

Horseshoe and Bartlett Reservoirs Habitat Conservation Plan Annual Report 2017



PREPARED FOR:

U.S. Fish and Wildlife Service
Arizona Ecological Services Field Office
9828 North 31st Avenue #C3
Phoenix, Arizona 85051-2517

PREPARED BY:

*Salt River Project
Environmental, Management, Policy & Compliance
PAB 352
P.O. Box 52025
Phoenix, Arizona 85072-2025*

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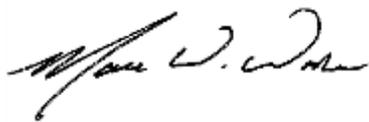
APPENDICES

Appendix A. Southwestern willow flycatcher and yellow-billed cuckoo surveys on the Horseshoe Reservoir study area, Arizona, 2017.¹

¹Locations of endangered species are sensitive data considered confidential by U.S. Fish and Wildlife Service.

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 25, 2018

Marc W. Wicke
Senior Scientist
Biological and Cultural Resource Services
Environmental Services Department
Salt River Project

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 (*Lithobates 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 the FWS, City of Phoenix, Arizona Game and Fish Department (AGFD), and U.S. Forest Service (USFS) 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 of the following year.

Actions: SRP submits this report to the FWS, City of Phoenix, AGFD, and USFS to fulfill the annual reporting requirement. The report covers all activities relating to the H-B HCP from November 1, 2016 through October 31, 2017, 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 for the 2017 water year (October 2016–September 2017).

Summary: A wet winter and continued maintenance projects on the Verde system reservoirs had the greatest influence on the reservoirs in Water Year 2017. Through this water year, the Salt-Verde watershed recorded an average precipitation accumulation of 20.33 inches (112

percent of normal) with the majority of that falling during the core winter months, and the SRP reservoir system received approximately 1,237,542 acre-feet of inflow (137% of median).

In general, El Niño and La Niña conditions can have a significant influence on Arizona's weather that is primarily observed during the cool season. El Niño conditions (warmer than normal sea surface temperatures in the equatorial eastern Pacific Ocean) are often associated with wetter than normal weather during the core winter months whereas La Niña conditions (cooler than normal sea surface temperatures in the equatorial eastern Pacific Ocean) often lead to dryer than normal weather through these months. Sea surface temperatures in the equatorial Pacific were in a weak La Nina phase of the El Nino/Southern Oscillation (ENSO) at the beginning of Water Year 2017 though most forecasts suggested a trend toward more neutral ENSO conditions was likely during the late fall and winter months.

This was the case as warming sea surface temperatures across the equatorial Eastern Pacific Ocean indicating a weakening trend in La Nina conditions were observed during this portion of the water year and may have played a role in the wet series of storm systems that affected Arizona during the core winter months. Although the series of winter storms failed to carry-over into early spring, a normally timed onset of the monsoon in early July preceded several intense monsoon bursts that helped produce summer rainfall accumulations on the Salt-Verde watersheds that were 100% of normal.

Precipitation: An average accumulation of 20.33" of precipitation was recorded across the Salt-Verde Watershed during Water Year 2017 which is 112% of normal. Near normal precipitation during the fall was followed by several productive storm systems passing from mid-December through February which provided the bulk of the water year's total accumulation. After this persistently unsettled period, the typically dry spring period started nearly a month early and included most of March before the onset of the monsoon in early July led to an average watershed accumulation for the summer months that very nearly equaled the normal value.

The chart below depicts the accumulated daily average precipitation observed on the Salt-Verde Watershed for Water Year 2017 (solid green) in comparison to that from Water Year 2016 (dashed green) and the long-term normal accumulation (solid red). Watershed average totals for each season through Water Year 2017 are included on the chart as are deficits (surpluses) with respect to the normal average accumulation for those months in red (blue). See Figure 1.

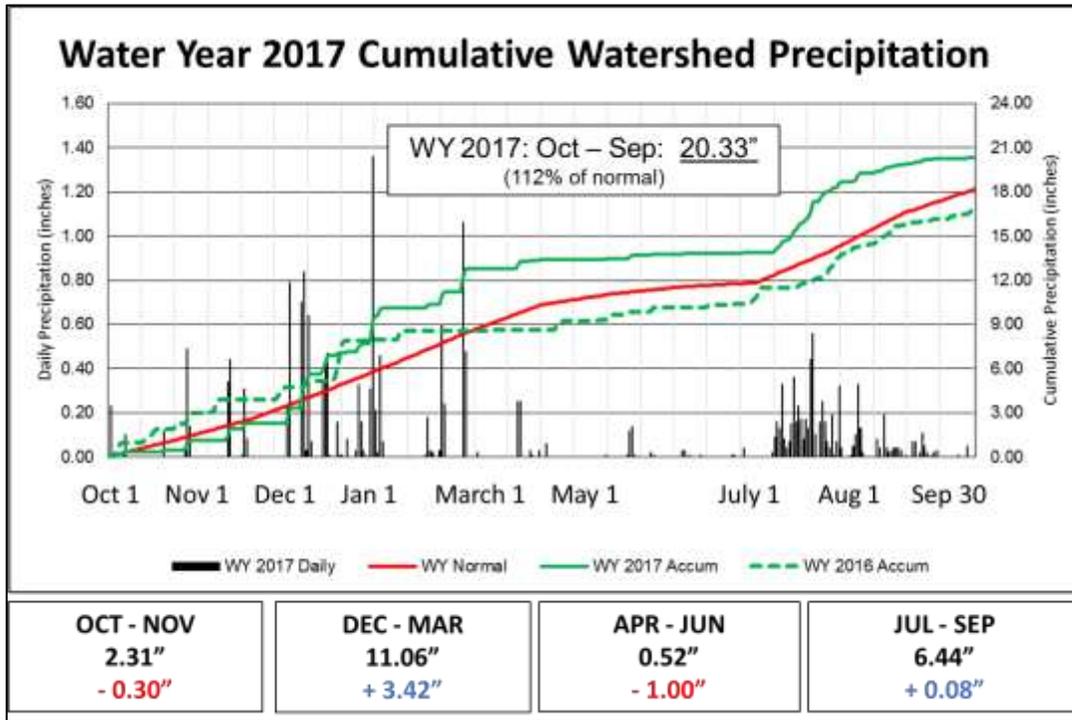


Figure 1: Water Year 2017 Precipitation Graph for the Salt-Verde Watershed.

Water Year 2017: These same seasonal totals for average accumulated precipitation across the Salt-Verde Watershed from Water Year 2017 are compared to normal values in the table below. The precipitation deficit accrued during the relatively “dry” fall and spring months was exceeded by the surplus occurring during the winter which was complimented by a normal summer total.

Table 1: Average Salt-Verde Seasonal Watershed Precipitation. In inches and in percent of the 1981-2010 normal

	OCT-NOV 2016	DEC-MAR 2016-17	APR-JUN 2017	JUL-SEP 2017
Salt + Verde	2.31	11.06	0.52	6.44
<i>% of normal</i>	89%	145%	34%	101%
Normal (1981-2010)	2.61	7.64	1.52	6.36

The average accumulated precipitation across the Salt-Verde Watershed during Water Year 2017 was the greatest of the past five water years, and this water year’s total exceeds Water Year 2016’s total of 16.97” by 3.36”, Water Year 2015’s total of 17.08” by 3.25”, Water Year 2014’s total of 16.41” by 3.92” and Water Year 2013’s total of 17.37” by 2.96”.

Reservoir Status: Arizona depends on wet winters to reverse drought conditions and this winter helped to relieve the previous six consecutive year dry streak. The 2011 – 2016 winter seasons rank as the lowest consecutive six water year period on record. The 2017 winter precipitation (December-March) ranked as the 15th wettest such period with an average accumulation of 11.06 inches across the Salt and Verde watershed. As a result, the 2017

winter produced 970,440 acre-feet of run-off from January through May which is 182% of median. This winter represents the first winter since 2010 with above median runoff and ranks as the 32nd highest winter runoff season. Runoff from the monsoon (July-September) produced about 97,780 acre-feet which is 91% of median. While the precipitation during the monsoon was 101% of normal, the subsequent monsoon runoff was still slightly below normal. However, runoff generated during the monsoon typically has little impact on SRP's total storage. Total runoff for water year 2017 was approximately 1,237,542 acre-feet (See Figure 2) which is 658,542 acre-feet more than what was received during water year 2016.

The groundwater pumping target for calendar year 2017 was reduced in anticipation of above median runoff based on weather and watershed conditions. The pumping target was reduced from 250,000 acre feet to 134,000 acre feet. The runoff resulted in higher reservoir levels as of May 1, 2017. The reservoir system total storage capacity started at 47% of capacity and finished at 65% during water year 2017 as a result of above median runoff. Roosevelt started the water year at 35% of capacity, reached a high of 71% of capacity on May 1, 2017, and ended the year at 59% of capacity. On the Verde system, Bartlett and Horseshoe reservoirs started the water year at 45% of capacity and ended at 59%. The Verde system reservoirs reached near capacity (>90%) by early February 2017 necessitating additional releases from February 10 through March 15, 2017. A total of 109,034 acre-feet was spilled at Granite Reef Dam during the winter season with the majority resulting from inflows on the Verde system exceeding reservoir capacity.

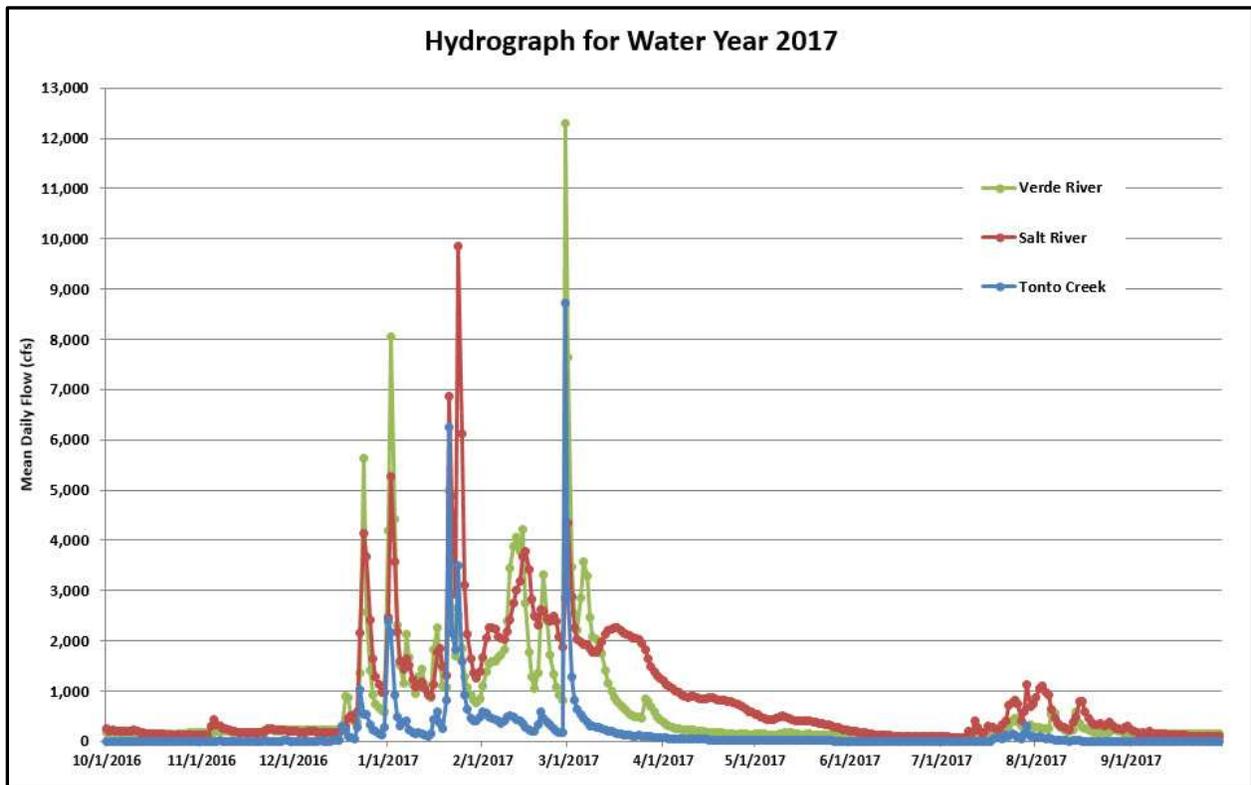


Figure 2: Verde River, Salt River, and Tonto Creek 2017 Water Year Hydrograph. Data from USGS and are preliminary

Reservoir Operations: Wet winter weather from late December 2016 through mid-March 2017 along with maintenance projects had the greatest influence on reservoir operations this water year. Typical operations call for the water order to be on the Verde reservoir system starting in October for operation during winter runoff season and then switched back to the Salt reservoir

system in May leaving Bartlett Dam release at minimum (110 cfs). Water stored behind Horseshoe Dam is also typically moved as soon as possible downstream to Bartlett Reservoir to reduce the amount of loss from seepage and evaporation, and meet H-B HCP objectives. The water order may be switched sooner depending on the winter runoff.

Verde Operations: At the beginning of water year 2017, Horseshoe and Bartlett were at elevations 1956.20 ft. (1%) and 1778.48 ft. (72%), respectively with a combined storage of almost 130,000 acre-feet. The fall 2016 seasonal transition to the Verde reservoir system was completed on October 22, 2016 when Stewart Mountain Dam release was returned to minimum flow (8 cfs) and Bartlett Dam release was increased to meet water order. River Outlet Works (ROW) valve replacement project at Horseshoe Dam was completed during the previous water year with the installation of a low flow cone valve (up to 370 cfs) and large jet valve (up to 1500 cfs). Manual control of the Horseshoe ROW valves began operation during water 2016 and remote control of the new Horseshoe ROW valves began on January 23, 2017.

The winter runoff (January-May) on the Verde produced approximately 367,000 acre feet which is 206% of median and resulted in Bartlett and Horseshoe reservoirs reaching capacity and spilling excess runoff. In early February 2017, both Horseshoe and Bartlett reservoirs began to reach near capacity at elevations of 2023 ft. (94%) and 1786 ft. (84%) respectively. On February 10, 2017, Bartlett Dam releases were increased and a low level release (approximately 500 cfs) at Granite Reef Dam was initiated to provide storage space on the Verde system for operational flexibility to accommodate early snowmelt and additional runoff anticipated to exceed capacity. On February 28, 2017 a winter storm produced peak flows along the Verde River up to 30,000 cfs. As a result, Horseshoe and Bartlett reservoirs reached capacity (2026 ft. and 1798 ft., respectively) and a peak release of approximately 22,000 cfs at Bartlett Dam was necessary to pass excess runoff through the system. Runoff from subsequent snowmelt led to additional release from Bartlett Dam and spill from Granite Reef Dam until March 15, 2017.

Additionally at this time, the Horseshoe ROW large jet valve experienced operational issues and valve releases were limited to the low flow cone valve (370 cfs). In late March 2017, as Verde inflows decreased, releases through the spillway at Horseshoe continued to move water down to Bartlett reservoir and drawdown Horseshoe. By late April 2017, Horseshoe elevation began to approach the spillway crest (2,000 ft.) and water no longer could be released through the spillway and releases were limited to 370 cfs.

On May 1, 2017, a partial switch from the Verde reservoir system to the Salt reservoir system occurred and Bartlett Dam releases were reduced to approximately 600 cfs. On June 15, 2017 the Horseshoe ROW large cone valve became operational in manual mode and releases from Horseshoe Dam were increased to continue drawdown of Horseshoe Reservoir to meet H-B HCP objectives. A full switch from the Verde reservoir system to the Salt reservoir system, reduced Bartlett Dam release to 200 cfs on June 22, 2017 once sufficient storage space was available in Bartlett Reservoir to accommodate the remaining volume for the drawdown of Horseshoe Reservoir. Horseshoe Reservoir was empty on July 8, 2017 and remained empty through July 17, 2017. At that time, Bartlett Reservoir elevation was at 1795 ft. (97%) and releases at Horseshoe Dam were reduced to 100 cfs to hold water in Horseshoe Reservoir to provide space in Bartlett Reservoir to accommodate potential local runoff from summer monsoon storms.

At the end of water year 2017, Horseshoe and Bartlett Reservoirs were at elevations of 1978.68 ft. (16%) and 1788.78 ft. (86%), respectively with a combined storage of almost 171,000 acre-feet. A partial switch from the Salt reservoir system to the Verde reservoir system occurred the week of October 2, 2017 with Bartlett Dam releases increased to 400 cfs. Additionally at this

time, Horseshoe release was increased to 370 cfs to move water stored in Horseshoe down to Bartlett. The full water order was transitioned back to the Verde reservoir system the week of October 23, 2017. The lake levels for Horseshoe and Bartlett reservoirs during water year 2017 are shown below (See Figure 3 and 4).

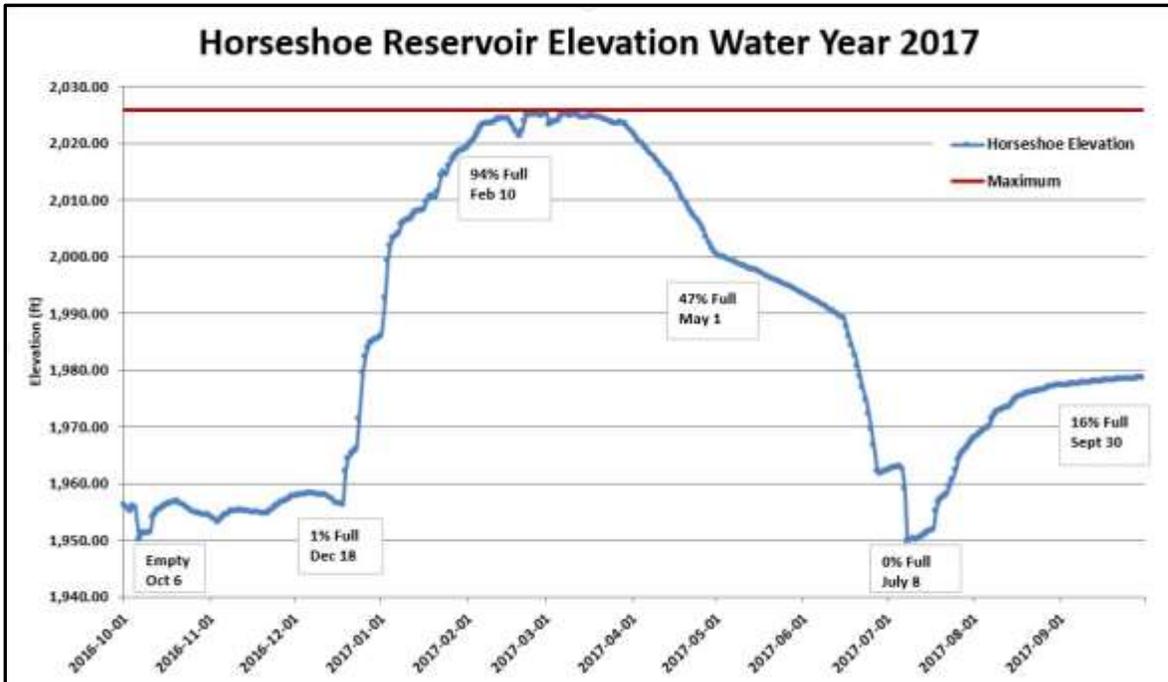


Figure 3: Horseshoe Reservoir Elevation for Water Year 2017. Data are preliminary

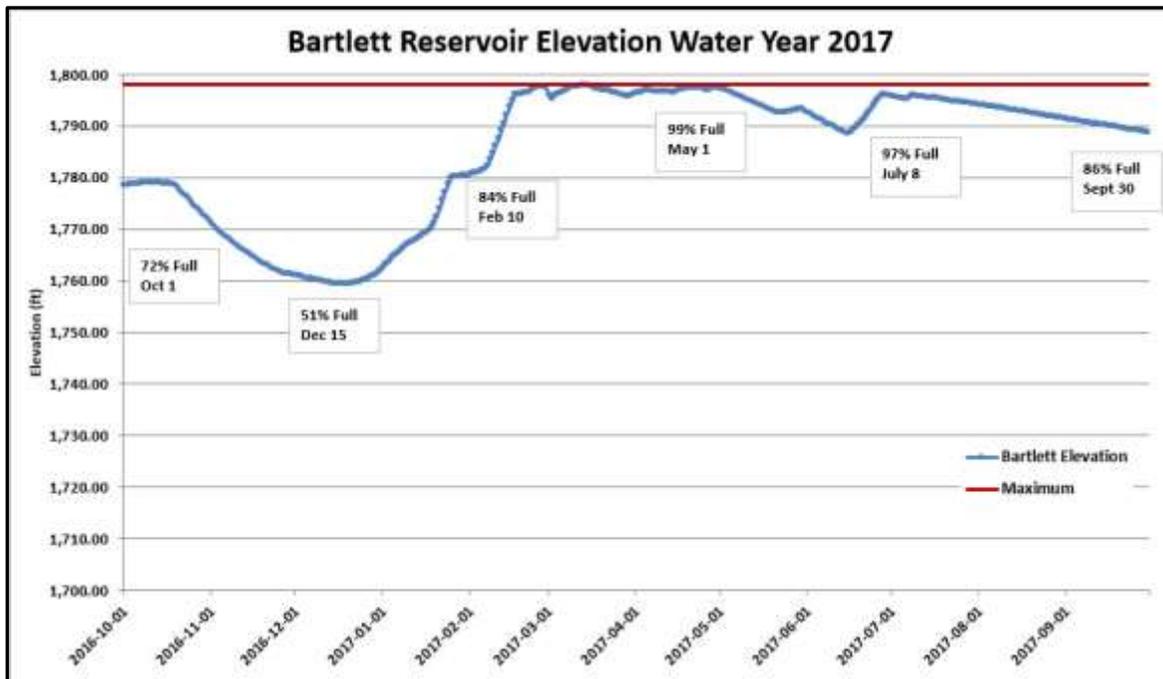


Figure 4: Bartlett Reservoir Elevation for Water Year 2017. Data are preliminary

Roosevelt Operations: Roosevelt Reservoir entered the season with almost 594,000 acre-feet of storage which is 36% of capacity (elevation 2086.54 ft.). The winter of 2017 produced

603,000 acre feet (171% of median) of runoff into Roosevelt Reservoir. The elevation at Roosevelt Dam increased 41 feet through the winter with above normal inflows and nearly doubled the total storage up to 71% of capacity (1,150,000 AF) by the end of April 2017. On May 1, 2017 the water order partially transitioned back to the Salt reservoir system and reservoir levels began to decline as water order increased in the late spring and into the summer. A full water order transition to the Salt reservoir system was completed by June 22, 2017. Roosevelt storage on October 1, 2017 was 968,000 acre-feet which is 59% of capacity (elevation 2,114.51 ft.) and 23% more than the previous year. A partial water order swap occurred on October 2, 2017 and the full water order will begin to transition back to the Verde reservoir system on October 23, 2017. Releases from Stewart Mountain Dam are anticipated to reach minimum flow on October 27, 2017. The lake levels for Roosevelt Reservoir during water year 2017 are shown below (See Figure 5).

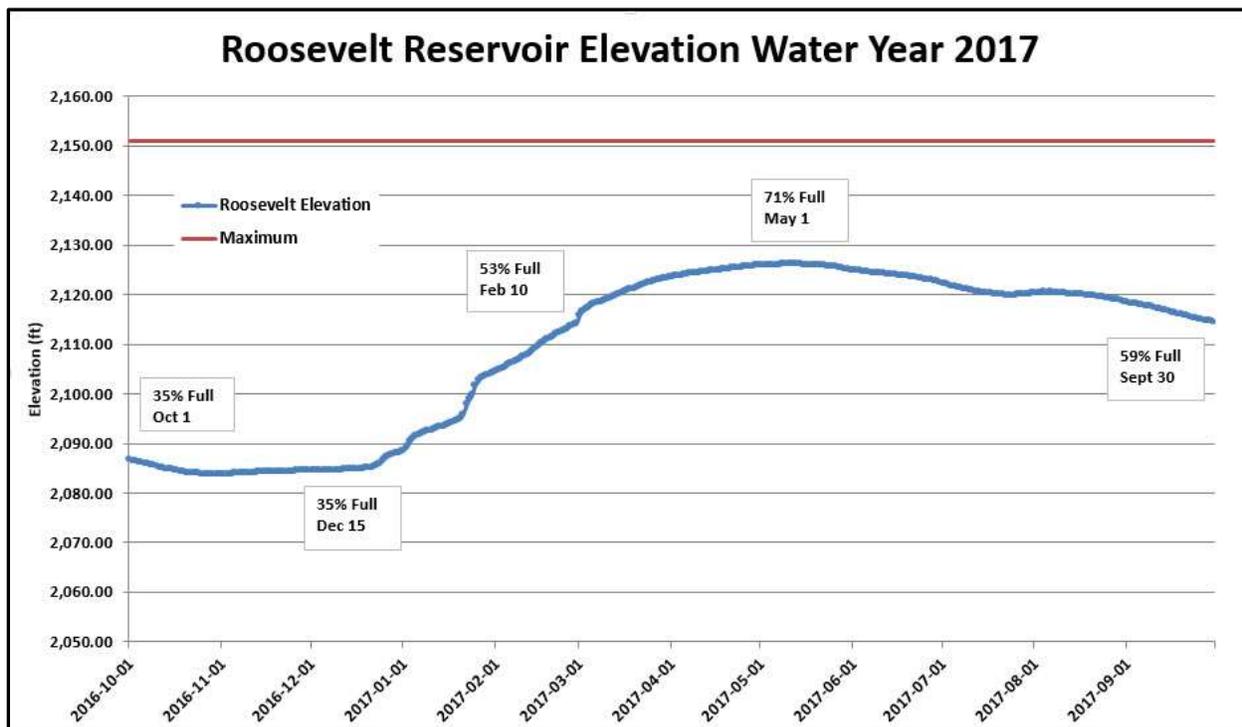


Figure 5: Roosevelt Reservoir Elevation for Water Year 2017. Data are preliminary

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 100% full (elevation 2026') on February 28, 2017 and was empty by July 8, 2017. Due to the valve's operational issues at Horseshoe Dam, it was not possible to achieve an empty reservoir by May 1. However, SRP was able to achieve

a reservoir elevation of 2000' by May 1 which correlated with the lowest ground elevation of a flycatcher territory observed during the flycatcher surveys conducted in 2015.

2018 Action: Currently the new, problematic valve at Horseshoe Dam is under repair and it is anticipated to operational by 2018. Therefor it is anticipated that the spring drawdown will occur as usual in 2018 with a target empty date of May 1.

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. In years when the reservoir is held high for flycatchers, this will provide opportunities for razorback sucker reproduction and recruitment.

Action: Horseshoe Reservoir was held at or below elevation 2000' (Figure 3) from May 1 until July 2017. Horseshoe was drawn down and empty July 8.

2017 Action: If valve repairs at Horseshoe Dam are completed as anticipated, Horseshoe Reservoir will be operated normally and will be scheduled to be empty by May 1.

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 ITP limits may be exceeded. Vegetation will be monitored once every three years.

Action: We estimated the amount of potential breeding habitat in 2017 that may be unavailable in 2018. For the second time, LiDAR (Light Detection and Ranging) data has been integrated with the GIS breeding habitat model (Hatten and Paradzick 2003) results. The LiDAR flight in May 2015 introduces an alternative method to delineate and forecast suitable breeding habitat within Horseshoe Reservoir. The data provided via LiDAR was used to generate a Canopy Height Model, where the location average of tree canopy height values within a modeled "cell" were analyzed. Those cells with values below the threshold of 6 meters were removed post GIS breeding habitat modeling through a raster reclassification process in the ArcGIS software. Model results (Figure 6) from this year estimate that of the 130 acres of potentially suitable flycatcher breeding habitat (GIS model classes 3-5) that occurred in the reservoir in 2017, 0 acres would have been unavailable on May 1, 2017 (Table 2). The average amount of potentially suitable habitat that was unavailable at the beginning of the 2009–2017 breeding seasons equates to 30 acres, which is below the 200 acre average long-term permit threshold.

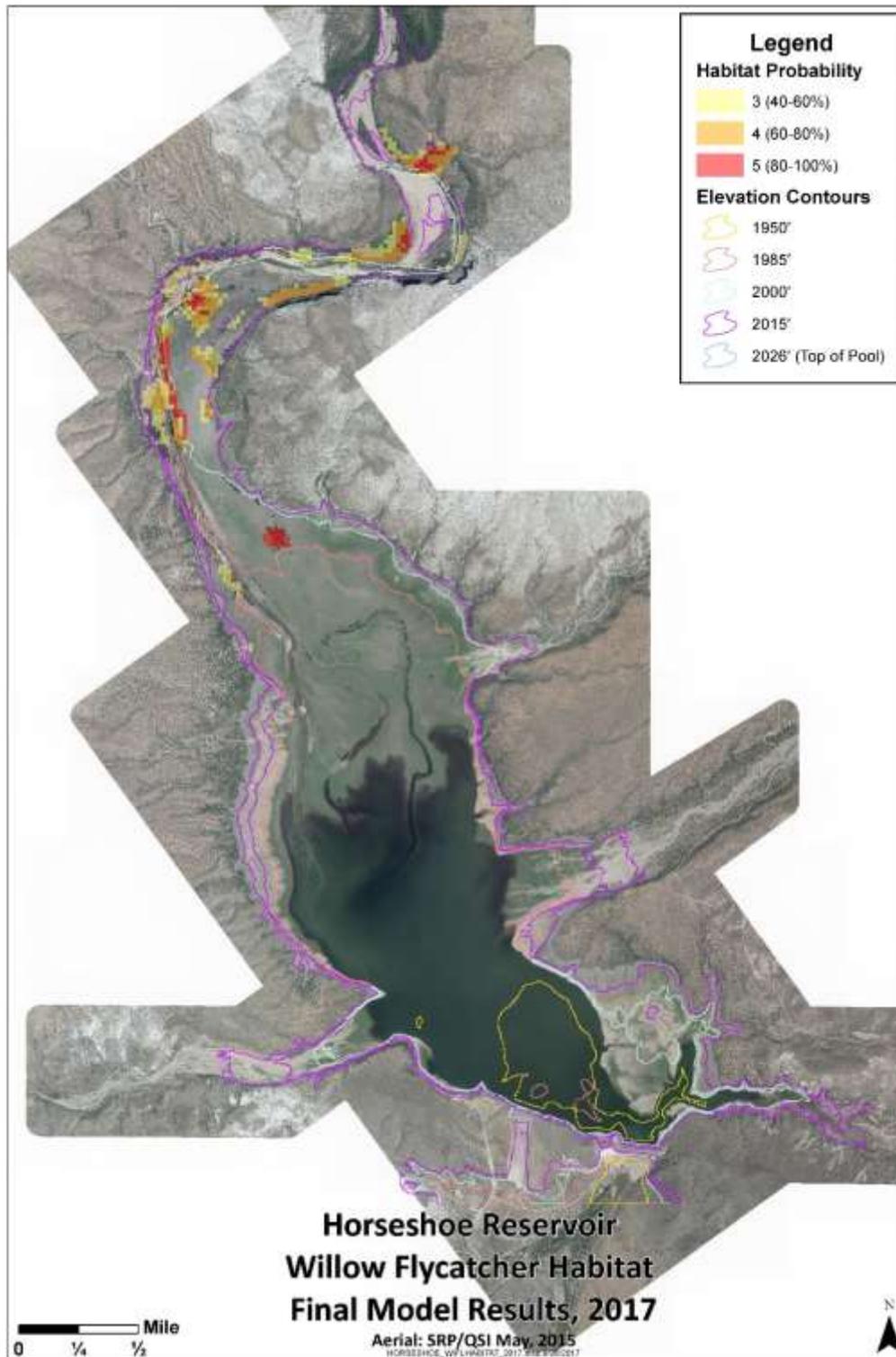


Figure 6. Willow flycatcher potential breeding habitat in Horseshoe Reservoir based on GIS satellite model results using May, 2015 imagery. [Note: model grid code scale: 3–5 breeding probability based on Hatten and Paradzick (2003); sediment contour interval 1950'≈0% storage; 1985'≈25% storage; 2000'≈50% storage; 2015'≈75% storage; 2025'≈98% storage.]

Table 2. Acres of occupied and predicted flycatcher habitat based on GIS breeding habitat model in Horseshoe Reservoir, 2008–2016

Year	May 1 Reservoir Elevation (feet)	Occupied Habitat (acres)		Predicted Habitat Probability class 3-5 (acres)	
		Occupied Habitat ¹	Occupied Habitat Unavailable May 1	Total within Reservoir	Estimated Habitat Unavailable May 1 ³
2008	-	52	-	95	-
2009	2000	-	0	141	42
2010	2026	-	52	28	87
2011	1981	82	0	82	0
2012	1950	-	0	76	0
2013	1987	-	0	147	0
2014	2005	-	6	133	107
2015	1966	32	0	203	0
2016	1994	-	0	130	34
2017	2000	85	0 ²	115	0
Annual Avg.				115	30
2018 predicted ⁴					87

¹Flycatcher surveys performed every three years within the reservoir (see Section 3.d.ii).

²The lowest elevation of occupied habitat in 2017 was 2000 ft. Water level on May 1, 2017 was 2000 ft.

³Estimated amount of habitat unavailable on May 1 is based on the elevation of classes 3-5 of the previous year's model results, the reservoir elevation on May 1, and the assumption that the vegetation is 25 ft. tall. If less than 15 ft. of vegetation was not above water on May 1 the habitat was considered unavailable (see assumptions outlined in the H-B HCP page 109).

⁴Assumes reservoir at full pool on May 1; habitat assumed unavailable if located at elevations ≤2015' (see assumptions in note #3 above and the H-B HCP page 109).

2018 Action: For 2018, SRP will be utilizing results of the 2017 flycatcher surveys at Horseshoe Reservoir to update the occupied habitat data used in the flycatcher habitat prediction model.

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 H-B 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: To determine the amount of occupied habitat in 2017, SRP contracted with EcoPlan Associates to survey for flycatchers and identify territory locations (EcoPlan Associates 2017; final survey report is included in Appendix A). LiDAR data was collected in 2015 in conjunction with flycatcher surveys to determine occupied canopy height within the reservoir. The intent of this exercise will be to verify habitat model prediction accuracy.

2018 Action: Flycatcher surveys will not be conducted in 2018.

iii. Yellow-billed Cuckoo Monitoring

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

Action: SRP contracted with EcoPlan Associates to conduct cuckoo surveys at Horseshoe in 2017. Result of the surveys in can be found in Appendix A.

2018 Action: Cuckoo surveys will not be conducted at Horseshoe in 2018.

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 ITP issuance.

Action: During the winter of 2015/16, AGFD identified a new bald eagle nest within Horseshoe Reservoir during annual nest search flights that SRP provides to the AGFD. The AGFD notified SRP of the nest and its location within the reservoir bottom. SRP initiated the HCP emergency response plan and began discussions with both the UFSWS and the AGFD as to a course of action. At the time the nest was discovered, Horseshoe Reservoir was in the process of filling. AGFD visited the nest sight by boat to determine its approximate elevation in relation to the reservoir. The nest sat at approximately elevation 2007' which is roughly 19 feet below the full pool elevation (2026'). AGFD installed 'do not disturb' buoys in the vicinity of the nest. When the nest was approximately six feet from the water surface, SRP made the decision to discharge water from the reservoir to ensure the nest would not be inundated. SRP released water through the spillway gates as the valve house was under construction and out of service. SRP continued to closely monitor reservoir operations to ensure nest success. The nest successfully fledged two juvenile bald eagles.

In August of 2016, SRP discussed with the AGFD and the USFWS the best course of action to take before the 2016/17 eagle breeding season. It was determined that the construction of two alternative nest sites near the existing nest would be the best choice. If the eagles were to occupy their established nest, and the nest was in danger of inundation, there would be alternative nests in the vicinity for the AGFD to relocate the eggs or nestlings to.

SRP and AGFD visited the site to identify trees of adequate height and structure to accommodate nesting platforms. GPS coordinates were collected at areas that seemed appropriate. The locations were analyzed using LiDAR data that was collected in the reservoir in 2015 to ensure tree heights were above full pool elevation.

SRP contracted with Liberty Wildlife for the construction of the two nest platforms. AGFD and SRP installed the platforms on November 1, 2016.

During annual bald eagle helicopter surveys in 2017, the AGFD noted that the eagles that had nested the previous year were not utilizing either the previous nest or the nests that were constructed.

2018 Action: SRP will coordinate nest monitoring with the AGFD. If the eagles return to nest at the same location as 2015-16, and it is anticipated that Horseshoe Reservoir elevations may impact the active nest, egg or nestling relocation may be implemented by the AGFD.

e. Covered Aquatic Species Monitoring

Obligation: SRP will monitor covered aquatic species populations and the effectiveness of minimization and mitigation measures. Periodic surveys in Horseshoe and several other 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 the first five years of implementation surveys will be focused near Horseshoe Reservoir.

Action: In 2017, SRP purchased passive integrated transponder (PIT) tags and planned to attempt the fish disposition study that failed in 2016. However, the newly installed valve at Horseshoe Dam malfunctioned and was scheduled to be out of service through the typical April draw down period. Furthermore, the upstream PIT tag reader equipment was damaged during a January 2017 flood event.



Figure 7. Cross channel PIT antenna on the bottom of the Verde River upstream of Horseshoe Reservoir.

2018 Action: SRP and the AGFD will be working with Biomark to repair the system and repeat the PIT tag study if typical reservoir operating conditions are anticipated in 2018.

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 ten years an additional 50 acres will be protected.

Action: On August 11, 2009, SRP and Freeport McMoRan executed a conservation agreement to secure the protection of the 150 acre preserve near Fort Thomas (SRPCE4). No additional action is needed until 2023 when the property will be purchased in fee.

SRP completed the purchase of the 55 acre Indian Springs parcel in December of 2011. The Fort Thomas baseline inventory report and management plans were updated to include both the 150 SRPCE4 parcel and the 55 acre Indian Springs parcel.

5. Mitigation Property Monitoring and Management

a. Fort Thomas H-B Preserve (SRPCE4 and SRP2)

i. Flycatcher and Cuckoo Monitoring

Obligation: SRP will conduct flycatcher and cuckoo surveys the first spring and summer following land 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 flycatchers and cuckoos every other year on average but not less than every third year.

Action: No flycatcher or cuckoo surveys were conducted on the Fort Thomas H-B Preserve in 2017. A summary of the 2008-2016 results can be found in Table 3.

Table 3. Southwestern willow flycatcher and yellow-billed cuckoo survey results for the Fort Thomas H-B Preserve, 2008–2016.

Year	Willow flycatcher				Yellow-billed cuckoo	
	Resident Adults	Territories	Pairs	Nests	Detections	Incidental
2008	10	6	4	0	2	0
2009	14	8	6	5	0	0
2010	No Surveys					
2011	No Surveys					
2012	12	10	9	4	2	1
2013	No Surveys					
2014	30	16	14	1	3	0
2015	No Surveys					
2016	33	17	16	7	0	0
2017	No Surveys					

2018 Action: Flycatcher and cuckoo surveys will be conducted at Fort Thomas Preserve in 2018.

ii. Vegetation and Habitat Monitoring

Obligation: SRP will conduct field observations assessment of habitat type, structure, and density of riparian and other vegetation. On-the-ground photo documentation from fixed points will be collected during the bird surveys.

Action: Photo points were repeated at the Fort Thomas Preserve in 2016. Photo points can be found in the 2016 annual report in Appendix B

2018 Action: Photo points are planned to be repeated in 2018.

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-B HCP 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 management actions on the Fort Thomas H-B Preserve in 2017:

- Management activities at Ft. Thomas consisted primarily of property patrol and fence maintenance.
- In October, TNC hired a new East Aravaipa Land Steward. This individual will continue to assist the Land Manager with duties on the Ft. Thomas properties, on a bi-weekly basis.
- Fences along the Indian Springs parcel were cleared of old Kochia, which has been slowly encroaching on the farm roads.
- Over-reaching tamarisk were cleared from the fence on the south highway side of the property, ahead of mowing of Kochia.

2018 Actions: SRP plans to conduct the following management actions in 2017 on the Fort Thomas Preserve:

- Continue to monitor both the tamarisk and native plant colonization in the burned areas.
- Continue to coordinate with Bureau of Land Management regarding fencing of the riparian area.
- Continue on-the-ground management activities in coordination with the Roosevelt HCP project manager.
- Continue to actively participate in the Gila Watershed Partnership and coordinate with staff on potential restoration projects.

b. Special Water Supply Protection Projects

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

Action: SRP provided funding to the U.S. Geological Survey (USGS) to conduct field work related to a 2-year Ecoflows project, which is a partnership among the USGS (Arizona and Utah offices), AZ Department of Water Resources, and TNC, to investigate the connection between

stream flow in the Verde River and habitat along the riparian corridor. The USGS is working toward completing the report of the two-year Phase 1 project.

The original agreement between the USGS and TNC did not include funds to support additional field work in Phase 1. The additional support from SRP provided crucial support for field efforts, macroinvertebrate identification, data analysis, and geospatial interpretation of habitat characteristics. The results obtained with the SRP funding are included in the Phase 1 report which is in draft form and being peer reviewed.

In addition to completing the first phase, USGS installed a Continuous Slope Area (CSA) gage below the low flow SRP gage at Campbell Ranch (AGFD issued a permit for the installation). The gage installation was supported by the USGS WaterSMART program. During the first phase of the Ecoflows project, a biotic sampling site was established at Campbell Ranch. The CSA gage, which consists of three recording stage sensors from which discharge can be computed, is intended to complement the SRP gage by allowing for the estimation of discharges higher than the rating curve at the low-flow gage. The combined low-flow and CSA discharges should provide complete discharge records at Campbell Ranch.

2018 Action: After completion of the final Ecoflows Phase 1 report, the USGS will begin planning Phase 2.

6. Aquatic Species Mitigation

The overall goal of the minimization and mitigation measures for covered aquatic 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 H-B 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 (BPH); stocking covered native fish in the Verde watershed; and watershed management activities that conserve in-stream 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.

2014 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 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: SRP continued funding AGFD Operation and Maintenance (O&M) and stocking actions at BPH under the collection agreement. As of January 2017, a total of 23,285 native fish were stocked into the Verde River watershed. (Table 4).

Table 4. Native fish stocked by AGFD in support of H-B HCP December 2016 through January 2017.

Stocking Date	Species	Number stocked	Pounds stocked	Location
12/19/16	Roundtail chub	2,177	62.13	Verde R. at Burnt Ranch
12/20/16	Roundtail chub	10,000	145	Oak Cr. at Crescent Moon
12/21/16	Roundtail chub	10,365	150	Verde R. at Perkinsville
1/10/17	Roundtail chub	740	14.35	Oak Cr. At Page Springs
Total		23,285	371.48	

2018 Action: SRP will again coordinate a meeting among the cooperators in the spring of 2018 to discuss the status of implementation, changes to the species priorities or locations, and plans for future culture and stocking effort. SRP will continue to fund BPH O&M and stocking activities and will coordinate to develop a culture and stocking plan to be implemented over the following year.

The collection agreement between SRP and the AGFD was renewed for an additional 10 years in March of 2017.

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 AGFD's BPH.

Action: SRP and AGFD have been discussing future hatchery operations and the potential of utilizing the remaining BPH renovation funds to expand fish production at BPH. AGFD shared that they are again planning to construct a new facility on the parcel adjacent to BPH. SRP is in the process of developing a collection agreement specific to the use of the remaining funds to partially fund the new hatchery.

2018 Actions: AGFD will be providing SRP with details of what is proposed at future meetings.

d. Installation of a Fish Barrier in Lime Creek

Obligation: SRP will construct and maintain a fish barrier in Lime Creek to benefit resident, covered aquatic species such as Gila topminnow, longfin dace, and lowland leopard frogs.

Action: The barrier was completed on November 4, 2010. The construction of the barrier was described in detail in the 2010 H-B HCP annual report. SRP and AGFD visited and inspected the barrier during a March 2017 site visit. The barrier was structurally sound and functional, and, as anticipated, sediment had filled in most of the pool above the barrier. During the site visit, 133 Gila topminnow and 114 longfin dace were captured.



Figure 8. Lime Creek fish survey, March 2017

2018 Actions: SRP will visually inspect barrier condition and conduct maintenance if necessary.

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 main-stem species.

Actions: SRP took the following actions in 2017 to protect watershed in-stream flow:

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

A detailed list of Watershed Management and Protection projects that occurred in 2017 is provided in Table 5.

2018 Action: SRP will continue supporting watershed protection efforts in 2018.

Table 5. SRP watershed protection efforts accomplished in 2017.

Project Name	Date Initiated	Date Completed	SRP Contribution	Description and Comments	In-kind	Cash
Public Presentations	Ongoing	Ongoing	NA	Several public presentations were given to community groups and various agencies (e.g., The Verde River: State of the Watershed Conference,	X	
Agreement in Principle re: Big Chino Groundwater withdrawals	Ongoing	Ongoing	\$185,213	Year 4 of Comprehensive Agreement #1 between SRP, the City of Prescott, and the Town of Prescott Valley to implement monitoring and modeling of groundwater conditions in the Big Chino sub-basin to ensure appropriate protections against impacts to the Upper Verde River. Includes long-term funding commitment.		X
Legal efforts to curtail illegal surface water diversions–Verde Valley	Ongoing	Ongoing	NA	SRP continued its litigation against irrigators in the Verde Valley who appear to be illegally diverting surface water.	X	
USGS/SRP cost share of stream gage maintenance	Jan 2013	Ongoing	~\$130,000	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 gage operations).		X
WatershedConnection.com	Sep 2007	Ongoing	NA	Updated site and will provide maintenance for the website (www.watershedconnection.com) which displays real time data for river flows and precipitation across the Salt and Verde Watersheds and provides more information about SRP's collaborative activities.	X	
Verde River Valley Nature Organization - Verde River Runoff		Mar 2017	\$2,500	Corporate sponsor of the Verde River Runoff.		X
Verde River Valley Nature Organization – Verde River Fest Brochure		Nov 2016	\$1,500	Verde River Fest Brochure		X

Table 5. SRP watershed protection efforts accomplished in 2017.

Project Name	Date Initiated	Date Completed	SRP Contribution	Description and Comments	In-kind	Cash
Verde River Valley Nature Organization - 17 th Annual Verde Valley Birding and Nature Festival			\$1,000	17 th Annual Verde Valley Birding and Nature Festival		X
Low Flow gages (Black Bridge, Verde Falls, , Bubbling Ponds Hatchery, Sterling Springs)	2005+	Ongoing	\$57,477	O&M and telemetry support for gages.	X	
Low Flow gage East Verde @ Crackerjack	March 2012	ongoing	\$35,000?	O&M for installation of gage.		X
Verde River Days		Sep 2017	\$1,000	SRP sponsorship for event. SRP was also an Exhibitor.		X
Environmental Education Center of the Verde Natural Resource Conservation District (VNRCD)		Sept. 2017	\$17,000	SRP made a \$17,000 contribution to the Verde NRCD for programming in the communities of Clarkdale, Cottonwood and Camp Verde. The programming for Grades K-4 is "Kids Conserve Water" and the programming for 5 th -8 th grade is "Water Stewardship".		X
Yavapai College Foundation		Oct 2017	\$5,000	SRP Donation/Table sponsorship for event. Theme re: Working Together for Sustainable Communities and Healthy Forests.		X

Table 5. SRP watershed protection efforts accomplished in 2017.

Project Name	Date Initiated	Date Completed	SRP Contribution	Description and Comments	In-kind	Cash
The Verde Valley Regional Economic Organization (VVREO)	Mar 2015	Mar 2017	\$2,500	Membership to VVREO and corporate sponsorship for 'speaker's series' featuring prominent educators and Industry representatives from the Verde Valley discussing Education and Workforce Planning.	X	X
Arizona Water Story	Jan 2010	Ongoing-Offered 2-4 times per year	In-Kind	SRP offers this 4 hour workshop to teachers throughout the Valley. Teachers receive a water education video as part of the Arizona Water Story to assist 4 th grade teachers throughout the state in teaching water science and Arizona history to their students.	X	
Water Education Grants	Oct 2007	Ongoing	\$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.		X
Water Chemistry/Quality Kits	Ongoing	Ongoing-Offered 2-4 times per year	In-Kind	Water Chemistry/Quality kit building and instruction to teachers through Sci4Kids EIG.	X	
Yavapai County Cooperative Extension Office /Project WET	Aug 2008	Ongoing	\$15,000	We offered a 5-day workshop this past summer in partnership with AZ Project WET. The workshop was called, "Water Solutions: Past, Present, and Future". We had 21 teachers from grades 3-6 that participated. The workshop covered the watershed, forest health, ground water, water chemistry and quality, water management and delivery. A variety of hands-on activities were used to show teachers how to improve their water education in their classrooms.	X	X

Table 5. SRP watershed protection efforts accomplished in 2017.

Project Name	Date Initiated	Date Completed	SRP Contribution	Description and Comments	In-kind	Cash
Verde Valley Youth Outreach Committee	Aug 2011	Ongoing	In-Kind leadership support	SRP serves on this committee to share and leverage partnerships in the Verde Valley related to youth education. Other partners on the committee include the parks, forest service, AZ Project WET, and V-Bar-V.	X	
Four Forest Restoration Initiative and Research Study Development	Jan 2012	Ongoing	In-Kind participation in 4FRI, and study design. \$600,000 to NAU thus far	SRP is supporting landscape level efforts to restore ponderosa pine forests, which includes the Salt and Verde watersheds to allow for increased ecologic function and decrease risk of catastrophic wildfire. We are also developing a study design to evaluate hydrologic effects of various forest treatment types, of which is being leveraged among the three Arizona universities. This study will evaluate impacts of forest restoration on variables such as run-off, groundwater infiltration, sedimentation, soil moisture, etc.	X	X

Table 5. SRP watershed protection efforts accomplished in 2017.

Project Name	Date Initiated	Date Completed	SRP Contribution	Description and Comments	In-kind	Cash
SRPs Forest Health Virtual Tour and Stakeholder Perspectives Video	January 2014	Ongoing	\$80,000	Outreach materials for engaging customers, stakeholders, investors.	X	X
Northern Arizona Forest Fund	January 2014	Ongoing	In kind program leadership and \$100,000	On the ground forest treatment sites that will be funded by SRP and corporate and private partners.	X	X
Cragin Watershed MOU	March 2014	Ongoing	In kind program leadership	Partnership between SRP, FS, NFF, Town of Payson and USBR to accelerate restoration objectives in Cragin Watershed.	X	
Oak Creek Watershed Council	September 2003	Ongoing	In-kind and \$30,000 to date	The Oak Creek Watershed Council is dedicated to maintaining a standard of excellence for watershed stewardship, as well as preserving the integrity of Oak Creek, and its tributaries.	X	X
Verde River Institute		Jan. 2017	\$10,000	Cash contribution to Verde River Institute, a non-profit organization committed to developing and facilitating the implementation of policies that help to ensure that the Verde River in central Arizona retains flows that will support sustainable, healthy and diverse economies and ecosystems.		X
The Verde River: State of the Watershed Conference		May 10-11, 2017	\$5,000	Hosted by the Verde Watershed Restoration Coalition (VWRC) , the conference aims to bring attendees into the folds of the state of the Verde River Watershed, through themes of sustaining flows, restoring habitat, and promoting community.		X
Spring Heritage Festival		March 2017	\$1,000	SRP contribution for local festival.		X

7. Funding Methods and Assurances for HCP Implementation

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

Action: Completed.

On March 24, 2009, SRP provided a letter to FWS indicating that we were proposing to establish an irrevocable trust to fund the H-B HCP. On November 2, 2009, the SRP Board approved an amendment to the Roosevelt Lake HCP trust, which allows for the creation and funding of a subaccount to meet the obligation of the H-B HCP. The subaccounts allow for each HCP trust fund to be managed (and reported) independently under a larger umbrella trust agreement. The H-B HCP subaccount was funded in January 2011 with approximately \$6.0M to support the estimated \$300,000 on average annual expenditures over the life of the permit and *in perpetuity* costs for some of the mitigation obligations.

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

Table 6. HCP Implementation, Survey, and Monitoring 10-year Schedule.

Obligation	Completed /Ongoing	Year										
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Horseshoe Reservoir												
Flycatcher and Cuckoo Reservoir Ops	Ongoing	RD ¹	RD	RD	RD	RD	Hold ²	RD	Hold	RD	RD	RD
Aquatic Species Reservoir Ops	Ongoing	RD	RD	RD	RD	RD	Hold	RD	Hold	RD	RD	RD
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	X
Fish Surveys:	Ongoing		X	X	X	X	X		X	X	X	X
Horseshoe			X	X	X ⁴	SRP ⁵	X		X	X		X
Verde (upstream Horseshoe)				X	X	X	-		X	X		
Verde (downstream Bartlett)							-			X		
Lime Creek		X	X	X	X	X					X	?
Frog and Garter Snake Survey	Ongoing					X	X					
Horseshoe/Verde River Aquatic Species Mitigation												
Bubbling Ponds Hatchery (BPH) Improvements		X	X	X	X	X	X	X				?
BPH O&M	Ongoing	-	X	X	X	X	X	X	X	X	X	X
Stocking razorback sucker & other covered native fish	Ongoing	-	-	X	X	X	X	X	X	X	X	X
Lime Creek Barrier Construction	Completed	X	X	X								
Watershed Protection Projects	Ongoing	X	X	X	X	X	X	X	X	X	X	X

Table 6. HCP Implementation, Survey, and Monitoring 10-year Schedule.

Obligation	Completed /Ongoing	Year										
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fort Thomas Mitigation Property (150 acres)												
Execute Conservation Easement Management	Completed	X	X									
Purchase	Ongoing		X	X	X	X	X	X	X	X	X	X
Flycatcher and Cuckoo Monitoring ³	Ongoing	X	X			X		X		X		X
Habitat Monitoring	Ongoing	X	X			X		X		X		X
Indian Springs Ranch–Fort Thomas Preserve (55 acres)												
Identify suitable property	Completed	X	X	X	X							
Secure protection and manage	Ongoing					X	X	X	X	X	X	X
Special water supply protection projects	Ongoing	X	X	X	X	X	X	X	X	X	X	X

¹Rapid drawdown and minimize pool

²Hold reservoir high if two successive years of low storage.

³Monitoring frequency dependent upon management needs and cowbird parasitism rate.

⁴Sampling for tagged fish also conducted downstream of Horseshoe dam

⁵SRP will, as feasible, investigate fish stranding in Horseshoe during and after rapid drawdown.

9. Literature Cited

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.

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APPENDIX A

SOUTHWESTERN WILLOW FLYCATCHER AND YELLOW-BILLED CUCKOO SURVEYS ON THE HORSESHOE RESERVOIR STUDY AREA 2017

EcoPlan Associates, Inc.

This report contains sensitive data, which is considered confidential by the USFWS. Therefore, it has been removed from this version of the report. The full version was sent to the USFWS Ecological Field Services Office in Phoenix, AZ and the USFWS Regional Office in Albuquerque, NM.

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