

Putah Creek 2010 Summary Report

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State of California

Natural Resources Agency

California Department of Fish and Game

Heritage and Wild Trout Program



Prepared by Jeff Weaver and Stephanie Mehalick

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 Mayacmas Mountains southeast of Clear Lake, CA, 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.

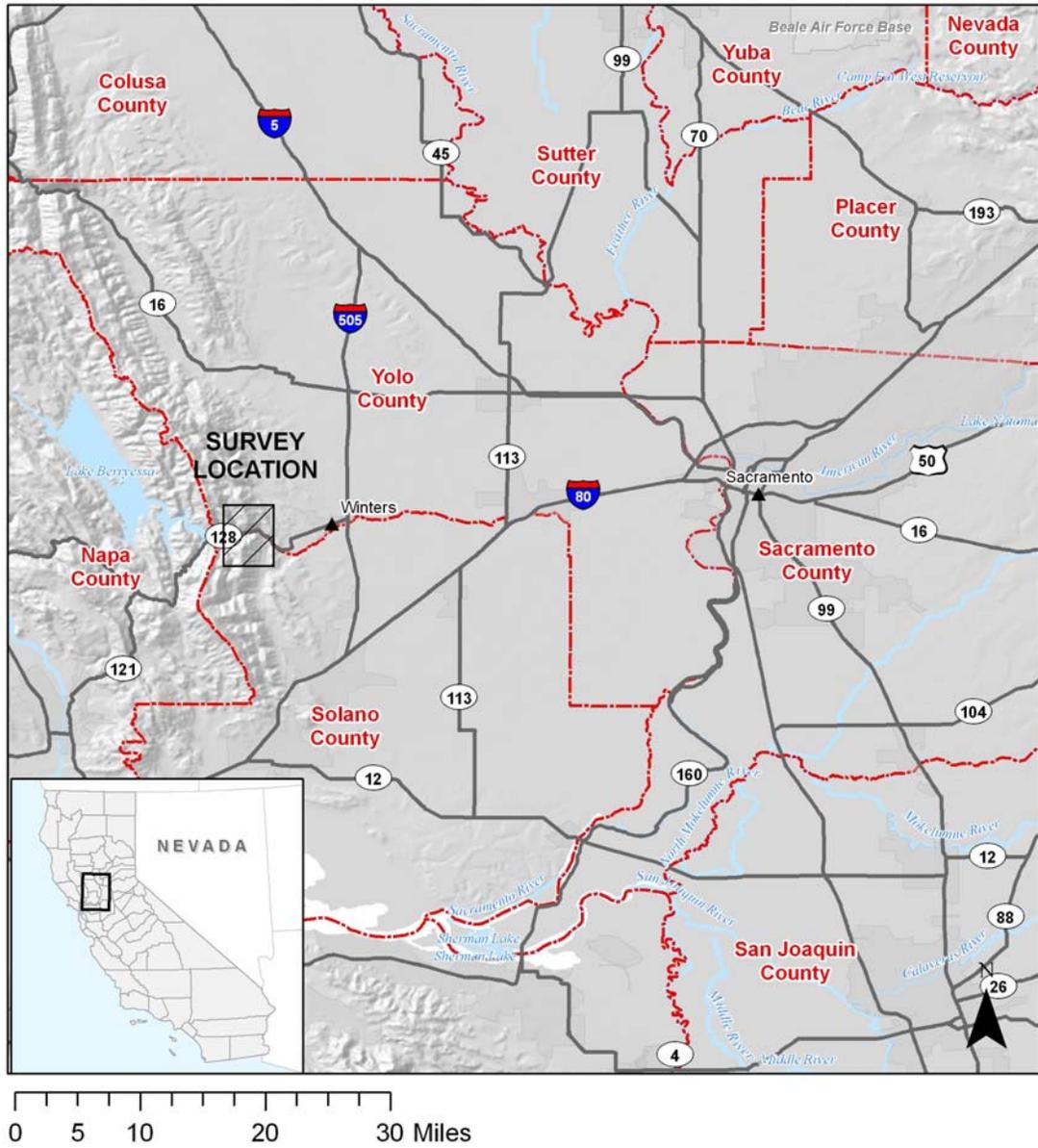
Prior to 2008, the California Department of Fish and Game (DFG) planted catchable-sized trout in Putah Creek and the inter-dam reach supported both hatchery and wild rainbow trout populations. Hatchery trout stocking in Putah Creek was suspended in 2008 and the DFG Heritage and Wild Trout Program (HWTP) began an evaluation of the wild trout fishery and existing management regime. At this time, Putah Creek was open to angling year-round and DFG fishing regulations included a five-fish bag limit with no gear restrictions from the last Saturday in April through November 15th. For the remainder of the year, a zero-fish bag limit with gear restricted to artificial lures with barbless hooks was in effect. Due to concerns that the existing five-fish bag limit from April through November was no longer appropriate for the fishery (due to lack of stocking) and could lead to over-harvesting of wild trout during that time of year, the HWTP proposed a regulation change in November, 2009 to year-round zero-limit angling limited to artificial lures with barbless hooks. On March 1st, 2010 the California Fish and Game Commission adopted this new regulation and the HWTP continued evaluating the changes to the management of this fishery.

In 2009, the HWTP conducted single-pass electrofishing surveys at five locations on Putah Creek in the inter-dam reach to better understand the size class and spatial distribution of fish and determine whether the trout were of hatchery or wild origin (Weaver and Mehalick 2009). This effort was a Phase 1 initial resource assessment to determine whether this fishery meets the minimum qualifications for designation as a Wild Trout Water. 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. HWTP Phase 1 assessments are designed to provide baseline information on fish species composition, relative abundance and size of fishes (specifically trout), public access, aesthetics of the fishery, basic habitat attributes, and whether the trout present are of wild or hatchery origin. Based on the size class distribution and presence of wild rainbow trout observed during the 2009 surveys, the HWTP proposed to initiate a Phase 2 candidate water assessment. HWTP Phase 2 assessments provide a comprehensive evaluation of the fishery (species composition, abundance, and instream distribution; and, angler use, success, satisfaction, and preferences) and associated habitat assessments and generally occur over a multi-year period. Following these recommendations, in 2010, the HWTP:

1. Conducted single-pass electrofishing surveys at four sections to identify the presence or absence of juvenile salmonids and to determine whether natural recruitment was occurring.
2. Conducted a scale analysis of coastal rainbow trout to better understand size class structure.
3. Maintained four Angler Survey Boxes (ASB) on Putah Creek in collaboration with Putah Creek Trout and analyzed voluntary angler data from 2008 through 2010 to better understand catch rates, catch size, angler preferences, and angler satisfaction.
4. Conducted an evaluation of trout spawning duration and angler use using remote cameras and bi-weekly site visits from November 2010 through March 2011 (with assistance from Putah Creek Trout).

Figure 1. Vicinity map of Putah Creek 2010 survey location.



Methods

On October 13 and 14, 2010, the HWTP conducted single-pass electrofishing at four locations (Sections 110-410) using Smith Root backpack electroshockers to identify the presence or absence of juvenile salmonids (Figures 2 and 3). In each section, two shockers and multiple netters targeted shallow-water habitat where water depths were conducive to backpack electroshocking. HWTP personnel captured fish opportunistically 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 air and water temperature (°C) and conductivity (specific and ambient). 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 electrofishing 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 total length (mm) and weight (g) were measured. 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.

An abbreviated habitat assessment was conducted in each section to measure section length (ft), average wetted width (ft), and average water depth (ft). The length of the section (measured along the thalweg) was divided into five cells of the same length. Wetted widths were measured at the center of each of the five cells. Across each width transect, five depths were taken (also at the center of five evenly divided cells), and both widths and depths were averaged for each section.

To better understand age class structure, scale samples were collected in 2009 from 106 trout across multiple size classes during single-pass electrofishing surveys. These scales were collected midway between the dorsal fin and lateral line using a knife. Each scale sample was placed in an envelope labeled with a

unique identification number that corresponded to information on the datasheets. In 2010, these scale samples were mounted on glass slides, digitally imaged under 4x magnification using Image-Pro software, and analyzed independently by two readers to identify the age of each fish at the time of scale collection. Of the 106 mounted slides, scales from 90 fish were readable (regenerated scales or scales with indistinct annuli were removed from analysis). Discrepancies between the two readers were discussed until a consensus was reached. In addition, spawning checks were identified and counted to better understand age of sexual maturity.

In collaboration with Putah Creek Trout, the HWTP maintained four ASBs on Putah Creek to better understand catch rates, catch size, angler satisfaction, and angler preferences. All completed forms received from these boxes from 2008 through 2010 were analyzed except those missing pertinent information (date, number of hours fished, or size classes of captured trout).

Figure 2. Topographic map of 2010 Putah Creek survey sections.

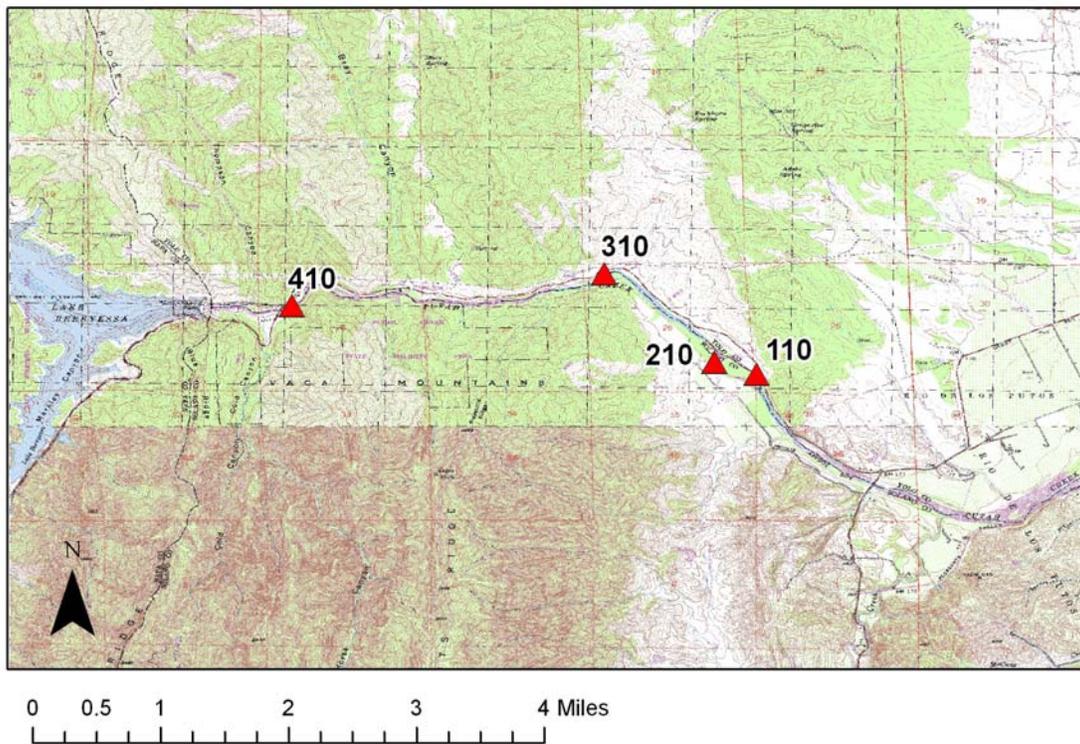
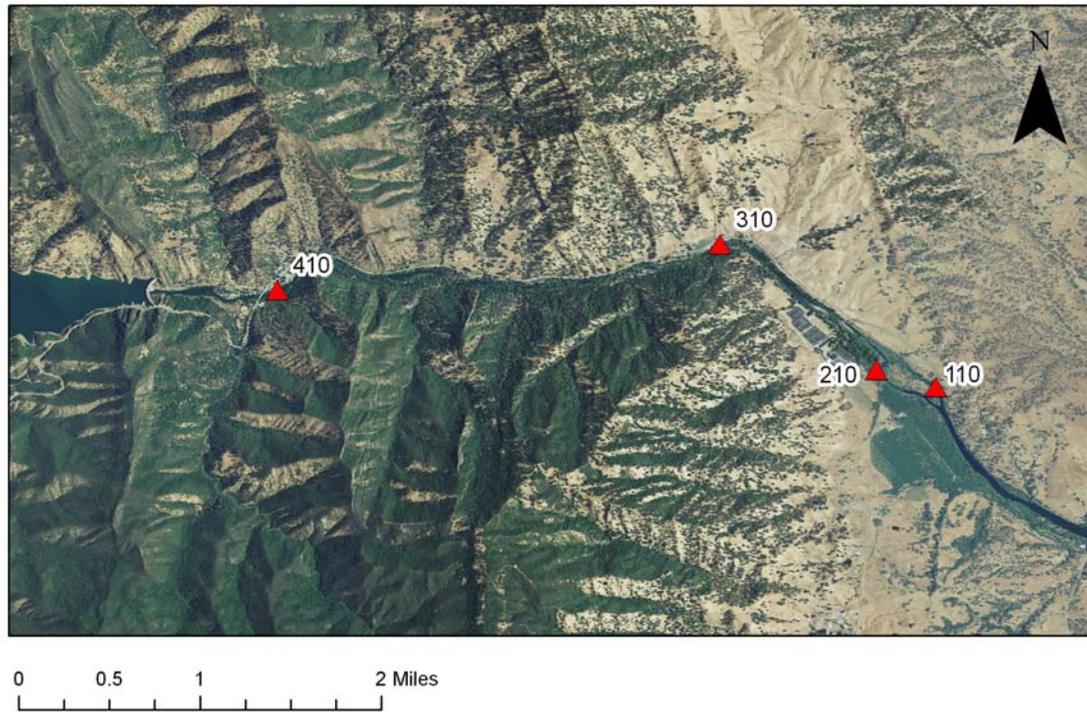


Figure 3. Aerial map of 2010 Putah Creek survey locations.



Results

Electrofishing

The inter-dam reach of Putah Creek is a tailwater fishery dominated by deep runs interspersed with short riffles and few pools. Water temperature was approximately 13 °C and water clarity ranged between two and four feet. Ambient conductivity was approximately 274 microsiemens. The air temperature fluctuated between 19 °C and 32 °C, depending on the time of day.

Section 110 was located in a side-channel downstream of Fishing Access 5. The lower 600 feet of the section was a continuous deep run and the upper half of the section consisted of numerous braids with varying water velocities and depths (Figure 4). Cover complexity was high and included water depth, woody debris, undercut banks, water turbulence, and both aquatic and overhanging vegetation. Substrate was dominated by cobbles and organic matter (rooted aquatic vegetation). The section was 1461.6 feet in length with an average wetted width

of 49.7 feet and an average water depth of 2.2 feet. A total of three coastal rainbow trout, three Western mosquitofish (*Gambusia affinis*), one Sacramento pikeminnow (*Ptychocheilus grandis*), eight suckers (*Catostomus* sp.), 73 sculpin (*Cottus* sp.), and 689 three-spine stickleback (*Gasterosteus aculeatus*) were captured. Neither sculpin nor suckers were identified to species. Capture efficiency appeared low in the deep run habitat; hundreds of three-spine stickleback and a few salmonids were visually observed upstream of the electroshockers but were able to swim away from the electric field and avoid capture. Captured coastal rainbow trout ranged in size from 178 mm to 184 mm total length with a mean of 179 mm.

Figure 4. Photographs of Putah Creek Section 110.



Section 210 was located in a side-channel directly downstream from a large beaver dam adjacent to Fishing Access 5. The section was 424.5 feet in length with an average wetted width of 25.6 feet and an average water depth 0.8 feet. Habitat was predominantly flatwater with one short riffle segment (Figure 5). Substrate was dominated by cobbles, gravels, and silts with some boulders. A total of 13 coastal rainbow trout, one Sacramento pikeminnow, 10 suckers, 28 sculpin, 15 three-spine stickleback, and two bluegill (*Lepomis macrochirus*) were captured. Captured coastal rainbow trout ranged in size from 122 mm to 215 mm total length with a mean of 152 mm.

Figure 5. Photographs of Putah Creek Section 210.



Section 310 was located in a side-channel adjacent to Fishing Access 4. Habitat was predominantly flatwater with some riffle (Figure 6). The section was 331.0 feet in length with an average wetted width of 42.7 feet and an average water depth of 1.4 feet. Overall instream cover was rated as excellent and cover types included water turbulence, water depth, woody debris, and overhanging vegetation. Substrate was dominated by gravels with some cobbles and boulders. The majority of the section was too deep to shock; wadeable areas with discrete micro-habitats were targeted. A total of four coastal rainbow trout and six sculpin were captured. Captured coastal rainbow trout ranged in size from 117 mm to 214 mm total length with a mean of 152 mm.

Figure 6. Photographs of Putah Creek Section 310.



Section 410 was located in a side-channel directly downstream of the Highway 128 bridge. The section was 257.6 feet in length with an average wetted width of

23.5 feet and average water depth of 0.8 feet. Habitat was predominantly flatwater with overall instream fish cover rated as good (Figure 7). Cover types included aquatic and overhanging vegetation, boulders, and large woody debris. Substrate included boulders, cobbles, organic matter, gravels, and silts. A total of 15 coastal rainbow trout, 37 sculpin, and six three-spine stickleback were captured. Coastal rainbow trout ranged in size from 100 mm to 157 mm total length with a mean of 130 mm.

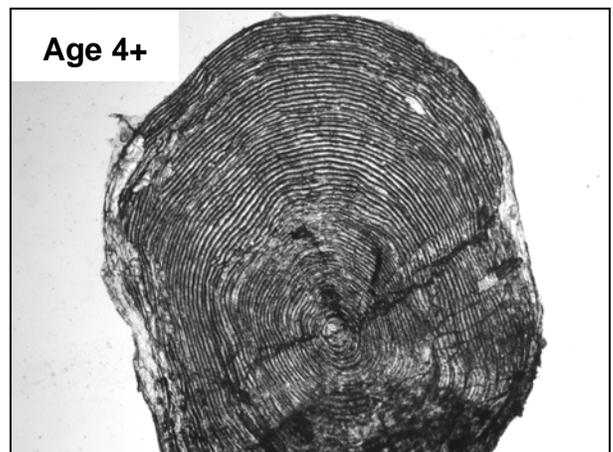
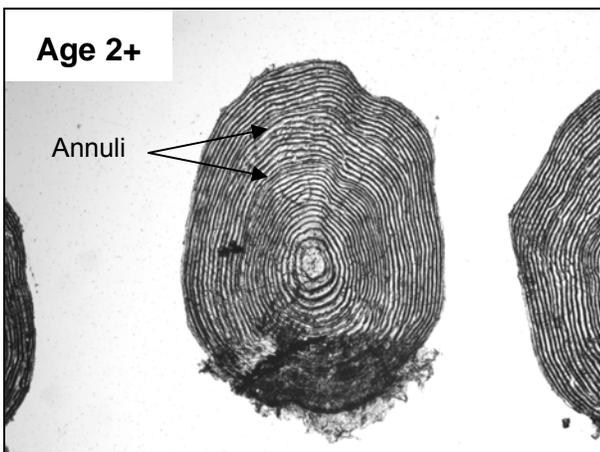
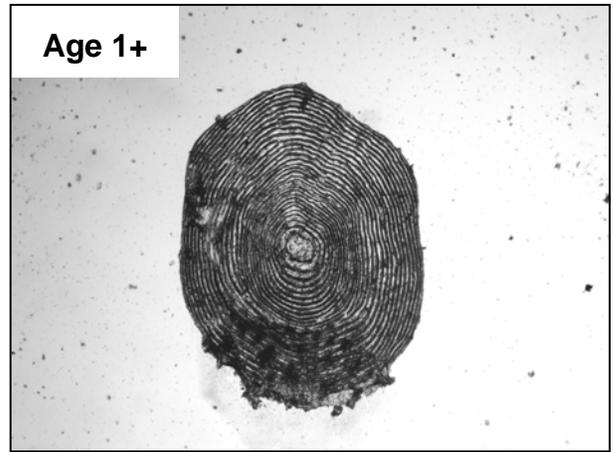
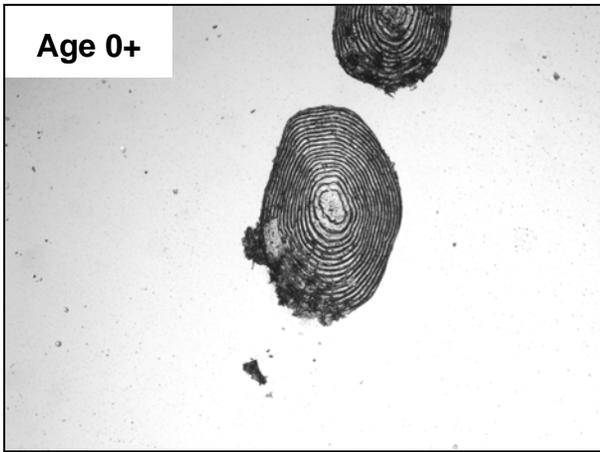
Figure 7. Photographs of Putah Creek Section 410.



Scale analysis

The analysis of coastal rainbow trout scales identified five age classes (Figure 8). The majority of fish sampled were in the 0+ age class (66 fish or 73% of the sample) and consisted of fish ranging from 46 mm to 215 mm total length. Age 1+ fish were between 204 mm and 292 mm total length and comprised 19% of the sample (17 individuals). Age 2+ fish were between 236 mm and 350 mm total length (3 fish or 3% of the sample). There was one age 4+ fish (516 mm; 1% of the sample) and age 5+ fish were between 548 mm and 615 mm (3 individuals or 3% of the sample). Spawning checks were observed in the four individuals equal to or greater than 516 mm in total length.

Figure 8. Photographs of Putah Creek coastal rainbow trout scales from 2009 showing various age classes (4X magnification).



Due to changes in management of the trout fishery that occurred in 2010, the HWTP compared ASB data from before (2008 and 2009) and after (2010) the year-round zero limit regulation change was implemented. Catch per hour was similar in 2009 and 2010 and was highest in 2008 (approximately twice as high as reported in either 2009 or 2010; Table 1). For all years 2008 through 2010, the majority of anglers reported using fly gear (Table 2). The overall number of forms decreased with each subsequent year and there were half as many forms submitted in 2010 than in 2008. In 2008 and 2009, when take was allowed, the majority of trout reported caught were released (Table 3). In 2010, post-regulation change to a zero-trout limit, all fish caught were reported released. Medium-sized fish (6"-11.9") dominated the reported catch for all three years (Figure 9).

Table 1. Summary of Putah Creek ASB data from 2008 to 2010.

Year	Number of anglers	Total number of hours fished	Total brown trout reported caught	Total coastal rainbow trout reported caught	Total trout reported caught	Catch per hour
2008	322	1227	5	785	790	0.64
2009	278	1043.7	6	299	305	0.29
2010	152	591.5	4	213	217	0.37

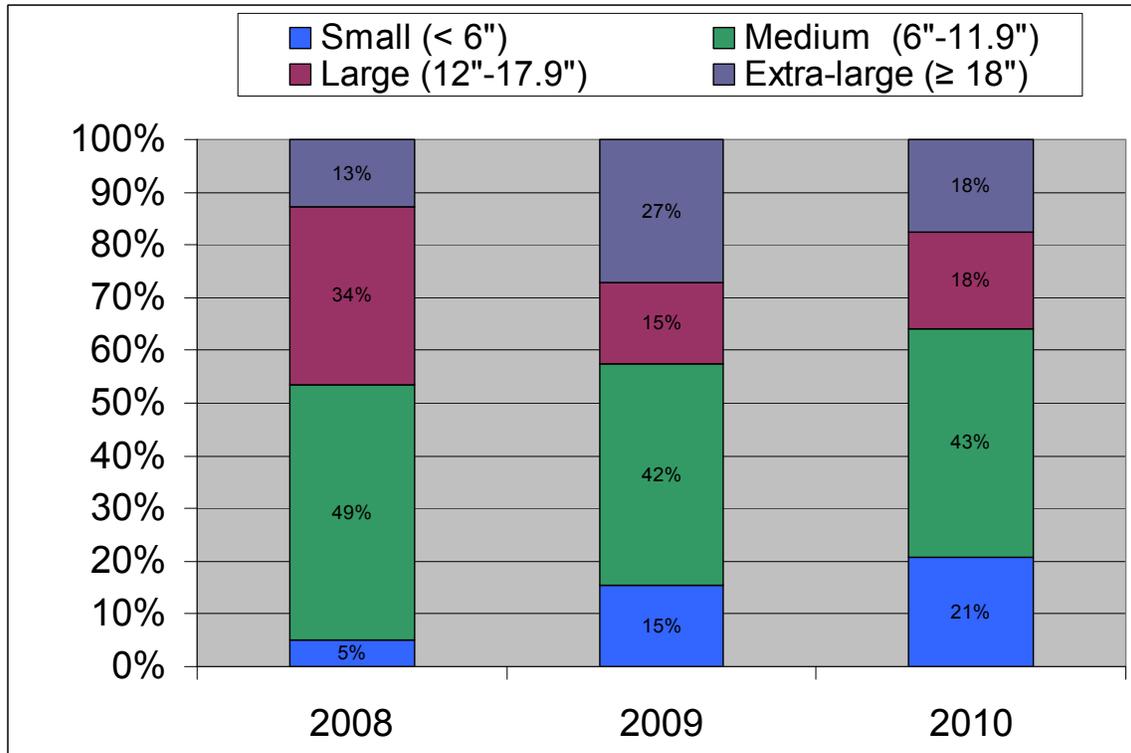
Table 2. Gear type reported from Putah Creek ASB data from 2008 to 2010.

Gear type	Five fish bag limit from the last Saturday in April-Nov 15 with no gear restrictions; remainder of year zero bag limit with artificial lures with barbless hooks only				Year-round zero limit angling with artificial lures with barbless hooks only	
	2008		2009		2010	
	Number reported	Percent of total	Number reported	Percent of total	Number reported	Percent of total
Bait	72	22%	31	11%	1	1%
Fly	224	70%	208	75%	133	88%
Lure	12	4%	24	9%	17	11%
Bait & Fly	0	0%	1	0%	0	0%
Lure & Bait	8	2%	5	2%	0	0%
Lure & Fly	2	1%	0	0%	1	1%
Lure , Bait & Fly	0	0%	3	1%	0	0%
Unknown	4	1%	6	2%	0	0%
Total	322	100%	278	100%	152	100%

Table 3. Summary of kept versus released fish reported from Putah Creek ASB data from 2008 to 2010.

Size Class	Five fish bag limit from last Saturday in April-Nov 15 with no gear restrictions; remainder of year zero bag limit with artificial lures with barbless hooks only						Year-round zero limit angling with artificial lures with barbless hooks only		
	2008			2009			2010		
	Total number reported caught	% reported kept	% reported released	Total number reported caught	% reported kept	% reported released	Total number reported caught	% reported kept	% reported released
< 6"	38	3%	97%	47	0%	100%	45	0%	100%
6"-11.9"	384	18%	82%	128	4%	96%	94	0%	100%
12"-17.9"	268	13%	87%	47	2%	98%	40	0%	100%
≥18"	100	8%	92%	83	0%	100%	38	3%	97%
Total	790	14%	86%	305	2%	98%	217	<1%	100%

Figure 9. Percentage of fish reported caught by size on Putah Creek from 2008 to 2010.



Discussion

The majority of coastal rainbow trout captured during the 2010 electrofishing effort were likely young of year. Few trout larger than eight inches were captured. Species diversity was the greatest in the downstream-most sections and may be due to the proximity to Lake Solano and movement of fishes into this portion of Putah Creek from the lake. Among the four sections (2474.7 ft), a total of 35 coastal rainbow trout were captured.

Based on scale analysis results, it appears that growth rates of coastal rainbow trout in Putah Creek are relatively high and that the majority of trout captured in both 2009 and 2010 were young of year. Scale analysis indicated some age 0+ fish greater than eight inches in total length when captured in November, 2009 (2 fish total). Due to the cessation of hatchery stocking in 2008, it is assumed these fish are wild and natural reproduction occurred. Spawning checks were observed

on fish age 4+ and greater (4 fish total). The scale analysis was limited in the number of large-sized fish examined and zero fish were identified as age 3+. Coastal rainbow trout in Putah Creek may or may not be sexually mature at age 3+. The lack of fish captured between 360 mm and 510 mm in 2009 may be due to survey bias, angler harvest that was allowed prior to 2008, and/or unknown reasons. Based on sexual maturity at age 3+ or 4+, the wild young of year (age 0+) coastal rainbow trout captured in 2009 will likely be sexually mature in 2012 or 2013.

The availability of suitable spawning habitat may be a limiting factor for trout reproduction in Putah Creek (Salamunovich 2009). Coastal rainbow trout typically spawn in the spring when water temperatures reach a threshold range and flows are conducive. However, the coastal rainbow trout in Putah Creek in the inter-dam reach appear to be primarily fall-spawning trout. The origins and/or selective factors that derived this trait are unknown. There is growing concern that anglers may impact the spawning success of these trout due to active wading on redds (increased mortality of eggs and emergent fry) and snagging 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 included the use of remote cameras and concurrent bi-weekly site visits to three areas of Putah Creek where trout spawning was previously documented. The data from this effort will be evaluated in 2011.

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 and is open to year-round fishing. Due to deep water habitat and the presence of aquatic vegetation in Putah Creek, adaptive survey techniques need to be developed in order to collect population-level information (density and biomass estimates) typically gathered from multiple-pass electrofishing with the use of block nets. Block nets may not be effective for closing off sections of the population in Putah Creek. The HWTP is in the process of evaluating Putah Creek for designation as a Wild Trout Water and potential changes in this fishery due to the cessation of stocking and fishing regulation changes. As a result, the HWTP will continue to

monitor Putah Creek in 2011 and beyond.

References

Bloom, R. and J Weaver. 2008. California Heritage and Wild Trout Program handbook (Draft). State of California Natural 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.

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