law enforcement officials, and assist with biological monitoring.
- SRP, TNC, and the Bureau of Land Management (BLM) met at the preserve in September to discuss cattle grazing, allotment boundaries, inspect existing fences, and efforts to coordinate fencing of the riparian area.

- SRP continued to review and revise the baseline inventory developed by Matt Turner in 2008. The Information will be incorporated into the Management Plan and Baseline report.

*2010 Actions:* SRP plans to conduct the following actions in 2010:

- Continue work on the baseline and management reports.
- SRP will have the property and location of the fence line (as defined in the fence license agreement) surveyed.
- Develop a contract to build a fence on the west portion of preserve.
- Continue to coordinate with BLM regarding fencing of the riparian area.
- Continue on-the-ground management activities in coordination with the Roosevelt HCP project manager.

#### **b. Special Water Supply Protection Projects**

*Obligation:* SRP will use its best efforts to protect future water supplies for mitigation lands.

*Action:* SRP purchased piezometer instrumentation to measure shallow water levels to support TNC ecoflow study on the upper and middle Verde River<sup>2</sup>. The information will be used to better understand the response of shallow groundwater levels within the floodplain (that support riparian vegetation and aquatic habitats) to changes in base flows from groundwater pumping and small scale diversions.

*2010 Action:* To protect water supplies in Oak Creek and the Verde River, SRP plans to assist Arizona Game and Fish Department and the U.S. Forest Service with the establishment of flow monitoring equipment at Sterling Spring. The spring outflow forms the perennial headwaters of Oak Creek, and the goal of the project is to produce a long term record of spring discharge. H-B HCP will fund (all or a portion) of the equipment and labor to install the monitoring devices at the two diversions from the spring. A 2" flow meter will be installed within the pipeline serving a U.S. Forest Service campground, and a water level sensor to monitor flow over a crested weir will be installed at the AGFD fish Hatchery; these values will be combined to yield total flow. Data will be logged on site (1 - 4 hr interval), communicated through a satellite link to SRP, and posted on the internet site for public view. Quarterly site visits will be made to this location to confirm instrument calibrations and equipment integrity. The schedule for this work has not been finalized; however, the goal of SRP Water Rights and

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<sup>2</sup> This project was described in the 2008 annual report, but the piezometers were not purchased until November 15, 2008 (i.e., this year's reporting period).

Contracts and Measurement Services is to have the instrumentation operational by the end of January 2010.

## 6. Aquatic Species Mitigation

The overall goal of the minimization and mitigation measures for covered native fish, frog, and gartersnake species is to offset the direct impacts caused from stranding and passage through the outlet works, and the indirect impacts (predation and competition) caused by the increase of nonnative fish produced in the reservoirs. Minimization and mitigation obligations under the HCP include: rapid draw down of Horseshoe Reservoir; stocking adult and sub-adult razorback sucker in Horseshoe or elsewhere; installation of a fish barrier on Lime Creek; funding and supporting improvements to Bubbling Ponds Hatchery; stocking covered native fish in the Verde watershed; and watershed management activities that conserve instream flow, species, and habitats. The following implementation actions were taken:

### a. Rapid Draw Down of Horseshoe Reservoir

*Obligation:* See Section 3.c.

*Action:* See Section 3.c.

*2009 Action:* See Section 3.c.

### b. Stocking of Razorback Sucker at Horseshoe and Other Covered Species in Verde River.

*Obligation:* SRP will provide support for Arizona Game and Fish Department (AGFD) to stock razorback sucker during Horseshoe fills when conditions may be favorable. Other river segments may be stocked with razorback sucker upon mutual agreement among AGFD, FWS, and SRP. SRP will provide support to increase stocking of other covered native fish species in the Verde watershed.

*Action:* On April 23, 2009, SRP and AGFD executed a collection agreement to fund the operation and maintenance of the hatchery to support culture of covered native fish, and support transport and stocking of covered fish to meet this obligation. The collection agreement provides for SRP to annually transfer funds (\$40,000) to AGFD to be utilized for O&M and stocking actions throughout the year. Prioritization of fish species and stocking locations are discussed at an annual meeting among AGFD, FWS, and SRP staff.

Funding was transferred to AGFD in August 2009 following a coordination meeting among AGFD, FWS, and SRP at the hatchery on June 18 to identify

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species culture targets and stocking locations. The outcome of the meeting, and subsequent follow-up comments, are presented in Table 2.

Species	Proposed Stocking Locations <sup>1,2</sup>	Approximate quantity
Razorback sucker	Upper Verde	1000
	Middle Verde (Beasley-Childs)	2000
Gila Topminnow	Fossil Creek	1000s (for sites as approved)
	Dutchman Grave Spring	
	Other tanks/locations in Verde watershed	
	Lime Creek (after barrier is constructed)	
Roundtail chub	Upper Verde (Stillman Lake)	500 (Stillman)
	Houston Creek	
	Middle Verde (Beasley-Childs)	3000 (for other sites as approved)
	Deadhorse State Park	
	Oak Creek	
	West Clear Creek	
	Fossil Creek	
	Gap Creek	
Lower Verde (Bartlett-Salt River confluence)		

<sup>1</sup>Pending AGFD, USFWS, and U.S. Forest Service coordination as necessary.

<sup>2</sup>Other locations may be considered and added with SRP, AGFD, and FWS concurrence.

**2010 Action:** Coordinate a meeting among AGFD, FWS, and SRP in April of 2010 to discuss the status of implementation, changes to the species priorities or locations, and plans for future culture and stocking effort.

**c. Bubbling Ponds Hatchery Improvements**

**Obligation:** SRP will provide \$500,000 in funding or in-kind support for planning, design, engineering, and fund raising to improve and expand Bubbling Ponds Hatchery (BPH).

**Action:** On April 23, 2009, SRP and AGFD executed a collection agreement to provide \$9,800 to fund the construction of a set of small tanks at the research house that will be used to culture and conduct research on small bodied covered species. The agreement also provided \$41,000 for AGFD to develop a hatchery improvement plan and an updated conceptual design (including cost estimates). The information will be used to inform subsequent hatchery improvements and for SRP to attempt to acquire federal funding for a major hatchery renovation.

Funding for the small tank improvements and hatchery planning were transferred in June of 2009. AGFD have indicated that they are working on the

small tank repairs and expect that the renovation will be completed in fall/winter 2009. They have also established a contract with HDR consultants to complete the hatchery planning updates. As part of that process, HDR and GF will be hosting stakeholder meetings in the fall of 2009; the project has a target completion date of October 1, 2010.

In coordination with AGFD to prepare for the hatchery renovation planning meetings, SRP Water Rights and Contracts staff has initiated a review of the water rights for both Bubbling Ponds and Page Springs Hatcheries to quantify existing and historic rights, locations and beneficial uses of those rights, and possible options for future uses (e.g., changing points of diversion from surface water to wells, and creation of wetland habitat for gartersnakes).

*2010 Actions:* Coordinate a meeting among AGFD, FWS, and SRP in April of 2010 to discuss the status of implementation (small tank repair, planning updates).

**d. Installation of a Fish Barrier in Lime Creek**

*Obligation:* SRP will construct and maintain a fish barrier in Lime Creek to benefit Gila topminnow, longfin dace, and lowland leopard frogs.

*Action:* In 2009, under contract with SRP, BOR finalized the project description document to be used for acquiring the necessary environmental compliance. BOR also finalized the construction specification drawings and a contract bid document. In coordination with the U.S. Forest Service (USFS), Tonto National Forest, a scoping notice of the action (USFS issuance of a Special Use Permit to SRP to build the barrier) was published on May 19, 2009 (Appendix E).

An Environmental Assessment (EA) has been drafted (approximately 80% complete) under contract with Alex Smith (EcoPlan, Aztec Consulting). To finalize the draft EA, SRP contracted with EcoPlan Associates to conduct a cultural and archeological survey of the area. The survey was completed in October 2009, and a draft report has been submitted to SRP for review and is expected to be finalized in November 2009. The draft EA is expected to be completed and submitted to the USFS in December 2009, and pending their review and comments, released for public review by February 2010. The U.S. Forest Service Record of Decision (ROD) is anticipated for spring of 2010. Following a 45 day waiting period after release of the ROD, SRP would issue a construction contract for work to occur in late September – October 2010<sup>3</sup>.

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<sup>3</sup> Construction is planned for October to avoid mid/late-winter precipitation and summer monsoon storms, and avoid the spring/summer migratory bird breeding season.

*2010 Actions:* See timeline above. SRP, in coordination with the USFS, will complete the necessary compliance, and has targeted construction of the barrier for fall 2010. The work is expected to take less than 1 month to complete.

**e. Watershed Management Efforts**

*Obligation:* SRP will continue, and expand where feasible, its substantial watershed management efforts to maintain and/or improve stream flows, which benefit all mainstem species.

*Actions:* SRP took the following actions in 2009 to protect watershed instream flow:

- Public outreach and education
- Funding research and monitoring
- Administrative and legal efforts to protect instream flows

Table 3 provides a detailed list of Watershed Management and Protection projects that occurred in 2009.

*2010 Action:* SRP will continue supporting watershed protection efforts in 2010.

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Table 3. SRP watershed protection efforts accomplished in 2009.						
Project Name	Date Initiated	Date Completed	SRP Contribution	Description and Comments	In-kind	Cash
Public Presentations	Ongoing	Ongoing	NA	9 public presentations to community groups and various agencies (e.g., Channel 12 News, AP News, Verde Valley Water Users Association, Master Watershed Program, and others)	X	
Legal efforts to curtail illegal groundwater and surface water diversions – Upper Verde	Ongoing	Ongoing	NA	Continued work on the objection and lawsuit filed against the City of Prescott regarding their application for an assured water supply (i.e., Big Chino pumping project). H-BHCP Project manager testified as expert witness during the administrative hearing.	X	
Legal efforts to curtail illegal groundwater pumping and surface water diversions – Verde Valley	Ongoing	Ongoing	NA	SRP continued its litigation against several groundwater pumpers in the Verde Valley who appear to be illegally diverting surface water.	x	
Verde Valley Geospatial Studies and Verde River Monitoring	May-08	May-09	\$15,555	Project specific funding for NAU WREP program.		X
USGS/SRP cost share of stream gage maintenance	Jan-09	Dec-09	\$83,000+	SRP's contribution to the USGS Joint Funding Agreement for the operation and maintenance of stream and reservoir gages in the Verde watershed (amount does not include reservoir gauge operations).		X
WatershedMonitor.com	Sep-07	Ongoing	NA	Maintain the website ( <a href="http://www.watershedmonitor.com">www.watershedmonitor.com</a> ) which displays real time data for river flows and precipitation across the Salt and Verde Watersheds.	X	
Arizona State Parks Foundation	Sep-08	Sep-09	\$15,000	\$10K for development of the "Friends of the Park" outreach programs. \$5K to assist in the completion of the Verde River Science Outreach and Education Project (NAU EMA) as it relates to the Ecological Flow Assessment.		X
Verde River Canoe Challenge	Mar-09	Mar-09	\$2,500	Corporate sponsor of the 10 <sup>th</sup> anniversary of the Verde River Canoe Challenge.		X
Low Flow gages (Black Bridge, Verde Falls, Campbell Ranch, Bubbling Ponds Hatchery)	Jan-09	Jan-10	\$8,000	2009 O&M and telemetry support for gages.	x	
Verde River Days	Sep-09	Sep-09	\$500	SRP donation for event.		X

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Table 3. SRP watershed protection efforts accomplished in 2009.						
Project Name	Date Initiated	Date Completed	SRP Contribution	Description and Comments	In-kind	Cash
Arizona Water Story – Verde River Teacher Guide	Jan-09	ongoing	NA	SRP provided this water education program to 4 <sup>th</sup> grade teachers throughout the state to assist them in teaching water science and Arizona history to their students. A Verde River Companion Guide to the curriculum is currently in development.	x	
Water Education Grants	Oct-07	May-10	\$4,750	SRP collaborated with the towns of Prescott and Prescott Valley as well as the Yavapai County Water Advisory Committee and Arizona Department of Water Resources to provide Water Education Grants to outstanding water education programs taking place in Yavapai County. Grants awarded included the Highlands Center’s Verde River Riparian Field Trip program, rainwater harvesting at the Primavera School in Prescott, and a water conservation curriculum program in Miller Valley.		X
Yavapai County Cooperative Extension Office /Project WET	Aug-08	May-10	\$45,000	SRP supported Edessa Carr with programming related to water education in Yavapai County. She has conducted numerous trainings on the Arizona Conserve Water curriculum guide, and worked with teachers from Prescott, Prescott Valley, Chino Valley, and Verde Valley towns.		X
ADWR School Water Audits	Apr-09	May-10	\$11,300	Funded three water conservation audits at Yavapai County Schools		x

## 7. Funding Methods and Assurances for HCP Implementation

*Obligation:* No later than 5 years after the Permit is issued, SRP shall insure that permanent funding is available to meet continuing obligations under the HCP.

*Action:* On March 24, 2009, SRP provided a letter to FWS indicating that we were proposing to establish an irrevocable trust to fund the H-BHCP. We anticipate approval by SRP's Board on November 2 to amend the Roosevelt Lake HCP trust, which allows for the creation and funding of a subaccount to meet the obligation of the H-BHCP. The subaccounts allow for each HCP trust fund to be managed (and reported) independently under a larger umbrella trust agreement. The estimated funding amount is \$6.0M to support approximately \$300,000 of annual expenditures over the life of the permit and *in perpetuity* costs for some of the mitigation obligations. We expect that the trust will be established within 1 – 2 months after the SRP Board provides the approval.

*2010 Action:* As noted above, SRP anticipates that the trust will be funded in November – December 2009.

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## 8. HCP Implementation, Survey, and Monitoring 10-year Schedule

Obligation	Completed /Ongoing	Year									
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017+
<b>Horseshoe Reservoir</b>											
Flycatcher and Cuckoo Reservoir Ops	Ongoing	RD <sup>1</sup>	RD	RD	RD	Hold? <sup>2</sup>	X	X	X	X	X
Aquatic Species Reservoir Ops	Ongoing	RD	RD	RD	RD	Hold?	X	X	X	X	X
Vegetation Monitoring	Ongoing	X	X	X			X	X			X
Flycatcher and Cuckoo Surveys	Ongoing	X			X			X			X
Bald Eagle Monitoring and Rescue Plan	Completed	X	X								
Bald Eagle Monitoring	Ongoing			X	X	X	X	X	X	X	X
Fish surveys:	Ongoing		X	X	X	X		X	X	X	X
Horseshoe			x	x	x				x		x
Verde Upstream of Horseshoe				x		x		x		x	
Lime Creek		x	x		x				x		
Verde below Bartlett								x			x
Frog and Gartersnake survey	Ongoing						X				
<b>Horseshoe/Verde River Aquatic Species Mitigation</b>											
Bubbling Ponds Hatchery (BPH) Improvements		X	X	X	X	?					
BPH O & M	Ongoing	-	X	X	X	X	X	X	X	X	X
Stocking RBS & other covered native fish	Ongoing	-	-	X	X	X	X	X	X	X	X
Lime Creek Barrier Construction		X	X	X							
Watershed Protection Projects	Ongoing	X	X	X	X	X	X	X	X	X	X
<b>Ft. Thomas Mitigation Property (150 acres)</b>											
Execute Conservation Easement	Completed	X	X								
Management	Ongoing		X	X	X	X	X	X	X	X	X
Purchase											2023-
Flycatcher and cuckoo monitoring <sup>3</sup>	Ongoing	X	X			X		X			X
Habitat monitoring	Ongoing	X	X			X		X			X
<b>Camp Verde or Other Area (50 acres)</b>											
Identify suitable property		X	X	X	X	X	X	X	X	X	X
Secure protection and manage											
<b>Special water supply protection projects</b>	Ongoing	X	X	X	X	X	X	X	X	X	X

<sup>1</sup> Rapid drawdown and minimize pool

<sup>2</sup> Hold reservoir high if two successive years of low storage.

<sup>3</sup>Monitoring frequency dependent upon management needs and cowbird parasitism rate.

## 9. Literature Cited

- EcoPlan Associates 2008. Southwestern willow flycatcher and yellow-billed cuckoo surveys on the Horseshoe Lake and Ft. Thomas HB Preserve study areas, Arizona. Report submitted to Salt River Project, Tempe Arizona.
- Fish and Wildlife Service. 2008. Final environmental impact statement for the incidental take permit for operations of Horseshoe and Bartlett Reservoirs. March 2008. Arizona Ecological Services Office, Phoenix, Arizona.
- Hatten, J. R. and C. E. Paradzick. 2003. A multiscaled model of southwestern willow flycatcher breeding habitat. *Journal of Wildlife Management* 67(4): 774-778.
- Salt River Project. 2008. Habitat Conservation Plan Horseshoe and Bartlett Reservoirs. Submitted to the U.S. Fish and Wildlife Service Pursuant to Section 10(A)(1)(B) of the Endangered Species Act. Salt River Project, Tempe Arizona.

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APPENDIX A

Bald Eagle Rescue and Monitoring Plan

Prepared by:  
Salt River Project  
in coordination with  
U.S. Fish and Wildlife Service and Arizona Game and Fish Department

## **Salt River Project - Horseshoe Reservoir Bald Eagle Monitoring and Rescue Protocol**

U.S. Fish and Wildlife Service (FWS) issued an Incidental Take Permit (ITP) under Section 10(a)(1)(B) of the Endangered Species Act to the Salt River Project on May 30, 2008 for operations of Horseshoe and Bartlett Reservoir (FWS 2008). The bald eagle is a covered species under the ITP. As required under the ITP and the associated Habitat Conservation Plan (HCP), SRP is obligated to develop and implement a monitoring and rescue protocol to determine if bald eagle build a nest within the conservation space<sup>1</sup> of Horseshoe Reservoir, assess if the nest would be inundated and lost due to SRP reservoir operations, and, if so, coordinate a rescue effort with wildlife agencies and develop a post-rescue mitigation strategy<sup>2</sup>. This monitoring and rescue protocol will be implemented and periodically reviewed by the SRP HCP project manager, and will remain in effect for the 50-year term of the ITP (until May 30, 2058).

This monitoring and rescue protocol is divided into five sections: 1) identification of bald eagle breeding activity within Horseshoe; 2) threat determination - potential for inundation; 3) coordination of rescue actions; 4) post-rescue management and mitigation; and 5) contact information.

### **1) Identification of Bald Eagle Breeding at Horseshoe**

The Arizona Game and Fish Department (AGFD), in cooperation with the Southwestern Bald Eagle Management Committee (SWBEMC) and funded in part by SRP under the Roosevelt Lake HCP, currently conducts a yearly Arizona bald eagle nest survey (McCarty and Jacobson 2008). The statewide effort is conducted using helicopters for winter count flights (January), monthly occupancy and reproductive (ORA) assessment flights (February to June), and nest search flights (April and May) (McCarty and Jacobson 2008). Some individual breeding areas are also accessed by boats, helicopters, and vehicles to determine nest occupancy (McCarty and Jacobson 2008).

SRP will coordinate with AGFD and the SWBEMC annually in the winter and early spring (prior to projected runoff and storage in Horseshoe) to ensure that the monitoring flights at Horseshoe will occur and to acquire post-flight results. SRP will work with AGFD to ensure that winter flights and early ORA flights include a thorough search of the reservoir pool to identify possible new nest locations. Based on the early season (i.e., January - March) information, SRP will determine the presence of eagle nests within the reservoir pool. If nesting is documented, SRP, in coordination with AGFD and FWS, will determine if additional aerial and/or on-the-ground information is necessary to determine nesting status and inform the threat assessment (see #2 below).

If during the 50 year time frame of the HCP annual surveys are discontinued, SRP will conduct (or contract for) an annual visit (aerial or on-the-ground) to determine if a nest has been built in the reservoir pool. The timing of the survey would be arranged through discussions with the agencies<sup>3</sup> and would be scheduled early in the breeding season (January – March) to identify nest sites prior to the reservoir filling. SRP would request that staff from the agencies participate in the survey. As described above, if necessary, SRP would coordinate additional aerial or on-the-ground nest inspections.

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<sup>1</sup> Conservation pool of Horseshoe Reservoir is between 1956 and 2026 ft elevation.

<sup>2</sup> At the time of permit issuance, there were no eagles nesting within the conservation space of the reservoir.

<sup>3</sup> “agencies” means both U.S. Fish and Wildlife Service and Arizona Game and Fish Department

## 2) Threat Determination – Inundation Potential

If an eagle nest is built in the conservation pool of Horseshoe, the potential for inundation and other potential forms of harm caused by water operations will be assessed<sup>4</sup>. Using existing reservoir data (sediment contours/elevations), approximate nest location, approximate nest height, proximity to river bank (stability of substrate), tree condition, and current watershed projected runoff and system storage information, SRP, in coordination with the agencies, will determine if the nest is at risk of inundation and/or if more accurate field measurements are needed. If on-the-ground field work is required to better assess the risk of inundation, SRP would conduct the work (e.g., measure the elevation of the nest tree and measure the height of the nest above ground). SRP would request that staff from the agencies participate in the field measurements. Using these data and projections, SRP, in coordination with the agencies would determine the inundation threat potential and next steps (see #3). If there is no threat of inundation, SRP, in coordination with the agencies, would assess potential impacts in future years (i.e., higher storage levels) and discuss management options (see #4).

## 3) Rescue Coordination

If an active nest is likely to be inundated and/or harmed by reservoir operations, SRP will coordinate with the agencies to determine the best course of action given the specific circumstances. These actions will include a three phased approach:

- A. To determine the immediacy of the threat, SRP will increase the frequency of evaluation of runoff-storage estimates and reservoir elevation measurements and report changes in status to the agencies. If necessary, based on known breeding status and immediacy of threat, SRP will coordinate and fund AGFD (Bald Eagle Nest Watch Program) or hire a consultant to conduct nest monitoring to track nest stage and activity (i.e., confirm adult eagle activity and track status of eggs and nestlings).
- B. In conjunction with increased monitoring, SRP will develop a detailed rescue strategy with the agencies<sup>5</sup>, and other organizations as necessary (e.g., wildlife rehabilitation organization)<sup>6</sup> based on the specific nest information and status. During this phase logistical preparations for a rescue operation will be made. Rescue options may include, but are not limited to the temporary replacement of the eggs with surrogate eggs, removal of nestlings, and hand rearing of the eggs/nestlings. Regulatory coverage of the rescue, transport, relocation, and/or fostering of eggs and nestlings would be addressed during this planning phase<sup>7</sup>.
- C. The rescue plan will be implemented based on the available hydrological and biological information. SRP will coordinate the rescue operation with the agencies, and other organizations as necessary. SRP will provide logistical support (e.g., helicopter) and funding

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<sup>4</sup> Other forms of impacts could include abandonment due to proximity of water level to the nest, and/or saturation of roots by stored water and subsequent tree fall.

<sup>5</sup> Currently, AGFD issues an annual Bald Eagle Emergency Protocol and maintains a Bald Eagle Rescue Team with expertise in handling, rescuing, and relocating eagle eggs and nestling.

<sup>6</sup> If agency programs do not exist that can perform the required rescue and rehabilitation work, SRP would identify and contact, prior to the breeding season, individuals and organizations that could support a rescue and relocation effort.

<sup>7</sup> For example, if AGFD performs the rescue any take associated with the action could be covered by their ESA Section 6 permit; ESA coverage for actions by wildlife rehabilitation organization will be addressed through their individual 10(a)(1)(A) permits.

assistance to the agencies and organizations for costs incurred for pre-rescue monitoring of the nest, rescue, relocation, and/or holding and caring for the eggs/nestlings while in captivity<sup>8</sup>.

#### 4) Post-Rescue Management and Mitigation

Following rescue and/or when the direct threat of inundation has abated, SRP will coordinate with the agencies to evaluate this protocol and coordination efforts, the outcome of the rescue action, and determine the best course of action to avoid reoccurring future impacts to the same nest. If rescue was necessary and the nest was lost, SRP is obligated to construct and maintain an alternative nest platform near Horseshoe - SRP would discuss and evaluate with the agencies this mitigation measure at that time. The need and outcome of a rescue and any future mitigation plans will be reported in HCP annual report to the FWS.

#### 5) Contact Information

Currently, AGFD prepares an annual Bald Eagle Emergency Protocol, which is distributed to various natural resource agencies prior to the onset of the eagle breeding season. The Emergency Protocol lists the current contact information for the Bald Eagle Rescue Team and other key agency contacts. SRP will request the Emergency Protocol from AGFD and maintain a copy of this with SRP's rescue protocol. If the Emergency Protocol is not available, SRP will contact the agencies directly for updated information. The contact information will be listed in the HCP annual report to the FWS. The current contacts are:

Agency	Contacts	
	Primary	Secondary
SRP	<u>Charles Paradzick</u> Horseshoe-Bartlett Reservoir Habitat Conservation Plan Coordinator Wk: (602) 236-2724 Cell: (602) 796-3974 Email: Charles.paradzick@srpnet.com	<u>Ray Hedrick</u> Manager, Siting and Studies Division Wk: (602) 236-2828 Cell: (602) 881-9600 Email: Ray.Hedrick@srpnet.com
FWS	<u>Greg Beatty</u> Biologist Wk: (602) 242-0210 Email: greg_beatty@fws.gov	Jeff Servoss Biologist Wk: (602) 242-0210 Email: jeff_servoss@fws.gov
AGFD	<u>Ken Jacobson</u> Bald Eagle Management Coordinator Wk: (623) 236-7575 Cell: (928) 941-0170 Radio Rm: (623) 236-7201 Email: kjacobson@azgfd.gov	<u>Jamey Driscoll</u> Birds Program Manager Wk: (623) 236-7581 Cell: (623) 261-3468 Radio Rm: (623) 236-7201 Email: jdriscoll@azgfd.gov

<sup>8</sup> SRP, through its Avian Protection Program, maintains a contract with wildlife rehabilitation centers (e.g., Liberty Wildlife) for such activities.

Agency	Contacts	
	Primary	Secondary
Liberty Wildlife	<u>Jan Miller</u> Animal Care Coordinator 480-998-0230 <a href="mailto:janm@libertywildlife.org">janm@libertywildlife.org</a>	
Phoenix Zoo	<u>Main Zoo Phone Number</u> (602) 273-1341	

### **Literature Cited**

- McCarty, K.M. and K.V. Jacobson. 2008. Arizona bald eagle management program 2008 summary report. Nongame and Endangered Wildlife Program Technical Report 252. Arizona Game and Fish Department, Phoenix, Arizona.
- FWS (U.S. Fish and Wildlife Service). 2008. Environmental impact statement for issuance of a Endangered Species Act Section 10(a)(1)(B) Permit to Salt River Project for incidental take of threatened and endangered species associated with operation of Horseshoe and Bartlett Reservoirs. March 2008.

Salt River Project – Horseshoe-Bartlett Habitat Conservation Plan  
2009 Annual Implementation Report

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APPENDIX B

ARIZONA GAME AND FISH DEPARTMENT REPORT

Horseshoe Reservoir HCP Fish Monitoring

December 31, 2009



# **Horseshoe Reservoir HCP Fish Monitoring**

**Final Report to Salt River Project – December 31, 2009**

William Stewart  
Research Branch  
Arizona Game and Fish  
5000 W. Carefree Highway  
Phoenix, AZ 85086

Collection Agreement between Arizona Game and Fish Department and Salt River  
Project

### ***Arizona Game and Fish Department Mission***

To conserve, enhance, and restore Arizona's diverse wildlife resources and habitats through aggressive protection and management programs, and to provide wildlife resources and safe watercraft and off-highway vehicle recreation for the enjoyment, appreciation, and use by present and future generations.

*The Arizona Game and Fish Department prohibits discrimination on the basis of race, color, sex, national origin, age, or disability in its programs and activities. If anyone believes they have been discriminated against in any of AGFD's programs or activities, including its employment practices, the individual may file a complaint alleging discrimination directly with AGFD Deputy Director, 5000 W. Carefree Hwy., Phoenix, AZ 85086, (623) 236-7290 or U.S. Fish and Wildlife Service, 4040 N. Fairfax Dr., Ste. 130, Arlington, VA 22203.*

*Persons with a disability may request a reasonable accommodation, such as a sign language interpreter, or this document in an alternative format, by contacting the AGFD Deputy Director, 5000 W. Carefree Hwy., Phoenix, AZ 85086, (623) 236-7290, or by calling TTY at 1-800-367-8939. Requests should be made as early as possible to allow sufficient time to arrange for accommodation.*

#### **Suggested Citation:**

Stewart, W. 2009. Horseshoe Reservoir HCP 2009 fish monitoring. Draft report to Salt River Project, Phoenix, Arizona. Arizona Game and Fish Department, Research Branch, Phoenix. 15 Pages.



#### **Acknowledgements**

Thanks to Arizona Game and Fish Department personnel Lorraine Avenetti, Amberle Vasey, Kyle Tulisiak, Curtis Gill, Andrea Salute, Tony Lopez, Cassandra Smith, Jamie Evans, and Justin Winter who helped conduct the fish surveys. Also a special thanks to Tony Robinson of Arizona Game and Fish Department and Chuck Paradzick of Salt River Project who provided valuable feedback and comments on the first draft of this report.

## Abstract

This report summarizes fish sampling in Horseshoe Reservoir by Arizona Game and Fish Department (AZGFD) in behalf of a long-term Salt River Project (SRP) Habitat Conservation Plan (HCP) for Bartlett and Horseshoe Reservoirs. The sampling period was June 8 through June 9, 2009. Standardized sampling protocols for electrofishing, seining, and setting minnow traps as established by AZGFD were implemented. During the survey period the reservoir was at minimum pool allowing for the entire shoreline and cross-reservoir transects to be surveyed by electrofishing. Fish greater than 150 mm TL were marked with either a spaghetti tag or by clipping the dorsal spine. A total of 4,011 fish were captured that represented eight different nonnative species with the vast majority of them (83%) being goldfish (*Carassius auratus*). Between the two tagging methods 1,140 fish were successfully marked to monitor future movement upstream and downstream from Horseshoe Reservoir. The timing of this survey was unique because the reservoir reached minimum pool just days before the survey began allowing little time for fish to disperse resulting in high catch rates. Due to the shallow depths of the reservoir gill nets were not set. Perhaps future surveys should be conducted when reservoir levels are above minimum pool enabling the use of greater variety of gear types that might better represent the fish community in the reservoir.

## Introduction

Salt River Project (SRP) developed the Habitat Conservation Plan (HCP) for Bartlett and Horseshoe Reservoirs to implement measures to minimize and mitigate incidental take of 16 covered bird, fish, frog, and snake species to the maximum extent

practicable, and to ensure that incidental take will not appreciably reduce the likelihood of survival and recovery of these species in the wild (USFWS, 2008). The U.S. Fish and Wildlife Service Record of Decision for the HCP documented the decision to implement Alternate 2, Optimum Operation of Horseshoe and Bartlett Reservoirs and Dams (the preferred alternative). The objectives of Alternative 2 were to operate the reservoir to support stands of tall dense riparian vegetation at the upper end of Horseshoe and to manage Horseshoe water levels to minimize impacts to covered native fish, frog, and gartersnake species; and to benefit the razorback sucker. The background information presented herein was taken from the HCP (USFWS, 2008).

The overall goal of the minimization and mitigation measures for aquatic native species is to offset the future direct impacts to native fish caused from stranding and passage through the outlet works, and the indirect impacts to the native fish, frog, and gartersnake communities caused by operation of Horseshoe and Bartlett dams resulting in a small (relative to baseline) increase of nonnative fish produced in the reservoirs, which may compete with or prey upon aquatic native species. The primary means to offset the direct impacts of operation and the indirect impact of additional predation and competition by nonnative fish on covered native fish will be:

1. Minimizing or reducing nonnative fish reproduction, recruitment, and movement;
2. Augmenting/increasing native fish populations, distribution, and relative abundance; and
3. Maintaining water flows in the Verde River above Horseshoe.

Monitoring is necessary to determine the effectiveness of

minimization and mitigation measures mentioned above and make subsequent adaptive management decisions. Outcomes from monitoring efforts could result in actions described in the collection agreement between Arizona Game and Fish Department (AZGFD) and Salt River Project (AZGFD and SRP, 2009). During the first 5 years of implementation the emphasis of monitoring will be to tag nonnative fish in Horseshoe Reservoir and survey for fish upstream and downstream in the Verde River to detect movements of marked nonnative fish out of the reservoir, and to assess native fish populations (composition and age-class structure) in the reservoir and Verde River in the immediate vicinity. Nonnative fish captured in the reservoir that are large enough will be marked to provide data on survivorship and movement patterns to help assess the effectiveness of the minimization and mitigation measures.

Fish movements in streams and reservoirs have been well studied. Recent surveys by AZGFD (Robinson 2007) in Horseshoe Reservoir found ten species of nonnative fishes (common carp *Cyprinus carpio*, goldfish *Carassius auratus*, red shiner *Cyprinella lutrensis*, largemouth bass *Micropterus salmoides*, green sunfish *Lepomis cyanellus*, bluegill *Lepomis macrochirus*, channel catfish *Ictalurus punctatus*, flathead catfish *Pylodictis olivaris*, yellow bullhead *Ameiurus natalis*, and mosquitofish *Gambusia affinis*), and three native fish species (razorback suckers *Xyrauchen texanus*, Colorado pikeminnow *Ptychocheilus lucius*, and Sonora sucker *Catostomus insignis*). Some of the nonnative fish species have been reported to move long distances. For instance, common carp have been reported to make long distance movements in the Murray-Darling Basin in Australia (Jones et al. 2009). Carp ranging in size from 400 to 612 mm TL

were found to move up to 127 km upstream and nearly 257 km downstream from where there were originally captured (Jones et al 2009). In Georgia, there are instances where largemouth bass were found to move upstream nearly 70 km in the Savannah River (Paller et al 2005). Flathead catfish in the Missouri River had a maximum dispersal of 161 km (Travnichek 2004).

The objective of this survey was to estimate species composition and age-class structure of fishes in Horseshoe Reservoir and mark nonnative fish to detect future movement out of Horseshoe Reservoir. The plan was to sample the reservoir sometime during May-June 2009.

### Study Site

The overall study area covered by the HCP is the Verde River from the Salt River confluence upstream, including both Horseshoe and Bartlett Reservoirs, to Allen Ditch Diversion near Clarkdale, Arizona. With respect to fish monitoring, focus will be on Horseshoe Reservoir and the Verde River upstream to Beasley Flats near Camp Verde, and the portion of the Verde River downstream of Bartlett Reservoir to the Fort McDowell Indian Reservation Boundary. During 2009, sampling was restricted to Horseshoe Reservoir. At full pool, Horseshoe Reservoir extends upstream 16.1 km from Horseshoe Dam and has a surface area of approximately 1200 ha. A little over one week prior to this study period however, the reservoir dropped to minimum pool (Figure 1). During the survey there was 1.54 km of shoreline with a surface area of 4.86 ha and maximum depth was less than one meter and the upper end of the reservoir was approximately 1 km downstream of the boat ramp (Figure 2).

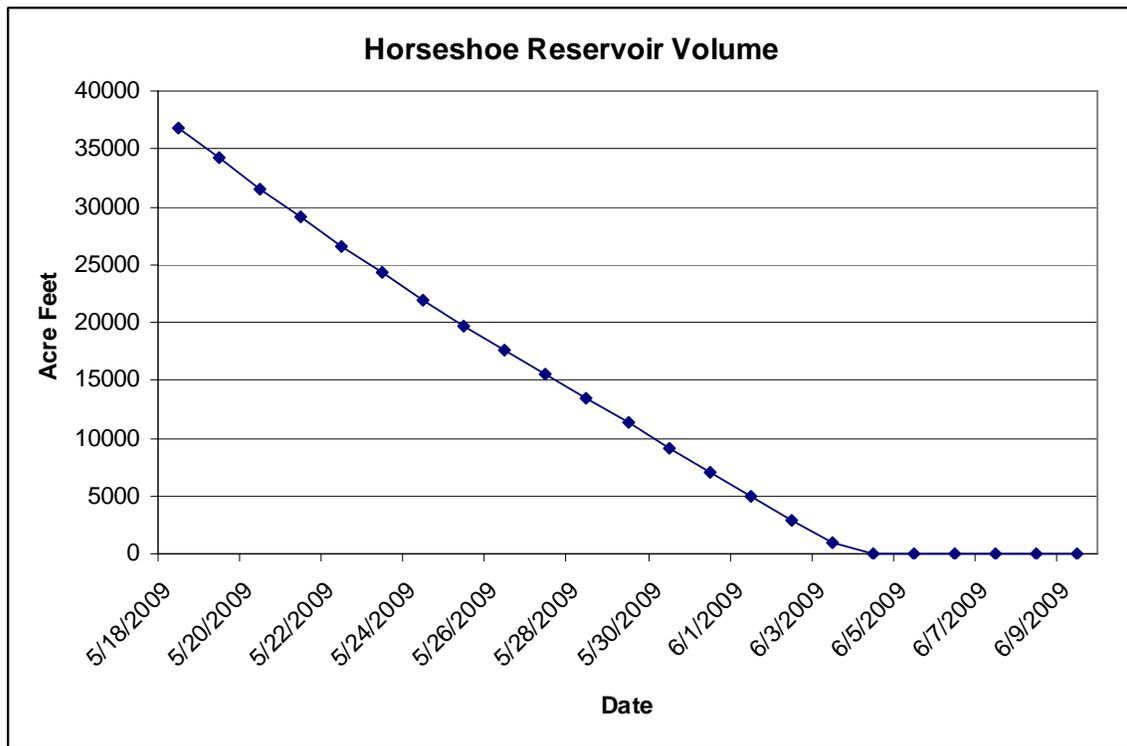


Figure 1. Volume (AF) of Horseshoe Reservoir from May 18, 2009 (28% full) to June 9, 2009 (< 1% full).



Figure 2. Image of Horseshoe Reservoir at full pool overlaid by actual size of reservoir during June 8-9, 2009.

Of the fish species recently reported (Robinson 2007) from Horseshoe Reservoir, common carp and goldfish tend to be the most numerous species (e.g., ~ 85% of catch during 2005 and 2006), with the other species being far less abundant. Black crappie *Pomoxis nigromaculatus*, walleye *Sander vitreus*, and redear sunfish *Lepomis microlophus* were found in Horseshoe Reservoir between 1987 and 1999, but none have been captured since 1999 (Robinson 2007).

## Methods

Sampling methods included electrofishing, seining, and minnow traps and were conducted based on the Arizona Game and Fish standardized sampling protocol (AZGFD 2004). Because there was only 1.54 km of shoreline at the level of the reservoir when we sampled on June 8-9, 2009, electrofishing effort was divided into three areas. The first was the reach of river from the boat ramp to start of the reservoir, the second was the entire shoreline of the reservoir, and the third were transects across the reservoir (Figure 3).



Figure 3. Areas electrofished in Horseshoe Reservoir during June 9, 2009 surveys. Area 1 was the Verde River, Area 2 was the shoreline of Horseshoe Reservoir, and Area 3 were transects across Horseshoe Reservoir.

Within the first area so many fish were captured that shocking times were reduced from the standard protocol of 900 seconds to 500 seconds to minimize crowding in the live well. Two electrofishing canoes were used for this survey each with a 30 cm diameter spherical cathode suspended from a bow mounted boom and 12 x 334 cm anodize aluminum strips that were permanently affixed to each side of the canoe such that they would be mostly submerged when the canoe was loaded. One canoe outfitted with a Smith Root 2.5 GPP electrofisher and was used to shock the stretch of the river and transects across the reservoir. The second canoe was outfitted with a Smith Root 5.0 GPP electrofisher and was used to shock the reservoir shoreline. Output for both canoe electro-fishers ranged from four to seven amps. Two 1.8 m tall and 3 mm mesh straight seines, one 3.6 m long and the other 8.2 m long were used to seine suitable backwaters in an effort to catch smaller fish. Ten baited minnow traps were set in reservoir overnight. Gill netting was not used because water levels were considered to be too low to effectively sample. All captured fish were identified to species, measured (mm TL), weighed (g), and with the exception of common carp any species greater than 150 mm were tagged with either a 1 1/2 or 2 3/8 inch red spaghetti labeled with WMRS followed by a four digit number that ranged from 3001 to 4200. Based on previous studies (Robinson 2007) spaghetti tag retention was low for common carp therefore dorsal spines were clipped on all carp. Once all 1,200 spaghetti tags were used, dorsal spines were clipped for all species greater than 150 mm.

### Analysis

Percent composition of fish was calculated for each gear type and combined for all gear types by species.

Percent composition of a particular species was calculated as:

$$\%comp_s = (s/n) \times 100$$

Where s is number of individuals of a given species and n is the total number of individuals of all species.

Electrofishing catch rate or catch per unit effort (CPUE) was calculated for each of the three areas. One electrofishing effort was defined as a 900 second time period and mean CPUE in each area was calculated as catch per 900 seconds:

$$CPUE = \frac{1}{n} \times \sum_{i=1}^n \left( \frac{C_i}{T_i} \right)$$

where  $C_i$  = catch in the  $i$ th electrofishing site,  $T_i$  = number of 900 second increments sampled in the  $i$ th transect, and  $n$  = number of transects or sites at each area.

Mean catch rates for minnow traps were calculated as follows:

$$CPUE = \frac{1}{n} \times \sum_{i=1}^n \left( \frac{C_i}{H_i} \right)$$

where  $C_i$  = number of individuals captured in the  $i$ th minnow trap,  $H_i$  = duration in hours that the  $i$ th minnow trap was set in water, and  $n$  = number of traps.

Catch rates for seines were calculated as:

$$catch_s = n_s \div (L \times W)$$

Where  $n_s$  is number of species  $s$  caught and  $(L \times W)$  is the area of the water that was seined.

Chi-square tests were used to determine differences in species percent composition and t-tests were used to determine differences in catch rates from 2006 to 2009. Electrofishing catch rates for each species were compared among

the three areas using ANOVA and Tukey's multiple comparison tests.

## Results

A total of eight electrofishing sites (two in the Verde River, three along the shoreline of the reservoir, and three transects across the reservoir), ten minnow traps, and three seine hauls (one in Verde River and two in reservoir backwater) were sampled during the two days of sampling June 8-9, 2009. A total of 4,011 fish of eight different nonnative species were captured with all gear types

(Table 1). The most dominate species captured were goldfish which comprised of 86.3% of the total catch from all gear types. Common carp (8.6%) and largemouth bass (2.8%) were the next two most common species. All other species combined to make up less than 2% of the total catch (Table 2). Percent composition of goldfish increased and common carp decreased from surveys conducted in 2006 (Table 3). The change in composition of these two species was statistically significant (chi-square;  $P < 0.001$ ).



Pushing an electrofishing canoe near pumping station in Horseshoe Reservoir.



Goldfish with spaghetti tag.



View near boat ramp of Verde River running through Horseshoe Lake bed.



View from Horseshoe Dam of electrofishing canoes.

Table 1. Total number of fish of each species captured with each gear type in Horseshoe Reservoir during June 8-9, 2009.

<b>Species</b>	<b>E-fishing N = 8</b>	<b>Minnow Traps N = 10</b>	<b>Seine N = 3</b>	<b>Totals</b>
Goldfish ( <i>Carassius auratus</i> )	1,767	1	1,691	3,459
Common Carp ( <i>Cyprinus carpio</i> )	210	4	131	345
Largemouth Bass ( <i>Micropterus salmoides</i> )	96	5	12	113
Red Shiner ( <i>Cyprinella lutrensis</i> )	36		31	67
Mosquitofish ( <i>Gambusia affinis</i> )	4		9	13
Bluegill ( <i>Lepomis macrochirus</i> )	7	1		8
Green Sunfish ( <i>Lepomis cyanellus</i> )	4			4
Channel Catfish ( <i>Ictalurus punctatus</i> )	2			2
<b>Total</b>	<b>2,126</b>	<b>11</b>	<b>1,874</b>	<b>4,011</b>

Table 2. Percent composition of fish species by each gear type in Horseshoe Reservoir from June 8-9, 2009.

<b>Species</b>	<b>E-fishing</b>	<b>Minnow Traps</b>	<b>Seine</b>	<b>Total</b>
Goldfish	83.2	9.1	90.2	86.3
Common Carp	9.8	36.4	7.0	8.6
Largemouth Bass	4.5	45.5	0.6	2.8
Red Shiner	1.7		1.7	1.7
Mosquitofish	0.2		0.5	0.3
Bluegill	0.3	9.1		0.2
Green Sunfish	0.2			0.1
Channel Catfish	0.1			<0.1

Table 3. Percent composition of fish species captured by electrofishing in Horseshoe Reservoir, 1987-2009. Data from 1987 to 2006 gathered from Robinson (2007), and those from June 8-9, 2009 during the current study.

<b>Species</b>	<b>Year</b>						
	<b>1987</b>	<b>1994</b>	<b>1998</b>	<b>1999</b>	<b>Fall 2005</b>	<b>Fall 2006</b>	<b>2009</b>
Common carp	10.7	5.2	9.2	48.1	27.6	31.6	9.8
Goldfish	0.1		2.6		72.4	63.2	83.2
Red shiner		0.3		20.4		1.6	1.7
Golden shiner	1.5						
Threadfin shad	1.0	0.5	72.6				
Channel catfish	0.1		0.5			1.0	0.1
Flathead catfish				7.4			
Largemouth bass	64.5	42.1	5.8	11.1			4.5
Smallmouth bass	1.5	15.2	0.3	5.6			
Black crappie	3.4	0.5	1.3				
Green sunfish			6.8	5.6			0.2
Bluegill	17.0	36.1	0.8	1.9			0.3
Mosquitofish						2.6	0.2
<b>Total fish</b>	<b>786</b>	<b>382</b>	<b>380</b>	<b>54</b>	<b>145</b>	<b>214</b>	<b>2,126</b>

Multiple size classes of goldfish, common carp, and largemouth bass were evident when the frequencies of 10-mm length classes were examined (Figure 4). Goldfish ranged from 41 to 248 mm TL with a mean length of 155 mm TL (Table 4), and two size classes, one 50 and 85 mm and the other 110 and 200 mm (Figure 4). Most goldfish (93%) were in the larger size class. Common

carp ranged in length from 29 to 640 mm TL with a mean of 165 mm TL, and most (59%) were less than 150 mm (Figure 4). Largemouth bass ranged from 50 to 426 mm TL, had a mean length of 104 mm TL, with only 3% were greater than 150mm (Figure 4). Too few fish of other species were captured to detect different age classes (Figure 4).

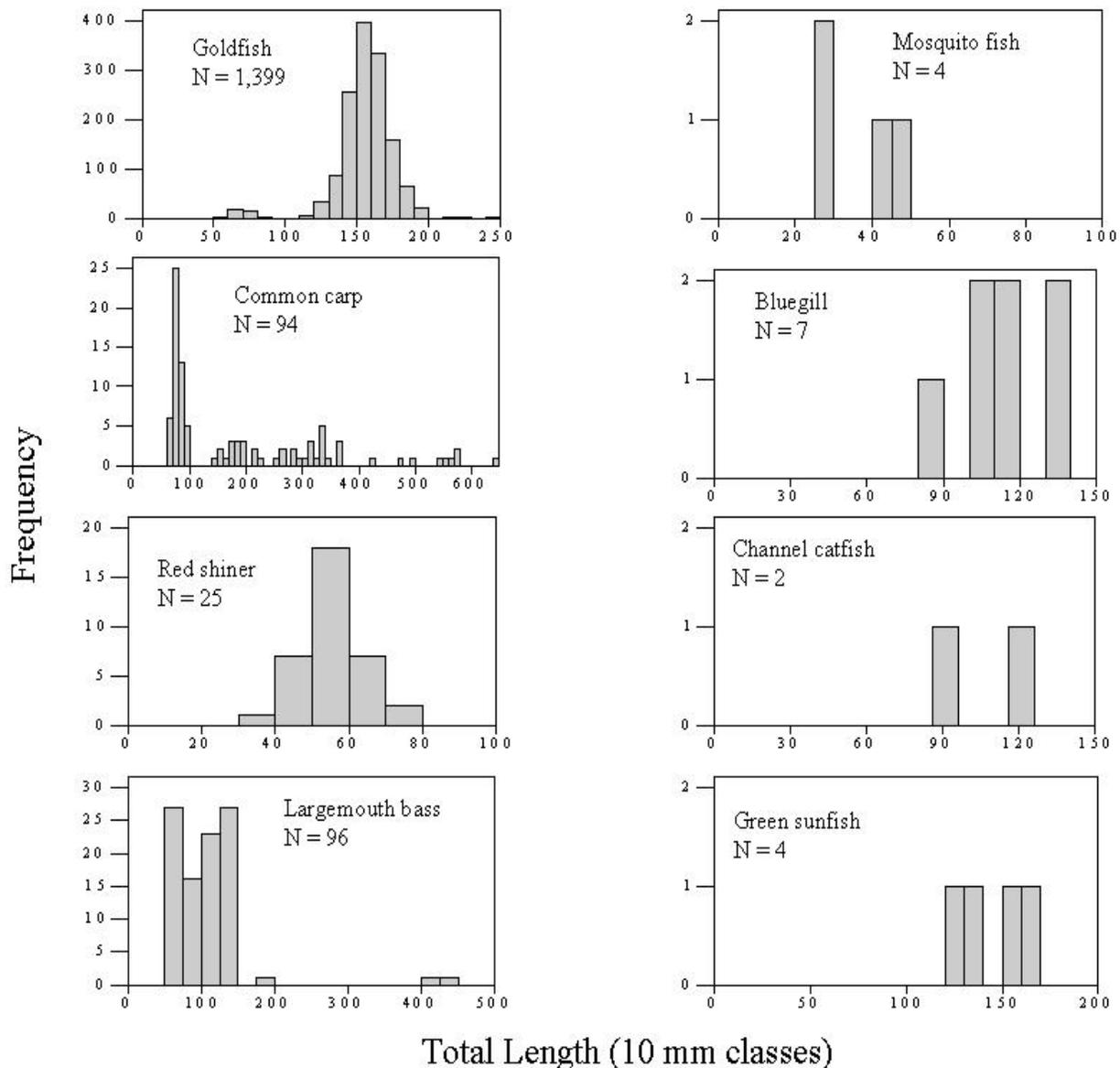


Figure 4. Length frequencies of fish species captured by electrofishing in Horseshoe Reservoir during June 8-9, 2009.

A total of 1,140 fish were marked, the vast majority of which were goldfish (1,044), and a moderate number of carp (91), but only three green sunfish and two largemouth bass (Table 4). All green sunfish, largemouth bass, and 1,027 of the goldfish were marked with spaghetti tags. All 91 common carp and the remaining 17 goldfish were fin clipped: once all tags were used, goldfish were marked in a similar fashion to carp. No fish marked during previous surveys were recaptured during June 2009. However, four fish that were marked during June 2009 were recaptured during the same sampling trip. One of the four fish was seined the day before in the Verde River reach and the three others were shocked and marked the same day of recapture.

More fish were captured by electrofishing than with the other sampling methods. Nearly as many fish were captured by seining (three hauls) as by electrofishing in only three sites. However, most of the fish caught seining were captured at one site (1,794 in one seine haul) near where the Verde River

runs into the reservoir. Most of the fish caught by seining were too small to tag. Only 11 fish were captured in 10 sets of minnow traps, most of which were largemouth bass and common carp.

With the exception of red shiner, shoreline electrofishing catch rates appear to be higher for all species, but only common carp were significantly higher when compared to river or cross-reservoir transect areas (ANOVA;  $P = 0.05$ ) (Table 5). Shoreline electro-fishing catch rates were more than 12 times higher when compared to survey data from spring 2006 (t-test;  $P = 0.05$ ). Goldfish catch rates (shoreline CPUE = 412.48; SE = 94.81) were over 16 times greater than in the spring of 2006 (CPUE = 25.00; SE = 8.11) (t-test;  $P = 0.05$ ). Catch rates for common carp (shoreline CPUE = 67.83; SE = 24.92) increased more than four times compared to spring 2006 (CPUE = 16.50; SE = 7.46) (t-test;  $P = 0.05$ ). No largemouth bass were captured by electrofishing in 2006 therefore catch rates cannot be compared.

Table 4. Total catch (N), minimum, maximum, and mean total length (mm) and number of fish tagged by tag type of species captured in Horseshoe Reservoir during June 8-9, 2009.

Species	Total N	Mean Length (mm)	Min. Length (mm)	Max. Length (mm)	Tag Type	
					Spaghetti	Dorsal Clip
Goldfish	3,459	148	41	248	1,027	17
Common Carp	345	165	29	640	0	91
Largemouth Bass	113	104	50	426	3	0
Red Shiner	67	55	33	72	0	0
Mosquitofish	13	35	22	50	0	0
Bluegill	8	113	85	135	0	0
Green Sunfish Channel	4	144	122	165	2	0
Catfish	2	108	92	124	0	0

Table 5. Catch per unit effort (SE) by gear type and area for each species captured in Horseshoe Reservoir during June 8-9, 2009. For electrofishing CPUE = number of fish captured/900 seconds electrofished, for minnow traps CPUE = number of fish captured/hour trap set, and for straight seining CPUE = num of fish/m<sup>2</sup> seined.

<b>Gear Type</b>	<b>Species</b>	<b>River</b>	<b>Lake Transects</b>	<b>Lake Shoreline</b>	<b>Total</b>
Electro-fishing	Goldfish	380.17 (210.56)	216.36 (20.70)	412.48 (94.81)	330.86 (61.14)
	Common Carp	18.44 (11.49)	1.90 (0.16)	67.83 (24.92)	30.76 (13.96)
	Red Shiner	9.19 (8.19)	11.74 (4.85)	4.44 (2.79)	8.37 (2.69)
	Mosquitofish			1.23 (1.23)	0.46 (0.46)
	Channel Catfish	1.00 (1.00)			0.25 (0.25)
	Green Sunfish			1.23 (1.23)	0.46 (0.46)
	Bluegill			2.16 (2.16)	0.381 (0.81)
	Largemouth bass	6.47 (0.48)	4.35 (1.82)	30.61 (11.71)	14.73 (60.06)
	Total	415.27 (206.74)	234.36 (25.42)	519.99 (112.32)	386.70 (71.91)
Minnow Traps	Goldfish				0.08 (0.08)
	Common Carp				0.32 (0.18)
	Largemouth bass				0.40 (0.18)
	Bluegill				0.08 (0.08)
	Total				0.88 (0.37)
Straight Seine	Goldfish				34.28 (31.61)
	Common Carp				2.77 (2.20)
	Largemouth bass				0.24 (0.24)
	Red Shiner				0.63 (0.58)
	Mosquitofish				0.26 (0.08)
	Total				38.17 (34.5)

## Discussion

Substantially more fish were captured during the June 2009 sampling compared to the numbers captured in April 2005 and March 2006. The greater numbers of fish captured in 2009 may have been because just prior to sampling the reservoir had been drawn down to minimum pool, concentrating fish in a small area and the entire reservoir was sampled. Sampling during April 2005 occurred at a time when the reservoir was near full. During March 2006 sampling occurred when the reservoir was near minimum pool level but had been near minimum pool levels (did not

exceed 3.5% full) since August 2005, so even if fish were abundant they likely had time to disperse upstream or downstream of the reservoir.

Electrofishing and gill nets were identified as, the most effective gears to capture fish in past Horseshoe Reservoir surveys (Robinson 2007). However, more fish and a greater number of species are usually captured in gill nets than by electrofishing (Robinson 2007). During June 2009 the maximum depth of the reservoir was less than one meter, so setting a 2-m tall gill net in less than a meter of water would probably have been ineffective, so gill nets were not set. However, we were able to sample

the entire reservoir by electrofishing. The water level was low enough that not only were we able to electrofish the shoreline, but we were able to sample by transecting the reservoir. It is likely that our catch was biased toward medium sized fish. While we did catch several large carp, some large carp were observed swimming away from the electrical current. Were we able to set gill nets perhaps a larger size class of carp would have been captured.

None of the 2,561 fish that were marked during the 2005-2006 surveys were captured during June 2009. An additional 1,140 fish were marked in June 2009, more than during any single survey in 2005-2006. One of the goals of the June 2009 sampling was to mark as many fish as possible. Two electrofishing canoes were used simultaneously during June 2009, which may be why more fish were captured during this survey than during any of the four 2005-2006 surveys. One of the canoes sampled the shoreline while the other was transected the reservoir so a few small areas were sampled twice, which might be the reason that three fish were recaptured the same day they were marked.

Similar to Robinson (2007) common carp and goldfish dominated the catch, indicating that they dominated the fish assemblage. The biggest difference was that goldfish made up 83.2% of the electrofishing catch whereas during 2005-2006 they were never more than 72.4% of the electrofishing catch. During electrofishing surveys in fall 2005 and spring and fall 2006 not a single largemouth bass was captured; they were captured in gill nets during these surveys. However, during the 2009 survey largemouth bass made up 4.5% of the electrofishing catch, which was a similar percentage (4.9%) in the April 2005 survey.

Common carp and goldfish are considered to be generalists who

typically favor large bodies with slow flowing water and soft sediment, but also thrive in large turbid rivers (Minckley 1973). This type of habitat is generally not favorable to largemouth bass that inhabit clearer water with good vegetation and overgrown banks (Minckley 1973). In the mid 1980's and 1990's during a relatively wet period, the reservoir would generally fill and carry-over storage occurred between years (Figure 5). Fish surveys during the 1980's and 1990's revealed that the lake was dominated by centrarchids (largemouth bass, bluegill, and black crappie). Beginning in the late 1990's with the onset of the current drought and as SRP operated reservoirs to maximize system storage. Horseshoe was emptied annually and a minimum pool was maintained for extended periods of time (Figure 5). As a result the fish community shifted from a centrarchid dominated assemblage to a cyprinid (carp and goldfish) dominated assemblage (Robinson 2007). Common carp are the most abundant large-bodied fish species in the Verde River immediately upstream from Horseshoe Reservoir; red shiner are the most abundant fish species, of any size, in this reach of the river (Robinson 2007). In the small portion of the Verde River in the Horseshoe Reservoir bed surveyed during 2009, goldfish dominated the catch; goldfish, although not the dominate species, were most abundant in this lowest reach compared to three adjacent upper reaches during the 2005-2006 surveys. Over 91% of the fish marked during the 2009 survey were goldfish, and only 8% of the fish marked were common carp, in contrast to 2005-2006 survey when most (79.3%) of the 2,561 fish marked were common carp. Goldfish typically are rare above Sheep's Bridge located 16.5 km up stream from Horseshoe Reservoir dam (Rinne 2005, Curtis Gill, Arizona Game and Fish Department, personal communication). If future Verde River

surveys also indicate that common carp are the most abundant large-bodied fish then it may be more useful to focus marking efforts on common carp as well as other large-bodied nonnative fish species commonly found upstream.

More common carp could probably be captured and marked in Horseshoe Reservoir if sampling was done when water levels are slightly above minimum pool which would enable the use of gill nets in addition to electrofishing.

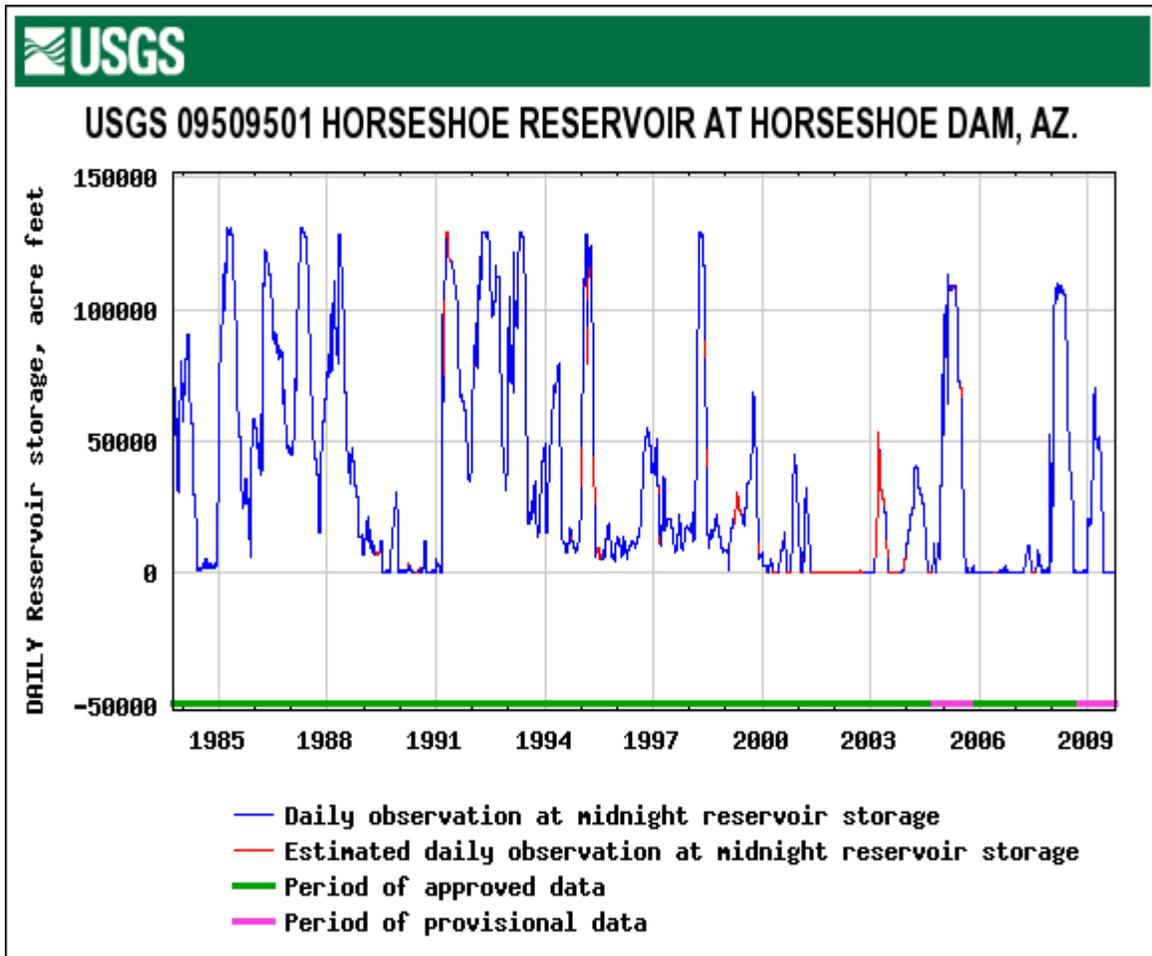


Figure 5. Daily water storage (AF) at Horseshoe Reservoir from 1984 to 2009.

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APPENDIX C

SRP AND AZTEC REPORT

Lime Creek Trip Report

September 24, 2009

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**Lime Creek Trip Report**

**TO:** Charles E. Paradzick, Salt River Project

**FROM:** Alexander B. Smith, AZTEC

**SUBJECT:** Lime Creek Barrier Assessment and Fish Survey

**DATE:** September 24, 2009

On September 4, 2009 Chuck Paradzick and Alex Smith performed a site visit to the proposed Lime Creek Fish barrier site. The primary purposes of the site visit were to reevaluate the conditions in Lime Creek, sample for fish, assess FS 1530 road conditions, and to discuss the upcoming archeology clearance of the site. EcoPlan Associates, in coordination with the Tonto National Forest, have been contracted by SRP to perform a cultural survey in early or mid-September. This information builds upon previous site assessments by Arizona Game and Fish Department and the U.S. Forest Service completed over the last decade.

During this trip the areas to be covered by the archeology clearance survey were discussed and reviewed. These areas were along FR1530 from the juncture with Horseshoe Dam Road to where it meets Lime Creek, and in Lime Creek from the juncture of FR1530 to the proposed barrier site. Two potential contractor campsites were located near where FR1530 meets Lime Creek. The preferred campsite was about 0.4 miles from where FR1530 meets Lime Creek, while the secondary campsite was about 0.67 miles from Lime Creek (Figures 1 and 2).

FR1530 was in poor condition and had significant ruts of greater than 1 foot in depth at several locations. The road, from the potential campsite to Horseshoe Dam Road, is generally passable by quads or similar vehicles in about 20 minutes. Passage would be possible, although difficult, and not recommended by a high clearance 4-wheel drive vehicle. No formal plant survey was conducted, however two Arizona cliff rose (*Purshia subintegra*) were detected at the edge of the road (Figure 3). These plants should likely be either flagged or demarcated in some manner to prevent inadvertent damage.

The general stream conditions on this visit were significantly drier than in previous visits. The reach of Lime Creek from FR1530 to 0.75 miles upstream of the barrier site lacked flowing or standing water except for one pool about 0.35 miles downstream of the barrier site. Although there was generally no surface water present, there were infrequent patches of moist sand at or slightly below the surface. The creek in the area of the barrier site lacked surface water. Pools upstream and downstream of the barrier site showed signs of recent sediment deposition; however the bedrock at the barrier site was still exposed and bedrock was exposed downstream of the barrier, which would form the toe or apron once the barrier was built.

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The one remaining pool of water (12S 429411, 3761289) was about 25 feet long and up to 10 feet wide (Figure 4). We used dip net sampling to determine that the pool contained a significant number of longfin dace. Single dips caught between a few to over 40 longfin dace. No other native or exotic fish (or amphibians) were captured or observed. There were a few dried remnants of crayfish in the vicinity of this pool. We observed no evidence of crayfish at or upstream of the barrier site.

During a June 2006 site visit there was a ~3 foot natural barrier about 50 yards upstream of the potential barrier site. On this visit, the natural barrier appeared to not be in the same configuration as it was in 2006. The minimum drop in this area was closer to two feet, however on this visit there was more than one drop in this area.

Attachments

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Figure 1. Preferred campsite



Figure 2. Secondary campsite



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Figure 3. Arizona cliff rose at edge of road.



Figure 4. Extant pool.



Figure 5. Location of barrier site (Photo taken on **May 22, 2006**)



Figure 6. Location of barrier site (Photo taken on **September 4, 2009**)



APPENDIX D

ECOPLAN ASSOCIATES REPORT

Southwestern willow flycatcher and yellow-billed cuckoo surveys  
along the Gila River at Fort Thomas, Arizona: 2009 summary report

**[REPORT REMOVED]**

**[Locations of endangered species are considered confidential by the U.S. Fish and Wildlife Service and therefore are omitted from this report. Management agencies requiring this information can contact SRP or the Arizona Ecological Services Office of the U.S. Fish and Wildlife Service to receive this information]**

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APPENDIX E

U.S. FOREST SERVICE, TONTO NATIONAL FOREST  
LIME CREEK FISH BARRIER SPECIAL USE PERMIT  
SCOPING LETTER



United States  
Department of  
Agriculture

Forest  
Service

Cave Creek  
Ranger  
District

40202 N. Cave Creek Rd.  
Scottsdale, AZ 85262  
Phone: 480.595.3300  
Fax: 480.595.3346

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File Code: 2670/2610

Date: May 18, 2009

Dear Interested Party:

The Cave Creek District of the Tonto National Forest is proposing to issue Salt River Project (SRP) a special-use permit allowing SRP to construct and maintain a concrete fish barrier in Lime Creek as is consistent with the Tonto National Forest Land Management Plan (1985, as amended). An Environmental Assessment (EA) will be prepared as part of this planning process. Decisions resulting from this analysis will address actions needed to issue a special-use permit to maintain or achieve desired resource conditions on the Cave Creek District.

Please review the proposed action for the Lime Creek Fish Barrier Project special-use permit. If you have information that would contribute to a decision regarding this action, please send your comments to Todd Willard, Wildlife & Fishery Staff Officer in writing by June 17, 2009. The information you provide will help identify issues, determine if there might be any significant impacts, and will help in the development of alternatives to address issues identified for this action. The alternatives, along with the analyses and effects, will be documented in the EA.

## **Background**

The proposed Lime Creek Fish barrier is an obligation of an Incidental Take Permit (ITP) issued on May 30, 2008, to SRP by the U.S. Fish and Wildlife Service (FWS) under Section 10(a)(1)(B) of the Endangered Species Act for continued operation of Horseshoe and Bartlett Reservoirs. The ITP and the accompanying Horseshoe and Bartlett Reservoirs Habitat Conservation Plan (HCP) identified the mitigation measures SRP will implement to minimize the impacts to threatened and endangered species and other sensitive riparian and aquatic species in the Verde River watershed. To protect a population of native fish and frogs from nonnative fish that could move from Horseshoe Reservoir into sensitive aquatic habitat in Lime Creek, the HCP included the construction and maintenance of a fish barrier for the term (50 years) of the ITP. A Record of Decision for the Environmental Impact Statement documenting the FWS decision to issue the ITP, which included the fish barrier as a mitigation measure, became effective on June 13, 2008. This scoping letter addresses the proposed issuance of a special-use permit by the U.S. Forest Service to SRP and the effects of SRP's construction and maintenance of the proposed fish barrier.

## **Purpose and Need for Action**

The purpose and need of this EA is to document existing conditions in the Lime Creek area and the expected effects of the Lime Creek Fish Barrier special-use permit and how this action will contribute to desired conditions documented in the Tonto National Forest Land Management Plan (LMP, 1985 as amended) and enable SRP to comply with the requirements of the ITP and HCP.



## **Proposed Action**

Under the proposed action the Tonto National Forest would issue a special-use permit to SRP, SRP would construct a concrete fish barrier in Lime Creek, SRP would monitor its effectiveness, and SRP would maintain the barrier.

The proposed location of the fish barrier is approximately 2 miles upstream of Horseshoe Reservoir in Lime Creek. Lime Creek is a small stream with perennial flow in the upper portions (upstream of the proposed barrier site) and intermittent flow in the lower reaches (near the reservoir). A fish barrier at this location would protect approximately 4 miles of native fish and frog habitat, including existing populations of longfin dace, Gila topminnow, and lowland leopard frogs. Nonnative fish, including green sunfish and goldfish, have been documented in Lime Creek below the proposed barrier site. The barrier will prevent the upstream movement of these species as well as crayfish, thus further aiding native aquatic species.

The proposed fish barrier would be constructed in an area of exposed bedrock at a height which provided for a 4 foot drop on the downstream side. The barrier would be anchored into the existing bedrock and constructed of concrete and reinforcing steel bars. The barrier would be constructed with concrete colored to match native exposed bedrock. To minimize the area disturbed by construction activities the proposed plan calls for materials and equipment to be flown or packed in to the site.

## **Decision to be Made**

The Cave Creek District Ranger is the responsible official for this project and will decide whether to issue SRP a special-use permit as described in the proposed action, any of the alternatives to the proposed action, or to continue with current management.

Implementation of Lime Creek Fish Barrier special-use permit would immediately follow the decision and close of the appeal period.

## **Scoping Input Needed**

Written comments on this scoping letter will be accepted during a 30-day comment period, ending on June 17, 2009. Please send all comments to:

USDA Forest Service  
Cave Creek Ranger District  
ATTN: Todd Willard, Project Leader  
40202 N. Cave Creek Road  
Scottsdale, AZ, 85262

or by e-mail to: [comments-southwestern-tonto-cave-creek@fs.fed.us](mailto:comments-southwestern-tonto-cave-creek@fs.fed.us)

Please share any specific concerns and/or alternatives that you feel need to be considered within the context of this proposed action. Make your comments as concise as you can and address the proposed action specifically.

Comments received in response to this solicitation, including names and addresses of those who comment, will be considered part of the public record of this analysis and will be included in the final project record. Pursuant to 7 CFR 1.27 (d), any person may request the agency to withhold a submission from the public record by showing how the Freedom of Information Act (FOIA) permits such confidentiality.

If you do not have comments at this time, but would like to be informed of this analysis as it progresses, please let us know. Those who do not respond to this request will be removed from future mailings regarding this project.

If you have any questions concerning this process, please contact Todd Willard at the Cave Creek Ranger District, Tonto National Forest at (480)595-3300.

Sincerely,

COLLEEN PELLE MADRID  
District Ranger

cc: Robert Calamusso, Charles Paradzick