

FISH MONITORING OF SELECTED STREAMS
WITHIN THE GILA RIVER BASIN

2014

Annual Report

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Introduction

This report summarizes monitoring activities conducted by Arizona Game and Fish Department (Department) during 2014 for Contract No. 12PC32007, Monitoring of Gila River Basin Waters (MGRB). 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)”.

Focal species identified to monitor for this project include the Gila topminnow (*Poeciliopsis occidentalis*), Gila chub (*Gila intermedia*), headwater chub (*G. nigra*), roundtail chub (*G. robusta*), loach minnow (*Tiaroga cobitis*), and spikedace (*Meda fulgida*). Table 1 (Appendix A) provides the common and scientific names as well as a “Species Code” of the fishes sampled throughout the 2014 effort; species code is an abbreviation of the scientific name (first two letters of genus followed by first two letters of epithet) that will be used throughout the document to identify or refer to an individual or group of fish belonging to a particular species. Table 2 (Appendix A) summarizes species occurrence (native and nonnative) across all sites sampled for the project during 2014.

Recommended changes in process that may improve completion of the project in following years include changing datasheet design to capture relevant qualitative data sequentially and only once, and eliminate redundant or uninformative fields; if data must be recorded more than once, use identical names (e.g. “upper” instead of “upper” on one sheet and “out” on another), format, and sequence on different data sheets. Greater emphasis needs to be placed on field notes, as they help capture other details of the streams sampled and their surrounding environments that are not reflected on data sheets. In future efforts, greater attention to detail by field personnel should result in more informative maps and photographs.

Methods

According to protocol (Clarkson et al. 2011), initial monitoring on each stream was directed primarily to points of historical occurrence of the target species that had vehicular access. If such access sites were not readily available, initial monitoring was directed to points of vehicular access that could be approached within 1 mile and safely hiked into. Discussion with the COR has established that sites greater than 1 mile of vehicular access are beyond the scope of the contract, so need not be sampled under the obligations of this contract, however in some cases, sampling occurred at locations that were not necessarily closely accessible by vehicle (e.g. Deadman Cr., lower Haigler Cr., upper W. Clear Cr.). According to protocol, streams less than five miles in length require one survey reach (up to three survey sites total), streams between five and 10 miles in length require two survey reaches (up to six survey sites total), and streams over 10 miles in length require three survey reaches (up to nine survey sites total).

At each site, a 0.5 km reach of stream was initially surveyed and numbers of each species recorded. If the target species was not detected within the initial search, another 0.5 km portion of the stream was surveyed at another access site within its known or suspected former range, unless the stream was too short or habitat too limited to allow an expanded search. Once the target species was detected, a measured 100-m long sample reach was quantitatively sampled according to procedures in Clarkson et al. (2011) to

record number of individuals and species encountered within major mesohabitat types (riffle, run, pool). If the focus species was rare within the 100-m reach, sampling continued into adjacent habitat for up to another 0.5 km, again targeting preferred habitats of the focus species. If less than 25 individuals of the target species were captured, an attempt was made to repeat the entire process at another access point not immediately adjacent to the prior sample, but accessible and geographically representative of the expected or former known distribution; a maximum of three sites per survey reach were to be sampled in this manner.

Species- and habitat-appropriate gear was selected to survey each reach. For the majority of surveys, electrofishing using the Smith-Root Model-12R Backpack Electrofisher (BPES) was the primary method of sampling. In areas where stream morphology, water depth, visibility, or substrate instability made sampling with the backpack electrofisher unsafe or impractical, other sampling techniques were employed. Other techniques and equipment included: baited 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 (61-cm x 2-m x 0.65-cm mesh); dip-nets (951.6 cm² 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), 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) and angling. Due to the compact size and light weight of the gear, angling was principally used as a secondary or tertiary sampling technique, usually in the more remote locations where access, gear choices and transport were limited. It was employed using species-appropriate bait or various artificial lures and flies, usually where habitat or access restricted the use of sufficient numbers of nets, or for qualitative sampling beyond the established 100-m quantitative reach.

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.

Large-bodied fishes captured during the efforts were identified to species, classified as age 0 or age 1+, enumerated and released. Small-bodied fishes were identified, enumerated and released. In the text of this report, the abundance of a species in the total catch is reported as a percentage in parentheses after the species has been identified. Tables reporting numbers captured, percentage of total catch for each species and effort expended for each site are provided in Appendix A. Coordinates of the stream sample boundaries in both 500-m and 100-m reaches were recorded and are provided as GPS coordinates in main body of the report, and maps of the sites and boundaries are provided in Appendix B. If the target species was found in sufficient densities to result in the establishment of a 100-m sampling reach, photographs of upper and lower boundaries were recorded, and are provided in Appendix C; also photographs of particular species of interest are included in Appendix C. In some drainages, tissue samples (fin clips) of headwater chub were collected for ongoing genetic studies.

Departures from Protocol

Noted departures from protocol include: not setting up a 100-m sample reach due to low density of target species (lower Haigler and West Clear Cr. at FR 142F), and not completing a second or third 500-m survey site in some locales due to distance, difficult or dangerous access, limited supplies, weather, or time limitations, typically at sites outside the scope of contract (e.g. Deadman Cr., lower Haigler, upper W. Clear Cr). Also, photographs for the upper and lower boundaries of the 100-m survey reach at Cottonwood Spring were taken, but apparently lost due to equipment malfunction.

Results

The seven streams that had been started but had not been completed during 2013 were complete by June 10, 2014. They include: West Clear Creek, Lower Salt River, upper Santa Cruz River, Tonto Creek, Sonoita Creek, lower Gun Creek (determined outside the SOW by the COR) and Redrock Canyon. All totaled, the seven streams contained 13 stream sections and 22 survey sites. In only one of the seven drainages, was the sought-after target species found: in middle and upper West Clear Creek, GINI were found and densities were low (see appropriate section for details); in both cases, sample reaches had to be extended. Details for the seven streams are provided in the following sections.

During the 2014 sampling year, a total of 23 streams or wetlands were sampled, with target species found in 20% of the total 64 stream-sites surveyed. A yet-to-be-determined number of streams will be removed from the focus of this project for a variety of reasons; some because they are currently being surveyed by other agencies or consulting firms (e.g. Black River, Mangus Cr., Lime Cr., and others), others have been stocked with the target species within the last five years (e.g. Oak Creek, upper Verde river). Yet other streams or stream sections are not accessible to the project because they are private property (e.g. Williamson Valley Wash, Jake Fousek, AGFD, pers. comm.; lower Whitewater Creek, D. Allred, pers. comm.; Bylas Spring); as part of this process, other streams will be added in place of those removed.

Of particular note again this year is that triple 500-m reaches were once more not completed at several sites (e.g. lower Haigler, upper W. Clear Creek and Deadman Cr.). The target species was found in low densities in two of three of these sites, but the remoteness and terrain allowed only limited access (e.g. long, deep, wall-to-wall pools in steep-walled canyons). They required decisions regarding circumstances and the decision to continue sampling that were outside of those foreseen in the protocol. For example, having the survey team swim long pools with sampling gear in tow is not within the SOW of the project, and the decision to go no further with sampling at such sites was appropriate. These sites will be reviewed with the contracting officer regarding the means and methods for their future sampling.

Tables summarizing effort and catch data for each site are provided in Appendix A. In text, relative abundance of a species in the total catch is reported as a percentage in parentheses after the species has been identified. Coordinates of the stream sample boundaries in both 500-m and 100-m reaches are found in the main body of the report in the heading for each of the stream sections; maps of the sites and their boundary coordinates are provided in Appendix B. If the target species was found in sufficient densities

to result in the establishment of a 100-m sampling reach, photographs of upper and lower boundaries were recorded, and are provided in Appendix C. Occasionally; photo-documents of particular species or group of species referenced in text are included in Appendix C. Also of note, in some drainages, tissue samples (fin clips) of headwater chub were collected for ongoing genetic studies.

Salt River - East of Guest Ranch

April 7, 2014.

Upper Boundary: 12S 450338E, 3713872N

Lower Boundary: 450514E, 3713383N

On April 7, 2014, Department personnel conducted a survey of 500-m in the upper reach of the lower Salt River, east of Saguaro Lake Guest Ranch (Appendix B, Fig. 1). Conditions at the site were sunny and warm. The target species was roundtail chub (*Gila robusta*; GIRO); no GIRO were captured or observed. The site was sampled using a canoe electrofishing unit, with a capture crew dip-netting from a second canoe. Water velocity at the site was very low, with depths greater than 1-m limited to 10-15-m along bedrock below the upper boundary of the site. During the time of sampling, there was little flow and instream structure within this 500 m.

Fish numbers were low in this reach of stream, with largemouth bass (*Micropterus salmoides*; MISA) being the most common species captured (50.0% relative abundance) during 999 seconds of effort; no GIRO were captured or observed in this section of stream. Other species captured during the effort include bluegill (*Lepomis machrochirus*; LEMA; 25.0%), common carp (*Cyprinus carpio*; CYCA; 12.5%), and yellow bullhead (*Amiurus natalis*; AMNA; 12.5%); there were no native species caught or observed. Table 3 provides a complete summary of effort and fish captured at this site.

At this time of year, due to greatly reduced flows, the sample area appeared to receive light recreational use. Upstream of this section of the Salt River is Saguaro Lake, a reservoir managed as a sport fishery which provides a constant source of nonnatives into the system. Sampling during this project (through nine 500m reaches along the lower Salt River) and finding no GIRO indicates their status is poor in the Lower Salt River; the greatest threat to GIRO (and possibly all of the native fishes) in the lower Salt River is nonnative fishes. Brood stock of GIRO from the lower Salt and Verde rivers should be collected for propagation and potential augmentation of lower Salt River/Verde River populations as soon as feasible.

Plants common along the shoreline of the reach included mesquite (*Prosopis velutina*), cottonwood (*Populus fremonti*), willow (*Salix* sp.) and common reed (*Phragmites australis*). No wildlife was noted during the period of sampling at the site.

Salt River - South of Guest Ranch

April 7, 2014.

Upper Boundary: 12S 450388E 3713872N

Lower Boundary: 450514E 3713383N

On April 7, 2014, Department personnel conducted a survey of 500-m in the upper reach of the lower Salt River, south of Saguaro Lake Guest Ranch (Appendix B, Fig. 1); conditions during the survey were sunny

and warm. The target species at this site was GIRO. The site was sampled using a canoe electrofishing unit and a capture crew dip-netting from a second canoe.

No GIRO were captured or seen during the survey. The habitat best suited to GIRO was found in the upper portion of this site, consisting of a large, long pool, a substantial portion of which was greater than 10 ft. deep. Sonora sucker (*Catostomus insignis*; CAIN) was the only native species captured during the effort and was the most common species sampled (63.6%), with the majority caught from this large pool. Other species caught include MISA (22.7%), green sunfish (*Lepomis cyanellus*; LECY; 4.6%), and bluegill (LEMA; 9.1%); Table 4 provides a complete summary of fish captured during 2073 seconds of effort.

The effectiveness of the electrofishing unit varied greatly within this reach, and a modified approach may be necessary to effectively sample this site during future efforts. A number of fish (almost all appeared to have been CAIN) were observed dashing away from the canoe when current from the electrofishing unit was applied. Different settings were tried, but repeatedly it appeared that fish in the deeper portions of the pool responded by swimming rapidly away rather than swimming towards the electrode. Fish captured here were caught primarily by shocking from the deeper portion of the pool into the steep, cobble side of the pool along the northern shoreline, essentially forcing fish into shallower habitat where the electrical field was effective. Future efforts would prove more effective using a single or multiple trammel nets deployed across or along the bottom of the pool, in the deeper waters.

At this time of year, due to greatly reduced flows, the sample area receives light recreational use. At the upper end of the lower Salt River is Saguaro Lake, a reservoir managed as a sport fishery, which provides a constant source of predaceous nonnative species into the system. Sampling during this project (through nine 500m reaches along the lower Salt River) and finding no GIRO indicates their status is poor in the Lower Salt River; the greatest threat to GIRO (and possibly all of the native fishes) in the lower Salt River is likely predaceous nonnative fishes. Brood stock of GIRO from the lower Salt and Verde rivers should be collected for propagation and potential augmentation of lower Salt River/Verde River populations as soon as feasible.

Common plants along the sample section consisted of mesquite (*Prosopis velutina*), cottonwood (*Populus fremontii*), and willow (*Salix* sp.). No wildlife was noted during the effort at this location, but bald eagles (*Haliaeetus leucocephalus*) are known to nest nearby.

Salt River - Foxtail Administrative Site

April 8, 2014

Upper Boundary: 12S 443903E 3712275N

Lower Boundary: 443755E 3712764N

On April 8, 2014, Department and Forest Service personnel conducted a survey of 500-m in the middle reach of the lower Salt River, below the U.S. Forest Service Foxtail Administrative Site (Appendix B, Fig. 2). The target species at this site was GIRO. The site was sampled using a canoe electrofishing unit, with a capture crew dip-netting from a second canoe. The site originally intended for sampling (above the Administrative site) was selected based on aerial photographs of the stream, but inspection of the intended reach after arrival found it to be too shallow and cobble-strewn to provide suitable chub habitat.

Subsequent examination of downstream habitat found several large pools that contained native suckers and habitat suitable for chub, so the survey site was established along this portion of stream. This resulted in the upper and lower boundaries of the next survey site (Bluepoint Administrative Site; Fig. 2) being closer to adjacent survey sites than was intended.

A total of seven fish species were sampled in this reach of the Salt River (Table 5). Sonora sucker and desert sucker were the only native species captured or observed during the effort, with Sonora sucker being the most abundant species sampled in the reach, accounting for 60% of the total fish captured. Although habitat appeared suitable, desert sucker (*Pantosteus clarki*; PACL; 0.7%) was unusually scarce. Forest Service personnel reported that there had been a “sucker die-off” several weeks prior to our sampling, with hundreds of dead suckers observed (Matt Killford, USFS, pers. comm.). Largemouth bass was the most abundant nonnative species (14.6%) sampled in this section of stream. Other species captured include: LEMA (11.8%); MISA (14.6%); CYCA (5.6%); LECY (2.8%); and AMNA (4.2%). Table 5 provides a summary of effort and capture data for the survey.

At the time of the survey, there were no noticeable signs of recreational use along this 500-m reach. Management recommendations for the lower Salt River were covered previously, and the same apply for this section of river. Sampling during this project (through nine 500m reaches along the lower Salt River) and finding no GIRO indicates their status is poor in the Lower Salt River; the greatest threat to GIRO (and possibly all native fishes remaining in the system) is likely predaceous nonnative fishes. Brood stock of GIRO from the lower Salt and Verde rivers should be collected for propagation and potential augmentation of lower Salt River/Verde River populations as soon as feasible.

Predominant plants along this section included many of those found along upstream sites, with arrow weed (*Pluchea sericea*) more abundant along this section than had been observed previously. A bald eagle (*Haliaeetus leucocephalus*) was seen flying downstream during sampling. Scat containing fish bones and crayfish exoskeleton were also noted on a large boulder in the pool towards the lower end of this 500-m section of stream, along with a large area of disturbed sand at the water’s edge adjacent to the boulder, which may indicate the presence of the North American otter (*Lontra canadensis*) in the lower Salt River.

Salt River - Bluepoint Administrative Site

April 8, 2014

Upper Boundary: 12S 443719E 3713177N;

Lower Boundary: 443437E 3713503N

On April 8, 2014, Department personnel conducted a survey of 500-m in the middle reach of the lower Salt River, below the U.S. Forest Service Blue Point Administrative Site (Appendix B, Fig. 2); conditions throughout the effort were sunny and warm. The target species at this site was roundtail chub. The site was sampled using a canoe electrofishing unit, with a capture crew dip-netting from a second canoe.

The intended second sampling site was originally laid out further upstream, but had to be moved because the site upstream (Foxtail Administrative Site) had to be established further downstream than originally planned. This also led to the unintended close proximity of the lower boundary for this site and the upper boundary of the site that had been previously sampled downstream during December of 2013; sampling

of the lower Salt River was initiated in 2013, but not completed until 2014 (see Timmons et al. 2013 for additional monitoring results in the lower Salt River).

The target species in this sample reach was the roundtail chub (GIRO); no GIRO were captured or observed during the effort. Only four species of fish were captured in this portion of river, however two other species, MISA and flathead catfish (*Pylodictus olivaris*; PYOL) were stunned and observed while shocking, but not caught. The only native species captured in this sample reach was CAIN, accounting for 84% of the total fish caught. Other species sampled and comprising a minor portion of total fish sampled include CYCA (8.1%), AMNA (5.4%), and mosquitofish (*Gambusia affinis*; GAAF; 2.7%). Table 6 provides a summary of effort and capture data for the survey; species observed but not captured during sampling are not reflected in Table 6.

At the time of the survey, there were no noticeable signs of recreational use along this 500-m reach. Management recommendations for the lower Salt River were covered previously (in the section “Salt River East of Guest Ranch”); the same recommendations apply for this section of river. Plants noted along this section of stream included mesquite, cottonwood, willow, common reed, salt cedar (*Tamarix* sp.), and arrow weed. Bald eagles were also seen throughout the afternoon and a pair of peregrine falcons (*Falco peregrinus*) was observed on cliffs along the river.

Salt River - Phon D. Sutton

April 9, 2014

Upper Boundary: 12S 439375E 3712369N

Lower Boundary: 438900E 3712211N

On April 9, 2014, Department personnel conducted a survey of approximately 500-m in the lower reach of the lower Salt River, above the U.S. Forest Service Phon D. Sutton recreational area (Appendix B, Fig. 3). Early in the day conditions were warm and sunny, with broken clouds moving into the area during early afternoon. The target species at this site was GIRO; no GIRO were captured or observed. The site was sampled using a canoe electrofishing unit, with a capture crew dip-netting from a second canoe.

Based on aerial photographs, the original sampling site was planned for 500-m adjacent to and upstream of the Phon D. Sutton recreation area, but was moved upstream because evaluation of the habitat planned for sampling indicated it was at best marginal for chub, and due to the number of pedestrians recreating at the site. The sampling reach was moved several hundred meters upstream into an area of deep pools, large instream boulders and undercut banks, with no pedestrian activity.

A total of five different species of fish were sampled from this section of river (Table 7), with MISA being most abundant (45.2%), and CAIN (the only native species captured) second in abundance (38.7%). Other species captured included LECY (6.4%), LEMA (3.2%), and CYCA (6.4%); Table 7 provides a summary of effort and capture data for the survey. No roundtail chub were captured or observed during the effort.

At the planned sampling site (adjacent to the recreation area) roundtail habitat was considered moderate to marginal, and recreational use was heavy; for these reasons the sample site was moved further

upstream into an area with better potential habitat and no visible recreational use. Management recommendations for the lower Salt River were covered previously (in the section “ Salt River East of Guest Ranch”); the same recommendations apply for this section of river. Plants common along the sample reach included common reed (*Phragmites australis*), willow, salt cedar and cottonwood. Chewed willow trunks along the banks and branches in the river indicated recent beaver activity in this section of river.

Salt River - Below Verde Confluence

April 09, 2014.

Upper Boundary: 12S 437677E 3711368N

Lower Boundary: 437659E 3710854N

On April 9, 2014, 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 (Appendix B, Fig. 3). 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. The target species for this sampling effort was roundtail chub; no chub were captured or observed.

A different site had been originally selected based on access, in the vicinity of the Granite Reef recreation area, above the Granite Reef river access site on Tonto National Forest. In previous years, the Granite Reef area had been sampled and was considered marginal GIRO habitat, but due to accessibility, was chosen as the only remaining viable spot for sampling. The decision to change from the site near Granite Reef was made while canoeing downstream from Phon D. Sutton to the proposed Granite Reef site. The site at the recorded coordinates was selected based on what was assessed to be superior habitat suitability for GIRO, compared to previously selected Granite Reef site.

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. Sonora sucker (CAIN) was the most abundant species seen and captured in this reach (48.0%), followed by PACL (24.0%). All individuals of both sucker species were large adults (> 30 cm) and were sampled primarily in stretches of turbulent, high velocity water over large cobble and small boulder, with both species noted as tuberculate and expressing gametes. Other species captured included MISA (20.0%) and CYCA (8.0%); Table 8 provides a summary of effort and capture data for the survey. Due to increased water volume and velocity, time spent shocking in this 500-m section of river was substantially less than in upstream sections.

This location is only easily accessible by canoe or raft, and future efforts should take this into account prior to sampling. Due to the higher flows and turbidity of the reach, a number of Sonora and desert suckers (> 20) were seen but not captured during the sampling effort. Below the sample reach, a large number of common carp appeared to be spawning in shallow waters.

Management recommendations for the lower Salt River were covered previously (in the section “ Salt River East of Guest Ranch”); the same recommendations apply for this section of river. Plants common along this reach of river reflect other species observed upstream, with the impression of a greater proportion of willow than in upstream sites.

Deadman Creek at South Fork confluence

April 02, 2014.

Upper Boundary: 12S 450829E 37731164N

Lower Boundary: 450780E 3772923N

On April 2, 2014, seven Arizona Game & Fish personnel hiked to, and sampled Deadman Creek in the Mazatzal Wilderness of Tonto National Forest (Appendix B, Fig. 4). The crew hiked from a base camp established roughly 5.2 km up the South Fork Deadman Creek drainage to the confluence with Deadman Creek, a hike requiring roughly 4 hours to complete. Due to time required to reach Deadman Creek from the camp, relatively short day-length and the appearance of a weather front moving into the area, sampling on the stream was limited to just over 2 hours. After completing their sampling efforts and while hiking back to camp, the crew encountered rain and snow that continued intermittently throughout the night.

The target species of the sampling effort was the headwater chub (*Gila nigra*, GINI). The site was sampled using hoop nets and a straight seine, and was selected based on aerial photographs of habitat, accessibility and limited daylight. Hikers set out during early morning, hiking down-canyon to the confluence with Deadman Creek. Several waterfalls were encountered during the hike, requiring the sampling crew to leave the canyon-bottom and climb around them, in order to continue down-canyon. The falls were considered barriers to upstream fish movement in the South Fork, but pools beneath the falls are believed to be perennial.

The crew arrived at Deadman Creek roughly 4 hours after starting their hike, and deployed 5 hoop nets downstream of the confluence. A straight seine (4 ft. X 6 ft. X 0.25 in. mesh) was employed to sample several pools upstream of the confluence; Tables 9 and 10 provide summaries of the effort expended for the survey. There were no fish sampled by either technique, or seen by any of the crew throughout the reach during the entire sampling effort. Due to limited time, rough terrain and weather, the hoop nets were fished for only 2 hours, and caught no fish. Though suitable habitat was present, it is possible that impacts from the 2004 Willow Fire on the surrounding landscape (ash and sediment flows) may have eliminated or severely reduced fish populations throughout the drainage.

Headwater chub (GINI) may no longer exist in the Deadman Cr. drainage. The greatest threat to GINI in the past appears to have been ash and sediment flows following the Willow Fire of 2004. Due to the fact that no fish were seen or captured during survey efforts, additional, more extensive and better supplied and prepared surveys should be conducted in the Deadman Creek drainage. If fish are no longer present, appropriate steps should be taken to reestablish the native fish community from the most appropriate sources. The Plants encountered within the drainage included Arizona alder, sycamore, cottonwood, seep willow, Arizona ash, oak (*Quercus* sp.), juniper sp.

South Fork Deadman Creek

April 01-03, 2014.

Upper Boundary: 12S 452891E 3770077N

Lower Boundary: 452599E 3770469N

On April 1-3, 2014, seven Arizona Game & Fish personnel hiked to, and sampled the South Fork Deadman Creek in the Mazatzal Wilderness of Tonto National Forest (Appendix B, Fig. 5). The sampling crew hiked from the Barnhardt Trailhead to the site via the Barnhardt Trail on the eastern slope of the Mazatzal Mountains. The hike required 7 hours to reach the South Fork, and a base camp was established in the canyon bottom roughly 3.25 miles upstream from the confluence with Deadman Creek.

The target species of the sampling effort was the headwater chub (GINI). The site was selected based on suitable habitat and accessibility and sampled using hoop nets and a gill net. A gillnet was set in a pool upstream from the campsite and fished for roughly 2 hours. Hoop nets were set in the remainder of the 500-m reach downstream from the campsite, and fished for roughly 10 hours until the next morning. Hoop nets were again set overnight on April 2nd and pulled the next morning. No fish were seen or caught in either the gill net or hoop nets during the effort, and no fish were observed during the crew's time on site or in the stream while hiking to and from the confluence with Deadman Creek; tables 11-12 provide a summary of effort for South Fork Deadman Creek. It is believed that several waterfalls downstream of the campsite may form a barrier which fish are unable to pass, however past surveys have reported both speckled dace and chub in the South Fork Deadman drainage (Lister, 1991; Girmendonk and Young, 1997). For threat assessment, see the previous section, Deadman Creek at South Fork Confluence.

Common plants found along the drainage included cottonwood, sycamore, prickly pear cactus (*Opuntia engelmanni*), and Arizona alder (*Alnus oblongifolia*) Wildlife observed during the effort include the common Blackhawk (*Buteogallus anthracinus*, with nest), black-necked gartersnake (*Thamnophis cyrtopsis*) and canyon treefrog (*Hyla arenicolor*).

Tonto Creek below Camp Tontozona

April 23, 2014.

Upper Boundary: 12S 492029E 3797335N

Lower Boundary: 492431E 3797180N

On April 23, 2014, Department personnel sampled Tonto Creek below Camp Tontozona, Gila County, approximately 23 miles northeast of Payson, AZ (Appendix B, Fig. 6). 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 400-m downstream. The site was sampled using a BPES and baited collapsible hoop nets.

The target species of the sampling effort was GINI and habitat throughout the reach appeared suitable though none were captured or observed. Baited hoop nets failed to capture any fish in this section of stream, with all fish caught using the BPES (Tables 13 and 14). Brown trout (*Salmo trutta*; SATR) was the most abundant species sampled, accounting for 96% of total fish caught (Table 14), with rainbow trout (*Onchorhynchus mykiss*; ONMY) second in abundance (2.7%). One individual PACL (1.4%) was

the only native species captured, and no other species were captured or observed. The present greatest threat to GINI (and other native fishes) at this site in Tonto Creek appears to be nonnative fishes.

Common plants along the drainage included willow, Arizona alder (*Alnus oblongifolia*), oak (*Quercus* sp.), box elder (*Acer negundo*) and pine (*Pinus* sp.). Large concentrations of simuliid larvae were noted, attached to boulders and bedrock in shallow flowing water. Other species noted along the sample reach included the painted redstart (*Myioborus pictus*), American robin (*Turdus migratorius*), acorn woodpecker (*Melanerpes formicivorus*), rufous-sided towhee (*Pipilo erythrophthalmus*), common raven (*Corvus corax*), Clark's spiny lizard (*Sceloporus clarkii*) and the ornate tree lizard (*Urosaurus ornatus*).

Tonto Creek - Bear Flats Campground

April 24, 2014.

Upper Boundary: 12S 493756E 3793697N

Lower Boundary: 493492E 3793463N

On April 24, 2014, 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. 7). 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. The site was sampled using a BPES and baited hoop nets.

The target species of the sampling effort was GINI and although habitat throughout the reach appeared suitable, none were captured or observed. Water visibility was roughly 0.5 m, with heavy sediment over the entire stream bottom except in swifter riffles; visibility in a large long pool at the bottom of the reach was substantially reduced. Except for one juvenile green sunfish (Table 15), all fish were captured using the BPES. The most common species captured was ONMY, accounting for 55% of total fish caught (Table 16), followed by SATR (33.3%). Many smaller ONMY (~ 8-16 cm) displayed strong parr marks with an overall yellowish color and red lateral stripe. The only native species captured in this section of stream was PACL (9.5%), with 4 adults being taken over riffle habitat, and others observed but not captured. All PACL were tuberculate, displaying a strong red lateral stripe, and expressing gametes. Several PACL were also lightly infected with black grub (*Neascus* sp.). Only one LECY was captured during the effort, comprising 2.4% of the total fish sampled. The present most obvious threat to GINI (and other native fishes) at this site in Tonto Creek appears to be nonnative fishes.

Common plants along the drainage included willow, douglas fir (*Pseudotsuga menziesii*), box elder, oak, Arizona alder, sycamore (*Platanus wrightii*), cottonwood, ponderosa pine (*Pinus ponderosa*) and willow. Locally large concentrations of simuliid larvae were noted, attached to boulders and bedrock in shallow flowing water. Other species observed along the stream included the ornate tree lizard.

Tonto Creek above Gun Cr. Gauge

May 01, 2014

Upper Boundary: 12S 472531E 3760602N

Lower Boundary: 472165E 3760313N

On May 01, 2014, Department personnel and a volunteer sampled a 500-m reach of Tonto Creek approximately 300-m upstream from the Gun Creek Stream Gauge on Tonto Creek, Tonto National Forest, Gila County, AZ (Appendix B, Fig. 8). The stream was accessed via an unnamed dirt road roughly 4.8 km south of Jakes Corner. Conditions throughout the day were sunny and hot. Instream visibility was moderate throughout the reach. The site was sampled using a BPES and baited hoop nets.

The target species of the sampling effort was GINI, and although habitat appeared suitable, no GINI were captured or observed. Seven species were sampled in this stream section (Tables 17 and 18), the majority taken using the BPES. Green sunfish (LECY) was the only species collected in hoop nets (Table 17), comprising 0.96% of the total fish caught; all other species captured in this section were collected by BPES (Table 18), with the most abundant species being red shiner (*Cyprinella lutrensis*; CYLU), comprising 54.5% of the total catch. Fathead minnow (*Pimephales promelas*; PIPR) was second in abundance, accounting for approximately 12.4% of the total catch. Two native fishes were collected, longfin dace (*Agosia chrysogaster*; AGCH; 6.2%) and CAIN (1.9%); a number of post-larval catostomids (7.6%) were also captured, but were not determined to species. The remaining two species sampled at this site were GAUF (0.48%) and AMNA (15.8%). The present greatest threat to GINI (and other native fishes) at this site in Tonto Creek is nonnative fishes.

Common plants along the drainage included mesquite, salt cedar, seep willow (*Baccharis salicifolia*), Arizona ash (*Fraxinus velutina*), sycamore and common reed. Other species observed during sampling include the Sonora mud turtle (*Kinosternon sonoriense*, 3 caught in collapsible hoop nets). Shells of the Asian clam (*Corbicula fluminea*) were also noted along sandy sections of the stream bottom and the shoreline.

Tonto Creek below Narrows

May 01, 2014.

Upper Boundary: 12S 472531E 3760602N

Lower Boundary: 472165E 3760313N

On May 01, 2014, Department personnel and a volunteer sampled a 500-m reach of Tonto Creek approximately 900-m upstream from the Tonto Creek - Gun Creek Stream Gauge on Tonto National Forest, Gila County, AZ (Appendix B, Fig. 8). The stream was accessed via an unnamed dirt road roughly 4.8 km south of Jakes Corner, Gila County. Conditions throughout the day were sunny and hot. Instream visibility was moderate throughout the reach. Due to the presence of unpassable narrows at the upper end of this stream section, it was located much closer to (approximately 100-m above) the previous stream section, to ensure that a 500-m reach could be sampled. Electrofishing with the BPES was the only sampling method employed within this reach.

The target species of the sampling effort was GINI, and although habitat appeared suitable, no GINI were captured or observed. A total of six species were collected in this stream section (Table 19), with CYLU being the most abundant, accounting for 63.3% of total fish caught; catostomid post-larvae (~20 mm; not determined to species) were second most abundant comprising 15.3% of total fish caught (there were also

2 adult CAIN collected in this stream section; 1.3%). Longfin dace (AGCH; 9.3%) were also collected, in approximately equal numbers to those sampled in the previous reach downstream. There were three additional nonnative species sampled: AMNA (4.0%), LECY (2.7%) and PIPR (4.0%). The present greatest threat to GINI (and other native fishes) at this site in Tonto Creek is nonnative fishes.

Common plants along the drainage included mesquite, salt cedar, seep willow, Arizona ash, sycamore and common reed. No wildlife was noted for this section of stream.

Tonto Creek above The Box

May 02, 2014.

Upper Boundary: 12S 473873E 3771249N

Lower Boundary: 473814E 3770864N

On May 02, 2014, Department personnel and a volunteer sampled a 500-m reach of Tonto Creek above “The Box” Tonto National Forest, Gila County, AZ, roughly 3.2 km south of Gisela (Appendix B, Fig. 9). The stream was accessed south from Gisela following an unnamed 2-track road at the end of Tonto Creek Drive. Conditions at the time of sampling were cool and sunny with clear skies. Instream visibility was moderate to good throughout the reach. Much of this section consisted of pool habitat due to the presence of beaver dams, and much of the sampling was completed by following the stream channel through extensive stands of cattail (*Typha* sp.).

The target species of the sampling effort was GINI, and although habitat appeared suitable, no GINI were captured or observed. A total of eight species of fish were captured during the survey (Table 20), with CYLU being the most common species sampled (39.2% of total catch) and LECY being the second most common (25.0% total catch); additionally one LECY X LEMA hybrid (0.8%) was captured. The only native species captured in this survey section was CAIN, accounting for 9.2% of the total catch. Other species captured include: AMNA (10.0%); ICPU (0.8%); MIDO (3.3%); CYCA (5.0%), and GAAF(6.7%). The present greatest threat to GINI (and other native fishes) at this site in Tonto Creek is nonnative fishes.

Common plants along the drainage were cattail, cottonwood, willow and seep willow. Beaver sign was common throughout this 500-m survey site.

Tonto Creek above Gisela

May 02, 2014.

Upper Boundary: 12S 474431E 3773137N

Lower Boundary: 474147E 3772631N

On May 02, 2014, Department personnel and a volunteer sampled a 500-m section of stream on Tonto Creek on Tonto National Forest, Gila County, AZ, east of Gisela (Appendix B, Fig. 9). The section of stream was accessed by hiking along the stream flood channel and terraces on the eastern side of the drainage to avoid private property. Conditions at the time of sampling were hot and sunny with clear skies. Instream visibility was moderate to good throughout the reach. Much of this section consisted of shallow riffle and run habitat with shallow pools.

The target species of the sampling effort was GINI; no GINI were captured or observed. A total of eight species were collected during the survey effort at this site (Table 21), with CYLU being the most common species collected (86.0% of total catch), and LECY the second most common (4.1% of total catch). Two native species, CAIN and AGCH, were also collected in this reach, accounting for 0.3 % and 0.9% of the total catch, respectively; AGCH were noted as tuberculate. Other species sampled include: MIDO (0.5%); AMNA (4.0%); PIPR (4.0%); GAAF (0.3%). Table 21 provides a summary of species, effort and capture data for the survey. The present greatest threat to GINI (and other native fishes) at this site in Tonto Creek is nonnative fishes.

Common plants along the drainage included cottonwood, willow, mesquite and seep willow. No notes for wildlife were recorded for this survey section.

Redrock Canyon @ Pig Camp

May 07, 2014.

Upper Boundary: 12R 529013E 3491316N

Lower Boundary: 528356E 3491229N

On May 07, 2014, a Department employee sampled a 500-m section of stream in Redrock Canyon at Pig Camp, roughly 8 km east of Patagonia AZ (Appendix B, Fig. 10). Redrock Canyon is tributary to Sonoita Creek, a tributary of Santa Cruz River. The target species for this site was Gila topminnow (*Poeciliopsis occidenatilis*; POOC).

No POOC were captured or observed at this site. Habitat within the survey reach was limited to three small pools, connected by a slight trickle of water, all less than 4.6 m² in surface area and within a 24-m length of stream. It was estimated that only 30% of water present was greater than 7.6-cm deep, most of this over exposed bedrock. All sampling at the site was limited to dipnet sweeps and no fish were seen or captured (Table 22); much of the habitat was too shallow to effectively sample. A large number of aquatic invertebrates were seen to occupy available waters at this site. Due to the slight inflow of water it was felt that surface water at the site might not persist for more than several weeks. The survey was extended an additional 500-m further downstream from the first 500-m to locate additional habitat, but no surface water was present, nor were there any instream structure or vegetation to suggest additional surface water within several hundred meters further downstream. The present greatest threat to POOC (and other native fishes) at this site in Redrock Canyon is habitat loss due to prolonged drought and nonnative fishes.

Common plants along the drainage included cottonwood, Arizona ash, black walnut (*Juglans major*), spiny hackberry (*Celtis pallida*) and seep monkeyflower (*Mimulus guttatus*). A pair of Gray hawk (*Asturina nitida*) were also noted in the immediate vicinity of the remaining surface water, and three domestic horses (*Equus caballus*) were found in the stream channel above a fence located several hundred meters downstream; the fence crossing the stream appeared intact.

Redrock Canyon @ The Falls

May 08, 2014.

Upper Boundary: 12R 530619E 3489623N

Lower Boundary: 529892E 3490397N

On May 08, 2014, a Department employee sampled a 500-m section of stream in Redrock Canyon at The Falls, roughly 9.6 km east of Patagonia AZ (Appendix B, Fig. 10). Redrock Canyon is tributary to Sonoita Creek, a tributary of Santa Cruz River. The target species for this site was POOC.

No POOC were seen or sampled at this site. Habitat within the reach was limited to a series of small pools on a large bedrock sill in the stream channel, connected to one another by surface flow over vertical rock surfaces, with the deepest pool at the base of the falls. Sampling at the site was limited to dip net sweeps (n=55) and minnow traps (Tables 23 and 24), with only the pool at the base of the falls deep enough to allow a limited number of minnow traps to be fished effectively. Above the falls there was shallow surface water and wetted soils, but shallow water depth, organic debris and vegetation prevented effective sampling. Aquatic invertebrates were abundant in the lowermost pool.

The survey was extended an additional 600-m upstream from the first 500 m, with damp substrates encountered at several locations along this reach. One additional source of surface water was found upstream, but was no deeper than 15-cm and full of rotting vegetation. Wildlife had dug a small trench in the channel roughly 1-m upstream from this pool and the density of tracks present suggest they may have been using it as a source of drinking water. The present greatest threat to POOC (and other native fishes) at this site in Redrock Canyon is habitat loss due to prolonged drought and nonnative fishes.

Common plants along the drainage included cottonwood, oak, willow, Arizona ash, alligator juniper (*Juniperus deppeana*), mesquite, black walnut and seep monkeyflower. Wildlife observed along the drainage included two zone-tailed hawks (*Buteo albonotatus*), white-tail deer (*Odocoileus virginianus*), turkey (*Meleagris gallopavo*), vermilion flycatcher (*Pyrocephalus rubinus*), and Sonoran whipsnake (*Masticophis bilineatus*).

Gun Creek

May 20, 2014.

Proposed Access: 12S 475084E 3762622N

On May 20, 2014, Department employees and the Bureau of Reclamation Contract Officer Representative (COR) undertook to survey a 500-m section of stream in Gun Creek, a tributary of Tonto Creek, at a location roughly 6.4 km east of Jakes Corner, AZ (Appendix B, Fig. 11). The target species for this was GINI. Sampling of Gun Creek had been initiated in 2013, but was not completed due to a lack of accessibility to the majority of the drainage. Access and sampling of the site in 2014 was attempted but not completed as it was deemed beyond the scope of the current contract by the COR. The COR suggested possible contract modifications to address future sampling of this site and similar sites, to achieve the goals of the contract.

Sonoita Creek below Highway 82 bridge

May 21, 2014.

Upper Boundary: 12R 527325E 3502106N

Lower Boundary: 527093E 3501644N

On May 21, 2014, Department employees sampled a 500-m section of stream in Sonoita Creek, roughly 6.5 km southwest of Sonoita AZ. Sonoita Creek (Appendix B, Fig. 12), is a tributary of Santa Cruz River. The target species for the survey was POOC. The upper boundary for the survey was established at the first suitable surface water in the Sonoita Creek stream channel, deemed suitable for Gila topminnow.

No POOC were seen or sampled at this site. Due to the size of habitat present and the target species, dipnets were the gear selected for sampling Sonoita Creek at this location. The only fish caught were AGCH (Table 25). Sampling effort consisted of 169 net sweeps, resulting in a total 46 AGCH (100.0%) caught.

Habitat within the reach consisted of a series of small to large pools. Some pools were isolated with no connection to other pools, while others had slight amounts of surface flow connecting them to adjacent pools. From the upper boundary of the sample reach, surface water was only present for approximately 350 m, after which the channel was dry. Much of the surface flow in the lower half of the wetted reach was shallow, less than 5-cm deep. According to topographic maps of the site, it is believed that much of the surface water in the sample reach is found along an old, abandoned ditch rather than the stream channel proper. Hiking to the eastern terrace of the stream channel, we traversed a wide, dry sandy streambed that appears to channel the majority of runoff during periods of flooding. Of the 500-m surveyed, roughly the lowermost 200-m of channel was dry. The present greatest threat to POOC (and other native fishes) at this site in Sonoita Creek is habitat loss due to prolonged drought and nonnative fishes.

Common plants along the drainage included cottonwood, willow, Arizona ash, black walnut, cattail and netleaf hackberry (*Celtis reticulata*). Wildlife seen at the sampling site included turkey and Sonora mud turtle (KISO).

Sonoita Creek below Patagonia Lake

May 22, 2014.

Upper Boundary: 12R 511122E 3483141N

Lower Boundary: 510707E 3482679N

On May 22, 2014, Department employees sampled a 500-m section of stream in Sonoita Creek, roughly 1.6 km southwest of Patagonia Lake, AZ (Appendix B, Fig. 13). Sonoita Creek is a tributary of Santa Cruz River. The target species for the survey was POOC. The upper boundary for the survey was established at the first suitable surface water encountered in the Sonoita Creek stream channel downstream of Patagonia Lake.

No POOC were seen or collected at this site. Sampling was conducted using the BPES, resulting in five species captured (Table 26). The upper boundary of the sample reach was established at the first surface water of suitable size, and fish (GAFF) were captured in a pool less than 60-m downstream. The last substantial surface water suitable for sampling was located roughly 275-m below the upper boundary of the survey reach, but another 400-m of stream channel was hiked looking for additional habitat. The most

abundant fish captured was GAAP, accounting for 93.6% of the total catch; the second most abundant was AMNA, comprising 5.0% of the total fish caught. Other species caught included MISA (0.8%), PYOL (0.3%) and channel catfish (*Ictalurus punctatus*, ICPU; 0.3%). No native species were sampled or seen throughout the reach. The present greatest threat to POOC (and other native fishes) at this site in Sonoita Creek is nonnative fishes.

According to State Park personnel, discharge from Patagonia Lake was absent for several weeks prior to the sampling date, due to maintenance of dam valves and was expected to begin again sometime in July. We were informed that a base flow from water releases at the dam is maintained during the summer. No surface water was found in the upper 2 km of stream channel, but was found shortly downstream. Habitat within the reach consisted of a series of moderate to large pools. Some pools were isolated with no connection to other pools, while others were connected to adjacent pools by very shallow, low volume surface flow.

Common plants along the drainage included cottonwood, willow, Arizona ash, sycamore, and netleaf hackberry. Wildlife seen include turkey, gray hawk, Gila monster (*Heloderma suspectum*), gopher snake (*Pituophis catenifer*) and red-ear slider (*Trachemys scripta*). Crayfish (not identified to species) were also present, and shells of the Asiatic clam were commonly seen in sandy substrates along the channel.

West Clear Creek below Bull Pen

May 30, 2014.

Upper Boundary: 12S 435059E 3822233N

Lower Boundary: 434780E 3821848N

On May 01, 2014, Department personnel sampled a 500-m reach of West Clear Creek below Bull Pen Ranch on Coconino National Forest, Yavapai County, approximately 15 km east of Camp Verde, AZ (Appendix B, Fig. 14). West Clear Creek is tributary to the Verde River, and flows in a westerly direction to its confluence with the Verde River south of Camp Verde. Conditions throughout the day were sunny and warm. Instream visibility was good throughout the reach. The target species of the survey was GIRO, and the survey site was selected based on suitable habitat and accessibility.

No GIRO were seen or collected during sampling efforts at this site. The survey site was established near a point of access downstream from the Bull Pen recreational area parking lot on Coconino Forest lands. Habitat within the reach consisted primarily of pool and slow runs with short sections of riffle. Sampling was conducted using a BPES, resulting in the capture of five species. The most abundant species sampled during 2810 seconds of effort was MIDO, accounting for 79.0% of the total catch (Table 27); ONMY (5.3%), LECY (7.9%) and AMNA (5.3%) were also captured. The only native species within this section of West Clear Creek was PACL, comprising roughly 3% of the total catch (Table 27). The single PACL caught during sampling showed a light infection of yellow grub (*Clinostomum complanatum*).

Common plants along the drainage included sycamore, cottonwood, Arizona alder, mesquite, and willow. Wildlife seen during sampling included bighorn sheep and Coopers Hawk.

West Clear Creek @ Cash Tank Trail

June 09, 2014.

Upper Boundary: 12S 452254E 3825897N

Lower Boundary: 452166E 3825833N

On June 09, 2014, Department personnel and a volunteer sampled a 100-m reach of West Clear Creek upstream from Cash Tank Trail on Coconino National Forest, Coconino County, approximately 34 km east of Camp Verde, AZ (Appendix B, Fig. 15). West Clear Creek is tributary to the Verde River, and flows in a westerly direction to its confluence with the Verde River, south of Camp Verde. Conditions throughout the day were sunny and warm and instream visibility was good throughout the reach. The target species of the survey was GIRO, and the 500-m survey site was selected based on accessibility. The 100-m sample reach was selected based on accessibility and visual confirmation of the presence of GIRO. An additional 78-m was added to the original 100-m reach because only 23 chub had been captured within the sample reach.

The reach of stream sampled was accessed by UTV along a jeep trail (FR 142J) to the canyon's edge at Cash Tank, and by hiking a steep trail from the plateau above down to the stream. On reaching streamside, GIRO were observed in pools above the point where the trail intersected the creek. A 100-m reach was laid out and baited hoop nets deployed; several of the crew also fished the area within the 100-m sample reach. Habitat within the reach consisted of pools, runs and riffles, with numerous, large instream boulders throughout.

The most abundant species sampled during the effort were GIRO (62.2%; Table 28); also captured were speckled dace (*Rhinichthys osculus*; RHOS; 13.5%), ONMY (8.1%) and PACL (5.4%). A total of 22 chub were captured in hoop nets within the 100-m reach, with one additional chub caught on hook and line. It was perceived that the hoop nets were not catching chub in the numbers desired, so remaining nets (n=6) were deployed in a pool above the 100-m reach, catching one additional chub. Angling efforts were also extended beyond the 100-m reach to this pool, catching three more chub for a total of 27 chub caught altogether. This population of GIRO and its habitat appear stable and in good condition; no threats to this population were readily apparent.

Efforts with hook and line were not timed for the 100-m reach, so times were estimated. Numerous other chub (mostly juveniles) were observed but not captured during sampling efforts. Tables 28-30 provide summaries of effort and capture data for this site.

Common plants along the drainage included Arizona alder, willow (*Salix* sp.), juniper (*Juniperus* sp.) Wildlife seen during sampling included two bighorn sheep rams which came down into the canyon and lingered in our vicinity for roughly 20 minutes.

West Clear Creek below FR 142F

June 10, 2014.

Upper Boundary: 12S 452254E 3825897N

Lower Boundary: 452166E 3825833N

On June 09, 2014, Department personnel and a volunteer sampled a 500-m reach of upper West Clear Creek, Coconino National Forest, roughly 2.7 km below the confluence of Willow and Clover creeks (Appendix B, Fig. 16). West Clear Creek is tributary to the Verde River, and flows in a westerly direction

to its confluence with the Verde River south of Camp Verde. Conditions throughout the day were sunny and warm. Instream visibility was good throughout the reach. The target species of the survey was GIRO, and the survey site was selected based on previous collections, suitable habitat and accessibility.

The site was accessed using ATVs to travel FR 142F, and hiking down an abandoned auxiliary road and a side canyon to the stream. Sampling methods selected for the effort included minnow traps, collapsible hoop nets, a 30.5-m “green meanie” gill net and angling; large pools were also scrutinized visually. Chub (GIRO) were captured at this site, and appeared to be common. A 100-m sample reach was selected shortly below the point of stream ingress based on visual confirmation of the presence of GIRO, and collapsible hoop nets, minnow traps and gill net deployed.

Only 11 GIRO were caught in the 100-m sample reach and due to limited time and the type of sampling gear employed, the decision was made to expand the effort throughout an additional 400-m of stream. Remaining nets were set up- and downstream, resulting in the capture of 43 GIRO in total, comprising 37.1% of total fish caught (Tables 33-37); other species captured during the effort include PACL (4.3%), RHOS (47.1%), ONMY (0.7%), SATR (2.1%) and PIPR (8.6%). It appears that chub are doing well in this reach of stream, even in the presence of nonnative fishes. While this population of GIRO and its habitat appear stable and in good condition, the only threat perceived at the time was the presence of the piscivorous SATR.

Although 43 chub were captured overall, the average catch rate was only 8.6 chub/100-m of stream sampled, and a 100-m reach could not be selected within the 500-m to obtain the 25 chub sample required; efforts were terminated due to darkness. Because the initial 100-m sample effort unsuccessful (producing only 11 chub) and the effort had to be expanded to 500 m, only a map delineating the 500-m reach was produced (Appendix B, Figure 16); Tables 31-35 provide summaries of effort and capture data for the survey.

Common plants along the stream in the upper reach included box elder, Arizona alder, cattail, pine (*Pinus* sp.) and willow (*Salix* sp.).

Upper Santa Cruz River - Humphrey's Corrals

June 02-03, 2014

Upper Boundary: 12R 539140E, 3474854N

Lower Boundary: 539227E, 3474403N

On June 02-03, Department and U.S. Fish and Wildlife Service personnel sampled a 500-m reach of the upper Santa Cruz River in Santa Cruz County AZ (Appendix B, Fig. 17). The stream section was located on private property roughly 3.2 km E of the San Rafael Cattle Company headquarters. The target species of the survey was POOC. Permission to access and sample the site was obtained from the company owner.

No POOC were sampled or seen at this survey site. Sampling of the site was conducted using minnow traps and hoop nets, the results of which are provided in Tables 36-37. A total of 15 minnow traps and 15 hoop nets were deployed and allowed to fish overnight for roughly 18 hours. Only two fish species were captured at the site, GAAF and LECY; LECY comprised 29% (n= 35) of the total fishes caught, with

GAAF making up the remainder of the catch. Habitat along this section of river consists of long, steep-sided pools with depths ranging between 1.4 - 1.8-m deep. The pools are separated by various-length stretches of shallow water covered in heavy vegetation. Except for the presence of nonnative fishes, this habitat is suitable for GIIN, POOC and CAIN; the prevalent and most serious threat to reestablishment of a native fish component in the Santa Cruz River is nonnative fishes.

The ranch owner of this property has an active interest in native wildlife and fishes of Arizona, and has enrolled the property under the Safe Harbor Agreement for topminnow and pupfish. Discussions should be initiated with the landowner regarding other opportunities for conservation of native fishes on his property, especially Gila chub from Sheehy Spring at this locality.

Common plants along the sample reach included cottonwood, willow and cattail. Other wildlife found at the site included bullfrog (*Litobates [Rana] catesbiana*), Sonoran mud turtle, and Mearns's quail (*Certonyx montezumae*). Also observed in the vicinity (approximately 2.4 km downstream) was a California kingsnake (*Lampropeltis getulus*) in the river channel at dusk on June 3.

Upper Santa Cruz River - above Bridge #8169

June 03-04, 2014

Upper Boundary: 12R 539264E, 3469558N

Lower Boundary: 539038E, 3469130N

On June 03-04, 2014, Department and U.S. Fish and Wildlife personnel conducted a 500-m survey along the Santa Cruz River, in Santa Cruz County, AZ (Appendix B, Fig. 17). The stream section was located on private property roughly 5.6 km SSE of the San Rafael Cattle Company headquarters. Permission to access and sample the site was obtained from the company owner. This section of river borders an agricultural field to the east, and appeared to be in good condition with regard to plant health and stream bank stability. The target species of the survey was POOC.

No POOC were sampled or seen during the survey. Methods selected to sample the site included minnow traps (n=15) and hoop nets (n=15), which were deployed throughout the 500-m reach, and fished for roughly 22 hours. Only GAAF (n=106) and LECY (n=100) were caught during the effort (Tables 38-39), with LECY comprising 48.5% of the total catch and GAAF 51.5% the balance. Tables 40-41 provide summaries of effort and capture data for the survey.

This habitat is suitable for GIIN, POOC and CAIN; the two greatest threats that exist to native fishes in the Santa Cruz River (and associated aquatic habitats) of the San Rafael Valley are nonnative fishes and the potential loss of habitat due to drought conditions. This year in both spring and river habitats we found unusually high numbers of mud turtles, which may have been due to loss or reduction of other aquatic habitats across the landscape.

Common streamside vegetation along the reach included cottonwood, willow and monkey flower. Other wildlife caught or observed during the survey include RACA (n=1), KISO (n=93), one northern Mexican gartersnake (*Thamnophis eques*; THEQ) and one larval Sonoran tiger salamander (*Ambystoma mavortium stebbinsi* [AMMAST]) approximately 4-cm TL (Appendix C, Photo. 26). The Mexican gartersnake

(THEQ; Appendix C, Photo. 27) was captured in a minnow trap, was very active and appeared in excellent condition.

The presence of larval AMMAST in stream habitat is unusual for the species, and this may be the first recorded instance of their occurrence in lotic habitat; there may however, be a previous verbal report of a juvenile of the species being captured in stream habitat in Los Fresnos Cienega, Sonora, Mexico (T.R. Jones, AGFD, pers. comm.). Water flow through the system appeared to be quite low, at some points imperceptible, with a heavy volume of submergent vegetation, but apparently providing conditions suitable for the species.

Sheehy Spring

June 03-04, 2014

Upper Boundary: 12R 540147E, 3470459N

Lower Boundary: 540049E, 3470453N

On June 03-04, 2014, Department and U.S. Fish and Wildlife personnel conducted a survey of Sheehy Spring, tributary to the Santa Cruz River, Santa Cruz County, AZ (Appendix B, Fig. 18). The Stream section was located on private property roughly 5.2 km SE of the San Rafael Cattle Company headquarters. There were two target species for the survey, Gila chub (*Gila intermedia*; GIIN) and POOC. Permission to access and sample the site was obtained from the San Rafael Cattle Company owner.

Habitat along this section of stream consists of several pools with depths ranging between 0.9-1.5-m deep. The pools were separated by various-length stretches of shallow run, with an abundant growth of emergent vegetation. Sampling of the site was conducted using minnow traps and hoop nets. Visual observation determined the presence of GIIN at the survey site and a 100-m sample reach was established.

Fifteen minnow traps and 11 hoop nets were deployed and fished for approximately 23.5 hours, resulting in the capture of 90 GIIN, comprising 93.8% of the total fish caught (Tables 40-41). The only other fish species present at Sheehy Spring was GAUF, with a total of six captured in minnow traps (6.2%).

No POOC were captured or seen at the site, so an additional 400-m of stream channel was explored below the 100-m reach. Soils were wet and spongy below the 100-m reach, and where surface water occurred within the 400 m, it was typically less than 5-cm deep, with no fish sampled or seen. Surface water ended roughly 100-m below the 500-m reach. Protocol called for two additional 500-m reaches to be surveyed for POOC, so one 500-m reach was established roughly 140-m down channel, but only drying mud holes (no actual surface water) were found. An additional 1 km of stream channel was hiked with no sign of surface water found, so a third 500-m reach could not be established. The greatest threat to POOC and other native fishes in the river and spring systems of the San Rafael Valley are nonnative fishes.

Of considerable note and perhaps cause for alarm is the exceptionally high density of mud turtles (KISO; n=60) in the available waters at Sheehy Spring. The cause of these high numbers was not established, but speculation suggests that a prolonged change in the quality or quantity of surface water from seasonal sources on the surrounding landscape may be driving turtles towards more permanent water sources. Within an essentially closed system such as Sheehy Spring, a change in predator densities such as this can prove disastrous for the remaining native chub population. It is recommended that a considerable portion

of the remaining chub population be taken into facilities for security and propagation as soon as can be arranged.

Vegetation at the site of consisted of cottonwoods, willow, quince (*Cydonia oblonga*), and wild blackberry (*Rubus* sp.). Other wildlife found within the spring system included RACA, and KISO. Javelina (*Tayassu tajacu*) were also observed during the hike down-drainage.

Spring Creek (Verde R. subbasin)

July 08-10, 2014.

Upper Boundary: 12S 416634E, 3845826N

Lower Boundary: 416690E, 3845759N

On July 8 and 10, 2014 Department personnel sampled Spring Creek, tributary to the Verde River, in Prescott National Forest, Yavapai County, AZ (Appendix B, Fig. 19). Spring Cr. is located approximately 19 km SW of Sedona, AZ, and flows in a generally southerly direction to its confluence with Oak Creek. Gila chub (GIIN) was the target species of the survey. Lands surveyed included private and Prescott National Forest.

This sampling effort was made in cooperation with CAP crews sampling the stream to remove LECY. Personnel from the Gila River Monitoring Program assisted CAP crews with the removal efforts and in return received the data and assistance with monitoring efforts. Sampling efforts were conducted on the 8th and 10th of July, and data from the 8th was used for the monitoring survey. A 100-m survey reach was established above a diversion dam on the stream.

Large hoop nets and collapsible hoop nets were used to sample the site, and resulted in the capture of a total of 112 GIIN (99.1%) and one speckled dace (*Rhynchithys osculus*; RHOS; 0.9%). Nets were fished for between 2.25 and 3 hours (Tables 42-43), resulting in the capture of only native species (Table 42). Large hoop nets proved more effective than the collapsible hoop nets in capturing chub (Tables 42- 43). The nonnative northern crayfish (*Orconectes virilis*; ORVI) was also present and common in the sample reach, with a total of 101 caught during the same period. Greatest perceived threats to Gila chub and other native fishes within this drainage are nonnative species, including nonnative fishes that periodically appear in the stream, and crayfish.

Plants commonly encountered along the drainage included willow, cattails Arizona ash, horsetail (*Equisetum* sp.), seep willow, mesquite, juniper, cottonwood and salt cedar. Wildlife observed along the drainage included Sonoran mud turtle, mountain patch-nosed snake (*Salvadora grahami*), black hawk, and beaver sign in the form of chewed willows.

Cottonwood Spring

July 16, 2014.

Upper Boundary: 12R 527555E, 3502062N

Lower Boundary: 527486E, 3502126N

On July 16, 2014, Department personnel conducted a survey at Cottonwood Spring, tributary to Sonoita Creek in Santa Cruz County, AZ (Appendix B, Fig. 20). Cottonwood Spring is a tributary spring to Sonoita Creek in the Santa Cruz River subbasin. It is located roughly 5.6 km SW of Sonoita, Santa Cruz County, AZ.

The target species of the survey was POOC, which comprised 100% of the fish sampled in the spring system; they were also the only species found in the system. Due to the presence of POOC, a 100-m section of stream was established, beginning at the spring head and continuing for 100-m downstream. Water from the spring channel was diverted from the diversion ditch by a small earthen berm and flowing into the Sonoita Creek stream channel, therefore by necessity, the 100-m sample reach was established to include a portion of the Sonoita Creek channel. Surface water was present below the spring for roughly 150 m, but for the last 90-m was primarily in an area of short grasses in which much of it was too shallow and diffuse to be sampled effectively. All POOC seen and sampled were located either at the springhead or in the spring channel below; none were seen or sampled in the Sonoita Creek stream channel.

A total of 217, 1-m dip net sweeps were expended during sampling; 121 of them in the stream channel where shallow, dispersed surface flow made sampling difficult, and an additional 96 in the spring channel just below the springhead and down to the diversion ditch. Dip netting efforts resulted in a total of 43 Gila topminnow captured (Table 44). Photographs for upper and lower boundaries of the 100-m sample reach for Cottonwood Spring were taken, but an equipment malfunction was experienced and the photos deleted. Photographs provided in Appendix C (Photos 37-39) are from a visit to the site earlier in 2014, and are provided as an example of the habitat at the site.

Of note at this site is that periodically, dense vegetative overgrowth that blocks the system from direct sunlight is removed; in the 2 instances where this population was sampled or observed prior to and following such activities, numbers of POOC appear (at least to the eye) to have responded positively to the treatment, suggesting increased sunlight resulted in greater production in the system. In situ experiments addressing this perceived response to disturbance by POOC are strongly recommended, to assist in determining future successful management actions for this species. Though small, isolated, and entirely dependent on this single small spring source for its continued existence, this population appears to remain stable. The greatest perceived threat to this population is a loss of water at the spring head, and the possible introduction of nonnative species into the upper Sonoita Creek drainage.

Common plants in the vicinity of the spring included cottonwood, mesquite, willow, and oak. Wildlife seen during the effort included vermilion flycatcher, gray hawks, turkeys and an Arizona gray squirrel (*Sciurus arizonensis*).

Monkey Spring

July 16, 2014.

Upper Boundary: 12R 528085E, 3499707N

Lower Boundary: 528075E, 3499794N

On July 16, 2014, Department personnel conducted a survey of Monkey Spring, tributary to Sonoita Creek, Santa Cruz County, AZ. The sample site was located on private property approximately 11 km NNE of Patagonia, AZ (Appendix B, Fig. 21). Gila topminnow (POOC) was the target species of the survey and was relatively common at this site, comprising 100% of fish sampled during the survey. The springhead and upper portion of spring run are enclosed by fencing, with the majority of flow from the spring entering a concrete diversion ditch at the downstream fence line

A seine and dip-nets were the methods used to sample Monkey Spring. Run and pool habitats were sampled by seine along the stream above the fence line, and in the concrete ditch below. Due to a heavy accumulation of aquatic vegetation and organic debris, a side channel with low flow was sampled using a dipnet. A total of 305 POOC were captured (Tables 45-46) and the majority of them released; 125 were transported to the ASU animal care facility in Tempe, to augment the refuge populations maintained there. There were no POOC mortalities during transport. POOC were found in all four habitats sampled, but appeared least abundant in a connected pool along the stream channel, and most abundant in the stream run below the springhead.

Management of this population and its habitat under the current landowner appears to be stable at this time, with no perceived threats except perhaps future management practices with unforeseen consequences. Serious efforts should be expended to obtain a conservation easement on both Monkey and Cottonwood springs, and both populations should be duplicated locally, as sites in the area are identified and become available.

Common plants along streamside included juniper, Arizona ash, mesquite, oak and willow. Turkey were the only wildlife noted during the time spent on site.

Chalky Spring

August 06, 2014

Upper Boundary: 378702E, 3746840N

Lower Boundary: 378695E, 3746757N

On August 6, 2014, Department and Maricopa County Regional Park personnel conducted a survey at Chalky Spring, Maricopa County, AZ. Chalky Spring is a desert spring found roughly 6 km west of Lake Pleasant near the boundary of Lake Pleasant Regional Park (Appendix B, Fig. 22), and is tributary to Morgan City Wash. Weather during the sample period was clear and hot. The drainage was found to be heavily overgrown with mesquite, catclaw (*Acacia greggi*), cattail and willow, with only intermittent surface flow. Due to the nature and density of vegetation in this canyon, sampling of the stream was conducted with aquarium net and seine; results of the sampling effort are provided in Tables 47- 48.

Gila topminnow (POOC) was the target species of the survey, and on arrival at the site, were determined to still be present. A 100-m sample site was established a short distance downstream from where POOC was first seen; surface flow was not continuous throughout the reach, and much of the channel was

overgrown by dense stands of cattails. Little or no surface water was found in cattail stands, but small pools connected by slight surface flows occurred in more open areas.

While hundreds of POOC were observed, sampling proved difficult because of shallow water and extremely limited mobility because of dense undergrowth. Where open surface water did occur, sampling was conducted by seine, resulting in a total of 26 Gila topminnow captured (Table 48). An aquarium dip net also proved useful, and with a total of 14 aquarium dip net sweeps, an additional 12 POOC were caught (Table 47). POOC was the only species found at Chalky Spring, comprising 100% of the species captured. Habitat below the sample reach was similar to that of the area sampled. All size classes were observed and assessed to be common.

The most likely perceived threat to this population is the loss of remaining surface waters due to continuing, or increasingly dry conditions. Selective vegetation (cattails) removal should be considered for the continuing management of this site; efforts to reduce or remove them should be conducted at least biannually.

Common vegetation along the drainage included mesquite, catclaw acacia, willow and cattail. No other wildlife was noted during the sampling.

Morgan City Wash

August 06, 2014

Upper Boundary: 12S 381542E, 3744844N Lower Boundary: 381619E, 3744777N

On August 6, 2014, Department and Maricopa County Regional Park personnel conducted a survey at Morgan City Wash in Maricopa County, AZ. 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. 23). Surface flow occurs in the lower portion of the drainage, reaching the Agua Fria River channel downstream from the New Waddell Dam and Lake Pleasant. The target species at Morgan City Wash was POOC; pupfish had been stocked in 2009 and 2010, but did not establish (Pearson, et al. 2013).

A 500-m survey of the site was begun roughly 30-m upstream from the road crossing lower Morgan City Wash, and proceeded upstream for approximately 250 m, until POOC were observed in a large bedrock pool. Much of the surface flow below this point had appeared fishless, but minnow traps were deployed in likely habitat. Recent flooding in the drainage was evident from the presence of muddy banks, debris in brush and trees, and large rafts of flattened cattail in the stream channel.

Once POOC were observed, the 100-m sample reach was established in the next pool upstream, encompassing a series of pools and short runs. Flooding had covered much of the run habitat in the narrow channel with downed cattail, willow and seep willow, making sampling within those specific portions of the 100-m reach implausible. Sampling of the pool habitats was conducted with baited minnow traps (n=7) set for 6-7 hours, resulting in the capture of 189 POOC (Table 49), as well as AGCH, and LECY. The two native species were the most abundant, with POOC comprising 82.5% and AGCH 14.1% of the total catch; LECY accounted for only 3.4% of the total catch. Dipnet sweeps (~ 32) and

trapping below the 100-m reach resulted in the capture of an additional 16 POOC. Stomach contents of five LECY were examined; two contained a total of 12 POOC (Appendix C, Photo 52), two were empty, and one contained only insect larvae.

Common vegetation along the drainage included willow, seep willow, cattail and salt cedar. Wildlife in the area was not noted.

Walker Creek

August 14, 2014

Upper boundary: 12S 436035E, 3833684N

Lower Boundary: 435923E, 3833664N

On August 14, 2014, Department personnel conducted a survey at Walker Creek, on Coconino National Forest, Yavapai County, AZ (Appendix B, Fig. 24). Walker Creek is tributary to Wet Beaver Creek in the Verde River drainage. The sample site was located above Rancho Roco Roja, upstream from Lander Spring. The target species in Walker Creek was GIIN. Access into Walker Creek was gained off of the Walker Basin Trail.

Sampling in Walker Creek was conducted exclusively using a BPES. After visually confirming the presence of chub, a 110-m reach was sampled; the original 100-m sample reach was extended by 10-m to encompass an additional pool at the top of the reach. Sampling efforts found only native species present in Walker Cr., GIIN, RHOS and PACL (Table 50). Speckled dace were the most common species captured (79.5% of total fish caught), followed by PACL (11.5%) and GIIN (8.9%); Tables 52-53 provide a summary of effort and capture data for the site. Both RHOS and GIIN were noted to be infected with black grub, but otherwise healthy. Crayfish (ORVI) were abundant throughout the reach.

Common plants along the riparian area included Arizona alder, sycamore and Arizona ash. No wildlife species were recorded.

Haigler Creek @ Fisherman's Point

August 18, 2014

Upper Boundary: 12S 505077E, 3788623N

Lower Boundary: 504778E, 33788752N

On August 18, 2014, Department personnel conducted a survey at upper Haigler Creek at Fisherman's Point in Tonto National Forest, Gila County, AZ (Appendix B, Fig. 25). Haigler Creek is located north of Young, AZ and flows in a generally westerly direction to its confluence with Tonto Creek, in the Salt River subbasin. Tributaries of Haigler include Marsh and Gordon creeks. The target species of the survey was GINI. Access to Haigler Creek was gained by hiking down from the parking area along the Chamberlain Trail road.

The 500-m section of stream along Haigler was surveyed with BPES and collapsible hoop nets; no GINI were seen or captured. Tables 52-53 provide a summary of effort and capture data for the site. Surveys with the BPES produced two species of fish, ONMY (66.1%) and SATR (33.9%) with 2381 seconds shocking effort expended (Table 52); no fish were captured using hoop nets (Table 53). Surveys conducted by Madsen (1935) in Haigler Creek during 1934 found "bonytails" (chub) and suckers

abundant and in excellent condition, throughout the 9 miles of stream surveyed; rainbow and cutthroat trout were also present.

Streamside plants included Arizona alder, oak, willow, cattail, ponderosa pine, juniper, Arizona ash, box elder, poison ivy (*Toxicodendron* sp.), and manzanita (*Arctostaphylos pungens*). No additional wildlife was noted during the survey.

Haigler Creek @ The Bridge

August 28, 2014

Upper Boundary: 12S 503468E, 3786926N

Lower Boundary: 503457E, 3786428N

On August 28, 2014, Department personnel conducted a survey on upper Haigler Creek above the bridge at Haigler Canyon campground, in Tonto National Forest, Gila County, AZ (Appendix B, Fig. 26). Haigler Creek is located north of Young, AZ and flows in a generally westerly direction to its confluence with Tonto Creek in the Salt River basin. Tributaries of Haigler include Marsh and Gordon creeks. The target species of the survey was GINI. Access to the creek was gained from the campground.

A 500-m section of stream was surveyed along Haigler using the BPES exclusively, resulting in the capture of only one species of fish, ONMY (100%; Table 54). No GINI were caught or observed at this survey site. Much of the habitat sampled was shallow riffle, but with some riffle approaching 1-m in depth. Cover within much of the reach consisted largely of instream boulders and undercut grassy banks. Most smaller fish were caught at the head of riffles, with the majority of larger fish caught in pools. No native species were captured or observed during the effort. Table 54 provides a summary of effort and capture data for the site.

Streamside plants included Arizona alder, oak, willow, Arizona ash, juniper, and sycamore. Crayfish (ORVI) were abundant throughout the reach.

Haigler Creek below Alderwood Campground

August 28, 2014

Upper Boundary: 12S 499690E, 3785043N

Lower Boundary: 499343E, 3784783N

On August 28, 2014, Department personnel conducted a survey on upper Haigler Creek (below Alderwood campground), in Tonto National Forest, Gila County, AZ (Appendix B, Fig. 27). Haigler Creek is located north of Young, AZ and flows in a generally westerly direction to its confluence with Tonto Creek in the Salt River basin. Tributaries of Haigler include Marsh and Gordon creeks. The target species of the survey was GINI. Access to the creek was gained from FR 249 by hiking down a side drainage roughly 4.4 km downstream from Alderwood Campground. The target species for this stream was GINI.

A 500-m section of stream was surveyed using the BPES and collapsible hoop nets. Habitat in the upper portion of the survey site consisted of a series of small cascading pools of moderate depth, interspersed by shallow riffles, with several long, deep, canyon-bound pools in the lower portion. A total of 154 fish were caught during the sampling effort. No GINI were caught or seen during sampling efforts. Sampling with

the BPES resulted in the capture of three species: ONMY (Table 55; 87.7%), SATR (10.4%) and RHOS (1.9%). A total of 4 collapsible hoop nets were set in pool habitat but caught no fish (Table 56). Tables 55-56 provide a summary of effort and capture data for the site.

Streamside plants included Arizona alder, oak, willow, Arizona ash, juniper, and sycamore. Crayfish (ORVI) were abundant throughout the reach. Of particular note was a neonate narrow-headed gartersnake that was found crawling out of the stream at the water's edge (Photo 62).

Lower Haigler Creek

October 12, 2014

Upper Boundary: 12S 494812E, 3784214N

Lower Boundary: 494348E, 3784445N

On October 15, 2014, Department personnel conducted a survey on lower Haigler Creek at the confluence of Gordon Creek and below, in Tonto National Forest, Gila County, AZ (Appendix B, Fig. 28). Haigler Creek is located north of Young, AZ and flows in a generally westerly direction to its confluence with Tonto Creek in the Salt River basin. Tributaries of Haigler include Marsh and Gordon creeks. Access to the creek was gained via Gordon Creek by hiking and swimming roughly 2.5 km downstream from Ellinwood Ranch. The target species of the survey was GINI.

Because it was necessary to swim through slot pools to reach Haigler, a BPES was deemed impractical for the survey; instead, sampling was conducted using collapsible hoop nets, minnow traps, an experimental gill net, and by angling with fly rod and fly. Habitat within the survey reach consisted of several large pools, interspersed with long riffles with large instream boulders. The larger of the pools was over 2-m in depth, with water visibility roughly 30 cm.

Below the confluence with Gordon Creek, GINI were observed in the first pool, but only 13 individuals were seen within the next 100-m of stream, so gear was set over a 600-m reach of stream to ensure adequate numbers were sampled. Two native species were captured from the 600-m sample reach, GIRO comprising 74.5% of the total fish caught, and PACL comprising 7.3%; LECY was the only nonnative species captured, accounting for 18.2% of total fish caught; tables 57-60 provide a summary of effort and fish caught per sampling gear type.

A total of 41 GINI were caught, averaging just less than 7 GINI per 100-m of stream. The various passive gears were fished for between 2 -17 hours (Tables 57-59), with 30 minutes of fly fishing resulting in the capture of 4 additional GINI (Table 60); SATR was also observed during efforts with the fly rod, but not captured.

The population of GINI appears to be doing well in this stretch of Haigler Creek, with the greatest apparent threat to their continued success at this time being crayfish and nonnative fishes.

Common plants along the stream included oak, sycamore and Arizona alder. Crayfish (ORVI) were abundant throughout the sample reach.

Spring Creek at Brady Canyon

September 3, 2014

Upper Boundary: 12S 492966E, 3770969N

Lower Boundary: 492962E, 3771091N

On September 3, 2014, Department personnel conducted a survey in the middle reach of Spring Creek at the confluence of Brady Canyon, in Tonto National Forest, Gila County, AZ (Appendix B, Fig. 29). Spring Cr. is located west of Young, AZ and flows in a generally northwesterly direction to its confluence with Tonto Cr. in the Salt River basin. Major tributaries to Spring Cr. include Buzzard Roost Canyon and Rock creeks. The creek was accessed via a jeep trail off of Mailbox Mesa. The target species of the survey was GINI.

A 100-m section of stream was sampled using the BPES. Habitat throughout the sample reach consisted of a long continuous pool with instream boulders in the lower reach. A total of four species were sampled at this site (Table 61), two native fishes, GINI (33.8%) and PACL (2.7%), and two nonnative species, AMNA (29.7%) and LECY(33.8%). The two most abundant species were GINI and LECY, each comprising 34% of the total fish captured. Only two PACL were caught, and no juveniles of either native species were seen or captured. Adults and juveniles of both nonnatives were present. Table 61 provides a summary of effort and capture data for the site.

The population of GINI appears to be maintaining itself in this stretch of Spring Creek, but this may possibly be due to dispersal from upstream sources where nonnatives are rare (see the following section). The greatest apparent threat to the continued success of the native fish component at this time appears to be the nonnative LECY and AMNA.

Streamside plants included Arizona alder, sycamore, and willow. No wildlife was noted for this site. No crayfish were recorded for this section of stream.

Spring Creek below Spring Creek Ranch

September 4, 2014

Upper Boundary: 12S 495842E, 3766013N

Lower Boundary: 495943E, 3766064N

On September 4, 2014, Department personnel conducted a survey at upper Spring Creek below Spring Creek Ranch, Gila County, AZ (Appendix B, Fig. 30). Spring Cr. is located west of Young, AZ and flows in a generally northwesterly direction to its confluence with Tonto Cr. in the Salt River basin. Major tributaries to Spring Cr. include Buzzard Roost Canyon and Rock creeks. The creek was accessed through Spring Creek Ranch, hiking downstream to the sample site. The target species of the survey was GINI.

The sample site for this effort was selected shortly below where chub were first detected visually. Habitat within the sample reach was generally shallow, consisting of a mixture of run, riffle and pools. The BPES would have been preferred for sampling this stream, however due to an equipment failure, other sampling gear was employed. A 100-m section of stream was sampled using collapsible hoop nets, which were fished for between 3-4 hours each.

A total of three native species were found to be present at this site, GINI (42.5%), PACL (53.5%) and RHOS (3.9%; Table 62); no nonnative fishes were seen or captured. Juveniles of both GINI and PACL

were captured at this site (Table 62). It is believed that due to the large mesh size of the hoop nets, juveniles of both GINI and PACL, and the number of speckled dace in general, may be underrepresented, introducing a bias to the sample. Table 62 provides a summary of effort and capture data for the site. Native fishes including GINI, appear to be doing well in upper Spring Creek at this time.

Common streamside vegetation included Arizona ash, sycamore, Arizona alder, black walnut, oak, wild blackberry, and Virginia creeper (*Parthenocissus quinquefolia*). While sampling at the site, an Arizona black rattlesnake (*Crotalus cerberus*) was seen swimming across the stream (Appendix C, photo 75); the snake was photographed and released. No crayfish were recorded for this section of stream.

Wet Beaver Creek below Montezuma Castle 1

September 9, 2014

Upper Boundary: 12S 422870E, 3828895N

Lower Boundary: 422366E, 3828936N

On September 9, 2014 Department personnel conducted a survey on lower Wet Beaver Creek, approximately 1 km downstream from Montezuma Castle National Monument (MCNM), Yavapai Co., AZ (Appendix B, Fig. 31). 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 target species of the survey was GIRO. The site was accessed from an unnamed dirt road off of Montezuma Castle Road.

The only method of sampling employed in this 500-m section of stream was the BPES, with a total sampling effort of 1826 seconds; no GIRO were captured or seen. Only two species were detected during the survey, LEMA and CYLU (Table 63). The majority of fish captured were CYLU, comprising 90.2% of the total fish sampled; LEMA accounted for 9.8% of fish caught. No native fishes were captured or observed and almost all fish caught were in riffle habitat. Table 63 provides a summary of effort and capture data for the site.

Crayfish and nonnative fishes appear to pose the greatest threat to GIRO in the stream at this time. Common plants along the drainage included sycamore, willows, cottonwood, oak and cattail. The only wildlife noted in the area were RANA tadpoles and crayfish.

Wet Beaver Creek below Montezuma Castle 2

September 9, 2014

Upper Boundary: 12S 422755E, 3829430N

Lower Boundary: 423057E, 3829201N

On September 9, 2014 Department personnel conducted a survey on lower Wet Beaver Creek, approximately 0.25 km below MCNM southern boundary, Yavapai Co., AZ (Appendix B, Fig. 31). Wet Beaver Cr. 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. The target species of the survey was GIRO. The site was accessed from an unnamed dirt road off of Montezuma Castle Road.

Collapsible hoop nets and the BPES were the methods used to sample this 500-m section of stream. Total effort with the BPES was 1529 seconds (Table 64), and total set-time for the hoop nets was

approximately 5.75 hours (Table 65); no GIRO were captured or seen. Three species were detected during the survey, LECY, MISA and CYLU (Tables 64-65). The majority of fish captured were CYLU, comprising 97.0% of the total fish sampled; of the other two species sampled were MISA (1.5%) and LECY (1.5%). No native fishes were captured or observed throughout the survey reach. Tables 64-65 provide a summary of effort and capture data for the site.

Nonnatives (crayfish and fishes) appear to pose the greatest threat to GIRO in Wet Beaver Creek at this time. Common plants along the drainage included sycamore, willows, cottonwood, oak and cattail. The only wildlife noted in the area were crayfish.

Wet Beaver Creek above Montezuma Castle

September 9, 2014

Upper Boundary: 12S 422755E, 3829430N

Lower Boundary: 423057E, 3829201N

On September 9, 2014 Department personnel conducted a survey on lower Wet Beaver Creek, approximately 0.85 stream km above the MCNM boundary, Yavapai Co., AZ (Appendix B, Fig. 32). Wet Beaver Cr. 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. The target species of the survey was GIRO.

No GIRO were captured or seen at this survey site. Collapsible hoop nets and the BPES were the methods used to sample this 500-m section of stream. The habitat along this reach was a large pool approximately 500-m long and 15-m wide, formed by a beaver dam at the lower end. A total of 23 collapsible hoop nets were set and fished for between 4.5-5.5 hours, but caught no fish (Table 66). A total of 673 seconds of effort were expended with the BPES, resulting in the capture of 54 total fish of 5 different species (Table 67). Species captured within this section of stream were MISA (11.1%), LEMA (7.4%), CYLU (70.4%), MIDO (9.3%) and PACL (1.8%). Tables 66-67 provide a summary of effort and capture data for the site.

Crayfish and nonnative fishes appear to pose the greatest threat to GIRO in the stream at this time. Common plants along the drainage included sycamore, willows, cottonwood, and cattail. Wildlife noted in the area were crayfish and KISO (n=2); both KISO were captured in hoop nets.

Wet Beaver Cr. at Lawrence Crossing

September 10, 2014

Upper Boundary: 12S 433056E, 3834938N

Lower Boundary: 432643E, 3834701N

On September 10, 2014 Department personnel conducted a survey on middle Wet Beaver Creek, at the Lawrence Crossing approximately 1.5 km ENE of Montezuma Well, Yavapai Co., AZ (Appendix B, Fig. 33). Wet Beaver Cr. 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. The target species of the survey was GIRO.

No GIRO were captured or seen within this 500-m survey site. The only method of sampling employed in this section was the BPES, with a total of 4306 seconds of sampling effort expended. Four species of fish

were captured during the survey, MIDO (86.8%), LECY (6.6%), PACL (4.6%) and ONMY (2.0%; Table 68); the only native species caught was PACL. Table 68 provides a summary of effort and capture data for the site.

No notes were provided on the presence of crayfish in this reach of stream; nonnative fishes appear to pose the greatest threat to GIRO in the stream at this time. Common plants along the drainage included Arizona alder, sycamore, willows and cottonwood.

Wet Beaver Cr. at Beaver Cr. Campground

September 10, 2014

Upper Boundary: 12S 434602E, 3836562N

Lower Boundary: 434181E, 3836289N

On September 10, 2014 Department personnel conducted a survey on middle Wet Beaver Creek (Appendix B, Fig. 33), adjacent to the Beaver Creek Campground, approximately 0.4 km S of the Beaver Creek Ranger Station, Yavapai Co., AZ (Fig. 33). Wet Beaver Cr. 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. The target species of the survey was GIRO.

The only method of sampling employed in this 500-m section of stream was the BPES, with a total of 4373 seconds of sampling effort expended. No GIRO were captured or seen at this site. Three species of fish were captured during the survey, MIDO (63.0%; Table 69), ONMY (2.5%) and the native sucker PACL (34.6%). Desert sucker (PACL) was the second most abundant species sampled in this reach of stream, accounting for over 1/3 of the total catch. During the surveys on Wet Beaver Creek, the number of adult PACL sampled here accounted for the largest number of native fish sampled, and a larger proportion of total fish caught than in any of the other sections sampled; juvenile suckers were rare, however, with only two individuals caught. Adult PACL were noted to be infected with yellow grub. Table 69 provides a summary of effort and capture data for this site.

No notes were provided on the presence of crayfish in this section of stream; nonnative fishes appear to pose the greatest threat to GIRO in the stream at this time. Common plants along the drainage included Arizona alder, sycamore and willows.

Wet Beaver Cr. below Beaver Cr. Ranch

September 10, 2014

Upper Boundary: 12S 435673E, 3837424N

Lower Boundary: 435249E, 3837293N

On September 10, 2014 Department personnel conducted a survey on middle Wet Beaver Creek, approximately 0.6km W of Beaver Creek Ranch (Appendix B, Fig. 33), Yavapai Co., AZ. Wet Beaver Cr. 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. The target species of the survey was GIRO.

The only method of sampling employed in this 500-m section of stream was the BPES, with a total of 3860 seconds of sampling effort expended; no GIRO were captured or seen. Only two species of fish were captured during the survey, MIDO (89.6%) and the native sucker PACL (10.4%; Table 70). No juvenile PACL were caught or seen in this reach, and no other native fishes were sampled or seen.

No notes were provided on the presence of crayfish in this section of Wet Beaver Cr.; nonnative fishes appear to pose the greatest threat to GIRO in the stream at this time. Common plants along the drainage included Arizona alder, sycamore and willows.

Salome Creek E. of JR Ranch

September 11, 2014

Upper Boundary: 12S 496263E, 3752479N

Lower Boundary: 496460E, 3752006N

On September 11, 2014 Department personnel conducted a survey on upper Salome Creek, approximately 1.2 km E of the JR Ranch (Appendix B, Fig. 34), Gila Co., AZ. Salome Cr. was formerly tributary to the Salt River, but now flows are intercepted by Roosevelt Lake at its confluence roughly 6.5 km N of Tonto National Monument. Tributaries to Salome Creek include Reynolds and Workman creeks, which periodically connect to Salome during periods of high flow. The target species of the survey was GIRO.

No GIRO were caught or seen during this survey. Habitat within much of the upper drainage of Salome consists of an extended series of slick, granitic bedrock pools, oftentimes isolated with no flow connecting them, or occasionally connected by cascading flows over water –smoothed boulder and bedrock. Methods employed to sample this 500-m section of stream included hoop nets, gill net and angling with fly rods. The only species of fish sampled throughout the 500-m survey site was LECY (100%; Tables 71-73), with hoop nets and angling proving the most effective means of capture. Although fished for six hours, a 100-ft. gill net captured only 6 LECY (Table 72). Tables 71-73 provide a summary of effort and capture data for the site.

The greatest threat to GIRO in Salome Cr. at this time appears to be nonnative fish, specifically LECY. Common plants along the drainage included Arizona ash, scrub oak (*Quercus turbinella*), oak, Arizona alder, sycamore, willow, juniper, ponderosa pine, poison ivy and Virginia creeper.

Salome Creek S.E. of JR Ranch

September 24, 2014

Upper Boundary: 12S 496135E, 3751875N

Lower Boundary: 496264E, 3751531N

On September 24, 2014 Department personnel conducted a survey on upper Salome Creek, approximately 1.2 km SE of the JR Ranch, Gila Co., AZ (Appendix B, Fig. 34). Salome Cr. was formerly tributary to the Salt River, but now flows are intercepted by Roosevelt Lake at its confluence, roughly 6.5 km N of Tonto

National Monument. Tributaries to Salome Creek include Reynolds and Workman creeks, which periodically connect to Salome. The target species of the survey was GIRO.

No GIRO were caught or seen during survey efforts. Habitat within this portion of the upper drainage of Salome was similar to the previous reach sampled upstream in the drainage, a series of water-smoothed granitic bedrock pools, oftentimes isolated with no flow connecting them. The only sampling method employed in this reach was collapsible hoop nets. The only species of fish sampled throughout the 500-m survey site was LECY (100%), with a total of 148 caught in 10 nets, set for slightly more than 2.5 hours each (Table 74). Table 74 provides a summary of effort and capture data for the site.

The greatest threat to GIRO in Salome Cr. at this time appears to be nonnative fish, specifically LECY. Common plants along the drainage included Arizona ash, cottonwood, scrub oak, Arizona alder, sycamore, willow, cottonwood, ponderosa pine, poison ivy and Virginia creeper.

Salome Creek below The Jug

September 30, 2014

Upper Boundary: 12S 489087E, 3737107N

Lower Boundary: 488929E, 3736784N

On September 30, 2014 Department personnel conducted a survey in mid-drainage of Salome Creek, below “The Jug” (Appendix B, Fig. 35), approximately 12.1 km N of Roosevelt Dam, Gila Co., AZ. Salome Cr. was formerly tributary to the Salt River, but now during periods of runoff when lower Salome flows, waters are intercepted by Roosevelt Lake at its confluence, roughly 6.5 km N of Tonto National Monument. Tributaries to Salome Creek include Reynolds and Workman creeks, which periodically connect to Salome. The target species of the survey was GIRO.

No GIRO were caught or seen in Salome Creek during the survey; in fact, no native fishes were captured or observed. Habitat in the 500-m reach above the Jug was variable; surface flow was intermittent in some portions of stream. Downed cattails, high water marks and flotsam, and deep sediment deposits all suggested recent high flows. On reaching the slots (the upper boundary of “The Jug”) the decision was made by a member of the crew with experience traveling through the canyon, not to proceed further, as recent flows and detritus may have made passage through treacherous; sampling was subsequently conducted further downstream, below The Jug. The only sampling methods employed here were seines and angling, both of which produced only LECY (100%; Tables 75-76). Tables 75-76 provide a summary of effort and capture data for the site. It is recommended that if conditions and crew experience allow, future sampling take place in The Jug as more suitable habitat for chub is believed to be present there.

The greatest threat to GIRO in Salome Cr. at this time appears to be nonnative fish, specifically LECY. Common plants in the Salome drainage include Arizona ash, cottonwood, cattail and willow. Slopes above the canyon walls, however, are covered in a variety of desert plants typical of upper Sonoran foothills, including saguaro (*Carnegiea gigantea*), ocotillo (*Fouquieria splendens*), prickly pear (*Opuntia engelmannii*), foothill palo verde (*Parkinsonia microphylla*), catclaw acacia and teddy bear cholla (*Cylindropuntia bigelovii*). No wildlife was noted for this reach of stream.

Bass Canyon

September 23, 2014

Upper Boundary: 12S 572035E, 3579701N

Lower Boundary: 571953E 3579664N

On September 23, 2014 Department personnel conducted a survey in the lower drainage of Bass Canyon, Cochise County, AZ (Appendix B, Fig. 36). Bass Canyon is located approximately 42 km north of Benson, AZ, within the Muleshoe Ranch Cooperative Management Area (CMA). Bass Canyon creek flows into Hot Springs Canyon, which is tributary to the San Pedro River. Target species of the survey was Gila chub, which were determined to be present.

The sampling site was accessed by hiking trail from Jackson Canyon roughly 150-m downstream; GIIN was seen immediately upon arrival at the sample site, and the 100-m sample site established. Within the sample reach, stream morphology included pool, run and riffle habitats. Due to ease of accessibility and perceived abundance of chub, the BPES was the only sampling technique employed. Four species of fish were found within the sample reach, all natives, including the target species GIIN, which was the most abundant sampled (86.2%; Table 77); the other three species were CAIN (5.7%), PACL (4.1%), and RHOS (4.1%). Table 77 provides a summary of effort and capture data for the site.

The only potential threat to the population perceived at this time is habitat loss due to prolonged drought.

Common vegetation along the riparian corridor included cattails, willow, Arizona ash, sycamore, cottonwood, Arizona alder and poison ivy.

East Verde River above Water Wheel

August 04, 2014

Upper Boundary: 12S 474237E, 3801326N

Lower Boundary: 473821E, 3801212N

On August 04, 2014 Department personnel conducted a 500-m survey along the upper East Verde River, north of Payson in Gila County. The site was from just above the confluence with Ellison Creek to 500m downstream (Appendix B, Fig. 37). The East Verde River flows in a westerly direction to its confluence with the Verde River, roughly 21 km SW of Payson.

Due to lack of familiarity with the stream, its structures, and zero water visibility, employing the BPES was deemed too hazardous, and only passive gears were employed (i.e. minnow traps, promar and large hoop nets). Habitat within the 500-m consisted of various-sized pools connected by cascading riffle, or long, moderate- to slow-velocity runs. All habitats within the 500-m of the stream were covered by silt, with visibility at the water's surface less than 2.5 cm.

The various styles of nets were fished for roughly 22 hours, resulting in a total of 4 species caught in the reach. The target species for the effort was GINI and they were present in the 500 m, but only in such numbers as to account for 8% (n=6) of the total fish caught (Tables 78-80). Desert sucker (PACL) was more common (24.0%), with RHOS (66.7%) being the most abundant of all the species sampled, and ONM Y (1.3%) being the only nonnative fish detected in this reach. Low numbers of GINI may have been due to water conditions from recent storms and subsequent run-off, which suspended substantial

amounts of fine silts and ash, reducing water visibility to zero; alternatively, chub numbers might just be normally low throughout the sample reach.

Over 600 crayfish were captured in the same net sets as caught the fish sample. These extreme densities of crayfish in the upper reaches of East Verde River are currently perceived as the greatest threat to native fishes.

The greatest threat to GINI in the East Verde River at this time appears to be crayfish and nonnative fish. Common plants along the drainage included Arizona alder, cottonwood, willow, sycamore and Arizona ash; no wildlife observations were noted.

East Verde River below East Verde Park 1

September 22, 2014

Upper Boundary: 12S 465623E, 3794454N

Lower Boundary: 465521E, 3794090N

On September 22, 2014 Department personnel conducted a 500-m survey along the middle East Verde River (Appendix B, Fig. 38), Gila County, N of Payson, AZ. East Verde River flows in a westerly direction to its confluence with the Verde River, roughly 21 km SW of Payson. The target species for East Verde River is GINI.

GINI was not captured or seen at this survey site. Several previous attempts to sample the East Verde River had been undertaken, but due to poor water visibility (literally less than 3 cm) the BPES was not deemed a safe or effective means of sampling the site, so hoop nets were used. Habitat within this reach consisted primarily of long pools. Habitats within this entire portion of the stream had heavy silt deposits, with visibility less than 3 cm. Gear was fished for roughly 2.5 hours, capturing 2 nonnative species, LECY(14.3%) and AMNA (85.7%; Table 81). No native species were captured or observed. Table 81 provides a summary of effort and capture data for the site.

The greatest threat to GINI in the East Verde River at this time appears to be crayfish and nonnative fish. Common plants along the drainage included Arizona alder, cottonwood, willow, sycamore and Arizona ash. The only wildlife observations recorded for surveys along this reach were crayfish.

East Verde River below East Verde Park 2

September 22, 2014

Upper Boundary: 12S 465143E, 3793845N

Lower Boundary: 464962E, 3793385N

On September 22, 2014 Department personnel conducted a 500-m survey along the middle East Verde River (Appendix B, Fig. 38), Gila County, N of Payson, AZ. East Verde River flows in a westerly direction to its confluence with the Verde River, roughly 21 km SW of Payson. The target species for East Verde River is GINI.

No GINI were sampled or seen during survey efforts at this site. Several previous attempts to survey the East Verde River had been undertaken, but due to poor water visibility the BPES was not deemed a safe or effective means of sampling the stream, so collapsible hoop and gill nets were used. Habitat within this

portion of the stream consisted primarily of long pools interspersed with boulder riffles; the entire portion of the stream had heavy silt deposits, and visibility was reduced to less than 3 cm. Gear was fished for between 2.5-3 hours, capturing 2 nonnative species, AMNA (86.7%; Table 82) and LECY (6.7%), and the native species PACL (6.7%; Table 83). The one PACL caught was observed to be lightly infected with black grub. Tables 82-83 provide a summary of effort and capture data for the site.

The greatest threat to GINI and other native fishes in the East Verde River at this time appears to be crayfish and nonnative fish. Common plants along the drainage included Arizona alder, cottonwood, willow, sycamore and Arizona ash. The only wildlife observations recorded for surveys along this reach were crayfish.

East Verde River below Gowan Mine

September 22, 2014

Upper Boundary: 12S 460437E, 3788775N

Lower Boundary: 459950E, 3788661N

On September 22, 2014 Department personnel conducted a 500-m survey along the middle East Verde River (Appendix B, Fig. 39), Gila County, N. of Payson, AZ. East Verde River flows in a westerly direction to its confluence with the Verde River, roughly 21 km SW of Payson. The target species for East Verde River is GINI.

No GINI or any other native were sampled or seen during the effort. Several previous attempts to sample the East Verde River had been undertaken, but due to poor water visibility, the BPES was not deemed a safe or effective means of sampling, so collapsible hoop nets were the only sampling gear fished at this site. Habitat within this portion of the stream consisted primarily of long bedrock pools interspersed with long, shallow riffles. The entire length of this survey site also suffered heavy silt deposits, and visibility was less than 6 cm. Gear was fished for roughly 2.5 hours, capturing 2 nonnative species, AMNA (23.5%; Table 84) and LECY (76.5%) with LECY the most common. Table 84 provides a summary of effort and capture data for the site.

The greatest threat to GINI and other native fishes in the East Verde River at this time appears to be crayfish and nonnative fish. Common plants along the drainage included Arizona alder, cottonwood, willow, sycamore and Arizona ash. The only wildlife observations recorded for surveys along this reach were for KISO and crayfish.

East Verde River below Doll Baby Ranch

September 23, 2014

Upper Boundary: 12S 455570E, 3786286N

Lower Boundary: 455208E, 3786687N

On September 23, 2014, Department personnel conducted a survey along lower East Verde River, below the Doll Baby Trail Head (Appendix B, Fig. 40), in Gila County, W. of Payson, AZ. The East Verde River flows in a westerly direction to its confluence with the Verde River, roughly 21 km SW of Payson. The target species for East Verde River is GINI.

No GINI or any other native were sampled or seen during the effort. Several previous attempts to sample the East Verde River had been undertaken. Water visibility (though better than on previous days) was still deemed too poor to effectively or safely use the BPES to sample the site, so collapsible hoop nets were the only sampling gear used. Habitat within this portion of the stream consisted primarily of long shallow pools, interspersed with long, shallow riffles. The entire reach of this survey site also suffered heavy silt deposits, and visibility was less than 10 cm. Gear was fished for approximately 2.0 hours, capturing 4 nonnative species, CYLU (37.5%; Table 85), AMNA (18.8%), PIPR (18.8%) and LECY (25.0%). Table 84 provides a summary of effort and capture data for the site.

The greatest threat to GINI in the East Verde River at this time appears to be crayfish and nonnative fish. Common plants along the drainage included Arizona alder, cottonwood, willow, sycamore and Arizona ash. The only wildlife observations recorded for surveys along this reach were for KISO and crayfish.

East Verde River above LF Ranch

September 29, 2014

Upper Boundary: 12S 452937E, 3787057N

Lower Boundary: 452906E, 3787555N

On September 29, 2014 Department personnel conducted a survey at a second 500-m site along the lower East Verde River, above the LF Ranch (Appendix B, Fig. 41), in Gila County, W. of Payson, AZ. The East Verde River flows in a westerly direction to its confluence with the Verde River, roughly 21 km SW of Payson. The target species for East Verde River is GINI.

No GINI or any other native were sampled or seen during the effort. Several previous attempts to sample the East Verde River had been undertaken, but were postponed due to extremely poor visibility in the stream from high suspended sediments. Storms over the previous weekend had again washed excess sediments into the stream causing extremely high turbidity. Water visibility was still deemed too poor to safely or effectively use the BPES to sample the site, so collapsible hoop nets were the only sampling gear deployed.

Habitat within this portion of the stream consisted primarily of long shallow pools believed to contain good chub habitat, but too difficult to sample effectively with the BPES due to visibility less than 3 cm. Hoop nets were fished for roughly 4.5 hours, capturing 2 nonnative species, AMNA (50.0%) and LECY (50.0%; Table 86). Table 86 provides a summary of effort and capture data for the site.

The greatest threat to GINI in the East Verde River at this time appears to be crayfish and nonnative fish. Common plants along the drainage included Arizona alder, cottonwood, willow, sycamore and Arizona ash. The only wildlife observations recorded for surveys along this reach were for crayfish.

East Verde River below LF Ranch

September 29, 2014

Upper Boundary: 12S 452471E, 3787569N

Lower Boundary: 452008E, 3787724N

On September 29, 2014 Department personnel conducted a survey at a third location along the lower East Verde River, below the LF Ranch (Appendix B, Fig. 41), in Gila County, W. of Payson, AZ. The East Verde River flows in a westerly direction to its confluence with the Verde River, roughly 21 km SW of Payson. The target species for East Verde River is GINI.

No GINI or other native species were sampled or seen during the effort. Several previous attempts to sample the East Verde River had been undertaken. Water visibility was still deemed too poor to effectively or safely use the BPES to sample the site, so collapsible hoop nets were the only sampling gear deployed. Habitat within this portion of the stream consisted primarily of long shallow pools, interspersed with long, shallow riffles; the entire reach of this survey site also suffered heavy silt deposits, and visibility was less than 5 cm. Gear was fished for roughly 4.5 hours, capturing only one species, AMNA (100%; Table 87).

The greatest threat to GINI in the East Verde River at this time appears to be crayfish and nonnative fish. Common plants along the drainage included Arizona alder, cottonwood, willow, sycamore and Arizona ash. The only wildlife observations recorded for surveys along this reach was crayfish.

East Verde River @ First Crossing

October 13, 2014

Upper Boundary: 12S 473364E, 3800149N

Lower Boundary: 473258E, 3800129N

On October 13, 2014 Department personnel conducted a survey on upper East Verde River, adjacent to the First Crossing Campground (Appendix B, Fig. 37), on Tonto National Forest, Gila Co., AZ. The East Verde River flows in a westerly direction to its confluence with the Verde River, roughly 21 km SW of Payson. The target species for East Verde River is GINI.

Due to recent flooding, stream visibility was less than 3-cm and deemed too poor to effectively or safely use the BPES, so sampling was conducted using a straight seine. A 500-m survey was initiated but chub were captured within the first seine haul, so a 100-m quantitative sample reach was established. Five seine hauls were made within the 100-m reach, resulting in the capture of three species of native fishes, RHOS (20.0%), PACL (15.6%) and GINI (64.4%; Table 88). The most common species captured was GINI, with 29 individuals (all juveniles) caught; there were no nonnatives caught at this sample site. Habitat within this portion of the stream consisted almost exclusively of riffle, with silt, sand and gravel substrates. Table 88 provides a summary of effort and capture data for the site.

The greatest threat to GINI and other native fishes in the East Verde River at this time and location appears to be crayfish. Common plants along the drainage included Arizona alder, oak, juniper, willow, sycamore and Arizona ash. The only wildlife observations recorded for surveys along this reach were for KISO and crayfish.

Upper Verde River – South of Packard Ranch 1

October 06, 2014

Upper Boundary: 12S 402051E, 3856595N

Lower Boundary: 401951E, 3856395N

On October 6, 2014, Department personnel conducted a survey at the lower section of the Upper Verde River at the coordinates described above. The section of river chosen for this portion of the monitoring effort is roughly 9.3 km N of Clarkdale, Yavapai County, AZ. (Appendix B, Fig. 42), and lies downstream from the confluence with Sycamore Creek. The target species for this section of river was originally GIRO and MEFU, but due to recent stockings (and subsequent monitoring) of GIRO in the upper Verde River, GIRO is not currently a target species for this monitoring project in the upper Verde. All survey efforts were directed towards MEFU and the habitats they were more likely to occupy.

No MEFU were captured or observed in this survey section. A 500-m section of stream was sampled using the BPES. Habitat within the section of stream consisted of run, riffle and pool habitat, with perhaps 60% of total habitat shallow pool. Much of the stream bottom in slower and shallower areas was covered with silt, but in areas of swifter flows cobble and boulder substrates remained relatively clean. Sampling was conducted through this reach using the BPES, resulting in the capture of only two species, MIDO (64.3%; Table 89) and PIPR (35.7%). No native species were seen or caught within this reach. The most abundant of the two species was MIDO, with a total of nine fish caught. Table 89 provides a summary of effort and fish sampled for this site.

The greatest threat to MEFU and other native fishes in the Verde River at this time appears to be nonnative fishes. Streamside plants included Arizona alder, sycamore, spiny hackberry (*Celtis pallida*), the nonnative invasive plant alianthus (*Alianthus altissima*), seep willow, Arizona ash and willow. No wildlife was noted for this site.

Upper Verde River – South of Packard Ranch 2

October 06, 2014

Upper Boundary: 12S 401988E, 3856637N

Lower Boundary: 402335E, 3856961N

On October 6, 2014, Department personnel conducted a second survey in the lower section of the Upper Verde River at the coordinates provided above. The section of river chosen for this portion of the monitoring effort is roughly 9.3 km N of Clarkdale, Yavapai County, AZ. (Appendix B, Fig. 42), and lies downstream from the confluence with Sycamore Creek. The target species for this reach of river was originally GIRO and MEFU, but due to recent stockings (and subsequent monitoring) of GIRO in the Upper Verde River, GIRO for the time being, is not a target species for the GRMP in this section of the river. All efforts were therefore directed towards MEFU and their more likely habitats.

A 500-m section of stream was sampled using the BPES. No MEFU were seen or captured at this site. Habitat within the survey section consisted of run, riffle and pool habitat, with perhaps 50% of the total habitat shallow pool. Much of the stream bottom in slower and shallower stream margins was covered with silt, but in areas of swifter flows cobble and boulder substrates remained relatively clean. Sampling was conducted through this reach using the BPES, resulting in the capture of only two species, MIDO (50.0%) and LECY (50.5%; Table 90), with a total of one of each species being captured. No native species were seen or caught within this survey reach. The two species were equally abundant (or scarce),

each accounting for 50% of the total fish captured. Table 90 provides a summary of effort and fish sampled for this site.

The greatest threat to MEFU and other native fishes in the upper Verde River at this time appears to be nonnative fishes. However, the general paucity of fish in what appears to be suitable habitat in this reach of stream suggests the possibility of other factors affecting the native and nonnative fish community in this section of the Verde River. Streamside plants included Arizona alder, sycamore, spiny hackberry (*Celtis pallida*), the nonnative invasive plant alianthus (*Alianthus altissima*), seep willow, Arizona ash and willow. No wildlife was noted for this site.

Upper Verde River – South of Packard Ranch 3

October 06, 2014

Upper Boundary: 12S 402491E, 3857078N

Lower Boundary: 402812E, 3856828N

On October 6, 2014, Department personnel conducted a survey along the lower section of the Upper Verde River at the coordinates described above. The section of river chosen for this portion of the monitoring effort is roughly 9.3 km N of Clarkdale, Yavapai County, AZ. (Appendix B, Fig. 42), and lies downstream from the confluence with Sycamore Creek. The target species for this reach of river was originally GIRO and MEFU, but due to recent stockings (and subsequent monitoring) of GIRO in the Upper Verde River, for the time being it is not a target species for the GRMP in this section of river. All efforts were therefore directed towards MEFU.

A 500-m section of stream was sampled using the BPES, no MEFU were captured or observed within this survey section of stream. The majority of habitat within the survey section consisted primarily of run, with little pool and riffle habitats. Substrates were largely of cobble and boulder, with little silt deposited due to water velocity. Sampling was conducted through this reach using the BPES, resulting in the capture of five species, GIRO (4.0%; Table 91), MIDO (28.0%), CYLU (60.0%), LECY (4.0%) and AMNA (4.0%). Red shiner (CYLU) were the most common of the five species sampled, with 15 individual fish caught. Table 91 provides a summary of effort and capture data for this site.

The greatest threat to MEFU and other native fishes in the upper Verde River at this time appears to be nonnative fishes. However, the general paucity of all fish species in what appears to be suitable habitat in this reach of stream suggests the possibility of other factors affecting the aquatic community in this section of the Verde River. Streamside plants included Arizona alder, sycamore, Spiny hackberry (*Celtis pallida*), the nonnative invasive plant alianthus (*Alianthus altissima*), seep willow, salt cedar, Arizona ash and willow. No wildlife was noted for this site.

Upper Verde River – Perkinsville below bridge

October 07, 2014

Upper Boundary: 12S 389801E, 3862080N

Lower Boundary: 390195E, 3862392N

On October 7, 2014, Department personnel conducted a survey along the middle section of the Upper Verde River at the coordinates described above. The section of river chosen for this portion of the

monitoring effort is roughly 21 km NW of Clarkdale, Yavapai County, AZ. (Appendix B, Fig. 43), and lies 1 km upstream from Perkinsville. The target species for this reach of river was originally GIRO and MEFU, but due to recent stockings (and subsequent monitoring) of GIRO in the Upper Verde River, for the time being it is not a target species for the GRMP in this section of river. All efforts were therefore directed towards MEFU.

A 500-m section of stream was sampled using the BPES with a total expended effort of 2472 seconds; no MEFU were captured or seen in this section of river. Efforts with the BPES resulted in the capture of seven species (Table 92), including four native species. Habitat throughout the reach was primarily riffle and run, with predominate substrates of cobble and boulder. Species caught during the sampling effort included RHOS (25.7%; Table 92), PACL (6.75%), CAIN (8.1%), GIRO (10.8%), CYLU (31.1%), PIPR (6.8%) and MIDO (10.8%). In slower and shallower areas the stream bottom was covered with silt, but in areas of swifter flows, cobble and boulder substrates remained clean. The two most abundant species (CYLU and RHOS), were found almost exclusively in an area of shallow flow over clean sand, immediately adjacent to the Perkinsville bridge. Table 92 provides a summary of effort and capture data for the site.

The greatest threat to MEFU and other native fishes in the upper Verde River at this time appears to be nonnative fishes. Streamside plants included Arizona alder, sycamore, black walnut, Arizona ash and willow. No wildlife was noted for this site.

Upper Verde River – Perkinsville above bridge

October 07, 2014

Upper Boundary: 12S 389141E, 3861938N

Lower Boundary: 389623E, 3861983N

On October 7, 2014, Department personnel conducted a survey along the middle section of the Upper Verde River at the coordinates described above. The section of river chosen for this portion of the monitoring effort is roughly 21 km NW of Clarkdale, Yavapai County, AZ (Appendix B, Fig. 43), and lies 1.8 km SW (upstream) from Perkinsville. The target species for this reach of river was originally GIRO and MEFU, but due to recent stockings (and subsequent monitoring) of GIRO in the Upper Verde River, for the time being it is not a target species for the GRMP in this section of river. All efforts were therefore directed towards MEFU.

A 500-m section of stream was sampled using the BPES with a total expended effort of 1332 seconds, that resulted in the capture of eight species (Table 93), including three native species. No MEFU were captured or observed at this survey site. Habitat throughout the reach was a series of fast flowing runs, riffles and pools, with predominate substrates of gravel and small cobble. Species captured included one each of the native sucker species PACL (2.1%; Table 93) and CAIN (2.1%) and 5 GIRO (10.4%). Nonnative species were most common, with CYLU accounting for the majority of nonnatives sampled (39.6%), and the remainder being comprised of LECY (10.4%) , AMNA (2.1%), PIPR (2.1%) and MIDO (31.2%). Table 93 provides a summary of effort and capture data for the site.

The greatest threat to MEFU and other native fishes in the upper Verde River at this time appears to be nonnative fishes. Streamside plants included Arizona alder, sycamore, black walnut, Arizona ash and willow. Signs of wildlife in the area included willow chewed down along the stream by beaver and extensive sign of otter instream and along the banks, within the upper 150-m of the survey reach.

Upper Verde River – U.S. Mine

October 07, 2014

Upper Boundary: 12S 385002E, 3863548N

Lower Boundary: 385350E, 3863586N

On October 7, 2014, Department personnel conducted a survey along the middle section of the Upper Verde River at the coordinates described above. The section of river chosen for this portion of the monitoring effort is roughly 24 km NW of Clarkdale, Yavapai County, AZ. (Appendix B, Fig. 44), and lies 6 km W (upstream) of Perkinsville. The target species for this reach of river were originally GIRO and MEFU, but due to recent stockings (and subsequent monitoring) of GIRO in the Upper Verde River, for the present, GIRO is not a target species for the GRMP in this section of the river. All efforts were therefore directed towards MEFU and their more likely habitats.

A 500-m section of stream was surveyed using the BPES with a total expended effort of 1537 seconds; no MEFU were seen or sampled at this survey site. Sampling efforts resulted in the capture of six species including the native sucker PACL (2.3%; Table 94), CYLU (72.1%), LECY (11.6%), GAUF (7.1%) and MIDO (4.6%); also caught was a highly piscivorous species we had not yet seen in the upper Verde at previous sites, PYOL (2.3%; Appendix C, Photo 99). Habitat throughout the site was primarily run and pool, connected by short stretches of riffle, with predominate substrates of cobble and boulder. The prevalent species sampled was CYLU, with one PACL the only native fish sampled in the reach. Table 96 provides a summary of effort and capture data for the site.

The greatest threat to MEFU and other native fishes in the upper Verde River at this time appears to be nonnative fishes. Streamside plants included Arizona alder, sycamore, black walnut, Arizona ash and willow. No wildlife was noted for this site.

Upper Verde River – Pipeline Road 1

October 08, 2014

Upper Boundary: 12S 374601E, 3861065N

Lower Boundary: 375019E, 3861201N

On October 8, 2014, Department personnel conducted a survey the upper section of the Upper Verde River at the coordinates described above. The section of river chosen for this portion of the monitoring effort is roughly 32 km NW of Clarkdale and 9km E of Paulden, Yavapai County, AZ., at FR638/Pipeline Road (Appendix B, Fig. 45). The target species for this reach of river was originally GIRO and MEFU, but due to recent stockings (and subsequent monitoring) of GIRO in the Upper Verde River, GIRO is not a target species for GRMP monitoring at the present in this section of river. All efforts were therefore directed towards MEFU and their more likely habitats.

A 500-m section of stream was surveyed using the BPES, with a total sampling effort of 2576 seconds. The majority of habitat within the survey section consisted of run, riffle and small pools, with almost all substrates throughout the reach sand or silt. Sampling was conducted throughout the reach exclusively using the BPES, resulting in the capture of seven species (Table 95).

No MEFU were seen or sampled at this survey site. Species sampled included MIDO (50.8% of total catch; Table 95), AMNA (2.6%), CYLU (35.6%), LECY (3.1%), GAFF (3.1%); the only native species caught were PACL (3.1%) and CAIN (1.6%). The two suckers combined accounted for less than 5% of all fish caught during this effort. Table 95 provides a summary of effort and capture data for the site.

The greatest threat to MEFU and other native fishes in the upper Verde River at this time appears to be nonnative fishes. Streamside plants included Arizona alder, sycamore, black walnut, Arizona ash and willow. No wildlife was noted for this site.

Upper Verde River – Pipeline Road 2

October 08, 2014

Upper Boundary: 12S 373899E, 3861236N

Lower Boundary: 374407E, 3861125N

On October 8, 2014, Department personnel conducted a survey the upper section of the Upper Verde River at the coordinates described above. The section of river chosen for this portion of the monitoring effort is roughly 32 km NW of Clarkdale and 9 km E of Paulden, Yavapai County, AZ., at FR638-Pipeline Rd. (Appendix B, Fig. 45). The target species for this reach of river were originally GIRO and MEFU, but due to recent stockings (and subsequent monitoring) of GIRO in the Upper Verde River, GIRO is not a target species for GRMP monitoring at the present in this section of river. All efforts were therefore directed towards MEFU and their more likely habitats.

A 500-m section of stream was sampled exclusively with the BPES. Habitat within the survey section consisted of approximately 50% pool habitat that did not provide good habitat for MEFU; the other 50% was comprised of riffle and run, with clean sand and gravel substrates. Survey efforts resulted in the capture of five species, two of them native suckers (Table 96).

No MEFU were caught or seen in this section of river. Species that were sampled included CYLU (49.2%; Table 92), MIDO (33.8%), CAIN (4.6%), AMNA (7.7%), and PACL (4.6%). Red shiner (CYLU) accounted for nearly half of all fish captured in this reach. Three adult CAIN and three juvenile PACL were also captured at this site, and were the only native species captured. Table 96 provides a summary of effort and capture data for the site.

The greatest threat to MEFU and other native fishes in the upper Verde River at this time appears to be nonnative fishes. Streamside plants included Arizona alder, sycamore, black walnut, Arizona ash and willow. No wildlife was noted for this site.

Upper Verde River – Pipeline Road 3

October 08, 2014

Upper Boundary: 12S 373292E, 3860995N

Lower Boundary: 373720E, 3861251N

On October 8, 2014, Department personnel conducted a survey the upper section of the Upper Verde River at the coordinates described above. The section of river chosen for this portion of the monitoring effort is roughly 32 km NW of Clarkdale and 9 km E of Paulden, Yavapai County, AZ., at FR638-Pipeline Rd. (Appendix B, Fig. 45). The target species for this reach of river were originally GIRO and MEFU, but due to recent stockings (and subsequent monitoring) of GIRO in the Upper Verde River, GIRO is not currently a target species for GRMP monitoring in this section of river. All efforts were therefore directed towards MEFU and their more likely habitats.

A 500-m section of stream was sampled using the BPES. Habitat within the survey section consisted of approximately 50% pool habitat that did not provide good habitat for MEFU; the other 50% was comprised of riffle and run, with clean sand and gravel substrates. Sampling was conducted exclusively with the BPES, resulting in the capture of four species, one of them comprised of a single adult CAIN; species captured included MIDO (68.8%; Table 97), CAIN (1.3%), AMNA (1.3%), and GAAP (28.6%). MIDO accounted for the greatest number of fish caught (n=53), followed by GAAP. Table 97 provides a summary of effort and capture data for the site.

The greatest threat to MEFU and other native fishes in the upper Verde River at this time appears to be nonnative fishes. Streamside plants included Arizona alder, sycamore, black walnut, Arizona ash and willow. No wildlife was noted for this site.

Whitewater Creek NM @ The Catwalk

October 30, 2014

Upper Boundary: 12S 373292E, 3860995N

Lower Boundary: 373720E, 3861251N

On October 30, 2014, Department personnel conducted a survey along Whitewater Creek, Catron County, NM, at the coordinates described above. The section of stream chosen for this portion of the monitoring effort is roughly 7.3 km NNE of Glenwood NM, Catron County, NM, at the Catwalk Trailhead (Appendix B, Fig. 46). The target species for this reach of river was TICO.

Only one section of stream was sampled for TICO in Whitewater Creek, because the stream above the site selected was steep and canyon-bound, appearing unsuitable for the species. Stream below the site was either dry or private property for which we could not obtain permission from the landowner to sample. Also, U.S. Forest personnel had sampled for trout up through the canyon reaches above this site earlier in the year, and found it fishless.

A 500-m section of stream was selected for sampling adjacent to and below the Whitewater Trailhead. Habitat within the survey section consisted of run and riffle habitat; the only pool habitat was a connected backwater adjacent to the road into the Whitewater picnic area, and was estimated to be less than 5% of total habitat sampled. Substrates were almost entirely comprised of unconsolidated cobble, small boulder and large gravel. Sampling was conducted exclusively with the BPES and block net, with a total of 1969

seconds of effort expended and no fish captured or observed (Table 98); TICO was not found in the sample reach. Table 98 provides a summary of effort for the site.

There may be plans to stock the upper drainage of Whitewater Creek with trout sometime in the near future. Habitat at the sample site appears excellent for TICO, and an effort should be made to assess the site for TICO stocking. Streamside plants included sycamore, narrow-leaf cottonwood (*Populus angustifolia*), juniper and willow. No wildlife was noted for this site.

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Appendix A: Tables

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

Appendix B: Maps

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

Appendix C: Site Photographs

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

Appendix A

Tables

2014

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Common Name	Scientific Name	Species Code
Longfin dace	<i>Agosia chrysogaster</i>	AGCH
Sonoran sucker	<i>Catostomus insignis</i>	CAIN
Desert sucker	<i>Pantosteus clarki</i>	PACL
Headwater chub	<i>Gila nigra</i>	GINI
Roundtail chub	<i>Gila robusta</i>	GIRO
Gila chub	<i>Gila intermedia</i>	GIIN
Gila topminnow	<i>Poeciliopsis occidentalis</i>	POOC
Speckled dace	<i>Rhynchithys osculus</i>	RHOS
Spikedace	<i>Meda fulgida</i>	MEFU
Flathead catfish	<i>Pylodictus olivaris</i>	PYOL
Channel catfish	<i>Ictalurus punctatus</i>	ICPU
Yellow bullhead	<i>Amiurus natalis</i>	AMNA
Green sunfish	<i>Lepomis cyanellus</i>	LECY
Bluegill	<i>Lepomis macrochirus</i>	LEMA
Smallmouth bass	<i>Micropterus dolomieu</i>	MIDO
Largemouth bass	<i>Micropterus salmoides</i>	MISA
Rainbow trout	<i>Oncorhynchus mykiss</i>	ONMY
Brown Trout	<i>Salmo trutta</i>	SATR
Fathead minnow	<i>Pimephales promelas</i>	PIPR
Red shiner	<i>Cyprinnella lutrensis</i>	CYLU
Common carp	<i>Cyprinus carpio</i>	CYCA
Mosquitofish	<i>Gambusia affinis</i>	GAAF
American bullfrog	<i>Lithobates (Rana) catesbiana</i>	RACA

Table 1. List of species sampled in the Gila River Basin Monitoring in 2014, their scientific names and 4-letter species codes.

Common Name	Scientific Name	Species Code
Mexican Gartersnake	<i>Thamnophis equus</i>	THEQ
Narrow-headed gartersnake	<i>Thamnophis rufipunctatus</i>	THRU
Sonoran tiger salamander	<i>Ambystoma mavortium stebbinsi</i>	AMMA
Sonoran mud turtle	<i>Kinosternon sonoriense</i>	KISO

Table 1. (cont.) List of species sampled in the Gila River Basin Monitoring in 2014, their scientific names and 4-letter species codes.

Site/Species	AGCH	CAIN	GIIN	GINI	GIRO	MEFU	PACL	POOC	RHOS	AMNA	CYCA	CYLU	GAAF	ICPU	LECY	LEMA	MIDO	MISA	ONMY	PIPR	PYOL	SATR
Salt River1-2	-	14	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	5	-	-	-	-
Salt River1-3	-		-	-	-	-	-	-	-	1	1	-	-	-		2	-	4	-	-	-	-
Salt River2-2	-	87	-	-	-	-	1	-	-	6	8	-	-	-	4	17	-	21	-	-	-	-
Salt River2-3	-	31	-	-	-	-	-	-	-	2	3	-	1	-	-	-	-	-	-	-	-	-
Salt River3-2	-	12	-	-	-	-	-	-	-	-	2	-		-	2	1	-	14	-	-	-	-
Salt River3-3	-	12	-	-	-	-	6	-	-	-	2	-	-	-	-	-	-	5	-	-	-	-
Tonto Creek1-2	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	71
TontoCreek1-3	-	-	-	-	-	-	4	-	-	-	-	-	-	-	1	-	-	-	23	-	-	14
Tonto Creek2-2	-	11	-	-	-	-	-	-	-	12	6	47	8	1	30	1	4	-	-	-	-	-
Tonto Creek2-3	6	2	-	-	-	-	-	-	-	26	-	565	2	-	27	-	3	-	-	26	-	-
Tonto Creek3-2	13	4	-	-	-	-	16	-	-	33	-	114	1	-	2	-	-	-	-	26	-	-
Tonto Creek3-3	14	2	-	-	-	-	23	-	-	6	-	95	-	-	4	-	-	-	-	6	-	-
Redrock Canyon-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Redrock Canyon-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sonoita Creek-2	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sonoita Creek-3	-	-	-	-	-	-	-	-	-	18			337	1	-	-	-	3	-	-	1	
Deadman_1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Deadman_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
East Verde1_2	-	-	-	29	-	-	7	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-
Haigler Creek1_1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37	-	-	19
Haigler Creek1_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	158	-	-	

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).

Site/Species	AGCH	CAIN	GIIN	GINI	GIRO	MEFU	PACL	POOC	RHOS	AMNA	CYCA	CYLU	GAAF	ICPU	LECY	LEMA	MIDO	MISA	ONMY	PIPR	PYOL	SATR
Haigler Creek1_3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	135	-	-	16
Haigler Creek 2	-	-	-	41	-	-	4	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-
Upper Verde3_1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	5	-	-
Upper Verde3_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-
Upper Verde3_3	-	-	-	-	1	-	-	-	-	1	-	15	-	-	1	-	7	-	-	-	-	-
Upper Verde2_1	-	6	-	-	8	-	5	-	19	-	-	23	-	-	-	-	8	-	-	5	-	-
Upper Verde2_2	-	1	-	-	5	-	1	-	-	1	-	19	-	-	5	-	15	-	-	1	-	-
Upper Verde2_3	-	-	-	-	-	-	1	-	-	-	-	31	3	-	5	-	2	-	-	-	-	-
Upper Verde1_1	-	3	-	-	-	-	6	-	-	5	-	68	6	-	6	-	97	-	-	-	-	-
Upper Verde1_2	-	3	-	-	-	-	3	-	-	5	-	32	-	-	-	-	22	-	-	-	-	-
Upper Verde1_3	-	1	-	-	-	-	-	-	-	1	-	-	22	-	-	-	53	-	-	-	-	-
Walker Creek	-	-	31	-	-	-	40	-	276	-	-	-	-	-	-	-	-	-	-	-	-	-
Morgan City Wash	33	-	-	-	-	-	-	193	-	-	-	-	-	-	8	-	-	-	-	-	-	-
Chalky Spring	-	-	-	-	-	-	-	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bass Canyon	-	7	106	-	-	-	4	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-
East Verde3_1	-	-	-	-	-	-	-	-	-	3	-	6	-	-	4	-	-	-	-	3	-	-
East Verde3_2	-	-	-	-	-	-	-	-	-	3	-	-	-	-	3	-	-	-	-	-	-	-
East Verde3_3	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
East Verde2_1	-	-	-	-	-	-	-	-	-	18	-	-	-	-	3	-	-	-	-	-	-	-
East Verde2_2	-	-	-	-	-	-	1	-	-	3	-	-	-	-	1	-	-	-	-	-	-	-
East Verde2_3	-	-	-	-	-	-	-	-	-	8	-	-	-	-	28	-	-	-	-	-	-	-

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

Site/Species	AGCH	CAIN	GIIN	GINI	GIRO	MEFU	PACL	POOC	RHOS	AMNA	CYCA	CYLU	GAAF	ICPU	LECY	LEMA	MIDO	MISA	ONMY	PIPR	PYOL	SATR
Spring Creek1	-	-	-	102	-	-	138	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-
Spring Creek2	-	-	-	25	-	-	2	-	-	22	-	-	-	-	25	-	-	-	-	-	-	-
Cottonwood Spring	-	-	-	-	-	-	-	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Monkey Spring	-	-	-	-	-	-	-	275	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Salome Creek_1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	209	-	-	-	-	-	-	-
Salome Creek_2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	148	-	-	-	-	-	-	-
Salome Creek_3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Wet Beaver Creek2_1	-	-	-	-	-	-	9	-	-	-	-	-	-	-	13	-	171	-	4	-	-	-
Wet Beaver Creek2_2	-	-	-	-	-	-	56	-	-	-	-	-	-	-	-	-	102	-	4	-	-	-
Wet Beaver Creek2_3	-	-	-	-	-	-	19	-	-	-	-	-	-	-	-	-	164	-	-	-	-	-
Wet Beaver Creek3_1	-	-	-	-	-	-	-	-	-	-	-	55	-	-	-	6	-	-	-	-	-	-
Wet Beaver Creek3_2	-	-	-	-	-	-	-	-	-	-	-	64	-	-	1	-	-	1	-	-	-	-
Wet Beaver Creek3_1	-	-	-	-	-	-	1	-	-	-	-	38	-	-	-	4	5	6	-	-	-	-
Santa Cruz River_3	-	-	-	-	-	-	-	-	-	-	-	-	118	-	35	-	-	-	-	-	-	-
Santa Cruz River_2	-	-	-	-	-	-	-	-	-	-	-	-	106	-	100	-	-	-	-	-	-	-
Sheehy Spring_1	-	-	90	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-
West Clear Creek1	-	-	-	-	75	-	6	-	66	-	-	-	-	-	-	-	-	-	1	-	-	3
West Clear Creek2	-	-	-	-	30	-	2	-	24	-	-	-	-	-	-	-	-	-	3	-	-	-
West Clear Creek3	-	-	-	-	-	-	1	-	-	2	-	-	-	-	3	-	30	-	2	-	-	-
Spring Creek	-	-	112	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Whitewater Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MISA	1	4	999	0.004	50.00
CYCA	1	1	999	0.001	12.50
AMNA	1	1	999	0.001	12.50
LEMA	1	2	999	0.002	25.00
TOTAL		8	999	0.008	100

Table 3. Salt River east of Guest Ranch - summary of effort and catch data for canoe electrofishing within a 500-m qualitative survey for the Upper Reach of the lower Salt River.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CAIN	1	14	2073	0.007	63.64
MISA	1	5	2073	0.002	22.73
LECY	1	1	2073	0.000	4.55
LEMA	1	2	2073	0.001	9.09
TOTAL		22	2073	0.011	100

Table 4. Salt River south of Guest Ranch - summary of effort and catch data for canoe electrofishing within a 500-m qualitative survey for the Upper Reach of the lower Salt River.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CAIN	0	1	2840	0.000	0.69
CAIN	1	86	2840	0.030	59.72
PACL	1	1	2840	0.000	0.69
LEMA	1	17	2840	0.006	11.81
MISA	0	3	2840	0.001	2.08
MISA	1	18	2840	0.006	12.50
CYCA	1	8	2840	0.003	5.56
LECY	1	4	2840	0.001	2.78
AMNA	1	6	2840	0.002	4.17
TOTAL		144	2840	0.051	100

Table 5. Salt River at Foxtail Administrative Site - summary of effort and catch data for canoe electrofishing within a 500-m qualitative survey for the Middle Reach of the lower Salt River.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CAIN	1	31	1112	0.028	83.78
CYCA	1	3	1112	0.003	8.11
GAAF	N/A	1	1112	0.001	2.70
AMNA	1	2	1112	0.002	5.41
TOTAL		37	1112	0.033	100

Table 6. Salt River at Bluepoint Administrative Site – summary of effort and catch data for canoe electrofishing within a 500-m qualitative survey for Middle Reach of the lower Salt River.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MISA	0	3	1517	0.002	9.68
MISA	1	11	1517	0.007	35.48
LECY	1	2	1517	0.001	6.45
LEMA	1	1	1517	0.001	3.23
CYCA	1	2	1517	0.001	6.45
CAIN	1	12	1517	0.008	38.71
TOTAL		31	1517	0.020	100

Table 7. Salt River at Phon D. Sutton – summary of effort and catch data for canoe electrofishing within a 500-m qualitative survey for Lower Reach of the lower Salt River.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CYCA	1	2	884	0.002	8.00
CAIN	1	12	884	0.014	48.00
MISA	0	2	884	0.002	8.00
MISA	1	3	884	0.003	12.00
PACL	1	6	884	0.007	24.00
TOTAL		25	884	0.028	100

Table 8. Salt River below Verde Confluence - summary of effort and catch data for canoe electrofishing within a 500-m qualitative survey for the Lower Reach of the lower Salt River.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
0000	N/A	0	5	2.00	0.000	0.00
TOTAL		0	5	2.00	0.000	0

Table 9. Deadman Cr. at Confluence – summary of effort and catch data for hoop nets within a 500-m qualitative survey for Deadman Cr. at the South Fork confluence.

Species	Age class	Fish captured	Effort (Total m²)	CPUE (fish/m²)	% of total catch
0000	N/A	0	8	0.000	0.00
TOTAL		0	8	0.000	0

Table 10. Deadman Cr. at Confluence – summary of effort and catch data for straight seine hauls within a 500-m qualitative survey of Deadman Cr. at the South Fork confluence.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
0000	N/A	0	4	14.00	0.000	0.00
TOTAL		0	4	14.00	0.000	0

Table 11. South Fork Deadman Cr. – summary of effort and catch data for hoop nets within a 500-m qualitative survey at upper South Fork Deadman Cr.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
0000	N/A	0	1	2	0	0
TOTAL		0	1	2	0	0

Table 12. South Fork Deadman Cr. – summary of effort and catch data for 100 ft. gill net within a 500-m qualitative survey at upper South Fork Deadman Cr.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
0000	N/A	0	6	3.83	0.000	0.00
TOTAL		0	6	3.83	0.000	0

Table 13. Tonto Creek below Camp Tontozona – summary of effort and catch data for hoop nets within a 500-m qualitative survey.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
PACL	1	1	1583	0.001	1.35
SATR	0	53	1583	0.033	71.62
SATR	1	18	1583	0.011	24.32
ONMY	1	2	1583	0.001	2.70
TOTAL		74	1583	0.047	100

Table 14. Tonto Creek below Camp Tontozona – summary of effort and catch data for BPES within a 500-m qualitative survey.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
LECY	1	1	8	46.46	0.022	100.00
TOTAL		1	8	46.46	0.022	100

Table 15. Tonto Cr. at Bear Flats Campground - summary of effort and catch data for hoop nets within a 500-m qualitative survey.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
SATR	0	9	2202	0.004	21.95
SATR	1	5	2202	0.002	12.20
ONMY	0	1	2202	0.000	2.43
ONMY	1	22	2202	0.009	53.66
PACL	1	4	2202	0.002	9.76
TOTAL		41	2202	0.019	100

Table 16. Tonto Cr. at Bear Flats Campground - summary of effort and catch data for BPES within a 500-m qualitative survey.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
LECY	1	2	3	13.12	0.152	100.00
TOTAL		2	3	13.12	0.152	100

Table 17. Tonto Creek above Gun Creek Gauge - summary of effort and catch data for hoop nets within a 500-m qualitative survey.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CYLU	N/A	114	2673	0.043	55.07
AMNA	1	33	2673	0.012	15.94
PIPR	N/A	26	2673	0.010	12.56
AGCH	N/A	13	2673	0.005	6.28
CA spp.	0	16	2673	0.006	7.73
CAIN	1	4	2673	0.001	1.93
GAAF	N/A	1	2673	0.000	0.48
TOTAL		207	2673	0.077	100

Table 18. Tonto Creek above Gun Creek Gauge - summary of effort and catch data BPES within a 500-m qualitative survey.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CYLU	N/A	95	1130	0.084	63.33
AGCH	N/A	14	1130	0.012	9.33
PIPR	N/A	6	1130	0.005	4.00
CA spp.	0	23	1130	0.020	15.33
CAIN	1	2	1130	0.002	1.33
LECY	1	4	1130	0.004	2.67
AMNA	1	6	1130	0.005	4.00
TOTAL		150	1130	0.133	100

Table 19. Tonto Creek below the Narrows – summary of effort and catch data BPES within a 500-m qualitative survey.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CAIN	1	11	1933	0.006	9.17
LECY	1	30	1933	0.016	25.00
AMNA	1	12	1933	0.006	10.00
ICPU	1	1	1933	0.001	0.83
MIDO	1	4	1933	0.002	3.33
CYCA	1	6	1933	0.003	5.00
CYLU	N/A	47	1933	0.024	39.17
GAAF	N/A	8	1933	0.004	6.67
LECY/LEMA	1	1	1933	0.001	0.83
TOTAL		120	1933	0.062	100

Table 20. Tonto Creek above The Box - summary of effort and catch data for BPES within a 500-m qualitative survey.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CAIN	1	2	1976	0.001	0.30
AGCH	N/A	6	1976	0.003	0.91
MIDO	1	3	1976	0.002	0.46
CYLU	N/A	565	1976	0.286	86.00
AMNA	1	26	1976	0.013	3.96
LECY	1	27	1976	0.014	4.11
PIPR	N/A	26	1976	0.013	3.96
GAAF	N/A	2	1976	0.001	0.30
TOTAL		657	1976	0.332	100

Table 21. Tonto Creek above Gisela - summary of effort and catch data for BPES within a 500-m qualitative survey.

Species	Age class	Fish captured	Effort (# of 1m sweeps)	CPUE (fish/??)	% of total catch
0000	N/A	0	24	0.000	0
TOTAL		0	24	0.000	0

Table 22. Redrock Canyon at Pig Camp – summary of effort and catch data for dipnet within a 500-m survey reach.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
0000	N/A	0	2	2.42	0.000	0.00
TOTAL		0	2	2.42	0.000	0

Table 23. Redrock Canyon at The Falls - summary of effort and catch data for minnow traps within a 500-m survey reach.

Species	Age class	Fish captured	Effort (# of m ² hauls)	CPUE (fish/m ²)	% of total catch
0000	N/A	0	55	0.000	0
TOTAL		0	55	0.000	0

Table 24. Redrock Canyon at The Falls - summary of effort and catch data for dipnet within a 500-m survey reach.

Species	Age class	Fish captured	Effort (# of m ² hauls)	CPUE (fish/m ²)	% of total catch
AGCH	N/A	46	169	0.272	100
TOTAL		46	169	0.272	100

Table 25. Sonoita Creek below Highway 82 bridge summary of effort and catch data for dipnet within a 500-m survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
GAAF	N/A	337	1463	0.230	93.61
AMNA	1	18	1463	0.012	5.00
ICPU	1	1	1463	0.001	0.28
PYOL	1	1	1463	0.001	0.28
MISA	1	3	1463	0.002	0.83
TOTAL		360	1463	0.246	100

Table 26. Sonoita Creek below Patagonia Lake - summary of effort and catch data for BPES within a 500-m qualitative survey.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MIDO	1	30	2810	0.011	78.95
PACL	1	1	2810	0.000	2.63
ONMY	1	2	2810	0.001	5.26
LECY	1	3	2810	0.001	7.89
AMNA	1	2	2810	0.001	5.26
TOTAL		38	2810	0.014	100

Table 27. West Clear Creek below Bullpen - summary of effort and catch data for BPES within a 500-m qualitative survey.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
ONMY	1	3	17	41.84	0.072	9.09
GIRO	1	23	17	41.84	0.550	69.70
PACL	1	2	17	41.84	0.048	6.06
RHOS	N/A	5	17	41.84	0.120	15.15
TOTAL		33	11	41.84	0.789	100

Table 28. West Clear Creek @ Cash Tank Trail- summary of effort and catch data for collapsible hoop nets within a 178-m quantitative sample.

Species	Age class	Fish captured	Time (hour)	CPUE (fish/hour)	% of total catch
GIRO	1	4	1	4.000	100.00
TOTAL		4	1	4.000	100

Table 29. West Clear Creek @ Cash Tank Trail- summary of effort and catch for angling effort within a 178-m quantitative sample; time is estimate made on site.

Species	Age class	Fish observed	Effort (mins)	CPUE (fish/min)	% of total catch
RHOS	N/A	21	10	2.100	75.00
GIRO	0	7	10	0.700	25.00
TOTAL		28	10	2.800	100

Table 30. West Clear Creek @ Cash Tank Trail- summary visual observation within a 100-m quantitative sample.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
PACL	1	3	24	66.58	0.045	21.43
GIRO	1	9	24	66.58	0.135	64.29
RHOS	N/A	1	24	66.58	0.015	7.14
ONMY	1	1	24	66.58	0.015	7.14
TOTAL		14	24	66.58	0.210	100

Table 31. West clear Creek below FR 142F – summary of effort and catch data for collapsible hoop nets within a 500-m qualitative sample.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
RHOS	N/A	65	11	28.34	2.294	57.52
GIRO	0	36	11	28.34	1.270	31.86
PIPR	N/A	12	11	28.34	0.423	10.62
TOTAL		113	11	28.34	3.987	100

Table 32. West clear Creek below FR 142F – summary of effort and catch data for collapsible hoop nets within a 500-m qualitative sample.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
GIRO	1	5	1	3.5	1.429	45.45
SATR	1	3	1	3.5	0.857	27.27
PACL	1	3	1	3.5	0.857	27.27
TOTAL		11	1	3.5	3.143	100

Table 33. West clear Creek below FR 142F – summary of effort and catch data for 100ft gill net within a 500-m qualitative sample.

Species	Age class	Fish captured	Time (hour)	CPUE (fish/hour)	% of total catch
GIRO	1	2	0.75	2.667	100.00
TOTAL		2	0.75	2.667	100

Table 34. West clear Creek below FR 142F – summary of effort and catch data for angling within a 500-m qualitative sample

Species	Age class	Fish observed	Effort (mins)	CPUE (fish/min)	% of total catch
GIRO	1	18	10	1.800	78.26
GIRO	0	5	10	0.500	21.74
TOTAL		23	10	2.300	100

Table 35. West clear Creek below FR 142F – summary of visual observation within a 500-m qualitative sample

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
LECY	1	7	15	263.76	0.027	5.60
GAAF	N/A	118	15	263.76	0.447	94.40
TOTAL		125	15	263.76	0.474	100

Table 36. Upper Santa Cruz River at Humphrey's Corrals - summary of effort and catch data for minnow traps within a 500-m qualitative survey.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
LECY	1	28	15	263.90	0.106	100.00
TOTAL		28	15	263.90	0.106	100

Table 37. Upper Santa Cruz River at Humphrey's Corrals - summary of effort and catch data for collapsible hoop nets within a 500-m qualitative survey.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
LECY	1	4	20	428.59	0.009	3.28
LECY	0	12	20	428.59	0.028	9.84
GAAF	N/A	106	20	428.59	0.247	86.89
TOTAL		122	20	428.59	0.285	100

Table 38. Upper Santa Cruz River above Bridge 8169 - summary of effort and catch data for minnow traps within a 500-m qualitative survey.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
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LECY	1	82	20	429.89	0.191	97.62
LECY	0	2	20	429.89	0.005	2.38
TOTAL		84	20	429.89	0.195	100

Table 39. Upper Santa Cruz River above Bridge 8169 - summary of effort and catch data for hoop nets within a 500-m qualitative survey.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
GIIN	1	9	15	350.47	0.026	45.00
GIIN	0	5	15	350.47	0.014	25.00
GAAF	N/A	6	15	350.47	0.017	30.00
TOTAL		20	15	350.47	0.057	100

Table 40. Sheehy Spring – summary of effort and catch data for minnow traps within a 100-m quantitative sample at Sheehy Spring.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
GIIN	1	73	11	257.55	0.283	96.05
GIIN	0	3	11	257.55	0.012	3.95
TOTAL		76	11	257.55	0.295	100

Table 41. Sheehy Spring - summary of effort and catch data for hoop nets within a 100-m quantitative sample at Sheehy Spring.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
GIIN	1	112	6	14.10	7.943	99.12
RHOS	N/A	1	6	14.10	0.071	0.88
TOTAL		113	6	14.10	8.014	100

Table 42. Spring Creek (Verde R. drainage) – summary of effort and catch data for large hoop nets within a 100-m quantitative sample reach.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
0000	N/A	0	4	14.00	0.000	0.00
TOTAL		0	4	14.00	0.000	0

Table 43. Spring Creek (Verde R. drainage) – summary of effort and catch data for collapsible hoop nets within a 100-m quantitative sample reach.

Species	Age class	Fish captured	Effort (# of m² hauls)	CPUE (fish/m²)	% of total catch
POOC	N/A	43	96	0.448	100
TOTAL		43	96	0.448	100

Table 44. Cottonwood Spring (Sonoita Cr. drainage) - summary of effort and catch data for dip net sweeps within a 100-m quantitative sample.

Species	Age class	Fish captured	Effort (# of m² hauls)	CPUE (fish/m²)	% of total catch
POOC	N/A	26	47	0.553	100.00
TOTAL		26	47	0.553	100

Table 45. Monkey Spring – summary of effort and catch data for dip net sweeps in a 100-m quantitative sample.

Species	Age class	Fish captured	Effort (# of m² hauls)	CPUE (fish/m²)	% of total catch
POOC	N/A	196	18	10.889	100.00
TOTAL		196	18	10.889	100

Table 46. Monkey Spring – summary of effort and catch data for straight seine hauls within a 100-m quantitative sample reach.

Species	Age class	Fish captured	Effort (# of m ² hauls)	CPUE (fish/m ²)	% of total catch
POOC	N/A	12	14	0.857	100
TOTAL		12	14	0.857	100

Table 47. Chalky Spring – summary of effort and catch data for aquarium net sweeps within a 100-m quantitative sample reach.

Species	Age class	Fish captured	Effort (# of m ² hauls)	CPUE (fish/m ²)	% of total catch
POOC	N/A	26	24	1.083	100.00
TOTAL		26	24	1.083	100

Table 48. Chalky Spring - summary of effort and catch data for straight seine hauls within a 100-m quantitative sample reach.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
POOC	N/A	193	15	86.29	2.237	82.48
AGCH	N/A	33	15	86.29	0.382	14.10
LECY	0	1	15	86.29	0.012	0.43
LECY	1	7	15	86.29	0.081	2.99
TOTAL		234	15	86.29	2.712	100

Table 49. Morgan City Wash - summary of effort and catch data for minnow traps within a 100-m quantitative sample reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
GIIN	1	26	2144	0.012	7.60
RHOS	N/A	276	2144	0.129	80.70
PACL	0	3	2144	0.001	0.88
PACL	1	37	2144	0.017	10.82
TOTAL		342	2144	0.160	100

Table 50. Walker Creek – summary of effort and catch data for BPES within a 100-m quantitative sample reach.

Species	Age class	Fish observed	Effort (mins)	CPUE (fish/min)	% of total catch
GIIN	1	5	5.35	0.935	100.00
TOTAL		5	5.35	0.935	100

Table 51. Walker Creek – summary of visual observation data within a 100-m quantitative sample reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
ONMY	1	37	2381	0.016	66.07
SATR	1	19	2381	0.008	33.93
TOTAL		56	2381	0.024	100

Table 52. Haigler Creek at Fisherman's Point – summary of effort and capture data for BPES for 500-m qualitative survey.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
0000	N/A	0	11	4.00	0.000	0.00
TOTAL		0	11	4.00	0.000	0

Table 53. Haigler Creek at Fisherman's Point – summary of effort and capture data for collapsible hoop nets for 500-m qualitative survey.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
ONMY	0	44	3603	0.012	27.85
ONMY	1	114	3603	0.032	72.15
TOTAL		158	3603	0.044	100

Table 54. Haigler Creek at The Bridge - summary of effort and capture data for BPES for 500-m qualitative survey.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
ONMY	0	38	3000	0.013	24.68
ONMY	1	97	3000	0.032	62.99
SATR	0	12	3000	0.004	7.79
SATR	1	4	3000	0.001	2.60
RHOS	N/A	3	3000	0.001	1.95
TOTAL		154	3000	0.051	100

Table 55. Haigler Creek at Alderwood Campground - summary of effort and capture data for BPES within a 500-m qualitative survey.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
0000	N/A	0	4	3.58	0.000	0.00
TOTAL		0	4	3.58	0.000	0

Table 56. Haigler Creek at Alderwood Campground - summary of effort and capture data for collapsible hoop nets within a 500-m qualitative survey.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hour)	% of total catch
GINI	1	29	17	38.92	0.713	80.56
LECY	0	4	17	38.92	0.103	11.11
LECY	1	3	17	38.92	0.131	8.33
TOTAL		36	17	38.92	0.947	100

Table 57. Lower Haigler Creek – summary of effort and catch data for collapsible hoop nets within a 600-m survey reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hour)	% of total catch
LECY	1	2	4	9.12	0.217	100
TOTAL		2	4	9.12	0.217	100

Table 58. Lower Haigler Creek – summary of effort and catch data for minnow traps within a 600-m survey reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hour)	% of total catch
GINI	1	8	1	2.33	3.433	61.54
PACL	1	4	1	2.33	1.717	30.77
LECY	1	1	1	2.33	0.429	7.69
TOTAL		13	1	2.33	5.579	100

Table 59. Lower Haigler Creek – summary of effort and catch data for 100ft. gill net within a 600-m survey reach.

Species	Age class	Fish captured	Time (hour)	CPUE (fish/hour)	% of total catch
GINI	1	4	0.5	8	100
TOTAL		4	0.5	8	100

Table 60. Lower Haigler Creek – summary of effort and catch data for angling within a 600-m survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
GINI	1	25	2428	0.010	33.78
PACL	1	2	2428	0.001	2.70
AMNA	0	6	2428	0.002	8.11
AMNA	1	16	2428	0.007	21.62
LECY	0	13	2428	0.005	17.57
LECY	1	12	2428	0.005	16.22
TOTAL		74	2428	0.030	100

Table 61. Spring Creek at Brady Canyon – summary of effort and capture data for BPES within a 100-m quantitative sample reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hour)	% of total catch
GINI	0	4	19	57.82	0.069	1.57
GINI	1	104	19	57.82	1.799	40.94
PACL	0	9	19	57.82	0.156	3.54
PACL	1	127	19	57.82	2.197	50
RHOS	N/A	10	19	57.82	0.173	3.94
TOTAL		254	19	57.82	4.393	100

Table 62. Spring Creek below Spring Creek Ranch - summary of effort and capture data for collapsible hoop nets within a 100-m quantitative sample reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CYLU	N/A	55	1826	0.030	90.16
LEMA	N/A	6	1826	0.003	9.84
TOTAL		61	1826	0.033	100

Table 63. Wet Beaver below Montezuma Castle 1 - summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CYLU	N/A	64	1529	0.042	98.46
MISA	N/A	1	1529	0.001	1.54
TOTAL		65	1529	0.043	100

Table 64. Wet Beaver below Montezuma Castle 2 - summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
LECY	1	1	5	26.58	0.038	100.00
TOTAL		1	5	26.58	0.038	100

Table 65. Wet Beaver below Montezuma Castle 2 - summary of effort and capture data for collapsible hoop nets within a 500-m qualitative survey reach.

Species	Age class	Fish	Nets	Net	CPUE	% of total
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		captured	set	hours	(fish/net hour)	catch
0000	N/A	0	23	4.87	0.000	0.00
TOTAL		0	23	4.87	0.000	0

Table 66. Wet Beaver above Montezuma Castle - summary of effort and capture data for collapsible hoop nets within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MISA	0	1	673	0.001	1.85
MISA	1	5	673	0.007	9.26
LEMA	0	2	673	0.003	3.70
LEMA	1	2	673	0.003	3.70
CYLU	0	38	673	0.056	70.37
MIDO	0	3	673	0.004	5.56
MIDO	1	2	673	0.003	3.70
PACL	0	1	673	0.001	1.85
TOTAL		54	673	0.080	100

Table 67. Wet Beaver above Montezuma Castle - summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MIDO	0	102	4306	0.024	51.78
MIDO	1	69	4306	0.016	35.03
LECY	0	1	4306	0.000	0.51
LECY	1	12	4306	0.003	6.09
PACL	0	1	4306	0.000	0.51
PACL	1	8	4306	0.002	4.06
ONMY	1	4	4306	0.001	2.03
TOTAL		197	4306	0.046	100

Table 68. Wet Beaver at Lawrence Crossing - summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
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MIDO	0	49	4373	0.011	30.25
MIDO	1	53	4373	0.012	32.72
ONMY	1	4	4373	0.001	2.47
PACL	0	2	4373	0.000	1.23
PACL	1	54	4373	0.012	33.33
TOTAL		162	4373	0.037	100

Table 69. Wet Beaver at Beaver Creek Campground - summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MIDO	0	42	3860	0.011	22.95
MIDO	1	122	3860	0.032	66.67
PACL	1	19	3860	0.005	10.38
TOTAL		183	3860	0.047	100

Table 70. Wet Beaver below Beaver Creek Ranch- summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hour)	% of total catch
LECY	1	132	9	22.38	5.898	100
TOTAL		132	9	22.38	5.898	100

Table 71. Salome E. of JR Ranch - summary of effort and capture data for collapsible hoop nets within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Nets set	Net hours	CPUE (fish/net hour)	% of total catch
LECY	1	6	1	1	6	100
TOTAL		6	1	1	6	100

Table 72. Salome E. of JR Ranch - summary of effort and capture data for 100ft. gill net within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Time (hour)	CPUE (fish/hour)	% of total catch
LECY	1	71	1	71	100
TOTAL		71	1	71	100

Table 73. Salome E. of JR Ranch - summary of effort and capture data for angling within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hour)	% of total catch
LECY	0	19	10	27.75	0.728	12.84
LECY	1	129	10	27.75	4.776	87.16
TOTAL		148	10	27.75	5.504	100.00

Table 74. Salome SE of JR Ranch - summary of effort and capture data for collapsible hoop nets within a 500-m qualitative survey reach.

Species	Age Class	Fish captured	Effort (# of m ² hauls)	CPUE (fish/m ²)	% of total catch
LECY	0	1	5	0.2	100
TOTAL		1	5	0.2	100

Table 75. Salome Creek above The Jug - summary of effort and capture data for straight seine hauls within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Time (hour)	CPUE (fish/hour)	% of total catch
LECY	1	1	0.5	2	100
TOTAL		1	0.5	2	100

Table 76. Salome Creek above The Jug - summary of effort and capture data for angling within a 500-m qualitative survey reach.

Species	Age	Fish	Effort	CPUE	% of total
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	class	captured	(sec)	(fish/sec)	catch
GIIN	0	44	2132	0.021	35.77
GIIN	1	62	2132	0.029	50.41
CAIN	1	7	2132	0.003	5.69
RHOS	N/A	5	2132	0.002	4.07
PACL	1	5	2132	0.002	4.07
TOTAL		123	2132	0.058	100

Table 77. Bass Canyon - summary of effort and capture data for BPES within a 100-m quantitative sample reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hr)	% of total catch
RHOS	N/A	11	3	54.12	0.204	100
TOTAL		11	3	54.12	0.204	100

Table 78. East Verde River above Water Wheel – summary of effort and capture data for minnow traps within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hr)	% of total catch
GINI	1	3	15	295.83	0.010	14.29
PACL	1	13	15	295.83	0.043	61.90
RHOS	N/A	4	15	295.83	0.015	19.05
ONMY	1	1	15	295.83	0.003	4.76
TOTAL		21	15	295.83	0.070	100

Table 79. East Verde River above Water Wheel – summary of effort and capture data for collapsible hoop nets within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hr)	% of total catch
GINI	1	3	12	236.95	0.012	6.98

PACL	1	5	12	236.95	0.020	11.63
RHOS	N/A	35	12	236.95	0.152	81.40
TOTAL		43	12	236.95	0.184	100

Table 80. East Verde River above Water Wheel – summary of effort and capture data for large hoop nets within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hour)	% of total catch
AMNA	1	18	11	27.07	0.680	85.71
LECY	0	1	11	27.07	0.036	4.76
LECY	1	2	11	27.07	0.072	9.52
TOTAL		21	11	27.07	0.789	100

Table 81. East Verde River below East Verde Park 1 – summary of effort and capture data for collapsible hoop nets within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hour)	% of total catch
AMNA	1	11	7	21.88	0.496	91.67
LECY	1	1	7	21.88	0.047	8.33
TOTAL		12	7	21.88	0.543	100

Table 82. East Verde River below East Verde Park 2 – summary of effort and capture data for collapsible hoop nets within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hour)	% of total catch
AMNA	1	2	1	2.33	0.858	66.67
PACL	1	1	1	2.33	0.429	33.33
TOTAL		3	1	2.33	1.288	100

Table 83. East Verde River below East Verde Park 2 – summary of effort and capture data for 30ft. gill net within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hour)	% of total catch
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AMNA	0	6	9	22.95	0.287	17.65
AMNA	1	2	9	22.95	0.075	5.88
LECY	0	12	9	22.95	0.589	35.29
LECY	1	14	9	22.95	0.641	41.18
TOTAL		34	9	22.95	1.591	100

Table 84. East Verde River below Gowan Mine – summary of effort and capture data for collapsible hoop nets within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hour)	% of total catch
PIPR	N/A	3	12	24.02	0.125	18.75
CYLU	N/A	6	12	24.02	0.25	37.5
LECY	0	2	12	24.02	0.083	12.5
LECY	1	2	12	24.02	0.083	12.5
AMNA	0	3	12	24.02	0.125	18.75
TOTAL		16	12	24.02	0.666	100

Table 85. East Verde River below Doll Baby Ranch – summary of effort and capture data for collapsible hoop nets within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hour)	% of total catch
AMNA	0	1	4	23.98	0.041	16.67
AMNA	1	2	4	23.98	0.082	33.33
LECY	1	3	4	23.98	0.126	50
TOTAL		6	4	23.98	0.249	100

Table 86. East Verde River above LF Ranch – summary of effort and capture data for collapsible hoop nets within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Nets set	Net hours	Mean CPUE (fish/net hour)	% of total catch
AMNA	0	1	4	16.97	0.057	50
AMNA	1	1	4	16.97	0.058	50
TOTAL		2	4	16.97	0.116	50

Table 87. East Verde River below LF Ranch – summary of effort and capture data for collapsible hoop nets within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (# of m ² hauls)	CPUE (fish/m ²)	% of total catch
GINI	0	29	50	0.58	64.44
PACL	0	7	50	0.14	15.56
RHOS	N/A	9	50	0.18	20.00
TOTAL		45	50	0.9	100

Table 88. East Verde River @ First Crossing – summary of effort and capture data for straight seine within a 100-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MIDO	0	3	732	0.004	21.43
MIDO	1	6	732	0.008	42.86
PIPR	0	5	732	0.007	35.71
TOTAL		14	732	0.019	100

Table 89. Upper Verde River – South of Packard Ranch 1 – summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
LECY	1	1	1138	0.001	50.00
MIDO	0	1	1138	0.001	50.00
TOTAL		2	1138	0.002	100

Table 90. Upper Verde River – South of Packard Ranch 2 – summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MIDO	0	5	1605	0.003	20.00

MIDO	1	2	1605	0.001	8.00
CYLU	N/A	15	1605	0.009	60.00
GIRO	1	1	1605	0.001	4.00
LECY	0	1	1605	0.001	4.00
AMNA	1	1	1605	0.001	4.00
TOTAL		25	1605	0.016	100

Table 91. Upper Verde River – South of Packard Ranch 3 – summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CAIN	0	2	2472	0.001	2.70
CAIN	1	4	2472	0.002	5.41
CYLU	N/A	23	2472	0.009	31.08
PIPR	N/A	5	2472	0.002	6.76
GIRO	1	8	2472	0.003	10.81
MIDO	0	7	2472	0.003	9.46
MIDO	1	1	2472	0.000	1.35
RHOS	N/A	19	2472	0.008	25.68
PACL	0	3	2472	0.001	4.05
PACL	1	2	2472	0.001	2.70
TOTAL		74	2472	0.030	100

Table 92. Upper Verde River – Perkinsville below bridge – summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
GIRO	1	5	1332	0.004	10.42
CYLU	N/A	19	1332	0.014	39.58
MIDO	0	8	1332	0.006	16.67
MIDO	1	7	1332	0.005	14.58
PACL	1	1	1332	0.001	2.08
PIPR	N/A	1	1332	0.001	2.08

LECY	0	5	1332	0.004	10.42
AMNA	1	1	1332	0.001	2.08
CAIN	0	1	1332	0.001	2.08
TOTAL		48	1332	0.036	100

Table 93. Upper Verde River – Perkinsville above bridge – summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CYLU	N/A	31	1537	0.020	72.09
GAAF	N/A	3	1537	0.002	6.98
MIDO	0	2	1537	0.001	4.65
PACL	1	1	1537	0.001	2.33
LECY	0	3	1537	0.002	6.98
LECY	1	2	1537	0.001	4.65
PYOL	1	1	1537	0.001	2.33
TOTAL		43	1537	0.028	100

Table 94. Upper Verde River – U.S. Mine – summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MIDO	0	34	2576	0.013	17.80
MIDO	1	63	2576	0.024	32.98
AMNA	0	2	2576	0.001	1.05
AMNA	1	3	2576	0.001	1.57
CYLU	N/A	68	2576	0.026	35.60
LECY	0	6	2576	0.002	3.14
PACL	0	5	2576	0.002	2.62

PACL	1	1	2576	0.000	0.52
GAAF	N/A	6	2576	0.002	3.14
CAIN	1	3	2576	0.001	1.57
TOTAL		191	2576	0.074	100

Table 95. Upper Verde River – Pipeline Rd. 1 – summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
CYLU	N/A	32	1050	0.030	49.23
MIDO	0	12	1050	0.011	18.46
MIDO	1	10	1050	0.010	15.38
AMNA	0	5	1050	0.005	7.69
CAIN	1	3	1050	0.003	4.62
PACL	0	3	1050	0.003	4.62
TOTAL		65	1050	0.062	100

Table 96. Upper Verde River – Pipeline Rd. 2 – summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
MIDO	0	19	1195	0.016	24.68
MIDO	1	34	1195	0.028	44.16
CAIN	1	1	1195	0.001	1.30
AMNA	1	1	1195	0.001	1.30
GAAF	N/A	22	1195	0.018	28.57
TOTAL		77	1195	0.064	100

Table 97. Upper Verde River – Pipeline Rd. 3 – summary of effort and capture data for BPES within a 500-m qualitative survey reach.

Species	Age class	Fish captured	Effort (sec)	CPUE (fish/sec)	% of total catch
0000	N/A	0	1969	0.000	0.00
TOTAL		0	1969	0.000	0

Table 98. Whitewater Creek NM – summary of effort and capture data for BPES and blocking seine within a 500-m qualitative survey reach.

Appendix B

Maps

2014

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04/07/2014

UTM 12S Lower: 450208E, 3713104N

Upper: 450710E, 3713242N

Salt River - South of Guest Ranch (red)

04/07/2014

UTM 12S Lower: 450514E, 3713383N

Upper: 450338E, 3713872N

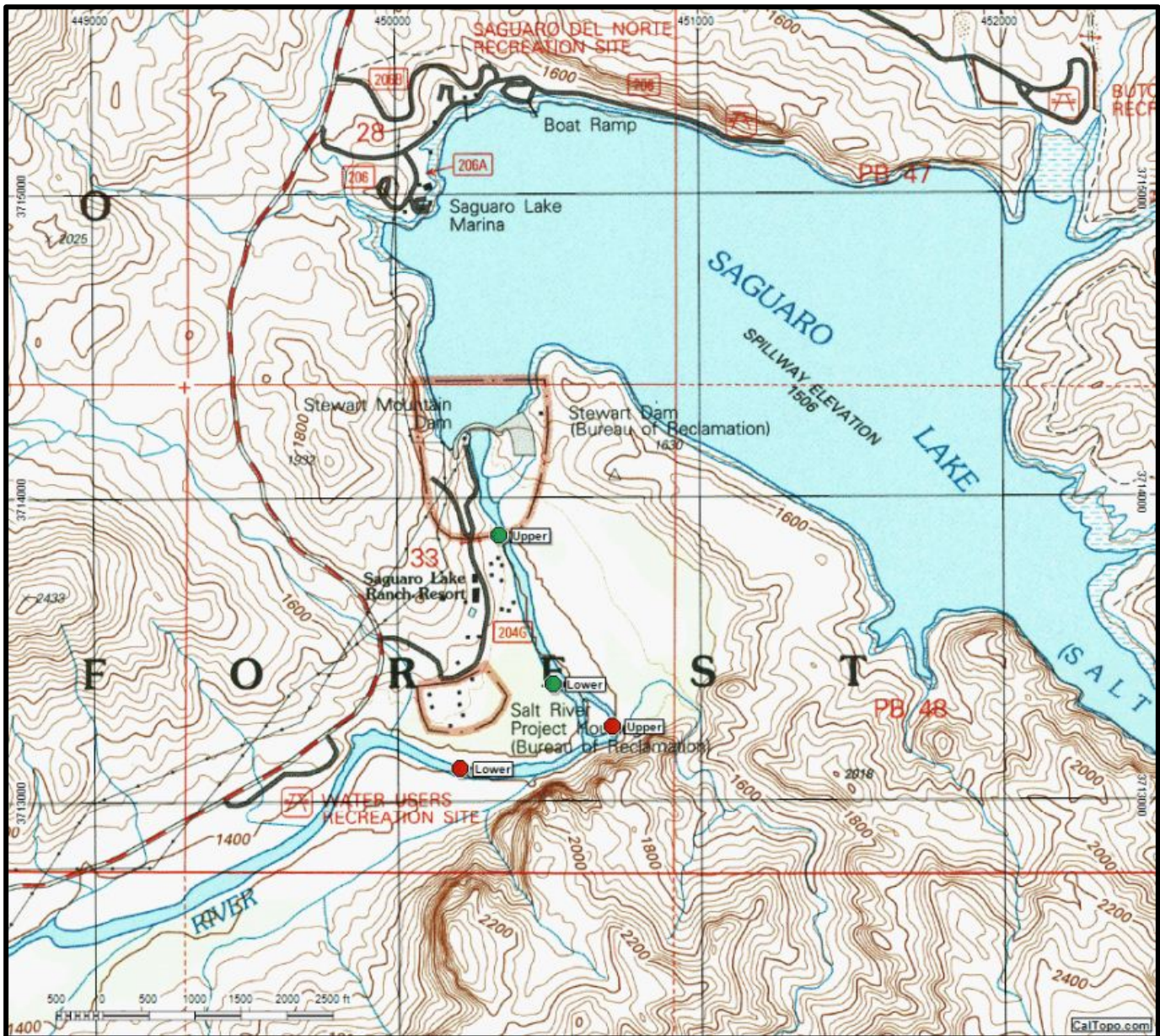


Figure 1. Salt River - East (green) of Guest Ranch and - South (red) of Guest Ranch – 500-m survey sites.

Salt River – Foxtail Administrative Site (red)

04/08/2014

UTM 12S Lower: 443755E, 3712764N

Upper: 443903E, 3712275N

Salt River – Bluepoint Administrative Site (green)

04/08/2014

UTM 12S Lower: 443437E, 3713503N

Upper: 443719E, 3713177N

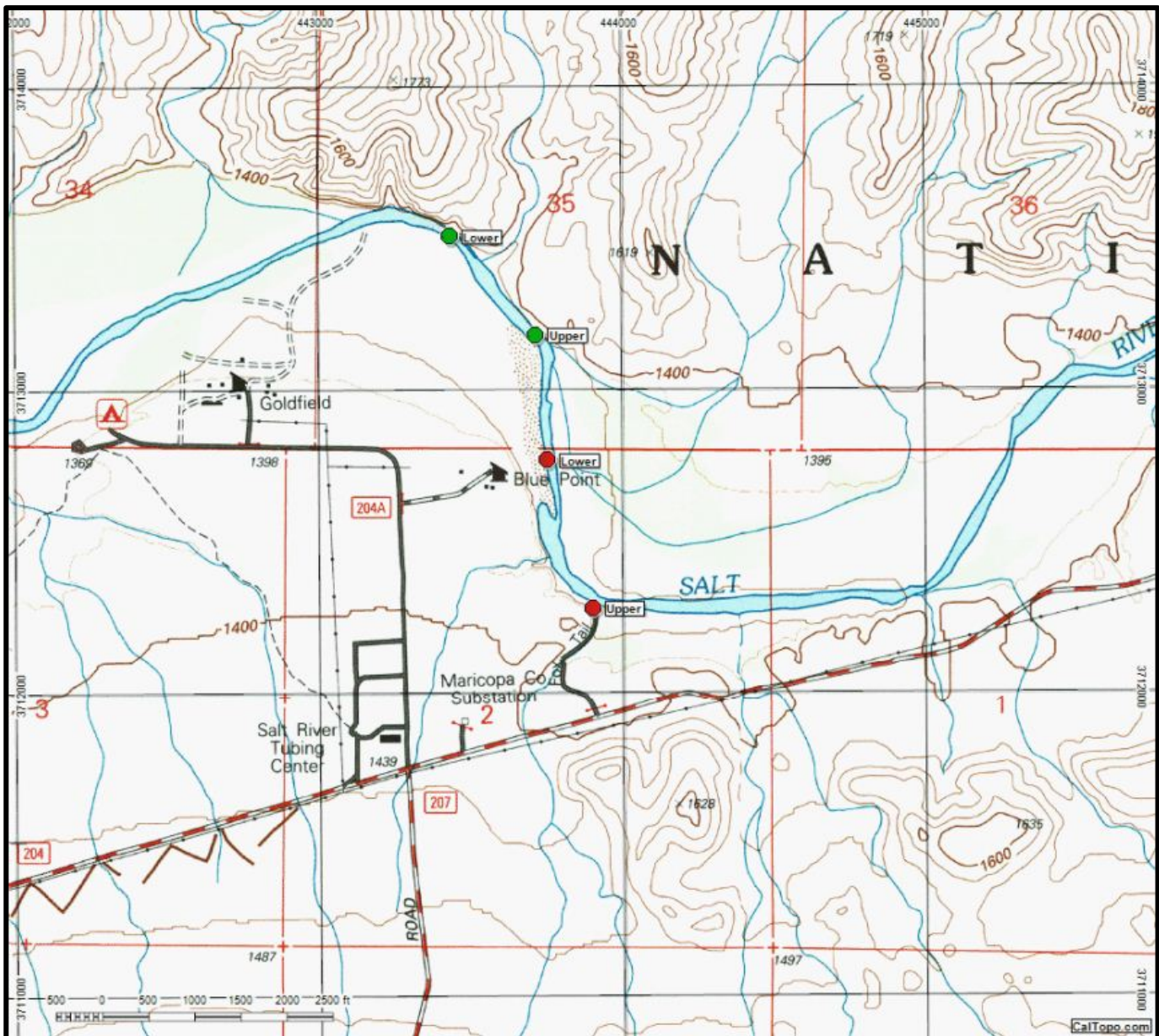


Figure 2. Salt River – Foxtail (red) and Bluepoint (green) Administrative sites – 500-m survey sites, middle reach 2 and 3

Salt River – Phon D. Sutton (green)

04/09/2014

UTM 12S Lower: 438900E, 3712211N

Upper: 439375E, 3712369N

Salt River – Below Verde Confluence (red)

04/09/2014

UTM 12S Lower: 437695E, 3710854N

Upper: 437677E, 3711368N

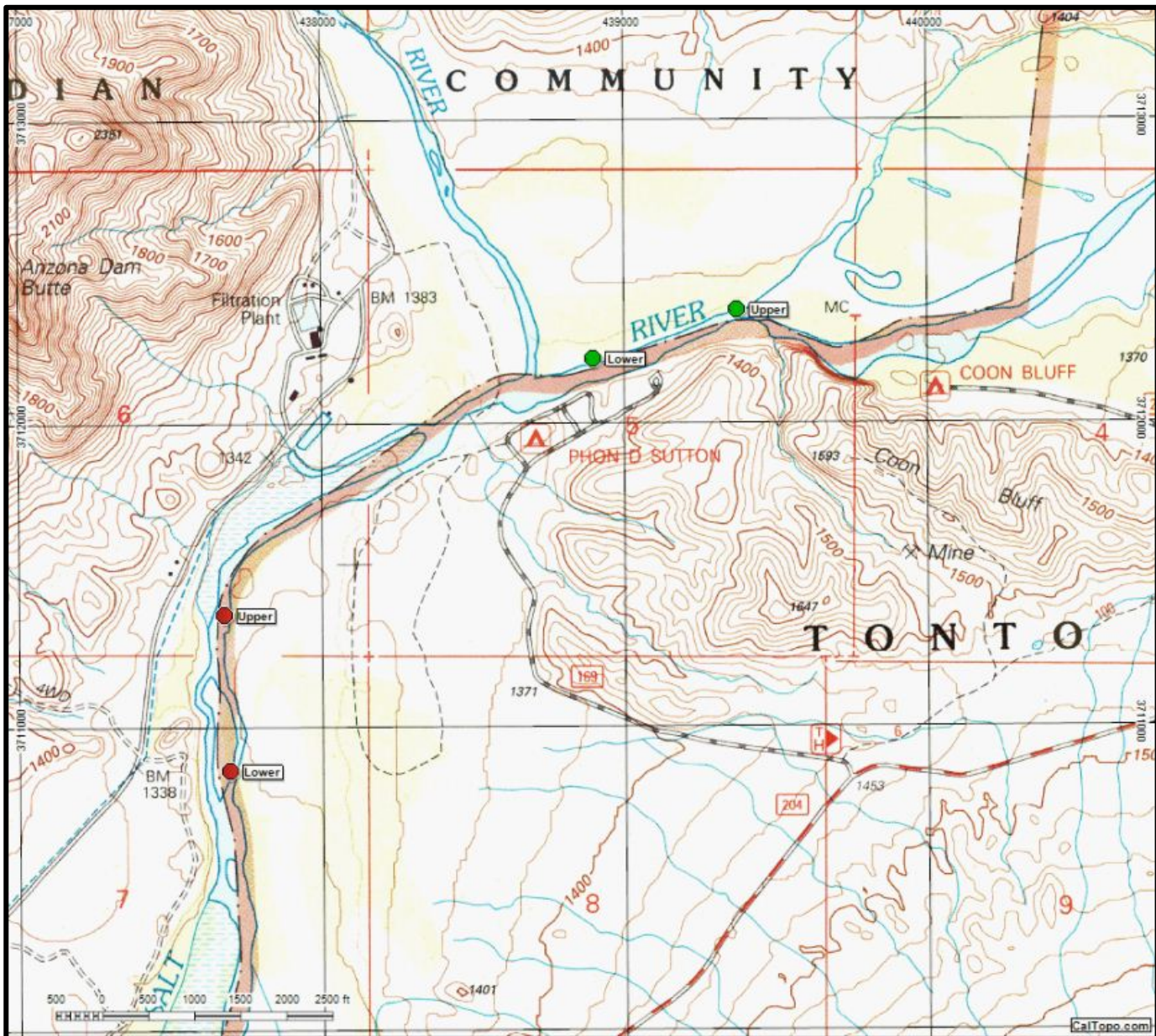


Figure 3. Salt River Phon D. Sutton (green) and below Verde confluence (red) – 500-m survey sites for lower reach 2 and 3

Deadman Creek at South Fork Confluence

04/02/2014

UTM 12S

Lower: 450780E, 3772923N

Upper: 450829E, 3773164N

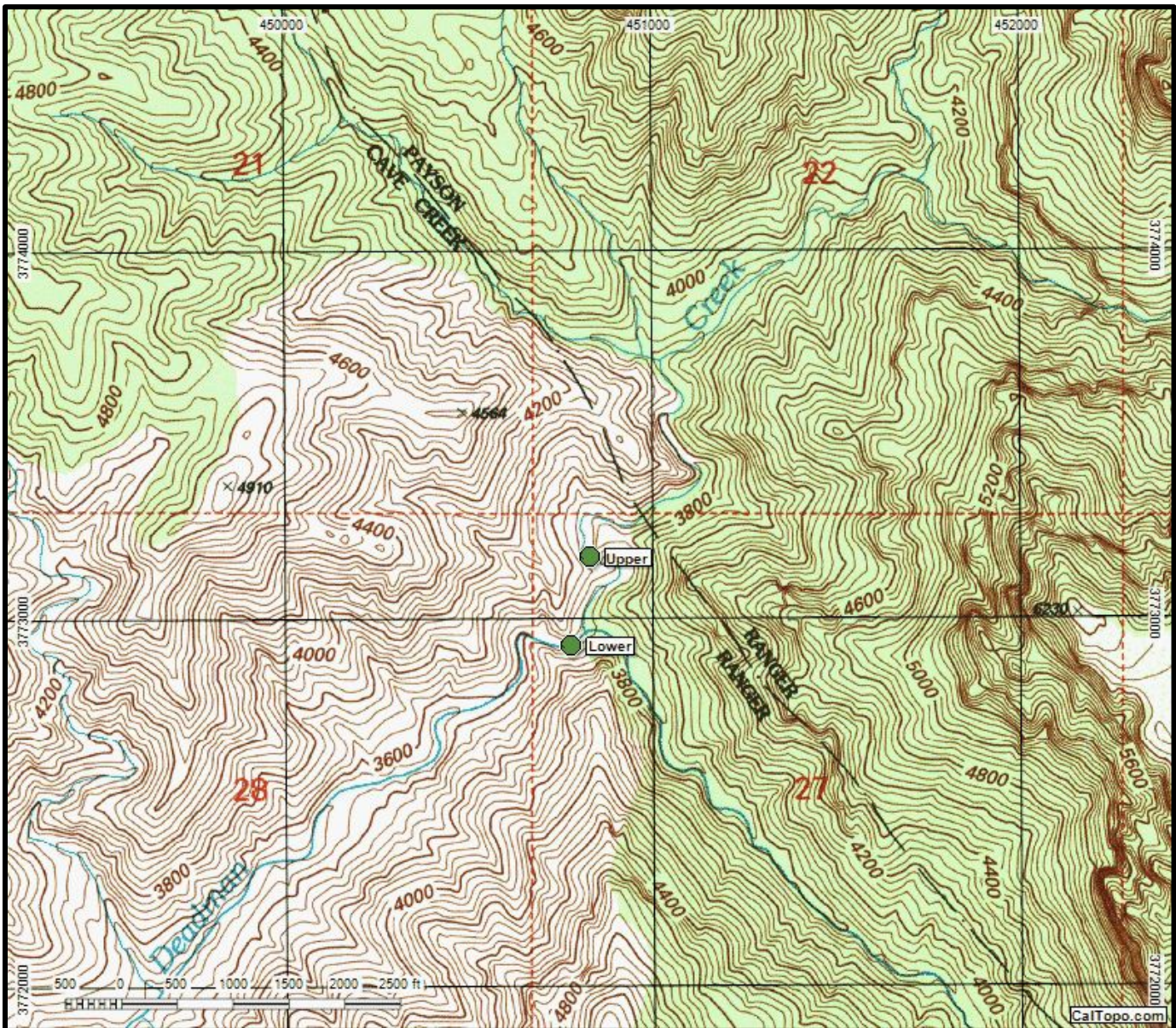


Figure 4. Deadman Creek at S. Fork Confluence – 500-m survey site.

South Fork Deadman Creek

04/02/2014

UTM 12S

Lower: 452599E, 3770469N

Upper: 452891E, 3770077N

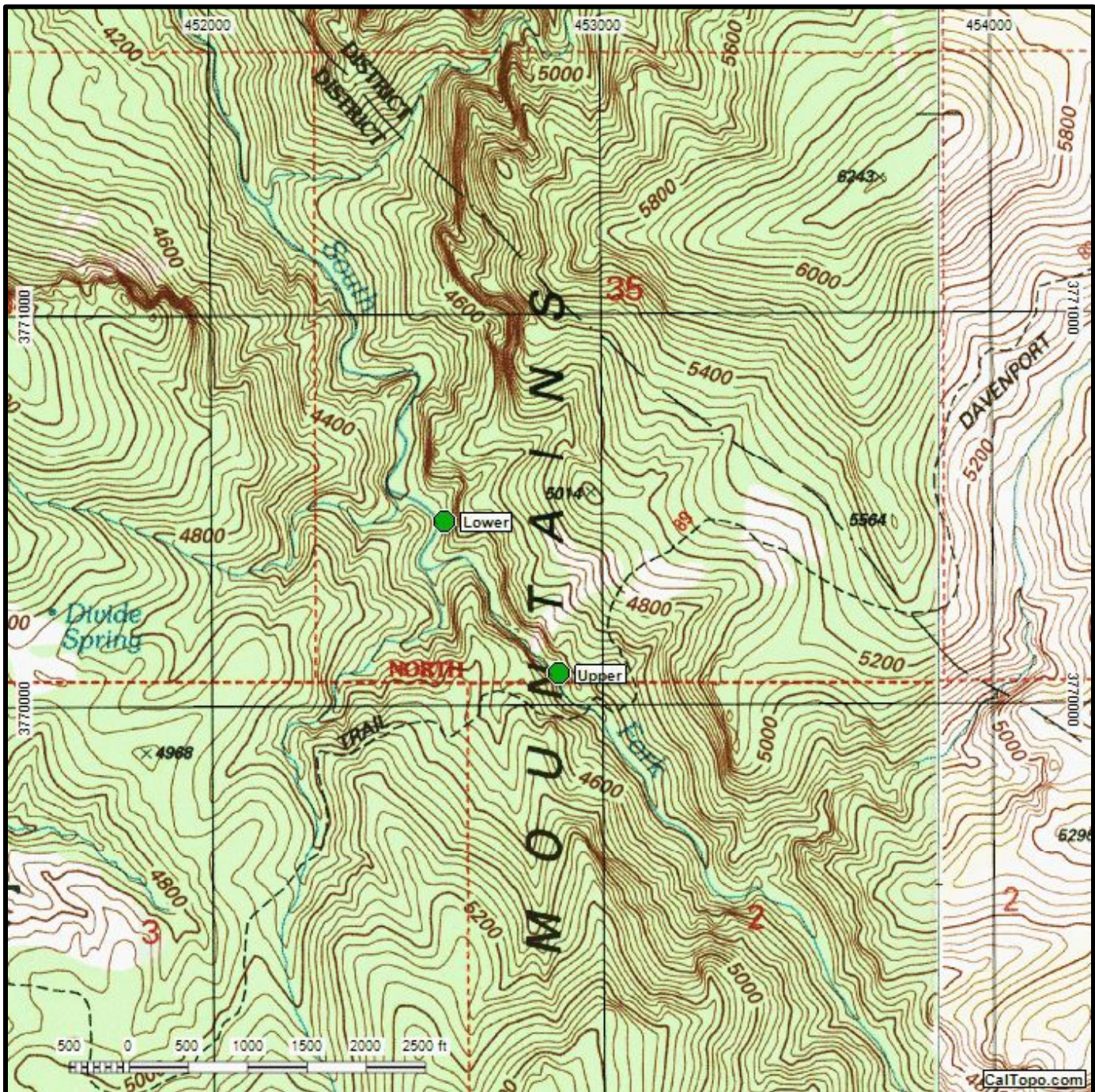


Figure 5. South Fork Deadman Cr. – 500-m survey site.

04/23/2014

UTM 12S

Lower: 492431E, 3797180N

Upper: 492029E, 3797335N

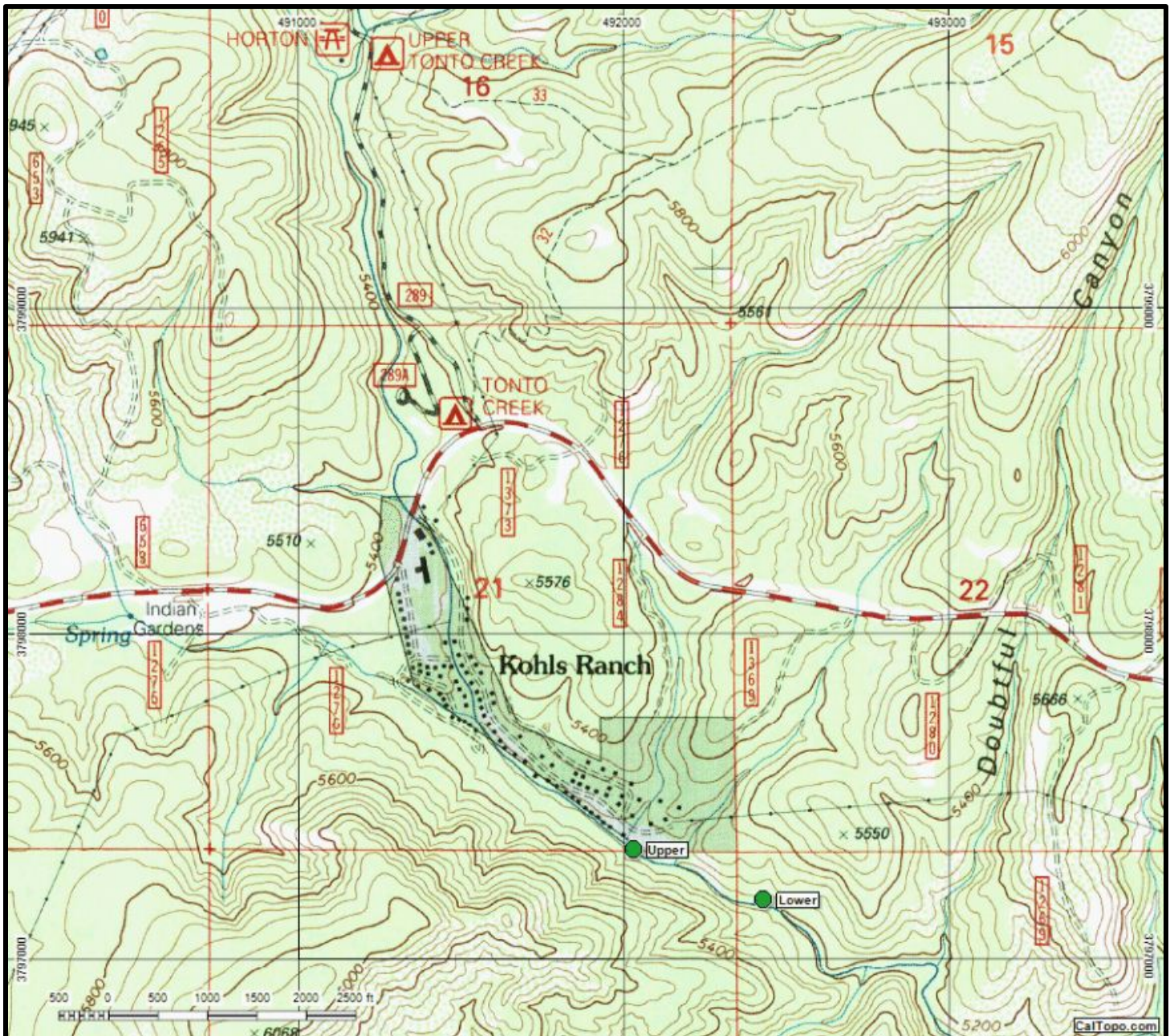


Figure 6. Tonto Cr. below Camp Tontozona – 500-m survey site for upper reach.

Tonto Creek – Bear Flat Campground

04/24/2014

UTM 12S Lower: 493492E, 3793463N

Upper: 493756E, 3793697N

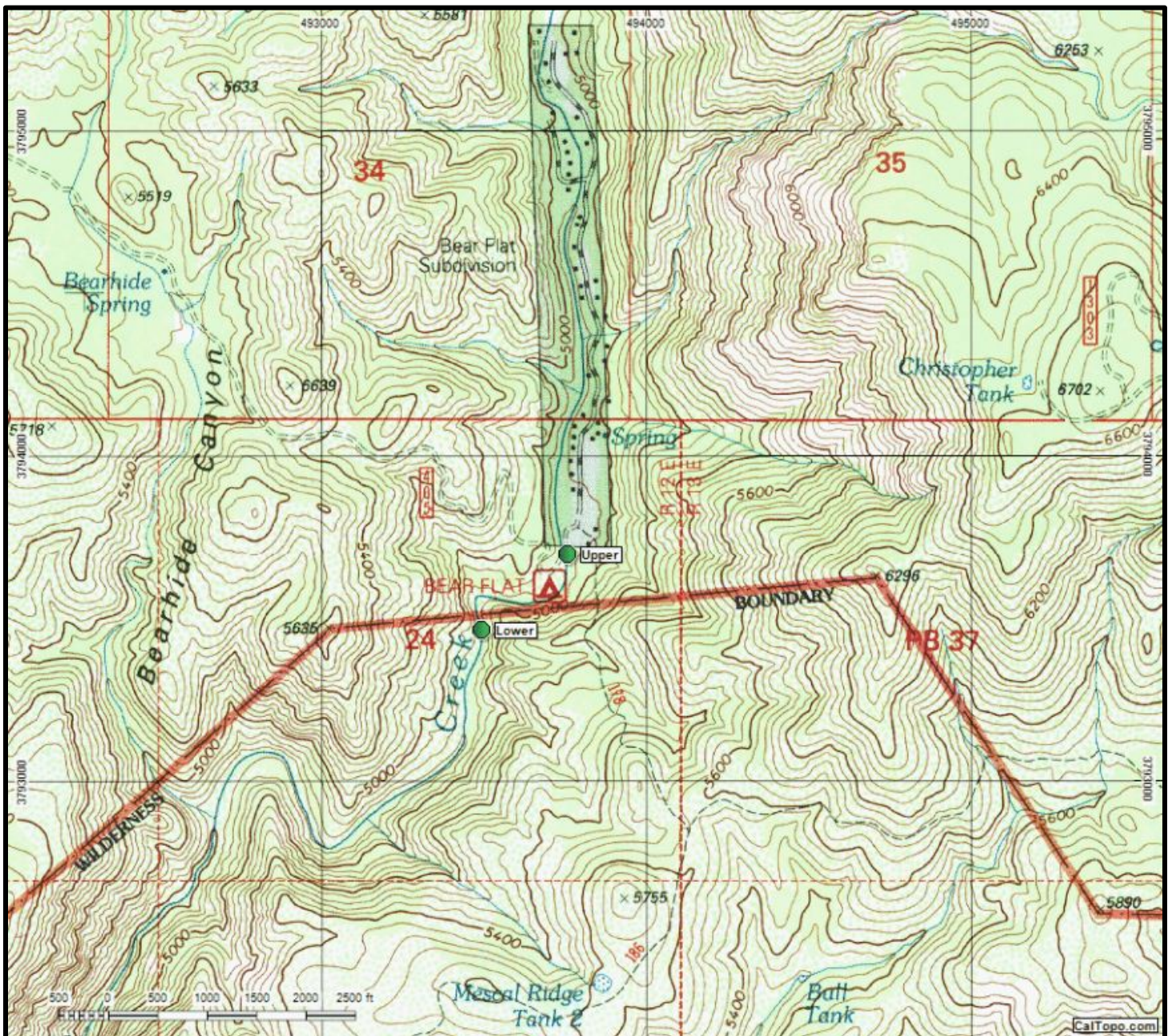


Figure 7. Tonto Cr. @ Bear Flat Campground – 500-m survey for upper reach.

Tonto Creek – above Gun Cr. Gauge (red)

05/01/2014

UTM 12S Lower: 472165E, 3760313N

Upper: 472531E, 3760602N

Tonto Creek – below Narrows (green)

05/01/2014

UTM 12S Lower: 472561E, 3760686N

Upper: 472969E, 3760974N



Figure 8. Tonto Cr. – above Gun Cr. Gauge (red) and below Narrows (green) – 500-m survey sites, lower reach.

Tonto Creek – above The Box (red)

05/02/2014

UTM 12S Lower: 473814E, 3770864N

Upper: 473873E, 3771249N

Tonto Creek – above Gisela (green)

05/02/2014

UTM 12S Lower: 474147E, 377263N

Upper: 474431E, 3773137N

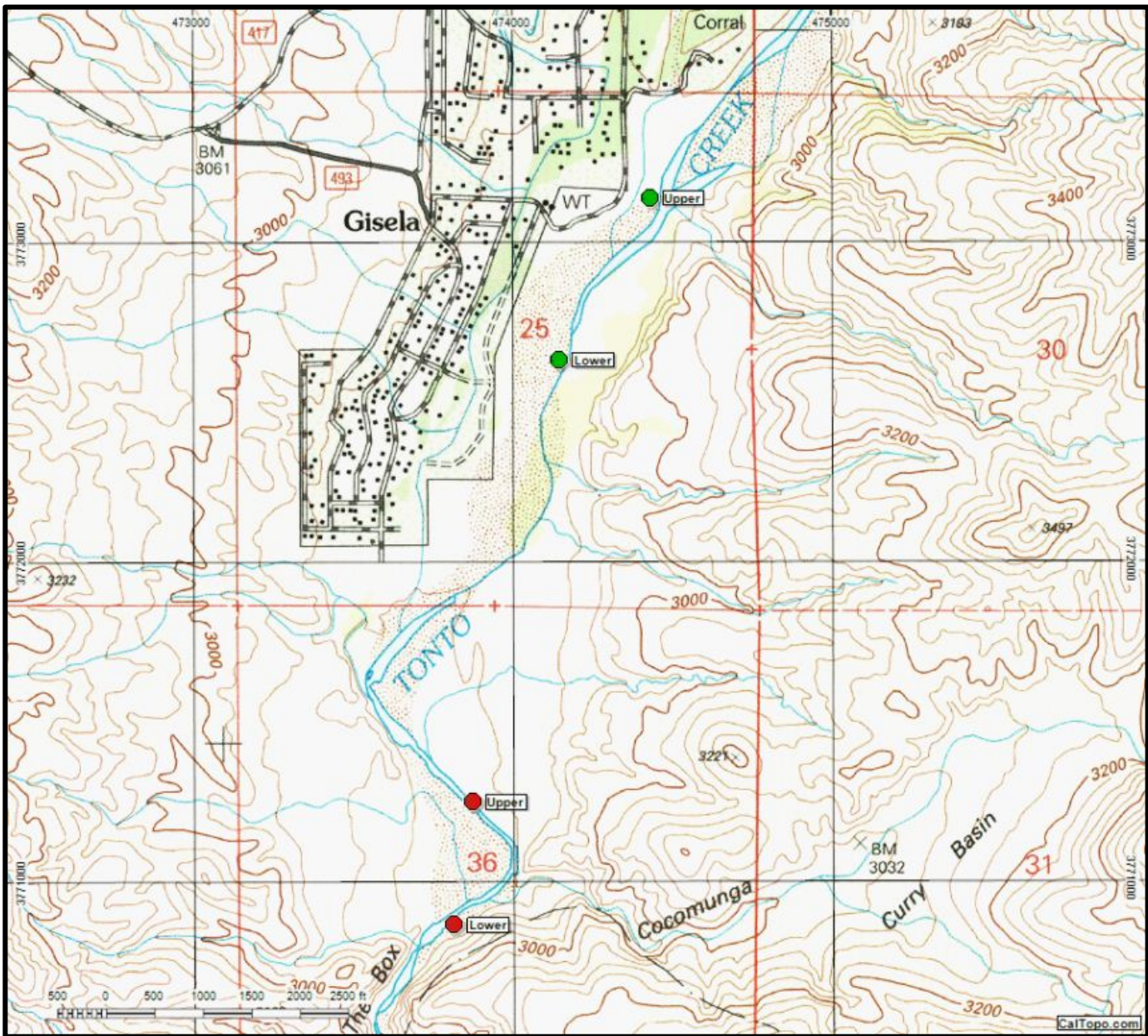


Figure 9. Tonto Cr. above The Box (red) and above Giesela (green) – 500-m survey sites for Tonto Creek middle reach.

05/07/2014

UTM 12R Lower: 528356E, 3491229N

Upper: 529013E, 3491316N

Redrock Canyon @ The Falls (Red)

05/08/2014

UTM 12R Lower: 529892E, 3490397N

Upper: 530619E, 3489623N

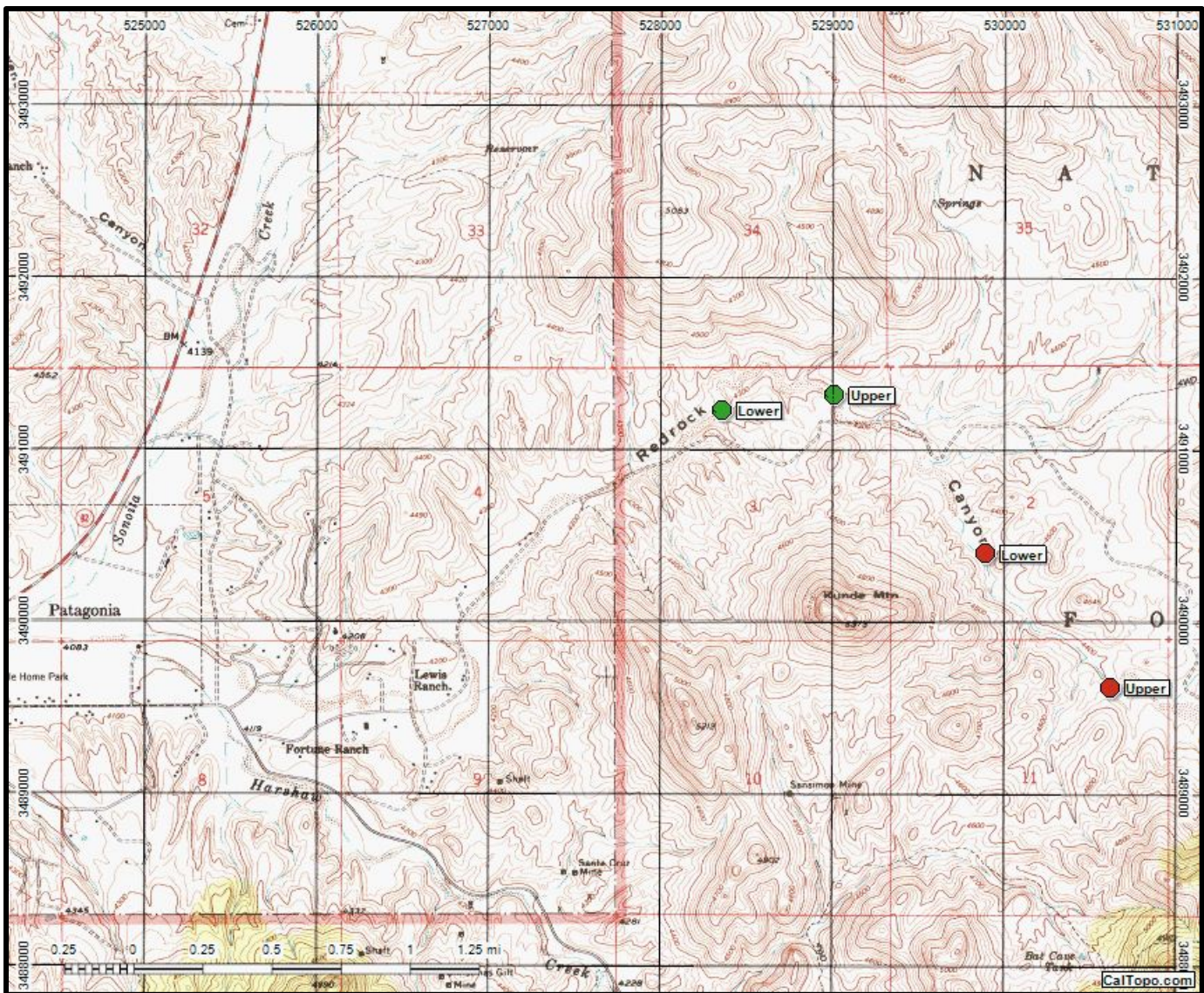


Figure 10. Redrock Canyon lower reach (green) and middle reach (red) – 500-m survey sites.

Gun Creek

05/20/2014

UTM 12S Lower: 475084E, 3762622N

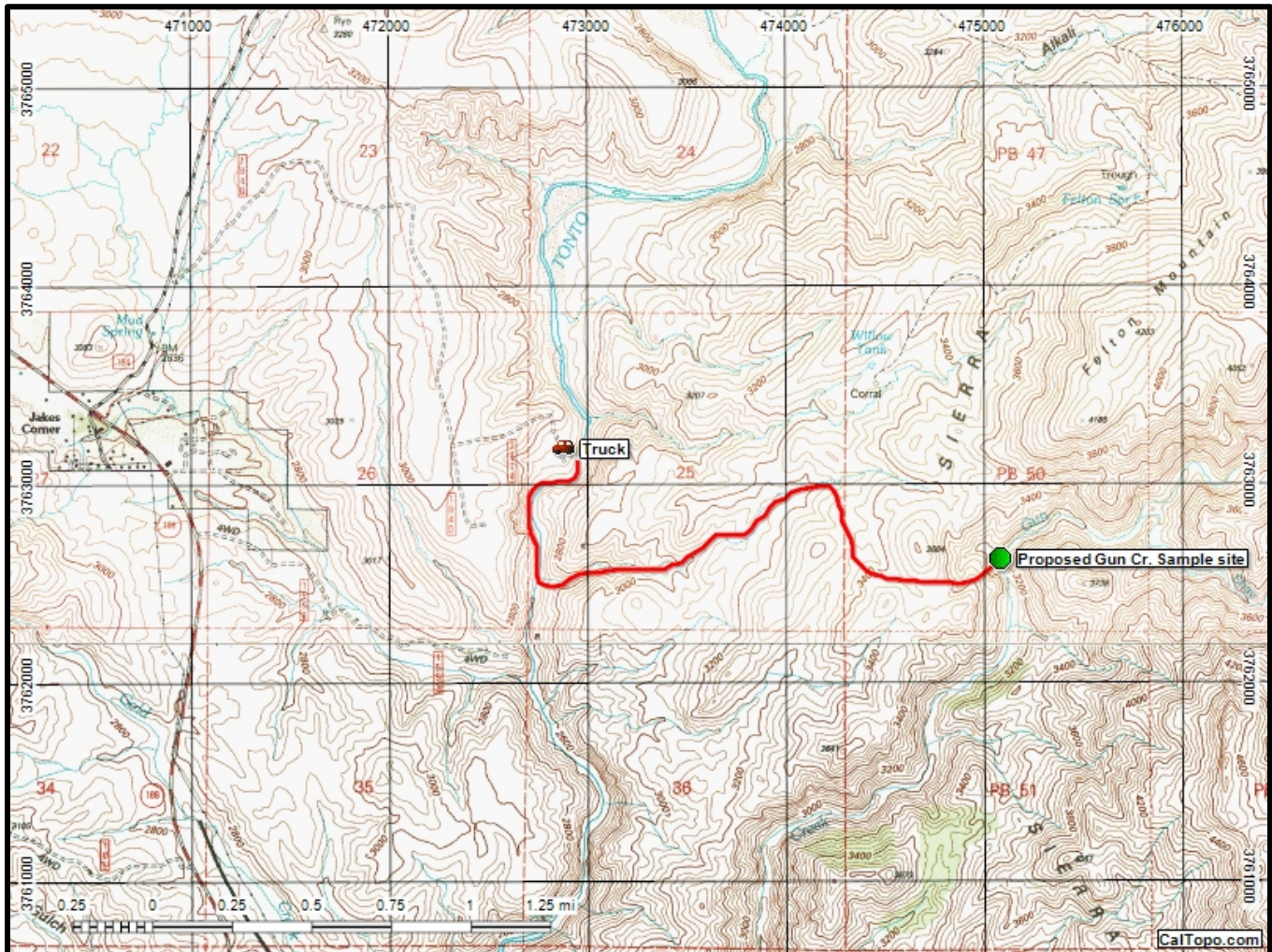


Figure 11. Proposed access to survey reach on Gun Creek for future sampling efforts.

Sonoita Creek – Below Hwy 82 Bridge

05/21/2014

UTM 12R Lower: 527093E, 3501644N

Upper: 527325E, 3502106N

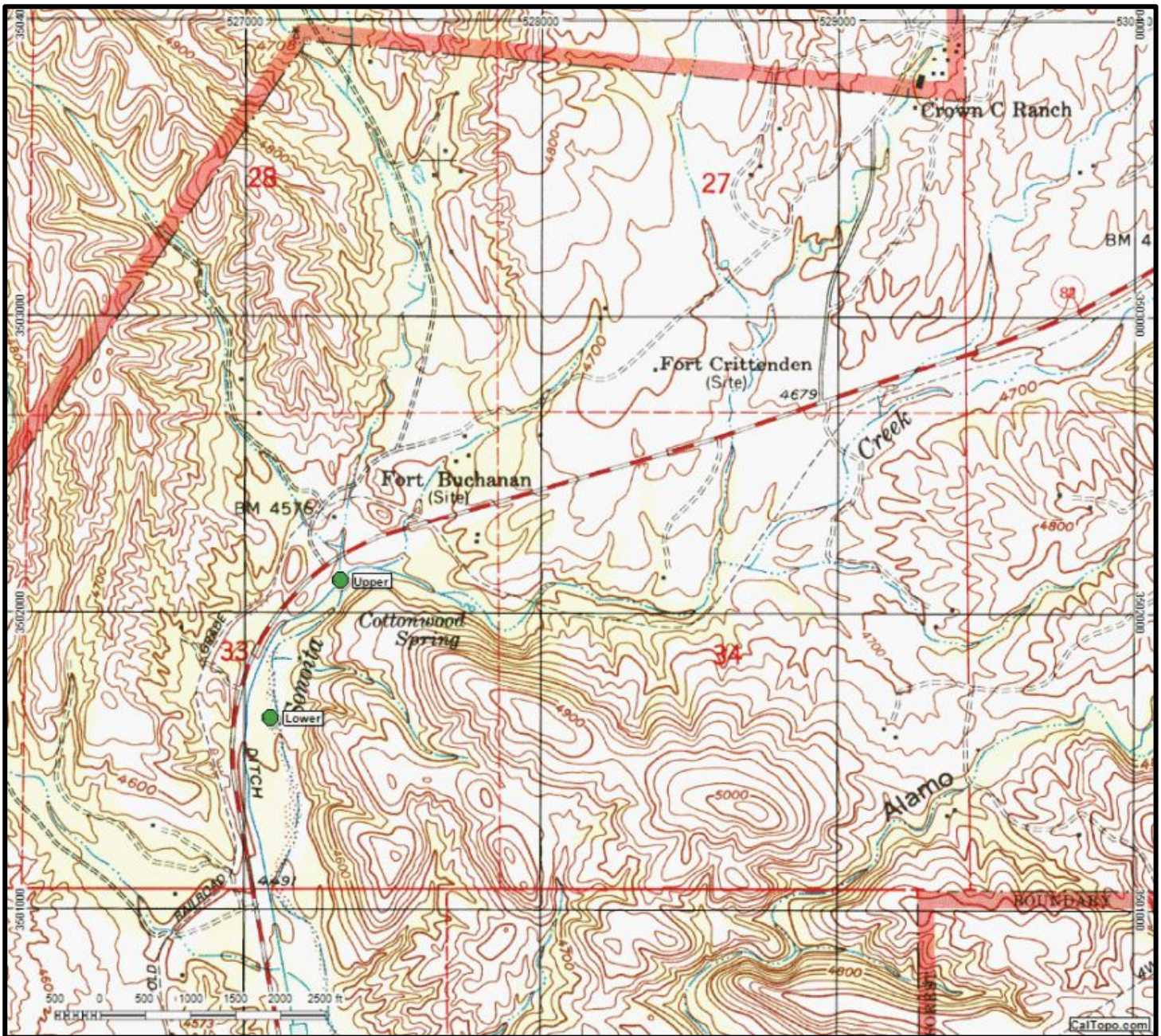


Figure 12. Sonoita Creek below Hwy 82 Bridge – 500-m survey site.

Sonoita Creek – Below Patagonia Lake

05/22/2014

UTM 12R Lower: 510707E, 3482679N

Upper: 511122E, 3483141N

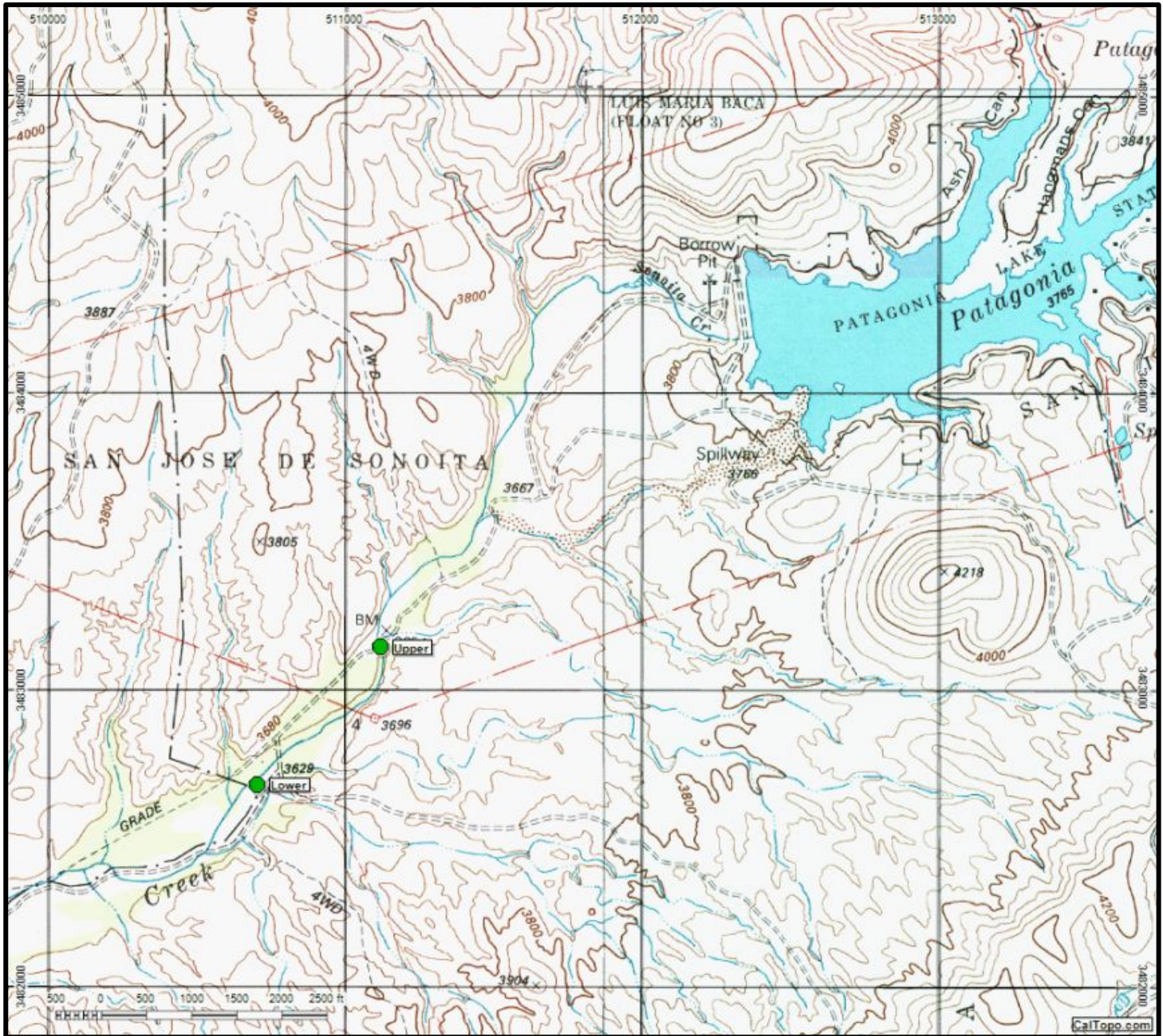


Figure 13. Sonoita Creek below Patagonia Lake – 500-m survey site.

West Clear Creek below Bull Pen Ranch

05/30/2014

UTM 12S

Lower: 434780E, 3821848N

Upper: 435059E, 3822233N

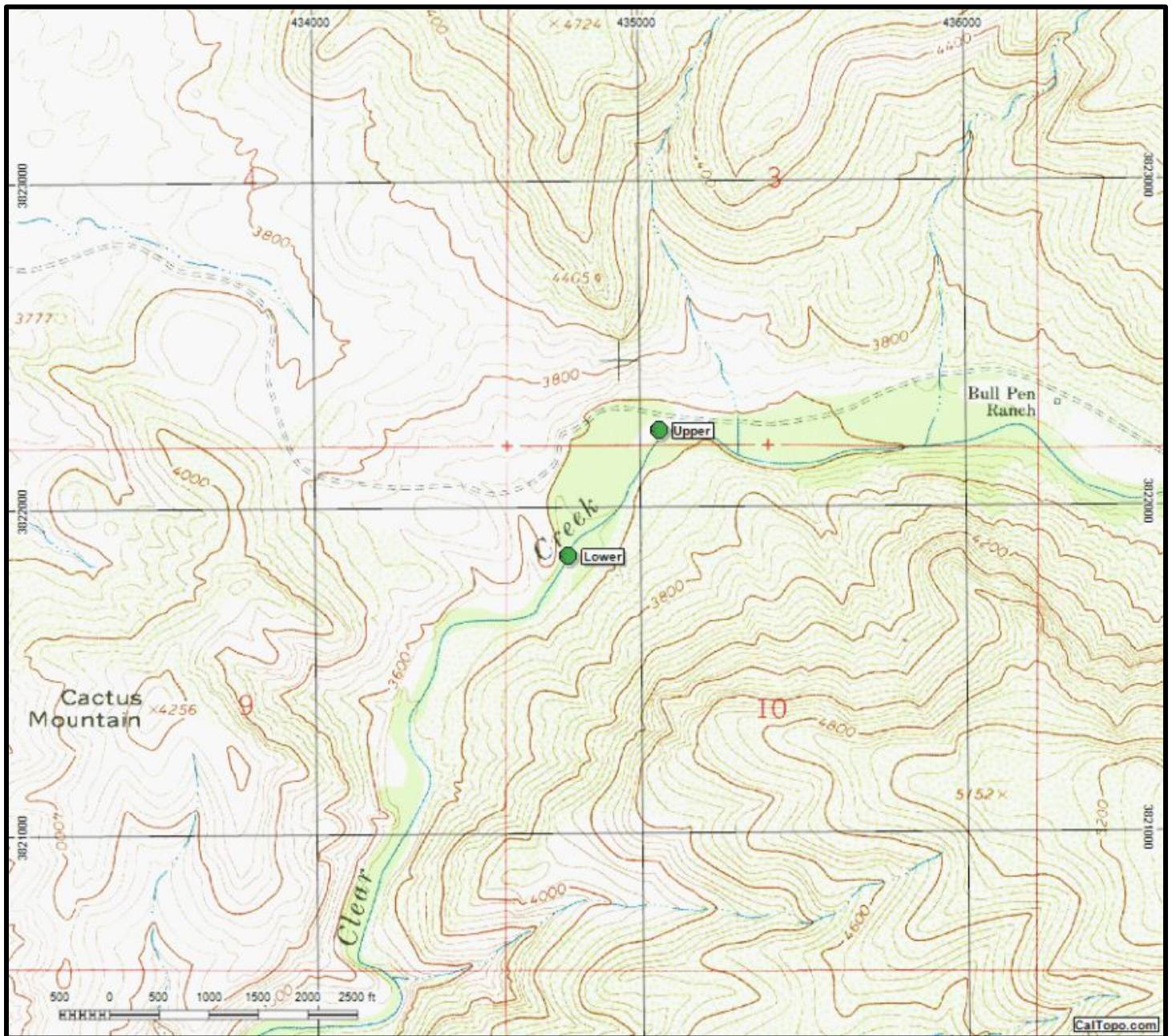


Figure 14. West Clear Creek below Bull pen Ranch - lower reach 500-m survey site.

West Clear Creek @ Cash Tank Trail

06/09/2014

UTM 12S

Lower: 452166E, 3825833N

Upper: 452254E, 3825897N

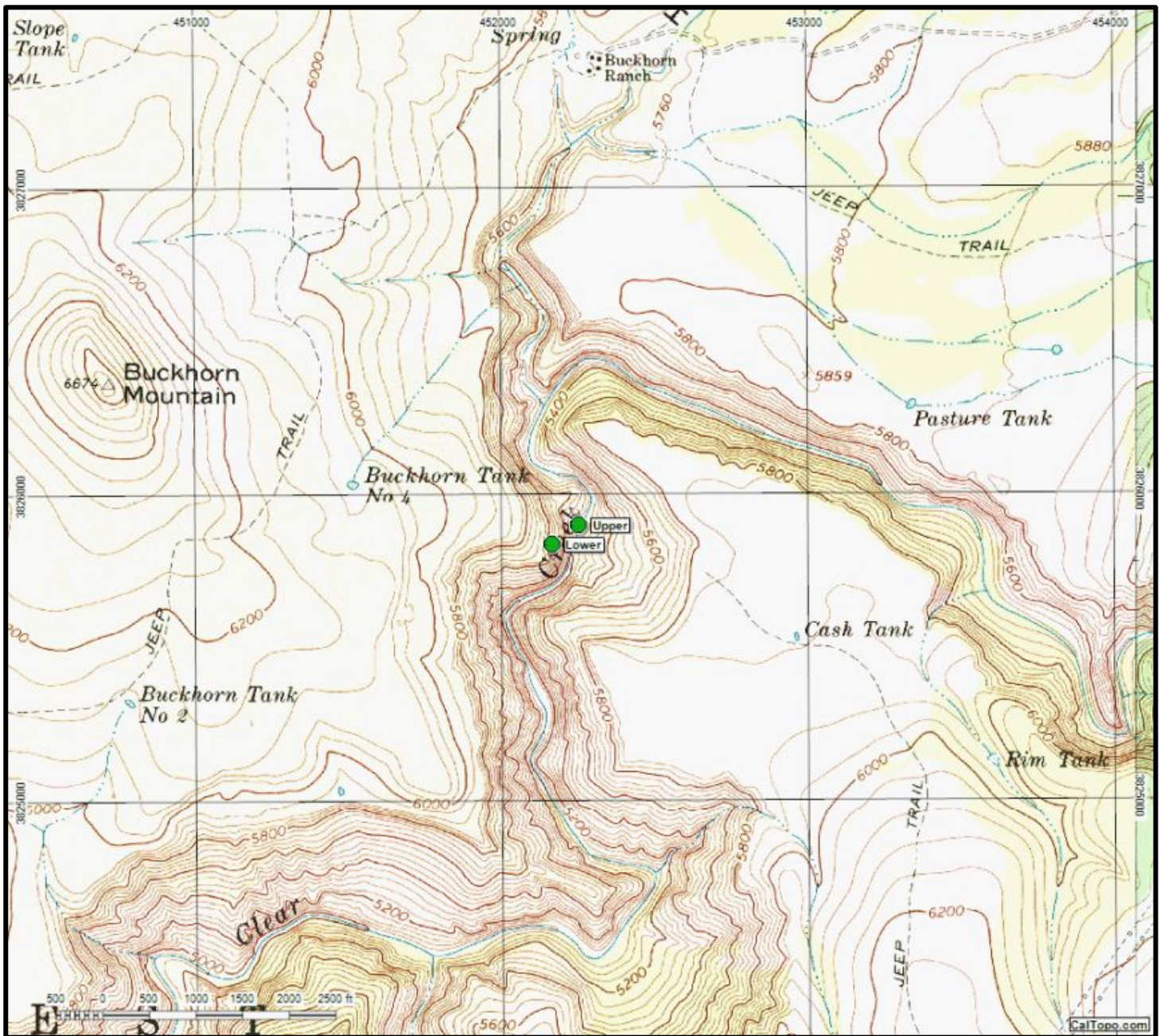


Figure 15. West Clear Creek at Cash Tank Trail - middle reach 100-m sample site.

West Clear Creek below FR 142F

06/10/2014

UTM 12S

Lower: 461349E, 3823677N

Upper: 461760E, 3823930N



Figure 16. West Clear Creek below FR 142F – 500-m survey site for upper reach.

Upper Santa Cruz River – @ Humphrey’s Corrals

06/02/2014

UTM 12R Lower: 539215E, 3474405N

Upper: 539155E, 3474863N

Upper Santa Cruz River – above Bridge 8169

06/03/2014

UTM 12R Lower: 539038E, 3469130N

Upper: 539264E, 3469558N

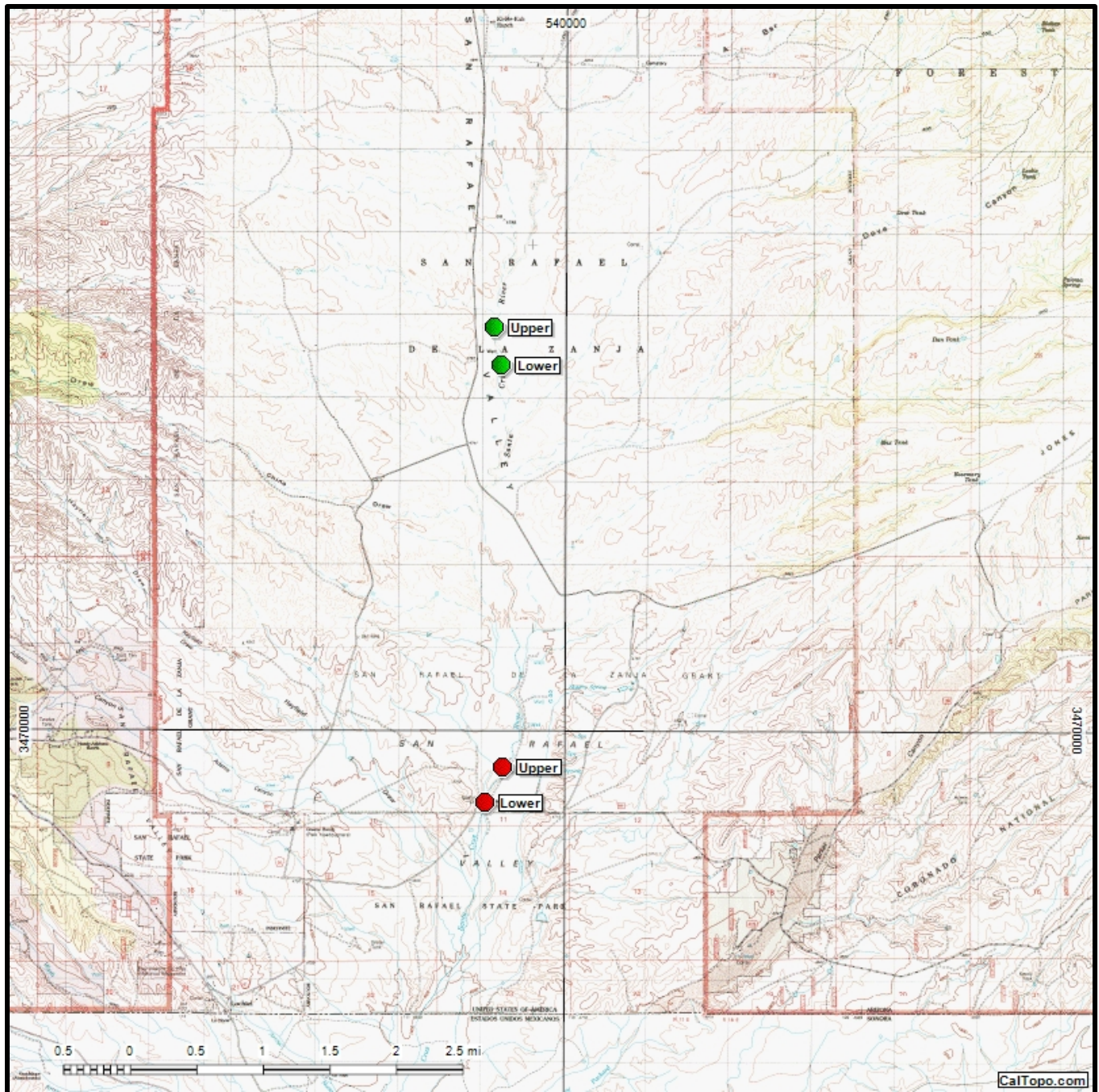


Figure 17. Upper Santa Cruz River at Humphrey’s Corrals (green) and Bridge 8169 (red) – 500-m survey sites.

Sheehy Spring

06/03/2014

UTM 12R Lower: 540049E, 3470453N

Upper: 540147E, 3470459N

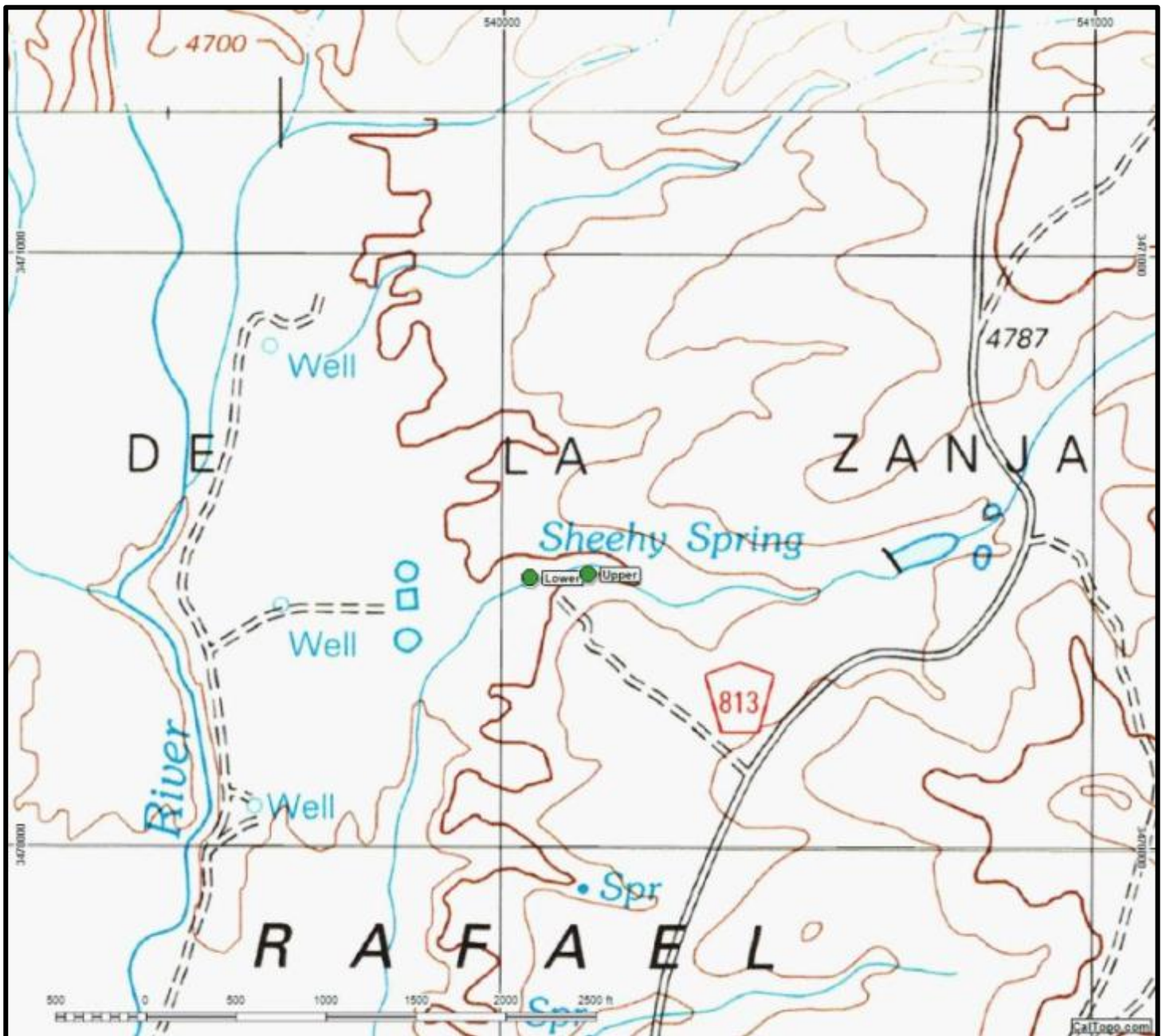


Figure 18. Sheehy Spring – 100-m sample site.

Spring Creek (Verde R. drainage)

07/10/2014

UTM 12S Lower: 416690E, 3845759N

Upper: 416634E, 3845826N

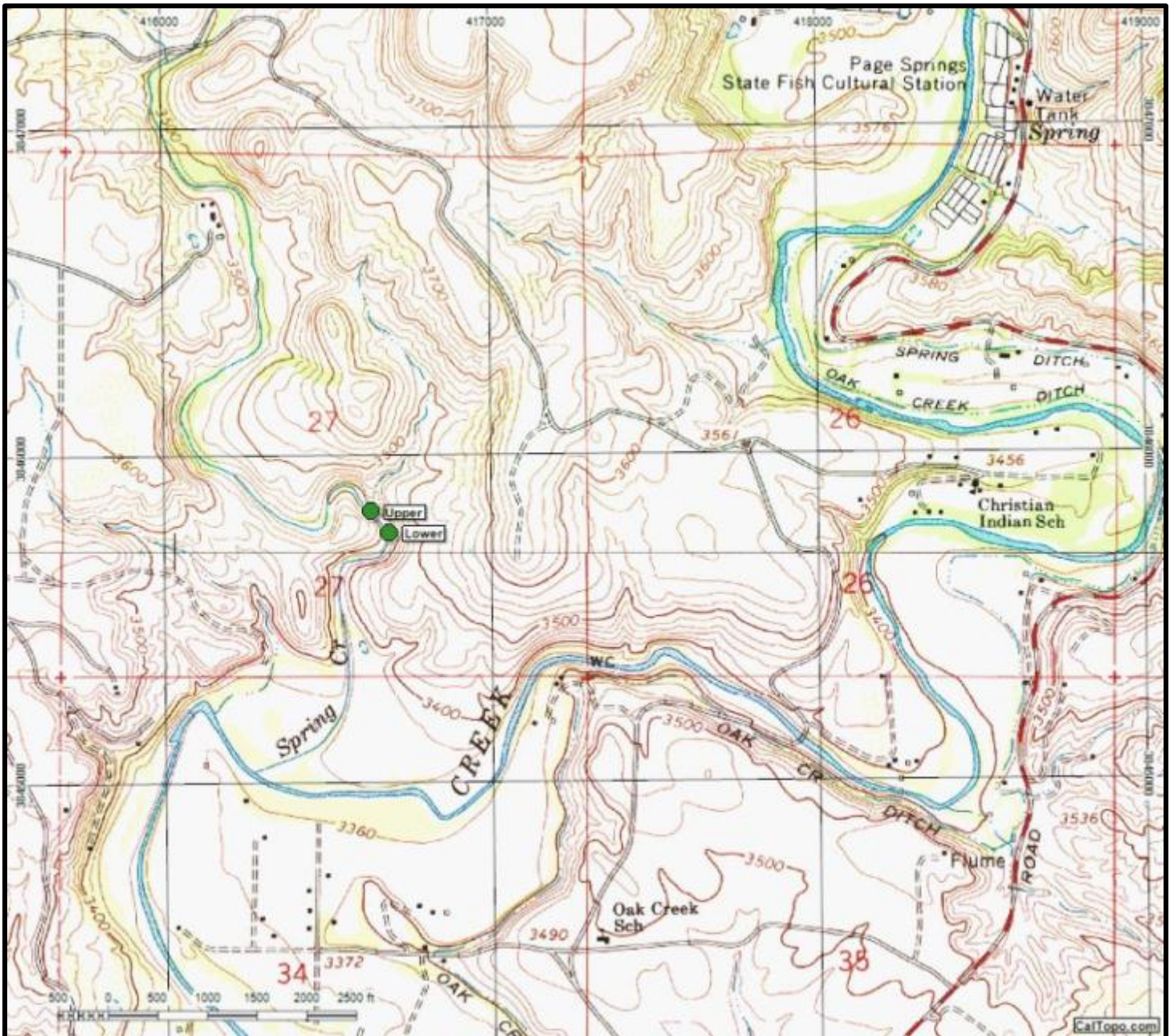


Figure 19. Spring Creek (Verde R. drainage) – 100-m sample site.

Cottonwood Spring

07/16/2014

UTM 12R Lower: 527486E, 3502126N

Upper: 527555E, 3502062N

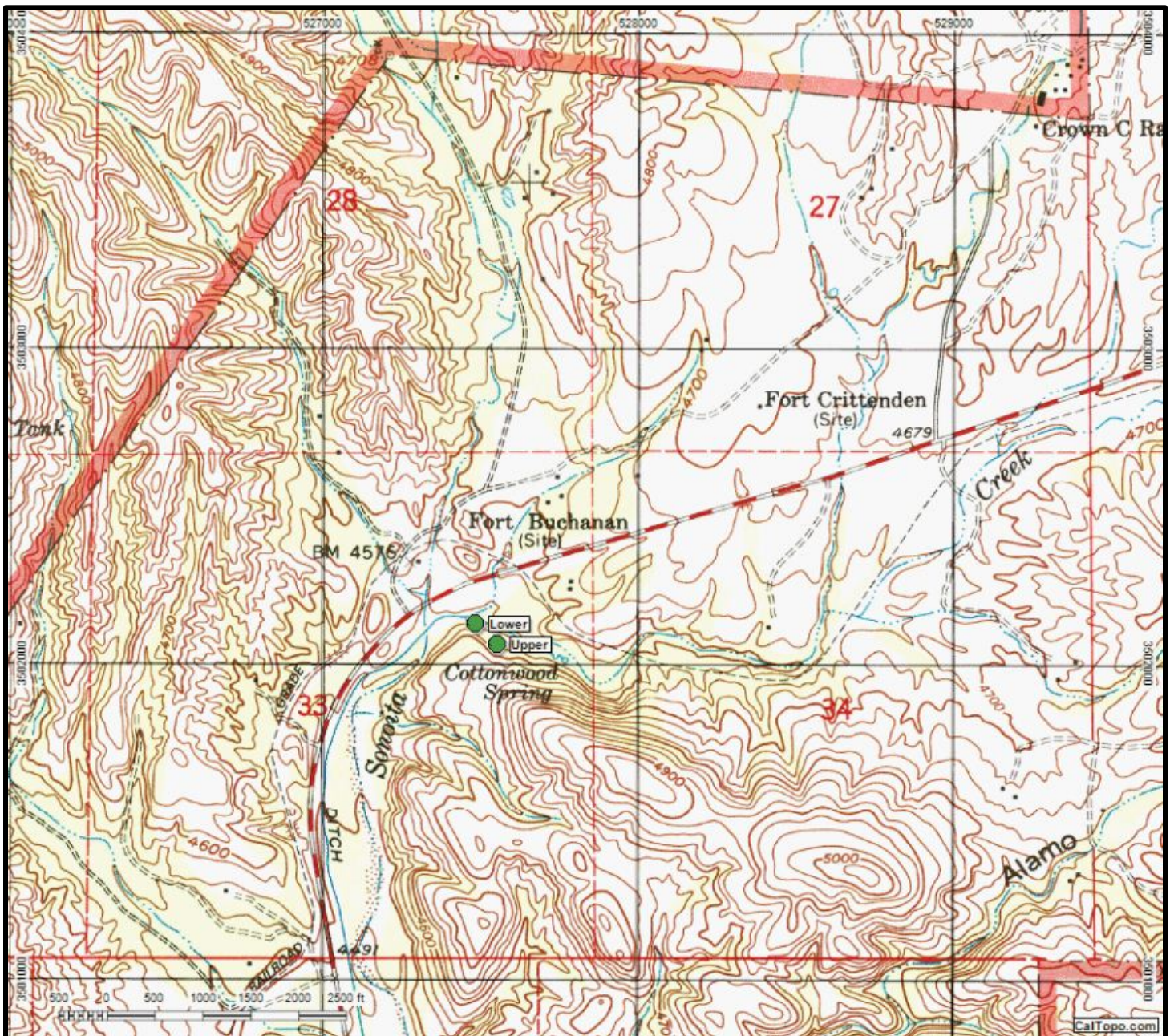


Figure 20. Cottonwood Spring – 100-m sample site.

Monkey Spring

07/16/2014

UTM 12R Lower: 528075E, 3499794N

Upper: 528085E, 3499707N

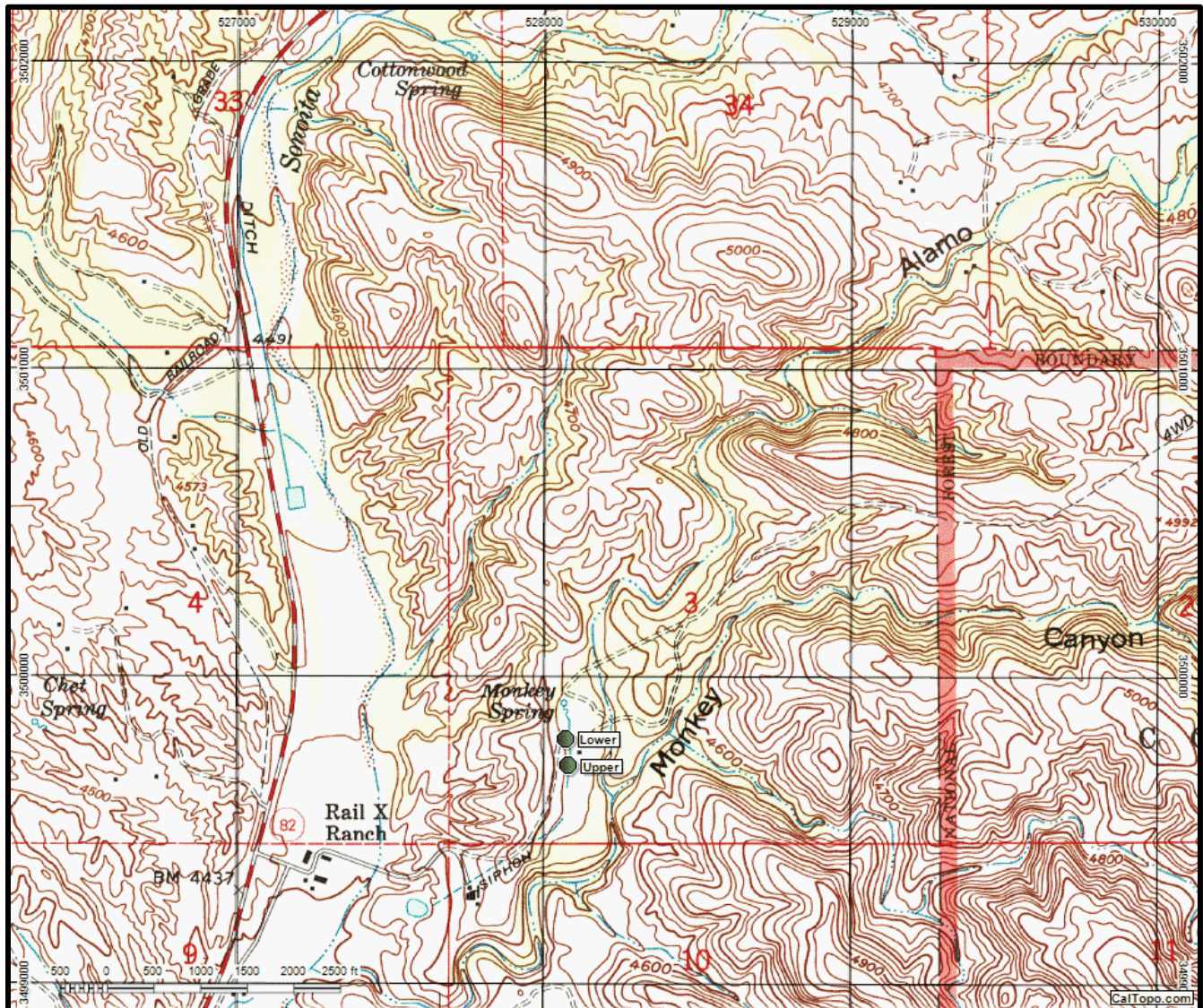


Figure 21. Monkey Spring – 100-m sample site.

Chalky Spring

08/06/2014

UTM 12S Lower: 378695E, 3746757N

Upper: 378702E, 3746840N

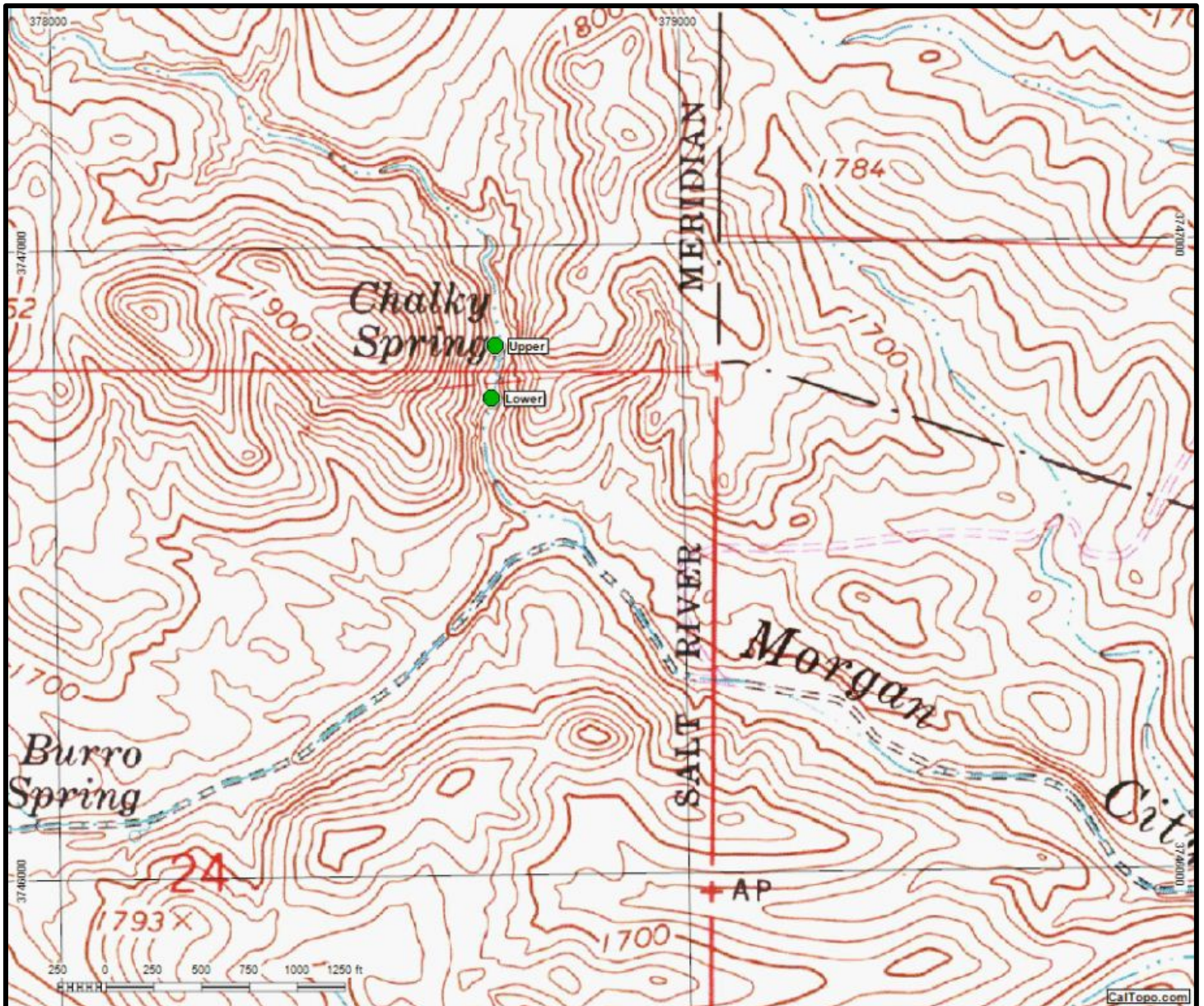


Figure 22. Chalky Spring – 100-m sample site.

Morgan City Wash

08/06/2014

UTM 12S

Lower: 381619E, 3744777N

Upper: 381542E, 3744844N

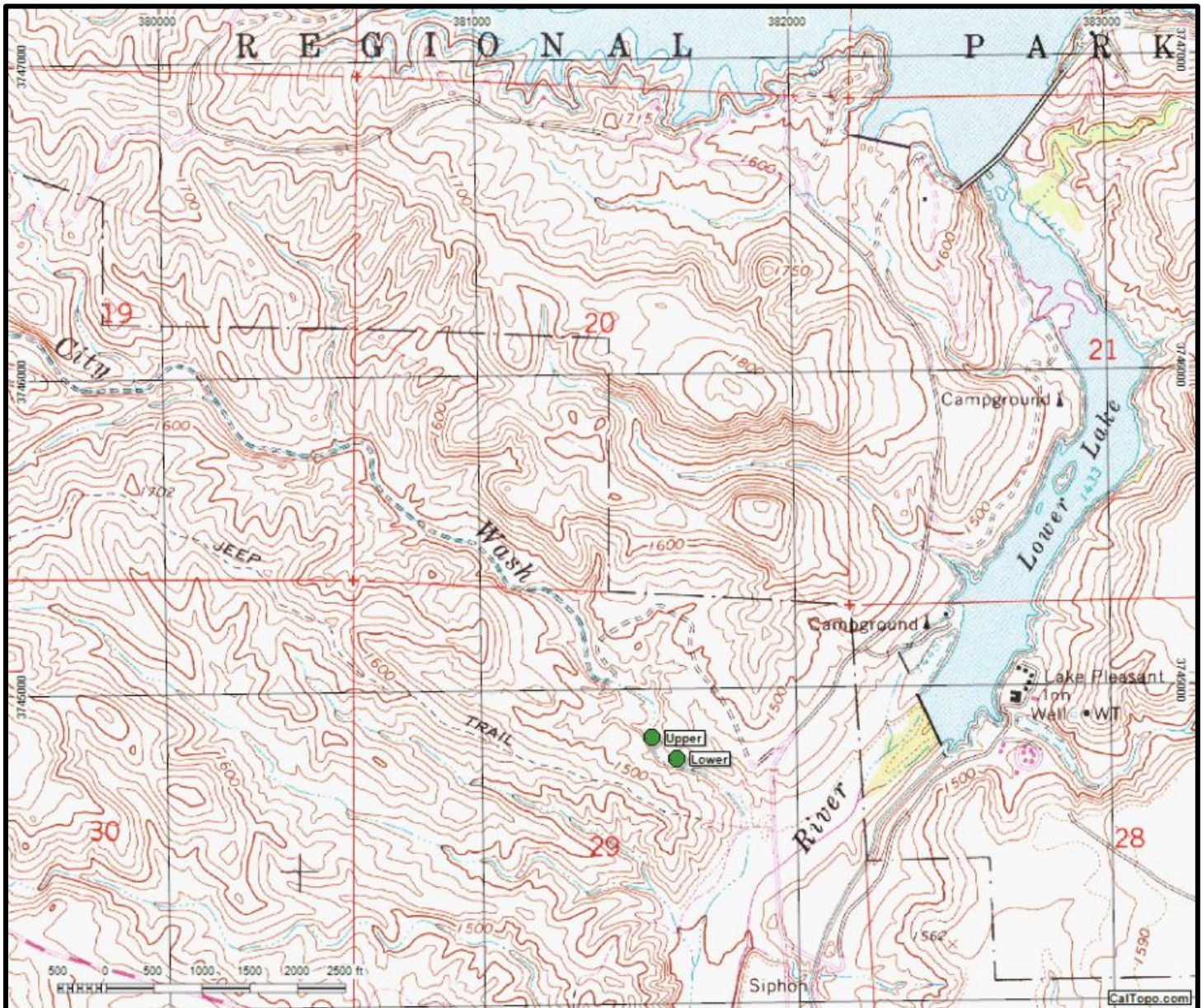


Figure 23. Morgan City Wash – 100-m sample site.

Walker Creek

08/14/2014

UTM 12S

Lower: 435923E, 3833664N

Upper: 436035E, 3833684N

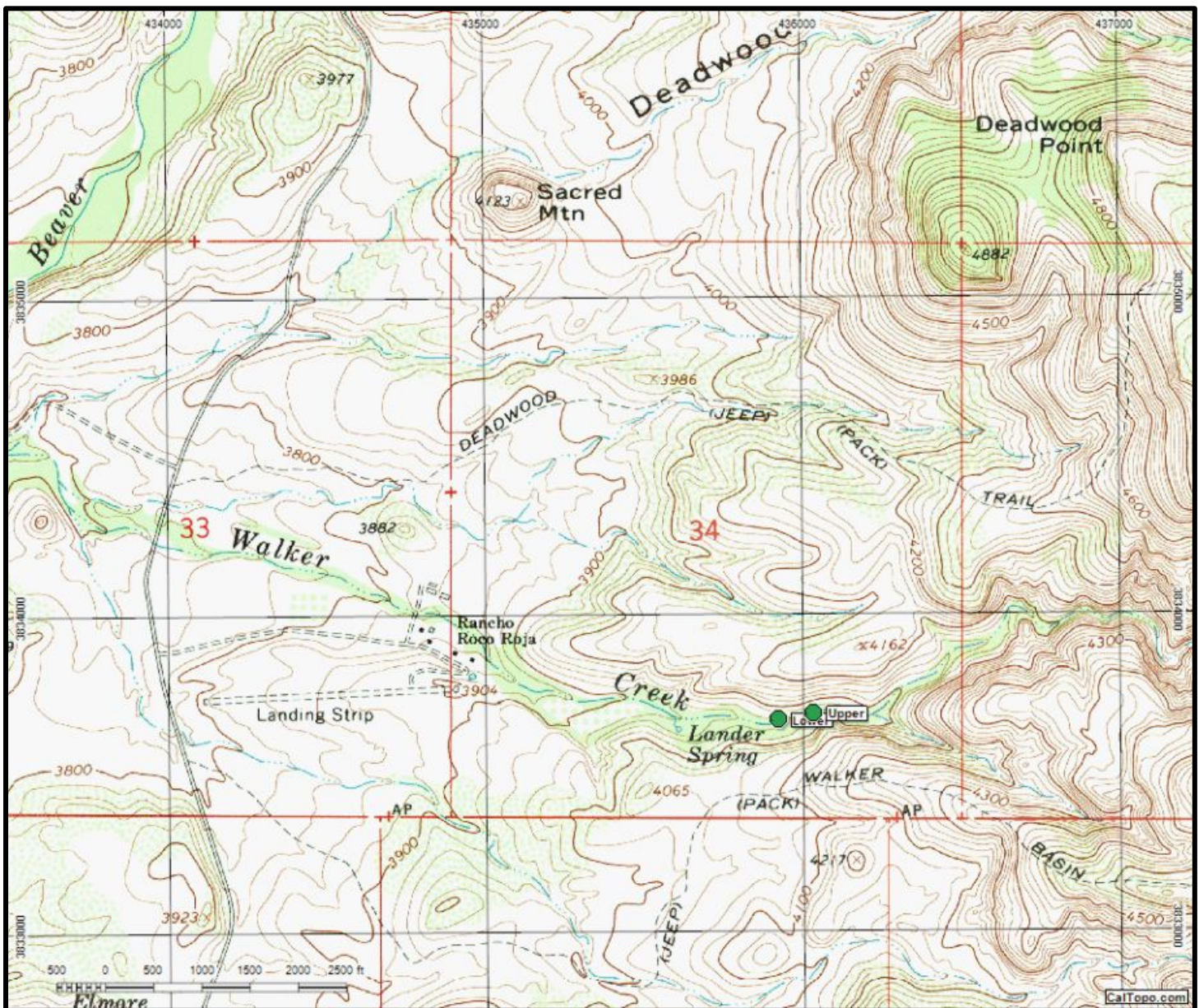


Figure 24. Walker Creek – 100-m sample site.

Haigler Creek @ Fisherman's Point

08/18/2014

UTM 12S

Lower: 504778E, 3788752N

Upper: 505077E, 3788623N

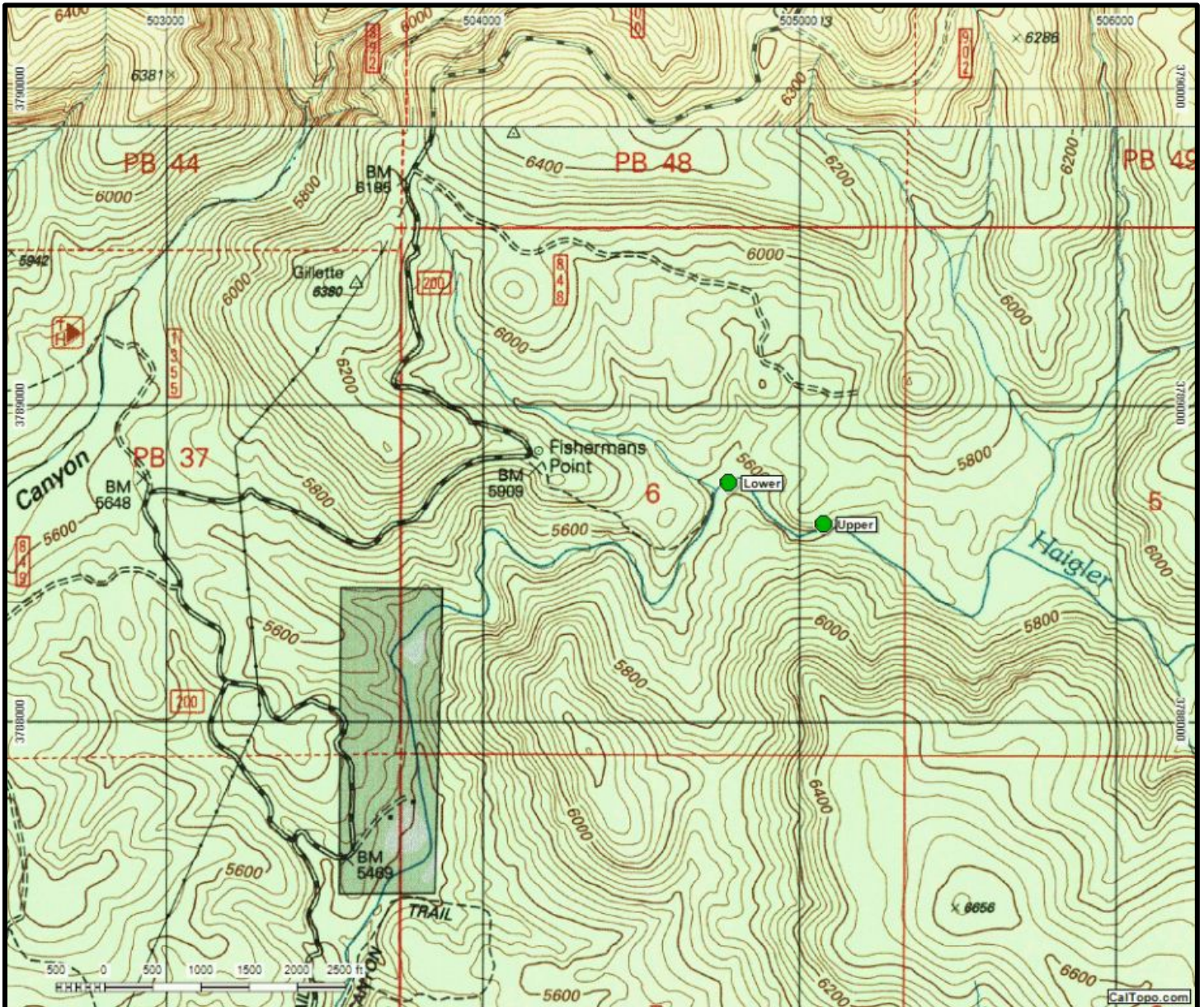


Figure 25. Haigler Creek @ Fisherman's Point – 500-m survey site on upper reach.

Haigler Creek @ The Bridge

08/28/2014

UTM 12S

Lower: 503457E, 3786428N

Upper: 503468E, 3786926N

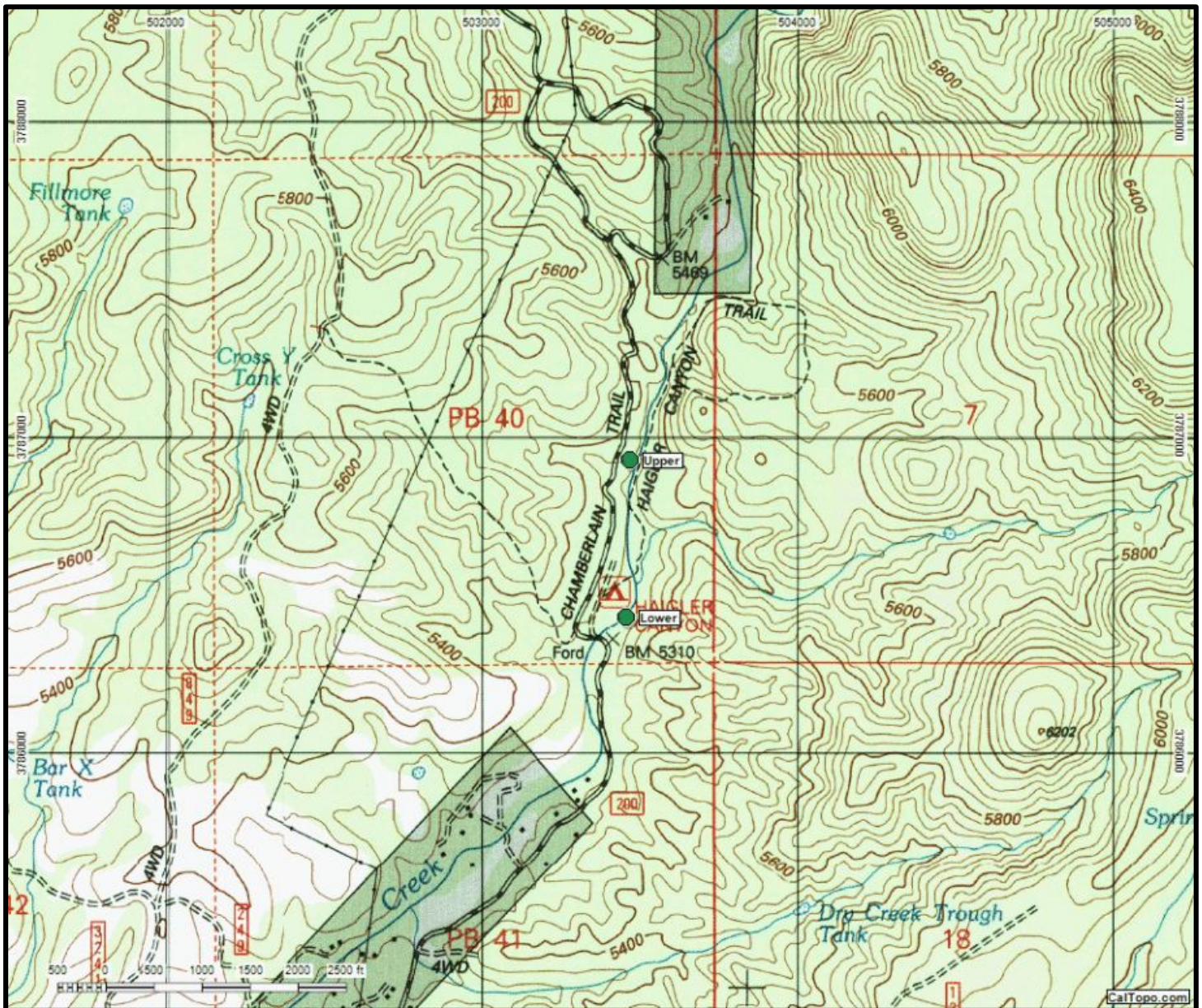


Figure 26. Haigler Creek @ the Bridge -500-m survey site on upper reach.

Haigler Creek - below Alderwood Campground

08/28/2014

UTM 12S

Lower: 499343E, 3784783N

Upper: 499690E, 3785043N

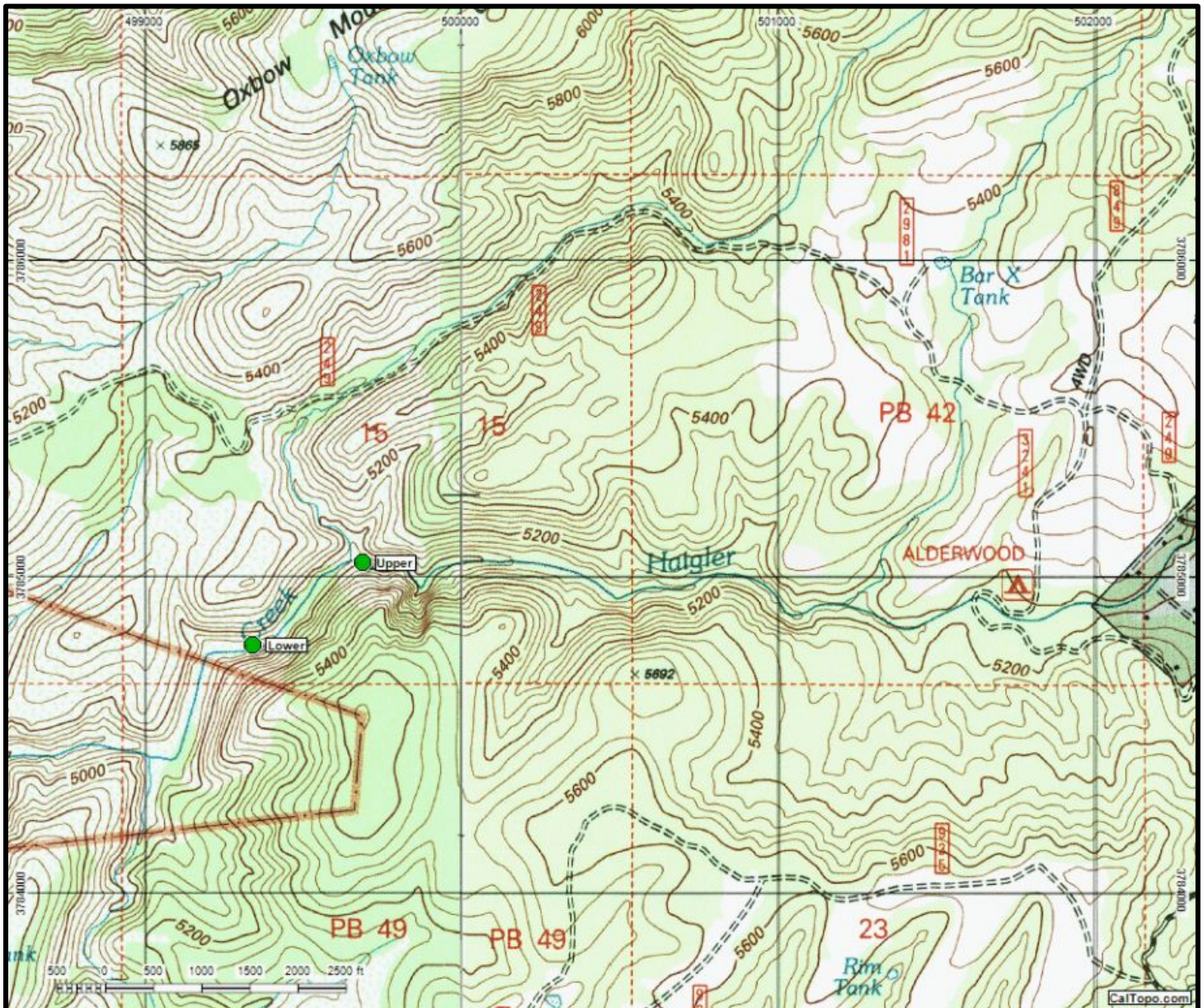


Figure 27. Haigler Creek below Alderwood Campground – 500-m survey site on upper reach.

10/15/2014

UTM 12S Lower: 494348E, 3784445N

Upper: 494812E, 3784214N

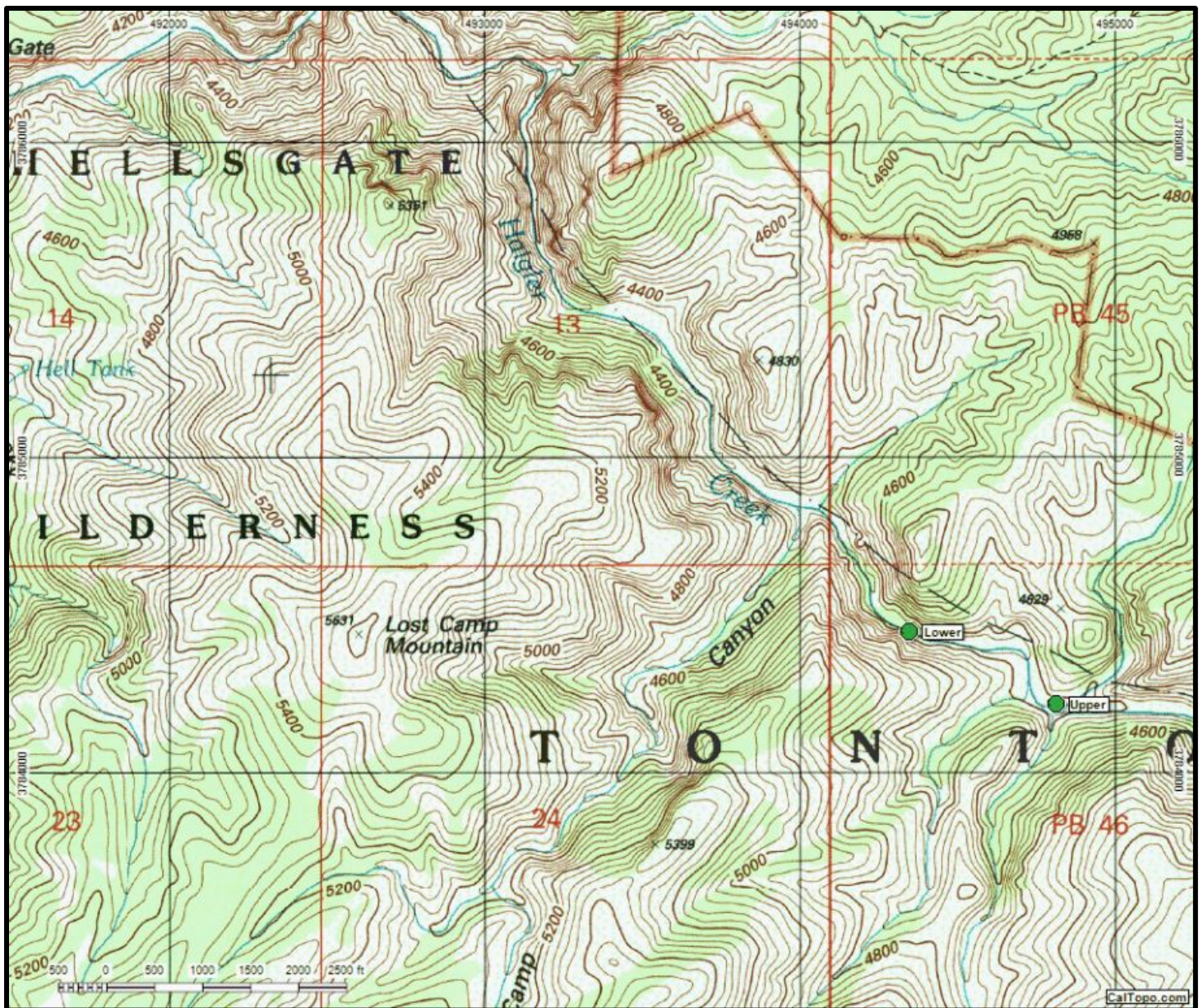


Figure 28. Lower Haigler Creek – 500-m survey site for lower reach.

Spring Creek at Brady Canyon (Salt R. drainage)

09/03/2014

UTM 12S

Lower: 492962E, 3771091N

Upper: 492966E, 3770969N

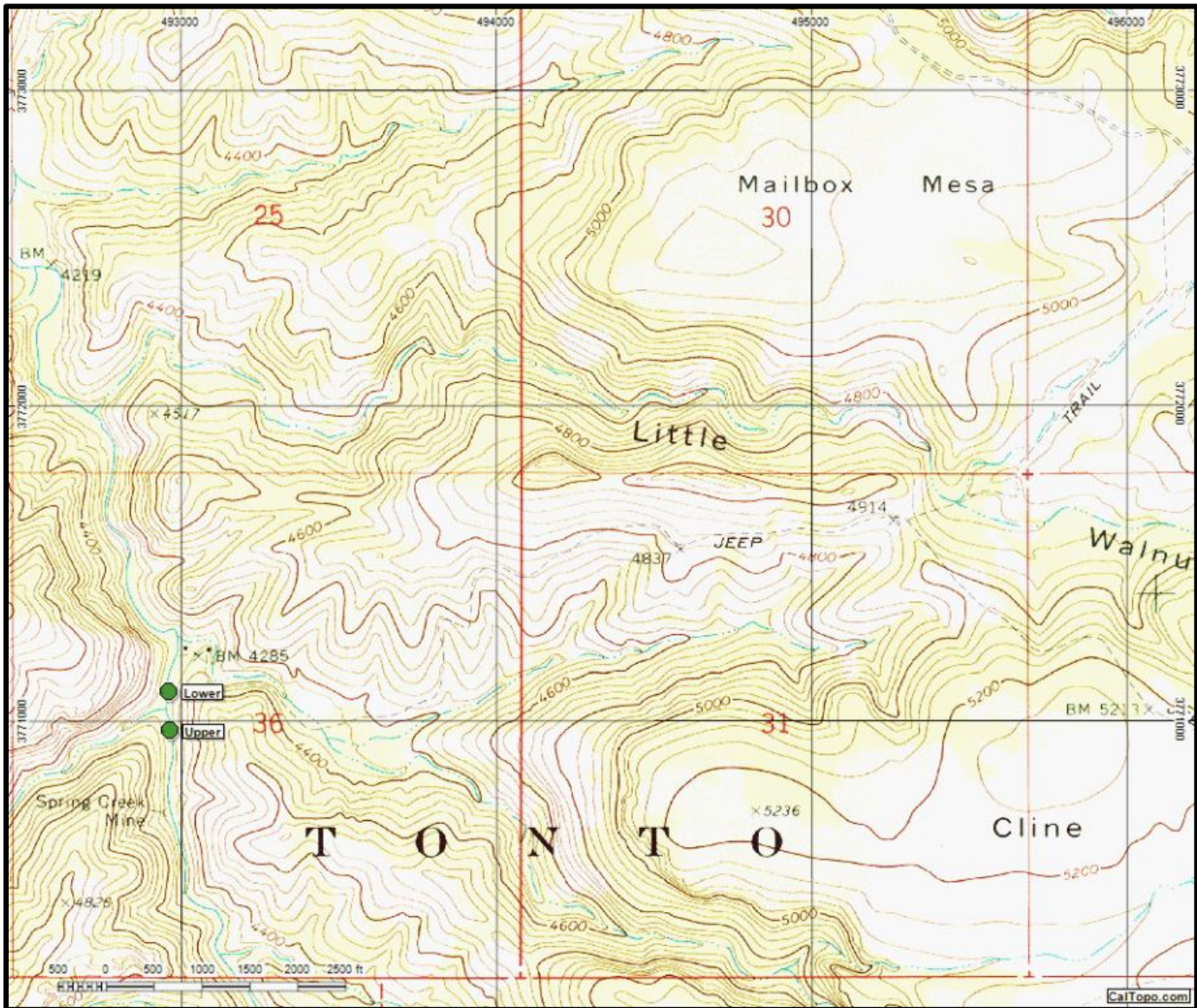


Figure 29. Spring Cr. at Brady Canyon – 100-m sample site on middle reach.

Spring Creek below Spring Cr. Ranch (Salt R. drainage)

09/04/2014

UTM 12S

Lower: 495943E, 3766064N

Upper: 495842E, 3766013N

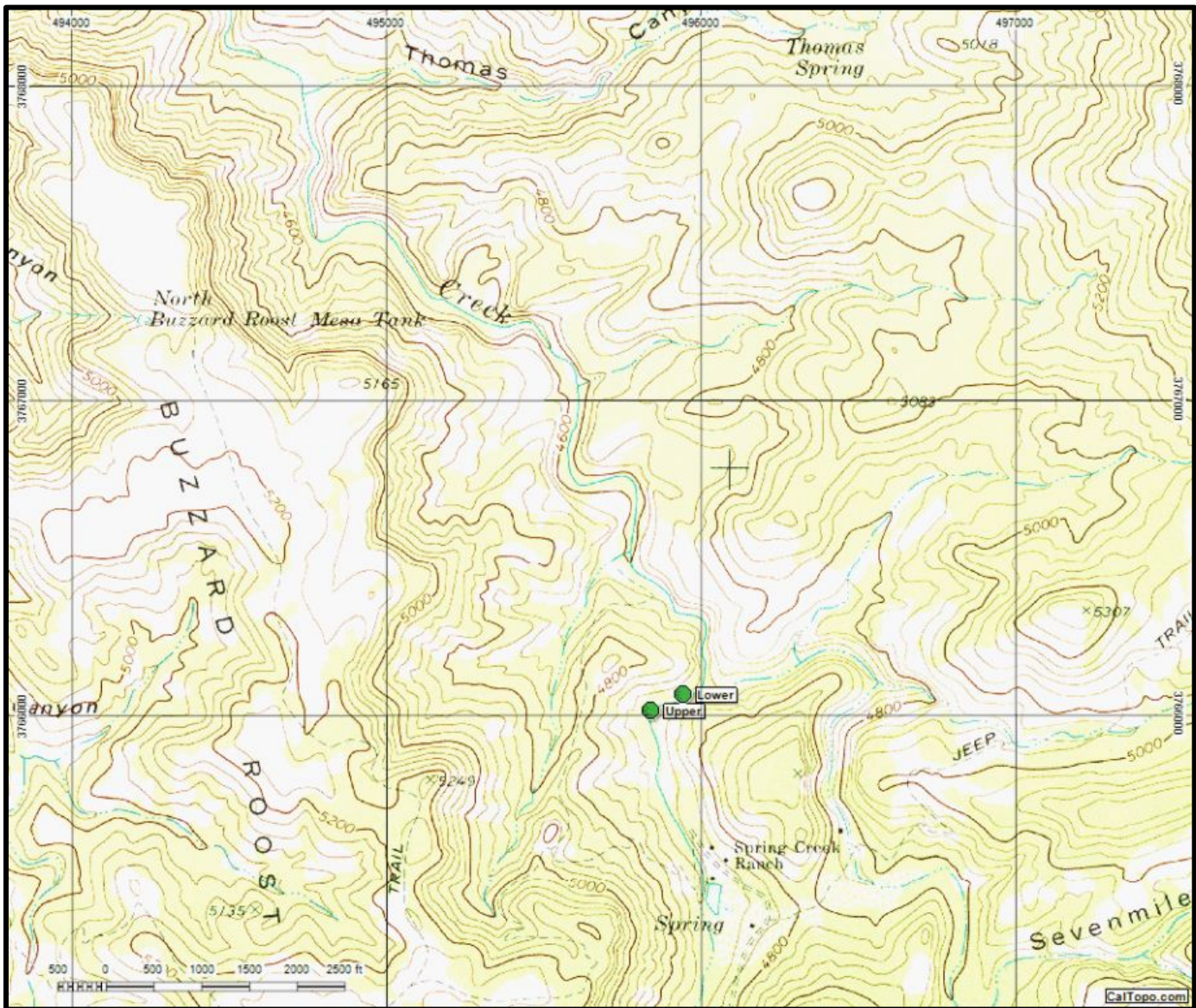


Figure 30. Spring Creek below Spring Cr. Ranch – 100-m sample site for upper reach.

09/09/2014

UTM 12S Lower: 422366E, 3828936N

Upper: 422870E, 3828895N

Wet Beaver Creek below Montezuma Castle 2 (red)

09/09/2014

UTM 12S Lower: 423057E, 3829201N

Upper: 422755E, 3829430N

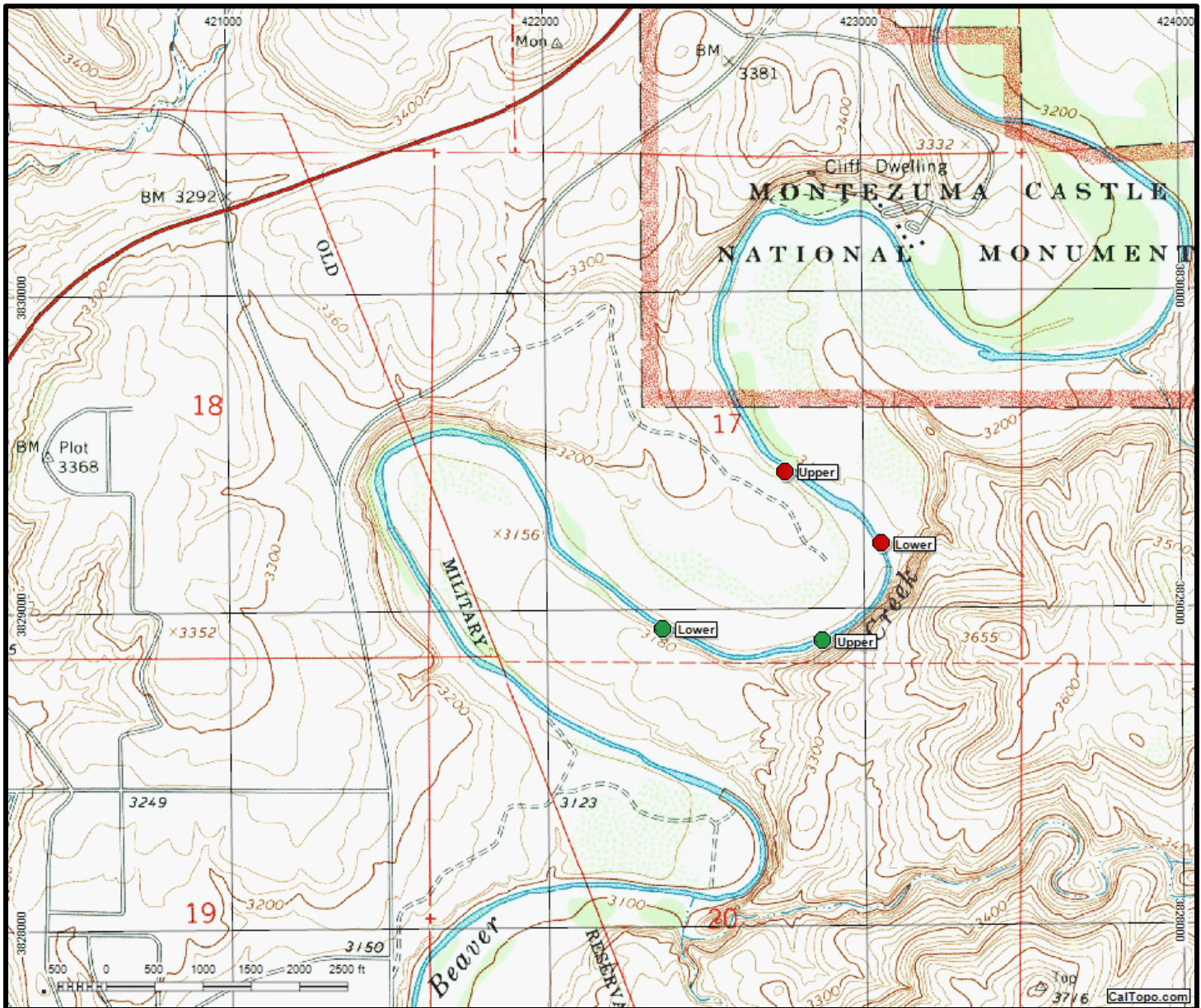


Figure 31. Wet Beaver Creek below Montezuma Castle 1 (green) and 2 (red) – 500-m survey sites for lower reach.

Wet Beaver Creek – above Montezuma Castle

09/09/2014

UTM 12S

Lower: 423937E, 3831039N

Upper: 424196E, 3831286N

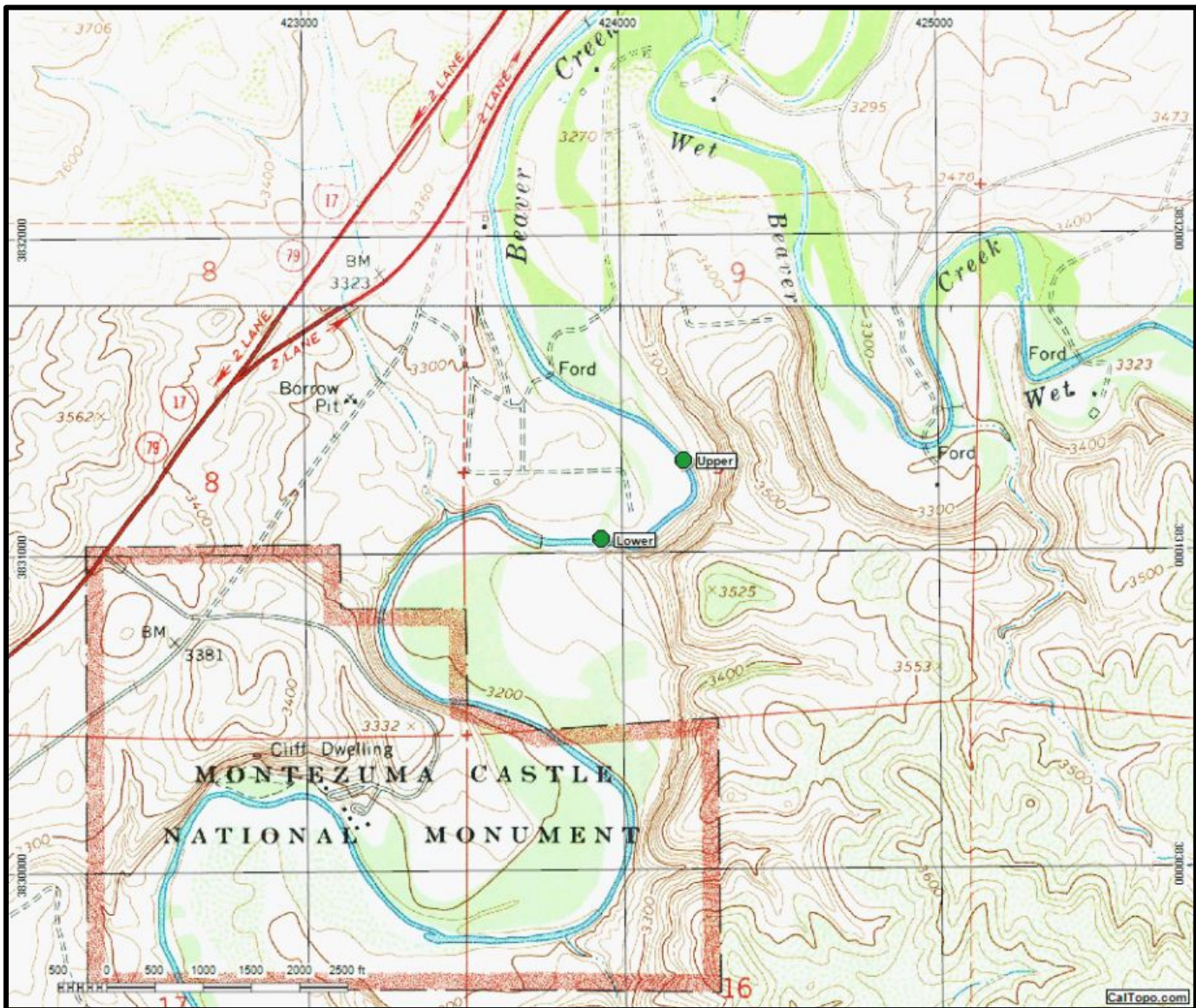


Figure 32. Wet Beaver Creek above Montezuma Castle – 500-m survey site for lower reach.

Wet Beaver Creek @ Lawrence Crossing (green)

09/10/2014

UTM 12S Lower: 432643E, 3834701N

Upper: 433056E, 3834938N

Wet Beaver Creek @ Beaver Cr. Campground (red)

09/10/2014

UTM 12S Lower: 434181E, 3836289N

Upper: 434602E, 3836562N

Wet Beaver Creek below Beaver Cr. Ranch (blue)

09/10/2014

UTM 12S Lower: 435249E, 3837293N

Upper: 435673E, 3837424N

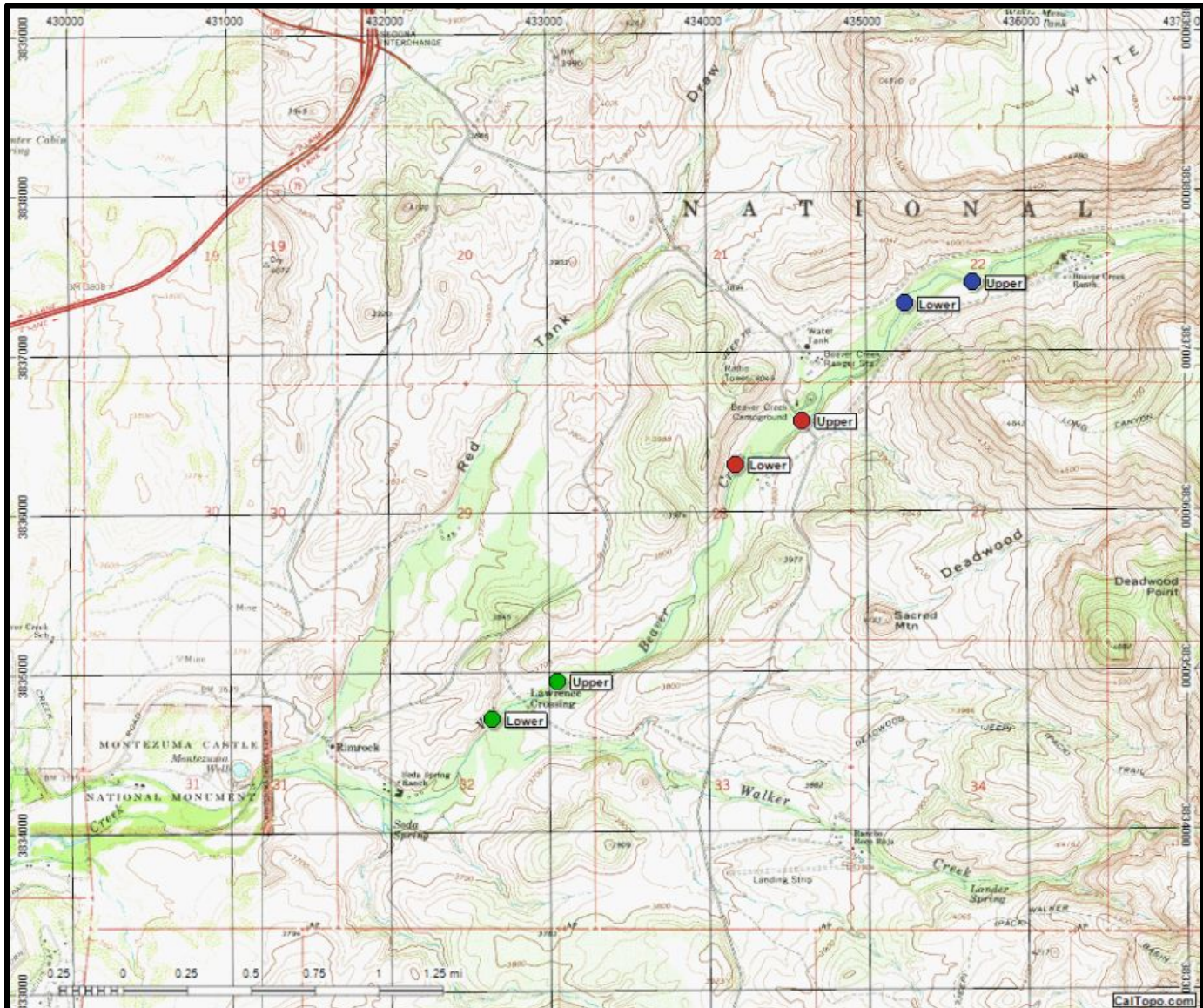


Figure 33. Wet Beaver Creek @ Lawrence Crossing (green), Beaver Cr. Campground (red), and below Beaver Cr. Ranch (blue) – 500-m survey sites for middle reach.

Salome Creek – E. of JR Ranch (green)

09/11/2014

UTM 12S Lower: 496263E, 3752479N

Upper: 496460E, 3752006N

Salome Creek – S.E. of JR Ranch (red)

09/24/2014

UTM 12S Lower: 496264E, 3757531N

Upper: 496135E, 3751875N

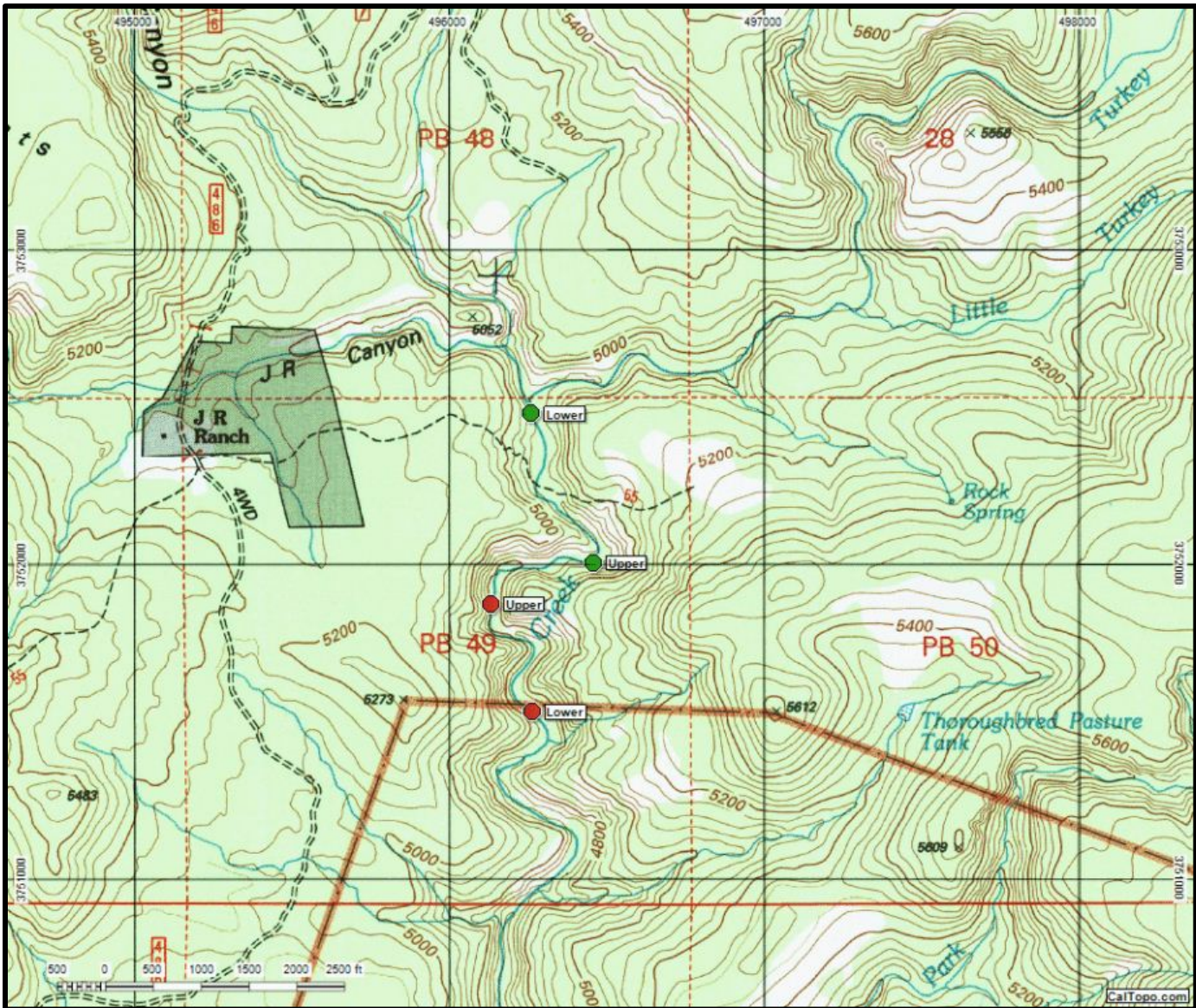


Figure 34. Salome Creek E. of JR Ranch (green) and SE of JR Ranch (red) – 500-m survey sites for upper reach.

09/30/2014

Upper: 489087E, 3737107N

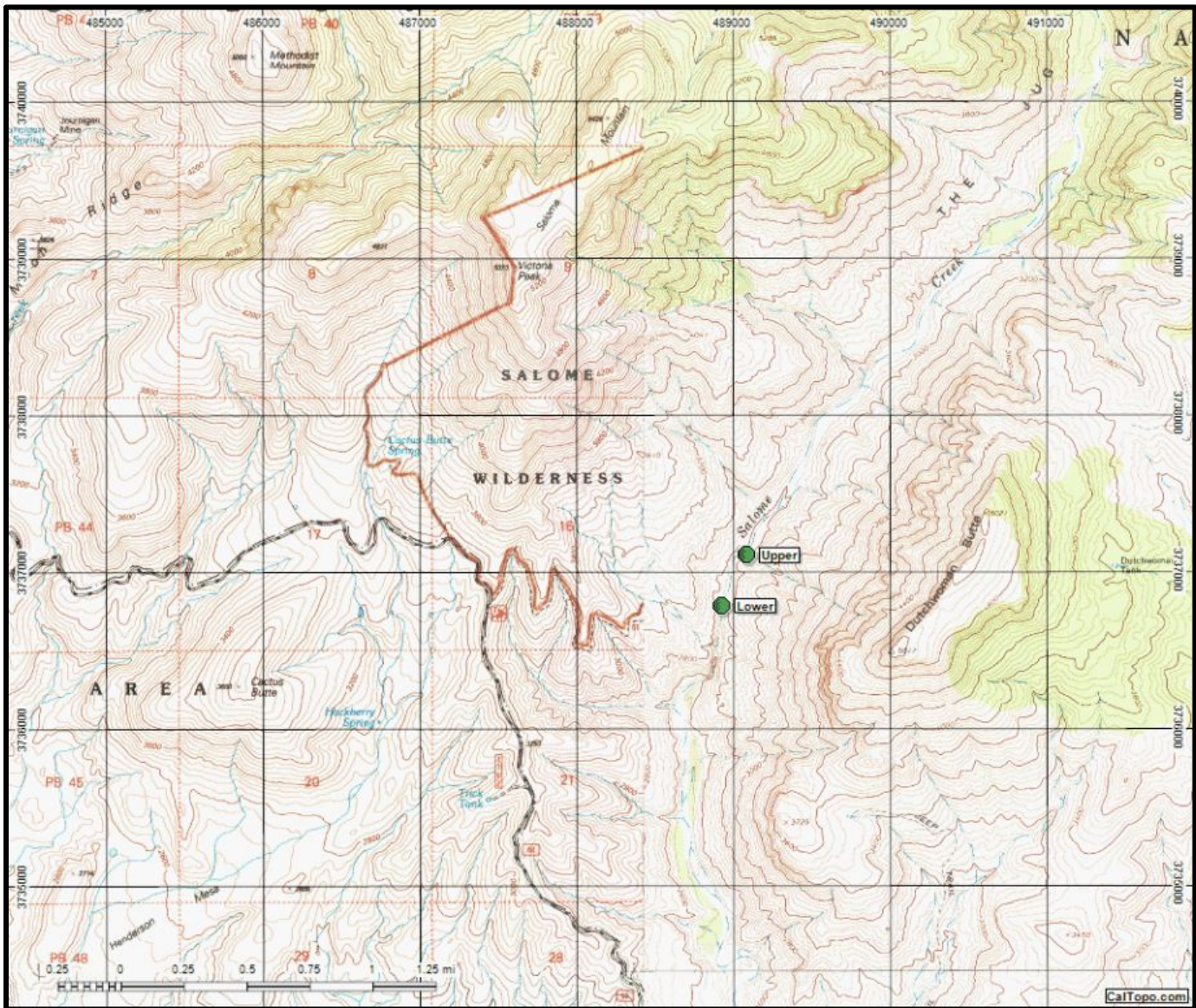


Figure 35. Salome Creek below The Jug – 500-m survey site for lower reach.

Bass Canyon

09/23/2014

UTM 12S

Lower: 571953E, 3579664N

Upper: 572035E, 3579701N

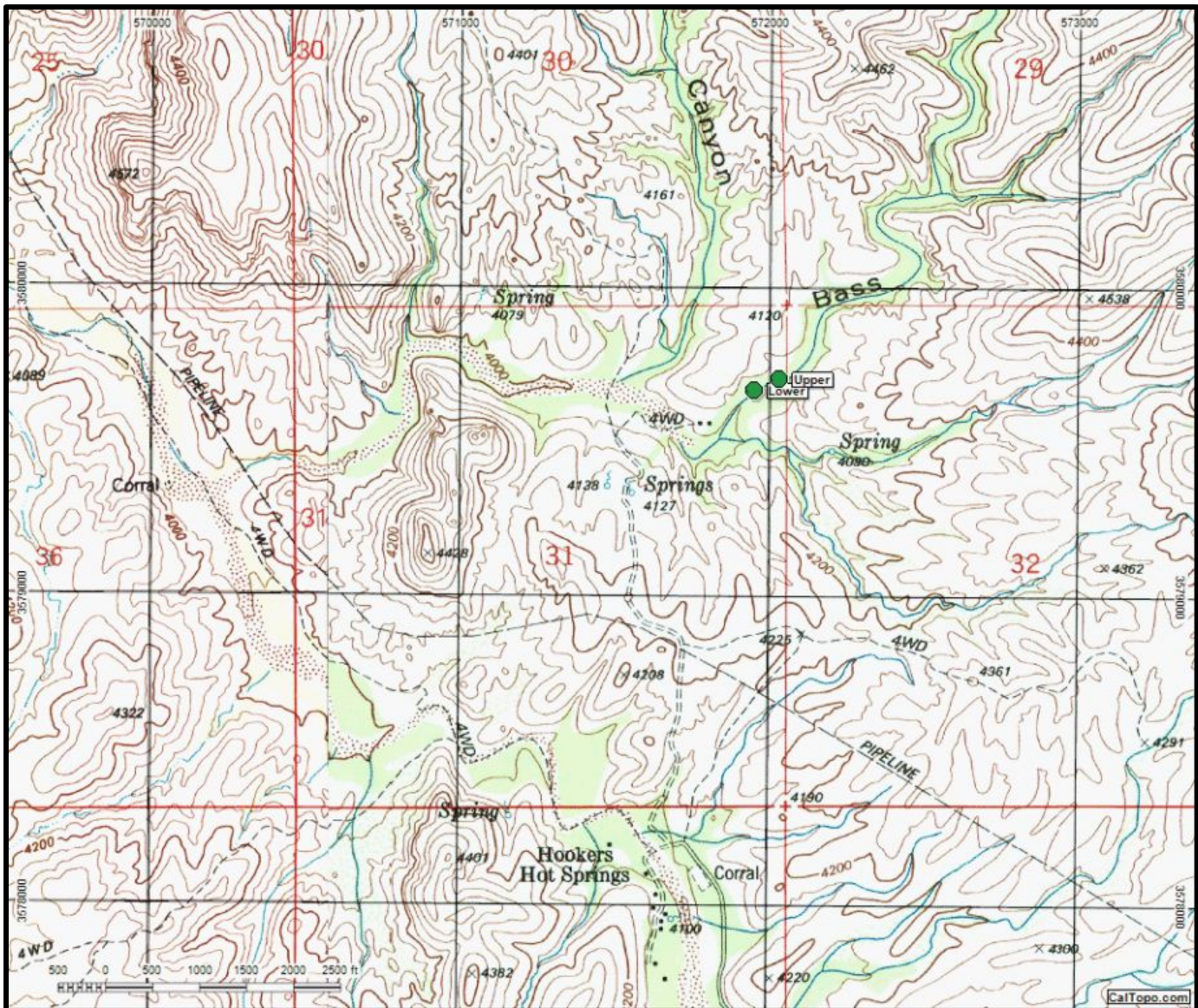


Figure 36. Bass Canyon – 100-m sample site.

East Verde River above Water Wheel (red)

08/04/2014

UTM 12S Lower: 473821E, 3801212N

Upper: 474237E, 3801326N

East Verde River @ First Crossing (green)

10/13/2014

UTM 12S Lower: 473258E, 3800129N

Upper: 473364E, 3800149N

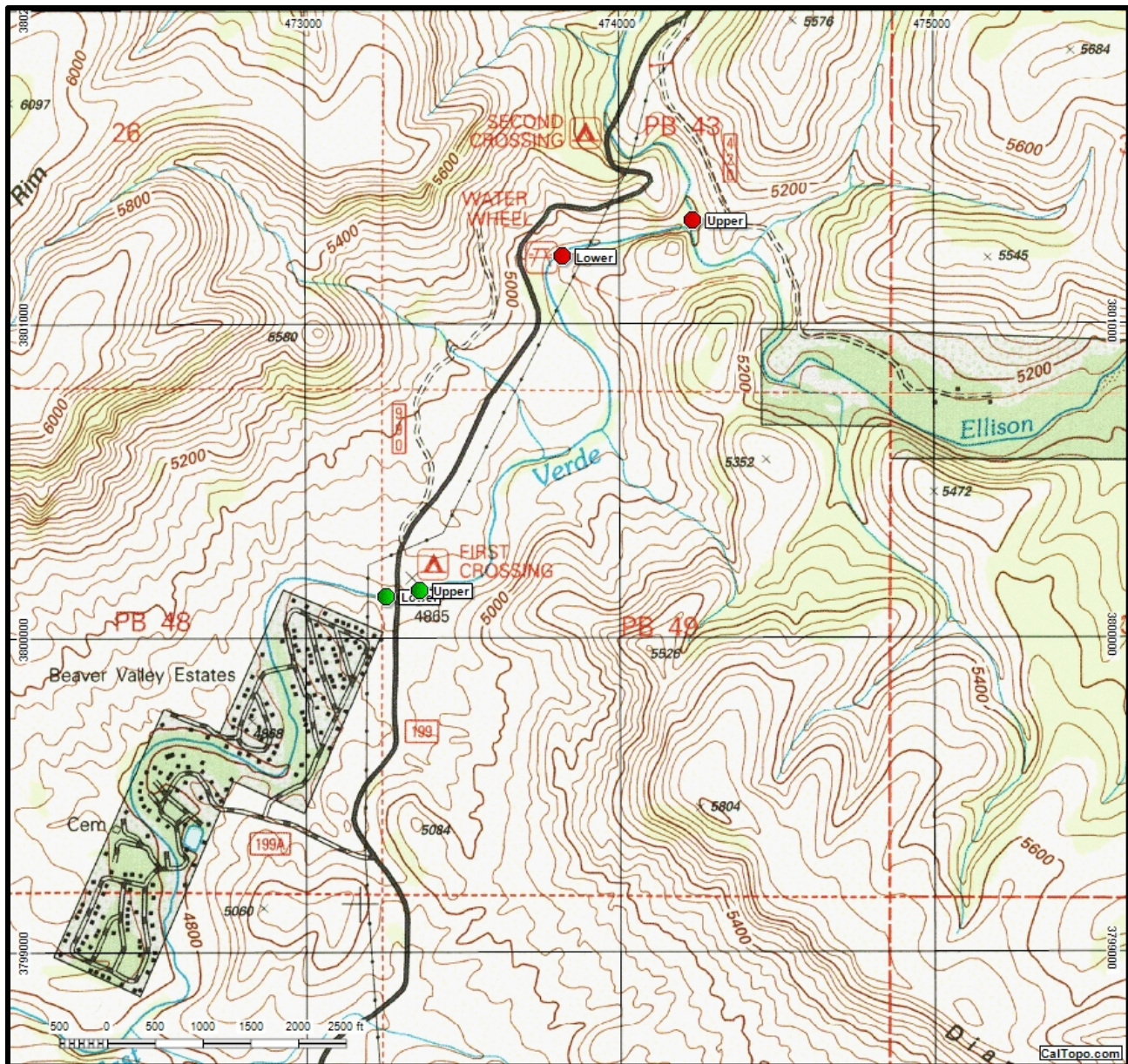


Figure 37. East Verde River @ Water Wheel (red) and @ First Crossing (green) – 500-m survey site for Upper 1 and 100m sample site for Upper 2, upper reach.

East Verde River – Below East Verde Park 1 (green)

09/22/2014

UTM 12S Lower: 465521E, 3794090N

Upper: 465623E, 3794454N

East Verde River – Below East Verde Park 2 (red)

09/22/2014

UTM 12S Lower: 464962E, 3793385N

Upper: 465143E, 3793845N

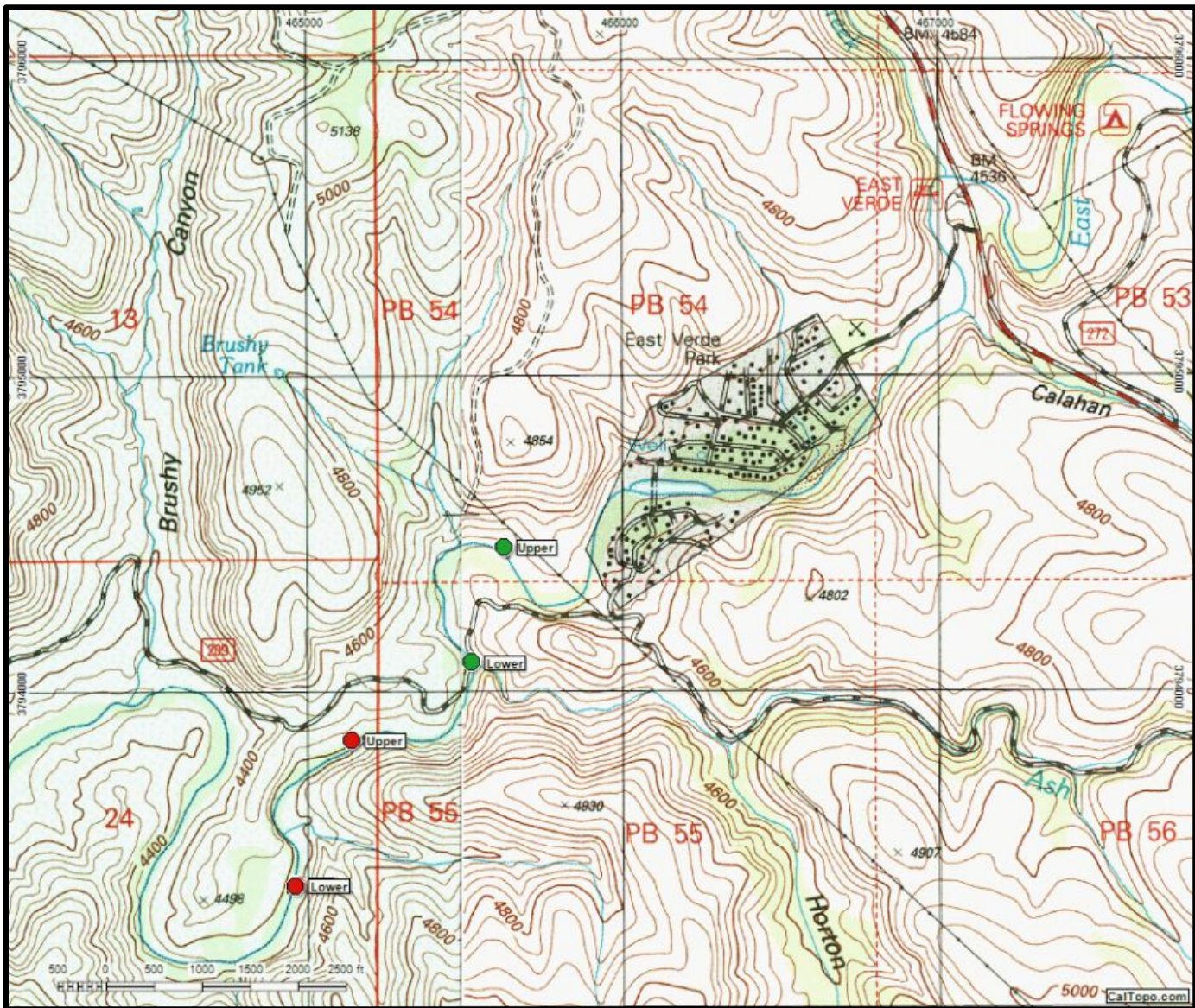


Figure 38. East Verde River – Below E. Verde Park 1 (green) and below E. Verde Park 2 (red) – 500-m survey sites for middle reach.

East Verde River – Below Gowan Mine

09/22/2014

UTM 12S

Lower: 459950E, 3788661N

Upper: 460437E, 3788775N

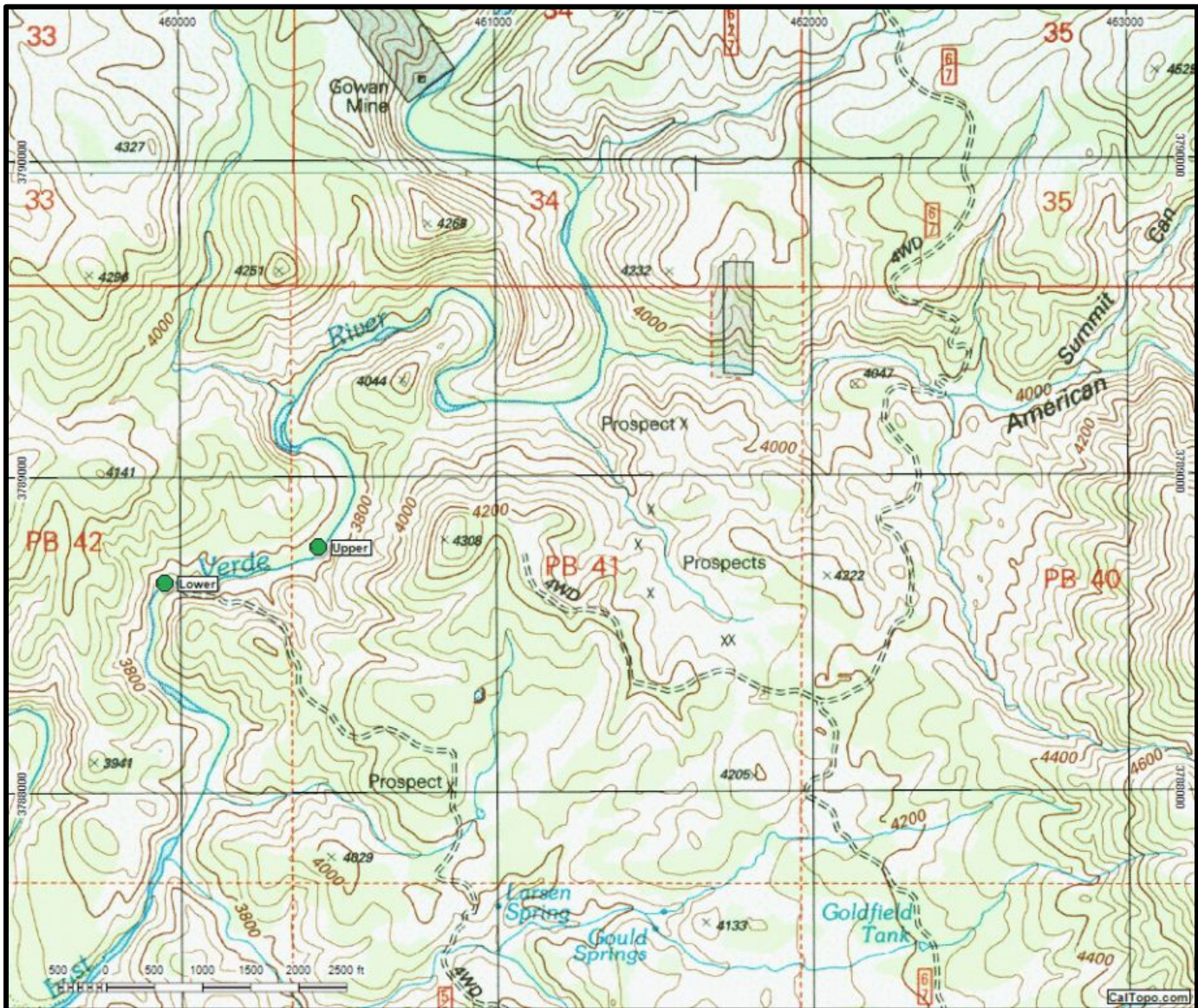


Figure 39. East Verde River – Below Gowan Mine – 500-m survey site for middle reach.

East Verde River – Below Doll Baby Ranch

09/23/2014

UTM 12S

Lower: 455208E, 3786687N

Upper: 455570E, 3786286N

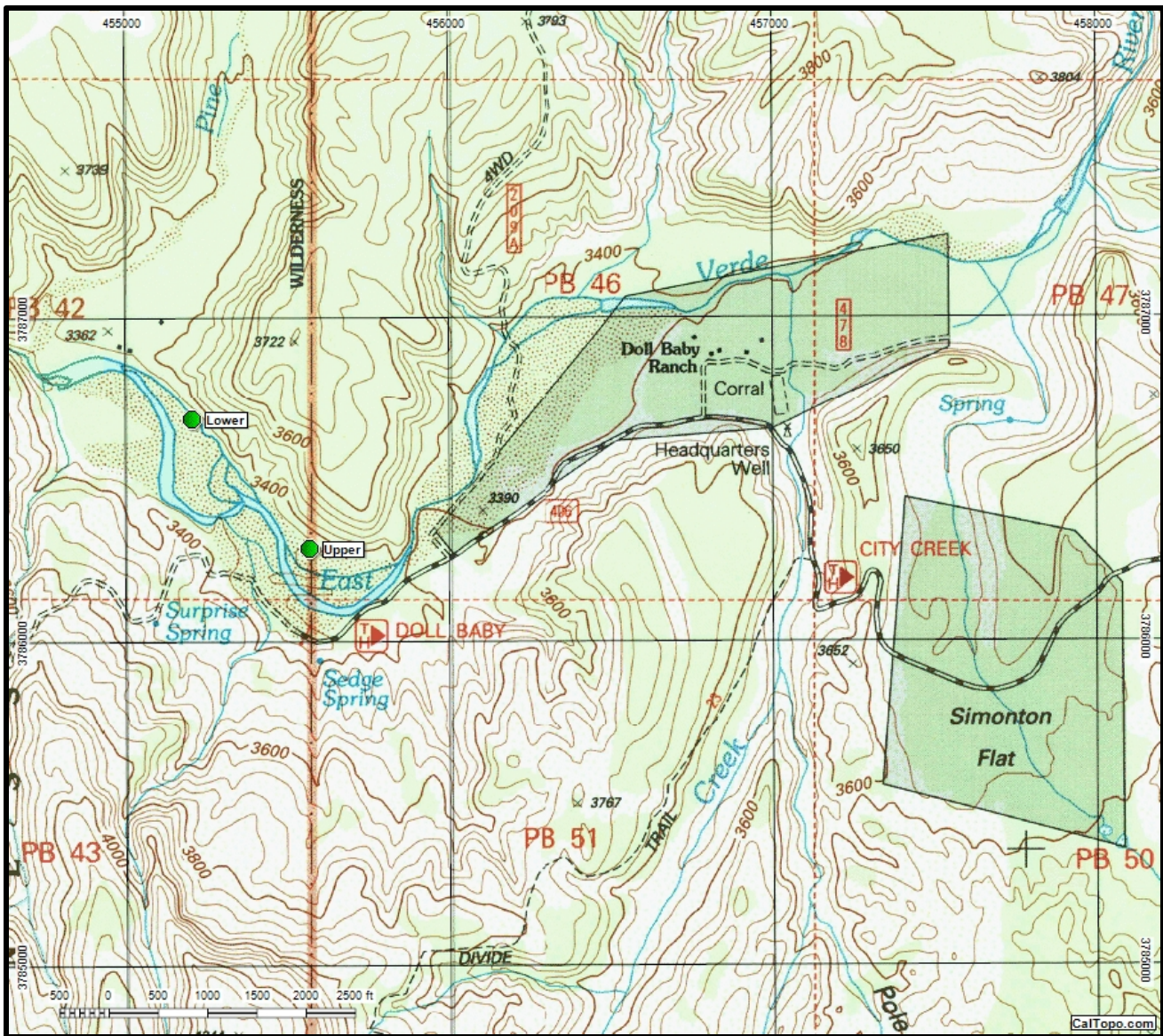


Figure 40. East Verde River – below Doll Baby Ranch – 500-m survey site for lower reach.

East Verde River – Above LF Ranch (green)

09/29/2014

UTM 12S Lower: 452906E, 3787555N

Upper: 452937E, 3787057N

East Verde River – Below LF Ranch (red)

09/29/2014

UTM 12S Lower: 452008E, 3787724N

Upper: 452471E, 3787569N

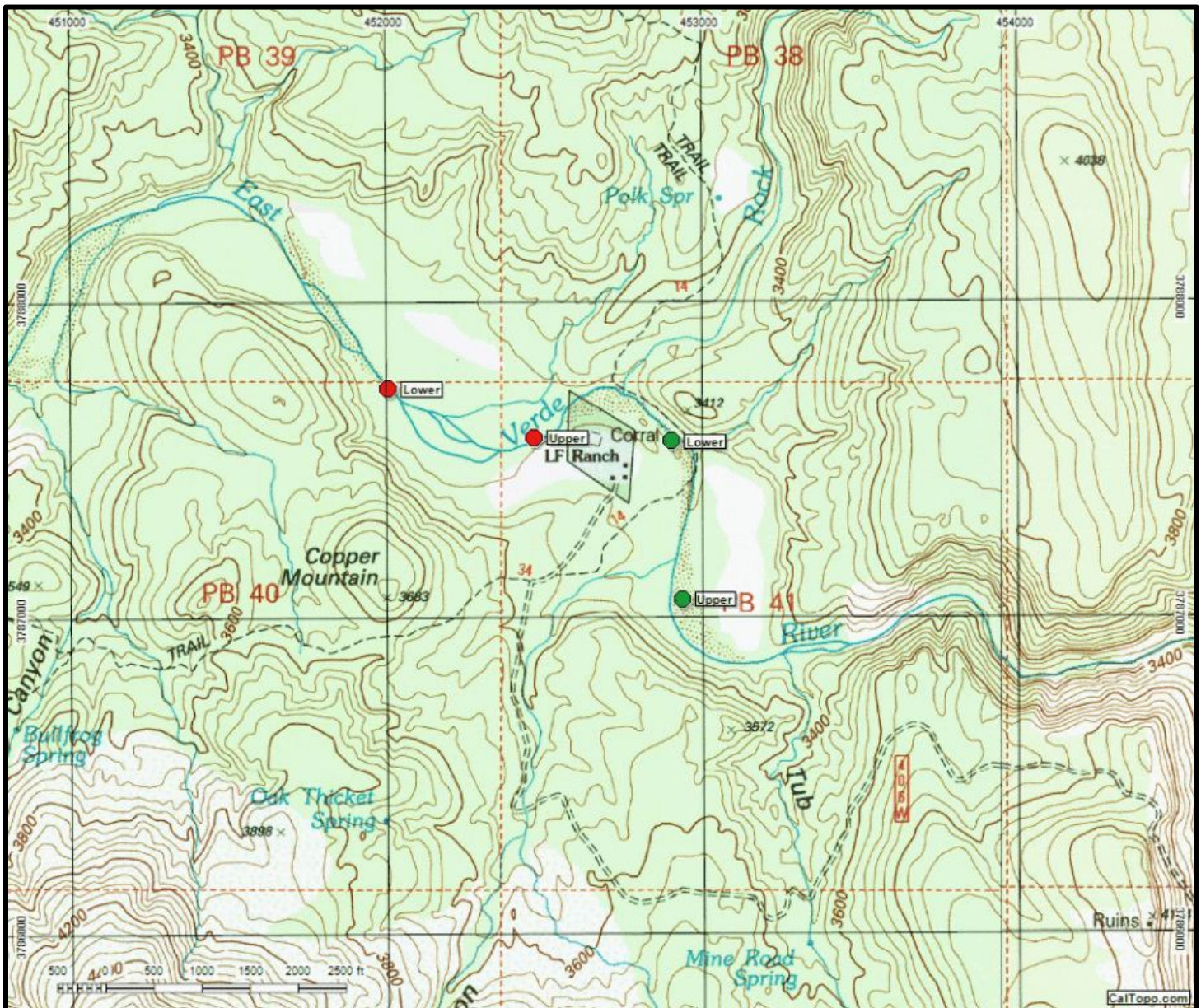


Figure 41. East Verde River – Above LF Ranch (green) and below LF Ranch (red) – 500-m survey sites for lower reach.

Upper Verde River – S. of Packard Ranch 1 (green)

10/06/2014

UTM 12S Lower: 401951E, 3856395N

Upper: 401968E, 3857293N

Upper Verde River – S. of Packard Ranch 2 (red)

10/06/2014

UTM 12S Lower: 402335E, 3856961N

Upper: 401988E, 3856637N

Upper Verde River – S. of Packard Ranch 3 (blue)

10/06/2014

UTM 12S Lower: 402812E, 3856828N

Upper: 402491E, 3857078N

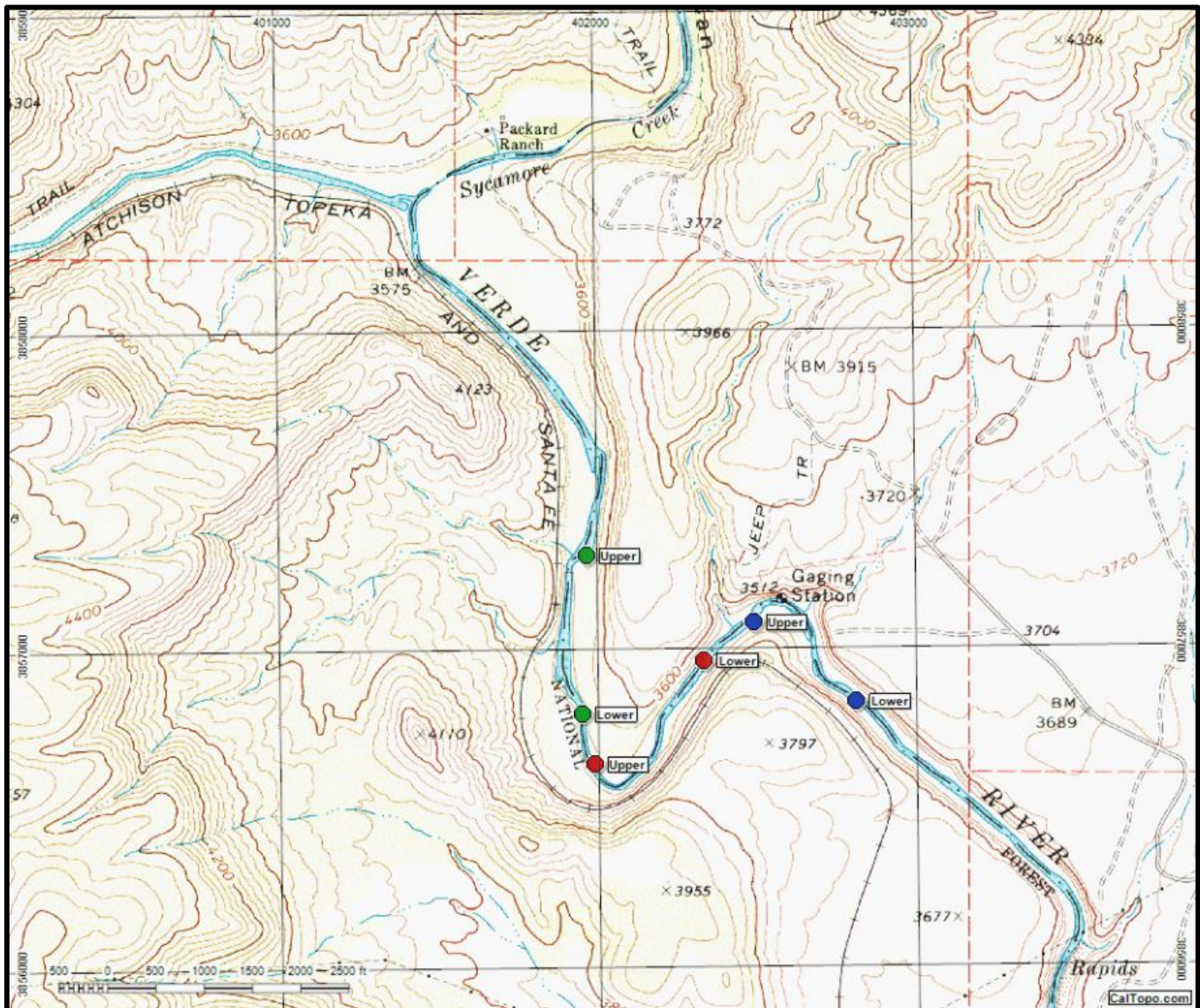


Figure 42. Upper Verde River – South of Packard Ranch 1 (green), 2 (red), and 3 (blue) – 500-m survey sites.

Upper Verde River – Perkinsville below bridge (green)

10/07/2014

UTM 12S Lower: 390195E, 3862392N

Upper: 389801E, 3862080N

Upper Verde River – Perkinsville above bridge (red)

10/07/2014

UTM 12S Lower: 389623E, 3861983N

Upper: 389141E, 3861938N

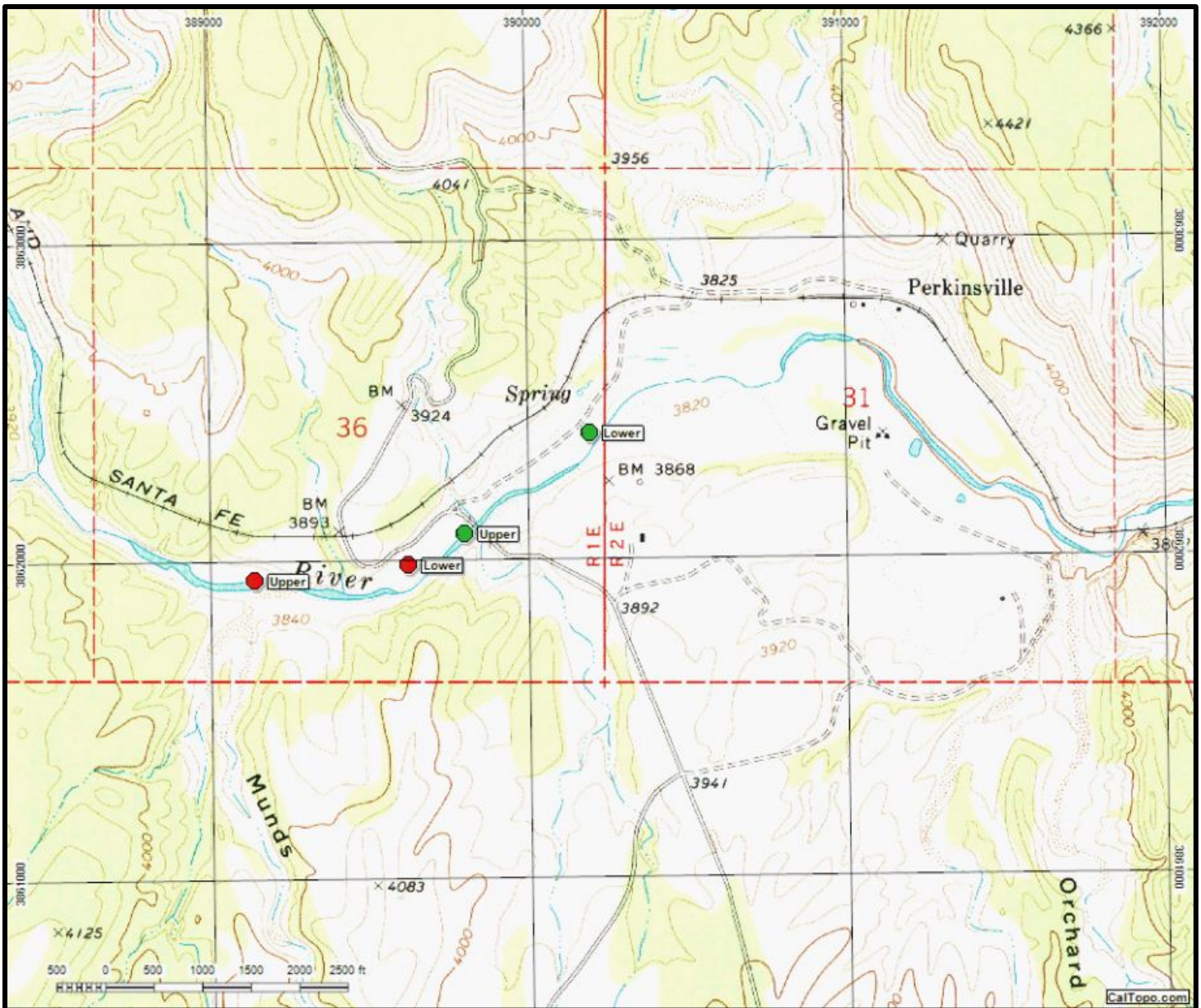


Figure 43. Upper Verde River – Perkinsville below bridge (green) and Perkinsville above bridge (red) – 500-m survey sites.

Upper Verde River – U.S. Mine

10/07/2014

UTM 12S

Lower: 385350E, 3863586N

Upper: 385002E, 3863548N

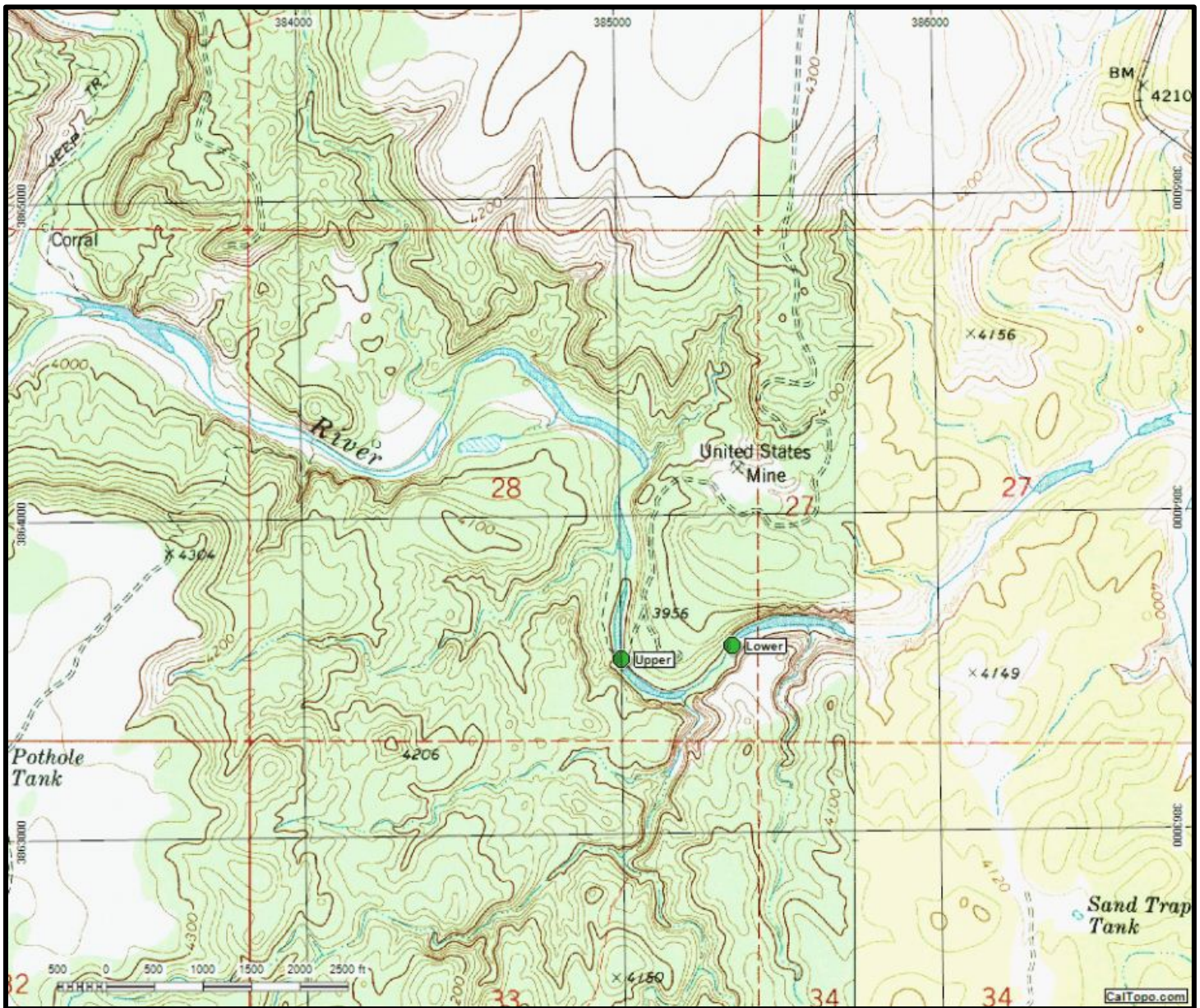


Figure 44. Upper Verde River – U.S. Mine – 500-m survey site.

Upper Verde River – Pipeline Road 1 (green)

10/08/2014

UTM 12S Lower: 375019E, 3861201N

Upper: 374601E, 3861065N

Upper Verde River – Pipeline Road 2 (red)

10/08/2014

UTM 12S Lower: 374407E, 3861125N

Upper: 373899E, 3861236N

Upper Verde River – Pipeline Road 3 (blue)

10/08/2014

UTM 12S Lower: 373720E, 3861251N

Upper: 373292E, 3860995N

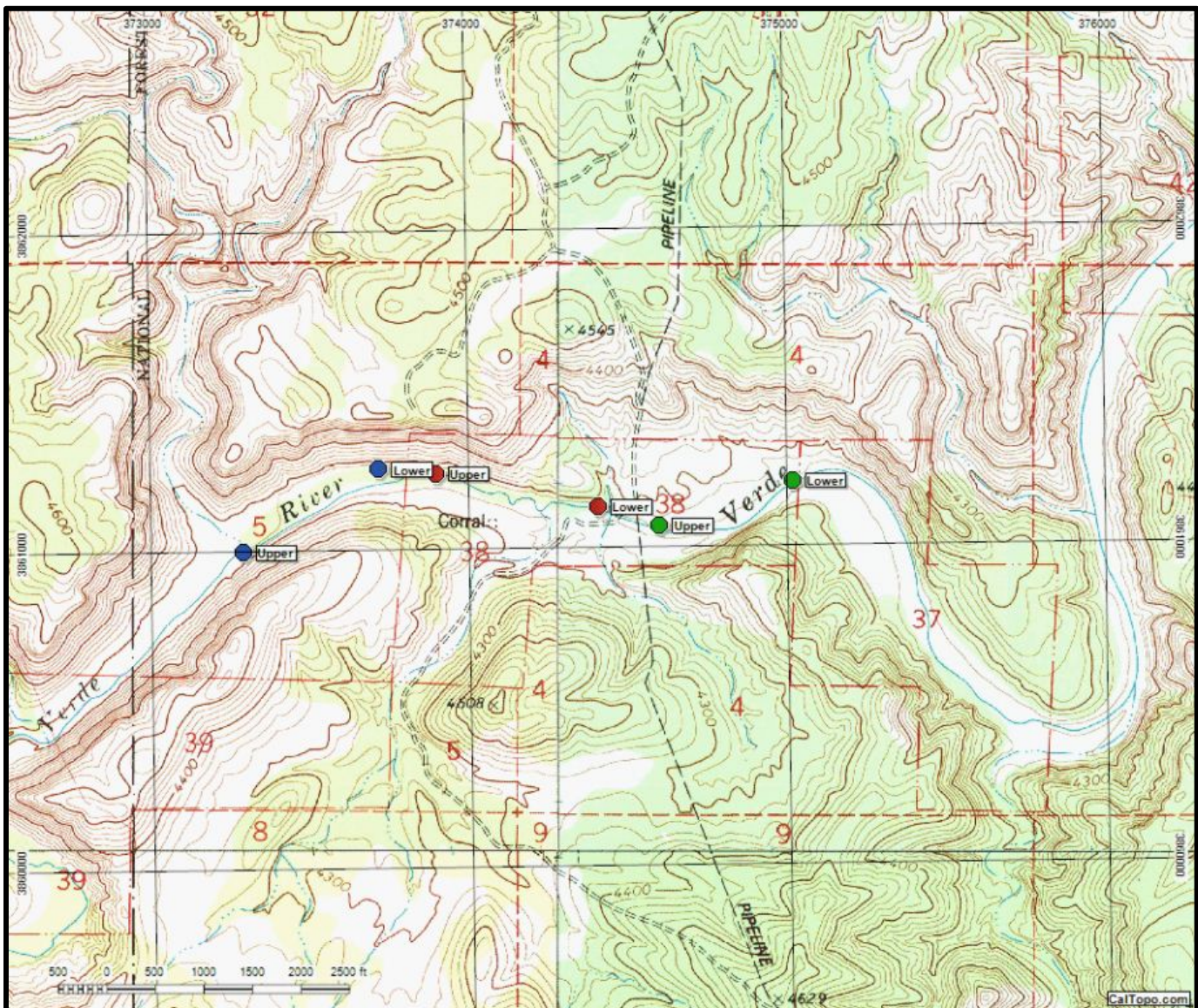


Figure 45. Upper Verde River – Pipeline Road 1 (green), 2 (red), and 3 (blue) – 500-m survey sites.

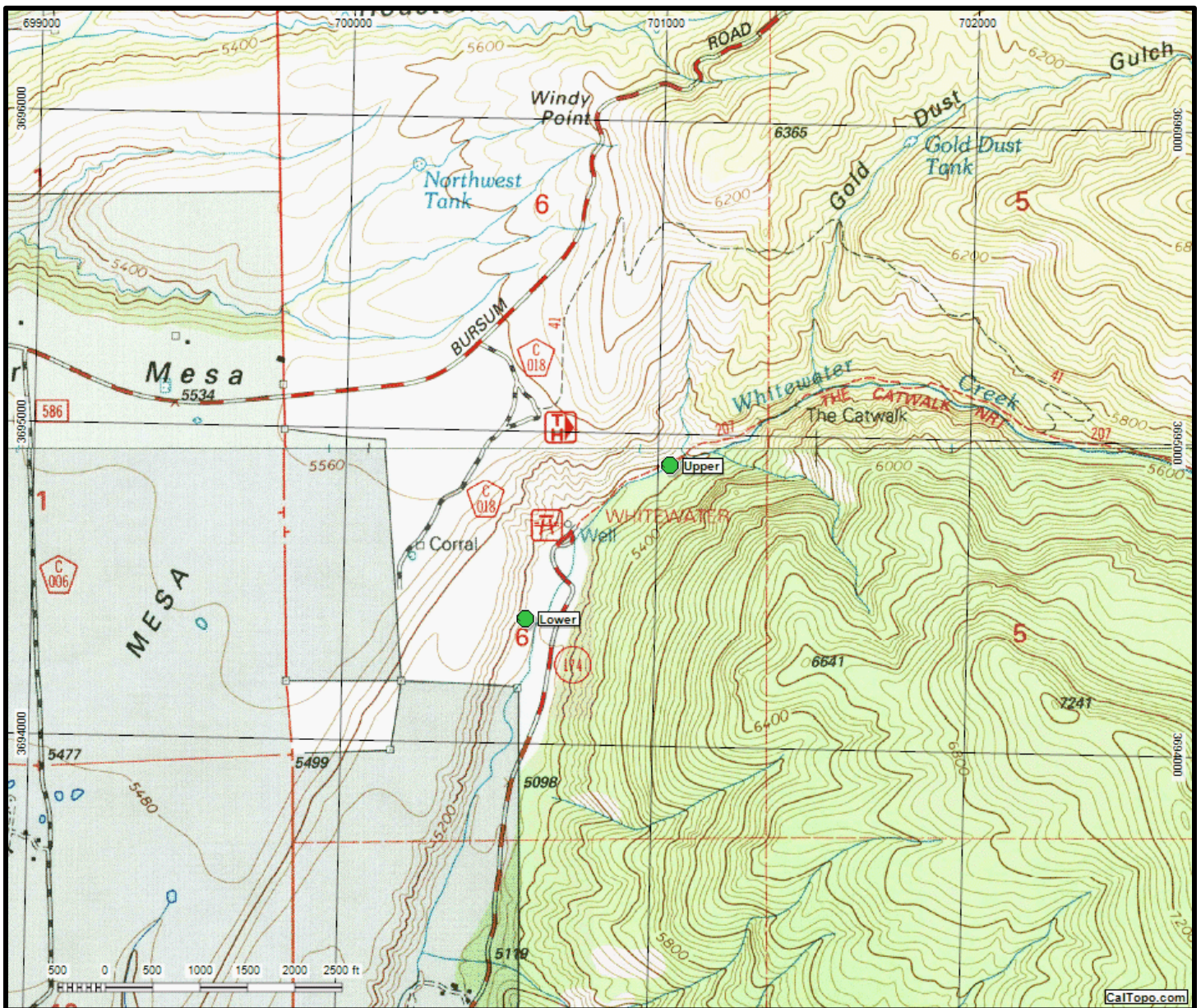


Figure 46. Whitewater Creek NM – 500-m sample site.

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2014

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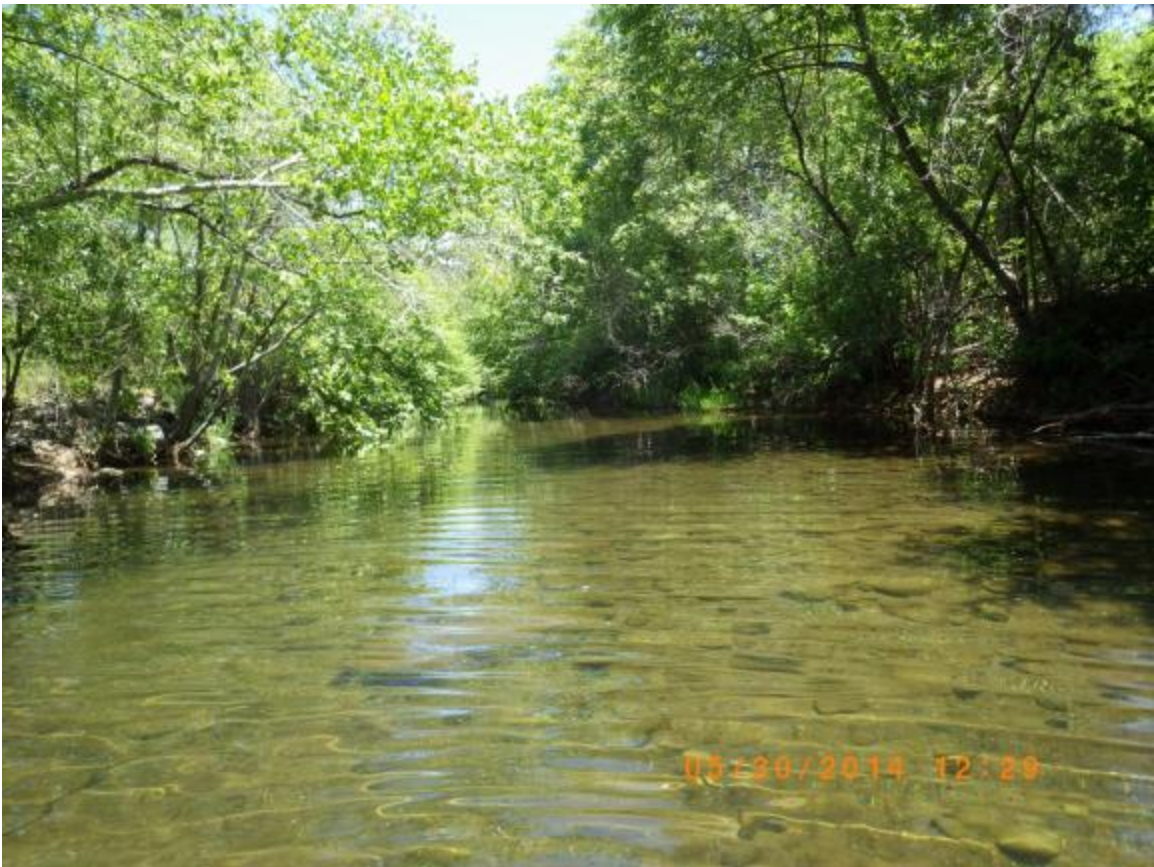


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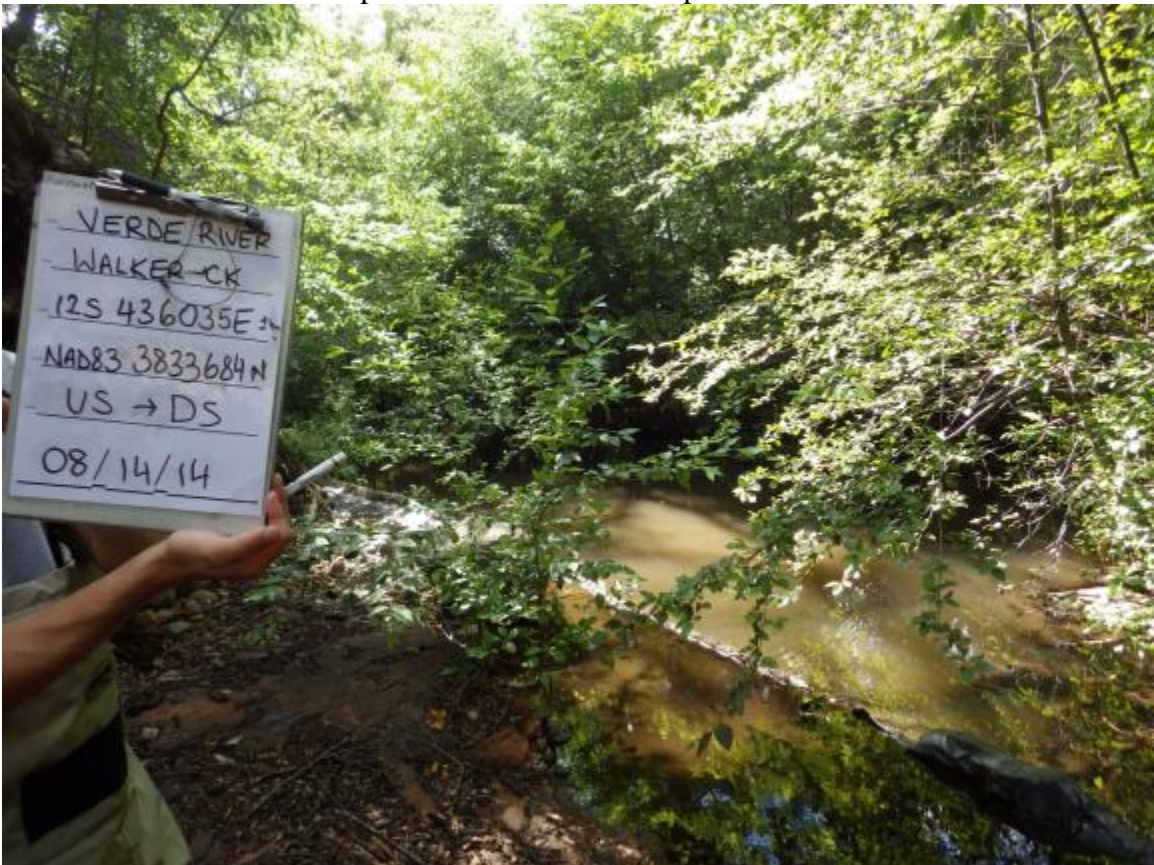


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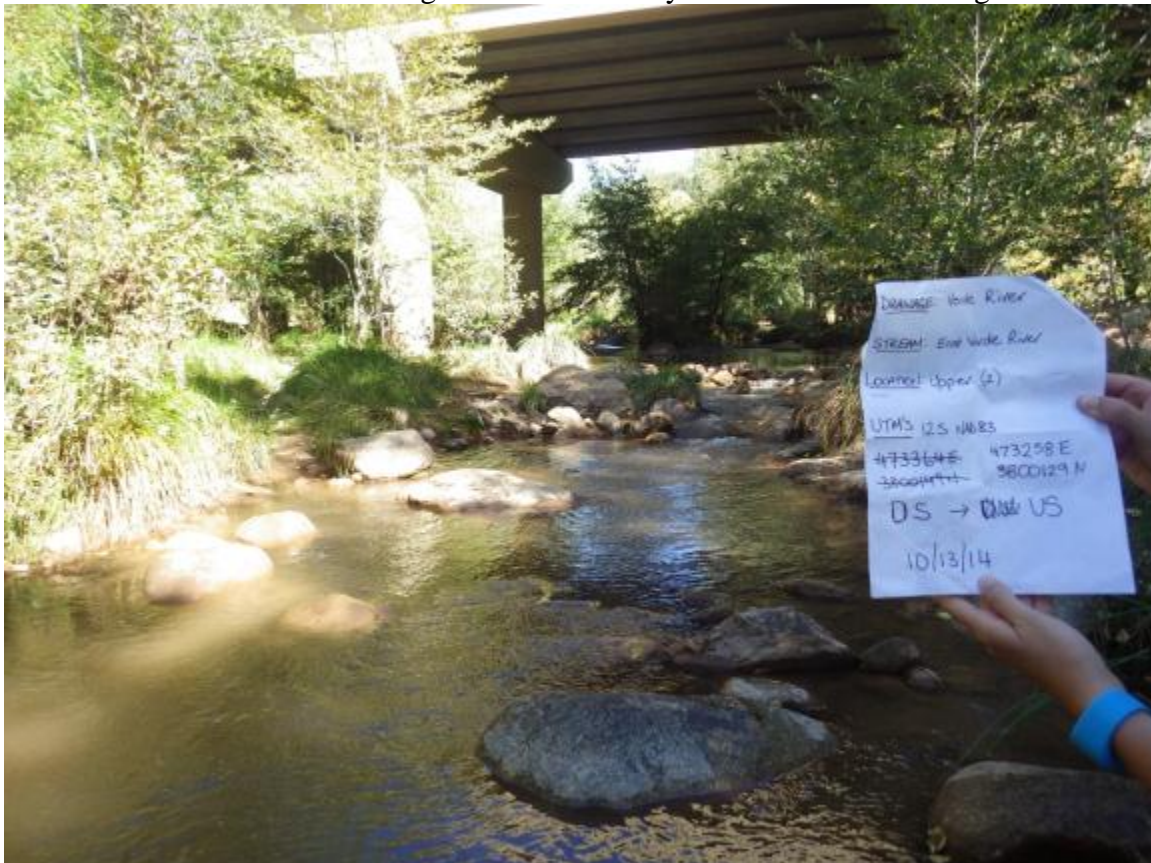


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