

Putah Creek 2011 summary report

May 18 and September 11-12, 2011

State of California

Natural Resources Agency

California Department of Fish and Wildlife

Heritage and Wild Trout Program



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Introduction

Putah Creek, in the Sacramento River basin, supports a popular fishery for coastal rainbow trout (*Oncorhynchus mykiss irideus*) in their native range (Figure 1). Putah Creek's popularity is due, in large part, to its close proximity to both the Sacramento and San Francisco metropolitan areas. Putah Creek originates in the Mayacamas Mountains southeast of Clear Lake, CA. It is impounded at lakes Berryessa and Solano, and flows into the Putah Creek Sinks in the Yolo Bypass. The inter-dam reach is approximately eight miles in length and is regulated by Monticello Dam on Lake Berryessa, which releases cold water year-round for agricultural demand.

The California Department of Fish and Wildlife (CDFW) Heritage and Wild Trout Program (HWTP) has evaluated Putah Creek for candidacy as a designated Wild Trout Water since 2009 (Weaver and Mehalick 2009). Wild Trout Waters are those that support self-sustaining trout populations, are aesthetically pleasing and environmentally productive, provide adequate catch rates in terms of numbers or size of fish, and are open to public angling (Bloom and Weaver 2008). Wild Trout Waters may not be stocked with catchable-sized hatchery trout. The HWTP evaluates candidate waters using a phased approach to systematically collect data and evaluate whether or not a stream or lake meets designation criteria. Phase 1 initial resource assessments were conducted by the HWTP in 2009 to determine whether this fishery meets the qualifications for designation as a Wild Trout Water. In 2010, a Phase 2 candidate water assessment was initiated. HWTP Phase 2 assessments provide a comprehensive evaluation of the fishery (species composition, size class structure and abundance) and associated habitat and generally occur over a multi-year period. Following the recommendations of the 2010 assessment, the HWTP continued Phase 2 assessments in 2011. The goals and objectives of these surveys included:

1. Conduct population-level fisheries and habitat assessments throughout the inter-dam reach of Putah Creek to better understand species composition, size class structure, and fish abundance.
2. Maintain, in collaboration with Putah Creek Trout (PCT), four Angler Survey Boxes (ASB) on Putah Creek and analyze voluntary angler data to better understand catch rates, catch size, gear preferences and angler satisfaction.

In addition, insufficient high flow events in the interdam reach has resulted in increased aquatic vegetation, sediment trapping and embedded spawning gravels. The concern over limited spawning habitat in Putah Creek prompted vegetation removal efforts to increase the availability of exposed gravel. Spawning habitat enhancement was conducted at three key spawning locations in 2011.

Methods

Single-pass electrofish

On May 18, 2011, the HWTP (Headquarters, Bay Delta Region and North Central Region) conducted single-pass electrofish surveys at two locations (Sections 111-211) using Smith Root backpack electroshockers to identify the presence or absence of juvenile salmonids (Figures 2 and 3). These sections were located in side-channel habitats where water depths were conducive to backpack electroshocking and where young-of-year had previously been captured (Weaver and Mehalick 2010). In each section, three shockers and multiple netters opportunistically captured fish at accessible locations in each section and did not attempt to collect all fish within a given section. Physical measurements of the stream and environmental conditions were taken, including water temperature (°C) and conductivity (specific and ambient; microsiemens; μS). These factors were used to determine appropriate electroshocker settings. Coordinates were taken for both the upstream and downstream boundaries of the survey using a Global Positioning System hand-held unit (North American Datum 1983). Current weather conditions were noted and the area was scouted for any species of concern prior to commencing the electrofish effort. Surveys proceeded in an upstream direction, with netters capturing fish and placing them in live cars to be held until processed. Live cars consisted of 32-gallon plastic trash bins, perforated with holes to allow water circulation. Over the course of the survey, fish were handled carefully to minimize injury and stress. Each trout was identified to species and measured for total length (mm). All other fishes (non-trout) were identified to species and tallied by section. Fish were recovered in live cars secured in the stream (with fresh flowing water) and released back into the section. Section length was measured along the thalweg (ft).

Direct observation

On September 11 and 12, 2011, the HWTP (Headquarters staff) conducted direct observation surveys at 16 locations (Sections 111-1611) throughout the inter-dam reach of Putah Creek using snorkeling methods, an effective survey technique in many small streams and creeks in California and the Pacific Northwest (Hankin and Reeves 1988). Sections were selected based on representative habitat and conditions that were conducive to direct observation. Areas with reduced visibility (often associated with faster water) and unsafe conditions were excluded from the sample frame. Where feasible, specific section boundaries were located at distinct breaks in habitat type and/or stream gradient. A maximum section length of 500 feet was established and in habitat units exceeding this distance, the section was confined to the upper 500 feet of the habitat unit; a range-finder was used to estimate linear distance. Individual sections were surveyed with two to five divers; the number of divers was determined based on wetted width, water visibility and habitat complexity within each section. Surveys were conducted in either an upstream or downstream direction depending on streamflow.

Divers maintained an evenly-spaced line perpendicular to the current and counted fish by species. All observed trout were further separated and counted by size class. Size classes were divided into the following categories: small (< 6 inches); medium (6-11.9 inches); large (12-17.9 inches); and extra-large (≥ 18 inches). Divers were instructed in both visual size class estimation and proper snorkel survey techniques prior to starting the survey (establishing a dominant side, determining the extent of their visual survey area, how and when to count (or not count) fish observed, safety considerations, etc.). For each section, surveyors measured section length along the thalweg (ft), water and air temperature ($^{\circ}\text{C}$) and average wetted width (ft), water depth (ft) and water visibility (ft). Habitat type (flatwater, riffle or pool) was identified following Level 2 protocol as defined in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1988). Representative photographs were taken and coordinates were recorded for the section boundaries using GPS hand-held units (North American Datum 1983). Fish abundance was estimated by species and section (fish/mi) and was averaged across all sections (total number of all fish observed by species divided by total survey length).

Angler surveys

In collaboration with PCT, the HWTP maintained four ASB on Putah Creek to better understand catch rates and sizes and angler satisfaction. All completed forms received from these boxes in 2011 were analyzed. Forms missing pertinent information (date, number of hours fished or size classes of captured trout) were excluded from analysis. Catch per unit effort (CPUE; fish/hr) was calculated for each angler and averaged by year.

In addition, PCT maintained an online angler survey form that mirrored the HWTP ASB form. Forms submitted online in 2011 were analyzed and compared to the traditional (hard-copy) ASB data.

Spawning habitat enhancement

In collaboration with PCT and numerous volunteers, the HWTP conducted spawning habitat enhancement at three major spawning areas in Putah Creek (Monticello Dam, Highway 128 and Deer sign). Aquatic vegetation was removed and gravels were loosened to a depth of up to six inches in highly embedded areas to improve spawning habitat using various tools including rakes and shovels. Photographs were taken pre- and post-restoration to document the amount of vegetation that was removed. No physical measurements or data were collected for the treated areas.

Results

Single-pass electrofish

Two sections located in side-channel habitat in the upper portion of the inter-dam reach were surveyed via single-pass electrofish methodology (Figure 4). A total of 24 coastal rainbow trout, 14 sculpin (*Cottus* sp.), nine threespine stickleback (*Gasterosteus aculeatus*), one sucker (*Catostomus* asp.), and two cyprinids (Family Cyprinidae) were captured in approximately 954 ft of habitat (Table 1). Captured coastal rainbow trout ranged in total length from 37 to 93 mm (1.5-3.7 in) with a mean of 68 mm (2.7 in). Water temperature was 11° C at 1000.

Direct observation

The inter-dam reach of Putah Creek is a tail-water fishery dominated by deep runs interspersed with short riffles and few pools. A total of 4338 feet of habitat was surveyed among 16 sections using direct observation methodology (Figure 5). Mean wetted width and water depths were 88.0 ft and 4.5 ft, respectively. Surveyed habitat was comprised entirely of flatwater; faster water habitat and riffles were excluded from the sample frame due to safety concerns and presumed poor fish detection. Weather conditions during the survey effort ranged from clear to overcast and air temperature was between 20° C and 33° C, depending on the time of day. Water temperature was measured between 12° C and 17° C and water visibility ranged from four to greater than ten feet; in four sections water depth was greater than water visibility, potentially impacting fish detection and/or identification. Surveyors observed a total of 189 coastal rainbow trout, one unknown trout, 49 unknown cyprinids, and 830 threespine stickleback (Table 2). Size class distribution of observed trout was 11% small-, 34% medium-, 49% large- and 5% extra-large sized fish (Figure 6). Estimated fish density was 230 coastal rainbow trout/mi, one unknown trout/mi, 60 unknown cyprinids/mi, and 1010 threespine stickleback/mi. Threespine stickleback were only observed via direct observation in the downstream portion of the inter-dam reach near Lake Solano (Section 1611); the estimated density of threespine stickleback in Section 1611 (excluding all other sections) was 33,200 fish/mi.

Angler surveys

Four ASB were evaluated in 2011 and included a total of 136 forms (not including online forms). Anglers reported a total effort of 470 hours and a capture of 261 coastal rainbow trout and 14 brown trout (*Salmo trutta*; Table 3). Catch per unit effort ranged from zero to 5.7 fish/hr with a mean of 0.6 fish/hr. The majority of coastal rainbow trout reported caught were between six and 11.9 inches (medium-size class; Figure 7). The majority of brown trout reported caught were less than 12 inches in total length (Figure 8).

Data from the online ASB forms were provided to the HWTP by PCT. A total of 139 forms were evaluated in 2011 and anglers reported catching 674 coastal rainbow trout and one brown trout. Total effort reported was 559 hrs. Catch per unit ranged from zero to 5.5 fish/hr with a mean of 1.2 fish/hr. The majority of coastal rainbow trout reported caught were in the medium-size class and the one brown trout reported caught in 2011 was in the small-size class.

Discussion

A scale analysis of coastal rainbow trout captured by the HWTP in October of 2009 showed young-of-year ranging in size from 46 mm to 215 mm total length (Weaver and Mehalick 2009). Presumably, the majority of coastal rainbow trout captured in side-channel habitat via electrofishing in 2011 were 0+ fish. The presence of young-of-year indicates natural reproduction and recruitment occurred in 2011. The electrofish surveys were limited in geographic scope and during the surveys, numerous fish were observed moving upstream of the electrical field and evading capture. The side channels in Putah Creek appear to provide habitat for numerous species as well as a rearing environment for juvenile trout.

The direct observation surveys occurred throughout the inter-dam reach of Putah Creek and were more comprehensive in nature compared to the electrofish surveys. Poor water visibility may have impaired fish detection and identification, especially in the lower portion of the inter-dam reach. Additionally, in habitat units greater than 500 feet in length, survey end points did not correspond to breaks in gradient or habitat and may have negatively influenced observed fish densities. Observed coastal rainbow trout density appeared low (23 fish/mi) and may have been influenced by survey bias. Non-salmonids were mainly observed in braided side-channel habitat and species diversity appeared highest in the lower portion of the inter-dam reach.

Voluntary angler data from ASBs show catch rates on Putah Creek are relatively low (<1 fish/hr); however, the fishery provides an opportunity to catch trophy-sized trout (>18"). The majority of anglers reported catching trout in the medium-size class whereas direct observation surveys observed a higher proportion of large-sized fish. A comparison among the two angler survey methods (ASB versus online forms) shows similar species distribution and size class structure. The number of forms analyzed each year was similar for both survey methods. Average CPUE from the online forms was two times higher than that reported in ASB forms.

Conclusion

Putah Creek supports native populations of coastal rainbow trout, threespine stickleback, Sacramento suckers and sculpin. This popular fishery is publicly accessible along Highway 128 at multiple angler access locations, is open to year-round fishing and provides anglers with an opportunity to catch trophy-sized coastal rainbow trout. Putah Creek meets numerous criteria for designation as a Wild Trout Water and the HWTP recommends continued Phase 2 candidate water assessments including population-level monitoring, angler use studies and habitat evaluations. Due to deep water habitat and the presence of aquatic vegetation, block net installation for use in depletion electrofish surveys is not feasible at most locations. Poor water visibility observed in 2011 may have negatively biased observed fish density and species composition using direct

observation methodology. Consideration should be given to other population-level survey methods including mark-recapture techniques and/or replication of the HWTP 2009 single-pass electrofish effort.

The HWTP recommends continued maintenance and analysis of the four ASB as well as further evaluation of the applicability in using online methods to submit voluntary angler data. Potential effects to the Putah Creek fishery due to the cessation of stocking and fishing regulation changes should continue to be monitored. The presence of young-of-year observed in 2009, 2010 and 2011 indicates natural reproduction and recruitment is occurring, although the availability of suitable spawning habitat may be a limiting factor for trout reproduction in Putah Creek (Salamunovich 2009). The HWTP recommends continued efforts to improve spawning habitat by decreasing the amount of embedded gravel and removing aquatic vegetation in select locations. These efforts should be evaluated for project success and consideration should be given to gravel augmentation.

There is growing concern that anglers may impact the spawning success of coastal rainbow trout in Putah Creek due to wading on redds (increased mortality of eggs and emergent fry) and/or harassment of adult spawning fish, leading to reduced fecundity. In 2010, the HWTP initiated a study to evaluate trout spawning duration, redd distribution, angler use and angler wading practices in Putah Creek. This study includes the use of remote cameras and concurrent bi-weekly site visits to three areas of Putah Creek where trout spawning was previously documented. The HWTP is committed to continuing this study through 2012 to evaluate potential effects of angler impacts to trout spawning in Putah Creek.

References

Bloom, R. and J Weaver. 2008. California Heritage and Wild Trout Program handbook (Draft). State of California Resources Agency. Department of Fish and Game. Rancho Cordova, CA.

Salamunovich, T. 2009. 2008-2009 Trout spawning/redd surveys in the Putah Creek Interdam reach. Thomas Payne and Associates. Arcata, CA.

Weaver, J. and S. Mehalick. 2009. Putah Creek summary report. State of California Natural Resources Agency. Department of Fish and Game. Rancho Cordova, CA.

Weaver, J. and S. Mehalick. 2010. Putah Creek summary report. State of California Natural Resources Agency. Department of Fish and Game. Rancho Cordova, CA.

Figure 1. Vicinity map of Putah Creek 2011 survey location

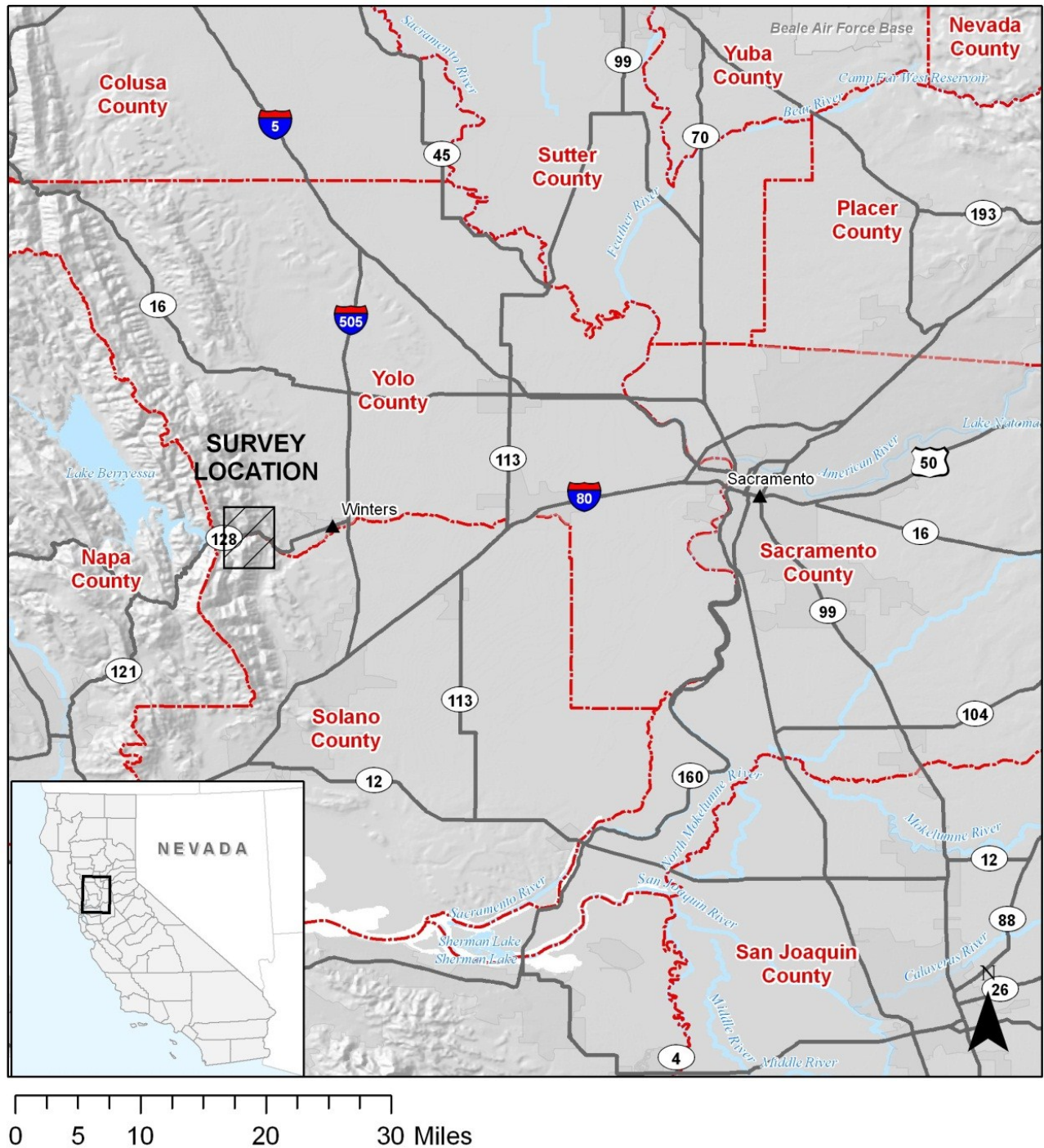


Figure 2. Detail map of 2011 Putah Creek survey sections

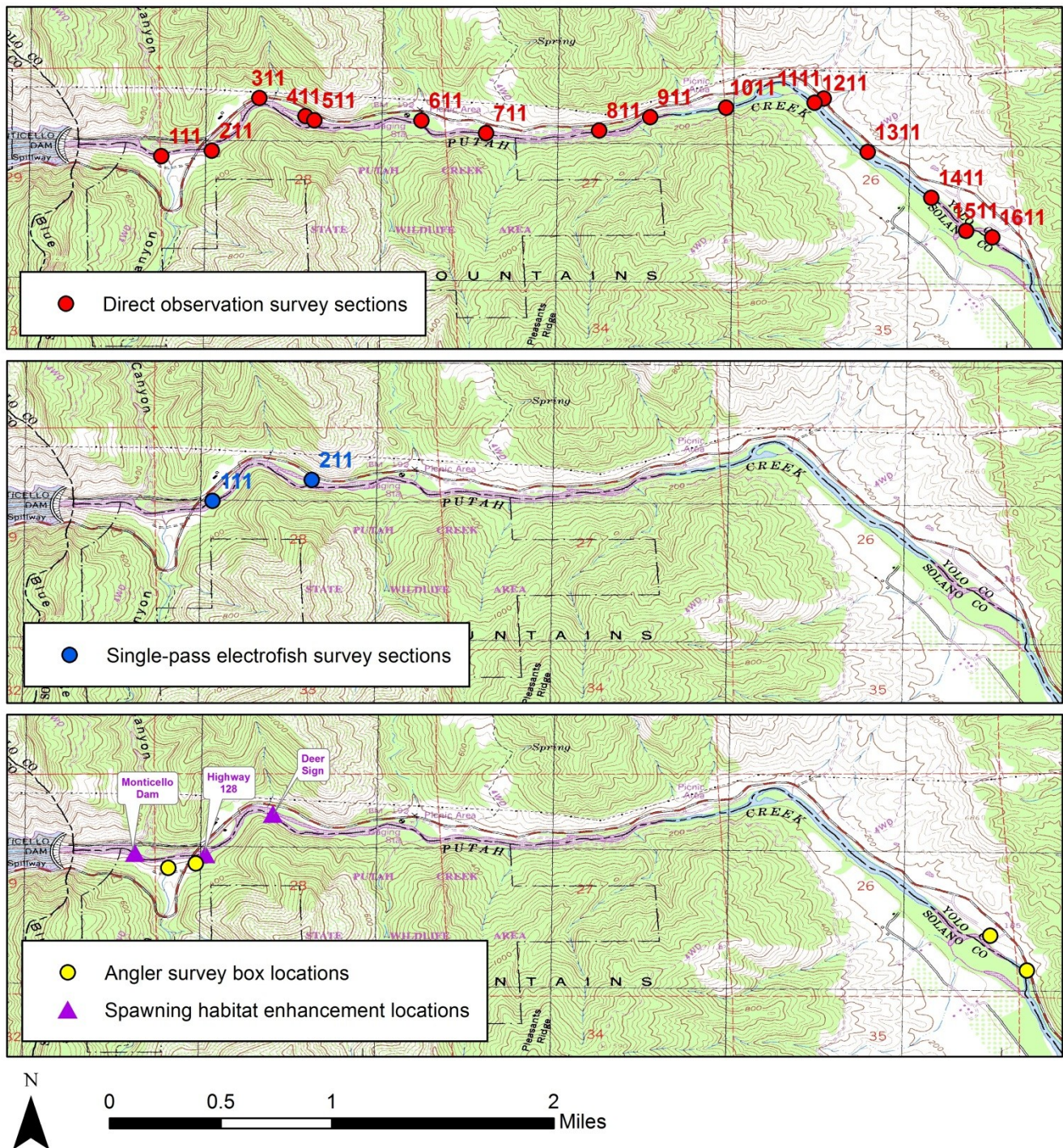


Figure 3. Aerial map of 2011 Putah Creek survey locations

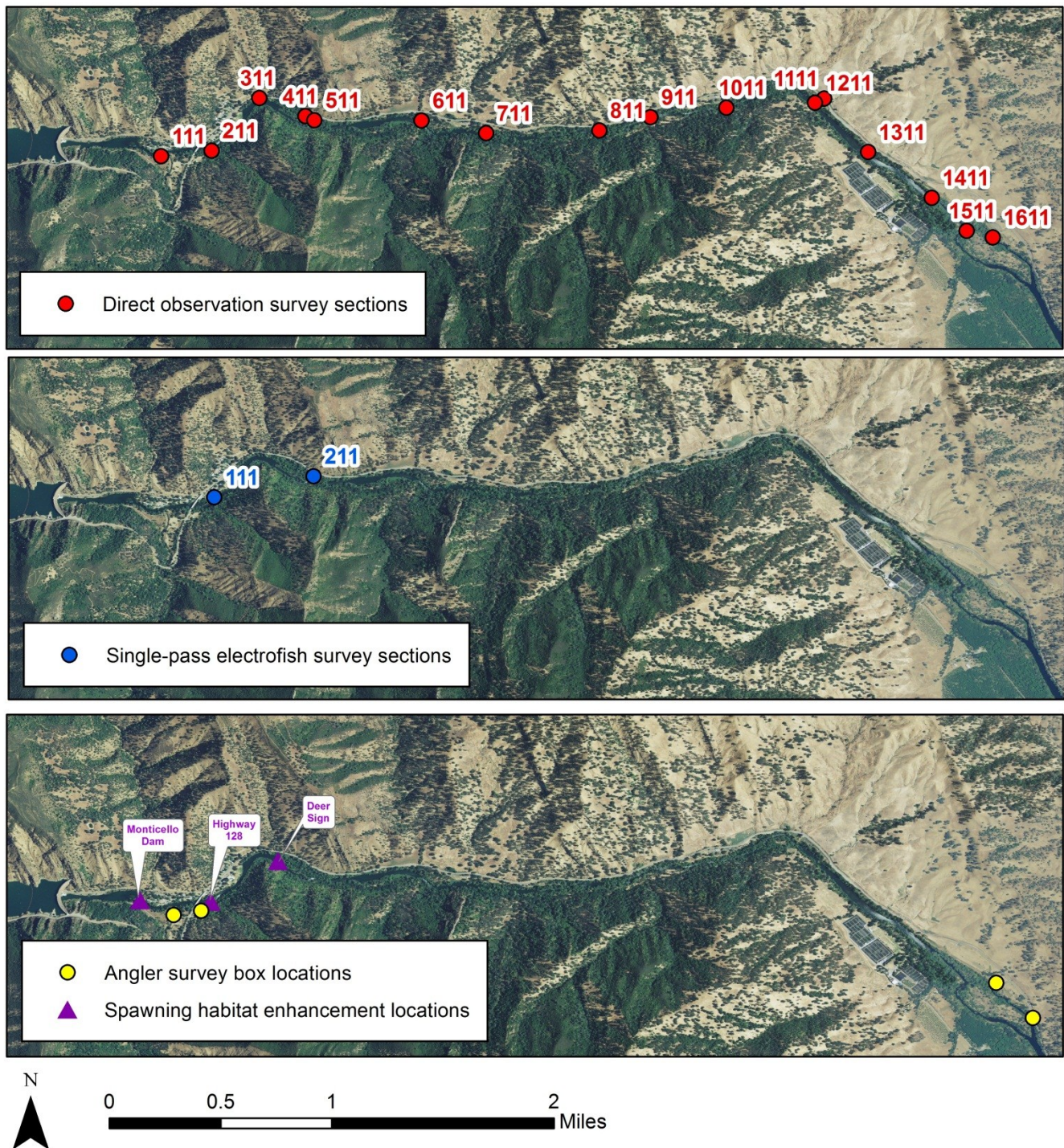


Figure 4. Representative photographs of 2011 Putah Creek single-pass electrofish survey in side-channel habitat



Figure 5. Representative photographs of 2011 Putah Creek direct observation survey sections

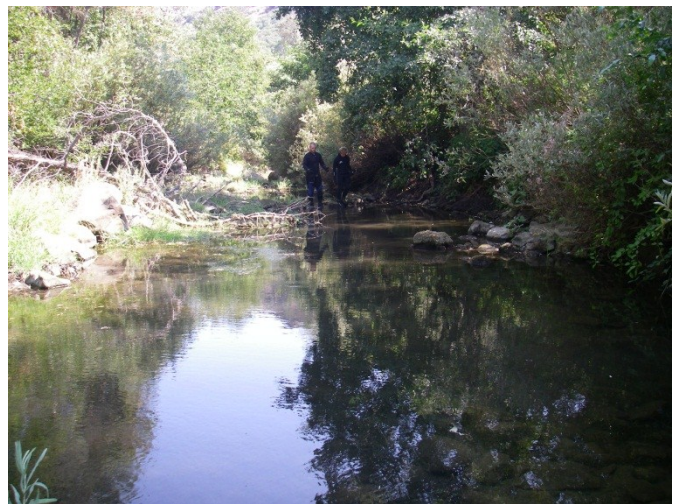


Figure 6. Size class distribution of the 190 trout observed in Putah Creek 2011 direct observation surveys

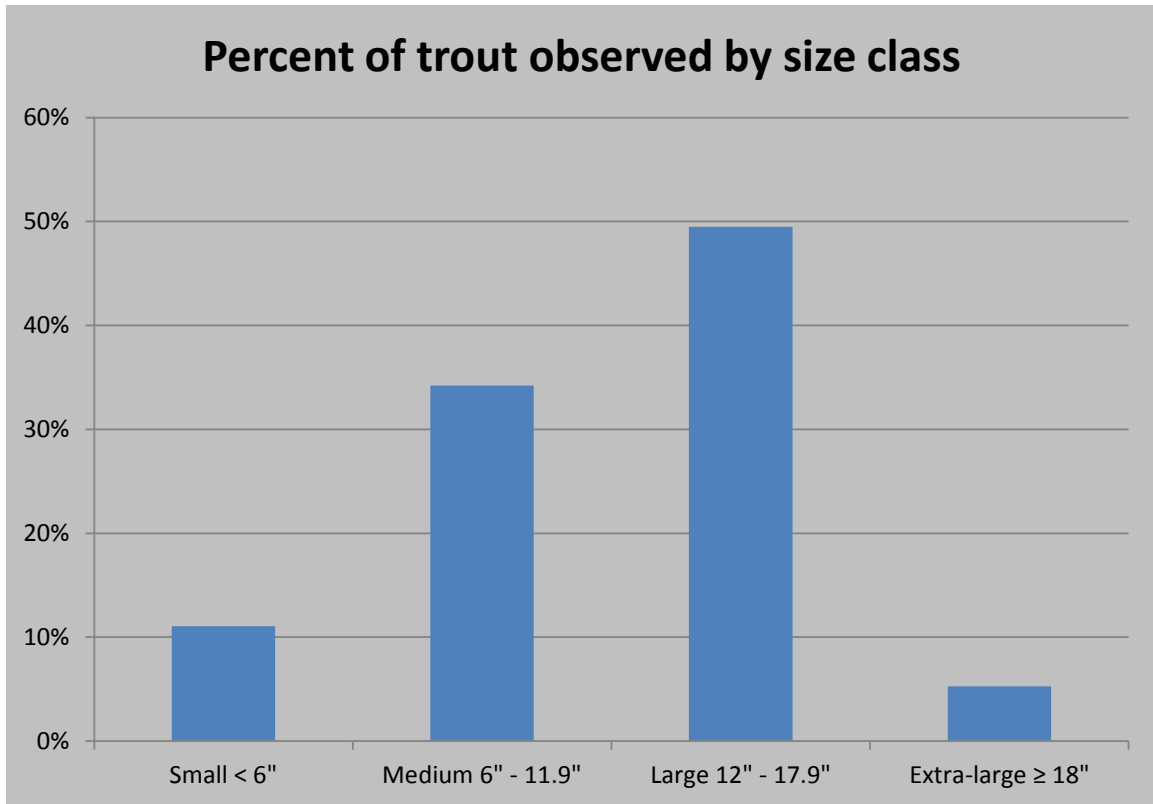


Figure 7. Size class distribution of coastal rainbow trout reported caught in Putah Creek 2011 voluntary angler surveys

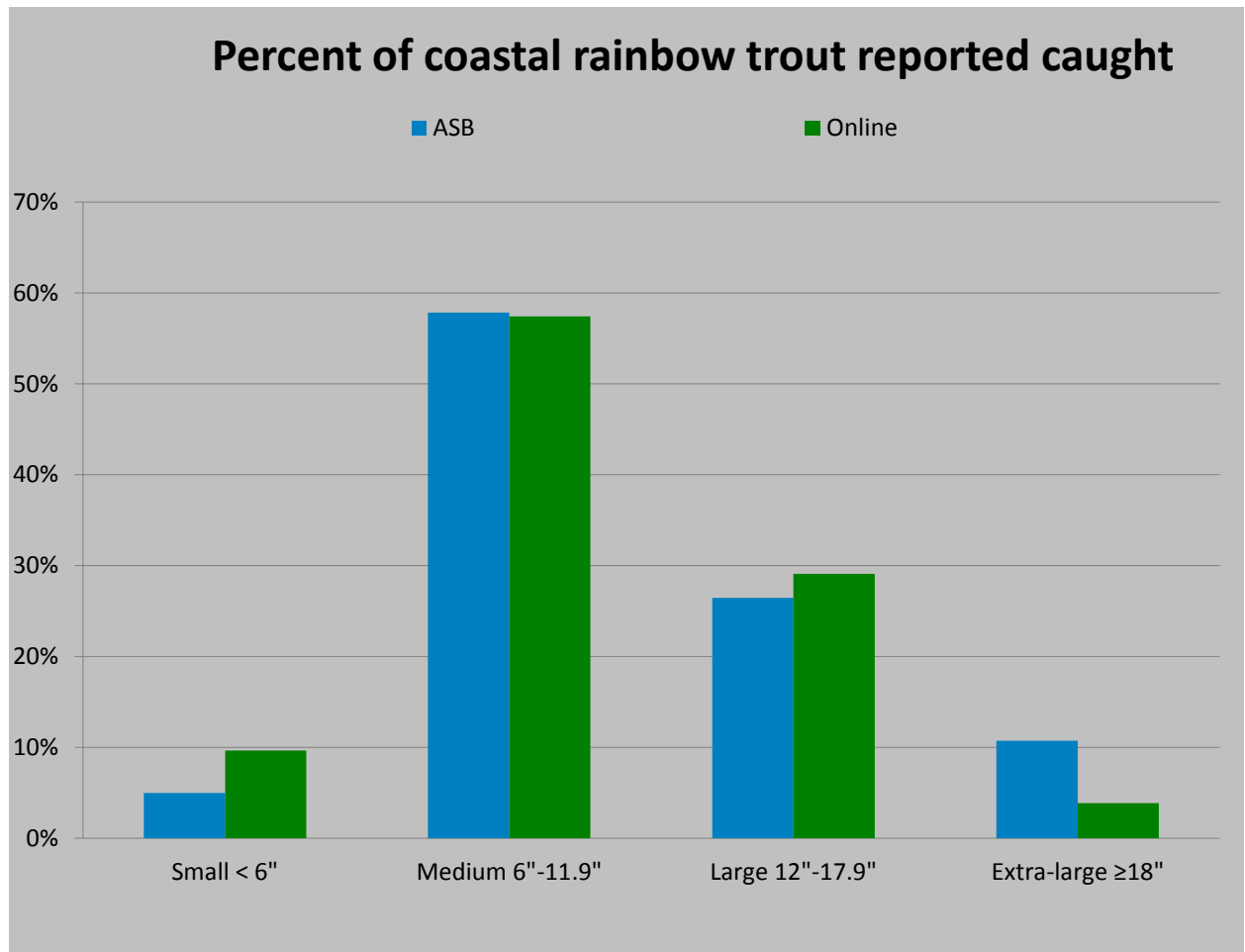


Figure 8. Size class distribution of brown trout reported caught in Putah Creek 2011 voluntary angler surveys

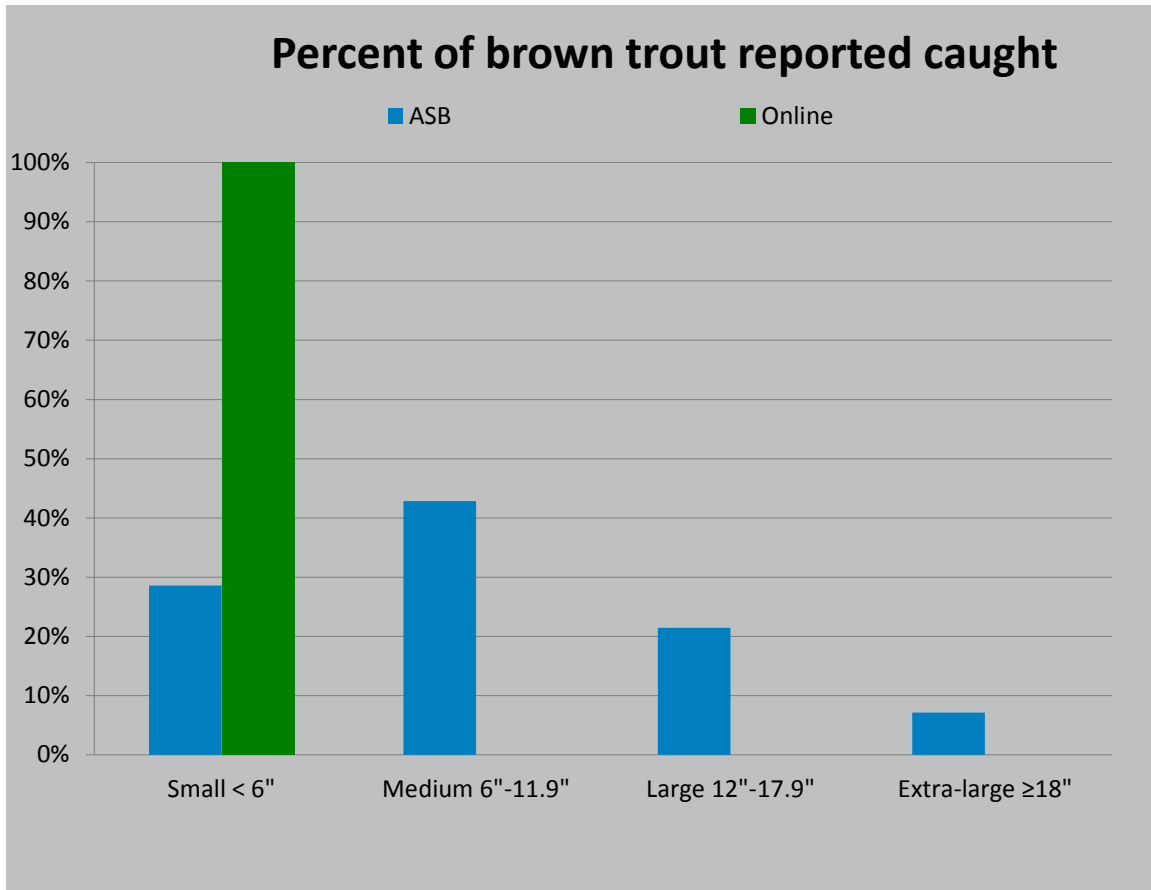


Table 1. Putah Creek 2011 single-pass electrofish data

Section	Section length (ft)	Species	Total number captured
111	229.0	coastal rainbow trout	10
		sculpin	13
		threespine stickleback	6
211	725.0	coastal rainbow trout	14
		sculpin	1
		threespine stickleback	3
		sucker	1
		cyprinid	2
Total	954.0	coastal rainbow trout	24
		sculpin	14
		threespine stickleback	9
		sucker	1
		cyprinid	2

Table 2. Putah Creek 2011 direct observation survey data

Section	Section length (ft)	Species	Number of fish observed				Total	Estimated density (fish/mi)
			Small < 6"	Medium 6" - 11.9"	Large 12" - 17.9"	Extra-large ≥ 18"		
111	357	coastal rainbow trout	10	8	11	4	33	488
		unknown trout	0	0	1	0	1	15
211	285	coastal rainbow trout	4	9	5	0	18	333
311	336	coastal rainbow trout	0	0	3	3	6	94
411	60	cyprinid	-	-	-	-	25	2200
511	69	cyprinid	-	-	-	-	23	1760
611	240	coastal rainbow trout	7	10	40	1	58	1276
		cyprinid	-	-	-	-	1	22
711	276	coastal rainbow trout	0	7	13	1	21	402
811	285	coastal rainbow trout	0	5	3	0	8	148
911	252	coastal rainbow trout	0	23	10	0	33	691
1011	252	coastal rainbow trout	0	0	2	1	3	63
1111	219	coastal rainbow trout	0	0	3	0	3	72
1211	273	-	-	-	-	-	0	0
1311	477	-	-	-	-	-	0	0
1411	486	-	-	-	-	-	0	0
1511	339	coastal rainbow trout	0	2	2	0	4	62
1611	132	coastal rainbow trout	0	1	1	0	2	80
		threespine stickleback	-	-	-	-	830	33200
Total	4338	coastal rainbow trout	21	65	93	10	189	230
		unknown trout	0	0	1	0	1	1
		cyprinid	-	-	-	-	49	60
		threespine stickleback	-	-	-	-	830	1010

Table 3. Putah Creek 2011 angler survey data

Year	Survey method	Number of forms	Effort (hrs)	Total brown trout reported caught	Total coastal rainbow trout reported caught	Total trout reported caught	Mean CPUE (fish/hr)
2011	ASB	136	470	14	261	275	0.6
2011	Online	139	559	1	674	675	1.2