

Lower Kings River Annual Trout and non-game fish Population
Survey:
2007 Electrofishing Results

Kings River Conservation District
Environmental Resources Division

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The Kings River Conservation District (KRCD), in cooperation with the California Department of Fish and Game (CDFG), began monitoring the rainbow trout (*Oncorhynchus mykiss*) population downstream of Pine Flat Dam in 1983 as part of a Federal Energy Regulatory Commission (FERC) requirement for compliance with Item 4 of the Memorandum of Agreement for FERC Project No. 2741. The survey has continued annually since that time. A three pass mark and recapture electrofishing survey was employed from 1983 until 1989. Starting in 1990, the annual electrofishing survey was modified to a single pass count of captured trout using only a single block seine net at the upstream end of the sample reach. This change was made due to a lack of trout being sampled (KRCD 1993). These data, however, only provide a rough estimate of the number of trout per mile and do not stand up to rigorous statistical analysis.

In the Fall of 2007, the KRCD revised the electrofishing survey protocol to include a full biomass three pass removal with upstream and downstream block seines; identifying, measuring and weighing every fish sampled. In addition, three sites were added to the six sites surveyed since 1995. The additional sites included the Large Woody Debris (LWD) Control site, as part of a pre-project survey for the Large Woody Debris Pilot Study, and two additional sites to study the difference in early non-irrigation and late non-irrigation river flows on fish population abundance under Exhibit “C” and “D” flows.

Methods

Over the course of nine days, nine separate sites were sampled (Figure 1) using standard electrofishing techniques (Nielsen 1983). For the 2007 survey, sample sites were reduced from approximately 1,000 feet to 300 feet in length and both the upstream and downstream ends were netted with block seines to avoid fish immigration or emigration from the survey reach. The surveys were completed using Smith-Root backpack electrofishers types VII, VIII, and LR-24's. Sampling was completed with the help of KRCD staff, Kings River Water Association (KRWA) staff, CDFG staff, and volunteers from the Department of Water Resources (DWR) and the public.

In-stream flows were approximately 107 cubic feet per second (cfs) for the duration of the survey. This represented the minimum flows from Pine Flat Dam during an Exhibit “C” year and did not necessitate a variance in scheduled releases.

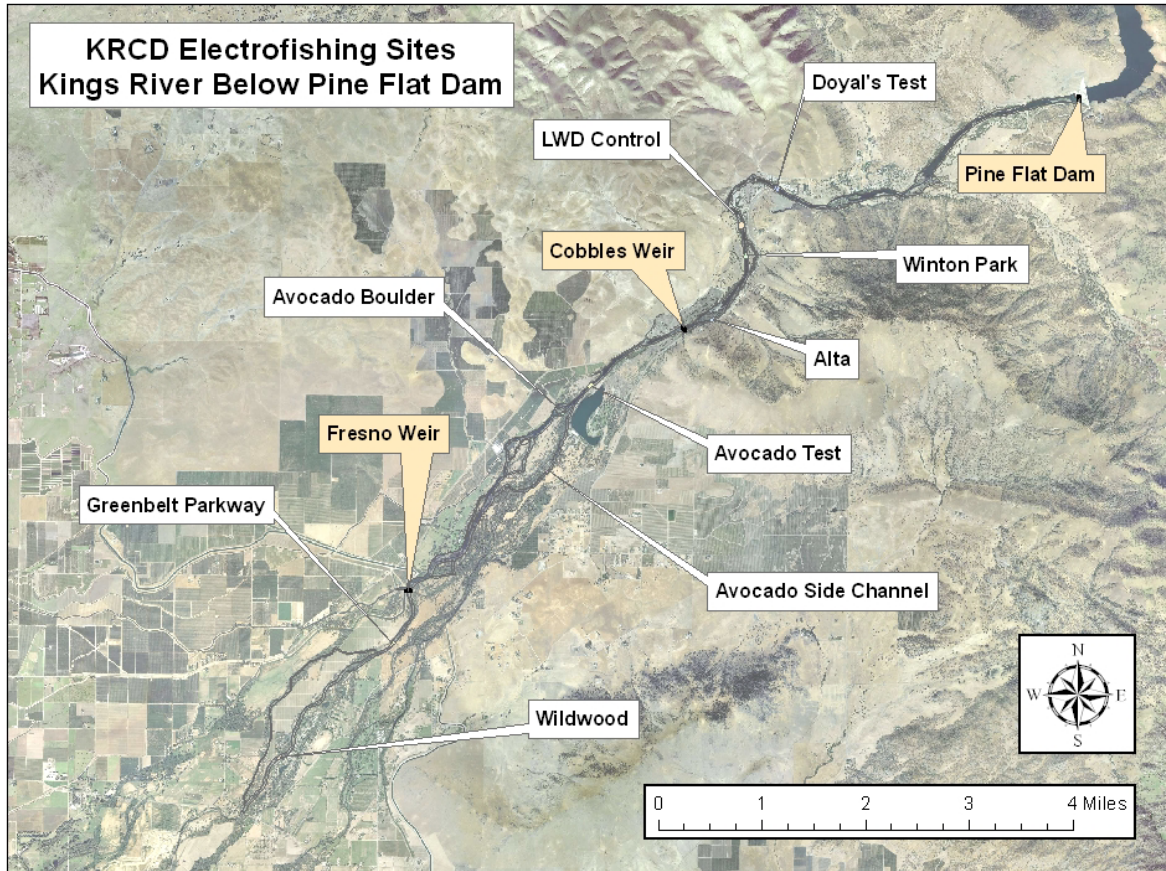


Figure 1: Map of 2007 Electrofishing survey sites.

All sites were sampled during the first two weeks in November. Water temperatures taken every 15 minutes with a Hydrolab Sonde at the Army Corps of Engineers (ACOE) bridge, approximately 0.5 miles downstream from Pine Flat Dam, ranged from a high of 20.13° C to a low of 16.82° C. Temperatures at Fresno Weir, approximately 9.7 miles downstream of Pine Flat Dam, were taken with a Ryan temperature sensor every hour and ranged from a high of 18.5°C to a low of 14.6°C.

Electrofishing was typically conducted using 4 to 7 fishing crews and 1 work-up crew when possible. Fishing crews consisted of a backpack electrofisher operator and a netter. Work-up crews consisted of 1 data recorder and 1 to 2 biologists identifying, measuring, and weighing the sampled fish. After all shocking was completed for the day, additional work-up crews were formed to complete the identification, enumeration measuring of the sampled fish.

All species of fish sampled were identified to the lowest practical taxon in the field, weighed to the nearest gram, and measured to total length (1mm) for biomass estimates, density and population estimates, and species composition analysis. Rainbow trout exhibiting obvious signs of having been in a hatchery (worn or abraded fins, clipped adipose fins) were treated as a separate species than those trout considered “wild.” After being worked-up, sampled fish were released outside of the netted sample reach. A minimum 30 minute hiatus was taken between passes.

Biological data was manually recorded on data sheets printed on water proof paper. Raw capture data was later entered into an Excel spreadsheet and saved as a CSV (Comma delimited) file before being imported into the MicroFish 3.0 program (Van Deventer. 2007). MicroFish generated the Total Catch and Population Estimate (Maximum Likelihood) tables used for analysis of the data.

Results

A total of 9,553 fish were collected during the 2007 electrofishing survey. Species included; California roach (*Hesperoluecus symettricus*), green sunfish (*Lepomis cyanellus*), lamprey sp. (*Lampetra sp.*), Sacramento pikeminnow (*Ptychocheilus grandis*), rainbow trout (*Oncorhynchus mykiss*), Sacramento sucker (*Catostomus occidentalis*), sculpin sp. (*Cottus sp.*), and threespine stickleback (*Gasterosteus aculeatus*).

The Total Catch numbers are displayed by site in Table 1. These data represent the total number of each species caught after 3 passes at each survey site. The percentage composition, by number, is summarized in Table 2. As shown in table 2, species composition varied substantially among sites reflecting, in part, site-specific variation in habitat characteristics. Population estimates and 95% confidence intervals are summarized in Table 3 by species and site. Catch Per Unit of Effort data for each species by site is displayed in Table 4.

Site 1 – Doyal’s Test

Three-pass depletion sampling at site 1 (Figure 1) yielded 1,318 fish representing seven species. In terms of abundance, sculpin sp. represented 58% of the sampled fish

while Sacramento sucker represented 34% of the fish collected. Other species collected included California roach, lamprey sp., Sacramento pikeminnow, hatchery rainbow trout, and threespine stickleback.

The estimated population density for this site is 26,576 fish per linear mile. By species this represents 15,012 sculpin sp., 9,222 Sacramento sucker, 1,003 Sacramento pikeminnow, 721 lamprey sp., 440 threespine stickleback, 140 California roach, and 35 hatchery rainbow trout. In terms of biomass, sculpin sp. (4,004.5g), Sacramento sucker (970.5g), and lamprey sp. (209g) represented the majority of the sampled species.

This site will be re-sampled in the late-winter/early-spring time period in 2008, and will not be sampled again until the Fall of 2009 at the earliest as per the 2007 Electrofishing Refinements Study Plan (KRFMP, 2007).

Site 2 – Large Woody Debris (LWD) Control

Three-pass depletion sampling yielded 1,719 fish representing eight species. In terms of abundance, Sacramento sucker represented 47% of the sampled fish while sculpin sp. represented 40%. Other species collected included California roach, green sunfish, lamprey sp., Sacramento pikeminnow, “wild” rainbow trout, and threespine stickleback.

The estimated population density for this site is 42,608 fish per linear mile. By species this represents 21,264 Sacramento sucker, 16,224 sculpin sp., 1,968 Sacramento pikeminnow, 1,760 lamprey sp., 1,312 threespine stickleback, 48 California roach, 16 “wild” rainbow trout and 16 green sunfish. In terms of biomass, Sacramento sucker (15,415.8g), sculpin sp. (4,237g), and lamprey sp. (372.5g) represented the majority of the sampled species.

Site 3 – Winton Park

Three-pass depletion sampling yielded 822 fish representing eight species. In terms of abundance, sculpin sp. represented 45% of the sampled fish while Sacramento sucker represented 39%. Other species collected included California roach, lamprey sp., Sacramento pikeminnow, hatchery rainbow trout, “wild” rainbow trout, and threespine stickleback.

The estimated population density for this site is 25,308 fish per linear mile. By species this represents 14,748 Sacramento sucker, 7,744 sculpin sp, 1,988 Sacramento pikeminnows, 422 “wild” rainbow trout, 176 threespine stickleback, 158 hatchery rainbow trout, 52 California roach, and 17 lamprey sp. In terms of biomass, sculpin sp (3,296g), Sacramento sucker (740.5g), hatchery rainbow trout (252.5g), and “wild” rainbow trout (241.5g) represented the majority of the sampled fish.

Site 4 – Alta

Three-pass depletion sampling yielded 1,185 fish representing eight species. In terms of abundance, Sacramento sucker represented 38% of the sampled fish while sculpin sp. represented 37% and lamprey sp. represented 17%. Other species collected included California roach, Sacramento pikeminnow, hatchery rainbow trout, “wild” rainbow trout, and threespine stickleback.

The estimated population density for this site is 20,856 fish per linear mile. By species this represents 10,859 sculpin sp., 9,416 Sacramento sucker, 7,163 lamprey sp., 809 threespine stickleback, 510 hatchery rainbow trout, 475 Sacramento pikeminnow, 70 “wild” rainbow trout, and 52 California roach. In terms of biomass, sculpin sp (2,447.5g), Sacramento sucker (962g), lamprey sp. (799g), and hatchery rainbow trout (755.5g) represented the majority of the fish collected.

Site 5 – Avocado Test

Three-pass depletion sampling yielded 1,156 fish representing seven species. In terms of abundance, hatchery rainbow trout represented 52.4% of the sampled fish while rainbow trout represented 45.2%. Other fish collected included California roach, lamprey sp., Sacramento pikeminnow, Sacramento sucker, sculpin sp., and threespine stickleback.

The estimated population density for this site is 25,450 fish per linear mile. By species this represents 14,186 Sacramento sucker, 7,339 sculpin sp., 1,760 Sacramento pikeminnow, 898 hatchery rainbow trout, 440 California roach, 387 “wild” rainbow trout, 299 threespine stickleback, 141 lamprey sp. In terms of biomass, Sacramento sucker (15,107.9g), sculpin sp. (3,809g), and hatchery rainbow trout (1,604g), and “wild” rainbow trout (1,113.5g) represented the majority of the fish collected.

This site will be re-sampled in the late-winter/early-spring time period in 2008, and will not be sampled again until the Fall of 2009 at the earliest as per the 2007 Electrofishing Refinements Study Plan(KRFMP, 2007).

Site 6 – Avocado Boulder Project

Three-pass depletion sampling yielded 682 fish representing eight species. In terms of abundance, Sacramento sucker represented 57% of the fish collected while sculpin sp. represented 26%. Other fish collected included California roach, lamprey sp., Sacramento pikeminnow, hatchery rainbow trout, “wild” rainbow trout, and threespine stickleback.

The estimated population density for this site is 16,332 fish per linear mile. By species this represents 10,084 Sacramento sucker, 3,537 sculpin sp., 1,971 Sacramento pikeminnow, 352 California roach, 140 “wild” rainbow trout, 123 threespine stickleback, 88 lamprey sp., and 35 hatchery rainbow trout. In terms of biomass, Sacramento sucker (96,916g), sculpin sp. (1,509.5g), and Sacramento pikeminnow (733.5g) represented the majority of the fish collected.

An approximately 50 foot long section along the right bank of this site was deep enough to trigger the submersion switch on the LR-24 backpack electrofisher. This section was fished to the best of our ability but could have allowed for the escape of some fish.

Site 7 – Avocado Side Channel

Three-pass depletion sampling yielded 794 fish representing seven species. In terms of abundance, sculpin sp. represented 31% of the fish collected while Sacramento sucker represented 27%. Other fish collected included California roach, lamprey sp., Sacramento pikeminnow, hatchery rainbow trout, and threespine stickleback.

The estimated population density for this site is 21,243 fish per linear mile. By species this represents 6,547 Sacramento sucker, 6,160 sculpin sp., 3,590 lamprey sp., 2,992 Sacramento pikeminnow, 1,443 California roach, 369 threespine stickleback, and 140 hatchery rainbow trout. In terms of biomass, sculpin sp (1,357.5g), Sacramento sucker (584g), and lamprey sp. (399g) represented the majority of the fish collected.

Site 8 – Greenbelt Parkway

Three-pass depletion sampling yielded 872 fish representing six species. In terms of abundance, Sacramento sucker represented 33% of the fish collected while Sacramento pikeminnow represented 26% and sculpin sp. represented 24%. Other fish collected included California roach, lamprey sp., Sacramento pikeminnow, and “wild” rainbow trout.

The estimated population density for this site is 19,835 fish per linear mile. By species this represents 6,705 Sacramento pikeminnow, 6,054 Sacramento sucker, 3,854 sculpin sp., 3,115 California roach, 52 lamprey sp., and 52 “wild” rainbow trout. In terms of biomass, Sacramento sucker (36,426g) and sculpin sp. (1,832.5g) represented the majority of the fish collected.

Site 9 – Wildwood

Three-pass depletion sampling yielded 1,005 fish representing six species. In terms of abundance, Sacramento pikeminnow represented 38% of the fish collected while Sacramento sucker represented 31% and sculpin sp. represented 24%. Other fish collected included California roach, lamprey sp., Sacramento pikeminnow, and threespine stickleback.

The estimated population density for this site is 39,582 fish per linear mile. By species this represents 25,361 Sacramento pikeminnow, 6,476 Sacramento sucker, 6,212 sculpin sp., 1,003 California roach, 387 threespine stickleback, and 140 lamprey sp. In terms of biomass, Sacramento sucker (2,315g), sculpin sp. (1,531g), and Sacramento pikeminnow (526.5g) represented the majority of the fish collected.

From 1990 to 2006, population estimates were arrived at by extrapolating “wild” trout per mile data from the number of trout sampled on a single pass. This provided an index by which to monitor changes in the trout population however, due to the incomplete sampling of trout in the sample reach, it underestimated the actual trout population. By extrapolating “wild” trout per mile data from the 1st pass numbers from the 2007 survey, we arrive at an estimated 39 “wild” trout per mile (Table 5). This estimate can be compared to the population estimates generated between 1990 and

Table 1: Total Catch by Species

Total Catch										
	Doyal's	LWD Control	Winton	Alta	Avo Test	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
California Roach	8	3	3	3	19	20	22	143	53	274
Green Sunfish	0	1	0	0	0	0	0	0	0	1
Lamprey sp.	34	78	1	202	4	5	136	3	4	467
Northern Pikeminnow	43	77	93	20	73	75	156	226	378	1141
Rainbow Trout	0	1	7	4	19	8	0	3	0	42
Hatchery Trout	2	0	9	21	43	2	5	0	0	82
Sacramento Sucker	444	820	326	454	663	390	248	288	315	3948
Sculpin sp.	765	694	376	450	321	175	211	209	242	3443
Threespined Stickleback	22	55	7	31	14	7	16	0	13	165

Table 2: Total catch, % by species.

Total Catch (% by species)										
	Doyal's	LWD Control	Winton	Alta	Avo Test	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
California Roach	2.9%	1.1%	1.1%	1.1%	6.9%	7.3%	8.0%	52.2%	19.3%	99.9%
Green Sunfish	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Lamprey sp.	7.3%	16.7%	0.2%	43.3%	0.9%	1.1%	29.1%	0.6%	0.9%	100.1%
Northern Pikeminnow	3.8%	6.7%	8.2%	1.8%	6.4%	6.6%	13.7%	19.8%	33.1%	100.1%
Rainbow Trout	0.0%	2.4%	16.7%	9.5%	45.2%	19.0%	0.0%	7.1%	0.0%	99.9%
Hatchery Trout	2.4%	0.0%	11.0%	25.6%	52.4%	2.4%	6.1%	0.0%	0.0%	99.9%
Sacramento Sucker	11.2%	20.8%	8.3%	11.5%	16.8%	9.9%	6.3%	7.3%	8.0%	100.1%
Sculpin sp.	22.2%	20.2%	10.9%	13.1%	9.3%	5.1%	6.1%	6.1%	7.0%	100.0%
Threespined Stickleback	13.3%	33.3%	4.2%	18.8%	8.5%	4.2%	9.7%	0.0%	7.9%	99.9%

2006 (Figure 2). Doing so shows a decrease in the number of “wild” trout per mile in the lower Kings River from 2006 to 2007.

By changing to a 3-pass depletion method, we achieved a more complete sampling of the survey site and were able to generate population estimates for each species. The extrapolated number of “wild” trout per mile found in Table 6 was calculated using the population estimate for “wild” trout generated in MicroFish 3.0. The result is a “wild” trout per mile estimate of 120, nearly 3 times higher than the single pass

Wild Trout Per Mile
Lower Kings River Below Pine Flat Dam
1990 - 2007

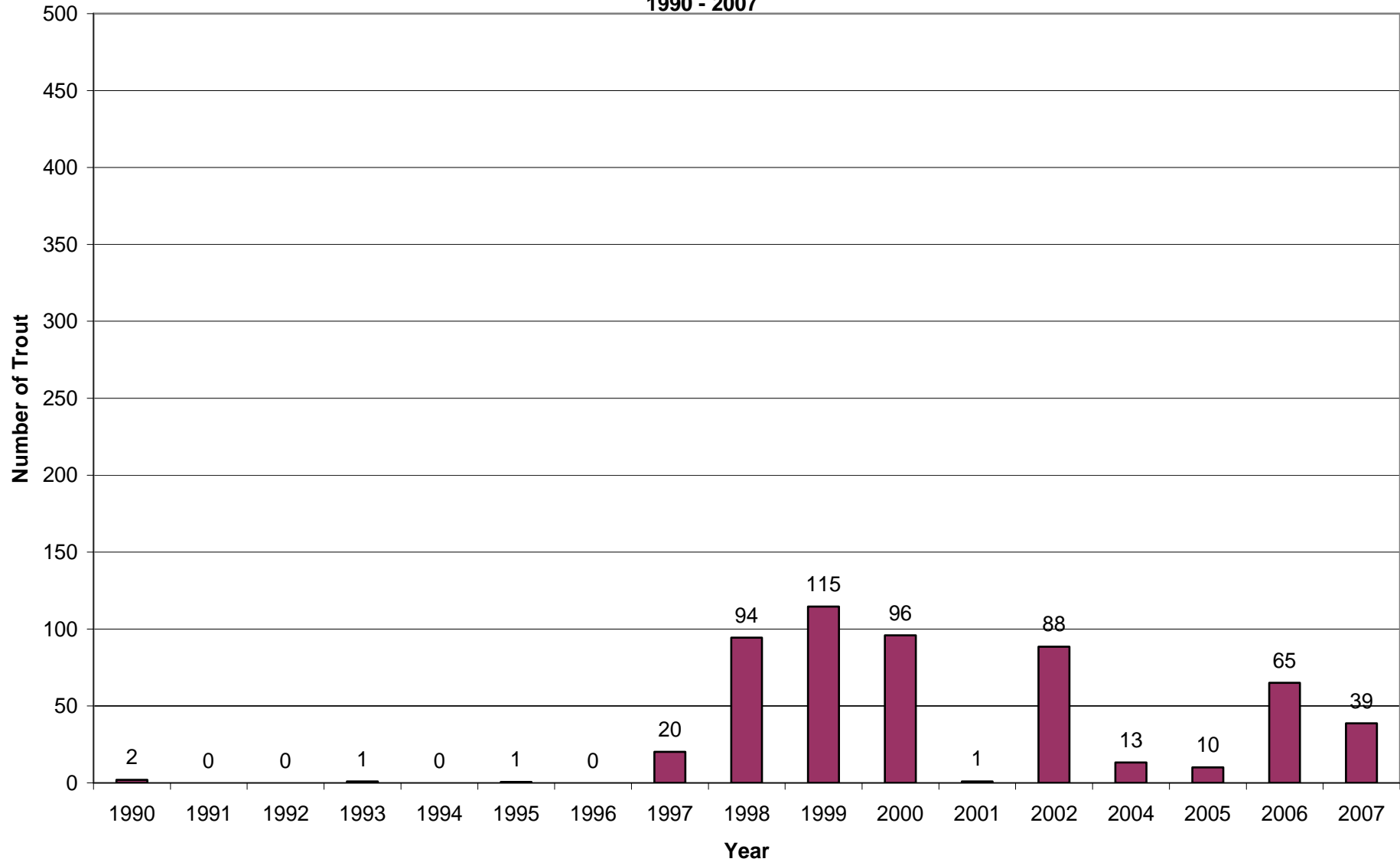


Figure 2: Single pass sampling, wild trout per mile, 1990 to 2007

Table 3: Population estimates by site

Population Estimate (Maximum Likelihood)									
	Doyal's	LWD Control	Winton	Alta	Avo Test	Avo Boulder	Avo Side	Greenbelt	Wildwood
California Roach	8 (8 - 9)	3 (3 - 8)	3 (3 - 3)	3 (3 - 3)	25 (19 - 42)	20 (20 - 21)	82 (22 - 437)	177 (146 - 208)	57 (53 - 64)
Green Sunfish	0 (0 - 0)	1 (1 - 1)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
Lamprey sp.	41 (34 - 55)	110 (78 - 152)	1 (1 - 1)	407 (206 - 624)	8 (4 - 50)	5 (5 - 6)	204 (204 - 204)	3 (3 - 6)	8 (4 - 50)
Northern Pikeminnow	57 (43 - 82)	123 (77 - 189)	113 (93 - 136)	27 (20 - 46)	100 (73 - 136)	112 (112 - 112)	170 (157 - 183)	381 (248 - 514)	1441 (378 - 2952)
Rainbow Trout	0 (0 - 0)	1 (1 - 1)	24 (7 - 200)	4 (4 - 5)	22 (19 - 31)	8 (8 - 10)	0 (0 - 0)	3 (3 - 8)	0 (0 - 0)
Hatchery Trout	2 (2 - 2)	0 (0 - 0)	9 (9 - 10)	29 (21 - 51)	51 (43 - 65)	2 (2 - 15)	8 (8 - 8)	0 (0 - 0)	0 (0 - 0)
Sacramento Sucker	524 (483 - 565)	1307 (1099 - 1515)	838 (326 - 1373)	535 (494 - 576)	806 (747 - 865)	573 (466 - 680)	372 (372 - 372)	344 (309 - 379)	368 (336 - 400)
Sculpin sp.	853 (818 - 888)	1014 (875 - 1153)	440 (405 - 475)	617 (530 - 704)	417 (359 - 475)	201 (179 - 223)	350 (228 - 472)	219 (210 - 228)	353 (271 - 435)
Threespined Stickleback	25 (22 - 33)	82 (82 - 82)	10 (10 - 10)	46 (46 - 46)	17 (14 - 28)	7 (7 - 10)	21 (16 - 37)	0 (0 - 0)	22 (13 - 58)
* 95%CI with adjusted lower CI in parenthesis									

Table 4: Catch Per Unit of Effort by site and species

C.P.U.E. (fish/hr)									
	Doyal's	LWD Control	Winton	Alta	Avo Test	Avo Boulder	Avo Side	Greenbelt	Wildwood
California Roach	0.7	0.3	0.4	0.3	1.9	2.7	3.1	16.2	7.5
Green Sunfish	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lamprey sp.	2.8	6.9	0.1	22.5	0.4	0.7	19.0	0.3	0.6
Northern Pikeminnow	3.5	6.9	11.9	2.2	7.3	10.1	21.8	25.6	53.6
Hatchery Trout	0.2	0.0	1.2	2.3	4.3	0.3	0.7	0.0	0.0
Rainbow Trout	0.0	0.1	0.9	0.4	1.9	1.1	0.0	0.3	0.0
Sacramento Sucker	36.3	72.9	41.7	50.5	66.7	52.4	34.7	32.7	44.7
Sculpin sp.	62.5	61.7	48.1	50.1	32.3	23.5	29.5	23.7	34.3
Threespined Stickleback	1.8	4.9	0.9	3.5	1.4	0.9	2.2	0.0	1.8

estimate. Table 6 also shows that the estimated number of hatchery trout per mile is less than the estimated number of “wild” trout per mile at 97.

A multi-pass mark and recapture technique was employed from 1983 to 1989 and provided a more representative estimate of the trout population than the single pass sampling employed between 1990 and 2006. A comparison of the 2007, 3 pass population estimate (120 trout/mile) to the 1983 to 1989 multi-pass mark and recapture population estimates (Figure 3) shows that the 2007 estimate, though higher than the 2007 single pass estimate, is still at the lower end of the population scale from the 1980s.

Wild Trout Per Mile
Lower Kings River Below Pine Flat Dam
1983 - 1989

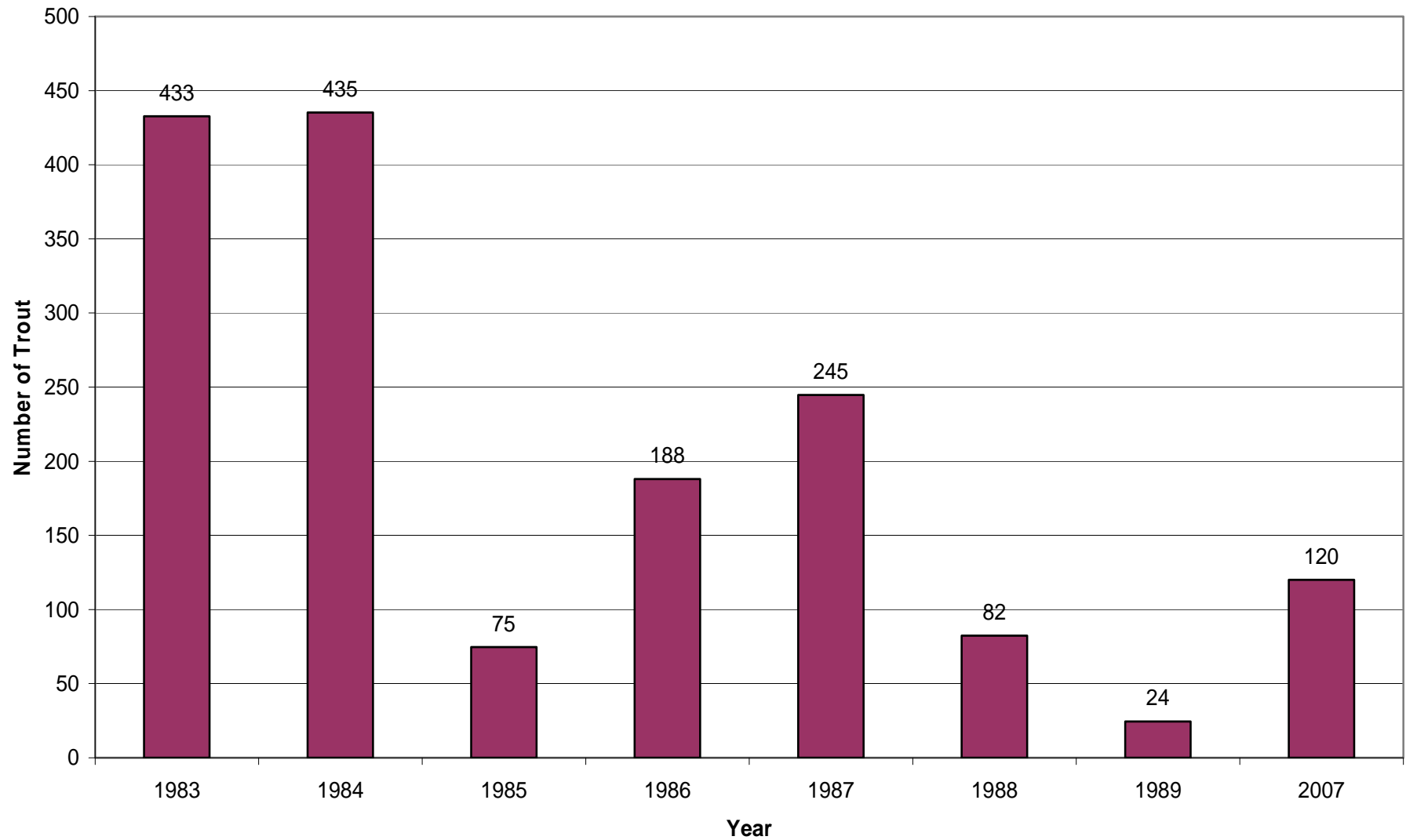


Figure 3: Multi-pass sampling, wild trout per mile, 1982 – 1989, 2007

Table 5: Estimated number of “wild” trout and hatchery trout per mile

Nov 2007					
Site Name	Site	Number	Wild Trout	Number	Hatchery Trout
	Length (ft.)	Wild Trout	per mile	Hatchery Trout	per mile
Winton Park Boulder	300	24	422	9	158
Alta Weir	300	4	70	29	510
Avocado Boulder	300	8	141	2	35
Avocado Side Channel	300	0	0	8	141
County Park Boulder	300	3	53	0	0
Wildwood	300	0	0	0	0
Avocado Test	300	22	387	51	898
Doyal's Test	300	0	0	2	35
LWD Control	330	1	16	0	0
Total	2730	62	120	101	195

A review of the length-frequency distribution (Figure 4) for all 9 sites shows that the majority of the “wild” trout sampled fall within 1 standard deviation (11.4 cm to 25.4 cm) of the mean length (18.4 cm). Figure 5 shows the length-frequency distribution for all trout sampled. Once again, the majority of the trout sampled fall within 1 standard deviation (11.6 cm to 22.4 cm) of the mean length (17 cm). Length-frequency distributions from the 1980’s show similar patterns with the majority of the trout ranging in length from 10 cm to 20 cm range (KRCD 1993). Length-frequency distributions for non-game species are found in Figures 6 – 11.

Unfortunately, no length-frequency data exists for non-game species sampled in

Table 6: Estimated “Wild” Trout Per Mile, first pass data only

Nov 2007			
Site Name	Site	Number	Est. Wild Trout
	Length (ft.)	Wild Trout	per mile
Winton Park Boulder	300	1	18
Alta Weir	300	3	53
Avocado Boulder	300	4	70
Avocado Side Channel	300	0	0
County Park Boulder	300	1	18
Wildwood	300	0	0
Avocado Test	300	10	176
Doyal's Test	300	0	0
LWD Control	330	1	16
Total	2730	20	39

previous surveys. The 2007 results serve as the baseline for monitoring of the non-game species inhabiting the lower Kings River downstream of Pine Flat Dam.

Estimated weight percentages found in Table 7 show that “wild” rainbow trout and hatchery rainbow trout represent less than 12% of the biomass at any given site. Typically, the greatest biomass was represented by Sacramento Pikeminnow, Sacramento sucker, and Sculpin sp.

Table 7: Estimated Weight, % by species and site

Estimated Weight, %by Site									
	Doyal's	LWD Control	Winton	Alta	Avo Test	Avo Boulder	Avo Side	Greenbelt	Wildwood
California Roach	0.3%	0.0%	0.0%	0.0%	0.8%	0.1%	6.3%	2.0%	2.4%
Green Sunfish	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hatchery Trout	0.7%	0.0%	3.6%	14.3%	54.8%	0.0%	7.1%	0.0%	0.0%
Lamprey sp.	4.2%	1.1%	0.1%	22.1%	0.2%	0.0%	13.4%	0.0%	0.5%
Northern Pikeminnow	1.3%	0.3%	2.0%	0.4%	1.9%	0.7%	3.0%	1.5%	28.0%
Rainbow Trout	0.0%	0.0%	11.8%	1.3%	5.1%	1.6%	0.0%	0.1%	0.0%
Sacramento Sucker	19.0%	85.4%	27.2%	15.5%	72.5%	96.3%	19.6%	92.3%	37.7%
Sculpin sp.	74.2%	13.0%	55.2%	46.0%	19.5%	1.2%	50.3%	4.1%	31.1%
Threespined Stickleback	0.3%	0.1%	0.1%	0.4%	0.0%	0.0%	0.2%	0.0%	0.2%
Total Trout	0.7%	0.0%	15.4%	15.6%	59.9%	1.6%	7.1%	0.1%	0.0%

**Length Frequency Distribution
All 9 Sites**

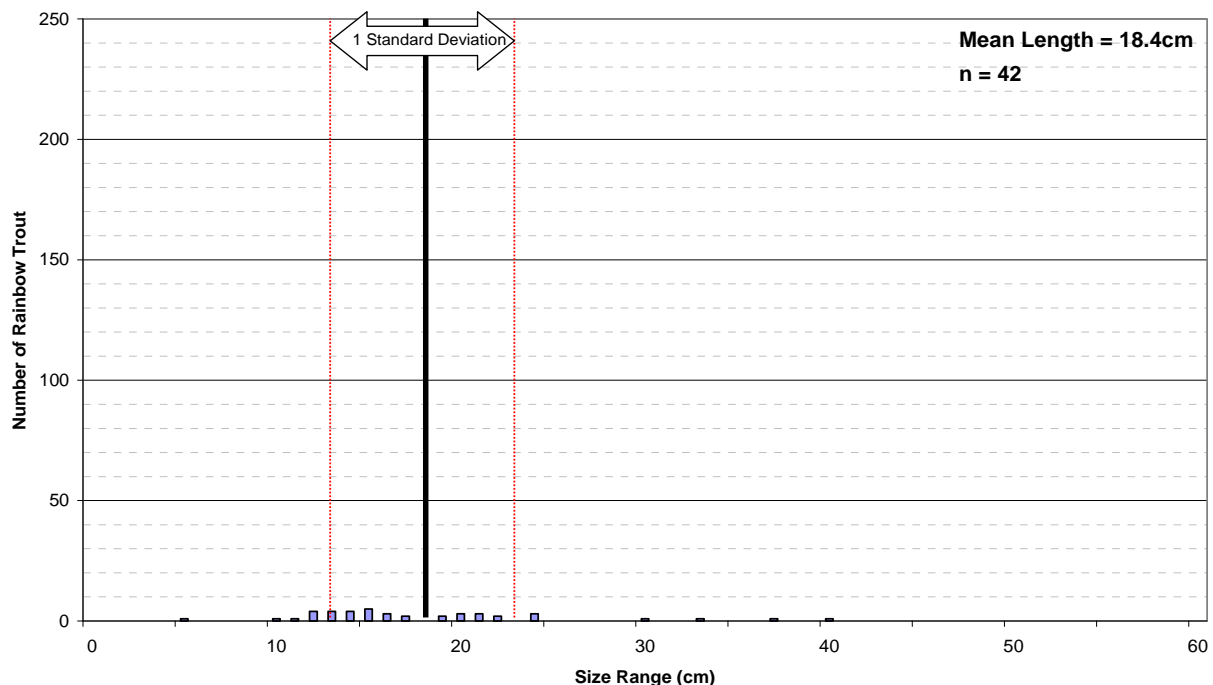


Figure 4: Length-Frequency Distribution for “wild” trout sampled.

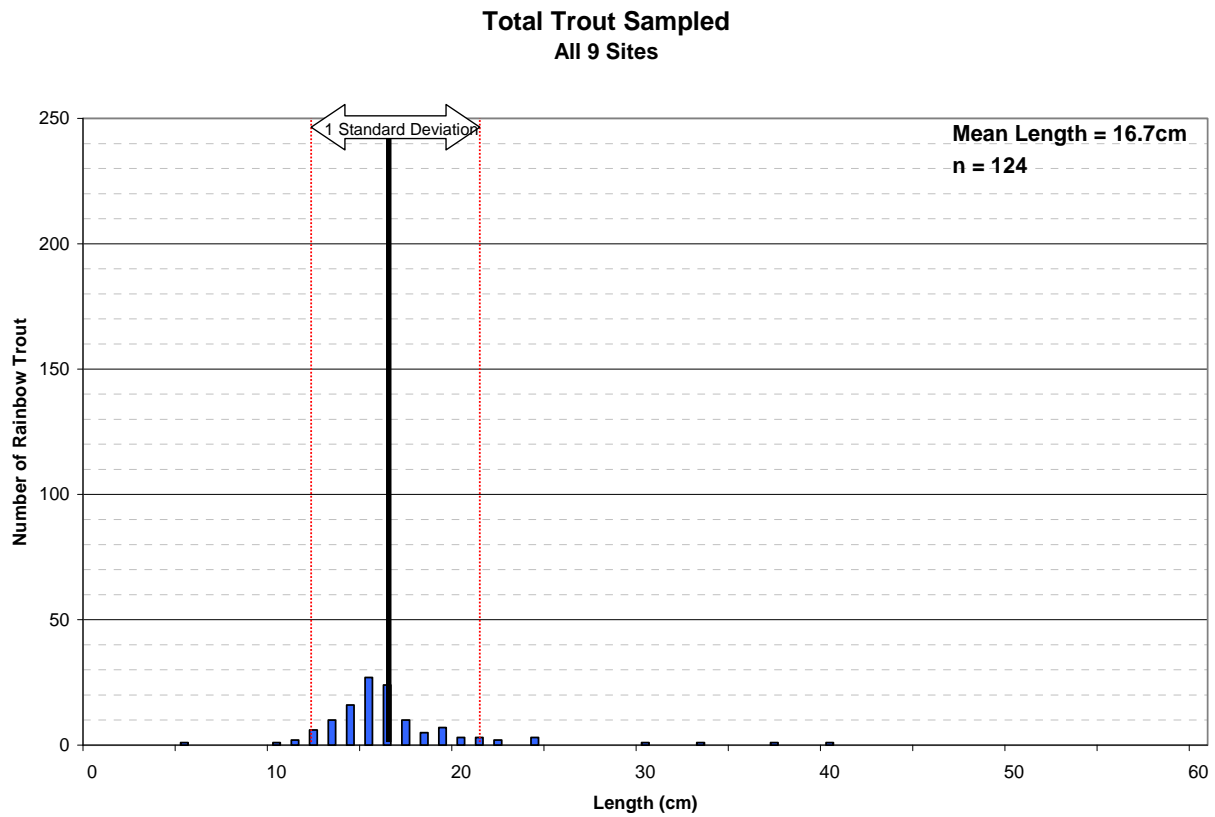


Figure 5: Length-Frequency Distribution for total number of trout sampled

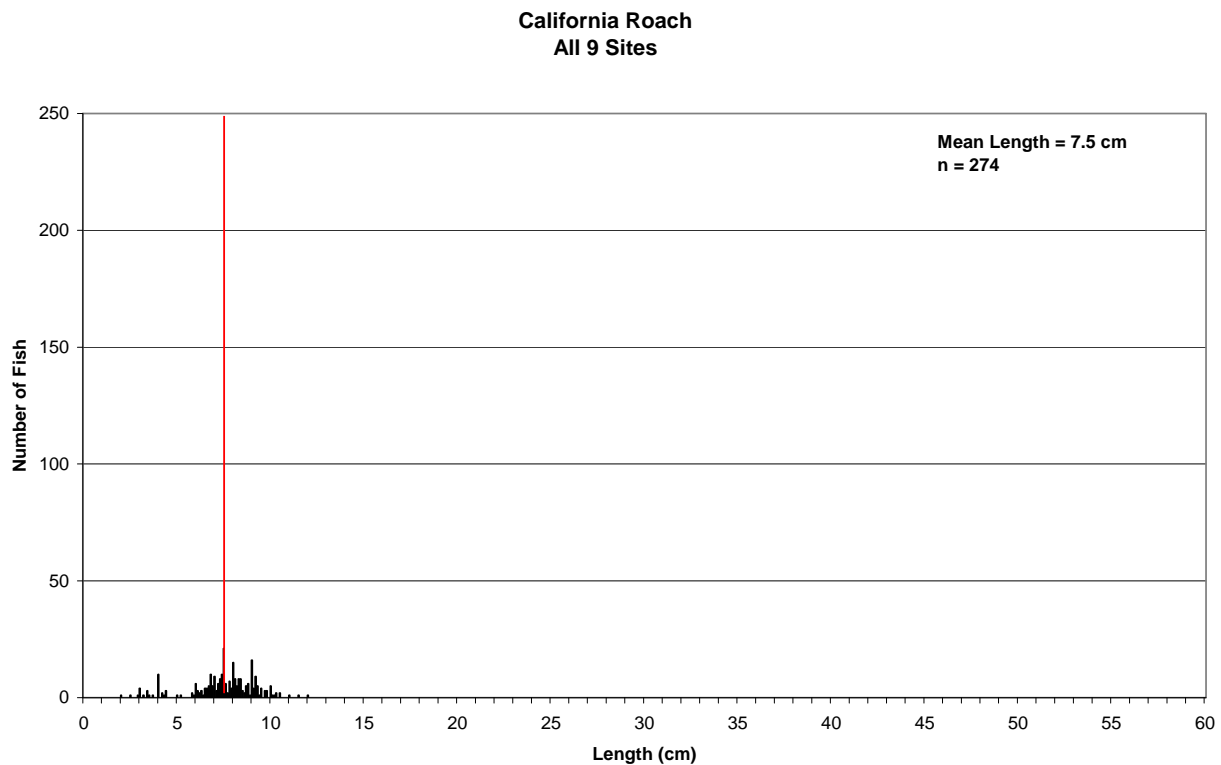


Figure 6: Length-frequency distribution – California roach (*Hesperoleucus symmetricus*)

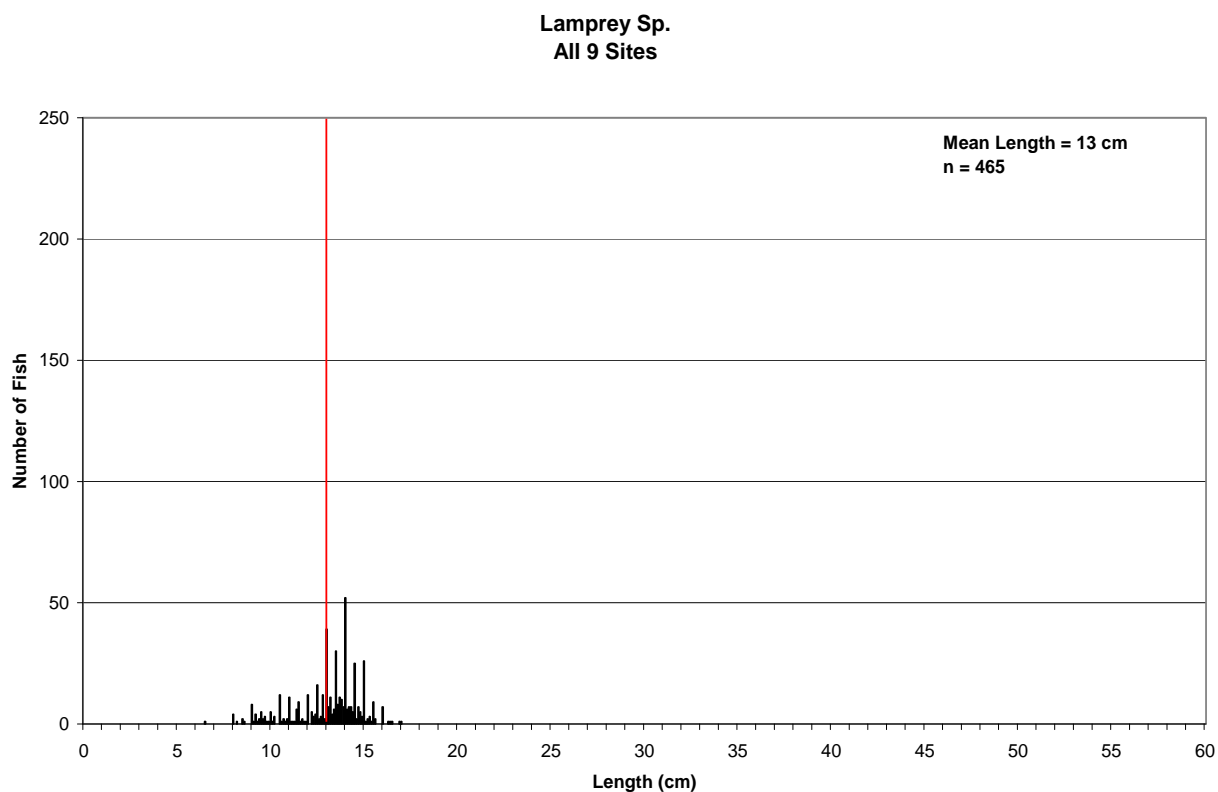


Figure 7: Length-frequency distribution – lamprey sp. (*Lampetra sp.*)

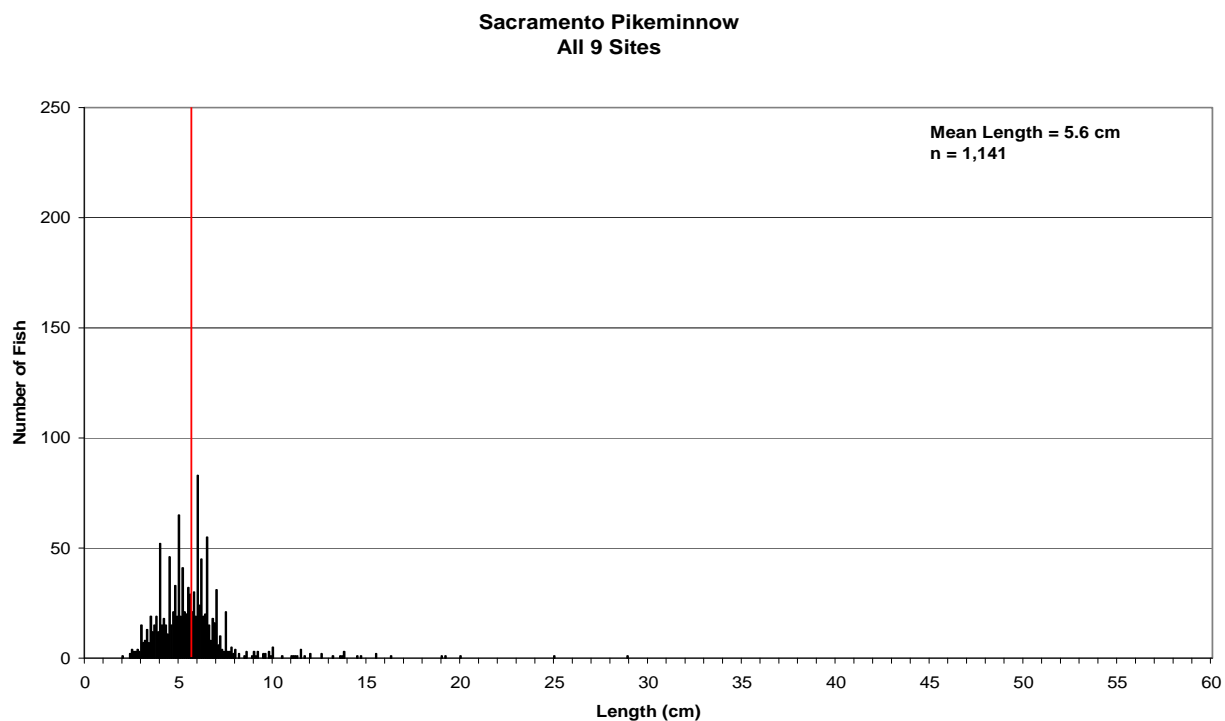


Figure 8: Length-frequency distribution – Sacramento pikeminnow (*Ptychocheilus grandis*)

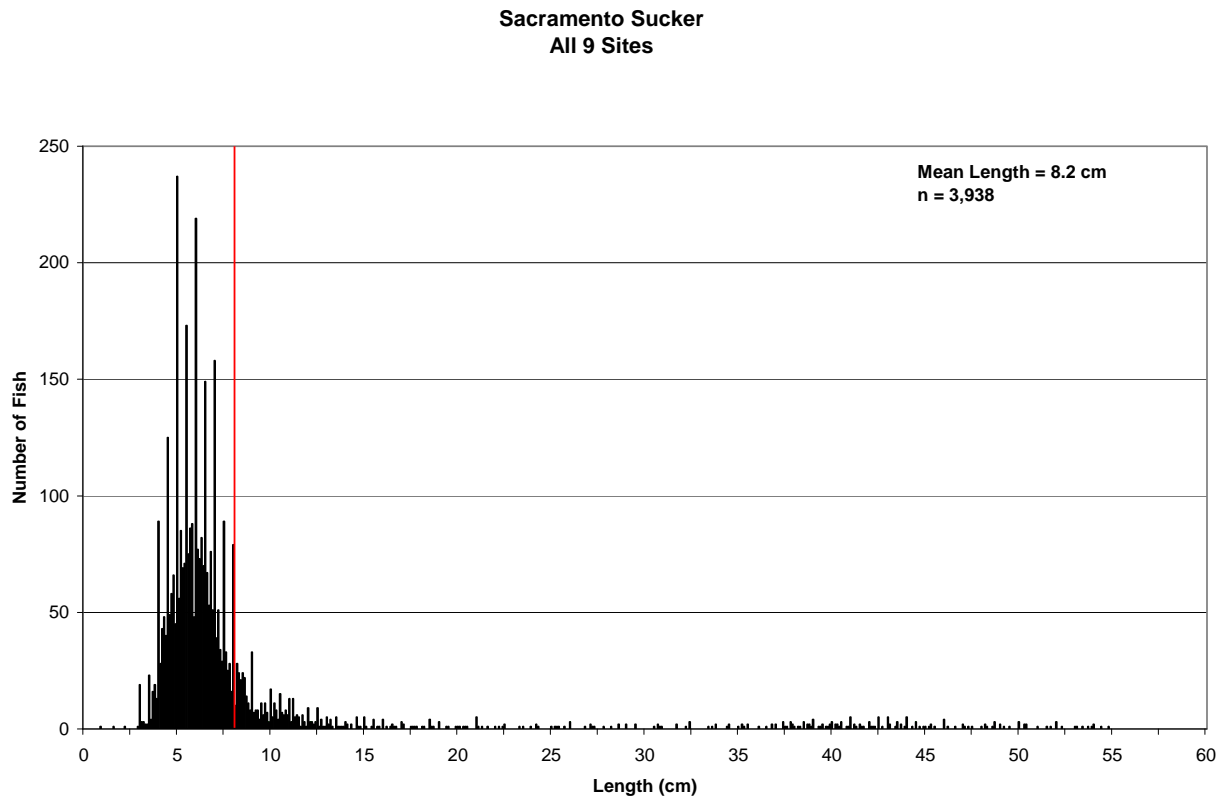


Figure 9: Length-frequency distribution – Sacramento sucker (*Catostomus occidentalis*)

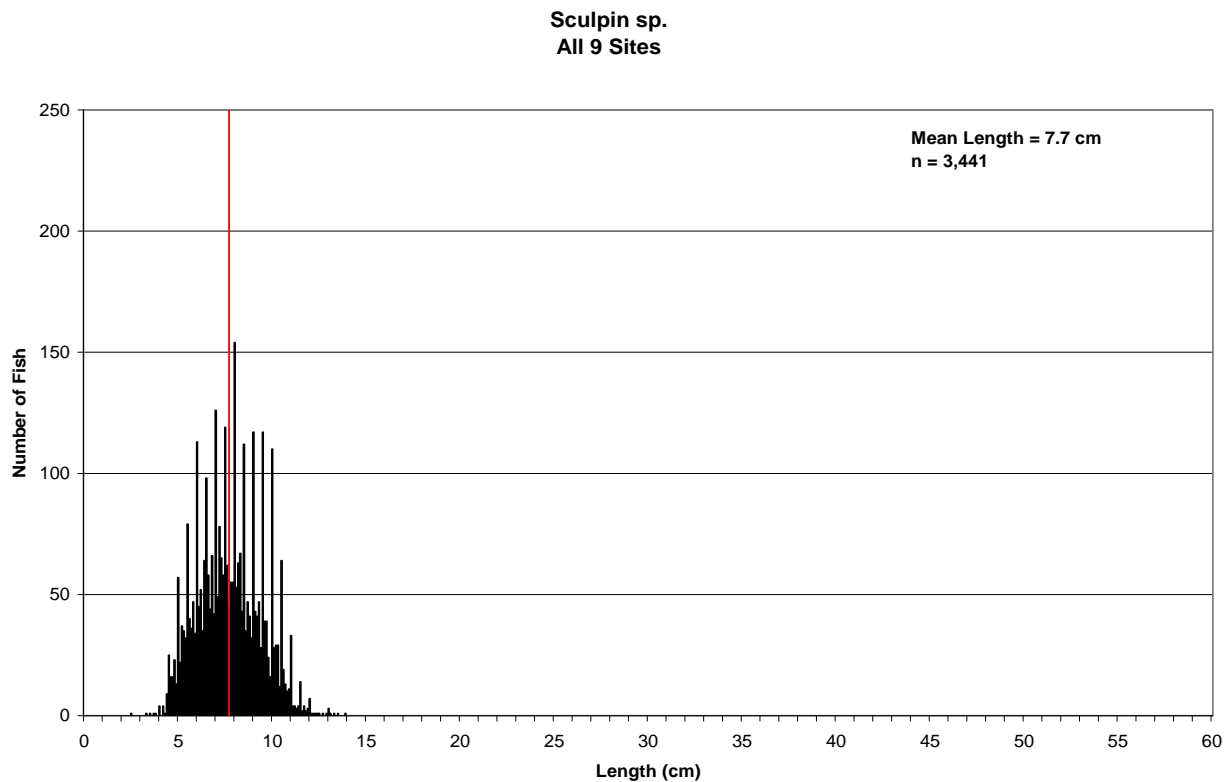


Figure 10: Length-frequency distribution – sculpin sp. (*Cottus sp.*)

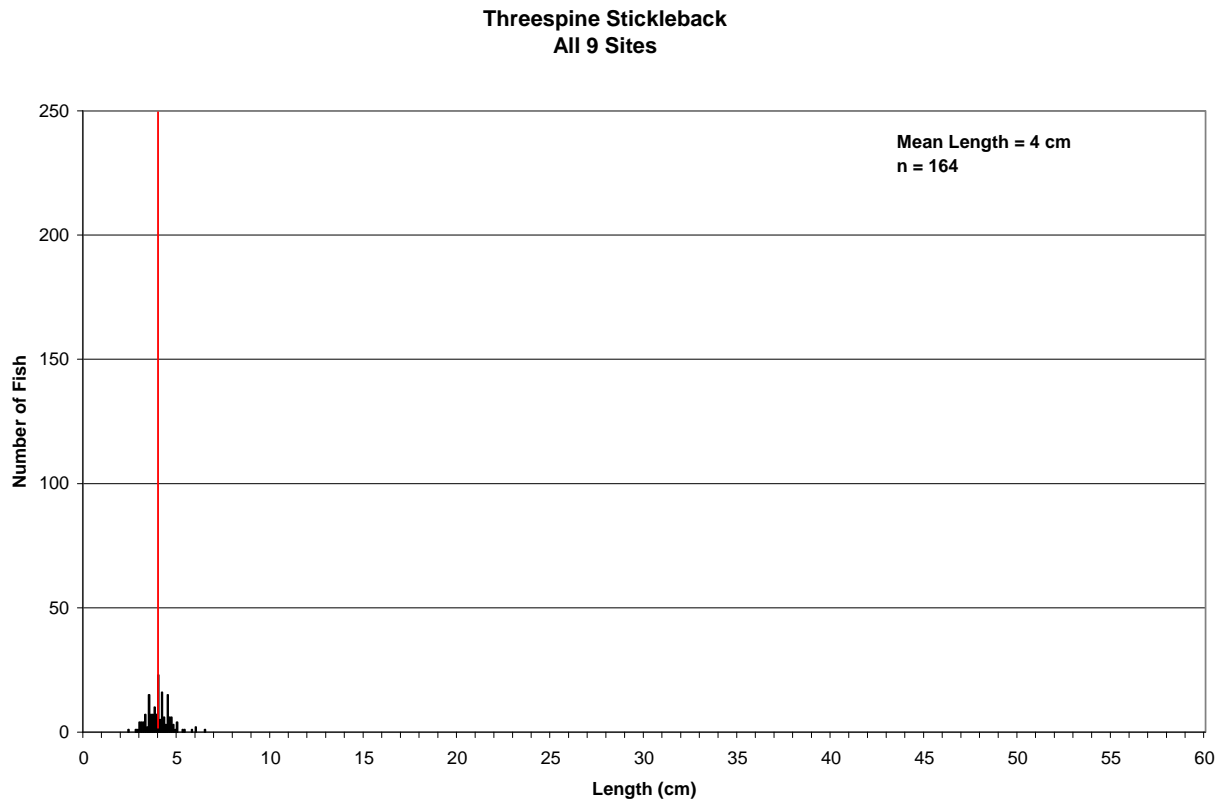


Figure 21: Length-frequency distribution – threespine stickleback (*Gasterosteus aculeatus*)

Discussion

In 1990, KRCD switched from a multi-pass mark and recapture electrofishing method for the annual trout population survey to a single-pass count of trout sampled. This modified method continued until 2007 when the decision was made to switch to a 3-pass depletion technique. The modified protocol employed from 1990 to 2006 generated an index of trout population trends but could not be used to estimate abundance with confidence intervals. For that reason, population estimates generated between 1989 and 2006 cannot be compared directly to data from this survey. The 2007 survey serves to re-establish a baseline population and biomass estimate.

In addition, sample reach lengths ranged from 656 feet to 1,368 feet since 1989. In order to complete the surveys using the 3-pass depletion method, sample reaches were reduced in length to 300 feet with the exception of the LWD Control site. Due to swift water at the 300 foot mark, this reach was extended to 330 feet. Reach lengths were measured starting at the historical bottom end of each sample site. Because the 3-pass method is labor intensive, each site took one day to complete.

We were unable to differentiate between trout reared in the streamside incubators and those spawned in-stream. Our inability to do so may have an impact on the overall population estimate of “wild” trout and could prove to be somewhat misleading in deciphering the affects of habitat improvement on in-stream spawning. That said, efforts to use triploid trout eggs in streamside incubators may allow future evaluation of the contribution the incubators are making to the abundance of trout inhabiting the lower Kings River.

It is important to note that with the continuance of habitat improvement work, sample sites will change significantly over time. Most notably, the Avocado Side Channel site will receive a significant number of boulders and spawning gravel in the Winter of 2007. The Winton Park site, which doubles as the LWD Treatment site will receive numerous boulder clusters and spawning gravel in the winter of 2007, and at least three clusters of large woody debris in the Fall of 2008 as part of a pilot study. It is unknown what impact these habitat improvements will have on in-stream spawning and juvenile trout rearing. It is expected, however, that these projects will provide more cover for “wild” and planted trout and other non-game species at a minimum, thus increasing the total number of fish inhabiting these sites.

Based on the trout population estimates generated by MicroFish, it appears as though the Winton Park and Avocado Test sites are the most productive sites sampled, holding an estimated 24 and 22 “wild” trout respectively, or 422 and 387 trout per mile. It should be noted, however, that a non-descending removal pattern among the three successive electrofishing passes at the Winton Park site (1,4,2) likely led to a higher trout population estimate than would normally be expected with a descending removal pattern. This non-descending removal pattern was most likely a result of a partially inexperienced crew working the first site of the Fall survey.

Personal conversations with anglers and trophy photographs posted at Doyal’s Market, located on Trimmer Springs road near Piedra road, show that some of the trophy trout being planted by the California Department of Fish and Game are surviving the summer season, even with the elevated water temperatures experienced in the summer of 2007. Just how many large trout held over is unknown since none were collected during the electrofishing survey.

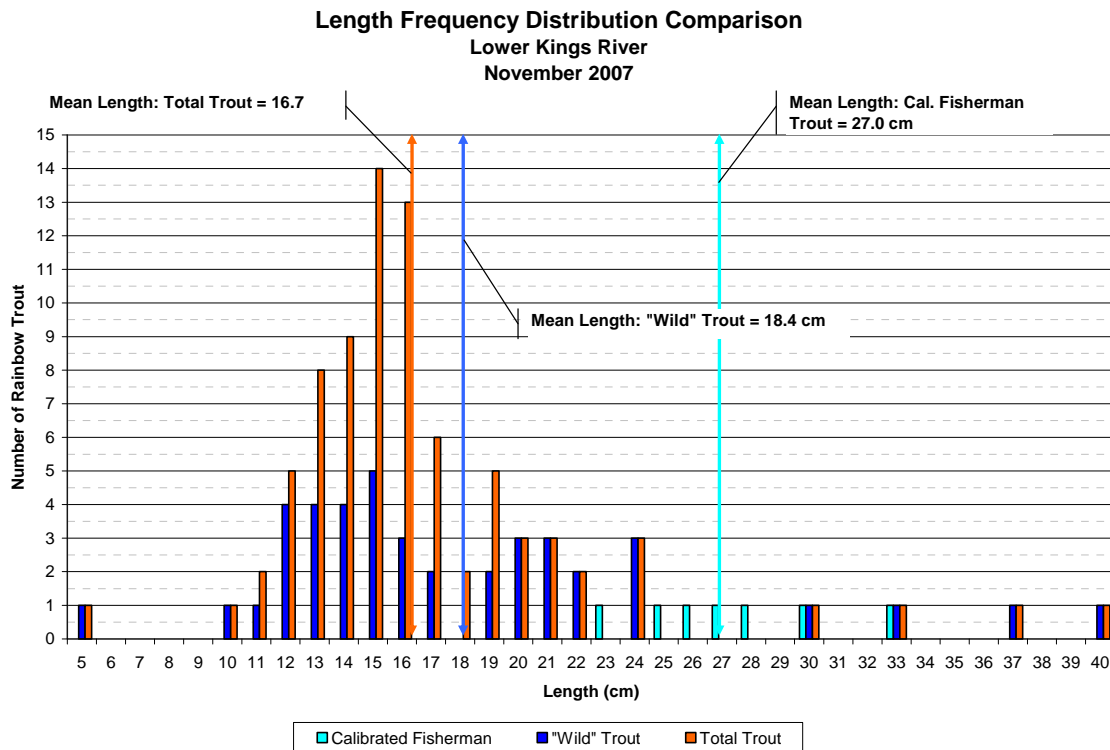


Figure 12: Length-Frequency Comparison of Electrofishing and Calibrated Fisherman Survey

The trout length-frequency distribution (Figure 5) for all sites was skewed towards smaller fish. The mean trout length for the total sample population was 16.7 cm, while the mean length of “wild” trout was 18.4 cm. This trend is consistent with data collected in the 1980’s. As with the data collected during the 1980’s, the length-frequency distribution fails to show the age-class structure that would be expected in a self-sustaining trout fishery.

Length-frequency data from a “hook and line” survey (Calibrated Fisherman) conducted two days prior to the start of the electrofishing survey show a larger size-class present in the river (KRCD 2008). The average length was 27.8 cm. The length-frequency distribution comparison is displayed in Figure 12. This suggests that the age-class structure might actually be present but that larger trout are not being effectively sampled during the electrofishing survey. This could be a result of backpack electrofishing site requirements (i.e. shallow, wadeable water) that would be less favorable habitat for larger trout.

The 2007 electrofishing survey re-established a baseline population and biomass estimate for the lower Kings River downstream of Pine Flat Dam. Continued sampling

using the multiple pass removal technique will allow for a more accurate assessment of the dynamics of the trout population, as well as other non-game species, and the effectiveness of the Fisheries Management Program's Habitat Master Plan. It is understood, however, that meeting the staffing requirements for such an endeavor may be difficult.

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