FISH MONITORING OF SELECTED STREAMS

WITHIN THE GILA RIVER BASIN

2016

Annual Report

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Introduction

This report summarizes monitoring activities conducted by Arizona Game and Fish Department (Department) during 2016 for Bureau of Reclamation (BoR) Contract No. R12PC32007, Monitoring of Gila River Basin Waters also known as the Gila River Basin Monitoring Program (GRBMP). The purpose of the project is to monitor the status of wild populations of listed fishes in the Gila River Basin.

Monitoring activities were conducted on a subset of streams identified in the "Scope of Work - Monitoring of Gila River Basin Waters to Assist with Conservation of Federally-listed Warm Water Fishes (Native Fish Monitoring, Revised per Modification 0007)". Focal species identified to monitor for this project include: Gila Topminnow, *Poeciliopsis occidentalis*; Gila Chub, *Gila intermedia*; Headwater Chub, *Gila nigra*; Roundtail Chub, *Gila.robusta*; Spikedace, *Meda fulgida*; and Loach Minnow, *Tiaroga cobitis*.

In September 2016, the American Fisheries Society and the American Society of Ichthyologists and Herpetologists reclassified and merged Roundtail Chub, Gila Chub, and Headwater Chub into one species, the Roundtail Chub. Arizona Game and Fish Department recognizes these changes, and all populations formerly recognized and referred to as Headwater Chub or Gila Chub (sensu Minckley and DeMarais, 2000) are reported herein as Roundtail Chub, *Gila robusta*.

Supporting tables, maps and photographs for the report are provided in Appendices A, B and C, respectively. Table 1 in Appendix A provides the common and scientific names as well as a "Species Code" of the fishes sampled throughout the project; for brevity, the species code is an abbreviation of the scientific name (First two letters of genus followed by first two letters of specific epithet) that is used throughout the appendices to identify or refer to an individual or group of fish belonging to a particular species. Table 2 summarizes species occurrence and absolute numbers per survey site (native and nonnative) across all sites sampled, while Table 3 provides percent relative abundance for each species collected for each site during 2016. To provide some continuity and comparability with former reports, Tables 2 and 3 (Appendix A) contain footnotes identifying populations formerly identified as Headwater Chub or as Gila Chub.

The following are several recommendations to improve the process for future sampling:

- Prior to any future monitoring efforts at any site, the contractor should contact Arizona Game and Fish Department to request all stocking records for the target species in the drainage in question.
- Sampling crew needs to always take detailed field notes, to supplement information that may not be captured on the data sheets.
- Field crew should always bring at least one backup piece of field equipment (e.g. cameras, GPS units, water quality meters) in case of equipment failure.
- Field crews need to ensure all data sheets are completed in the field at the time and site of sampling, to eliminate errors and ensure complete and accurate records.

Methods

Sampling was conducted according to the protocol in Clarkson et al., 2011. Species- and habitat-appropriate gear was selected to survey each reach. For the majority of surveys, electrofishing using the Smith-Root Model-LR24 Backpack Electrofisher

(BPES) was the primary method of sampling at the
majority of sites. In areas where stream morphology, water depth, visibility, or substrate instability made sampling with the BPES unsafe or impractical, other sampling techniques were employed. Alternate techniques and equipment employed included: baited collapsible minnow traps (Promar 45.6 cm x 25.4 cm x 0.32 cm mesh); Promar hoop nets (referred to throughout the text as "collapsible" hoop nets; 30.5 cm x 61 cm x 1.27 cm mesh); large hoop nets (61cm x 2 m x 0.65 cm mesh); dip-nets (951.6 cm^2 x 0.32 cm mesh); trammel nets (1.8 m x 15.2 m x 2.54 cm mesh); gill nets (1.4 m x 10 m x 2.54 cm; 1.4 m x 30 m x 2.54 cm mesh); canoe electrofishing (Smith-Root GPP 5.0), straight seines (1.8 m x 3.0 m x 0.64 cm mesh; 1.8 m x 4.6 m x 0.64 cm mesh), bag seines (1.8 m x 7.6 m x .635 cm mesh, with a 1.8 m x 1.8 m x 1.8m bag with .318 cm mesh) and angling. Due to the compact size and light weight of the gear, angling is used as a secondary or tertiary sampling technique, usually in more remote locations where access, gear choice and transport are limited. When employed, species-appropriate bait or various artificial lures and flies are used.

Larger species captured during the efforts were identified to species, classified as Age-0 (<10 cm) or Age-1+ (>10 cm), enumerated and released. Small-bodied fishes were identified to species, enumerated and released. Throughout much of the text, absolute number and relative abundance of a species at a specific site are provided in parentheses following the name or four letter species abbreviation.

All coordinates reported reference the Universal Transverse Mercator (UTM) geographic coordinate system, North American Datum 1983 (NAD83). Coordinates were determined using either a Garmin GPS 60 or Garmin GPS Map 62s. Discrepancies between photo boundary coordinates, map coordinates, data sheet coordinates and notebook coordinates do not reflect actual changes in localities for each, but are due largely to changing reception quality of satellite signals and resulting accuracy of the GPS units in many of the canyon-bound environments that the work was conducted in.

Departure from Protocol

Protocol for the establishment and sampling of 100 m sample sites were not followed at several sites once the focal species of the survey was detected. At three sites (Coalmine Canyon, Morgan City Wash and Dix Creek) field crews failed to conduct surveys at established sample sites, however were able to successfully collect the required of target species where they did sample. At one site (Spring Creek below Spring Creek Ranch), water quality data (dO2) was not recorded due to equipment failure while at three other sites (lower Salt River - Coon Bluff, Phon D. Sutton, and below Verde River confluence) water quality measurements were apparently forgotten. Also on two separate occasions (Blue River @ Blue River Campground and Spring Creek below Spring Cr. Ranch), 100 m boundary photos were taken but lost, presumably to equipment failure. Additionally, at Spring Creek below Spring Creek Ranch, effort per habitat within the 100 m sample reach was not recorded; only the total effort time was recorded. Field notes were frequently insufficient, providing little or no additional information about sampling or the sample sites.

Another problem arose when it was learned that the upper Blue River had been stocked with loach minnow prior to the 2016 sampling (during 2015), but the GRBMP Project Coordinator was not informed of this fact until after sampling was completed. For this reason, according to the project protocol, the upper Blue River (perhaps the entire mainstream Blue, e.g. Oak Creek

and Verde River) is not eligible for this project until after 5 years post-stocking of the target species, so Blue River should be removed from the project stream list until the year 2021.

Results

All streams scheduled for sampling during 2016 were completed, with a total of 53 survey sites on 21 streams, rivers, or wetlands sampled. Tables 2 and 3 (Appendix A) provide species presence per drainage, numbers sampled and percent total catch of each species per drainage. Of the 21 streams sampled, the focal species were found in 15 (71%) streams, and in 40% of the total sites sampled. Native fishes other than the focal species were found in 14 of the 21 streams sampled (67%) and no native species were found in two streams (10%; Table 2). Nonnative species were found in 10 of the 21 streams sampled (48%), and at 34 of 53 total sites sampled (64%).

Tables 4 through 74 summarizing effort and catch data for each site are provided in Appendix A. Total number per species per site and relative abundance is reported either in text or in parentheses after each species has been identified. Maps and coordinates of the stream sample boundaries in both 500 m and 100 m reaches are found in Appendix B. Habitat photographs, upper and lower boundary photographs of the 100 m survey reaches, and voucher photographs are provided in Appendix C. Most of the additional photographs found in Appendix C provide either a species photograph as photo-documentation, or representations of typical habitat within particular streams in which the target species was not found.

Buckhorn Spring March 22, 2016

UTM 12S Lower Boundary: 364309E, 3763874N Upper Boundary: 364318E, 3763778N

Buckhorn Spring is located approximately 13 miles northwest of Lake Pleasant in Yavapai County, Arizona (Appendix B, Fig. 1). The spring is located in the Arizona Upland plant community of the Sonoran Desert, at an elevation of 3,200 feet. Buckhorn Spring flows into Buckhorn Creek, which is tributary to Castle Creek, which itself flows into Lake Pleasant. Perennial water at Buckhorn Spring originates at an unnamed spring and continues downstream for about 1/3 mile, after which flow becomes intermittent. All perennial water in the system is within a 40 acre fenced livestock enclosure. Water quality measurements at 1045h were: 17.5^{0}C, pH 7.31, DO 3.6 mg/L, and a conductivity of 437µS/cm.

On March 22, 2016, Department personnel conducted a 100 m survey at Buckhorn Spring. Focal species at this site was the Gila topminnow. First stocking of Gila Topminnow at Buckhorn Spring occurred in November of 2011 using fish of Sharp Spring lineage; the population was augmented in May of 2012, also with fish derived from the Sharp Spring lineage. As they do at the nearby AD Wash site, Topminnow persist and appear to be thriving. Since their establishment, they have moved into three adjacent pools within the reach, and below a series of bedrock falls.

During monitoring in 2016, Gila Topminnow was the only species captured (232; 100%), with no exotics or other natives observed or sampled (Tables 4-5). Both dipnets and seines were employed for sampling, with seines proving the more effective; all that were caught appeared in good physical condition. Breeding behavior was observed with darker males being

seen and caught, but none displayed full black breeding coloration at the time. Photographs of the upper and lower boundaries of the 100 m sample site and adjacent habitat are provided in Appendix C (Fig.s 1-5). Other aquatic wildlife observed during the survey included Lowland Leopard Frog, Canyon Tree Frog, and a variety of aquatic invertebrates.

At Buckhorn Spring, the lower section of stream is characterized by slow moving pools and riffles, while the upper section slots through a series of bedrock pools, several of which are vertically separated from one another, and connected only by a slight trickle of water. In the lower section of stream, occupied habitat consisted of one large and five smaller pools, some of which were largely separated by dry bedrock; Topminnow were present in various densities throughout these pools. In the pools further upstream, individual Topminnow (n<3) were observed in only the two lowermost of a series of four or five cascading pools, suggesting this habitat may be ephemeral, or that exposed bedrock between the pools and the lower stream section form a partial barrier to the upstream movement of Topminnow.

Buckhorn Spring has a very dense over-story, comprised largely of Goodding's willow, Arizona ash, velvet mesquite and net leaf hackberry. Common plants occurring on the hillsides adjacent to the stream included mesquite, scrub oak, Saguaro and fishhook barrel cactus. Aquatic vegetation at the survey site included cattail, monkey flower, and stonewort.

This site should continue to be monitored on at least a triennial basis, more frequently if practicable.

Morgan City Wash March 23, 2016

UTM 12S Lower Boundary: 381557E, 3744935N Upper Boundary: 381480E, 3745007N

Morgan City Wash is a desert stream located roughly 1 km SW of lake Pleasant, and is tributary to the Agua Fria River (Appendix B, Fig. 2). Surface flow occurs in the lower portion of the drainage, reaching the Agua Fria River channel downstream from Lake Pleasant and the New Waddell Dam. Morgan City Wash is a typical desert riparian system with willow, seep willow, cattail and salt cedar common within the drainage. Vegetation on the slopes adjacent to the stream includes foothill palo verde and saguaro cactus.

On March 23, 2016, Department personnel sampled a 100 m reach of the stream, to monitor a previously established population of Gila topminnow. The focal species of this survey was the Gila topminnow, which comprised 13% of the species sampled at this site (Table 6). Gila Topminnow were stocked into Morgan City Wash using fish from of the Sharp Spring Lineage in July of 2009, with supplemental stockings occurring in October of 2009 and November of 2010. Desert pupfish were also stocked in 2009 and 2010, but did not establish (Pearson, et al. 2013). Water quality measurements at 0905h in Morgan City Wash were: 19.4^{0}C, pH 8.09, DO 6.8 mg/L with a conductivity of 522µS/cm.

Habitat available at the time of the survey consisted of three pools, connected by narrow, shallow riffles and wider runs. Overhanging vegetation was present in the first and second pools, and cattails present in first narrow riffle. Vegetation in the stream corridor included Cottonwood, Willow, Mesquite and Salt Cedar with in-stream vegetation comprised mostly of Typha and various sedges. Photographs of the upper and lower boundaries of the 100 m sample site are provided in Appendix C (Fig.s 6-9).

Sampling in this stream was completed using a BPES, and resulted in the capture of 51 Gila Topminnow (13%), and 334 (87%) Longfin Dace, *Agosia chrysogaster* (Table 6). Longfin were present in all habitats, while Topminnow were only found in pools. Gila Topminnow were most abundant in the fourth and largest bedrock pool sampled; 47 of 51 Topminnow captured were caught there. All individuals of both native species appeared in good condition, with many of the Longfin Dace tuberculate (Appendix C, Fig. 10). The population of Gila Topminnow should be augmented regularly. Other wildlife encountered during this effort included Green Sunfish, *Lepomis cyanellus*, Lowland Leopard Frog and unidentified tadpoles.

Surveys of Morgan City Wash in previous years were conducted further downstream from the present site, and resulted in the capture of Green Sunfish. Green Sunfish still occur in the drainage and during the preliminary efforts of this survey, were captured below the present site, but did not occur within the pools comprising the 2016 sample reach. Because of this, their presence in the drainage is not reflected in the data. During 2014 surveys of Morgan City Wash, Green Sunfish were throughout the stream below the wier, and were found to be preying heavily on Gila Topminnow (Timmons et al. 2015, Appendix C).

Recommendations for this site include the repair of an instream weir that previously served as a barrier to upstream movement of nonnatives and continued monitoring this population.

Post/Freeman Canyons March 29, 2016

UTM 12R Lower Boundary: 545166E, 3493988N Upper Boundary: 544997E, 3493866N

Located on the National Audubon Society Appleton-Whittell Research Ranch, in Santa Cruz County, Post Canyon is tributary O'Donnell Creek, which in turn is tributary to the Babocomari River of the San Pedro River drainage. Although frequently referred to as Post Canyon, the majority of habitat at this site is actually located in an unnamed drainage containing Freeman Spring, within roughly the 90 m immediately upstream from its confluence with Post (Appendix B, Fig. 3). At its confluence with Freeman Spring canyon, Post Canyon is a wide and mostly dry creek bed, predominated by sand and cobble substrates. Water quality at 1232h in Freeman Spring canyon was: temperature of 12.2^{0}C, pH of 8.45, DO_2 of 8.5 mg/L with a conductivity of 447µS/cm.

Lack of surface waters in Post Canyon focused all efforts on the habitat in the Freeman Spring canyon, from immediately above the confluence with Post Canyon to a dam located approximately 150 meters upstream. Surface waters in this system are contained within a narrow, bedrock drainage, with a series of isolated pools (some in excess of 3 m depth, which typically see only seasonal connection (a representative photo is provided in Appendix C, Fig. 11). At the time of these surveys, there was no flow in the channel, and these pools were the only habitat present. Vegetation within the drainage includes oaks, cottonwood and willow.

On March 29, 2016, a reach of 100 m at the site was surveyed for Roundtail Chub. Project protocol calls for the establishment of a 500 m reach of stream to be surveyed, but limited surface waters found all available habitat within 160 m. All habitat was sampled using a combination of hoop nets, dipnets, and minnow traps. No chub or native fishes were caught or observed during the survey. Only two species were present, both of them nonnatives; Mosquitofish, *Gambusia affinis*, was the more

abundant of the two (29; 69%), outnumbering Green Sunfish roughly 2:1 (10; 31%). Tables 7-9 summarize the catch and effort data for all sampling techniques used at the Freeman Spring drainage. Post and Freeman Spring canyons were last monitored for the GRBMP in 2012, with Green Sunfish, Mosquitofish and Sonora Mud Turtle also found during that survey (Timmons and Upton, 2013). Other wildlife observed during the 2016 effort included Sonora Mud Turtle, two species of rattlesnakes and a variety of aquatic invertebrates.

For the management of Post and Freeman canyons, dams upstream of this section should be evaluated to ascertain their current condition, and to evaluate if they continue to moderate flows through this section of Canyon. Post and Freeman canyons should continue to be monitored on a triennial basis.

Walker Creek April 5, 2016

UTM 12S Lower Boundary: 436017E, 3833684N Upper Boundary: 436188E, 3833689N

Walker Creek is a tributary to Wet Beaver Creek in the Verde River drainage. The sample site was located above Rancho Roco Roja, above Lander Spring. Access into Walker Creek was gained by the Walker Basin Trail. Water quality measurements at 1005h in Walker Creek were: temperature of 14.1^{0}C, pH of 8.44, DO_2 of 7.8 mg/L with a conductivity of 351µS/cm.

On April 5, 2016, a 100 m reach of Walker Creek in Coconino National Forest (Appendix B, Fig. 4) was surveyed for Roundtail Chub. Sampling at this site was completed using a BPES and visual observation; Tables 10-11 summarize the catch and effort data for sampling at Walker Creek. Chub were present in deep runs, riffles, and pools. A quick visual reconnaissance of the stream after reaching it found Chub in a large pool, so the100 m sample reach was established and sampling begun. During the last 25 m of the sample reach, fish were consistently swimming away from the electrical field of the BPES and out of the 100 m reach, so the end of the sample reach was extended to encompass a subsequent series of pools to capture fish that had left the sample reach. Sampling effort with the BPES resulted in a total of 25 Chub caught (12%; Table 10). Also captured during the effort were Desert Sucker *Catostomus (Pantosteus) clarki* (53; 24%) and Speckled Dace, *Rhinichthys osculus* (64%; Table 10). An additional 6 chub were observed in the deep pool at the beginning of the 100 m sample reach (Table 11). All species caught appeared to be in good condition, though one Chub appeared to have possible hook damage (Appendix C, Fig. 16). Other aquatic wildlife observed included crayfish and a variety of aquatic insects.

Stream habitat at the time of the survey consisted of pools connected by steep, short riffles and slow runs; margins along some of the larger pools had undercut banks and root masses present. Water depth varied from 10cm in riffles to over 1.5m in the largest pool. A dense canopy of Arizona alder, sycamore and Arizona ash covered much of the sampled reach. Photographs of the upper and lower boundaries of the 100 m sample site are provided in Appendix C (Fig.s 12-15).

Walker Creek continues to provide suitable habitat for Roundtail Chub and should continue to be monitored on a regular basis. The target species has been detected at the fixed station immediately above Rancho Roco Roja during the last two GRBMP surveys (2014, 2016), and further upstream during AGFD Region II surveys. Nonnative fishes including Smallmouth Bass, *Micropeterus dolomieu*, Red Shiner, *Cyprinella lutrensis*, and Green Sunfish are present in the lower section of Walker Creek near its confluence with Wet Beaver Creek (M. Rinker, AGFD, pers. comm. to T. Robinson, AGFD), but the presence of only

native fishes in the surveyed section of the stream is encouraging. Intermittent flows in the lower section stream probably play a role in hindering the movement of nonnative fishes upstream. Except for a small diversion structure immediately above Rancho Roca Rojo, there is no known physical barrier downstream preventing the upstream movement of nonnatives during high water events.

The entire stream course downstream of Rancho Roca Rojo should be hiked to determine the presence of any barrier. If none exist, the opportunity for the installation of a fish barrier downstream in the system should be evaluated.

Dix Creek Left Prong 1 and 2 April 25, 2016

1-UTM 12S Lower Boundary: 672374E, 3672743N Upper Boundary: 672472E, 3672781N

2- UTM 12S Lower Boundary: 672109E, 3673059N Upper Boundary: 672365E, 3672737N

Dix Creek is a small, north-flowing tributary stream of the San Francisco River approximately 50 miles northeast of Safford, AZ. It is a small stream, contained within a steep, narrow canyon and comprised of the confluence between the Left Prong Dix Creek and the Right Prong Dix Creek; both are located on the Apache-Sitgreaves National Forest. Left Prong Dix Creek is the easternmost drainage of Dix Creek (Appendix B. Fig. 5), last surveyed by GRBMP in 2013. The 0.5 km site was accessed by hiking upstream from the FR 215 road crossing. Water quality measurements at 1249h in Dix Creek Left Prong were: temperature of 17.9^{0}C, pH of 8.10, DO_2 of 3.7 mg/L with a conductivity of 333µS/cm.

The focal species of surveys at Dix Creek was the Roundtail Chub. The stream was last surveyed by the GRBMP in October of 2013, with a total of 33 Chub caught within a 100 m sample reach (Timmons et al. 2013). On April 25, 2016, a survey of the stream was carried out by a GRBMP crew using a BPES. However, rather than following protocol and returning to the previously established 100 m site, the crew began sampling from the road crossing up-drainage. Once they caught chub, they established a 100 m sample reach but were unable to capture sufficient numbers, and returned to surveying the 500 m reach. Although a total of 28 Roundtail Chub were caught across the 500 m of stream (Table 12), densities were not sufficiently high to catch the target number within any 100 m. After finishing the first 500 m without achieving their goal, they next established and sampled a 100 m sample reach at the previously established site and collected a total of 25 Chub (Table 13); Chub comprised 71% of all fish captured within the 100 m. Only native species were caught in the Left-Prong Dix Creek, with the other native species identified being Speckled Dace (9; 26%) and Sonora Sucker, *Catostomus insignis* (1; 3%). Photographs of upper and lower boundaries of Left Prong Dix Creek are provided in Appendix C (Fig.s 17-21).

Dix Creek has a heavy over-story of cottonwood, alder, New Mexico locust, willow and sycamore. Run and riffle habitats were the most typical habitats in the surveyed sections, with pool habitat most often occurring along the base of the canyon walls.

This stream continues to provide suitable habitat for Roundtail Chub and other native fish species, and should continue to be monitored on a triennial basis. Road access to stream is poor and future sampling efforts should utilize ATVs and UTVs in order to maximize time and effort at site. Additionally, the final decent into Dix Creek Left Prong is extremely treacherous,

and should only be driven on by experienced ATV/UTV operators, or accessed on foot. Due to the narrow and steep canyon enclosing Dix Creek, sampling should be avoided during seasonal rains as there is ample evidence of extreme flash flooding in the drainage.

Dix Creek Right Prong April 25, 2016

UTM 12S Lower Boundary: 671764E, 3673458N Upper Boundary: 671691E, 3673489N

On April 25, 2016, a reach of 100 m at Right Prong Dix Creek, on Apache-Sitgreaves National Forest (Appendix B, Fig. 5), was surveyed for Roundtail Chub. Right Prong Dix Creek is the southernmost drainage of Dix Creek and was last surveyed by GRBMP in 2013. The site was accessed by hiking downstream from the FR 215 crossing to the confluence of Right Prong Dix and Left Prong Dix creeks and hiking up Right Prong Dix Creek until Chub and suitable habitat were observed. At 1623h, water quality measurements at Right Prong Dix Creek were: temperature of 21.3^{0}C, pH of 7.61, DO_2 of 7.2 mg/L and a conductivity of 304µS/cm.

Sampling of the stream was conducted using a BPES and resulted in the capture of Roundtail Chub (42; 19%; Table 14), Sonora sucker (36; 16%), Desert Sucker (35; 15%), presumed hybrid suckers (*Catostomus* sp.; 2; 1%), Speckled Dace (96; 43%) and Longfin Dace (12; 5%). Speckled Dace was the most abundant species found in Right Prong Dix Creek, followed by Sonora and Desert suckers, which were nearly equal in numbers. No nonnatives were seen or captured. Photographs of upper and lower boundaries of Right Prong Dix Creek are provided in Appendix C (Fig.s 22-25). All fish sampled in this stream appeared to be in good condition (Appendix C, Fig. 26). Habitat throughout the 100m reach consisted primarily of bedrock pools with large boulders, under-cut banks and roots.

Dix Creek continues to provide suitable habitat for Chub and other native fishes, and should continue to be monitored on a regular basis. Road access to the stream is poor and future sampling efforts should utilize ATVs or UTVs in order to maximize time and effort at the site. Additionally, the final descent over the last 200 - 300 m of road into Dix Creek is extremely rough, and should only be driven over by experienced ATV/UTV operators, or accessed on foot. Due to the narrow and steep canyon enclosing both prongs of Dix Creek, sampling should be avoided during seasonal rains, as there is evidence of extreme flash flooding through both canyons.

Harden Cienega April 27, 2016

UTM 12S Lower Boundary: 674779E, 3674588N Upper Boundary: 674871E, 3674573N

Harden Cienega Creek is a north flowing tributary of the San Francisco River approximately 8.3 miles downstream of the Arizona-New Mexico border, on the Apache-Sitgreaves National Forest. Perennial water occurs for approximately 2.7 miles from the confluence with the San Francisco River upstream to the Prospect Creek confluence. The stream has served as a donor site for Chub from 2012-2015, with fish being collected and translocated to Mule Creek, New Mexico by way of the Arizona

Game and Fish Department's Aquatic Research and Conservation Center (Love-Chezem et al. 2015). This area consists of large canyon-bound pools and runs with areas of riparian and aquatic vegetation.

On April 27, 2016, a reach of 100 m at Harden Cienega Creek, was surveyed for Roundtail Chub (Appendix B, Fig. 6). On April 26, 2016, a reach of 100 m at Harden Cienega Creek was surveyed for Roundtail Chub by a GRBMP crew (Appendix B, Fig. 6). Harden Cienega has not been previously surveyed under the GRBMP; the focal species of this effort was Roundtail Chub. Sampling was conducted using a BPES and resulted in a total of 28 Roundtail Chub (10%; Appendix C, Fig. 32), 114 Desert Sucker (39%; Appendix C, Figure 31), 19 Sonora Sucker (6%), 46 Speckled Dace (16%) and 79 Longfin Dace (28%). Table 15 provides a summary of effort and catch data for this site. Photographs of upper and lower boundaries of Harden Cienega are provided in Appendix C (Fig.s 27-30). Desert Sucker was the predominant species captured in this section of stream surveyed; no nonnative species were seen or captured during the effort.

Available habitat within the sample reach at the time of the effort was comprised for the most part of a series of riffles and runs, and a small pool. Chub were found in all the habitat types, but were associated most commonly with run habitat. Vegetation at Harden Cienega includes mature cottonwoods, willows and ash trees.

Harden Cienega should continue to be monitored on at least a regular basis. While the distance from vehicle access (approx. 5 miles) is in excess of the contract guideline for distance from road access, accessing the stream is relatively easy during fair weather conditions, and can be accomplished by hiking up the San Francisco River channel.

Tonto Creek

Tributary to the Salt River, Tonto Creek is located on the Tonto National Forest, beginning at the base of the Mogollon Rim. When flowing throughout its entire length, Tonto Creek flows south for approximately 50 miles to Roosevelt Lake. Surface flow of Tonto Creek is seasonally intermittent below Gun Creek, where it enters a broad alluvial channel. The focal species for Tonto Creek was Roundtail Chub.

Tonto Creek at Gun 1 May 04, 2016

UTM 12S Lower Boundary: 471800E, 3759891N Upper Boundary: 472093E, 3760201N

Tonto Creek at Gun 1 is approximately 300-m upstream from the Gun Creek Stream Gauge on Tonto in Tonto National Forest, Gila County, AZ. The stream was accessed via an unnamed dirt road roughly 4.8 km south of Jakes Corner. Water quality measurements at 1230h in Tonto Creek above the confluence of Gun Creek were: 24.8^{0}C, pH of 8.17, DO_2 of 6.2 mg/L with a conductivity of 547µS/cm. Review of available records indicate that monitoring in 1991 may be the last recorded occurrence of Chub at this site (Abarca and Weedman, 1993).

On May 4, 2016, three sites above the Stream Gauge at Gun Creek on Tonto Creek were surveyed (Appendix B, Fig. 7); these sites were last surveyed for the GRBMP in 2014. The focal species of the survey was Roundtail Chub, but chub were neither captured nor observed during sampling efforts. Sampling was conducted using a combination of hoop nets, minnow traps, and a BPES. During the sampling effort, no native species were found in this reach of river; however Yellow Bullhead, *Ameiurus natalis* (14; 18%) Red Shiner, *Cyprinella lutrensis* (54; 68%) Green Sunfish (*Lepomis cyanellus*, 1; 1%), and Fathead Minnow, *Pimephales promelas* (10; 13%) were all sampled. The most abundant species found at this site was Red Shiner, with Yellow Bullhead second most abundant; Table 16 provides a summary of effort and catch data for Tonto Cr. at Gun Cr. 1. Other aquatic wildlife observed throughout this reach included Sonora Mud Turtles and crayfish. Common vegetation of the surrounding slopes in this reach included mesquite, foothills palo verde, and saguaro cactus (Appendix C, Fig. 33).

Fishes sampled in this reach during 2013, 2014, and 2016 were almost exclusively nonnative. At all three sites on lower Tonto Creek sampled during 2016, only three native fishes were caught (1 Longfin Dace and 2 Sonora Sucker), which suggests a low likelihood of Roundtail Chub in this reach of stream, at the present time. Habitat for chub at Gun 1 is considered poor and very limited. Tonto Creek should continue to be monitored on a regular basis.

Tonto Creek at Gun 2 May 04, 2016

UTM 12S Lower Boundary: 472112E, 3760211N Upper Boundary: 472331E, 3760491N

Tonto Creek at Gun 2 was the second of the three sites surveyed, roughly 300 m upstream from the Gun Creek Stream Gauge on Tonto Creek (Appendix B, Fig. 7). Habitat throughout this reach was largely comprised of long wide pools and runs with sand and silt substrates, interspersed with very large isolated boulders, and limited gravel-cobble riffles. Habitat for chub throughout this 500 m survey reach would be best described as moderate to poor for chub, and habitat complexity low; it was chosen due to the limited amount of habitat at this lower extreme of Tonto Creek. Sampling was conducted throughout the 500 m using a BPES.

The focal species of the effort was Roundtail Chub, but no Chub were captured or observed during the effort. Table 17 summarizes effort and catch data for this site. A total of 110 fish were captured at this site, Yellow bullhead (11; 10%), Red Shiner (92; 84%), Fathead Minnow (5; 5%), Longfin Dace (1; 1%) and Sonora Sucker (1; 1%). Native species comprised roughly 2% of the total catch (Table 17). The only other species noted during the survey include numerous crayfish.

At first glance, habitat within this reach appeared suitable for Roundtail Chub (Appendix C, Fig. 33), but closer examination while sampling suggested available habitat is insufficiently complex to prove ideal cover for them. While pools were moderately deep and often contained one or several large boulders in them, overhanging structure often associated with large instream boulders was largely lacking due to heavy deposits of sand and fine silts. Water depths associated with cover along stream margins also tended to be very shallow.

Fishes sampled in this reach during 2013, 2014, and 2016 were almost exclusively nonnative. Tonto Creek should continue to be monitored on a regular basis.

Tonto Creek at Gun 3 May 04, 2016

UTM 12S Lower Boundary: 472412E, 3760539N Upper Boundary: 472773E, 3760755N

Tonto Creek at Gun 3 was the third of the three sites surveyed upstream from the Gun Creek Stream Gauge on Tonto in Tonto National Forest (Appendix B, Fig. 7). The focal species of the survey was Roundtail Chub, but none were captured or observed during the effort. Habitat complexity in this reach of stream is low largely due to heavy deposits of fine and medium sediments. This survey section contained deeper pools with boulders much larger than the reaches downstream, with more overhangs and undercuts than sections downstream. Because of water depth in most of the pools, sampling with the BPES was limited here; other sampling methods employed included collapsible minnow traps, and hoop nets.

The focal species of the effort was Roundtail Chub, but no Chub were captured or observed during the effort. Tables 18-20 summarize absolute numbers, CPUE, and relative abundance for each species of fish caught per sampling method, distinguished by age-class of fish for larger species sampled. Efforts with the BPES in this stream section resulted in the capture of 95 fish, including Yellow bullhead (12; 13%), Sonora Sucker (1; 1%), Green Sunfish (3; 3%), Red Shiner (74; 78%), and Fathead Minnow (5; 5%). As in the previous two stream sections, Red Shiner was the most abundant species with native species extremely rare. While employing collapsible hoop nets, a total of 3 Green Sunfish were caught, with no fish captured in minnow traps. The only other species noted during the effort was crayfish.

Fishes sampled in this reach during 2013, 2014, and 2016 were almost exclusively nonnative. Tonto Creek should continue to be monitored on a regular basis.

Tonto Creek at Gisela 1 May 05, 2016

UTM 12S Lower Boundary: 473667E, 3771822N Upper Boundary: 473914E, 3772199N

The site established at Gisela 1, was a 0.5 km qualitative survey reach established below the road crossing on the north of where the main channel entered the pool. The reach extended upstream over the road crossing though a narrowed, heavily vegetated run, before encompassing another large pool, which was dammed at the lower end by beavers. On May 5, 2016, water quality measurements at 0946h in Tonto Creek near Gisela, Arizona were: Temperature of 19.6^{0}C, a pH of 8.26, Dissolved Oxygen of 6.2 mg/L and a conductivity of 561µS/cm.

On May 5, 2016, Department personnel surveyed three 500 m sites at Gisela on Tonto Creek in the vicinity of Gisela, AZ, at and above the first road crossing (Appendix B, Fig. 8). The focal species of this effort was Roundtail Chub, but no Roundtail Chub were observed or captured during the effort. This reach of stream was sampled using a BPES, and Table 21 provides a summary of the effort and catch data for this site. A total of 84 fish were caught, with the most common species encountered

being the Yellow bullhead (41; 49%) and the second most common Green Sunfish (14; 16%). Other species captured during the effort include Largemouth Bass (5; 6%), Sonora Sucker (4; 5%), Common Carp (11; 13%), Smallmouth Bass (1; 1%) and Mosquitofish (8; 10%). Sonora Sucker appeared less common than in previous surveys at these sites (Timmons et al. 2015). Also in contrast to former surveys here (ibid.), Sonora sucker was the only native species caught or observed during the 2016 effort. Common plants along this reach include cottonwoods, willows, and cattails (Appendix C, Fig. 34).

Fishes sampled in this reach during 2013, 2014, and 2016 were almost exclusively nonnative. Tonto Creek should continue to be monitored on a regular basis.

Tonto Creek at Gisela 2 May 05, 2016

UTM 12S Lower Boundary: 474098E, 3772568N Upper Boundary: 474371E, 3772967N

Tonto Creek at Gisela 2 was the second of the three 500 m reaches surveyed by the GRBMP crew on May 5, 2016 (Appendix B, Fig. 8). Water visibility was described as turbid throughout this reach of stream, creating poor visibility which may have affected capture rates. The stream channel throughout much of this section was braided, with flows moving through multiple channels over gravel, cobble and silt substrates. Common plants along this reach include cottonwoods, willows, and cattails (Appendix C, Fig. 34). On May 5, 2016, water quality measurements at 0946h in Tonto Creek near Gisela, Arizona were: Temperature of 19.6^{0}C, a pH of 8.26, Dissolved Oxygen of 6.2 mg/L and a conductivity of 561µS/cm.

The focal species of this effort was Roundtail Chub, but no Chub were captured or observed during the effort. Sampling in this reach was carried out primarily employing the BPES with collapsible hoop nets also deployed. Tables 22-23 summarize the effort and catch data for each method. Using the BPES, a total of 41 fish were caught during sampling, with Green Sunfish (22; 53%) and Common Carp, *Cyprinus carpio* (15; 37%) being the two most common species. Additionally, Smallmouth Bass (2; 5%), Yellow bullhead (1; 2%) and Fathead Minnow (1; 2%) were captured; no fish were caught in hoop net sets.

Fishes sampled in this reach during 2013, 2014, and 2016 were almost exclusively nonnative. Tonto Creek should continue to be monitored on a regular basis.

Tonto Creek at Gisela 3 May 05, 2016

UTM 12S Lower Boundary: 474383E, 3772984N Upper Boundary: 474633E, 3773365N

Tonto Creek at Gisela 3 was the third of three 500 m reaches surveyed on the middle reach of Tonto Creek on May 5, 2016 (Appendix B, Fig. 8). As at both previous downstream sites sampled earlier in the day, water throughout this reach was turbid, creating poor visibility. Cobbles and silt comprised the majority of substrates in the flowing portion of the stream. Common plants along this reach include cottonwoods, willows, and cattails (Appendix C, Fig. 34). Sampling in this reach was carried

out employing the BPES, collapsible hoop nets, and visual observation. On May 5, 2016, water quality measurements at 0946h in Tonto Creek near Gisela, Arizona were: Temperature of 19.6^{0}C, a pH of 8.26, Dissolved Oxygen of 6.2 mg/L and a conductivity of 561µS/cm.

The focal species of this effort was Roundtail Chub, but no Roundtail Chub were captured or observed during the effort. Tables 24-26 summarize absolute numbers, CPUE and relative abundance for each species of fish caught per sampling method. A total of 68 fish were caught employing the BPES (Table 24), with Yellow bullhead (36; 53%) and Green Sunfish (29; 42%) being most common. Other species captured with the BPES include Largemouth Bass (1; 1%) and Mosquitofish (2; 3%). Tables 25-26 provide the effort and capture data for the other two sampling methods employed. The only species caught in hoop nets deployed in this stream section was the Sonora Sucker (1; 100%), as reflected in Table 26.

Fishes sampled in this reach during 2013, 2014, and 2016 were almost exclusively nonnative. Tonto Creek should continue to be monitored on a regular basis.

Tonto Creek at Tontozona 1 May 09, 2016

UTM 12S Lower Boundary: 492918E, 3796839N Upper Boundary: 492664E, 3796966N

Two sites were surveyed on Tonto Creek below Camp Tontozona in Gila County, approximately 23 miles northeast of Payson, AZ (Appendix B, Fig. 9). Access was gained through Camp Tontozona after coordinating with the camp General Manager. Air temperatures during sampling were in the mid-70s, with high, light clouds and intermittent sunshine. The stream was accessed off of a trail leading from the east end of the soccer field on the Camp property to streamside, with the lower boundary of the survey reach established immediately above a 6-m waterfall, roughly 500-m downstream. Cobbles and boulders comprised the majority of substrates in the stream. Sampling in this reach was carried out using BPES and collapsible hoop nets. Water quality measurements at 0950h in Tonto Creek at Camp Tontozona were: temperature of 10.2^{0}C, pH of 8.43, DO_2 of 10.2 mg/L with a conductivity of 281µS/cm.

On May 9, 2016, a GRBMP crew sampled two 500 m sites along this section of stream. The focal species of this effort was Roundtail Chub, but no Chub were captured or observed at Tontozona 1 during the effort. Also, no other native fish species were caught or observed. Two sampling methods were employed in this stream section, a BPES and collapsible hoop nets. Tables 27-28 summarize absolute numbers, CPUE and relative abundance for each species of fish caught per sampling method, distinguished by age-class of fish for larger species sampled. A total of 70 fish were caught using the BPES (Table 27), with Brown Trout (47; 67%) being the most common; a total of 23 Rainbow Trout (33%) were also captured employing the BPES. Hoop nets deployed in the same reach failed to catch any fish (Table 28). Common plants along this reach include willows, oaks, and locust (Appendix C, Fig. 35).

While Roundtail Chub was not detected in this reach of Tonto Creek at Tontozona, they are believed to persist downstream at Hellsgate (at the confluence with Haigler Creek), where they were found during a 2013 GRBMP survey (Timmons et al.

2013). Future survey efforts in the upper section of Tonto Creek should focus downstream, on the more remote locations of Tonto Creek known or suspected to still hold Chub.

Tonto Creek at Tontozona 2 May 09, 2016

UTM 12S Lower Boundary: 492610E, 3796959N Upper Boundary: 492264E, 3797236N

Tonto Creek at Camp Tontozona 2 (Appendix B, Fig. 9) was the second of two sites surveyed on upper Tonto Creek on May 9, 2016. Air temperatures during sampling were in the mid-70s, with high, light clouds and intermittent sunshine. The stream was accessed off a trail from the east end of the soccer field on Camp property; the lower boundary of the survey reach was established immediately upstream from the upper boundary of Tonotozona 1 on Tonto Creek, with the upper survey boundary 500 m upstream. Cobbles and boulders comprised the majority of substrates in the stream. Sampling in this reach was carried out using BPES and collapsible hoop nets. Water quality measurements at 0950h in Tonto Creek at Camp Tontozona were: temperature of 10.2^{0}C, pH of 8.43, DO_2 of 10.2 mg/L and a conductivity of 281µS/cm.

The focal species of this effort was Roundtail Chub, but no Roundtail Chub were captured or observed. Also, no other native fishes were captured or observed during the effort. Tables 29-30 summarize absolute numbers, CPUE and relative abundance for each species caught per sampling method, distinguished by age-class of fish for larger species sampled. A total of 72 fish were captured during sampling at this site. Brown Trout (63; 87%) was the most common species caught and Rainbow Trout (8; 11%) the second; Green Sunfish (1; 1) was the only other species detected (Table 29). Collapsible hoop nets were deployed but caught no fish (Table 30). Common plants along this reach include willows, oaks, and locus (Appendix C, Fig. 35).

While the target species was not detected throughout the surveyed sections at Tontozona, Roundtail Chub are believed to persist downstream at Hellsgate (at the confluence with Haigler Creek), where they were found during a 2013 GRBMP survey (Timmons et al. 2013). Future survey efforts in the upper section of Tonto Creek should focus downstream, on the more remote locations of Tonto Creek known or suspected to still hold Chub.

Tonto Creek at Bear Flat May 10, 2016

UTM 12S Lower Boundary: 493311E, 3793021N Upper Boundary: 493461E, 3793399N

On May 10, 2016, Department personnel sampled a 500-m reach of Tonto Creek at Bear Flat Campground, Tonto National Forest, in Gila County, approximately 18 miles east of Payson, AZ (Appendix B, Fig. 10). Access to the site was gained by following Forest Service Road 405A to the Bear Flat camp site. Conditions throughout the day were warm with intermittent light clouds and slight breeze. The stream was accessed by trail from the camping area and sampled from several hundred meters downstream to below the private property boundary upstream. Water quality measurements at 0805h at Tonto Creek below Bear Flats were: 11.0^{0}C, pH of 8.74, DO_2 of 9.2 mg/L with a conductivity of 304µS/cm.

The focal species of this effort was Roundtail Chub, but no Roundtail Chub was captured or observed during the effort. Likely due to the predominance of deep pool habitat in this section of stream , the sampling crew during 2016 did not employ the BPES, instead using only hoop nets. Deployment of twenty hoop nets resulted in the capture of 6 fish of four species; Table 31 summarizes effort and catch data for the set. Green Sunfish (4; 67%) was the most abundant species detected; also capture were Rainbow Trout (1; 17%) and 1 Desert sucker (1; 17%). Figure 37, Appendix C provides an example of pooled habitat at the site. A previous GRBMP crew sampled this site employing a BPES and hoop nets, using the BPES in the limited areas of shallow pool, runs and riffles, with better results (Timmons et al. 2015). Future sampling should avoid establishing the 500 m sampling reach in a length of stream with only one type of habitat. Crayfish was the only other wildlife noted at this site. Common plants along this reach include oak, ponderosa, and sedges (Appendix C, Fig. 36).

As recently as 2013, Roundtail Chub were known to persist in Tonto Creek within the Hellsgate Wilderness, at the confluence of Tonto and Haigler creeks (Timmons et al. 2013). Future sampling should target this section of stream, which may require amending the Scope of Work for the current project, or the development of an additional project targeting more remote and inaccessible sites.

Spring Creek @ Brady Canyon confluence: 1 and 2 May 12, 2016

1-UTM 12S Lower Boundary: 492963E, 3771136N Upper Boundary: 492984E, 3770689N

2-UTM 12S Lower Boundary: 492956E, 3770785N Upper Boundary: 492984E, 3770688N

(Appendix B, Fig. 11), Spring Creek is a tributary to Tonto Creek in the Sierra Anchas of central Arizona. Located west of Young, Spring Creek flows in a generally northwesterly direction to its confluence with Tonto Creek in the Salt River basin. Major tributaries to Spring Creek include Buzzard Roost Canyon and Rock creeks. The creek was accessed via a jeep trail off of Mailbox Mesa. Habitat at Brady Canyon consisted primarily of large, slow moving pools with heavy sediments and filamentous algae, however, occasional riffles and runs with large boulder and cobble substrates are also present. Water quality measurements at 1232h at the site were: temperature of 21.4^{0}C, pH of 8.59, DO_2 of 7.4 mg/L with a conductivity of 372µS/cm.

On May 12, 2016, Department personnel began sampling a 500 m reach of Spring Creek at Brady Canyon. Sampling on Spring Cr. was focused on Roundtail Chub. Efforts through the 500 m were conducted using a BPES, resulting in the capture of only 16 Roundtail Chub (Table 32). Many of the captured Chub displayed light breeding coloration (Appendix C, Fig. 37). Density of Chub appeared low, and speculation suggested the target of 25 fish within a 100m of stream could not be obtained, so the survey of the 500 m continued. Yellow bullhead (85; 41%) and Green Sunfish (107; 51%) comprised the bulk of fishes sampled prior to the establishment of a 100 m reach (Table 32).

Near the end of 500 m, a large pool was found to hold Roundtail Chub in good numbers and a 100 m sample site was established; photographs of the 100 m boundaries are provided in Appendix C (Fig.s 38-41). Due to the depth of the pool, the BPES could not be effectively employed and sampling was conducted using visual observation exclusively. Visual observation through the 100 m resulted in a count of 30 Roundtail Chub (70%) and 13 Green Sunfish (30%; Table 33). Other aquatic

wildlife observed included crayfish and a variety of aquatic insects. Common vegetation occurring along the margins of Spring Creek included alder, Arizona ash, sycamore and willow.

Spring Creek continues to provide suitable habitat for Roundtail Chub, but the high density of Green Sunfish and Yellow Bullhead and low density of Roundtail Chub throughout this stream section is of concern. Spring Creek should continue to be monitored on a regular basis.

Spring Creek below Spring Creek Ranch June 28, 2016

UTM 12S Lower Boundary: 495872E, 3765735N Upper Boundary: 495919E, 3765658N

Located in the Sierra Anchas west of Young, Arizona (Appendix B, Fig. 12), Spring Creek flows in a generally northwesterly direction to its confluence with Tonto Creek in the Salt River basin. Major tributaries to Spring Creek include Buzzard Roost Canyon and Rock creeks. At this site, the creek was accessed through Spring Creek Ranch, hiking downstream to the sample reach. Water quality measurements at 0835h were: temperature of 14.7^{0}C, pH of 8.4 and conductivity of 371µS/cm; due to equipment failure, a DO measurement was not completed.

Focal species of the survey was Roundtail Chub. On June 28, 2016, GRBMP personnel conducted a survey of 100 m in Spring Creek below Spring Creek Ranch. Sampling was carried out using a BPES; Roundtail Chub (37; 49%) comprised of the bulk of all fishes sampled here, with no exotics observed or captured. Other species included: speckled dace (23; 31%), Longfin Dace (4; 5%) and Desert Sucker (12; 16%); Table 34 summarizes the catch and effort data. Habitat within the 100 m at the time of the survey consisted of large shallow runs and riffles. Chub were found to be most abundant within run habitats. Photographs of the lower boundaries of the 100 m sample site are provided in Appendix C (Fig.s 42-43); upper boundary photographs were not recorded or accidentally erased. Protocol was not followed recording effort per habitat, so only a total time was recorded for the 100 m, and is reflected in Table 34. Vegetation present along Spring Creek at the site included cottonwood, willow, sycamore, grasses, and sedges. The canopy along the riparian corridor produces heavy shade over the stream and much of the instream habitat.

Spring Creek continues to provide suitable habitat for Roundtail Chub and should continue to be monitored on a regular basis. Access to Spring Creek at this site requires access through private property (Spring Creek Ranch) and must be coordinated with the caretaker (contact information can be obtained from the local AGFD Wildlife Manager or the USFS Pleasant Valley Ranger District). Spring Creek Ranch also contains a small pond on the property in which numerous bullfrogs were observed.

Rock Creek May 13, 2016

UTM 12S Lower Boundary: 493047E, 3766154N Upper Boundary: 493149E, 3766099N

Rock Creek is a tributary to Spring Creek in the Sierra Anchas of central Arizona. Flowing in a northerly direction to its confluence with Spring Creek, it is located in Tonto National Forest, approximately 7 miles southwest of Young, AZ

(Appendix B, Fig. 13). Buzzard Roost and Clover canyons are major tributaries to Rock Creek. Water volume and clarity during sampling were good, with substrates in the sample reach consisting primarily of large cobble and small boulders. Habitat at the sample reach was comprised mainly of pool and riffle with boulders, undercut banks and downed branches providing suitable instream cover. Common vegetation along Rock Creek includes alder, willow, ash, sycamore, juniper and pinon pine. Water quality measurements at 0828h in Rock Creek were: temperature of 13.0^{0}C, pH of 8.59, DO_2 of 7.6 mg/L and a conductivity of 395µS/cm.

On May 13, 2016, Department personnel carried out a 100 m quantitative sample at Rock Creek. Photographs of the lower and upper boundary of the 100 m sample site are provided in Appendix C (Fig.s 44-47). The focal species of the survey was Roundtail Chub; sampling was conducted using a BPES and resulted in a total of 145 fish caught (Table 35), with Roundtail Chub being the most common species (82; 57%).. Other species captured within the 100 meters included Desert Sucker (15; 10%), Green Sunfish (45; 31%) and Speckled Dace (3; 2%). Table 35 provides a summary of capture and effort data for Rock Creek. Both Desert Sucker and Roundtail Chub showed breeding coloration at the time of monitoring (Appendix C, Fig. 48), and some were reportedly infected with black spot. Other aquatic wildlife observed in Rock Creek included crayfish.

Rock Creek continues to provide suitable habitat for Roundtail Chub and should continue to be monitored on a regular basis. Access to the stream can be accomplished using 4x4 vehicles, ATVs or UTVs.

Wet Beaver Creek below Montezuma Castle 1 May 17, 2016

UTM 12S Lower Boundary: 422442E, 3828917N Upper Boundary: 422845E, 3828889N

On May 17 and May 31, 2016, Department personnel surveyed three 500 m sites on lower Wet Beaver Creek, approximately 1 km downstream from Montezuma Castle National Monument (MCNM), Yavapai Co., AZ (Appendix B, Fig. 14). Wet Beaver Cr. is tributary to Beaver Creek, its confluence with the Verde River just north of Camp Verde. Tributaries to Wet Beaver Creek include Red Tank Draw and Walker Creek. The site was accessed from an unnamed dirt road off of Montezuma Castle Road. Common vegetation along lower Wet Beaver Creek included sycamore, cottonwood, mesquite, acacia and willow. Water quality measurements for Beaver Creek below Montezuma Castle were: temperature of 22.8^{0}C, pH of 8.92, DO_2 of 6.8 mg/L with a conductivity of 438µS/cm.

The focal species of the sampling was Roundtail Chub, but none were captured or observed during the effort. The survey was conducted employing a BPES exclusively. The effort produced only 66 fish of three species within the 500 m surveyed, with only one native species captured (Table 36). The most abundant species caught was Red Shiner (43; 65%), followed by Desert Sucker (20; 30%) and Smallmouth Bass (3; 5%). All individuals of the two larger species caught were classified Age – 0 (Table 36).

Habitat within this section consisted of large slow moving pools, wide, shallow, slow moving runs with cobble substrates and occasional riffles (Appendix C, Fig. 49). No Roundtail Chub have been detected within the lower sections of Wet Beaver Creek during two previous GRBMP surveys, but other Department surveys have found them in the headwaters of the drainage

as recently as 2012 (Rinker, 2012). During previous consultation with Bureau of Reclamation, the upper drainage was determined to be outside the scope of work for the project. Future survey efforts should focus on the area upstream of the Bell Trailhead which may identify the lowermost sections of stream occupied by Roundtail Chub. Crayfish were also noted as present in the survey reach.

Wet Beaver Creek below Montezuma Castle 2 May 17, 2016

UTM 12S Lower Boundary: 423057E, 3829201N Upper Boundary: 422736E, 3829450N

This site was the second of the three surveyed on lower Wet Beaver Creek, approximately 0.25 km below the southern boundary of the MCNM, Yavapai Co., AZ (Appendix B, Fig. 14). Wet Beaver Creek is tributary to the Verde River, where it connects with the Verde River just north of Camp Verde. Tributaries to Wet Beaver Creek include Red Tank Draw and Walker Creek. The site was accessed from an unnamed dirt road off of Montezuma Castle Road.

The focal species of this survey was Roundtail Chub, but none were captured or observed during the effort. Habitat within this 500 m of stream was comprised primarily of large, slow moving pools connected by wide, shallow and slow moving runs, with occasional shallow riffle habitat. Hoop nets were the only sampling method employed and were placed in the best available habitats likely to sample Roundtail Chub. Hoop nets produced only 8 fish of three species, Bluegill, *Lepomis macrochirus* (6; 75%) being the most common, with only one Yellow bullhead (13%) and one Red Shiner (13%) caught. Table 37 provides a summary of effort and catch data for this site. No native species were sampled in this reach, and all larger species were classified Age – 1+. Other species noted at this site include bullfrogs and crayfish. Common streamside vegetation included sycamore, cottonwood, mesquite, acacia and willow.

Hoop net catch rates for the lower section of Wet Beaver Creek were extremely low despite an overnight deployment. Future deployments of this gear in the sample reach should either be greatly intensified or eliminated altogether and replaced with BPES, gill nets and angling. No Roundtail Chub have been detected within the lower sections of Wet Beaver Creek during two previous GRBMP surveys, but other Department surveys have found them in the headwaters of the drainage as recently as 2012 (Rinker, 2012).

During past consultation with the Bureau of Reclamation, the upper drainage was determined to be outside the scope of work for the project. However, consideration should be given to elimination of the lower reaches on Wet Beaver Creek with future surveys focusing on the area upstream of the Bell trailhead which may identify the lowermost reach of stream occupied by Roundtail Chub.

Wet Beaver Creek above Montezuma Castle May 31, 2016

UTM 12S Lower Boundary: 423937E, 3831039N Upper Boundary: 424196E, 3831286N

Wet Beaver Creek above Montezuma Castle was the third of the three sites surveyed on lower Wet Beaver Creek, located approximately 0.60 km north of MCNM boundary, Yavapai Co., AZ (Appendix B, Fig. 14). Wet Beaver Cr. is tributary to the Verde River, with its confluence just north of Camp Verde. Tributaries to Wet Beaver Creek include Red Tank Draw and Walker Creek. Water quality measurements at 0907h above Montezuma Castle were: temperature of 20.0^{0}C, pH of 8.2, and conductivity of 535µS/cm; DO_2 was not collected due to equipment malfunction.

The focal species of this survey was Roundtail Chub, but none were captured or observed during the effort. A total of 18 Hoop nets and 8 minnow traps were deployed to sample this reach of stream, with poor results. No native species were found in this reach of stream, with only seven fish caught, the most common being Bluegill (4; 57%), and Red Shiner (3; 43%) the only other species captured. Tables 38 and 39 summarize the effort and catch data for both sampling methods.

Habitat within this stream section was comprised mainly of slow flowing pools, with short reaches of riffle; predominant substrates were boulder and cobble. Common streamside vegetation included sycamore, cottonwood, mesquite, acacia and willow.

Roundtail Chub have not been detected within the lower sections of Wet Beaver Creek during two previous GRBMP surveys. They have been found by other Department surveys near the headwaters of the drainage. No Roundtail Chub have been detected within the lower sections of Wet Beaver Creek during two previous GRBMP surveys, but other Department surveys have found them in the headwaters of the drainage as recently as 2012 (Rinker, 2012). During past consultation with the Bureau of Reclamation, the upper drainage was determined to be outside the scope of work for the project.

Future survey efforts should focus on the area upstream of the Bell trailhead which may identify the lowermost sections of stream occupied by Roundtail Chub. Hoop net and minnow trap catch rates for the lower section of Wet Beaver Creek were extremely low despite being deployed for several hours. Future use of these gear-types in the lower stream section should either be greatly increased or eliminated altogether and replaced with BPES, gill nets and angling.

Wet Beaver Creek at Lawrence Crossing May 17, 2016

UTM 12S Lower Boundary: 432645E, 3834691N Upper Boundary: 433075E, 3834949N

On May 17, 2016 department personnel conducted three 500 m surveys on Middle Wet Beaver Creek. The first of the three surveys was on middle Wet Beaver Creek, at the Lawrence Crossing approximately 1.5 km ENE of Montezuma Well, Yavapai Co., AZ (Appendix B, Fig. 15). Wet Beaver Creek is tributary to the Verde River, its confluence with the Verde River just north of Camp Verde. Tributaries to Wet Beaver Creek include Red Tank Draw and Walker Creek. Common streamside vegetation included alder, cottonwood, and grasses. Water quality measurements at 0928h in Wet Beaver Creek at Lawrence Crossing were: temperature of 16.8^{0}C, pH of 8.45, DO_2 of 6.2 mg/L with a conductivity of 278µS/cm.

The focal species of this 500 m survey was Roundtail Chub, but none were captured or observed. This site was sampled using a BPES exclusively, resulting in the capture of three different species, two nonnative and one native. Smallmouth Bass (50; 77%) was the most abundant species sampled in this stream section, followed by Rainbow Trout, *Oncorhynchus mykiss* (13; 20%) and Desert Sucker (2; 3%). All fish caught were classified as Age – 1+, with no Age – 0 captured or observed. Table 40 provides a summary of effort and catch data for this site. Habitat in this section and above was generally more complex than habitats in the lower section of Wet Beaver Creek, and was heavily shaded with a dense overstory (Appendix C, Fig. 51). Other aquatic wildlife observed in this reach of Wet Beaver Creek included crayfish.

Roundtail Chub have not been detected in the past two GRBMP surveys within the middle section of Wet Beaver Creek. They have been found by other Department surveys near the headwaters of the drainage. No Roundtail Chub have been detected within the lower sections of Wet Beaver Creek during two previous GRBMP surveys, but other Department surveys have found them in the headwaters of the drainage as recently as 2012 (Rinker, 2012). During past consultation with the Bureau of Reclamation, the upper drainage was determined to be outside the scope of work for the project.

Surveys on Wet Beaver Creek should be continued, but future efforts should focus on the area upstream of the Bell trailhead which may identify the lowermost sections of stream occupied by Roundtail Chub.

Wet Beaver Creek at Beaver Creek Camp May 17, 2016

UTM 12S Lower Boundary: 434213E, 3836327N Upper Boundary: 434613E, 3836573N

Wet Beaver Creek at Beaver Creek Camp was the second of three sites surveyed on middle Wet Beaver Creek (Appendix B, Fig. 16). It is located adjacent to the Beaver Creek Campground, approximately 0.4 km south of the Beaver Creek Ranger Station, Yavapai Co., AZ. Wet Beaver Creek is tributary to the Verde River, joining the Verde River just north of Camp Verde. Tributaries to Wet Beaver Creek include Red Tank Draw and Walker Creek.

The focal species of this survey was Roundtail chub, but none were captured or observed during the effort. This site was surveyed using a BPES exclusively. Sampling resulted in the capture of three species, with Rainbow Trout (56; 57%) and Smallmouth Bass (35; 35%) most common, and Desert Sucker (8; 8%) least abundant. Table 41 provides a summary of effort and catch data for this site. All fish captured were Age – 1+, with no Age - 0 captured or observed. Habitat between Lawrence Crossing and the Bell trailhead had swifter currents and generally narrower, more complex than in the lower sections of stream, with interconnected pool, run and riffle habitats (Appendix C, Fig. 52). Crayfish were also present in this section of stream. Common streamside vegetation included cottonwood, alder, mint, sycamore and grasses.

Roundtail Chub have not been detected in the past two GRBMP surveys within the middle section of Wet Beaver Creek, but have been found during other Department surveys near the headwaters of the drainage. No Roundtail Chub have been detected within the lower sections of Wet Beaver Creek during two previous GRBMP surveys, but other Department surveys have found them in the headwaters of the drainage as recently as 2012 (Rinker, 2012). During past consultation with the Bureau of Reclamation, the upper drainage was determined to be outside the scope of work for the project.

Future survey efforts should focus on the area upstream of the Bell trailhead which may identify the lowermost sections of stream occupied by Roundtail Chub.

Wet Beaver Creek below Beaver Creek Ranch May 17, 2016

UTM 12S Lower Boundary: 435264E, 3837315N Upper Boundary: 435660E, 3837432N

Wet Beaver Creek at below Beaver Creek Ranch was the last of three sites surveyed on middle Wet Beaver Creek. It is located approximately 0.6km west of Beaver Creek Ranch, near the Bell trailhead (Appendix B, Fig. 16). Wet Beaver Creek is tributary to the Verde River, with its confluence with the Verde River just north of Camp Verde. Tributaries to Wet Beaver Creek include Red Tank Draw and Walker Creek. Water quality data for this site was not taken.The focal species of this survey was Roundtail chub, but none were captured or observed during the effort. Sampling at this site was conducted with a BPES exclusively and resulted in the capture of only Smallmouth Bass (35; 100%). All Smallmouth Bass captured were classified as Age – 1+, with no Age – 0 captured or seen. No native fish species were caught or observed during the sampling effort. Table 42 provides a summary of effort and catch data.

Habitat within this stream reach consisted of a mixture of run, riffle and pool, with substrates consisting of bedrock, boulder and cobble. Habitat was complex with a series of pool, run and riffle habitats (Appendix C, Fig. 53). Common streamside vegetation included alder, mint, and grasses.

Roundtail Chub have not been detected in the past two GRBMP surveys within the middle section of Wet Beaver Creek, but have been found during other Department surveys near the headwaters of the drainage. No Roundtail Chub have been detected within the lower sections of Wet Beaver Creek during two previous GRBMP surveys, but other Department surveys have found them in the headwaters of the drainage as recently as 2012 (Rinker, 2012). During past consultation with the Bureau of Reclamation, the upper drainage was determined to be outside the scope of work for the project.

Future survey efforts should focus on the area upstream of the Bell trailhead which may identify the lowermost reach of stream occupied by Roundtail Chub.

O'Donnell Creek May 23, 2016

UTM 12S Lower Boundary: 544832E, 3492215N Upper Boundary: 544792E, 3492135N

On May 23, 2016, Department personnel conducted a survey in O'Donnell Canyon (Appendix B, Fig. 17), located on The Nature Conservancy's Canelo Hills Cienega Reserve. Located southeast of Sonoita, AZ. in Santa Cruz County, O'Donnell Canyon is tributary to the Babocomari River, directing runoff from much of the northerly slopes of the Canelo Hills, to its confluence with the Babocomari. Much of its perennial waters are limited to the middle and lower reaches of the drainage,

largely from the vicinity of the cienega and below. Tributary drainages of O'Donnell Canyon include Post Canyon and Turkey Creek. Water quality measurements at 1320h in O'Donnell Canyon were: temperature 23.0^{0}C, pH 7.63, DO 5.0 mg/L, with a conductivity of 639µS/cm.

Habitat in O'Donnell Canyon is characterized by typical cienega habitat of moderate-sized pools interconnected with small, shallow runs. The system is densely overgrown with willow (Appendix C, Fig.s 54-57) and is surrounded by cottonwood, oak, New Mexican Locust and grasses. O'Donnell Canyon was last sampled by the GRBMP in 2013 and found three species, Roundtail Chub, Sonora Sucker and Mosquitofish (Timmons et al. 2013).

The focal species of this survey was Roundtail Chub which was captured and observed during the effort. Dense streamside vegetation and overgrowth of the stream channel throughout, made sampling with the BPES impossible, so all sampling was completed using hoop nets. Hoop nets were set throughout the 500 m survey reach and fished overnight. Both Roundtail Chub and Sonora Sucker were found throughout the 500 m, so a 100 m subsample was established and catch recorded (Table 43). Within the 100 m sample section, Roundtail Chub (49; 88%) was most abundant, making up the bulk of the fish caught, with Sonora Sucker (7; 13%) locally not as abundant. However, a total of 36 Sonora Sucker (all adults) were captured throughout the 500 m, indicating they may be doing well in the area. Also throughout the 500 m, a total of ten Age – 0 Roundtail Chub were caught. Although previous surveys found Mosquitofish present, no nonnative species were captured or observed during this effort. However, this and the low numbers of Age – 0 fish captured, may be due to the net mesh size, a bias inherent to the sampling gear employed. Table 44 summarizes total effort and catch data throughout the 500 m, with Roundtail Chub (190; 83%) and Sonora Sucker (29; 13%). Photographs of the lower and upper boundaries of the 100 m sample site are provided in Appendix C (Fig.s 54-57). Other aquatic wildlife observed included crayfish and Sonora Mud Turtle.

O'Donnell Canyon continues to provide suitable habitat for Gila Chub and should continue to be monitored on a regular basis. Willow densities along and over the stream are extremely high resulting in heavy shade over much of the stream. Future surveys should employ minnow traps in suitable habitat in order to detect this species or the presence of Gila topminnow.

Coal Mine Canyon June 02, 2016

UTM 12R Lower Boundary: 510438E, 3487948N Upper Boundary: 510504E, 3488020N

On June 02, 2016, Department personnel conducted a 100 m survey in Coal Mine Canyon (Appendix B, Fig. 18), located in Santa Cruz County, AZ. Coal Mine Canyon is tributary to Fresno Canyon in the Sonoita Creek drainage of the Santa Cruz River sub-basin. Surface flow within Coal Mine is absent during much of the year, however bedrock at or close beneath the surface along the drainage provide sites of permanent water throughout the year (Appendix C, Fig.s 58-61). Water quality measurements at 1127h in Coal Mine Canyon were: temperature of 26.3^{0}C; pH of 8.68; DO of 7.02 mg/L; and conductivity of 336µS/cm.

The focal species at Coal Mine Canyon was Gila Topminnow (44), which comprised 100% of the species sampled (Table 45), with no other fishes (exotic or native) observed or captured. The majority of habitat at this site was comprised of a circular

pool over bedrock, roughly 15 m in diameter; the remainder of the 100 m reach was without surface water. The only sampling method employed at this site was dipnets. Table 45 provides a summary of effort and catch data for Coal Mine Canyon. One Gila Topminnow captured displayed a perforated abdominal wall (Appendix C, Fig. 62), but all other fish appeared in good condition. Photographs of the lower and upper boundaries of the 100 m sample site are provided in Appendix C (Figures 58-61). This site was last surveyed by GRBMP in October 2012 using minnow traps, and captured approximately 400 Gila Topminnow; Longfin Dace were also present (Timmons and Upton, 2013). Other aquatic wildlife observed during the 2016 survey included bullfrogs, crayfish and various aquatic insects. Riparian vegetation typical of this site included sedges, Arizona ash, oak, net-leaf hackberry, seep willow, desert broom, and deer grass.

Major threats to the Coal Mine Canyon population of topminnow appear to be loss of aquatic habitat due to extended drought, and degradation of aquatic habitats and surrounding terrestrial habitat due to the prolonged presence of cattle. A gate into the area was found open at the arrival of the survey team, and cattle were noted wading in the pool.

Coal Mine Canyon currently provides suitable habitat for Gila Topminnow and should continue to be regularly monitored. Road access to the stream is marginal, and should be accessed using ATVs or UTVs.

Fresno Canyon June 03, 2016

UTM 12R Lower Boundary: 507750E, 3485956N Upper Boundary: 507844E, 3485980N

Located in Santa Cruz County, Arizona (Appendix B, Fig. 19), Fresno Canyon drains south from the Grosvenor Hills to its confluence with Sonoita Creek in the Santa Cruz River sub-basin. Coal Mine Canyon is the primary tributary to Fresno Canyon. Surface waters are limited throughout much of the year in Fresno Canyon, however surface flow is maintained in the vicinity of the confluence of Fresno and Coal Mine canyons, providing permanent habitat for native fishes through the drier months. Water quality measurements at 0837h at Fresno Canyon were a temperature of 18.1^{0}C, a pH of 7.62, a DO of 5.4 mg/L and conductivity of 452µS/cm.

On June 03, 2016, Department personnel conducted a 100 m survey in Fresno Canyon. The sample site at Fresno Canyon can be characterized as multiple slow moving pools, interconnected by small, shallow flows. Riparian vegetation typical of Fresno Canyon includes mesquite, Arizona ash, net-leaf hackberry, seep willow, and deer grass. Photographs of the lower and upper boundaries of the 100 m sample site are provided in Appendix C (Fig.s 63-66). Focal species of the survey was Gila Topminnow and sampling was conducted using dipnets exclusively. A total of 86 Topminnow (79%) were caught, with Longfin Dace (23; 21%) being the only other species captured; no nonnative species were seen or captured. Table 46 (Appendix A) provides a summary of effort and catch data. All fish captured appeared in good condition, with gravid females, and males in breeding coloration noted; Age – 0 Topminnow were also noted to be present. Fresno Canyon was last surveyed by GRBMP in 2012, resulting in the capture of 4169 Gila Topminnow and 68 Longfin Dace (Timmons and Upton, 2013). Other wildlife observed during the survey included crayfish, bullfrogs, a variety of aquatic insects, and Whitetail Deer (*Odocoileus virginianus*).

This disparity in numbers captured is likely due to the different sampling methods employed. Sampling efforts in 2012 were undertaken during the cooler month of October, employing a straight seine and minnow traps, while the 2016 effort was carried out during June and the heat of midsummer, and employed only dipnets. Dipnets rather than seines were employed as the method of choice to minimize disturbance to water quality during a period of high temperatures, and to control the number of topminnow captured and subjected to stress. Seining is certainly more effective at capturing large numbers of Topminnow, but also exposes large numbers to excess stress, and often causes a major decline in water quality in very limited aquatic habitats. Employing dipnets or minnow traps in such limited habitats are undoubtedly the least stressful methods of capture during periods of high temperatures, and both are accepted methods of sampling for the GRBMP.

Fresno Canyon continues to provide suitable habitat for Gila Topminnow and should continue to be monitored on a regular basis. Fresh cattle droppings were present along streamside at the time of the survey. Traditionally the survey location has been accessed from the south via a network of jeep trails originating east of Rio Rico, Arizona. However, due to the convoluted nature of this trail network and inconsistencies between digitized maps, topographic maps and satellite imagery, Fresno Canyon can be accessed (temperatures allowing) from the northwest as an extension of the route to the Coal Mine Canyon sampling site. Hiking this route is approximately ½ mile longer than the traditional entry point, but allows access to both Coal Mine Canyon and Fresno Canyon.

Swamp Springs June 08, 2016

UTM 12S Lower Boundary: 566507E, 3589050N Upper Boundary: 566600E, 3589088N

Located approximately 30 miles north of Benson, AZ on the western slopes of the Galiuro Mountains, Swamp Springs is found within the Redfield Canyon Wilderness Area on the Muleshoe Ranch Cooperative Management Area (Appendix B, Fig. 20). The survey crew accessed the drainage from the crossing of the Pride Ranch Road, hiking down the dry streambed to the section with perennial flow. Swamp Springs Canyon is a narrow canyon with surface flow draining over bedrock and surrounded by cottonwood, sycamore, alder, willow and sedges. Run and pool habitats were present in the sample reach, with the majority of habitat sampled consisting of a series of pools separated by small riffles or debris piles. Leaf litter covered ~ 40% of water surface throughout the reach. Water quality measurements at 0715h were: temperature of 21.9^{0}C, pH of 7.9, DO_2 of 4.1 mg/L, and conductivity of 363µS/cm.

On June 08, 2016, Department personnel conducted a 100 m survey in Swamp Springs Canyon. The focal species for the effort was Gila Topminnow. Topminnow were first observed near the upper boundary of the sample reach. A quantitative 100 m sample reach was established beginning at a large pool containing topminnow (the location where stocking occurred in 2007 and 2008), and extending downstream. Sampling was carried out with minnow traps and dipnets, resulting in the capture of 531 Gila Topminnow (66%) and 268 Longfin Dace (34%). Tables 47 and 48 provide summaries of effort and capture data for both sampling methods. Photographs of the lower and upper boundaries of the 100 m sample site are provided in Appendix C (Fig.s 67-70).

Swamp Springs Canyon was last surveyed by the GRBMP in November of 2013 and captured a total of 1,382 Gila Topminnow and 367 Longfin Dace (Timmons et al. 2013). It continues to provide suitable habitat for Gila Topminnow and other native fishes, and should continue to be monitored on a regular basis. Canopy density should be monitored to prevent complete shading of the stream, which may result in habitat becoming unsuitable for Gila Topminnow. Road access to the stream is poor, and using ATVs or UTVs for access may be preferable. Due to the remoteness and narrow, steep topography of Swamp Springs Canyon, sampling should be avoided during periods of very high temperatures or during periods of seasonal rains, as there is a high likelihood of flash flooding through the system.

Cherry Spring June 09, 2016

UTM 12S Lower Boundary: 565378E, 3586895N Upper Boundary: 565972E, 3587075N

On June 09, 2016, Department personnel conducted a 500m survey in Cherry Spring Canyon (Appendix B, Fig. 21) on the Muleshoe Ranch Cooperative Management Area. Cherry Spring is located on the western slopes of the Galiuro Mountains, north of Benson, AZ. A 0.5 km section of stream was established, known to contain perennial surface water in the upper reach. However, roughly 90% of the 0.5 km was dry, so to encompass a tinaja known to exist in the lower drainage, roughly 150 m was added to the survey reach. The uppermost 40 m contained two large, and one small pool, all heavily shaded and covered with leaves. The only other surface water within the survey reach was the 20m long tinaja down canyon, which was used as the lower boundary of the survey. Water quality measurements at 0715h, at Cherry Spring Canyon were: temperature of 20.5^{0}C, pH of 7.46, DO_2 of 1.2 mg/L, with a conductivity of 366µS/cm.

Cherry Spring Canyon is a small, canyon-bound stream surrounded by ash, black walnut, sycamore and willow; cattails, sedges, and grasses are common within and along perennial surface waters. Habitat consists almost exclusively of pools, some with dense emergent vegetation. The lower tinaja is the most downstream perennial water in the system, and is clear and partially shaded at the base of a rock cliff. Sampling was carried out using collapsible minnow traps, with the focal species being Gila Topminnow. Traps were set in the spring pool at the top of the section, and in the tinaja at the lower end (Appendix B, Fig. 71). Between the two sampling sites, there was approximately 600 m of dry creek bed overgrown with vegetation. Efforts found no fish species in either location (Table 49). There was no other perennial water in the drainage, so no additional 0.5 km qualitative reaches were established.

Despite stockings of Gila Topminnow and Desert Pupfish in 2007 and 2008, both species appear to have failed at the Cherry Spring pools. Cherry Spring Canyon was last surveyed by the GRBMP in November 2013 where one juvenile Gila topminnow was captured (Timmons et al. 2013). The pools into which Topminnow and Pupfish were stocked is heavily shaded throughout much of the year, with low productivity and a heavy input of coarse organic materials.

At this time, Cherry Spring Canyon does not provide suitable habitat for Gila Topminnow, as well as other native fish species. Dissolved oxygen at the time of the 2013 survey was recorded at 4.78 mg/L, but was much lower during the 2016 survey (1.2 mg/L), with the water reportedly giving off a strong, unpleasant odor. Vegetation in and around Cherry Spring Canyon is very dense and prevents adequate light penetration, resulting in low productivity in the pools. If vegetation in the drainage can be

managed to increase light penetration to the spring and pools, this site may support topminnow or another native species in the future, however until that time it is recommended that monitoring of this site be discontinued for this project.

Campbell Blue Cr. at Turkey Cr. July 12, 2016

UTM 12S Lower Boundary: 679047E, 3734570N Upper Boundary: 678662E, 3734475N

On July 12, 2016, Department personnel conducted a 500 m survey of Campbell Blue Creek below the confluence of Turkey Creek (Appendix B, Fig. 22). Located in the Apache–Sitgreaves National Forest, Campbell Blue Cr. is tributary to Blue River, roughly 12.5 km (7.75 miles) south of Alpine AZ. It flows in an easterly direction from Arizona to its confluence with Pace Creek in Catron County, New Mexico, where it forms the upper extent of the Blue River. Tributaries to Campbell Blue Cr. include Coleman, Castle-Buckalou and Turkey creeks. Surface flows from the majority of tributaries in the drainage only reach their confluence with Campbell Blue Cr. intermittently. Water quality at 1000h at Campbell Blue Creek was: Temperature of 21.6°C; Conductivity of 259 µS; pH of 9.1, and dissolved Oxygen of 7.4 mg/L.

The focal species of the survey on Campbell Blue Cr. was Loach Minnow, *Tiaroga cobitis*. Sampling was conducted utilizing a BPES unit and a block seine exclusively, with cobble being rolled by foot during the application of current. Loach minnow in Campbell Blue Creek are a naturally occurring population, and are not known to have been augmented with any supplemental stockings. Loach Minnow were found in the two lower 500 m sections of stream surveyed, but a total of three 500 m sections were surveyed altogether (the second and third sites are summarized below) because an insufficient number were captured within either of the 100 m sample sites established in the lower two 500 m survey reaches.

Five species of fish were found in this section of stream (Table 50), 4 native and 1 nonnative. Loach minnow (19; 1%) were present but were the least abundant of all species encountered. Two Loach Minnow were caught within the first 100 m at Turkey Cr., but habitat was small and isolated, and most of the limited cobble substrate was strongly embedded. Sampling was therefore continued upstream until a stretch of suitable cobble substrate was reached. A 100 m sampling site was established, however, similar to the small stretch of cobble downstream, most of the cobble present was embedded and only 9 Loach Minnow were found within the 100 m site. After sampling in the 100 m was concluded, the survey continued through the remainder of the 500 m, with eight additional Loach Minnow captured. Speckled Dace (797; 58%) was the most abundant species throughout the 500 m length of stream. Other species present include Longfin Dace (314; 23%), Desert Sucker (166; 12%), and Brown Trout, *Salmo trutta* (68; 5%). This was the only section in Campbell Blue Creek in which Longfin Dace were found. Table 50 summarizes total effort and catch data throughout the 500 m.

Other species captured in the survey site included a juvenile Terrestrial Gartersnake, an unidentified species of toad, and an unidentified species of bat which was observed flying into the stream. Plant species regularly encountered at streamside included Arizona alder, willow, monkeyflower, with threadleaf crowfoot. Common plants on the adjacent terraces and slopes included cottonwoods and ponderosa pine.

Management recommendations for Loach Minnow include a search for practicable methods of habitat improvement, and consideration of a study evaluating mechanical disturbance (loosening) of strongly embedded cobbles and gravels, and the resulting effects on species occupation and total numbers in disturbed versus undisturbed habitats.

Campbell Blue Cr. at KE Canyon July 12, 2016

UTM 12S Lower Boundary: 677109E, 3734848N Upper Boundary: 676698E, 3734882N

On July 12, 2016, Department personnel conducted a second 500 m survey of Campbell Blue Creek below the confluence of KE Canyon (Appendix B, Fig. 22). As in the previous stream section, the focal species at this site was Loach Minnow, which were present but in lower relative and absolute abundance than in the lower section of stream. Only three Loach Minnow were caught within the 500 m (Appendix A, Table 51), and they comprised less than 1% of the total fish sampled. As with the lower section, a 100 m sample reach containing suitable habitat was established and sampled, yet no Loach Minnow were collected within it. Also similar to the section below Turkey Cr., cobble substrate was strongly embedded. After sampling was completed in the 100 meters and no Loach Minnow captured, the remainder of the 500 m stream section was sampled. Water quality at 1516h was pH of 8.8; conductivity of 251µS; temperature of 26.8° C, and dissolved oxygen of 6.3 mg/L.

Although Longfin Dace was not detected in this reach, an additional species, Sonora Sucker (6; 1%) was found, comprising just over 1% of the total fish sampled; both Age-1+ and Age-0 Sonora Sucker were present (Table 51). Other species collected in this reach include Desert Sucker (19; 4%), Speckled Dace (383; 79%) and Brown Trout (72; 15%). Brown Trout comprised a greater proportion of the population than found in the stream at Turkey Cr., sampled earlier in the day. Table 51 summarizes total effort and catch data throughout the 500 m. Other species encountered on Campbell Blue Cr. at KE Canyon include one adult terrestrial gartersnake. Common plants along the drainage include Ponderosa pine, Arizona alder, willow and Virginia creeper.

Management recommendations for Loach Minnow include a search for practicable methods of habitat improvement, and consideration of a study evaluating mechanical disturbance (loosening) of strongly embedded cobbles and gravels, and the resulting effects on species occupation and total numbers in disturbed versus undisturbed habitats.

Campbell Blue Cr. at Corral July 13, 2016

UTM 12S Lower Boundary: 675650E, 3734849N Upper Boundary: 675206E, 3734621N

On July 13, 2016, Department personnel completed a 500 m survey of Campbell Blue Creek below the confluence of Cat Creek (Appendix B, Fig. 23). Water quality at 1026h was pH of 8.76; conductivity of 244µS; temperature of 20.7° C, and dissolved oxygen of 5.9 mg/L.

As with the previous two sections, the target species was Loach Minnow, but none were found within this stream section. Species diversity was lower than in downstream sections, with only 4 species collected (Table 52). Unlike the two lower sections, Brown Trout (306; 58%) was the predominate species here, comprising 58% of the total fish sampled. Speckled dace (158; 30%) was the second most common species, followed by Desert Sucker (45; 8%) and Sonora Sucker (20; 4%). This was the lowest density of Speckled Dace found in the three sections sampled. Both Sonora Sucker and Desert Sucker Age-1+ individuals were common, however there were no Age-0 Sonora Sucker and only one Age-0 Desert Sucker captured. Table 52 provides a summary of total effort and catch data throughout the 500 m. Common vegetation along the drainage includes a number of grasses, Arizona alder, willow, Ponderosa pine and Virginia creeper.

Management recommendations for Loach Minnow include a search for practicable methods of habitat improvement, and consideration of a study evaluating mechanical disturbance (loosening) of strongly embedded cobbles and gravels, and the resulting effects on species occupation and total numbers in disturbed versus undisturbed habitats.

Dry Blue/Pace creeks at Dry Blue 1 July 12, 2016

UTM 12S Lower Boundary: 681878E, 3733822N Upper Boundary: 682087E, 3734124N

Dry Blue and Pace creeks are tributaries of Blue River in Catron County, NM. They are found on the Apache-Sitgreaves National Forest (Quemado Ranger District) in NM, but are administered by the Gila National Forest in NM (Appendix B, Fig. 24). Pace Cr. is tributary to Dry Blue Cr., which joins Campbell Blue Creek to form the upper extent of the Blue River. Three 500 m surveys were completed within Dry Blue and Pace creeks during 12-13 July, 2016.

Vegetation along the stream included monkey flower, wooly mullein, several varieties of grasses, and willows, with ponderosa pine the predominant tree along stream terraces and adjacent slopes.

On July 12, 2016, Department personnel conducted a 500 m survey of Dry Blue Creek, approximately 1.4 stream-km from its confluence with Campbell Blue Creek, at a site designated “Dry Blue 1”; the focal species of the surveys in this drainage was Loach Minnow. Water quality at the site at 0853h was pH of 8.4; conductivity of 371µS; temperature of 14.7° C, and dissolved oxygen of 7.7 mg/L.

Surveys were conducted employing a BPES and block seine, with cobble being rolled by foot during the application of current. Three species were collected in this reach of Dry Blue Cr., with Speckled Dace the most common (271; 56%), followed by Longfin Dace (198; 41%) and Brown Trout (13; 3%). No Loach Minnow were collected or seen during this effort. All Brown Trout collected at this locality were Age-0 fish. Table 53 provides a summary of total effort and catch data throughout the 500 m. Other species encountered in this stream section included Terrestrial Gartersnake and an unidentified species of anuran tadpole.

Management recommendations for Loach Minnow include a search for practicable methods of habitat improvement, and consideration of a study evaluating mechanical disturbance (loosening) of strongly embedded cobbles and gravels, and the resulting effects on species occupation and total numbers in disturbed versus undisturbed habitats.

Dry Blue/Pace at Dry Blue 2 July 12, 2016

UTM 12S Lower Boundary: 682078E, 3734150N Upper Boundary: 682158E, 3734531N

On July 12, 2016, Department personnel conducted a second 500 m survey of Dry Blue Creek, at a site designated "Dry Blue 2". Dry Blue and Pace creeks are tributaries of Blue River in Catron County, NM. They are found on the Apache-Sitgreaves National Forest (Quemado Ranger District) in NM, but are administered by the Gila National Forest (Appendix B, Fig. 24).

Due to limited suitable habitat within the stream, personnel chose to establish the site immediately adjacent to the previous sit (Dry Blue 1). As with the previous site, the focal species of this survey was Loach Minnow. The survey was completed employing a BPES and block seine; cobble substrates were rolled by foot during the application of current. No Loach Minnow were collected or seen during this effort. The majority of the habitat available within this reach was described as very shallow runs and riffles choked with aquatic vegetation, and with an occasional knee-deep pool. Water quality at 0853h was pH of 8.4; conductivity of 371µS; temperature of 14.7° C, and dissolved oxygen of 7.7 mg/L.

At the Dry Blue 2 section, the same three species encountered immediately downstream were the only species captured. Speckled Dace was again the most common species (94; 67%), followed by Longfin Dace (36; 26%) and Brown Trout (10; 7%). Similar to Dry Blue 1, all Brown Trout captured were found in very shallow pools, however unlike the lower section, Age-1 Brown Trout were found within this stream section. Table 54 provides a summary of total effort and catch data throughout the 500 m.

Management recommendations for Loach Minnow include a search for practicable methods of habitat improvement, and consideration of a study evaluating mechanical disturbance (loosening) of strongly embedded cobbles and gravels, and the resulting effects on species occupation and total numbers in disturbed versus undisturbed habitats.

Dry Blue/Pace at Pace Creek July 13, 2016

UTM 12S Lower Boundary: 683057E, 3736900N Upper Boundary: 682748E, 3737153N

The upper drainage of Pace Creek originates in Apache and Greenlee counties of Arizona and drains in southerly direction to its confluence with Jackson Creek, where the drainage changes to an easterly direction and shortly enters New Mexico. Dry Blue and Pace creeks are tributaries of Blue River in Catron County, NM. They are found on the Apache-Sitgreaves National Forest (Quemado Ranger District) in NM, but are administered by the Gila National Forest (Appendix B, Fig. 25).

On July 12, 2016, GRBMP crews undertook a third 500 m survey on Dry Blue Creek, however surface water in the third reach soon ended and a decision was made to complete the third survey the following day on Pace Creek. On July 13, 2016,

Department personnel initiated a 500 m survey of Pace Creek roughly 1 km above its confluence with Dry Blue Creek (Appendix B, Fig. 25). As with the previous two sites on Dry Blue Creek, the focal species of this survey was Loach Minnow, and the survey was conducted employing a BPES and block seine. Surface water and suitable habitat was limited within the drainage, with very shallow, intermittent flows and some isolated pools, allowing for a survey of only 300 m. No Loach Minnow were collected or seen during this effort. Water quality at Pace Creek at 1030h was pH of 7.7; conductivity of 405µS; temperature of 19.5° C, and dissolved oxygen of 3.1 mg/L.
The survey crew hiked upstream for an additional 1 km without encountering any surface water.

Table 55 provides a summary of total effort and catch data throughout the 500 m. Only two species were found in Pace Creek, Longfin Dace (287; 56%) and Speckled Dace (222; 44%); no Brown Trout were found in this stream. After sampling all available surface waters, the crew hiked 1 km further up the drainage, but found no additional waters.

Recommendations for Loach Minnow in Pace Creek include an assessment of current habitat suitability for Loach Minnow and a search for potential practicable methods of habitat improvement.

Blue River at Bobcat Flat July 13, 2016

UTM 12S Lower Boundary: 680425E, 3732213N Upper Boundary: 680653E, 3732447N

On July 13, 2016, Department personnel conducted a 500 m survey and 100 m sample of Blue River at Bobcat Flat (Appendix B, Fig. 26). Located in the Apache–Sitgreaves National Forest, the upper Blue River is one of two reaches of the Blue River (upper and middle) designated for sampling under this project; this was the first of two sites sampled on the upper Blue River. Bobcat Flat is located approximately 17 km (10.6 miles) southeast of Alpine AZ., roughly 1.5 km downstream from the confluence of Campbell Blue and Dry Blue creeks. The river throughout this section flows in a generally southwesterly direction.

For the first 50 m at the lower end of the 500 m survey site, the stream was comprised of braided channels, with much of the main stream channel pooled (Appendix C. Fig. 77), due to the presence of a beaver dam 50 m further downstream. Although some of the pooled habitat was sampled, the major effort in this 50 m was focused on riffles of a secondary channel; flows through much of the remaining 500 m were composed of riffle habitat. Water quality measurements at 1325h at Bobcat Flat were temperature 26.6° C; pH: 8.8; conductivity: 340 µS; and DO: 4.1 mg/L.

Table 56 provides a summary of total effort and catch data throughout the 500 m. Focal species for the survey was Loach Minnow, and the survey was conducted employing a backpack electrofishing unit and block seine; cobble substrates were rolled by foot during the application of current. The 500 m survey site was initiated roughly 50 m above a beaver dam on the stream. Loach minnow were found in this section of stream, but only a total of three were caught (Table 56). Sampling was carried out until a Loach Minnow was captured, upon which time a 100 m sample reach was established. Sampling of the 100 m caught no additional Loach Minnow, so efforts were resumed through the end of the 500 m. Suitable habitat was present at

the upstream end of the 500 m, so sampling was continued for an additional 40 m, resulting in the capture of two additional Loach Minnow.

Other species noted at Bobcat Flat include recent signs of beaver (*Castor canadensis*) and the capture of a narrow-headed gartersnake (*Thamnophis rufipunctatus*). Plant species regularly encountered at streamside included willow (*Salix* sp.) and monkeyflower (*Mimulus guttatus*); common plants on the adjacent terraces and slopes included cottonwoods (*Populus fremontii*) and juniper (*Juniperus* sp.).

A search for practicable methods of habitat improvement, and consideration of a study evaluating mechanical disturbance (loosening) of strongly embedded cobbles and gravels, and the resulting effects on species occupation and total numbers in disturbed versus undisturbed habitats should be considered.

Blue River at Upper Blue Campground May 14, 2016

UTM 12S Lower Boundary: 678301E, 3729448N Upper Boundary: 678378E, 3729509N

On July 14, 2016, Department personnel initiated a 500 m survey and completed a 100 m sample of Blue River at Upper Blue Campground (Appendix B, Fig. 27). Located in the Apache–Sitgreaves National Forest, the upper Blue River is within the first of two river sections of the Blue River (upper and middle) designated for sampling under this project. Only two 500 m sites were established and surveyed within the upper Blue River, as the required number of Loach Minnow were captured within a 100 m sample reach at Upper Blue Campground. This site is located approximately 4.4 km (2.7 miles) southeast of Bobcat Flat (the first site sampled in the upper Blue River). The river throughout this section flows in a generally southwesterly direction.

Focal species for the survey was Loach Minnow, and the survey was conducted employing a backpack electrofishing unit and block seine; cobble substrates were rolled by foot during the application of current. A 500 m lower boundary was established for the survey and sampling initiated. Once a Loach Minnow was captured, a 100 m reach was established upstream and sampling begun; habitat throughout the 100 m consisted of 96% riffle and 4% run. Compared to other sites sampled in the upper Blue River and Campbell Blue Creek, cobbles here were not as embedded, with roughly 30% estimated to be loose on the stream bottom. Upper and lower boundary photographs of the 100 m sample reach were taken but were inexplicably lost. Water quality measurements at 0815h at Upper Blue Campground were temperature 13.7° C; pH: 8.8; conductivity: 342 µS; and DO: 7.5 mg/L.

Loach minnow (Loach Minnow) were found throughout the 100 m sample section of stream, with a total of 48 caught, comprising 6% of the total catch (Table 57). Within the 100 m Speckled Dace (332) was the most abundant species caught within the 100 meters, comprising 44% of the total catch. Other species present included Desert Sucker (202; 27%), Longfin Dace (142; 19%) and Brown Trout (33; 4%). A total of 72 Age-0 Desert Sucker were captured, comprising roughly 36% of all

Desert Sucker caught. Brown Trout (Brown Trout) was the only nonnative detected, and all but one were Age-0. Table 57 provides a summary of total effort and catch data throughout the 500 m.

Due to the successful capture of the requisite number of Loach Minnow (n ≥25) within the 100 m sample reach, according to protocol, a third 500 m survey on the upper Blue River was not required. Unfortunately, though successfully collecting a sufficient number of the target species, it was discovered after the day was complete that Loach Minnow had been stocked during the previous year (2015) at Upper Blue Campground, which according to protocol (Clarkson, 2011) precludes the upper Blue River (perhaps the entire Blue River) from this monitoring program until at least 2021. This type of information needs to be disseminated much more widely when obtained. If this information had been known prior to the sampling trip, the upper and perhaps (depending on the assessment of Bureau of Reclamation) the middle sections of Blue River would likely not have been included in this project.

A search for practicable methods of habitat improvement, and consideration of a study evaluating mechanical disturbance (loosening) of strongly embedded cobbles and gravels, and the resulting effects on Loach Minnow occupation and total numbers in disturbed versus undisturbed habitats should be considered.

Blue River at Cole Flat 1 July 13-14, 2016

UTM 12S Lower Boundary: 666846E, 3712759N Upper Boundary: 667128E, 3713001N

On July 13 and 14, 2016, Department personnel completed a 500 m survey of at Cole Flat 1 on the middle Blue River (Appendix B, Fig. 28). Located in the Apache–Sitgreaves National Forest, the middle Blue River is the second of two river sections on the Blue River (upper and middle) designated for sampling under this project. The lower boundary of Cole Flat 1 was established on Blue River roughly 1 km (0.6 miles) below the river ford upriver from Cole Flat. The river through this section runs in a generally south-southwesterly direction.

This was the first of three 500 m survey sites on the middle Blue River; focal species for the surveys was Loach Minnow. A lower boundary was established for the survey, and sampling of the 500 m survey site initiated. Surveys were conducted employing a backpack electrofishing unit and block seine, with cobble substrates rolled by foot during the application of current. Following the detection of Loach Minnow, a 100 m sampling site was to be established, but densities were not sufficiently high to capture the required number within the 100 m, and sampling was completed through the remainder of the 500 m survey reach. Completion of the remainder of the 500 m was suspended until the following morning (July 14), due to loss of light. Water quality measurements at Cole 1 at 1648h were temperature 28.7° C; pH: 8.8; conductivity: 327 µS; and DO: 7.0 mg/L.

Table 58 provides a summary of total effort and catch data throughout the 500 m. Loach Minnow were found throughout the 500 m surveyed, with a total of 26 caught, comprising 1% of the total catch (Table 58). Speckled Dace (1319) was the most abundant species, comprising 52% of the total catch. Other species present included Desert Sucker (482; 18%), Longfin Dace

(696; 27%) and Sonora Sucker (31; approximately 1%). A total of 344 Age-0 Desert Sucker were captured, comprising 71% of all Desert Sucker caught. No nonnative fishes were detected at this site.

Recommendations for managing Blue River for Loach Minnow should include surveys of the stream for suitable Loach Minnow habitat, and stocking of Loach Minnow into appropriate habitat within the stream. Also, a search for practicable methods of habitat improvement, and consideration of a study evaluating mechanical disturbance (loosening) of strongly embedded cobbles and gravels, and the resulting effects on species occupation and total numbers in disturbed versus undisturbed habitats should be considered.

Blue River at Cole Flat 2 July 14, 2016

UTM 12S Lower Boundary: 667223E, 3713001N Upper Boundary: 667223E, 3713381N

On July 14, 2016, Department personnel completed a 500 m survey at Cole Flat 2 on the middle Blue River (Appendix B, Fig. 28). Located in the Apache–Sitgreaves National Forest, the middle Blue River is the second of two river sections on the Blue River (upper and middle) designated for sampling under this project. The lower boundary of Cole Flat 2 was established on Blue River roughly 0.6 km (0.4 miles) below the river ford upriver from Cole Flat. The river through this section runs in a generally south-southwesterly direction. Water quality measurements at Cole 2 were not recorded.

This was the second of three 500 m survey sites on the middle Blue River; focal species for the surveys was Loach Minnow. A lower boundary was established for the survey, and sampling of the 500 m survey site initiated. Surveys were conducted employing a backpack electrofishing unit and block seine, with cobble substrates rolled by foot during the application of current. Following the detection of Loach Minnow, a 100 m sampling site was to be established, and quantified sampling completed, but riffle habitat within the 500 m was scarce, and sampling continued in the expectation of encountering suitable habitat further upstream. Although Loach Minnow were present, densities were not sufficiently high to capture the required number within 500 m. Sampling was completed through the remainder of the 500 m survey reach, with the capture of only 12 Loach Minnow (Table 59).

A total of 12 Loach Minnow were captured throughout the 500 m, comprising 1% of the total catch, while Speckled Dace (943; 52%) was the most abundant species sampled. Other species present included Desert Sucker (482; 18%), Longfin Dace (696; 27%) and Sonora Sucker (31; approximately 1%). A total of 344 Age-0 Desert Sucker were caught, comprising roughly 71% of all Desert Sucker captured. No nonnative fishes were detected at this site. Table 59 provides a summary of total effort and catch data throughout the 500 m.

A search for practicable methods of habitat improvement, and consideration of a study evaluating mechanical disturbance (loosening) of strongly embedded cobbles and gravels, and the resulting effects on Loach Minnow occupation and total numbers in disturbed versus undisturbed habitats should be considered.

Blue River at KP Creek Confluence July 14, 2016

UTM 12S Lower Boundary: 666900E, 3711219N Upper Boundary: 666054E, 3711587N

On July 14, 2016, Department personnel completed a 500 m survey at the KP Creek confluence on the middle Blue River (Appendix B, Fig. 29). Located in the Apache–Sitgreaves National Forest, the middle Blue River is the second of two river sections on the Blue River (upper and middle) designated for sampling under this project. The boundaries of the 500 m survey reach were established roughly equidistant up- and downstream from the KP Creek confluence. The river through this section runs in a southerly direction. Water quality measurements at the KP Creek confluence at 1247h were temperature 26.8° C; pH: 8.4; conductivity: 399 µS; and DO was not recorded due to equipment failure.

This was the third of three 500 m survey sites on the middle Blue River. Loach minnow (Loach Minnow) was the target species of the survey. Surveys were conducted employing a backpack electrofishing unit and block seine, with cobble substrates rolled by foot during the application of current. Following the detection of Loach Minnow, a 100 m sampling site was to be established, and quantified sampling per habitat within the 100 m completed and recorded. However, Loach Minnow were extremely rare in this survey reach, with only one collected (Table 60) throughout the 500 m, so a quantitative sample was not carried out. Densities were not sufficiently high to capture the required number within 100 m, and sampling was completed through the remainder of the 500 m survey reach.

Table 60 provides a summary of total effort and catch data throughout the 500 m. Only one Loach Minnow was found throughout the 500 m reach, comprising < 1% of the total catch (Table 60), with Longfin Dace (598; 45%) being the most abundant species present within the survey reach. Other species present were Speckled Dace (415; 31%), and Desert Sucker (257; 19%), with the majority collected classified as Age – 0. Sonora Sucker (54; 5%) was also common, but next to Loach Minnow, the least abundant of all fish collected. No nonnative fishes were detected at this site. Field notes indicate that crayfish were present at this site.

A search for practicable methods of habitat improvement, and consideration of a study evaluating mechanical disturbance (loosening) of strongly embedded cobbles and gravels, and the resulting effects on species occupation and total numbers in disturbed versus undisturbed habitats should be considered.

Marsh Creek September 12, 2016

UTM 12S Lower Boundary: 497364E, 3780487N Upper Boundary: 497437E, 3780442N

On September 12, 2016, Department personnel conducted a 100 m survey in Marsh Creek on Tonto National Forest (Appendix B, Fig. 30). Marsh Creek drains in a westerly direction into the Hellsgate Wilderness and eventually converges with Haigler Creek; its upper tributaries originate along the base of the Naegelin Rim in Tonto National Forest. Water quality measurements at 1514h in Marsh Creek were: 19.0^{0}C, pH of 8.11, dissolved oxygen of 5.3 mg/L, and conductivity of 431µS/cm

Marsh Creek is a narrow stream where riffles can be found connecting habitat. Pool habitat was most typical in the surveyed sections where gravel was the main substrate. The stream consisted of cobble, bedrock, and gravel substrates. Common plant species within the riparian zone of the creek include Arizona alder, black walnut, velvet ash, and willow, with oak, pinyon pine, and juniper on adjacent slopes.

The focal species for the Marsh Creek survey was Roundtail Chub. Habitat at the site was comprised of a series of pools, connected by only a slight flow of surface water at the start of the survey; by the end of the survey, flow between pools had in some cases disappeared. Four hoop nets were set in a large pool at the beginning of the 500 m reach. During surveys in 2013, this pool contained chub, but in 2016 contained only Green Sunfish of various sizes. After setting four hoop nets, the crew hiked downstream to establish the bottom of the 500 meter survey site. A short distance downstream, Roundtail Chub were observed and a 100 m sampling site established. Sampling within the 100 meters was conducted using a BPES; the 4 hoop nets that were previously set, were outside of the sample reach. Efforts from the 100 m sample resulted in a total of 35 Roundtail Chub (52%; Table 60) and 33 Green Sunfish (48%); Table 61 summarizes effort and catch data for the sample reach. The majority of Roundtail Chub were collected in one pool, and all appeared in good condition. Table 62 summarizes catch and effort data for hoop nets set within the 500 m, but above the sample reach at Marsh Creek. Photographs of the lower and upper boundaries of the 100 m sample site are provided in Appendix C (Fig.s 79-82). Marsh Creek was last surveyed by the GRBMP in 2013, with a total of 16 Roundtail Chub captured and an additional 21 observed (Timmons et al., 2014).

Marsh Creek continues to provide suitable habitat for Roundtail Chub and should continue to be monitored regularly.

Gordon Creek 1 September 13, 2016

UTM 12S Lower Boundary: 496217E, 3785067N Upper Boundary: 496681E, 3785310N

On September 13, 2016, Department personnel conducted two 500 m surveys on Gordon Creek (Appendix B, Fig. 31), located in Tonto National Forest. With most of its upper drainage flowing from the southern face of the Mogollon Rim, Gordon Creek is a small stream in northeastern Gila County tributary to Haigler Creek. Located on private property of the Ellinwood Ranch within the Tonto National Forest, the monitoring site was approximately 14 miles northwest of Young, AZ. Dry for an extended reach above our survey sites, permanent water apparently recommences further up the drainage in the more canyon-bound reach. Upper reaches of Gordon Creek are formed by a number of smaller, tributary drainages flowing in a generally southwesterly direction off of the Mogollon Rim. Gordon Creek flows into Haigler Creek from the northeast, roughly five miles upstream of Haigler's confluence with Tonto Creek in the Hells Gate Wilderness. Common plant species along the stream include Arizona alder, juniper, Velvet ash, and Arizona Sycamore. Water quality measurements at 1054h in Gordon Creek were: 17.3^{0}C, 9.33 pH, DO_2 of 6.6 mg/L, with a conductivity of 368µS/cm.

Gordon Creek was surveyed at Ellinwood Ranch, on the private property in the lower portion of the drainage; target species for the survey was Roundtail Chub. This section of stream was surveyed exclusively with a BPES. Longfin dace (Longfin Dace;

139; 100%) was the only species captured during this survey. No Roundtail Chub were caught or observed. Table 63 provides a summary of effort and catch data for this site. Gordon Creek was last sampled by GRBMP in 2013, and resulted in the capture of 188 Longfin Dace and no Roundtail Chub in the first 500m reach (Timmons et al. 2014). Habitat within this stream section consisted of bedrock pools connected with riffles and runs (Appendix C, Fig. 83).

Roundtail Chub have not been detected in the three established reaches on Gordon Creek. A recommendation is that the survey sections for Gordon Creek should be moved to a different location. With the movement of these three 500m survey sections, Roundtail Chub may be detected in future surveys.

Roundtail Chub have not been detected in any of the surveys by GRBMP in the lower drainage. In March 2017, we received a report that chub occur in the drainage further upstream from the surveyed sites (Curtiss Gill, AGFD, pers. comm.), presumably in the canyon-bound sections of the drainage. Survey areas for Gordon Creek should be moved to a different location upstream of the present site.

Gordon Creek 2 September 13, 2016

UTM 12S Lower Boundary: 496681E, 3785366N Upper Boundary: 496833E, 3785616N

On September 13, 2016, Department personnel conducted two 500 m surveys on Gordon Creek (Appendix B, Fig. 31), located in Tonto National Forest. With most of its upper drainage flowing from the southern face of the Mogollon Rim, Gordon Creek is a small stream in northeastern Gila County tributary to Haigler Creek. Located on private property of the Ellinwood Ranch within the Tonto National Forest, the monitoring site was approximately 14 miles northwest of Young, AZ. Dry for an extended reach above our survey sites, permanent water apparently recommences further up the drainage in the more canyon-bound reach. Upper reaches of Gordon Creek are formed by a number of smaller, tributary drainages flowing in a generally southwesterly direction off of the Mogollon Rim. Gordon Creek flows into Haigler Creek from the northeast, roughly five miles upstream of Haigler's confluence with Tonto Creek in the Hells Gate Wilderness. Common plant species along the stream include Arizona alder, juniper, Velvet ash, and Arizona Sycamore. Water quality measurements at 1054h in Gordon Creek were: 17.3^{0}C, 9.33 pH, DO of 6.6 mg/L and conductivity of 368µS/cm.

Gordon Creek 2 was the second 500 m site to be sampled on Gordon Creek, at and above the private property at Ellinwood Ranch. Habitat within this survey section consisted largely of riffle and run, with a few small pools. Substrates consisted of large cobble with occasional silt –laden pools. The only species detected at this site was Longfin Dace (120; 100%). A summary of effort and capture data is provided in Table 64. Due to lack of surface water above this site on Gordon Creek, Department personnel did not complete a third 500 m survey of the stream.

Roundtail Chub have not been detected in any of the surveys by GRBMP on Gordon Creek. In March 2017, we received information that chub occur in the drainage further upstream from the survey sites, upstream from Ellinwood Ranch (Curtiss Gill, AGFD, pers. comm.). Survey sections for Gordon Creek should be moved upstream to a different location.

Lower Salt River east of Saguaro Guest Ranch October 25, 2016

UTM 12S Lower Boundary: 450514E, 3713383N Upper Boundary: 450338E, 3713872N

On October 25, 2016, Department personnel conducted a survey for Roundtail Chub, east of the Saguaro Guest Ranch on the Lower Salt River of the Tonto National Forest (Appendix B, Fig. 32). The Salt River is perennial from its tributary headwaters to Granite Reef Diversion Dam near Mesa, Arizona. Riffle, run and pool habitats were present in most surveyed sections, with cobble and silt-covered cobble the most common substrates. The Salt River is fed by numerous perennial streams that start as springs and seeps along the Mogollon Rim and in the White Mountains to Granite Reef Diversion Dam near Mesa, Arizona. Flow below the dam is modified annually, with minimal flows generally occurring between October and April or May. During this period, the major flow of water into the lower Salt River is provided from the Verde River. Plants common along the shoreline of the reach included mesquite, cottonwood, willow and common reed. On October 25, 2016 at 09:45, water quality measurements were: temperature of 21.5^{0}C, pH of 8.85, DO_2 of 3.9 mg/L and a conductivity of 1589mS.

Surveys were conducted throughout the lower Salt River sites exclusively using a canoe electrofishing unit (CES), with a capture crew dip-netting from a second canoe. The focal species of surveys along the Salt River was Roundtail Chub, but none were captured or observed during the entire effort. Only two species were captured in this stretch of river, Largemouth Bass, *Micropterus salmoides* (8; 89%) and Yellow bullhead (1; 11%). Table 65 summarizes the effort and catch data at this site. No native fishes were caught or seen during efforts at this site. At the time of the surveys, water volume and velocity at the site were very low, with depths greater than 1-m limited to 10-15-m along the stream margin near the upper boundary of the site. This section of stream was comprised largely of slow, shallow runs over cobble and boulder, and pools. Also, instream structure within this section of stream is very limited. Aquatic vegetation and low water levels reportedly made dip-netting difficult, resulting in low capture rates.

In future surveys, a more intensive sampling of the lower Salt River should be carried out, focusing efforts on sites with more suitable Chub habitats. Monitoring of the lower Salt River should be continued on a regular basis.

Lower Salt River south of Saguaro Guest Ranch October 25, 2016

UTM 12S Lower Boundary: 450208E, 3713104N Upper Boundary: 450710E, 3713242N

On October 25, 2016, Department personnel conducted the second of nine surveys on the Lower Salt River in Tonto National Forest (Appendix B, Fig. 32). Riffle, run and pool habitats were present in most surveyed sections, with cobble and gravels the most common substrates in this section. Plants common along the shoreline of the reach included mesquite, cottonwood, willow, seep willow and common reed. Water quality measurements were not taken for this site. On October 25, 2016 at 09:45, water quality measurements were: temperature of 21.5^{0}C, pH of 8.85, DO_2 of 3.9 mg/L and a conductivity of 1589mS.

Lower Salt River south of Saguaro Guest Ranch was the second of the three sites surveyed on Section 1 of the Lower Salt River (Appendix B, Fig. 32). Sampling at this site was largely conducted in habitat consisting of a large, long pool, a substantial portion of which was greater than 10 ft. deep. (Appendix C, Fig. 84). Due to dramatic changes in water depths within this section, the effectiveness of the electrofishing unit varied greatly, and a modified approach (the use of trammel nets in combination with electrofishing) may be necessary to effectively sample this site during future efforts.

The 500m reach sampled in this stream reach consisted of shallow runs and riffles with one large, deep pool. A total of six species were detected at this site, with 72 fishes caught in total, with Largemouth Bass (40; 56%) being the most abundant of the six. Other species included Yellow Bullhead (15; 21%), Sonora Sucker (7; 10%), Common Carp, *Cyprinus carpio* (6; 8%), Rainbow Trout (2; 3%) and Flathead Catfish, *Pylodictus olivarus* (2; 3%). Table 66 provides a summary of effort and catch data for this survey. Age – 0 fishes were captured for only two species, Largemouth Bass (14) and Yellow bullhead (2). Sonora Sucker was the only native detected at this site. Common plants along the sample section consisted of mesquite, cottonwood, and willow.

Habitat at this site was much more complex than in the first site sampled, but no Roundtail Chub were seen or caught. Fishes caught in this reach of river consisted mostly of nonnative species. Future sampling here should consider a modified approach (the use of trammel nets in combination with electrofishing) to more effectively sample this site. Monitoring of the lower Salt River should be continued on a regular basis.

Lower Salt River at Water Users October 25, 2016

UTM 12S Lower Boundary: 449650E, 3712857N Upper Boundary: 450022E, 3713182N

On October 25, 2016, Department personnel conducted the third of nine surveys on the Lower Salt River in Tonto National Forest (Appendix B, Fig. 32). This site is located approximately 1.5 km downstream from Stewart Mountain Dam at Water Users Park. Pool, run and riffle habitats were present in this section, with cobble the most common substrate. Plants common along the shoreline of the reach included mesquite, cottonwood, willow, seep willow and common reed. The 500 m survey reach was established to incorporate a large main channel pool and two small connected backwaters downstream. On October 25, 2016 at 09:45, water quality measurements were: temperature of 21.5^{0}C, pH of 8.85, DO_2 of 3.9 mg/L and a conductivity of 1589mS.

This was the third and most-downstream of the three sites surveyed on the upper section of the Lower Salt River (Appendix B, Fig. 32). The focal species of the effort was Roundtail Chub, but no Roundtail Chub were captured or observed during the effort. Sampling was completed using a canoe electrofishing unit. Table 67 summarizes effort and catch data for this site. A total of eight species were sampled, with Largemouth Bass (31; 30%) most abundant, followed by Rainbow Trout (24; 23%). Other species included Yellow bullhead (18; 18%), Sonora Sucker (18; 17%), Common Carp (6; 6%), Desert Sucker (3; 3%), Mosquitofish (3; 3%) and Smallmouth Bass (1; 1%).

Fishes sampled in this reach of river were primarily nonnatives, with Sonora Sucker and Desert Sucker the only native fishes captured. Due to difficult access, this site appears to receive limited recreational use during periods of low flows. Monitoring of the lower Salt River should be continued on a regular basis.

Lower Salt River at Foxtail Administration Site October 26-27, 2016

UTM 12S Lower Boundary: 443755E, 3712765N Upper Boundary: 443903E, 3712275N

On October 26, 2016, Department personnel conducted surveys for Roundtail Chub at three sites in the middle section of the lower Salt River on Tonto National Forest (Appendix B, Fig 33). Sites were sampled using a canoe electrofishing unit, with a capture crew dip-netting from a second canoe. Trammel nets were also employed with limited success, in two deeper pools. Foxtail Administration Site was the first of three sites sampled in the middle section of the Lower Salt River. Common vegetation at the site included mesquite, cottonwood, willow and seep willow. On October 27, water quality measurements were temperature of 19.7^{0}C, pH of 9.36, DO of 9.3 mg/L, and a conductivity of 1594mS.

Table 68 summarizes effort and catch data for the two trammel nets set in a large pool at Foxtail. No Roundtail Chub were captured or observed within this survey site. Three species were captured in the trammels, with Largemouth Bass (20; 80%) the most common, followed by Sonora Sucker (4; 16%) and Desert Sucker (1; 4%). Due to malfunctioning equipment, the canoe electrofishing survey was not conducted until the following day. On October 27, 2016 at 0900 department personnel returned to Foxtail Administration Site to finish the survey.

Electrofishing at Foxtail Administration Site resulted in the capture of eight species, two of which had not been sampled in the previous upstream sites during the 2016 surveys (Table 69). Common Carp (55; 35%) was the most common species, closely followed by Largemouth Bass (50; 32%). Other species caught included Desert Sucker (24; 15%), Sonora Sucker (15; 9%), Yellow Bullhead (5; 3%), Mosquitofish (5; 3%), Green Sunfish (2; 1%), and Red Shiner (1; <1%).

Fishes sampled in this reach of river were primarily nonnatives, the exception being Desert Sucker and Sonora Sucker. Of note, Age – 0 individuals of both species were present (Table 69), suggesting the possibility of continued recruitment for both species. Monitoring of the lower Salt River should be continued on a regular basis.

Lower Salt River at Blue Point Administration Site October 27, 2016

UTM 12S Lower Boundary: 443437E, 3713503N Upper Boundary: 443719E, 3713177N

Lower Salt River Blue Point Administration Site was the second of the three sites surveyed on the middle section of the Lower Salt River (Appendix B, Fig. 33). Conditions throughout the effort were sunny and warm. Much of the habitat throughout this

reach was composed of long, slow moving pools. Substrates were comprised of large boulders, cobbles and silt. Common plants along the survey reach consisted of mesquite, cottonwood, willow and seep willow. On October 27, water quality measurements were: temperature of 19.7^{0}C, pH of 9.36, dissolved oxygen of 9.3 mg/L and conductivity of 1594µS/cm.

The target species for the lower Salt River was Roundtail Chub; no Chub captured or observed during sampling efforts. While only four species were captured at this location, this was the first site on the lower Salt River that native fishes outnumbered nonnative fishes; Table 70 provides a summary of effort and catch data. Sonora Sucker (68; 72%) was the most abundant species, followed by Largemouth Bass (12; 13%) and Desert Sucker (11; 11%). Yellow bullhead (3; 3%) was the only other species captured at this site.

Due to limited vehicular access, this site appears to receive limited recreational use during low flows. A few cattle, and horses were noted, but signs of any impact were apparent. Monitoring of the lower Salt River should be continued on a regular basis.

Lower Salt River at Goldfield Administration Site October 27, 2016

UTM 12S Lower Boundary: 442940E, 3713480N Upper Boundary: 443429E, 3713527N

Lower Salt River Goldfield Administration Site- was the third of the three sites surveyed on reach 2 of the Lower Salt River (Appendix B, Fig. 33). Conditions throughout the effort were sunny and warm. Much of the habitat throughout this reach was composed of long, slow moving pools. Substrates were comprised of large boulders, cobbles and silt. The middle 0.5-km survey site on the lower Salt River was accessed via the Goldfield Recreation Site, north of Bush Highway located near the Blue Point Rangers Station and accessed from North Usery Pass Road. A 0.5-km reach was established which encompassed varying habitats, including deep pools immediately adjacent to a cliff face, shallow, connected backwater pools, and vegetated shallows, and riffles. Common plants along the sample section consisted of mesquite, cottonwood, and willow. On October 27, water quality measurements were: temperature of 19.7^{0}C, pH of 9.36, dissolved oxygen of 9.3 mg/L and conductivity of 1594µS/cm.

Table 71 summarizes absolute numbers, CPUE and relative abundance for each species of fish captured. A total of 35 fish were captured during the effort at this site; Sonora Sucker (16; 46%) and Largemouth Bass (16; 46%) were the two most abundant species, collected in equal numbers. Two other species were also caught, Yellow Bullhead (2; 6%) and Desert Sucker (1; 3%).

The number of native fishes collected at this site was nearly equal to nonnatives, but there were only two Age – 0 native fishes collected, while in the nonnatives, Age – 0 and Age – 1+ were present. Due to limited vehicular access, this site appears to receive limited recreational use during low flows. Monitoring of the lower Salt River should be continued on a regular basis.

Lower Salt River at Coon Bluff October 27, 2016

UTM 12S Lower Boundary: 439599E, 3712260N Upper Boundary: 440085E, 3712218N

Three 500 m sites were established in the third (lowermost) section of the Salt River. The first of the three sites was established at Coon Bluff (Appendix B, Fig. 34), roughly 1.5 km upstream from the confluence of the Salt and Verde rivers. A 0.5-km qualitative sampling reach was established and sampled using a canoe electrofishing unit. Habitats sampled included deep pools adjacent to large boulder outcrops, steep cliffs and overhangs, deep connected backwaters and shallow riffles. Water quality data was not recorded for this section of river.

The number of native fishes caught at Coon Bluff was nearly equal to nonnative fishes. Roundtail Chub was the focal species of sampling at the lower Salt River at Coon Bluff, but no Chub were caught or observed during sampling efforts. Fish were not abundant through this reach, with only six different species detected and a total of 18 fish caught; Table 72 provides a summary of effort and catch data for Coon Bluff. Two native fishes were among the six species, Sonora Sucker (7; 39%) which was the most abundant single species, and Desert Sucker (1; 6%). The four other species caught included Largemouth Bass (3; 17%), Flathead Catfish (3; 17%), Green Sunfish (2; 12%) and Yellow Bullhead (2; 11%).

Due to good vehicular access, this site appears to receive regular and moderate to heavy recreational use, even during periods of low flow. Monitoring of the lower Salt River should be continued on a regular basis.

Lower Salt River at Phon D Sutton October 27, 2016

UTM 12S Lower Boundary: 438900E, 3712211N Upper Boundary: 439375E, 3712369N

Lower Salt River at Phon D Sutton was the second site established and surveyed on the lowermost section of Salt River (Appendix B, Fig. 34). Habitats sampled during the survey included deep pools adjacent to large boulder outcrops, undercut banks with large root masses and overhanging vegetation, deep connected backwaters and shallow riffles. Water quality data was not recorded for this section of river.

A 500 m section of stream immediately above Phon D Sutton was surveyed using a canoe electrofishing unit, with a capture crew dip-netting from a second canoe. Focal species of the survey was Roundtail Chub, but none were captured or observed during the effort. Table 73 provides a summary of effort and catch data for this site. Largemouth Bass (9; 57%) was the most common species encountered; other species caught included Sonora Sucker (3; 19%), Green Sunfish (2; 13%), and Sailfin Molly, *Poecilia latipinna* (2; 13%). The only native species caught was Sonora Sucker.

Due to good vehicular access, this site appears to receive regular and moderate to heavy recreational use, even during periods of low flow. Monitoring of the lower Salt River should be continued on a regular basis.

Lower Salt River below the Verde Confluence October 27, 2016

UTM 12S Lower Boundary: 437695E, 3710854N Upper Boundary: 437677E, 3711368N

Lower Salt River below the Verde Confluence was the third site surveyed on reach 3 (Appendix B, Fig. 34). Department personnel conducted a survey of 500 m in the lower section of the lower Salt River, approximately 0.64 km below the confluence with the Verde River. This site was accessed by canoe from the upstream site at Phon D. Sutton, and was sampled using a canoe electrofishing unit, with a capture crew dip-netting from a second canoe. Water quality data was not recorded for this section of river.

Due to additional input from the Verde River and relative to other lengths of the Salt River sampled, water velocity in this reach was much greater and visibility dropped to less than 18 inches (Appendix C, Fig. 86). This location is only easily accessible by canoe, raft, or kayak. The focal species for this sampling effort was Roundtail Chub; no Roundtail Chub were captured or observed. Results of the effort were surprisingly poor given past surveys in this reach and a total of only 8 fish were caught. While not abundant, Largemouth Bass (4; 50%) was the most common species, followed by Sonora Sucker (2; 25%), Flathead Catfish (1; 12.5%) and Common Carp (1; 12.5%). Table 74 provides a summary of effort and catch data for the sampling completed at this site.

Due to no vehicular access, this site appears to receive little recreational use during periods of low flow. Monitoring of the lower Salt River should be continued on a regular basis.

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Appendix A.

Tables

(Appendices are available from Bureau of Reclamation in electronic format only)

Appendix B.

Maps

(Appendices are available from Bureau of Reclamation in electronic format only)

Appendix C.

Sample Site Photographs

(Appendices are available from Bureau of Reclamation in electronic format only)

Site photographs are available from U.S. Bureau of Reclamation in electronic format only.

FISH MONITORING OF SELECTED STREAMS WITHIN THE GILA RIVER BASIN

2016

Annual Report

Appendix A

Tables

Table of Contents

Common Name	**Scientific Name**	**Species Code**
Longfin dace	*Agosia chrysogaster*	AGCH
Sonora sucker	*Catostomus insignis*	CAIN
Desert sucker	*Pantosteus clarki*	PACL
Roundtail chub	*Gila robusta*	GIRO
Gila topminnow	*Poeciliopsis occidentalis*	POOC
Speckled dace	*Rhinichthys osculus*	RHOS
Loach minnow	*Tiaroga cobitis*	TICO
Flathead catfish	*Pylodictus olivaris*	PYOL
Yellow bullhead	*Ameiurus natalis*	AMNA
Channel catfish	*Ictalurus punctatus*	ICPU
Black bullhead	*Ameiurus melas*	AMME
Green sunfish	*Lepomis cyanellus*	LECY
Bluegill	*Lepomis macrochirus*	LEMA
Smallmouth bass	*Micropterus dolomieu*	MIDO
Largemouth bass	*Micropterus salmoides*	MISA
Rainbow trout	*Oncorhynchus mykiss*	ONMY
Brown Trout	*Salmo trutta*	SATR

Table 1. List of species sampled in the Gila River Basin Monitoring in 2016, their scientific names and 4-letter species codes.

Common Name	Scientific Name	Species Code
Fathead minnow	*Pimephales promelas*	PIPR
Red shiner	*Cyprinnella lutrensis*	CYLU
Common carp	*Cyprinus carpio*	CYCA
Mosquitofish	*Gambusia affinis*	GAAF
Sailfin molly	*Poecilia latipinna*	POLA
Lowland leopard frog	*Rana yavapaiensis*	RAYA
Sonoran mud turtle	*Kinosternon sonoriense*	KISO
American bullfrog	*Lithobates (Rana) catesbiana*	RACA

Table 1. (cont.) List of species sampled in the Gila River Basin Monitoring in 2016, their scientific names and 4-letter species codes.

Site/Species	AGCH	CAIN	GIRO	TICO	PACL	PA spp.	POOC	CASP	RHOS	AMNA	AMME	CYCA	CYLU	GAAF	ICPU	LE spp.	LECY	LEMA	MIDO	MISA	MISP	ONMY	PIPR	PYOL	SATR	POLA
Buckhorn Spring	–	–	–	–	–	–	232	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Morgan City Wash	334	–	–	–	–	–	51	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Post Canyon	–	–	–	–	–	–	–	–	–	–	–	–	–	29	–	–	10	–	–	–	–	–	–	–	–	–	–
Walker Creek[1]	–	–	31	–	53	–	–	–	140	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Dix Creek Left Prong[1]	9	1	25	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Dix Creek Right Prong[1]	12	36	42	–	35	–	–	2	96	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Harden Cienega[1]	79	19	28	–	114	–	–	–	46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tonto Creek at Gun 1	–	–	–	–	–	–	–	–	–	14	–	–	54	–	–	–	1	–	–	–	–	–	10	–	–	–	–
Tonto Creek at Gun 2	1	1	–	–	–	–	–	–	–	11	–	–	92	–	–	–	–	–	–	–	–	–	5	–	–	–	–
Tonto Creek at Gun 3	–	1	–	–	–	–	–	–	–	12	–	–	74	–	–	–	6	–	–	–	–	–	5	–	–	–	–
Tonto Creek at Gisela 1	–	4	–	–	–	–	–	–	–	41	–	11	–	8	–	–	14	–	1	5	–	–	–	–	–	–	–
Tonto Creek at Gisela 2	–	–	–	–	–	–	–	–	–	1	–	15	–	–	–	–	22	–	2	–	–	–	1	–	–	–	–
Tonto Creek at Gisela 3	–	1	–	–	–	–	–	–	–	36	–	12	3	2	–	2	29	–	–	1	4	–	–	–	–	–	–
Tonto Creek at Tontozona 1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	23	–	–	47	–	–
Tonto Creek at Tontozona 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	8	–	–	63	–	–
Tonto Creek at Bear Flat	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	4	–	–	–	–	1	–	–	–	–	–
Spring Creek at Brady[2]	–	–	46	–	–	–	–	–	–	85	–	–	–	–	–	–	120	–	–	–	–	–	–	–	–	–	–
Spring Creek below Spring Creek Ranch[2]	4	–	37	–	12	–	–	–	23	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Rock Creek[2]	–	–	82	–	15	–	–	–	3	–	–	–	–	–	–	–	45	–	–	–	–	–	–	–	–	–	–
Wet Beaver below Montezuma 1	–	–	–	–	20	–	–	–	–	–	–	–	43	–	–	–	–	3	–	–	–	–	–	–	–	–	–
Wet Beaver below Montezuma 2	–	–	–	–	–	–	–	–	–	1	–	–	1	–	–	–	–	6	–	–	–	–	–	–	–	–	–
Wet Beaver above Montezuma	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	4	–	–	–	–	–	–	–	–	–
Wet Beaver at Lawrence	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	50	–	–	13	–	–	–	–	–
Wet Beaver at Beaver Creek Camp	–	–	–	–	8	–	–	–	–	–	–	–	–	–	–	–	–	–	35	–	–	56	–	–	–	–	–
Wet Beaver below Ranch	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	35	–	–	–	–	–	–	–	–
O'Donnell[1]	–	7	49	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Coalmine	–	–	–	–	–	–	44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Fresno Canyon	23	–	–	–	–	–	86	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Swamp Spring	268	–	–	–	–	–	531	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cherry Spring	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Blue River at KP Confluence	595	54	–	1	257	–	–	–	415	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Blue River at Cole Flat 1	696	31	–	26	482	–	–	–	1319	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Blue River at Cole Flat 2	390	11	–	12	463	–	–	–	943	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Blue River at Bobcat Flat	122	3	–	3	68	–	–	–	249	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–
Blue River at Upper Blue Campground	142	–	–	48	202	–	–	–	332	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	33	–	–
Campbell-Blue at KE Canyon	–	2	–	–	4	–	–	–	84	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	–	–
Campbell-Blue at Turkey Creek Confluence	149	–	–	9	16	–	–	–	275	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–
Dry Blue and Pace Creek at Dry Blue 1	198	–	–	–	–	–	–	–	271	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13	–	–
Dry Blue and Pace Creek at Dry Blue 2	36	–	–	–	–	–	–	–	94	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	–	–
Dry blue and Pace Creek at Pace Creek	287	–	–	–	–	–	–	–	222	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Marsh Creek[2]	–	–	32	–	–	–	–	–	–	–	–	–	–	–	–	–	33	–	–	–	–	–	–	–	–	–	–
Gordon Creek	259	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Lower Salt River 1-1	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	8	–	–	–	–	–	–	–
Lower Salt River 1-2	–	7	–	–	–	–	–	–	–	14	–	6	–	–	–	–	–	–	–	40	–	2	–	2	–	–	–
Lower Salt River 1-3	–	18	–	–	3	–	–	–	–	18	–	6	–	3	–	–	–	–	1	31	–	24	–	–	–	–	–
Lower Salt River 2-1	–	4	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20	–	–	–	–	–	–	–
Lower Salt River 2-2	–	68	–	–	11	–	–	–	–	3	–	–	–	–	–	–	–	–	–	12	–	–	–	–	–	–	–
Lower Salt River 2-3	–	16	–	–	1	–	–	–	–	2	–	–	–	–	–	–	–	–	–	16	–	–	–	–	–	–	–
Lower Salt River 3-1	–	7	–	–	1	–	–	–	–	2	–	–	–	–	–	–	2	–	–	3	–	–	–	3	–	–	–
Lower Salt River 3-2	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	9	–	–	–	–	–	2	–
Lower Salt River 3-3	–	2	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	4	–	–	–	1	–	–	–

Table 2. Summary of fish species, native (blue) and non-native (red), detected in each stream (highlights indicate the target species for a specific stream).

[1] Indicates *Gila robusta* populations recognized in previous reports as *Gila intermedia*.

[2] Indicates *Gila robusta* populations recognized in previous reports as *Gila nigra*.

Site/Species	AGCH	CAIN	GIRO	TICO	PACL	PA spp.	POOC	CASP	RHOS	AMNA	AMME	CYCA	CYLU	GAAF	ICPU	LE spp.	LECY	LEMA	MIDO	MISA	MISP	ONMY	PIPR	PYOL	SATR	POLA
Buckhorn Spring	–	–	–	–	–	–	100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Morgan City Wash	86.75	–	–	–	–	–	13.25	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Post Canyon	–	–	–	–	–	–	–	–	–	–	–	–	–	74.36	–	–	25.64	–	–	–	–	–	–	–	–	–
Walker Creek[1]	–	–	13.84	–	23.66	–	–	–	62.50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Dix Creek Left Prong[1]	25.71	2.86	71.43	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Dix Creek Right Prong[1]	5.38	16.14	18.83	–	15.70	–	–	0.90	43.05	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Harden Cienega[1]	27.62	6.64	9.79	–	39.86	–	–	–	16.08	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tonto Creek at Gun 1	–	–	–	–	–	–	–	–	–	17.72	–	–	68.35	–	–	–	1.27	–	–	–	–	–	12.66	–	–	–
Tonto Creek at Gun 2	0.91	0.91	–	–	–	–	–	–	–	10.00	–	–	83.64	–	–	–	–	–	–	–	–	–	4.55	–	–	–
Tonto Creek at Gun 3	–	1.02	–	–	–	–	–	–	–	12.24	–	–	75.51	–	–	–	6.12	–	–	–	–	–	5.10	–	–	–
Tonto Creek at Gisela 1	–	4.76	–	–	–	–	–	–	–	48.81	–	13.10	–	9.52	–	–	16.67	–	1.19	5.95	–	–	–	–	–	–
Tonto Creek at Gisela 2	–	–	–	–	–	–	–	–	–	2.44	–	36.59	–	–	–	–	53.66	–	4.88	–	–	–	2.44	–	–	–
Tonto Creek at Gisela 3	–	1.11	–	–	–	–	–	–	–	40.00	–	13.33	3.33	2.22	–	2.22	32.22	–	–	1.11	4.44	–	–	–	–	–
Tonto Creek at Tontozona 1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	32.86	–	–	67.14	–
Tonto Creek at Tontozona 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.39	–	–	–	–	11.11	–	–	87.50	–
Tonto Creek at Bear Flat	–	–	–	–	16.67	–	–	–	–	–	–	–	–	–	–	–	66.67	–	–	–	–	16.67	–	–	–	–
Spring Creek at Brady[2]	–	–	18.33	–	–	–	–	–	–	33.86	–	–	–	–	–	–	47.81	–	–	–	–	–	–	–	–	–
Spring Creek below Spring Creek[2]	5.26	–	48.68	–	15.79	–	–	–	30.26	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Rock Creek[2]	–	–	56.55	–	10.34	–	–	–	2.07	–	–	–	–	–	–	–	31.03	–	–	–	–	–	–	–	–	–
Wet Beaver below Montezuma 1	–	–	–	–	30.30	–	–	–	–	–	–	–	65.15	–	–	–	–	4.55	–	–	–	–	–	–	–	–
Wet Beaver below Montezuma 2	–	–	–	–	–	–	–	–	–	12.50	–	–	12.50	–	–	–	–	75.00	–	–	–	–	–	–	–	–
Wet Beaver above Montezuma	–	–	–	–	–	–	–	–	–	–	–	–	42.86	–	–	–	–	57.14	–	–	–	–	–	–	–	–
Wet Beaver at Lawrence	–	–	–	–	3.08	–	–	–	–	–	–	–	–	–	–	–	–	–	76.92	–	–	20.00	–	–	–	–
Wet Beaver at Beaver Creek Camp	–	–	–	–	8.08	–	–	–	–	–	–	–	–	–	–	–	–	–	35.35	–	–	56.57	–	–	–	–
Wet Beaver below Ranch	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
O'Donnell[1]	–	12.50	87.50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Coalmine	–	–	–	–	–	–	100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Fresno Canyon	21.10	–	–	–	–	–	78.90	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Swamp Spring	33.54	–	–	–	–	–	66.46	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cherry Spring	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Blue River at KP Confluence	45.01	4.08	–	0.08	19.44	–	–	–	31.39	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Blue River at Cole Flat 1	27.25	1.21	–	1.02	18.87	–	–	–	51.64	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Blue River at Cole Flat 2	21.44	0.60	–	0.66	25.45	–	–	–	51.84	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Blue River at Bobcat Flat	27.35	0.67	–	0.67	15.25	–	–	–	55.83	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.22	–
Blue River at Upper Blue Campground	18.76	–	–	6.34	26.68	–	–	–	43.86	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.36	–
Campbell-Blue at KE Canyon	–	2.04	–	–	4.08	–	–	–	85.71	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8.16	–
Campbell-Blue at Turkey Creek	33.11	–	–	2.00	3.56	–	–	–	61.11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.22	–
Dry Blue and Pace Creek at Dry Blue 1	41.08	–	–	–	–	–	–	–	56.22	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.70	–
Dry Blue and Pace Creek at Dry Blue 2	25.71	–	–	–	–	–	–	–	67.14	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.14	–
Dry blue and Pace Creek at Pace Creek	56.39	–	–	–	–	–	–	–	43.61	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Marsh Creek[2]	–	–	49.23	–	–	–	–	–	–	–	–	–	–	–	–	–	50.77	–	–	–	–	–	–	–	–	–
Gordon Creek	100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Lower Salt River 1-1	–	–	–	–	–	–	–	–	–	11.11	–	–	–	–	–	–	–	–	–	88.89	–	–	–	–	–	–
Lower Salt River 1-2	–	9.86	–	–	–	–	–	–	–	19.72	–	8.45	–	–	–	–	–	–	–	56.34	–	2.82	–	2.82	–	–
Lower Salt River 1-3	–	17.31	–	–	2.88	–	–	–	–	17.31	–	5.77	–	2.88	–	–	–	–	0.96	29.81	–	23.08	–	–	–	–
Lower Salt River 2-1	–	16.00	–	–	4.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	80.00	–	–	–	–	–	–
Lower Salt River 2-2	–	72.34	–	–	11.70	–	–	–	–	3.19	–	–	–	–	–	–	–	–	–	12.77	–	–	–	–	–	–
Lower Salt River 2-3	–	45.71	–	–	2.86	–	–	–	–	5.71	–	–	–	–	–	–	–	–	–	45.71	–	–	–	–	–	–
Lower Salt River 3-1	–	38.89	–	–	5.56	–	–	–	–	11.11	–	–	–	–	–	–	11.11	–	–	16.67	–	–	–	16.67	–	–
Lower Salt River 3-2	–	18.75	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12.50	–	–	56.25	–	–	–	–	–	12.50
Lower Salt River 3-3	–	25.00	–	–	–	–	–	–	–	–	–	12.50	–	–	–	–	–	–	–	50.00	–	–	–	12.50	–	–

Table 3. Percent relative abundance of each species identified within each stream (highlights indicate the target species for a specific stream).

[1] Indicates *Gila robusta* populations recognized in previous reports as *Gila intermedia*.

[2] Indicates *Gila robusta* populations recognized in previous reports as *Gila nigra*.

Species	Age class	Fish captured	Effort (# of m^2 hauls)	CPUE (fish/m^2)	% of total catch
POOC	n/a	174	4.46	39.01	100
Total	n/a	**174**	**4.46**	**39.01**	**100**

Table 4. Buckhorn Spring. Summary of effort and catch data for a straight seine within a 100 m survey reach for POOC .

Species	Age class	Fish captured	Effort (# of m^2 hauls)	CPUE (fish/m^2)	% of total catch
POOC	n/a	58	10.74	5.40	100
Total	**n/a**	**58**	**10.74**	**5.40**	**100**

Table 5. Buckhorn Spring. Summary of effort and catch data for dip net sweeps within a 100 m survey reach for POOC .

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
AGCH	n/a	334	1157	0.289	87
POOC	n/a	51	1157	0.044	13
Total	**n/a**	**385**	**1157**	**0.333**	**100**

Table 6. Morgan City Wash. Summary of effort and catch data for BPES within a 100 m survey reach for POOC .

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
n/a	n/a	0	10	20.15	0	0
Total	**n/a**	**0**	**10**	**20.15**	**0**	**0**

Table 7. Post Canyon. Summary of effort and catch data for hoop nets within a 500 m survey for GIRO.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
LECY	0	10	8	15.80	0.63	31
GAAF	n/a	22	8	15.80	1.39	69
Total	**n/a**	**32**	**16**	**15.80**	**2.03**	**100**

Table 8. Post Canyon. Summary of effort and catch data for minnow traps within a 500 m survey for GIRO.

Species	Age class	Fish captured	Effort (# of m^2 hauls)	CPUE (fish/m^2)	% of total catch
GAAF	n/a	7	6	1.17	100
Total	**n/a**	**7**	**6**	**1.17**	**100**

Table 9. Post Canyon. Summary of effort and catch data for dipnet sweeps within a 500 m survey for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
GIRO	1	21	2162	0.010	10
GIRO	0	4	2162	0.002	2
PACL	1	35	2162	0.016	16
PACL	0	18	2162	0.008	8
RHOS	n/a	140	2162	0.065	64
Total	**n/a**	**218**	**2162**	**0.101**	**100**

Table 10. Walker Creek. Summary of effort and catch data for BPES within a 100 m survey for GIRO.

Species	Age class	Fish detected	Effort (sec)	CPUE (fish/sec)	% of total catch
GIRO	1	6	300	0.02	100
Total	**n/a**	**6**	**300**	**0.02**	**100**

Table 11. Walker Creek. Summary of effort and catch data for a visual observation within a 100 m survey for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
GIRO	1	24	2582	0.009	18
GIRO	0	4	2582	0.002	3
RHOS	n/a	61	2582	0.024	46
AGCH	n/a	41	2582	0.016	31
PACL	1	2	2582	0.001	2
Total	**n/a**	**132**	**2582**	**0.051**	**100**

Table 12. Dix Creek– Left Prong. Summary of effort and catch data for BPES within a 500 m survey for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
GIRO	1	19	1407	0.014	54
GIRO	0	6	1407	0.004	17
RHOS	n/a	9	1407	0.006	26
CAIN	1	1	1407	0.001	3
Total	**n/a**	**35**	**1407**	**0.025**	**100**

Table 13. Dix Creek– Left Prong. Summary of effort and catch data for BPES within a 100 m survey for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
GIRO	1	37	1127	0.033	17
GIRO	0	5	1127	0.004	2
CAIN	1	30	1127	0.027	13
CAIN	0	6	1127	0.005	3
PACL	1	21	1127	0.019	9
PACL	0	14	1127	0.012	6
CASP	1	2	1127	0.002	1
RHOS	n/a	96	1127	0.085	43
AGCH	n/a	12	1127	0.011	5
Total	**n/a**	**223**	**1127**	**0.198**	**100**

Table 14. Dix Creek– Right Prong. Summary of effort and catch data for BPES within a 100 m survey for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
GIRO	1	19	1802	0.011	7
GIRO	0	9	1802	0.005	3
PACL	1	87	1802	0.048	30
PACL	0	27	1802	0.015	9
CAIN	1	15	1802	0.008	5
CAIN	0	4	1802	0.002	1
RHOS	n/a	46	1802	0.026	16
AGCH	n/a	79	1802	0.044	28
Total	**n/a**	**286**	**1802**	**0.159**	**100**

Table 15. Harden Cienega. Summary of effort and catch data for BPES within a 100 m survey for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
AMNA	1	14	1975	0.007	18
CYLU	n/a	54	1975	0.027	68
LECY	1	1	1975	0.001	1
PIPR	n/a	10	1975	0.005	13
Total	**n/a**	**79**	**1975**	**0.04**	**100**

Table 16. Tonto Creek at Gun 1. Summary of effort and catch data for a BPES within a 500 m survey for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
AMNA	1	10	1276	0.008	9
AMNA	0	1	1276	0.001	1
CYLU	n/a	92	1276	0.072	84
PIPR	n/a	5	1276	0.004	5
AGCH	n/a	1	1276	0.001	1
CAIN	1	1	1276	0.001	1
Total	**n/a**	**110**	**1276**	**0.09**	**100**

Table 17. Tonto Creek at Gun 2. Summary of effort and catch data for a BPES within a 500 m survey for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
AMNA	1	11	1731	0.006	12
AMNA	0	1	1731	0.001	1
CAIN	1	1	1731	0.001	1
LECY	1	3	1731	0.002	3
CYLU	n/a	74	1731	0.043	78
PIPR	n/a	5	1731	0.003	5
Total	**n/a**	**95**	**1731**	**0.055**	**100**

Table 18. Tonto Creek at Gun 3. Summary of effort and catch data for BPES within a 500 m survey for GIRO.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
LECY	1	3	6	24.27	0.12	100
Total	**n/a**	**3**	**6**	**24.27**	**0.12**	**100**

Table 19. Tonto Creek at Gun 3. Summary of effort and catch data for collapsible hoop nets within a 500 m survey for GIRO.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
0	n/a	0	7	27.75	0	n/a
Total	**n/a**	**0**	**7**	**27.75**	**0**	**n/a**

Table 20. Tonto Creek at Gun 3. Summary of effort and catch data for minnow traps within a 500 m survey for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MISA	1	5	2363	0.002	6
AMNA	1	40	2363	0.017	48
AMNA	0	1	2363	0.000	1
CAIN	1	4	2363	0.002	5
LECY	1	12	2363	0.005	14
LECY	0	2	2363	0.001	2
CYCA	1	11	2363	0.005	13
MIDO	1	1	2363	0.000	1
GAAF	n/a	8	2363	0.003	10
Total	**n/a**	**84**	**2363**	**0.036**	**100**

Table 21. Tonto Creek at Gisela 1. Summary of effort and catch data for a BPES within a 500 m survey for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CYCA	1	15	1500	0.010	37
LECY	0	12	1500	0.008	29
LECY	1	10	1500	0.007	24
MIDO	1	2	1500	0.001	5
AMNA	1	1	1500	0.001	2
PIPR	n/a	1	1500	0.001	2
Total	**n/a**	**41**	**1500**	**0.027**	**100**

Table 22. Tonto Creek at Gisela 2. Summary of effort and catch data for a BPES within a 500 m survey for GIRO.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
0	0	0	5	10	0.00	0
Total	**n/a**	**0**	**5**	**10**	**0.00**	**0**

Table 23. Tonto Creek at Gisela 2. Summary of effort and catch data for collapsible hoop nets within a 500 m survey for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
LECY	1	24	1808	0.013	35
LECY	0	5	1808	0.003	7
AMNA	1	36	1808	0.020	53
MISA	1	1	1808	0.001	1
GAAF	n/a	2	1808	0.001	3
Total	**n/a**	**68**	**1808**	**0.038**	**100**

Table 24. Tonto Creek at Gisela 3. Summary of effort and catch data for BPES within a 500 m survey for GIRO.

Species	Age class	Fish detected	Effort (sec)	CPUE (fish/sec)	% of total catch
CYCA	1	12	30	0.400	57
MI sp.	1	4	30	0.133	19
LE sp.	1	2	30	0.067	10
CYLU	n/a	3	30	0.100	14
Total	**n/a**	**21**	**30**	**0.700**	**100**

Table 25. Tonto Creek at Gisela 3. Summary of effort and catch data for visual observation within a 500 m survey for GIRO.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
CAIN	1	1	5	11.1	0.090	100
Total	**n/a**	**1**	**5**	**11.1**	**0.090**	**100**

Table 26. Tonto Creek at Gisela 3. Summary of effort and catch data for collapsible hoop nets within a 500 m survey for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
SATR	1	47	2038	0.023	67
ONMY	1	19	2038	0.009	27
ONMY	0	4	2038	0.002	6
Total	**n/a**	**70**	**2038**	**0.034**	**100**

Table 27. Tonto Creek at Tontozona 1. Summary of effort and catch data for a BPES within a 500 m survey for GIRO.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
0	0	0	10	25.53	0.00	0
Total	**n/a**	**0**	**10**	**25.53**	**0.00**	**0**

Table 28. Tonto Creek at Tontozona 1 Summary of effort and catch data for collapsible hoop nets within a 500 m survey for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
SATR	1	55	2044	0.0269	76
SATR	0	8	2044	0.0039	11
ONMY	1	5	2044	0.0024	7
ONMY	0	3	2044	0.0015	4
LECY	1	1	2044	0.0005	1
Total	**n/a**	**72**	**2044**	**0.035**	**100**

Table 29. Tonto Creek at Tontozona 2 Summary of effort and catch data for BPES within a 500 m survey reach for GIRO.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
0	0	0	7	22.18	0.00	0
Total	**n/a**	**0**	**7**	**22.18**	**0.00**	**0**

Table 30. Tonto Creek at Tontozona 2. Summary of effort and catch data for collapsible hoop nets within a 500 m survey reach for GIRO.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
LECY	1	4	20	310.38	0.013	67
ONMY	1	1	20	310.38	0.003	17
PACL	1	1	20	310.38	0.003	17
Total	**n/a**	**6**	**20**	**310.38**	**0.02**	**100**

Table 31. Tonto Creek at Bear Flat Summary of effort and catch data for collapsible hoop nets within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
AMNA	1	83	2794	0.030	40
AMNA	0	2	2794	0.001	1
LECY	1	107	2794	0.038	51
GIRO	1	16	2794	0.006	8
Total	**n/a**	**208**	**2794**	**0.074**	**100**

Table 32. Spring Creek at Brady Summary of effort and catch data for BPES within a 500 m survey reach for GIRO.

Species	Age class	Fish detected	Effort (sec)	CPUE (fish/sec)	% of total catch
GIRO	1	30	120	0.25	70
LECY	1	13	120	0.11	30
Total	**n/a**	**43**	**120**	**0.36**	**100**

Table 33. Spring Creek at Brady Summary of effort and catch data for a visual observation within a 100 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
RHOS	1	8	766	0.010	11
RHOS	0	15	766	0.020	20
AGCH	0	4	766	0.005	5
GIRO	1	34	766	0.044	45
GIRO	0	3	766	0.004	4
PACL	1	10	766	0.013	13
PACL	0	2	766	0.003	3
Total	**n/a**	**76**	**766**	**0.099**	**100**

Table 34 .Spring Creek at Spring Creek Ranch Summary of effort and catch data for BPES within a 100 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
GIRO	1	82	1192	0.069	57
PACL	1	15	1192	0.013	10
LECY	1	44	1192	0.037	30
LECY	0	1	1192	0.001	1
RHOS	n/a	3	1192	0.003	2
Total	**n/a**	**145**	**1192**	**0.122**	**100**

Table 35. Rock Creek. Summary effort and catch data with BPES within a 100 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CYLU	n/a	43	1603	0.027	65
PACL	0	20	1603	0.012	30
MIDO	0	3	1603	0.002	5
Total	**n/a**	**66**	**1603**	**0.041**	**100**

Table 36. Wet Beaver Creek at below Montezuma 1. Summary of effort and catch data for BPES within a 500 m survey reach for GIRO.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
LEMA	1	6	9	171.25	0.035	75
AMNA	1	1	9	171.25	0.006	13
CYLU	n/a	1	9	171.25	0.006	13
Total	**n/a**	**8**	**9**	**171.25**	**0.047**	**100**

Table 37. Wet Beaver Creek at below Montezuma 2. Summary of effort and catch data for collapsible hoop nets within a 500 m survey reach for GIRO.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
LEMA	0	2	15	42.59	0.047	100
Total	**n/a**	**2**	**15**	**42.59**	**0.047**	**100**

Table 38. Wet Beaver Creek at Above Montezuma. Summary of effort and catch data for collapsible hoop nets within a 500 m survey reach for GIRO.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
LEMA	0	2	8	22.53	0.089	40
CYLU	n/a	3	8	22.53	0.133	60
Total	**n/a**	**5**	**8**	**22.53**	**0.625**	**100**

Table 39. Wet Beaver Creek at Above Montezuma Summary of effort and catch data for collapsible minnow traps within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
ONMY	1	13	2862	0.005	20
MIDO	1	50	2862	0.017	77
PACL	1	2	2862	0.001	3
Total	**n/a**	**65**	**2862**	**0.023**	**100**

Table 40. Wet Beaver Creek at Lawrence. Summary of effort and catch data for BPES within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MIDO	1	35	3043	0.012	35
PACL	1	8	3043	0.003	8
ONMY	1	56	3043	0.018	57
Total	**n/a**	**99**	**3043**	**0.033**	**100**

Table 41. Wet Beaver Creek at Beaver Creek Camp. Summary of effort and catch data for BPES within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MIDO	1	35	2949	0.012	100
Total	**n/a**	**35**	**2949**	**0.012**	**100**

Table 42. Wet Beaver Creek at Below Ranch. Summary of effort and catch data for BPES within a 500 m survey reach for GIRO.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
GIRO	1	49	9	85.47	0.573	88
CAIN	1	7	9	85.47	0.082	13
Total	**n/a**	**56**	**9**	**85.47**	**0.655**	**100**

Table 43. O'Donnell at TNC Canello. Summary of effort and catch data for collapsible hoop nets within a 100 m survey reach for GIRO.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
GIRO	1	190	25	536.39	0.354	83
GIRO	0	10	25	536.39	0.019	4
CAIN	1	29	25	536.39	0.054	13
Total	**n/a**	**229**	**25**	**536.39**	**0.427**	**100**

Table 44. O'Donnell at TNC Canello Summary of effort and catch data for collapsible hoop nets within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (# of m^2 hauls)	CPUE (fish/m^2)	% of total catch
POOC	n/a	44	17	2.59	100
Total	**n/a**	**44**	**17**	**2.59**	**100**

Table 45. Coal Mine. Summary of effort and catch data for dip net sweeps within a 100 m survey reach for POOC.

Species	Age class	Fish captured	Effort (# of m^2 hauls)	CPUE (fish/m^2)	% of total catch
POOC	n/a	86	22	3.91	79
AGCH	n/a	23	22	1.045	21
Total	**n/a**	**109**	**22**	**4.955**	**100**

Table 46. Fresno Canyon. Summary of effort and catch data for dip net sweeps within a 100 m survey reach for POOC.

Species	Age class	Fish captured	Effort (# of m^2 hauls)	CPUE (fish/m^2)	% of total catch
POOC	n/a	29	20	1.45	100
Total	**n/a**	**29**	**20**	**1.45**	**100**

Table 47. Swamp Spring Summary of effort and catch data for dip net sweeps within a 100 m survey reach for POOC.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
POOC	n/a	502	4	3.08	162.99	65
AGCH	n/a	268	4	3.08	87.01	35
Total	**n/a**	**770**	**4**	**3.08**	**250.00**	**100**

Table 48. Swamp Spring. Summary of effort and catch data for minnow traps within a 100 m survey reach for POOC.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
n/a	n/a	0	5	12.31	0	0
Total	**n/a**	**0**	**5**	**12.31**	**0**	**0**

Table 49. Cherry Spring. Summary of effort and catch data for minnow traps within a 500 m survey reach for POOC.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
TICO	n/a	1	876	0.001	0.1
PACL	0	161	876	0.184	12
PACL	1	96	876	0.110	7
CAIN	0	34	876	0.039	3
CAIN	1	20	876	0.023	2
RHOS	n/a	415	876	0.474	31
AGCH	n/a	598	876	0.683	45
Total	**n/a**	**1325**	**876**	**1.513**	**100**

Table 50. Blue River at KP Confluence. Summary of effort and catch data for BPES combined with a kick seine within a 500 m survey reach for TICO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
TICO	n/a	26	1573	0.017	1
PACL	1	138	1573	0.088	5
PACL	0	344	1573	0.219	13
CAIN	1	21	1573	0.013	1
CAIN	0	10	1573	0.006	0.4
RHOS	n/a	1319	1573	0.839	52
AGCH	n/a	696	1573	0.442	27
Total	**n/a**	**2554**	**1573**	**1.624**	**100**

Table 51. Blue River at Cole Flat 1. Summary of effort and catch data for BPES combined with a kick seine within a 500 m survey reach for TICO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
TICO	n/a	12	672	0.018	1
CAIN	0	9	672	0.013	0.5
CAIN	1	2	672	0.003	0.1
PACL	0	393	672	0.585	22
PACL	1	70	672	0.104	4
RHOS	n/a	943	672	1.403	52
AGCH	n/a	390	672	0.580	21
Total	**n/a**	**1819**	**672**	**2.707**	**100**

Table 52. Blue River at Cole Flat 2. Summary of effort and catch data for BPES combined with a kick seine within a 500 m survey reach for TICO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
TICO	n/a	3	1142	0.003	0.4
CAIN	0	1	1142	0.001	0.1
CAIN	1	2	1142	0.002	0.3
PACL	0	33	1142	0.029	4.8
PACL	1	53	1142	0.046	7.7
RHOS	n/a	424	1142	0.371	61.9
SATR	0	8	1142	0.007	1.2
SATR	1	1	1142	0.001	0.1
AGCH	n/a	160	1142	0.140	23.4
Total	**n/a**	**685**	**1142**	**0.600**	**100**

Table 53. Blue River at Bobcat Flat Summary of effort and catch data for BPES combined with a kick seine within a 500 m survey reach for TICO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
TICO	n/a	48	660	0.073	6
PACL	0	130	660	0.197	17
PACL	1	72	660	0.109	10
RHOS	n/a	332	660	0.503	44
SATR	0	32	660	0.048	4
SATR	1	1	660	0.002	0.1
AGCH	n/a	142	660	0.215	19
Total	**n/a**	**757**	**660**	**1.147**	**100**

Table 54. Blue River at Upper Blue Campground Summary of effort and catch data for BPES combined with a kick seine within a 100 m survey reach for TICO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
PACL	0	3	2279	0.001	1
PACL	1	16	2279	0.007	3
SATR	0	63	2279	0.028	13
SATR	1	11	2279	0.005	2
RHOS	n/a	384	2279	0.168	79
CAIN	0	1	2279	0.000	0
CAIN	1	5	2279	0.002	1
TICO	n/a	3	2279	0.001	1
Total	**n/a**	**486**	**2279**	**0.213**	**100**

Table 55. Campbell Blue Creek at KE Canyon. Summary of effort and catch data for BPES combined with a kick seine within a 500 m survey reach for TICO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
PACL	0	30	1845	0.016	4
PACL	1	168	1845	0.091	20
TICO	n/a	19	1845	0.010	2
SATR	0	50	1845	0.027	6
SATR	1	18	1845	0.010	2
RHOS	n/a	332	1845	0.180	40
AGCH	n/a	214	1845	0.116	26
Total	**n/a**	**831**	**1845**	**0.450**	**100**

Table 56. Campbell Blue Creek at Turkey Cr. confluence. Summary of effort and catch data for BPES combined with a kick seine within a 100 m survey reach for TICO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
SATR	0	232	2234	0.104	44
SATR	1	74	2234	0.033	14
RHOS	n/a	158	2234	0.071	30
PACL	0	1	2234	0.000	0
PACL	1	44	2234	0.020	8
CAIN	1	20	2234	0.009	4
Total	**n/a**	**529**	**2234**	**0.237**	**100**

Table 57. Campbell Blue Creek at below corral. Summary of effort and catch data for BPES within a 500 m survey reach for TICO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
RHOS	n/a	271	2666	0.102	56
AGCH	n/a	198	2666	0.074	41
SATR	0	13	2666	0.005	3
Total	**n/a**	**482**	**2666**	**0.181**	**100**

Table 58. Dry Blue Creek at Dry Blue 1. Summary of effort and catch data for BPES combined with a kick seine within a 500 m survey reach for TICO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
RHOS	n/a	94	2356	0.040	67
AGCH	n/a	36	2356	0.015	26
SATR	0	6	2356	0.003	4
SATR	1	4	2356	0.002	3
Total	**n/a**	**140**	**2356**	**0.059**	**100**

Table 59. Dry Blue Creek at Dry Blue 2. Summary of effort and catch data for a BPES combined with a kick seine within a 500 m survey reach for TICO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
AGCH	n/a	287	622	0.461	56
RHOS	n/a	222	622	0.357	44
Total	**n/a**	**509**	**622**	**0.818**	**100**

Table 60. Pace Creek Summary of effort and catch data for a BPES combined with a kick seine within a 500 m survey reach for TICO

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
GIRO	0	3	765	0.004	5
GIRO	1	29	765	0.038	45
LECY	0	28	765	0.037	43
LECY	1	5	765	0.007	8
Total	**n/a**	**65**	**765**	**0.085**	**100**

Table 61. Marsh Creek. Summary of effort and catch data for BPES unit within a 100 m survey reach for GIRO.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
LECY	1	20	4	4.4	4.55	100
Total	**n/a**	**20**	**4**	**4.4**	**4.55**	**100**

Table 62. Marsh Creek. Summary of effort and catch data for collapsible hoop nets within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
AGCH	n/a	139	2956	0.047	100
Total	**n/a**	**139**	**2956**	**0.047**	**100**

Table 63. Gordon Creek Reach 1. Summary of effort and catch data for BPES within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
AGCH	n/a	120	1516	0.079	100
Total	**n/a**	**120**	**1516**	**0.079**	**100**

Table 64. Gordon Creek Reach 2. Summary of effort and catch data for BPES within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MISA	1	7	1195	0.006	78
MISA	0	1	1195	0.001	11
AMNA	1	1	1195	0.001	11
Total	**n/a**	**9**	**1195**	**0.008**	**100**

Table 65. Lower Salt River- Reach 1- East of Saguaro Guest Ranch. Summary of effort and catch data for canoe electroshocker within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
AMNA	1	13	1444	0.009	18
AMNA	0	2	1444	0.001	3
MISA	1	25	1444	0.017	35
MISA	0	15	1444	0.010	21
CYCA	1	6	1444	0.004	8
ONMY	1	2	1444	0.001	3
PYOL	1	2	1444	0.001	3
CAIN	1	7	1444	0.005	10
Total	**n/a**	**72**	**1444**	**0.050**	**100**

Table 66. Lower Salt River- Reach 1- South of Saguaro Guest Ranch. Summary of effort and catch data for canoe electroshocker within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CYCA	1	5	1650	0.003	5
CYCA	0	1	1650	0.001	1
MISA	1	25	1650	0.015	24
MISA	0	6	1650	0.004	6
AMNA	1	12	1650	0.007	12
AMNA	0	6	1650	0.004	6
CAIN	1	17	1650	0.010	16
CAIN	0	1	1650	0.001	1
MIDO	1	1	1650	0.001	1
PACL	1	2	1650	0.001	2
PACL	0	1	1650	0.001	1
ONMY	1	24	1650	0.015	23
GAAF	n/a	3	1650	0.002	3
Total	**n/a**	**104**	**1650**	**0.063**	**100**

Table 67. Lower Salt River- Reach 1- Water Users Site. Summary of effort and catch data for canoe electroshocker within a 500 m survey reach for GIRO.

Species	Age class	# captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
MISA	1	20	2	4.8	4.17	80
CAIN	1	4	2	4.8	0.83	16
PACL	1	1	2	4.8	0.21	4
Total	**n/a**	**25**	**2**	**4.8**	**5.21**	**100**

Table 68. Lower Salt River- Reach 2- Foxtail Administration Site. Summary of effort and catch data for trammel nets within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
n/a	0	0	0	0.000	0
Total	**n/a**	**0**	**0**	**0.000**	**0**

Table 69. Lower Salt River- Reach 2- Foxtail Administration Site. Summary of effort and catch data for canoe electroshocker within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CAIN	1	46	673	0.068	49
CAIN	0	22	673	0.033	23
PACL	1	7	673	0.010	7
PACL	0	4	673	0.006	4
MISA	1	9	673	0.013	10
MISA	0	3	673	0.004	3
AMNA	1	1	673	0.001	1
AMNA	0	2	673	0.003	2
Total	**n/a**	**94**	**673**	**0.140**	**100**

Table 70. Lower Salt River- Reach 2- Blue Point Administration Site. Summary of effort and catch data for canoe electroshocker within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CAIN	1	14	839	0.017	40
CAIN	0	2	839	0.002	6
PACL	1	1	839	0.001	3
MISA	1	9	839	0.011	26
MISA	0	7	839	0.008	20
AMNA	1	1	839	0.001	3
AMNA	0	1	839	0.001	3
Total	**n/a**	**35**	**839**	**0.042**	**100**

Table 71. Lower Salt River- Reach 2- Goldfield Administration Site. Summary of effort and catch data for canoe electroshocker within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MISA	1	3	989	0.003	17
PYOL	1	3	989	0.003	17
CAIN	1	7	989	0.007	39
PACL	1	1	989	0.001	6
LECY	0	1	989	0.001	6
LECY	1	1	989	0.001	6
AMNA	1	2	989	0.002	11
Total	**n/a**	**18**	**989**	**0.018**	**100**

Table 72. Lower Salt River- Reach 3- Coon Bluff. Summary of effort and catch data for canoe electroshocker within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
LECY	1	2	788	0.003	13
MISA	1	7	788	0.009	44
MISA	0	2	788	0.003	13
CAIN	0	2	788	0.003	13
CAIN	1	1	788	0.001	6
POLA	n/a	2	788	0.003	13
Total	**n/a**	**16**	**788**	**0.020**	**100**

Table 73. Lower Salt River- Reach 3- Phon D Sutton. Summary of effort and catch data for canoe electroshocker within a 500 m survey reach for GIRO.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CAIN	1	2	604	0.003	25
CYCA	1	1	604	0.002	13
MISA	1	2	604	0.003	25
MISA	0	2	604	0.003	25
PYOL	1	1	604	0.002	13
Total	**n/a**	**8**	**604**	**0.013**	**100**

Table 74. Lower Salt River- Reach 3- Below Verde Confluence. Summary of effort and catch data for canoe electroshocker within a 500 m survey reach for GIRO.

FISH MONITORING OF SELECTED STREAMS

WITHIN

THE GILA RIVER BASIN

2016

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Buckhorn Spring March 22, 2016

UTM 12S Lower Boundary: 364309E, 3763874N Upper Boundary: 364318E, 3763778N

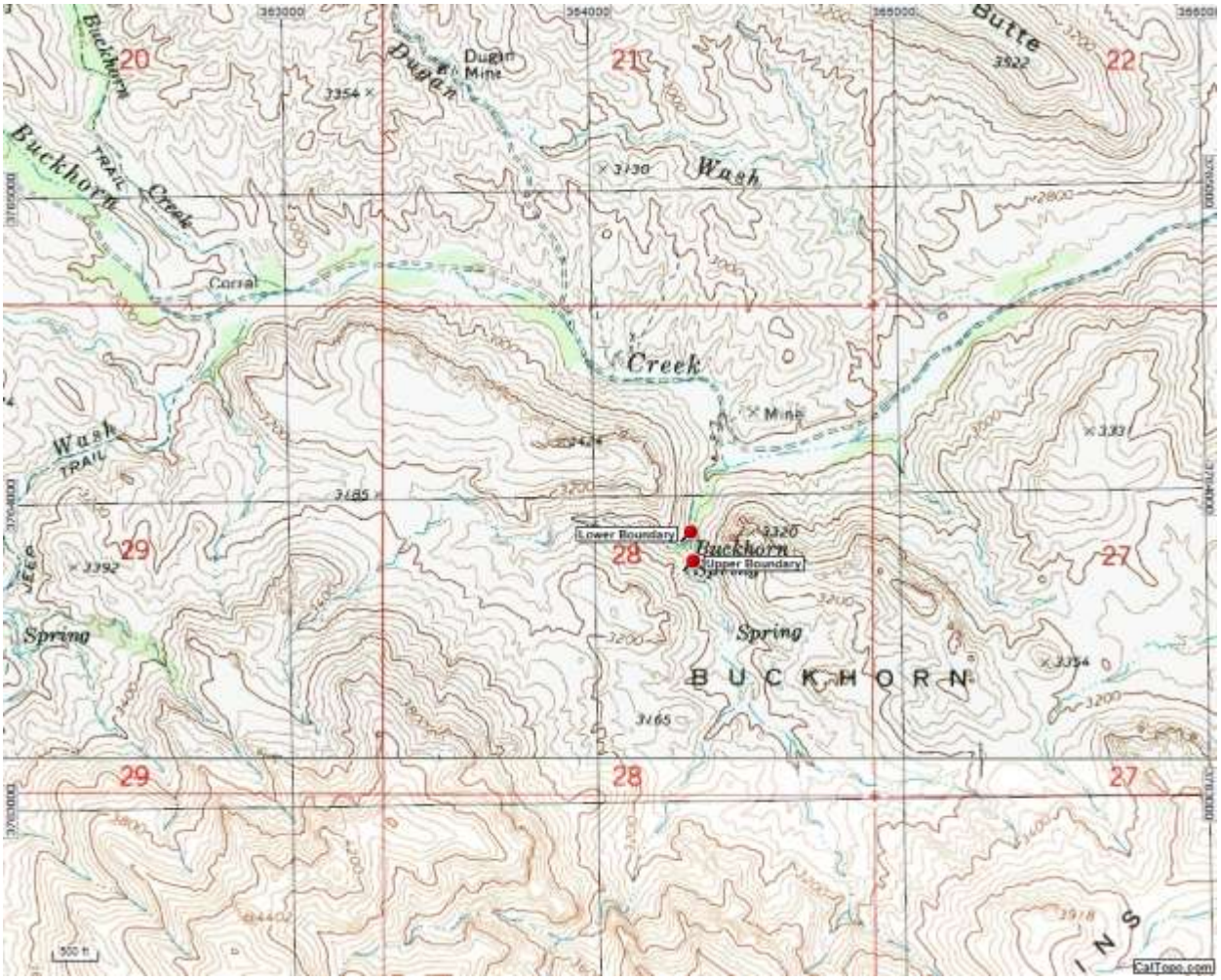


Figure 1. Buckhorn Spring.

Morgan City Wash March 23, 2016

UTM 12S Lower Boundary: 381557E, 3744935N Upper Boundary: 381480E, 3745007N

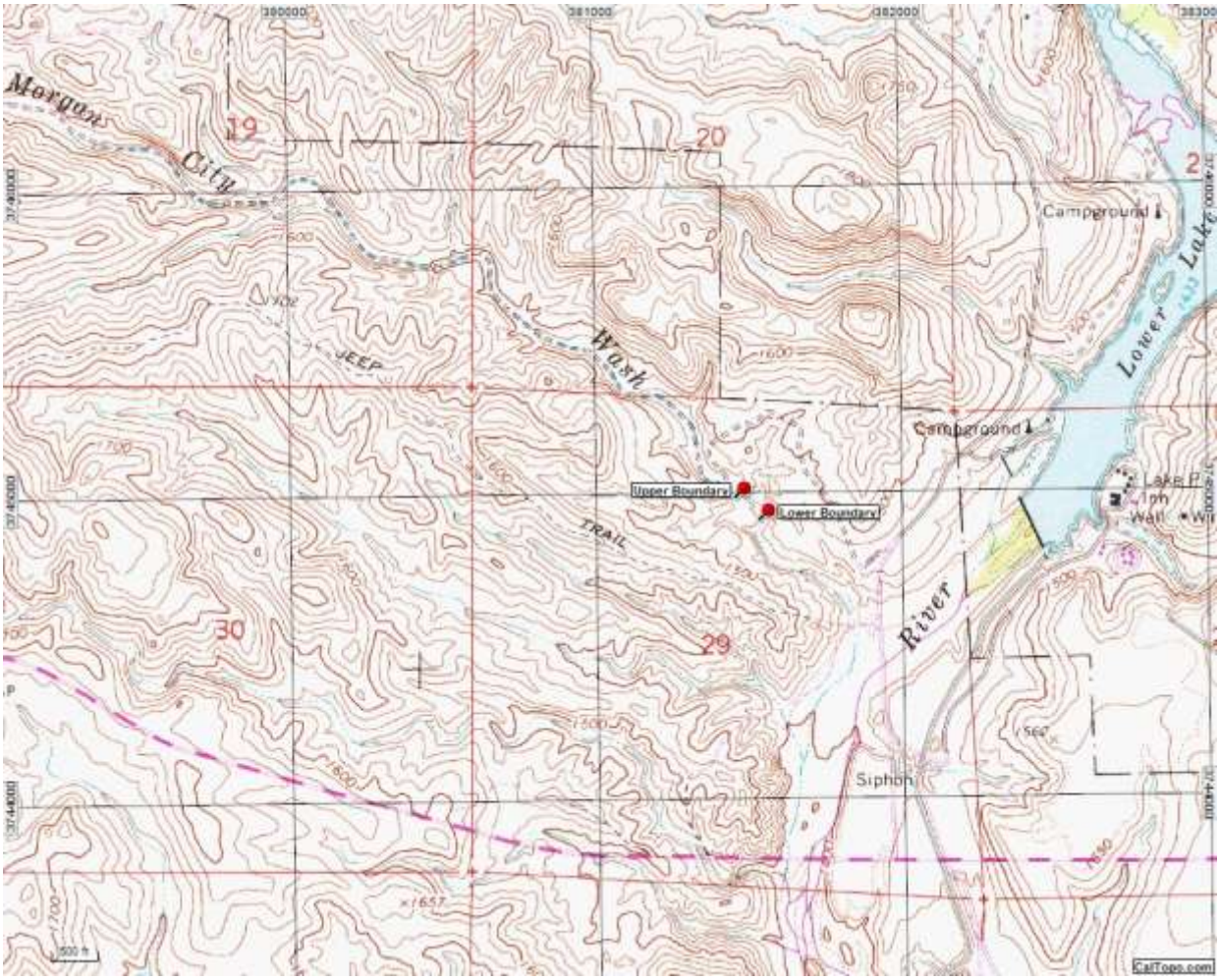


Figure 2. Morgan City Wash.

Post Canyon March 29, 2016

UTM 12R Lower Boundary: 545166E, 3493988N Upper Boundary: 544997E, 3493866N

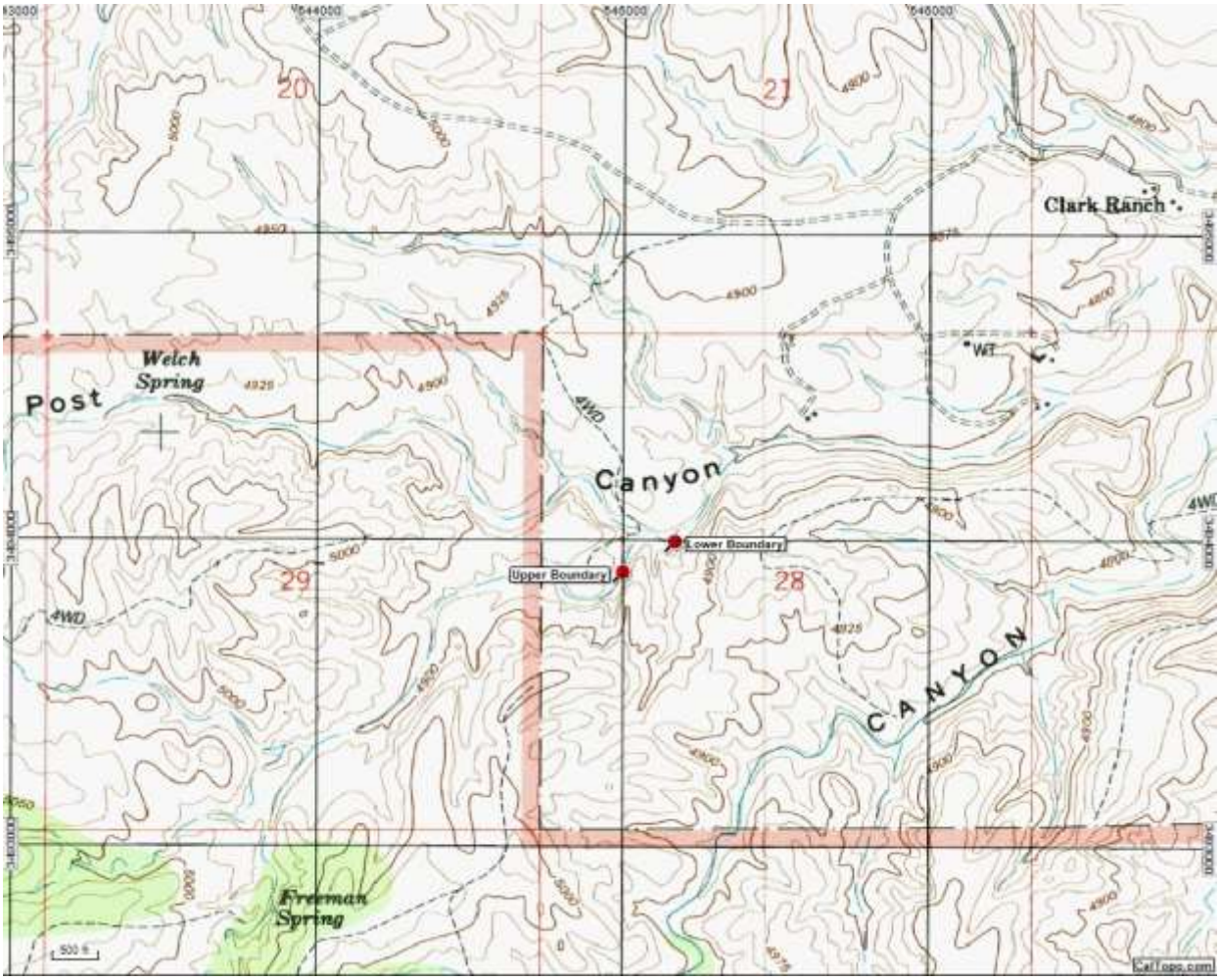


Figure 3. Post Canyon.

Walker Creek April 5, 2016

UTM 12S Lower Boundary: 436017E, 3833684N Upper Boundary: 436188E, 3833689N

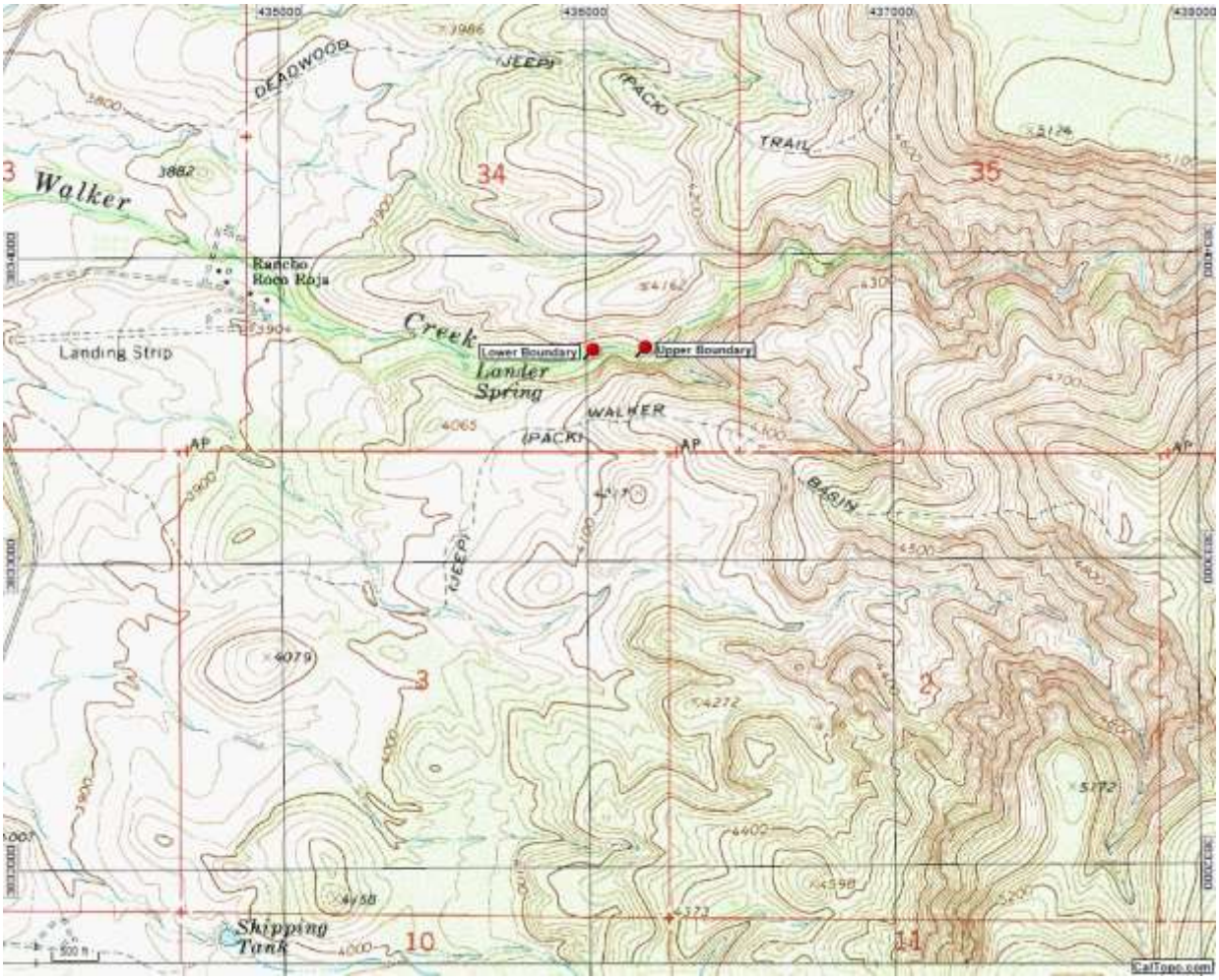


Figure 4. Walker Creek.

Dix Creek Left Prong 1 April 25, 2016

UTM 12S Lower Boundary: 672374E, 3672743N Upper Boundary: 672472E, 3672781N

Dix Creek Left Prong 2 April 25, 2016

UTM 12S Lower Boundary: 672109E, 3673059N Upper Boundary: 672365E, 3672737N

Dix Creek Right Prong 3 April 25, 2016

UTM 12S Lower Boundary: 671764E, 3673458N Upper Boundary: 671691E, 3673489N

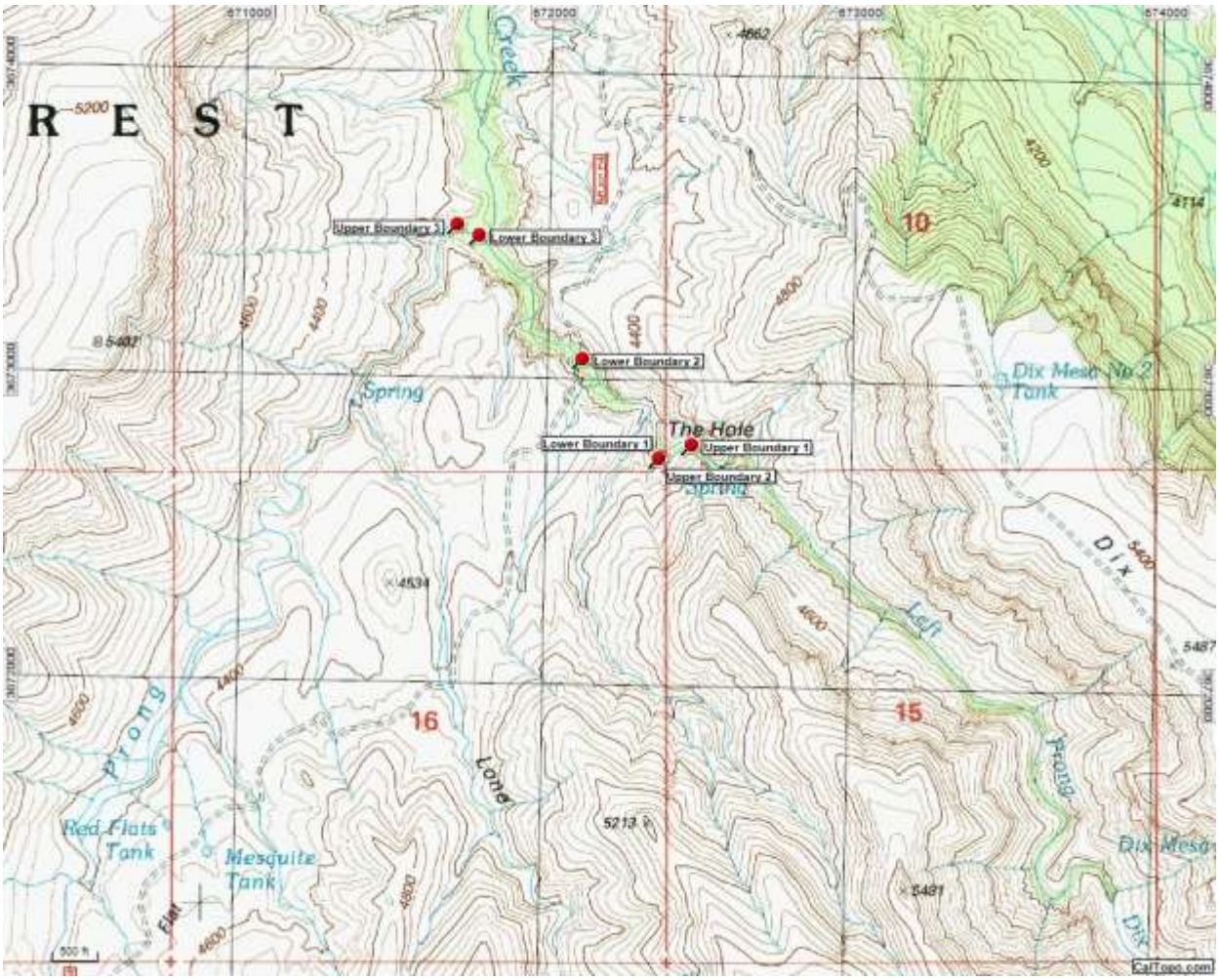


Figure 5. Dix Creek - Left and Right prongs.

Harden Cienega April 26, 2016

UTM 12S Lower Boundary: 674779E, 3674588N Upper Boundary: 674871E, 3674573N

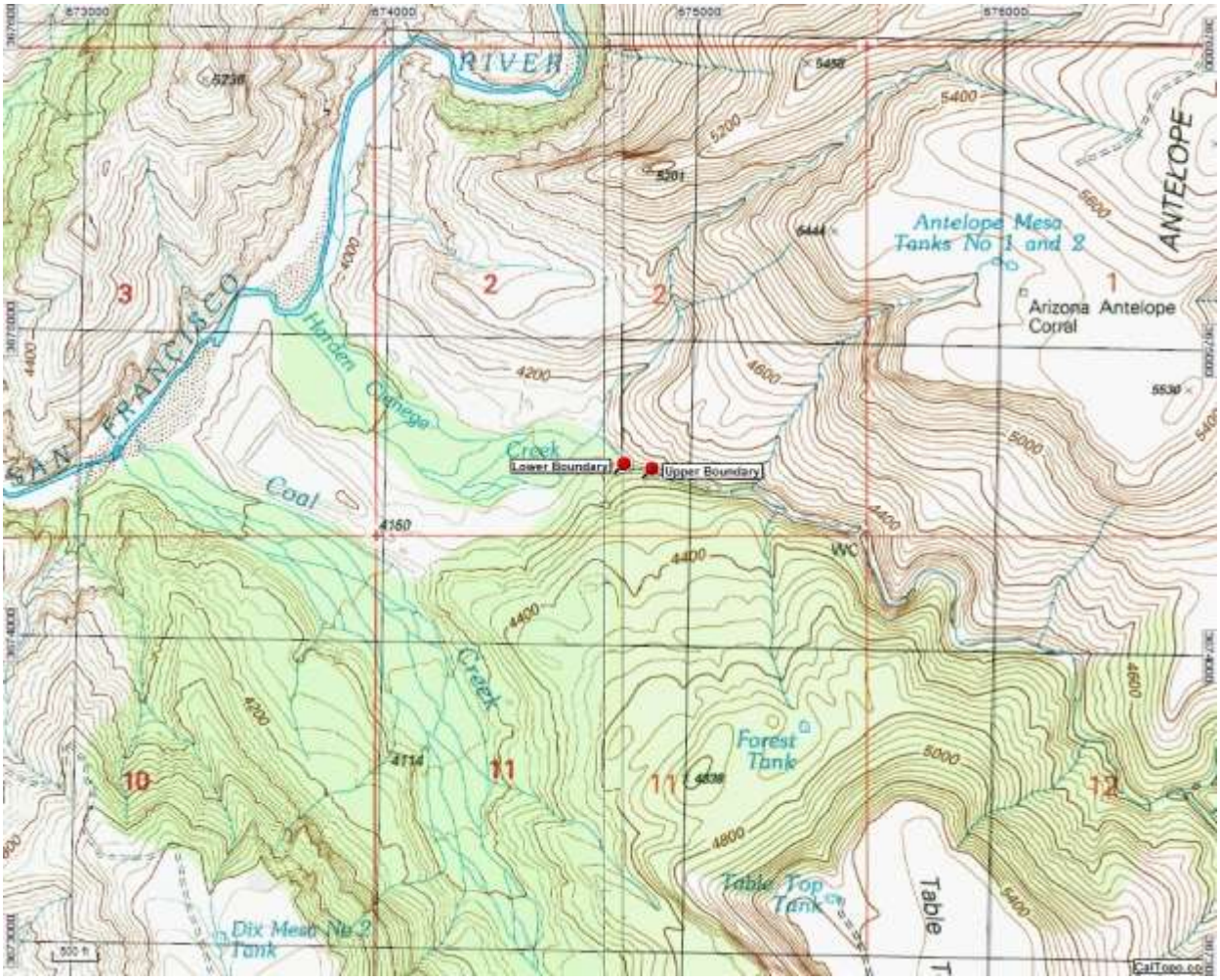


Figure 6. Harden Cienega.

Tonto Creek at Gun 1 May 04, 2016

UTM 12S Lower Boundary: 471800E, 3759891N Upper Boundary: 472093E, 3760201N

Tonto Creek at Gun 2 May 04, 2016

UTM 12S Lower Boundary: 472112E, 3760211N Upper Boundary: 472331E, 3760491N

Tonto Creek at Gun 3 May 04, 2016

UTM 12S Lower Boundary: 472412E, 3760539N Upper Boundary: 472773E, 3760755N

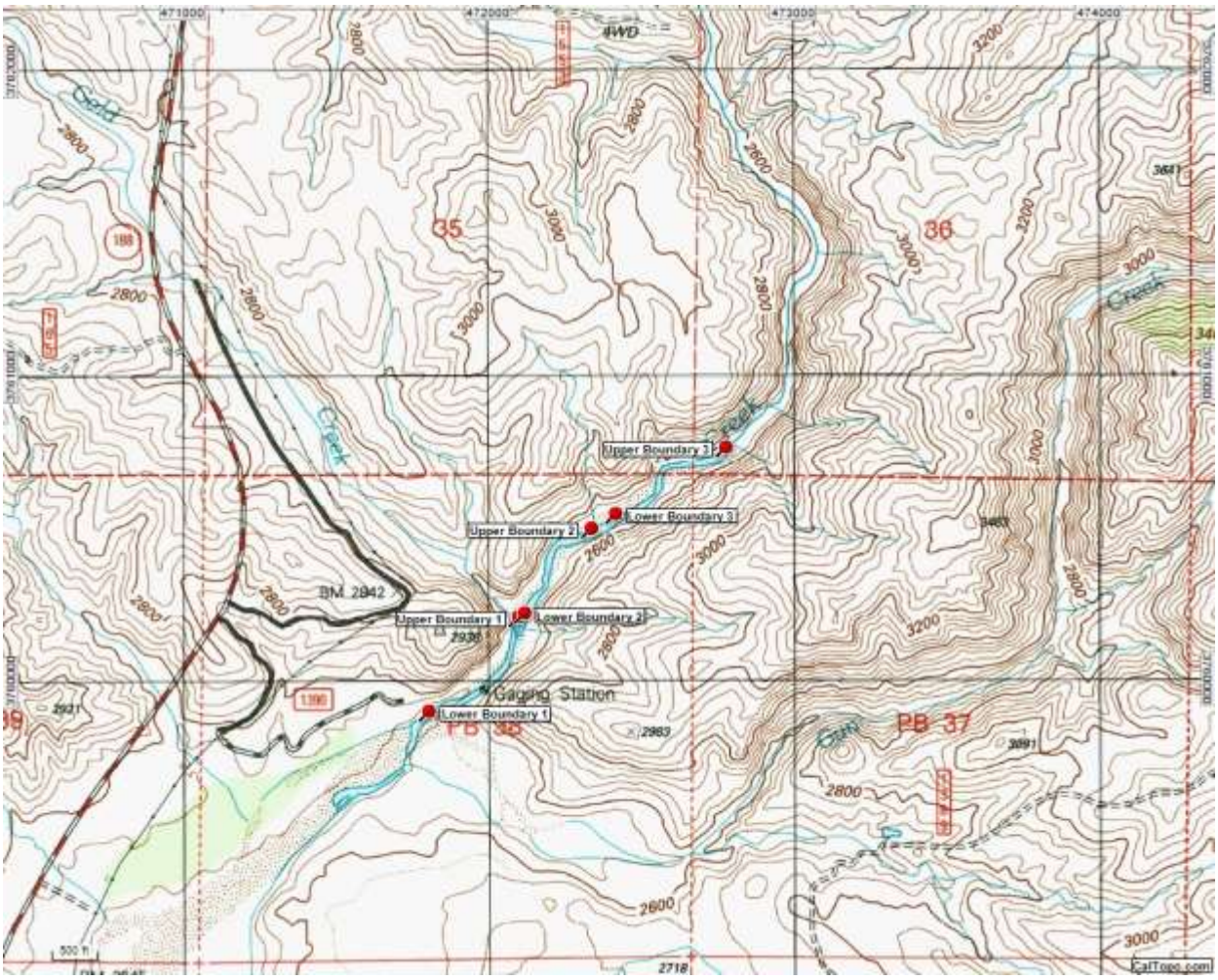


Figure 7. Tonto Creek at Gun Cr. - 1, 2 and 3.

Tonto Creek at Gisela 1 May 05, 2016

UTM 12S Lower Boundary: 473667E, 3771822N Upper Boundary: 473914E, 3772199N

Tonto Creek at Gisela 2 May 05, 2016

UTM 12S Lower Boundary: 474098E, 3772568N Upper Boundary: 474371E, 3772967N

Tonto Creek at Gisela 3 May 05, 2016

UTM 12S Lower Boundary: 474383E, 3772984N Upper Boundary: 474633E, 3773365N

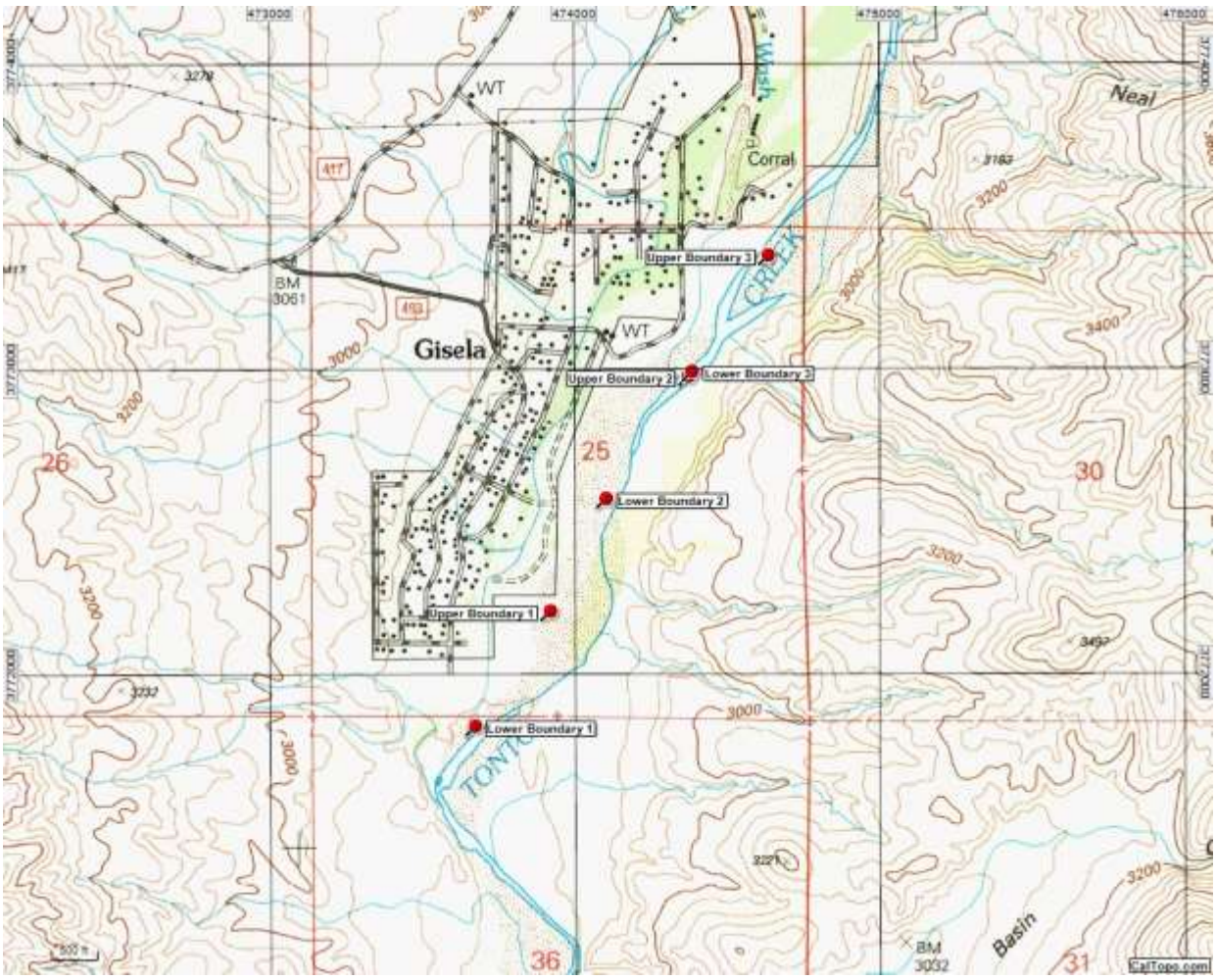


Figure 8. Tonto Creek at Gisela - 1, 2 and 3.

Tonto Creek at Camp Tontozona 1 May 09, 2016

UTM 12S Lower Boundary: 492918E, 3796839N Upper Boundary: 492664E, 3796966N

Tonto Creek at Camp Tontozona 2 May 09, 2016

UTM 12S Lower Boundary: 492610E, 3796959N Upper Boundary: 492264E, 3797236N

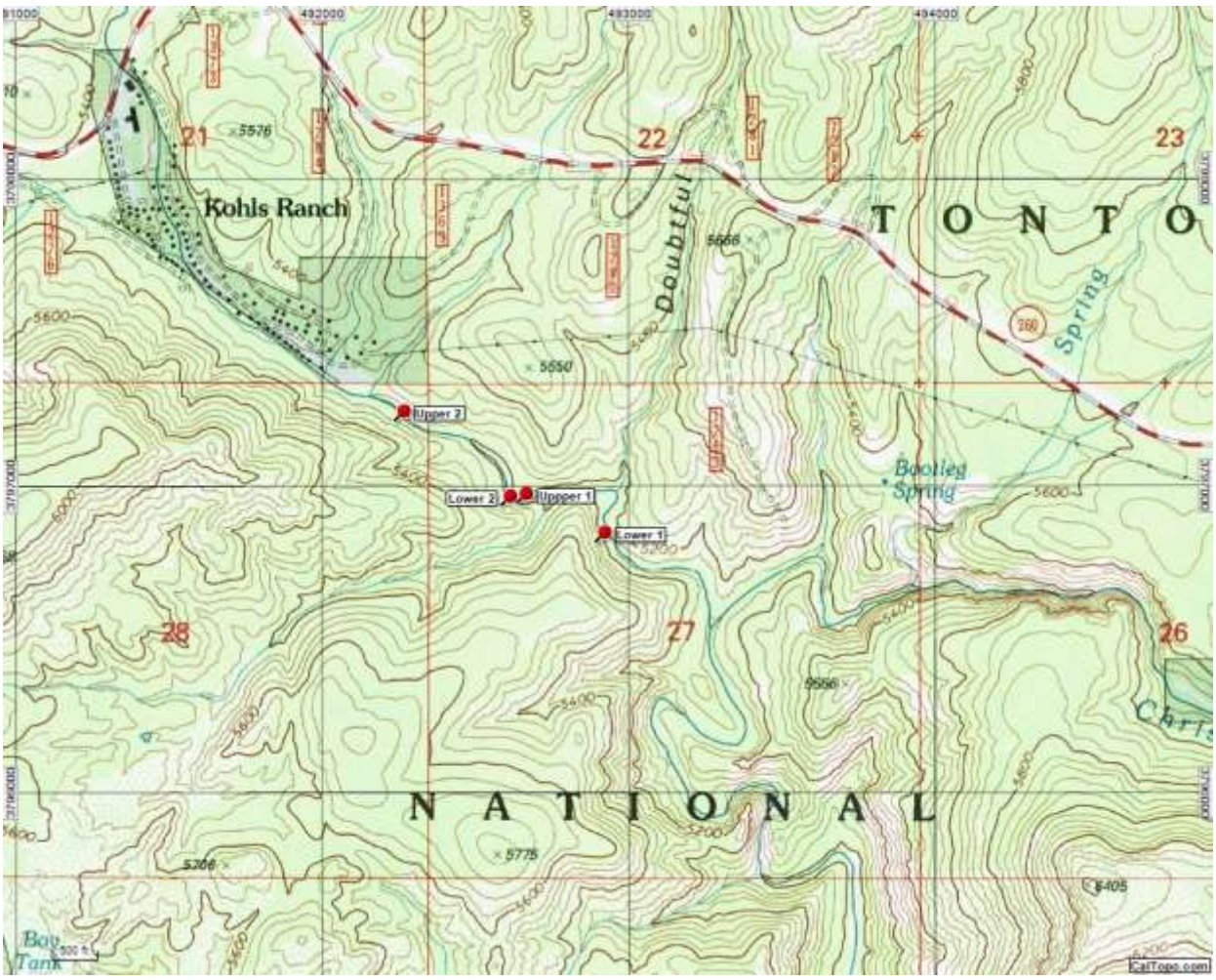


Figure 9. Tonto Creek at Camp Tontozona – Sites 1 and 2.

Tonto Creek at Bear Flat May 10, 2016

UTM 12S Lower Boundary: 493311E, 3793021N Upper Boundary: 493461E, 3793399N

Figure 10. Tonto Creek at Bear Flat.

Spring Creek @ Brady Canyon confluence 1 May 12, 2016

UTM 12S Lower Boundary: 492963E, 3771136N Upper Boundary: 492984E, 3770689N

Spring Creek @ Brady Canyon confluence 2 May 12, 2016

UTM 12S Lower Boundary: 492956E, 3770785N Upper Boundary: 492984E, 3770688N

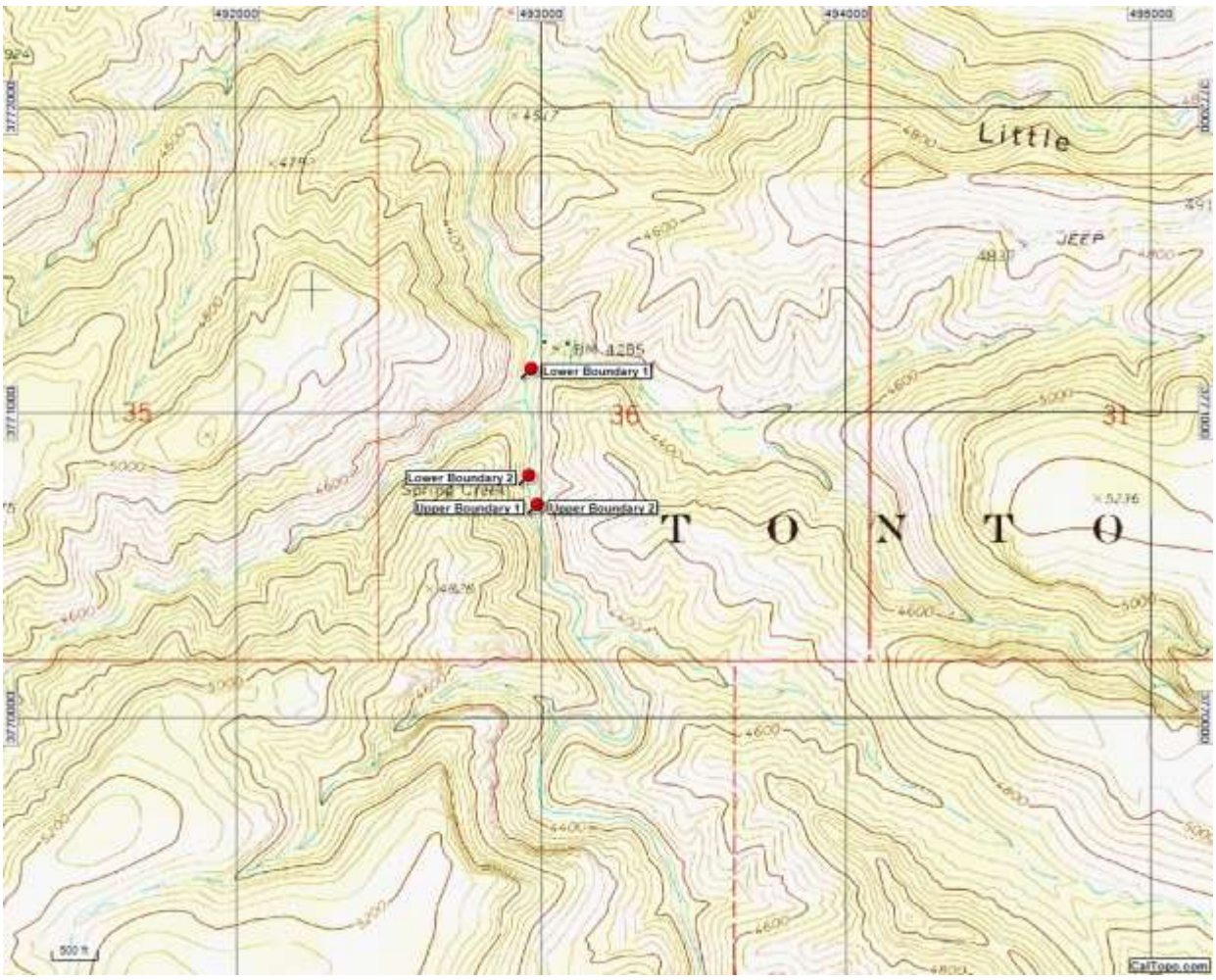


Figure 11. Spring Creek @ Brady Canyon confluence.

Spring Creek below Spring Creek Ranch July 28, 2016

UTM 12S Lower Boundary: 495872E, 3765735N Upper Boundary: 495919E, 3765658N

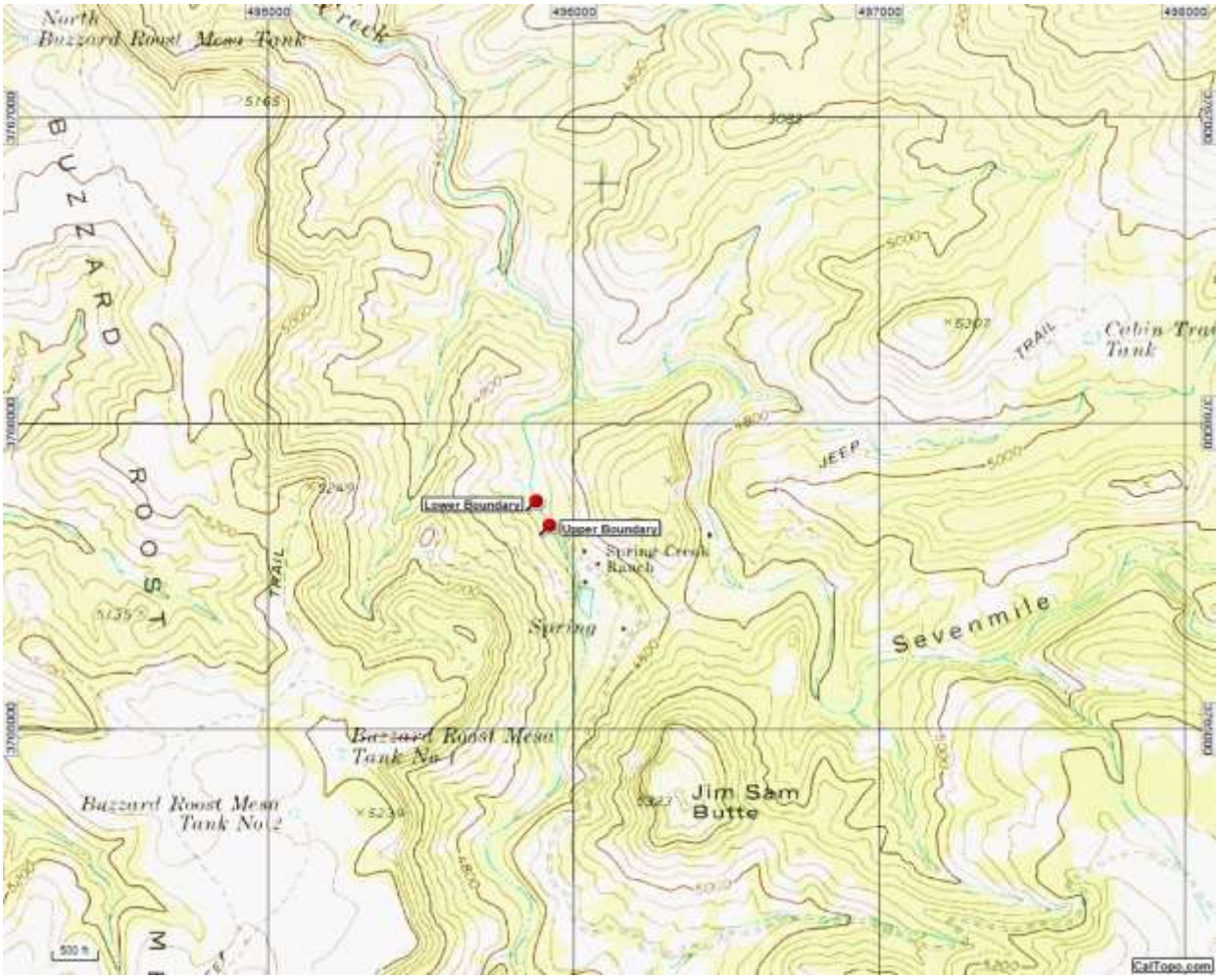


Figure 12. Spring Creek below Spring Creek Ranch.

Rock Creek May 13, 2016

UTM 12S Lower Boundary: 493047E, 3766154N Upper Boundary: 493149E, 3766099N

Figure 13. Rock Creek.

Wet Beaver Creek below Montezuma Castle 1 May 17, 2016

UTM 12S Lower Boundary: 422442E, 3828917N Upper Boundary: 422845E, 3828889N

Wet Beaver Creek below Montezuma Castle 2 May 17, 2016

UTM 12S Lower Boundary: 423057E, 3829201N Upper Boundary: 422736E, 3829450N

Wet Beaver Creek above Montezuma Castle May 31, 2016

UTM 12S Lower Boundary: 423937E, 3831039N Upper Boundary: 424196E, 3831286N

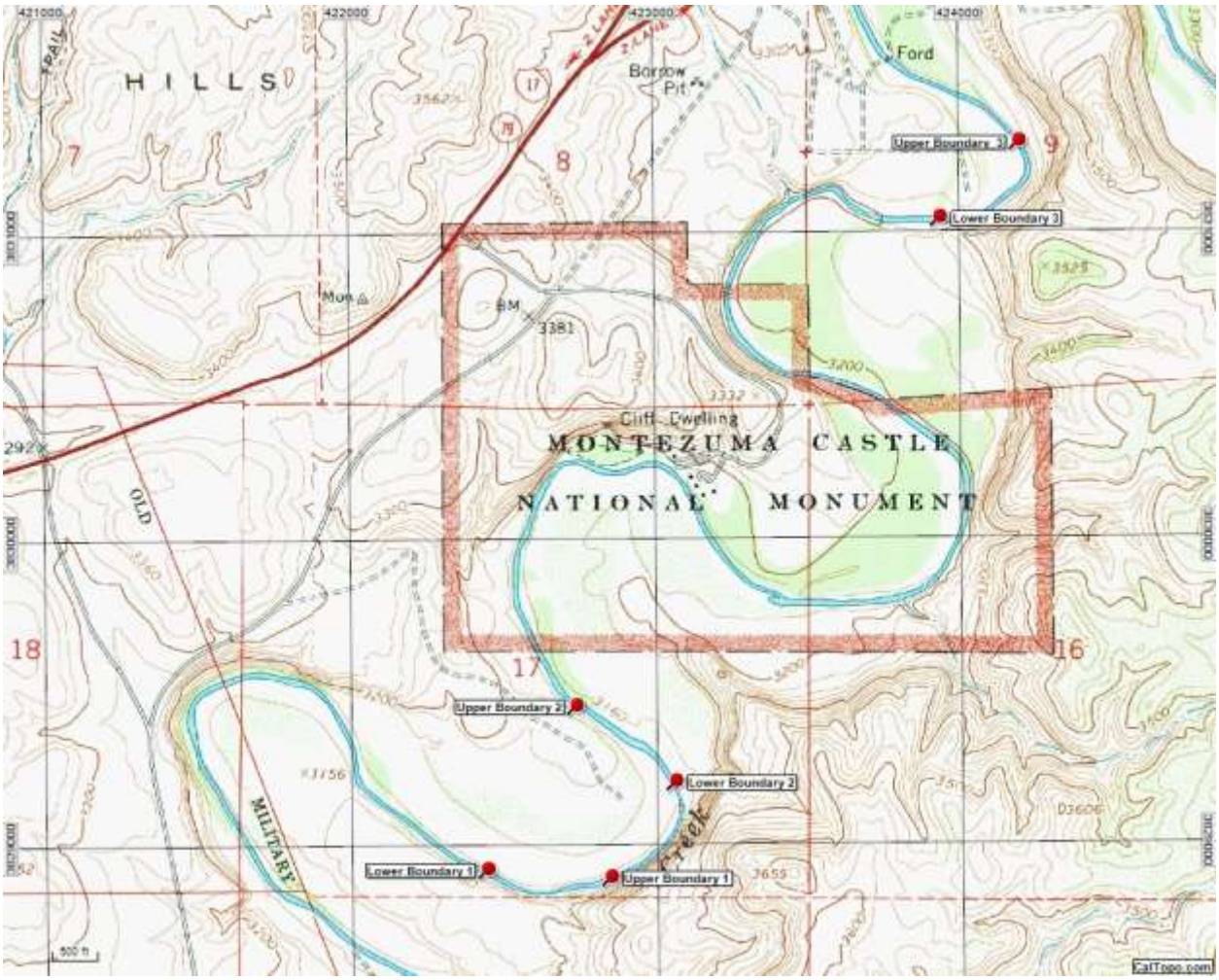


Figure 14. Wet Beaver Creek above and below Montezuma Castle.

Wet Beaver Creek at Lawrence Crossing May 17, 2016

UTM 12S Lower Boundary: 432645E, 3834691N Upper Boundary: 433075E, 3834949N

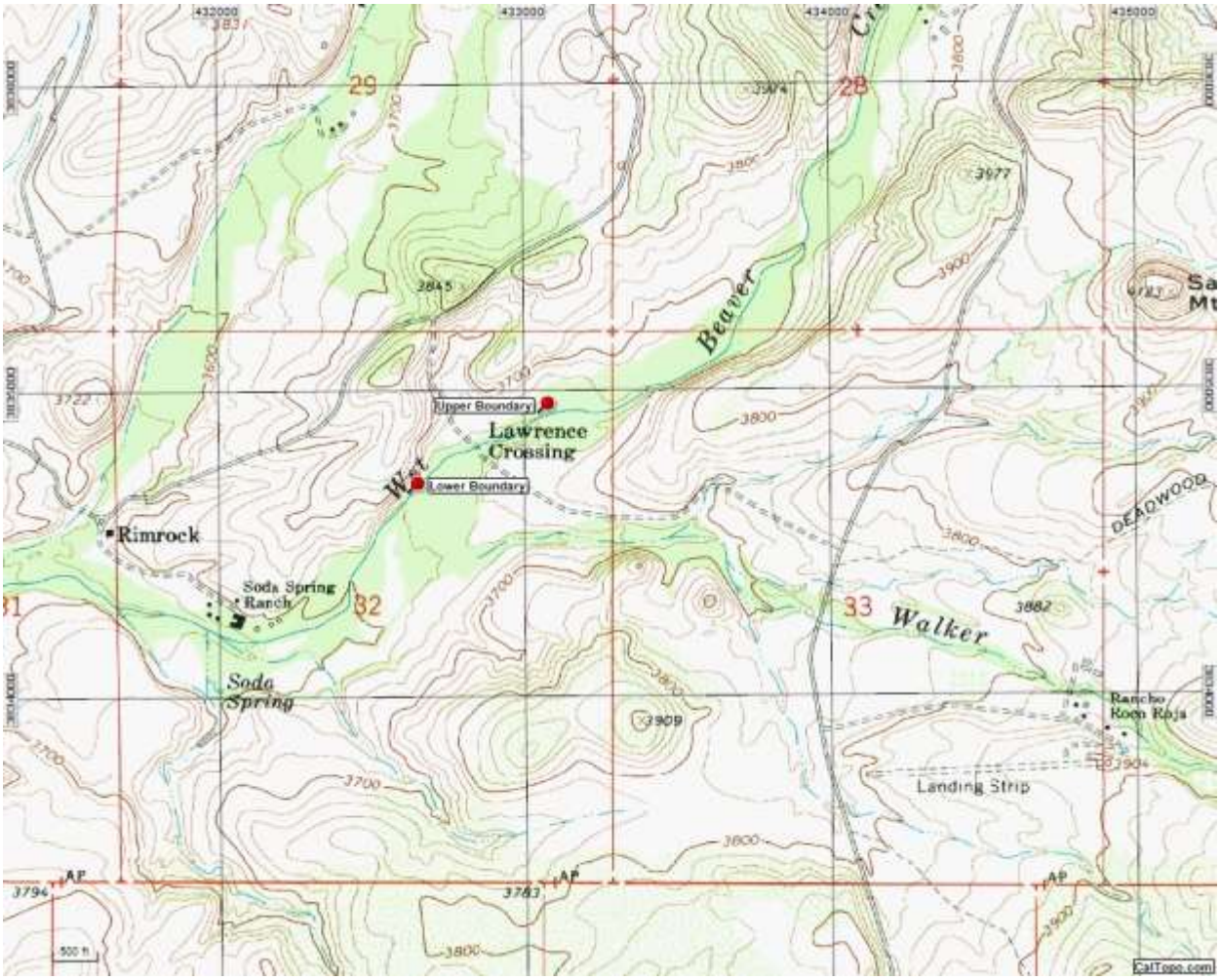


Figure 15. Wet Beaver Creek at Lawrence Crossing.

Wet Beaver Creek below Beaver Cr. Ranch May 17, 2016

UTM 12S Lower Boundary: 435264E, 3837315N Upper Boundary: 435660E, 3837432N

Wet Beaver Creek at Beaver Creek Camp May 17, 2016

UTM 12S Lower Boundary: 434213E, 3836327N Upper Boundary: 434613E, 3836573N

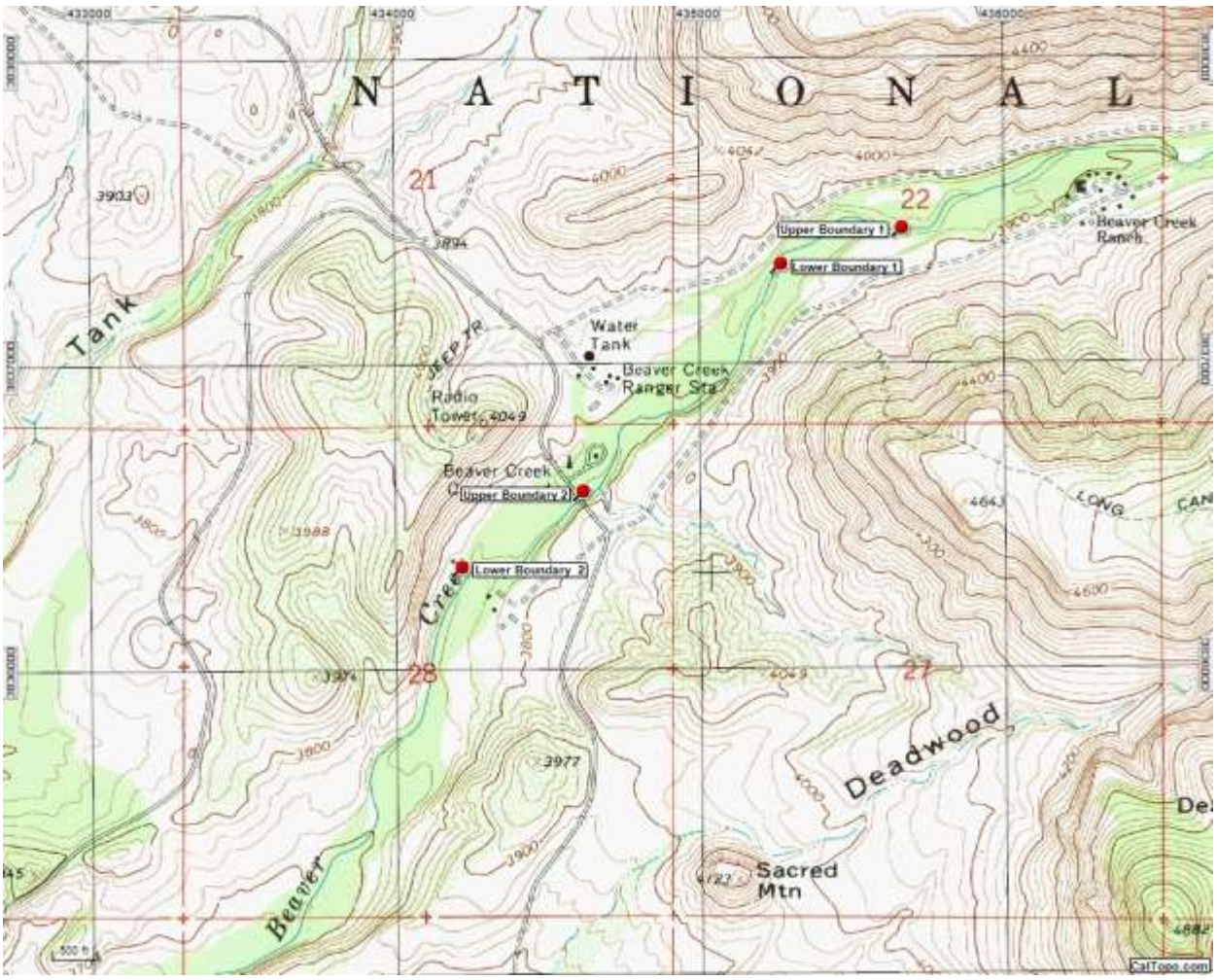


Figure 16. Wet Beaver Creek below Beaver Cr. Ranch, and Beaver Creek Camp.

O'Donnell Creek 1 May 23, 2016

UTM 12S Lower Boundary: 544832E, 3492215N Upper Boundary: 544792E, 3492135N

O'Donnell Creek 2 May 23, 2016

UTM 12S Lower Boundary: 545062E, 3492530N Upper Boundary: 544788E, 3492057N

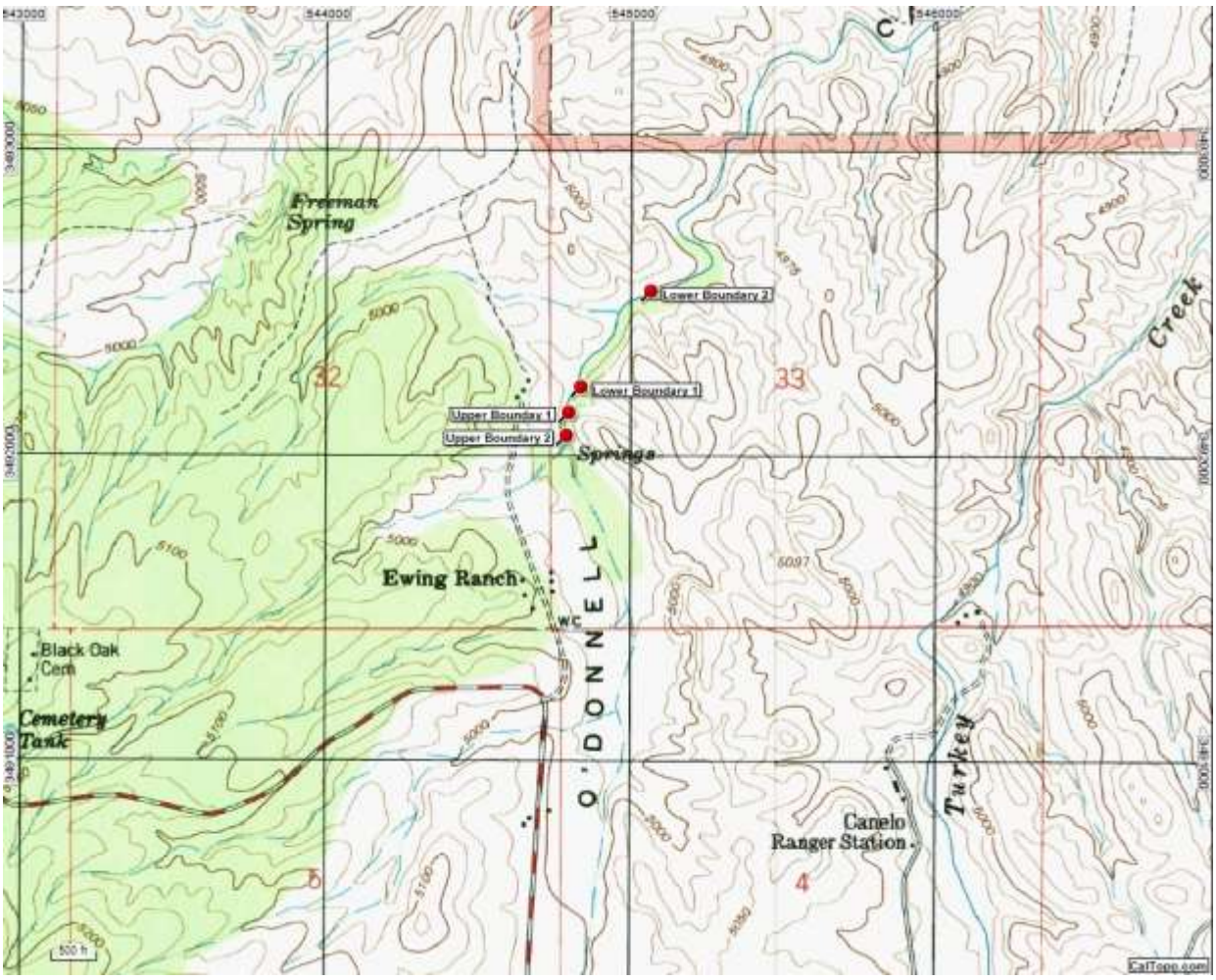


Figure 17. O'Donnell Creek.

Coalmine Canyon June 02, 2016

UTM 12R Lower Boundary: 510438E, 3487948N Upper Boundary: 510504E, 3488020N

Figure 18. Coalmine Canyon.

Fresno Canyon June 03, 2016

UTM 12R Lower Boundary: 507750E, 3485956N Upper Boundary: 507844E, 3485980N

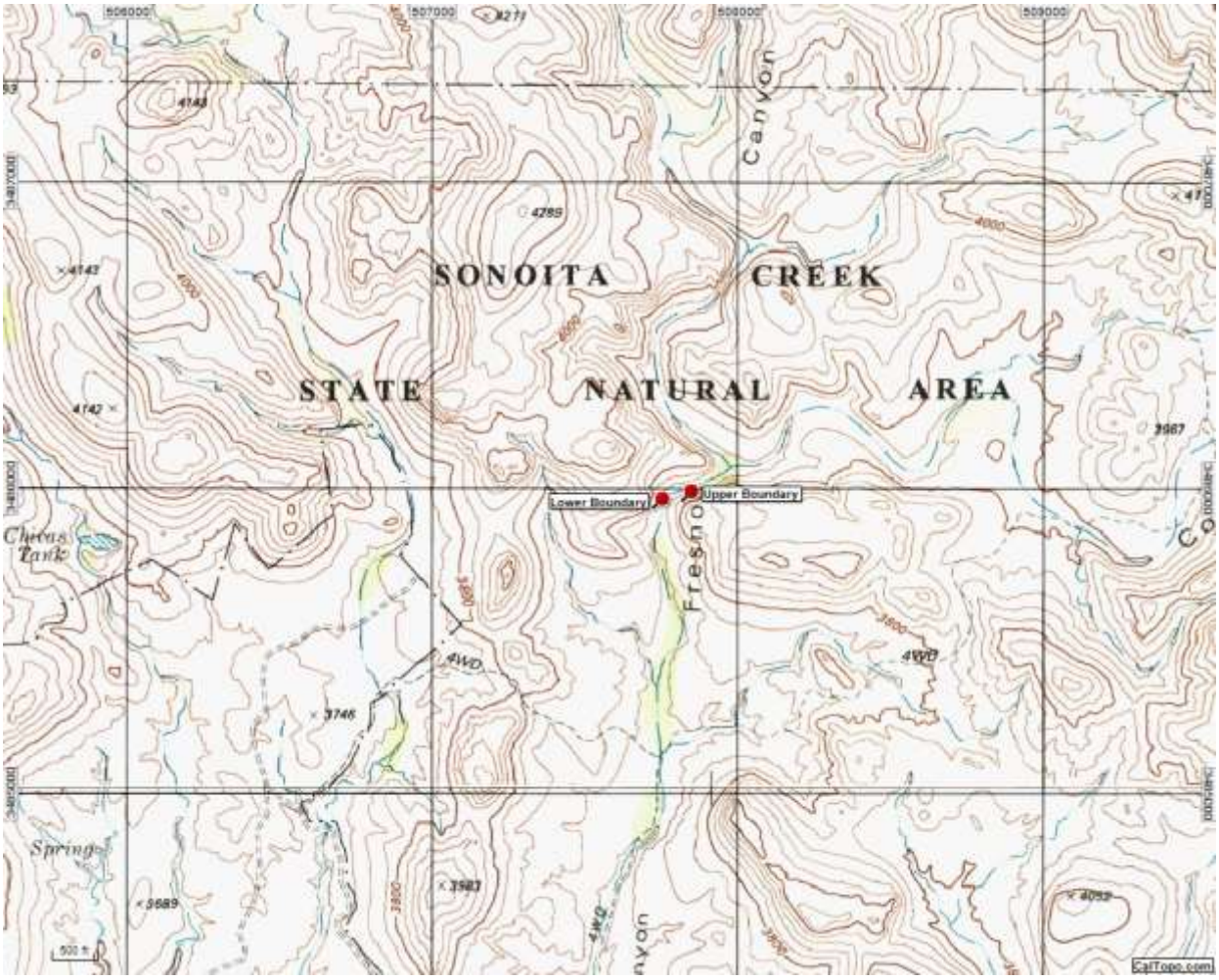


Figure 19. Fresno Canyon.

Swamp Springs June 08, 2016

UTM 12S Lower Boundary: 566507E, 3589050N Upper Boundary: 566600E, 3589088N

Figure 20. Swamp Springs.

Cherry Spring June 09, 2016

UTM 12S Lower Boundary: 565378E, 3586895N Upper Boundary: 565972E, 3587075N

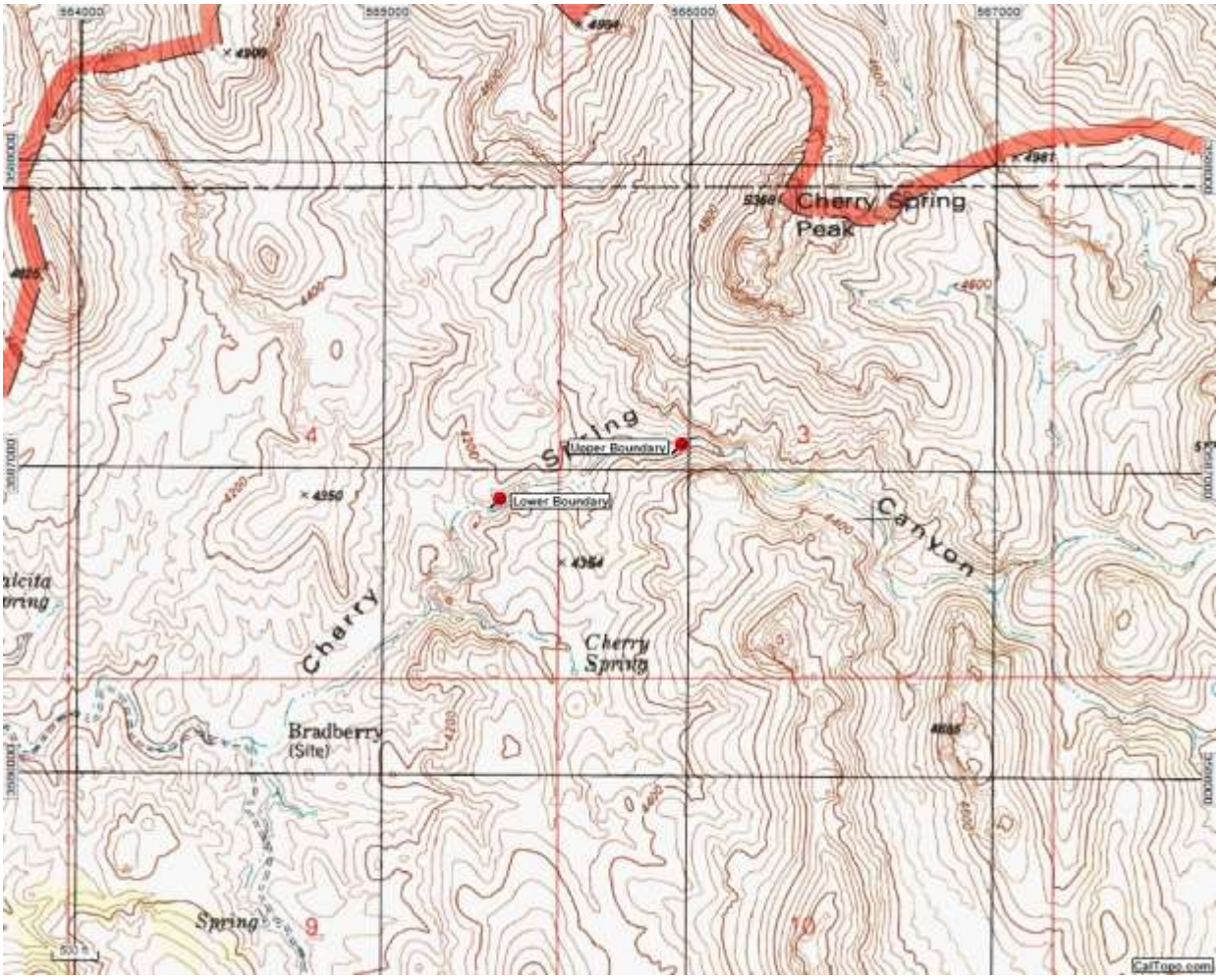


Figure 21. Cherry Spring.

Campbell Blue at Turkey Confluence July 12, 2016

UTM 12S Lower Boundary: 679047E, 3734570N Upper Boundary: 678662E, 3734475N

Campbell Blue at KE Canyon July 12, 2016

UTM 12S Lower Boundary: 677109E, 3734848N Upper Boundary: 676698E, 3734882N

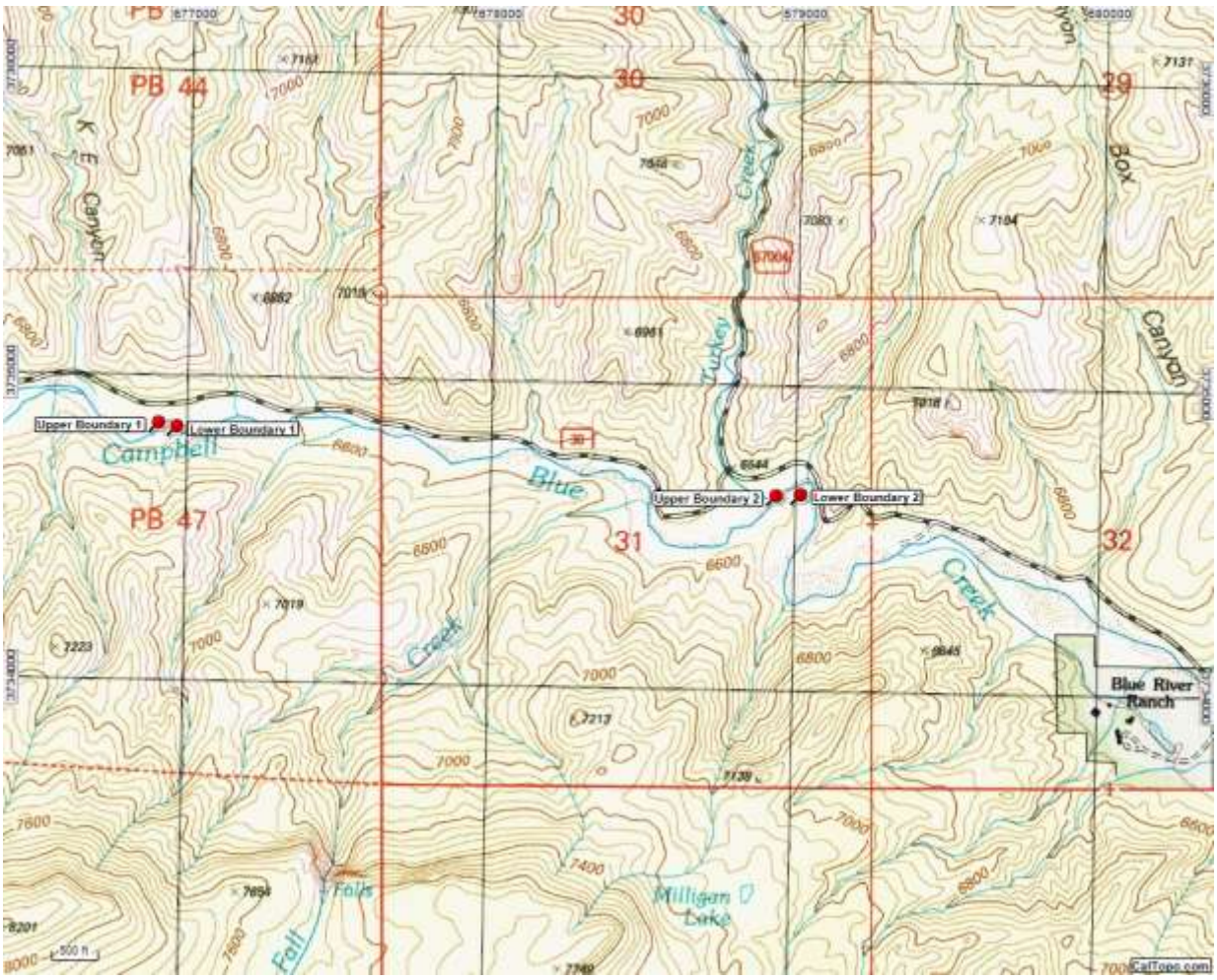


Figure 22. Campbell Blue Creek at Turkey Cr. confluence, and at KE Canyon.

Campbell Blue below Corrals July 12, 2016

UTM 12S Lower Boundary: 675650E, 3734849N Upper Boundary: 675206E, 3734621N

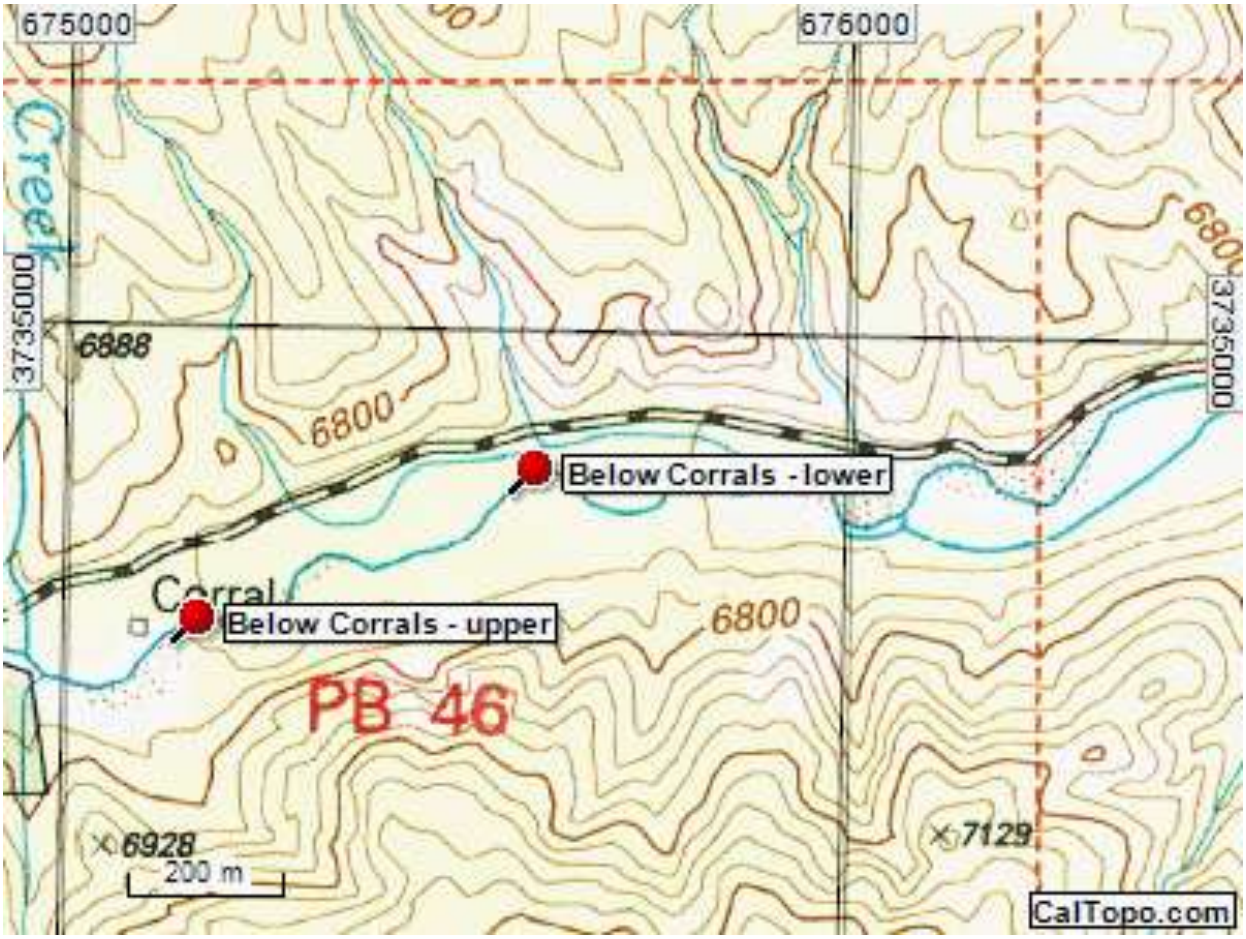


Figure 23. Campbell Blue below Corrals.

Dry Blue/Pace Cr.s - @ Dry Blue 1 July 12, 2016

UTM 12S Lower Boundary: 681878E, 3733822N Upper Boundary: 682087E, 3734124N

Dry Blue/Pace Cr.s - @ Dry Blue 2 July 12, 2016

UTM 12S Lower Boundary: 682078E, 3734150N Upper Boundary: 682158E, 3734531N

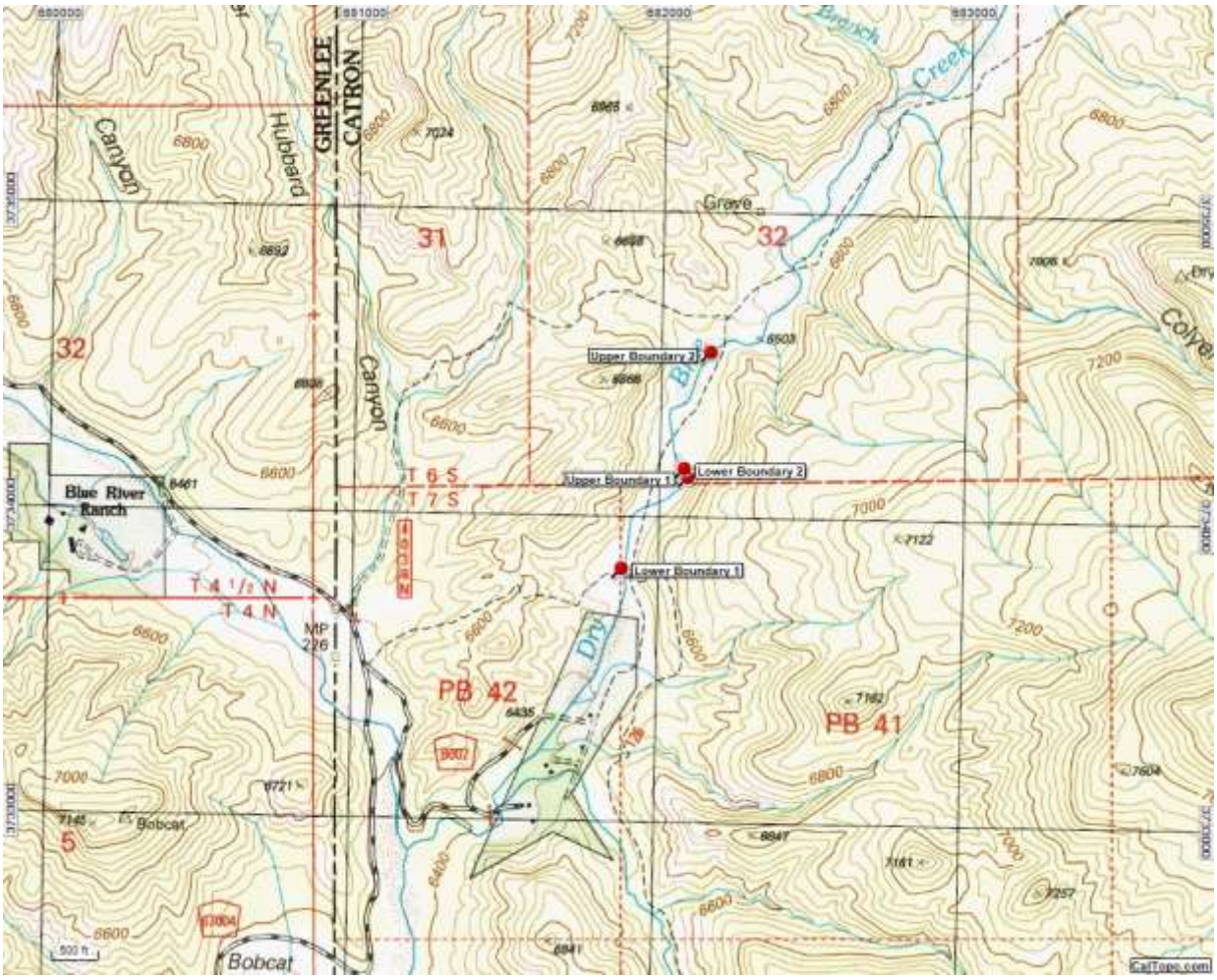


Figure 24. Dry Blue/Pace creeks at Dry Blue 1 and Dry Blue 2.

Dry Blue/Pace Cr.s - @ Pace Creek July 13, 2016

UTM 12S Lower Boundary: 683057E, 3736900N Upper Boundary: 682748E, 3737153N

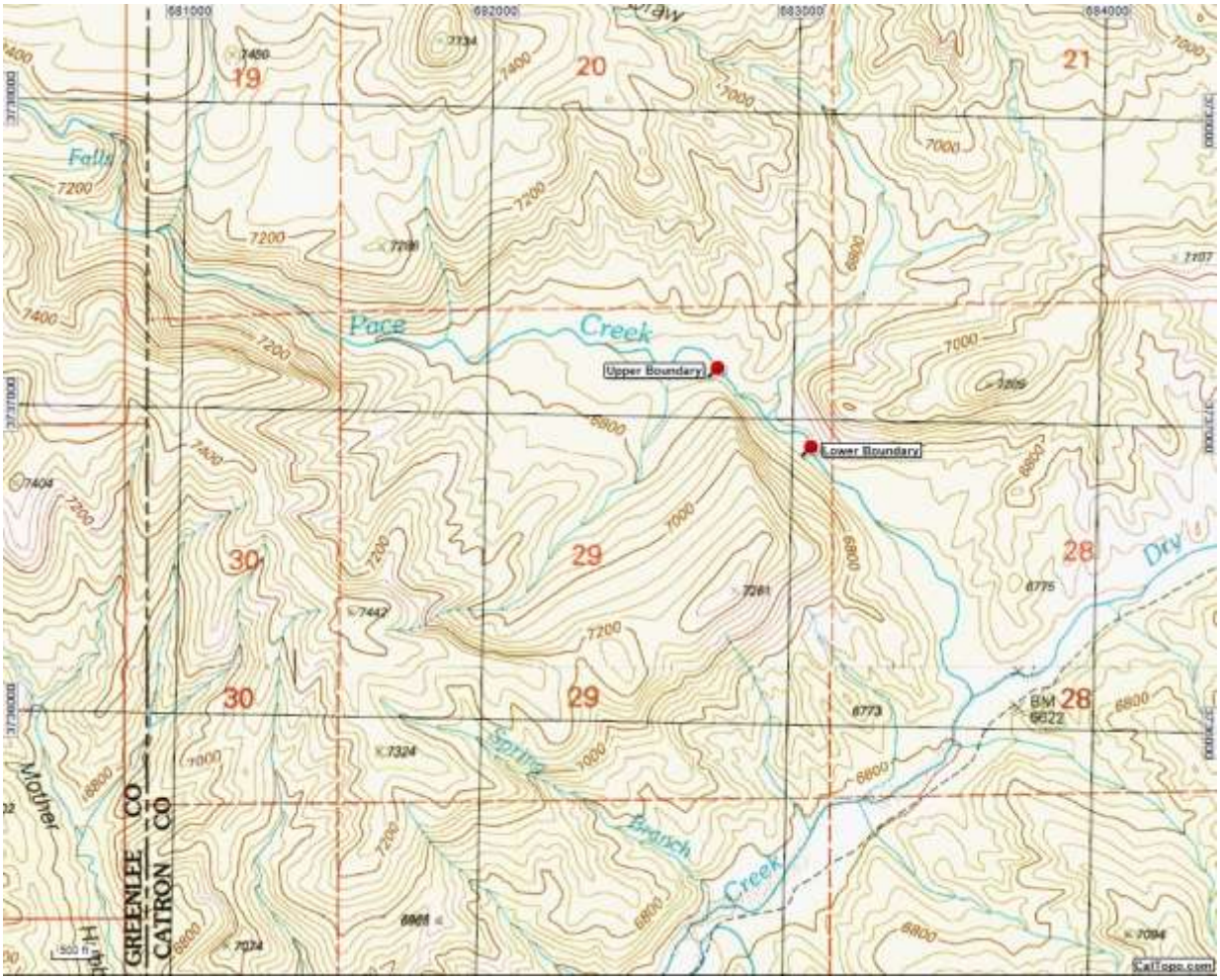


Figure 25. Dry Blue/Pace creeks @ Pace Creek.

Blue River @ Bobcat Flat July 13, 2016

UTM 12S Lower Boundary: 680425E, 3732213N Upper Boundary: 680653E, 3732447N

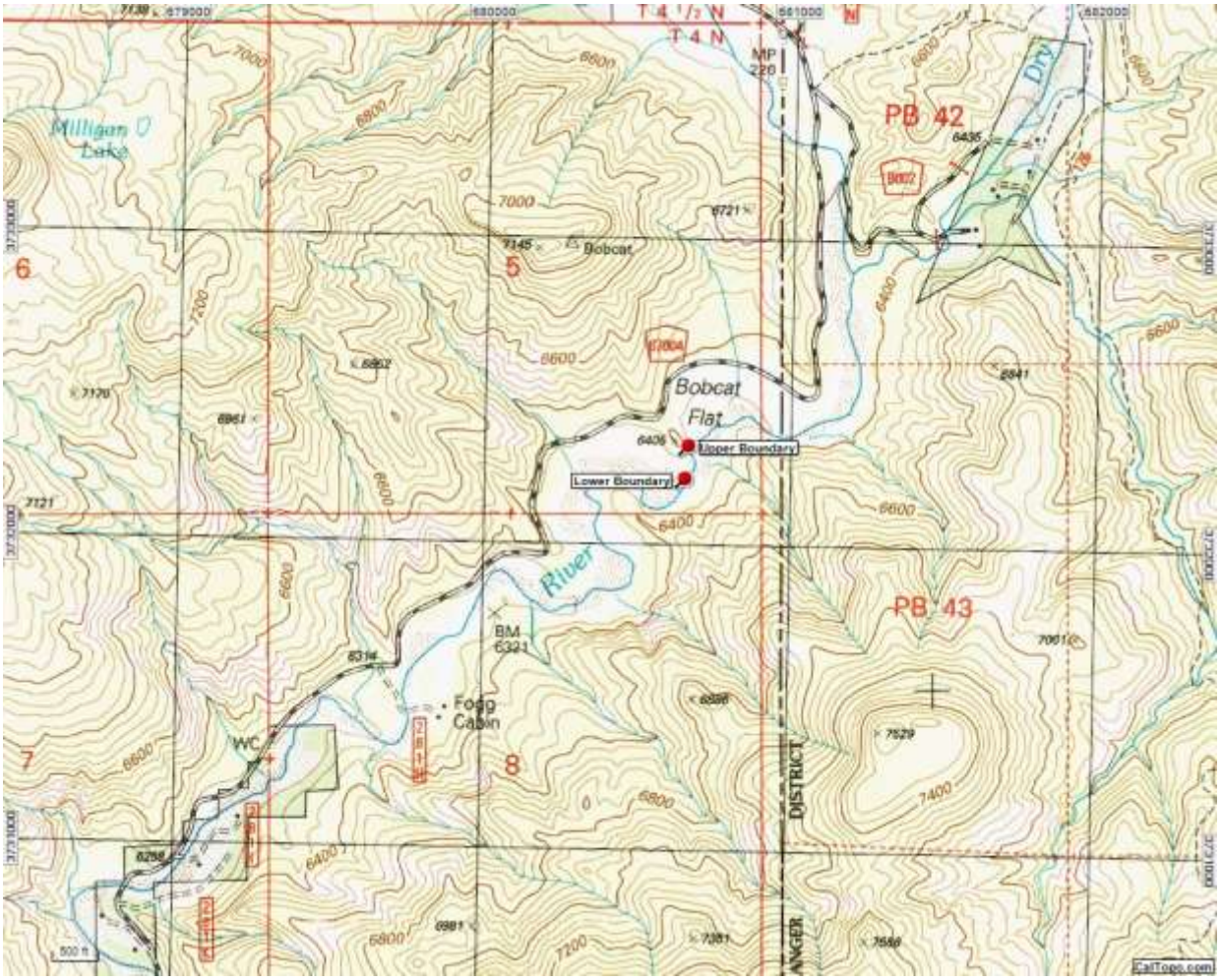


Figure 26. Blue River at Bobcat Flat.

Blue River at Upper Blue Campground May 14, 2016

UTM 12S Lower Boundary: 678301E, 3729448N Upper Boundary: 678378E, 3729509N

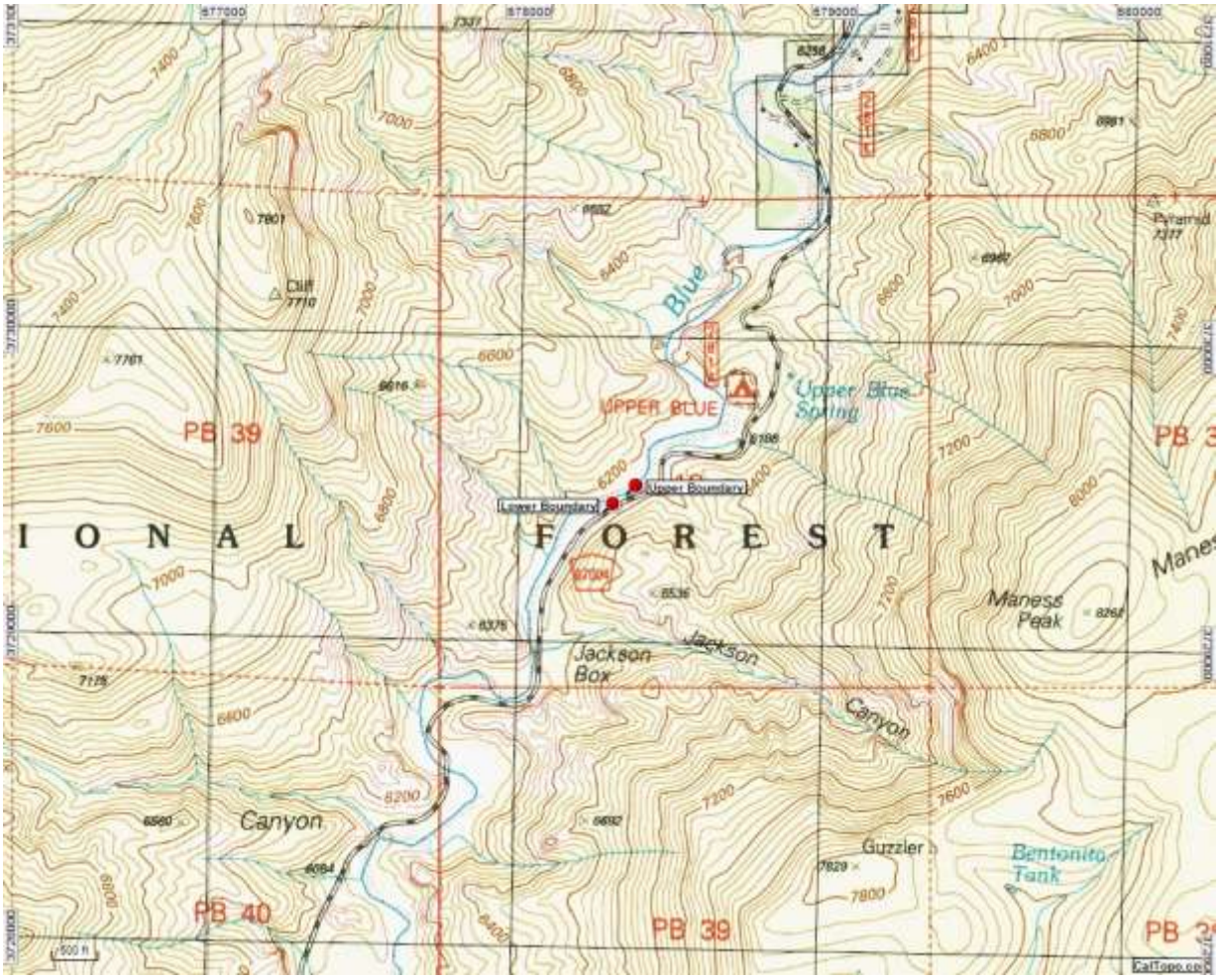


Figure 27. Blue River at Upper Blue Campground.

Blue River @ Cole Flat 1 July 14, 2016

UTM 12S Lower Boundary: 666846E, 3712759N Upper Boundary: 667128E, 3713001N

Blue River @ Cole Flat 2 July 14, 2016

UTM 12S Lower Boundary: 667223E, 3713001N Upper Boundary: 667223E, 3713381N

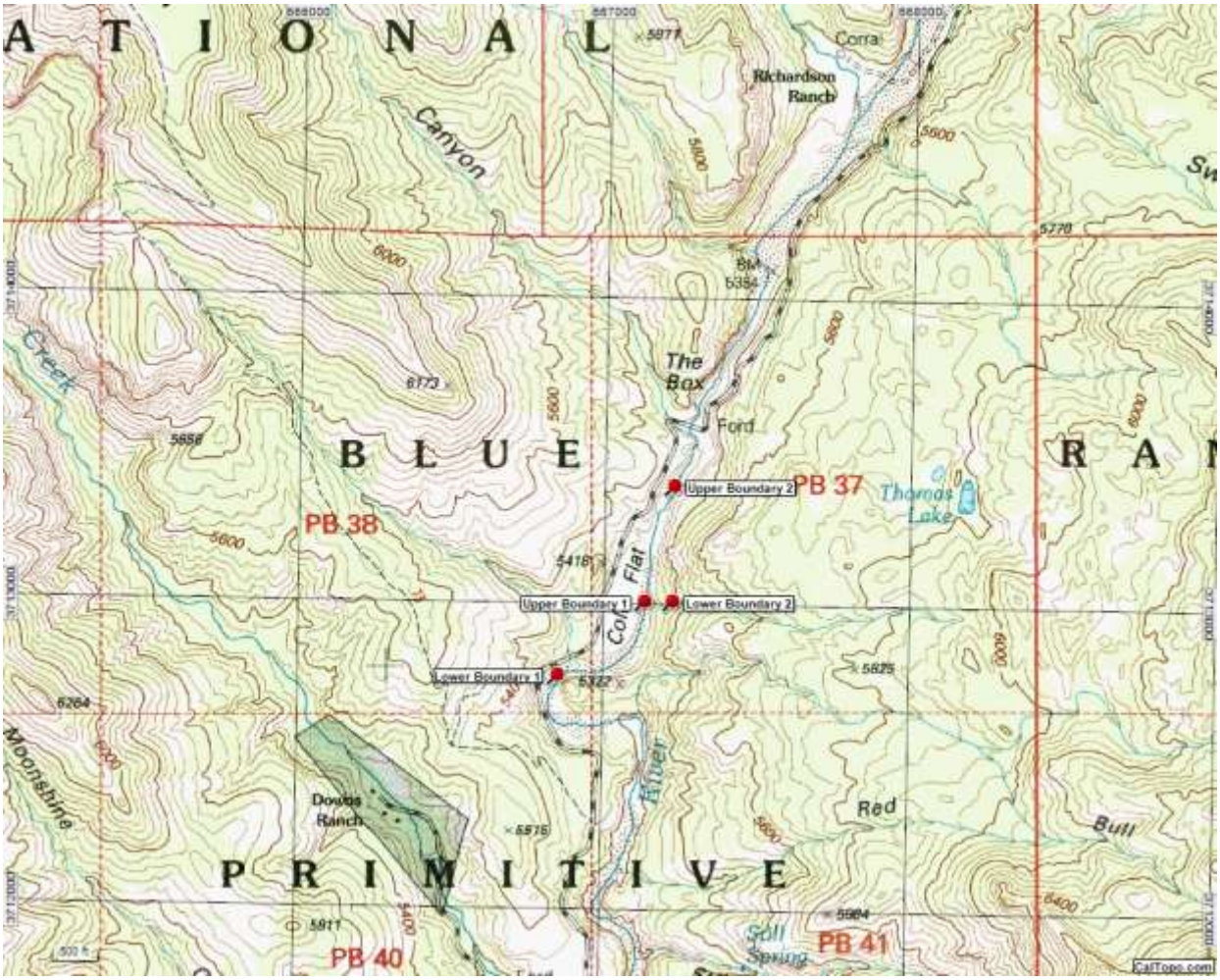


Figure 28. Blue River at Cole Flat, 1 and 2.

Blue River at KP Confluence July 14, 2016

UTM 12S Lower Boundary: 666900E, 3711219N Upper Boundary: 666054E, 3711587N

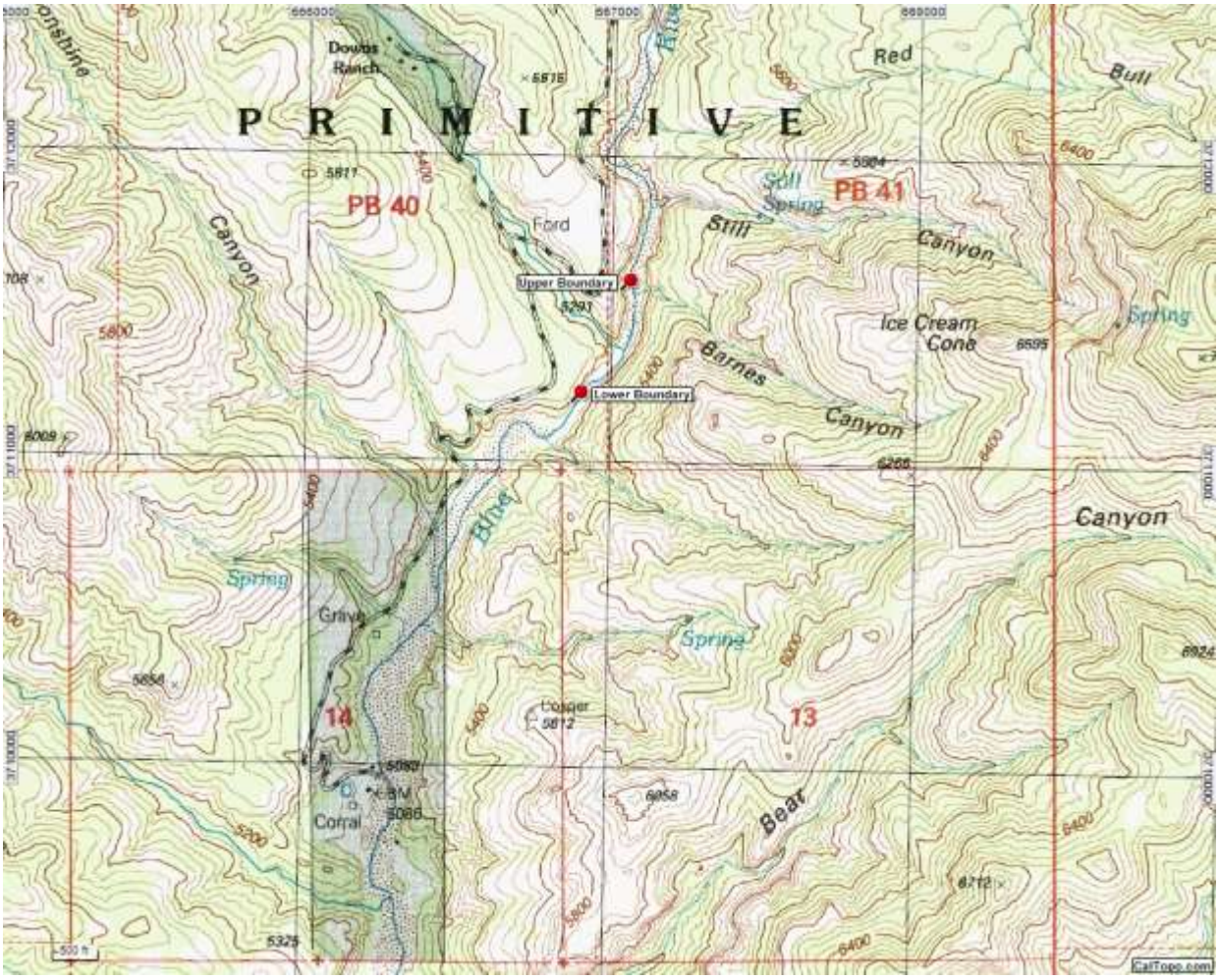


Figure 29. Blue River at KP Confluence.

Marsh Creek September 12, 2016

UTM 12S Lower Boundary: 497364E, 3780487N Upper Boundary: 497437E, 3780442N

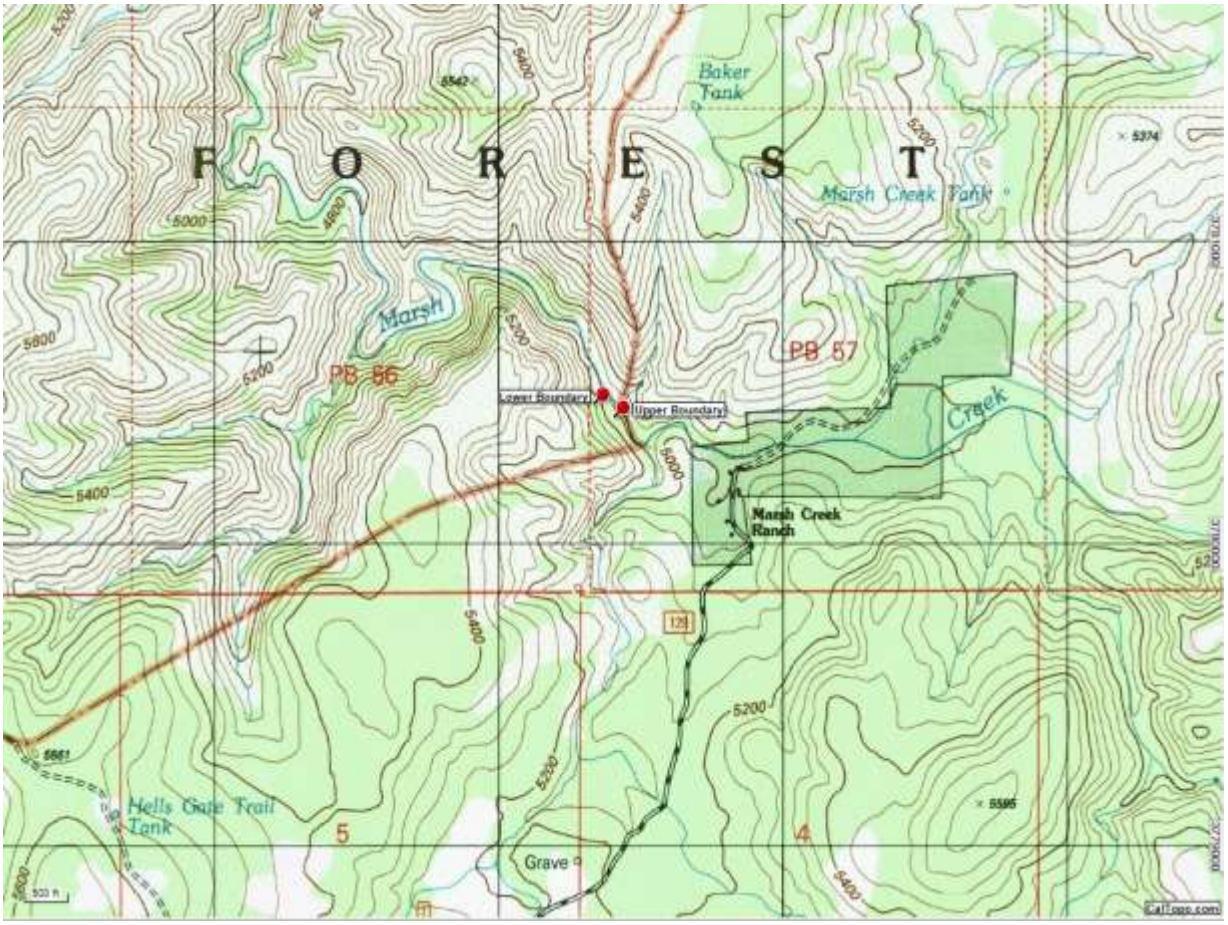


Figure 30. Marsh Creek.

Gordon Creek 1 September 13, 2016

UTM 12S Lower Boundary: 496217E, 3785067N Upper Boundary: 496681E, 3785310N

Gordon Creek 2 September 13, 2016

UTM 12S Lower Boundary: 496681E, 3785366N Upper Boundary: 496833E, 3785616N

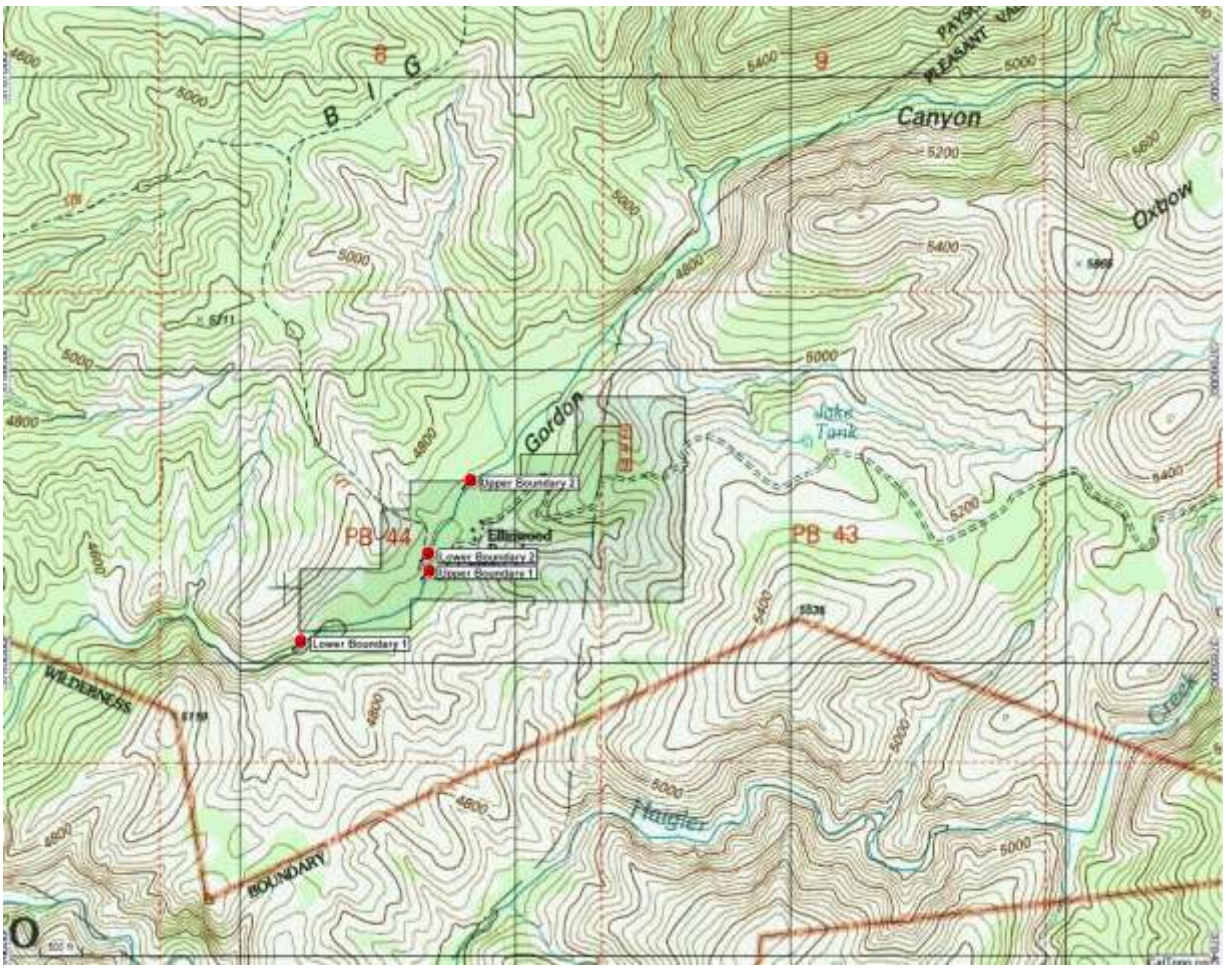


Figure 31. Gordon Creek 1 and 2.

Lower Salt River- Reach 1- East of Saguaro Ranch October 25, 2016

UTM 12S Lower Boundary: 450514E, 3713383N Upper Boundary: 450338E, 3713872N

Lower Salt River- Reach 1- South of Saguaro Ranch October 25, 2016

UTM 12S Lower Boundary: 450208E, 3713104N Upper Boundary: 450710E, 3713242N

Lower Salt River- Reach 1- Water Users October 25, 2016

UTM 12S Lower Boundary: 449650E, 3712857N Upper Boundary: 450022E, 3713182N

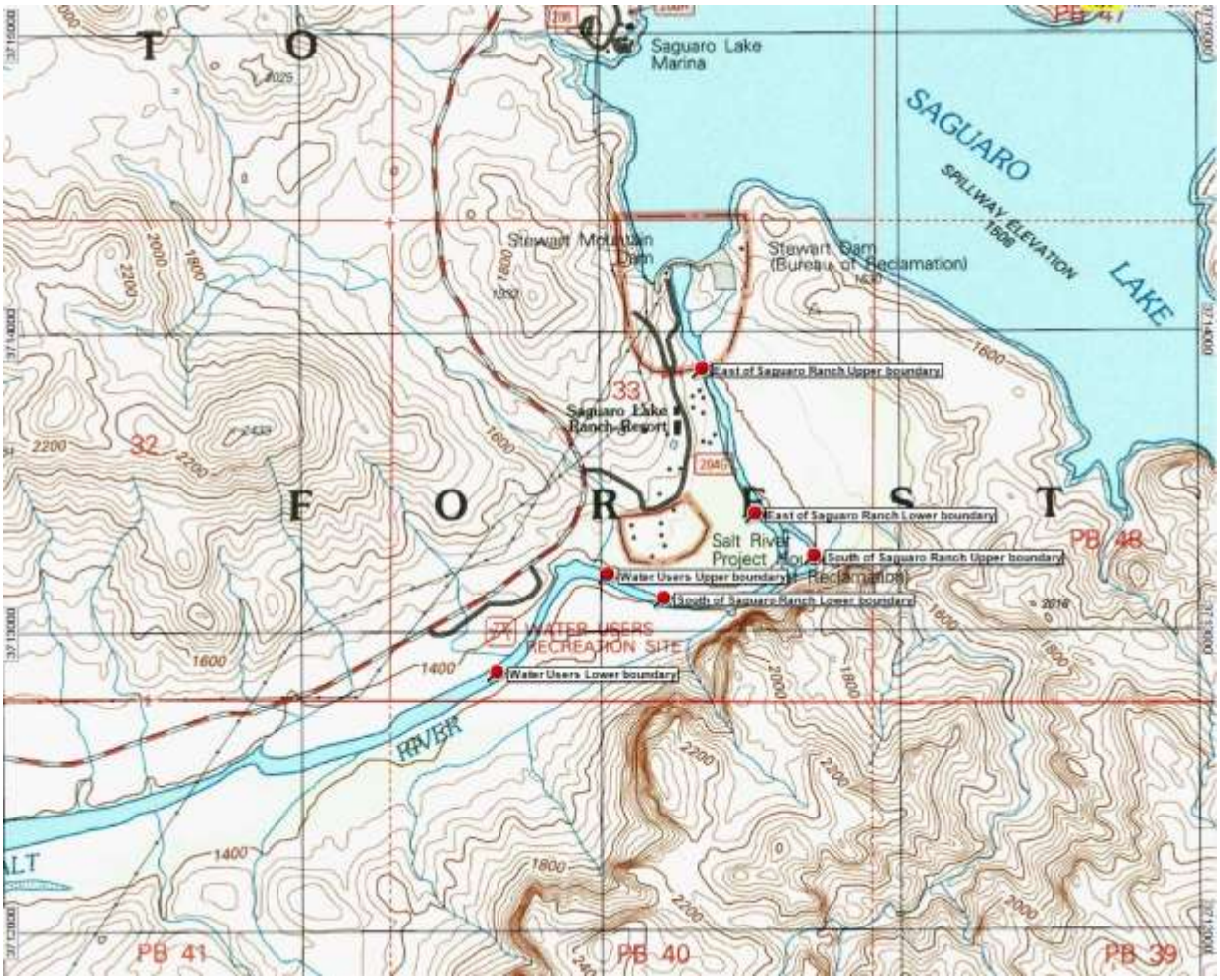


Figure 32. Lower Salt River, Reach 1 (Upper).

Lower Salt River- Reach 2- Foxtail Administration Site October 26, 2016

UTM 12S Lower Boundary: 443755E, 3712765N Upper Boundary: 443913E, 3712271N

Lower Salt River- Reach 2- Blue Point Administration Site October 27, 2016

UTM 12S Lower Boundary: 443437E, 3713503N Upper Boundary: 443719E, 3713177N

Lower Salt River- Reach 2-Goldfield Administration Site October 27, 2016

UTM 12S Lower Boundary: 442940E, 3713480N Upper Boundary: 443429E, 3713527N

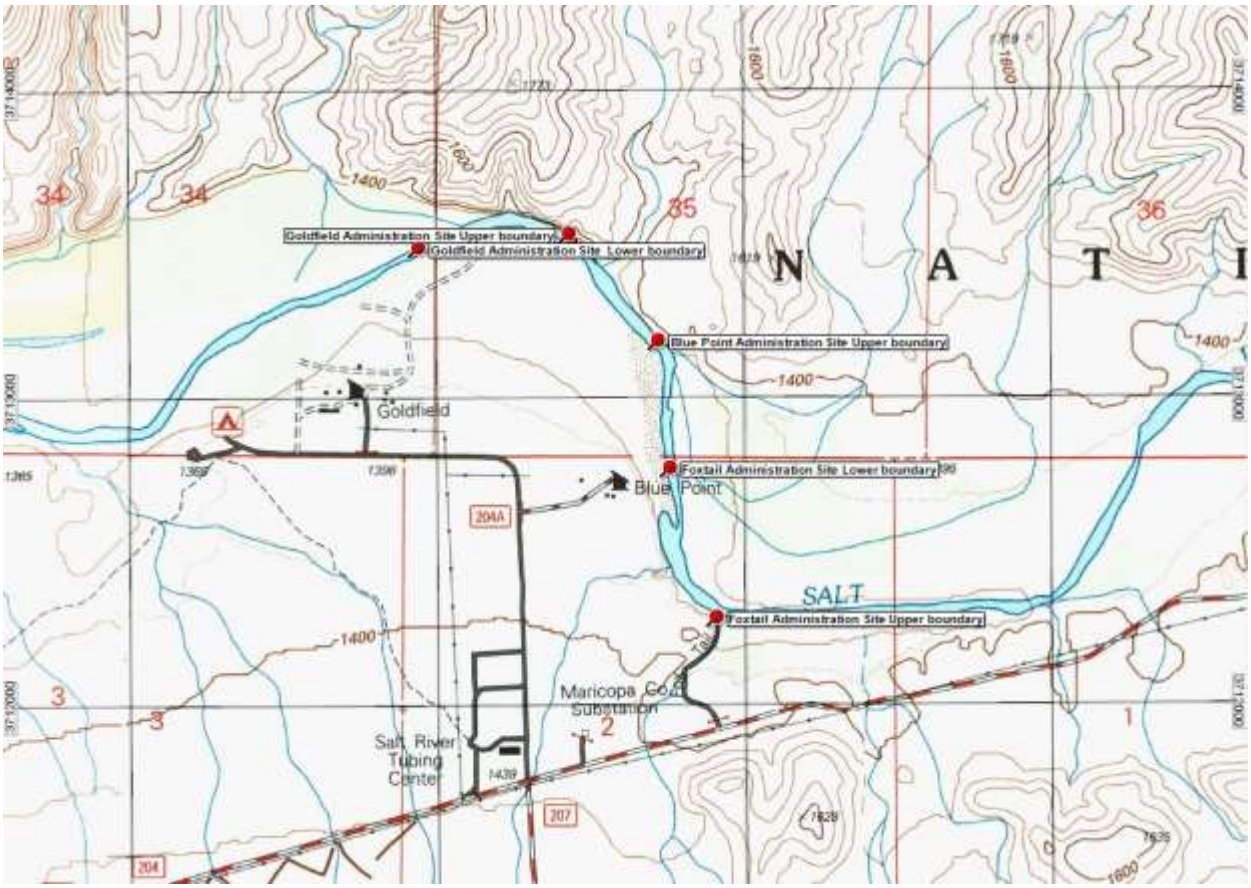


Figure 33. Lower Salt River, Reach 2 (Middle).

Lower Salt River- Reach 3- Coon Bluff October 27, 2016

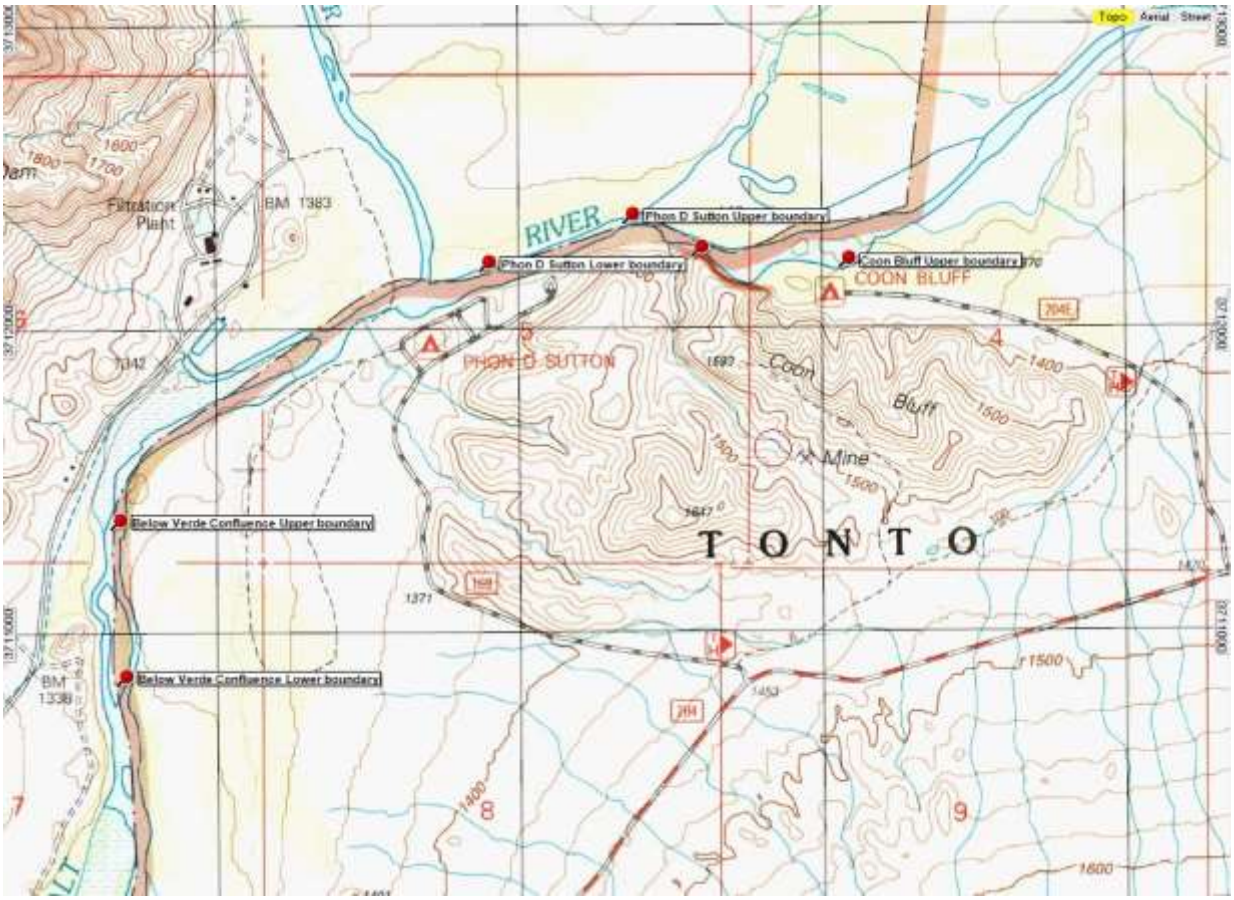
UTM 12S Lower Boundary: 439599E, 3712260N Upper Boundary: 440085E, 3712218N

Lower Salt River- Reach 3- Phon D Sutton October 27, 2016

UTM 12S Lower Boundary: 438900E, 3712211N Upper Boundary: 439375E, 3712369N

Lower Salt River- Reach 3- Below Verde Confluence October 27, 2016

UTM 12S Lower Boundary: 437695E, 3710854N Upper Boundary: 437677E, 3711368N



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FISH MONITORING OF SELECTED STREAMS WITHIN THE GILA RIVER BASIN

2016

Annual Report

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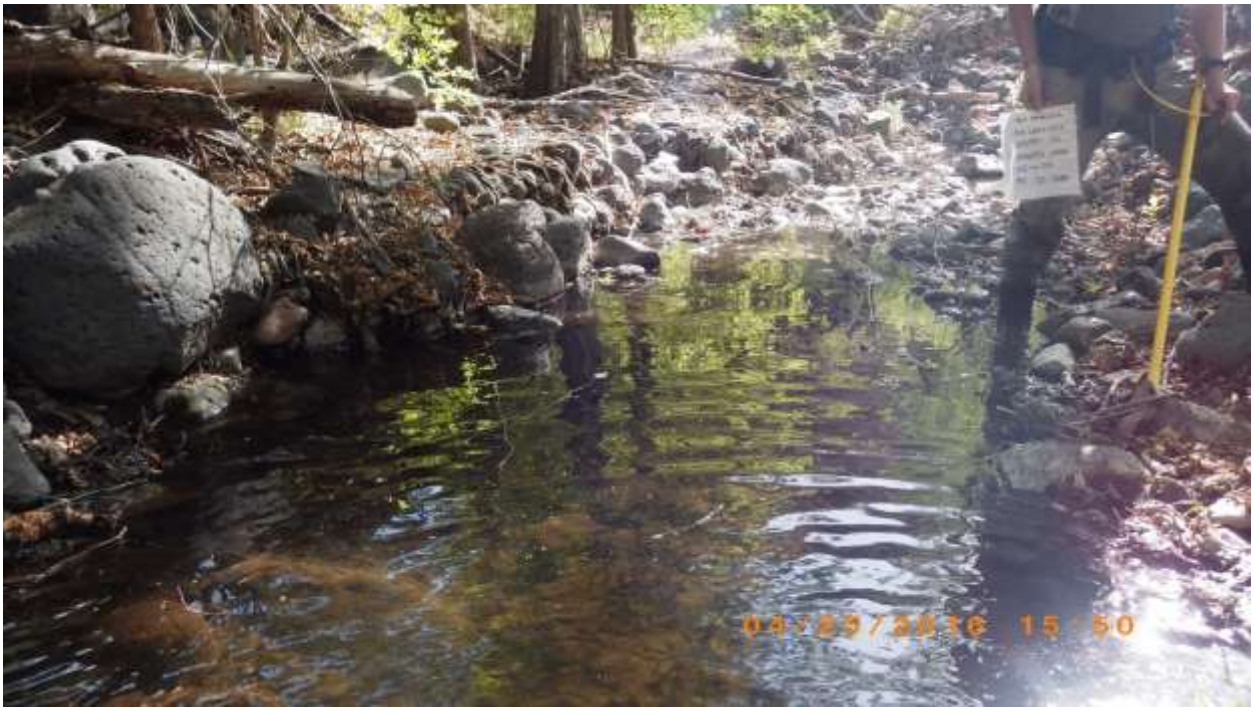

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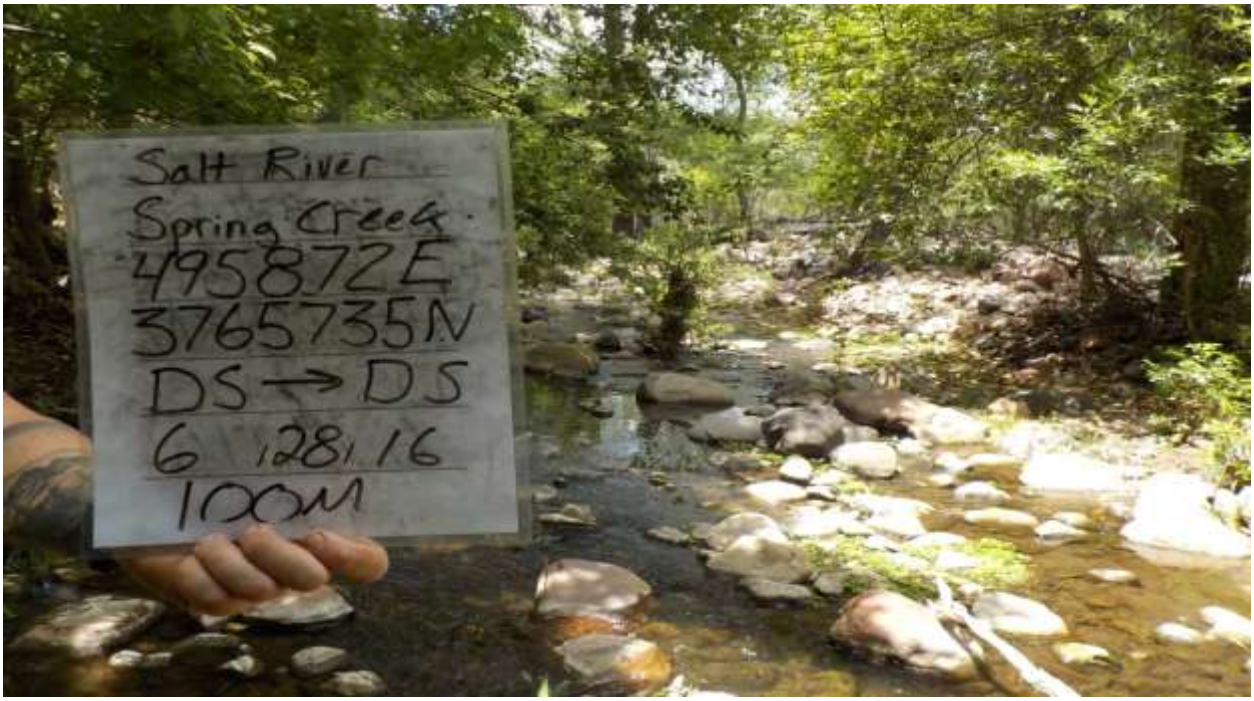

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