

Kings River Below Pine Flat Dam Fish Population Survey Results

Fall 2025



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EXECUTIVE SUMMARY

The Kings River Conservation District (KRCDD), in coordination with the California Department of Fish and Wildlife (CDFW), the Kings River Water Association (KRWA), and the Kings River Fisheries Management Program (KRFMP), conducted the 2025 Fish Population Survey to evaluate species composition, relative abundance, biomass, and trout condition in the lower Kings River downstream of Pine Flat Dam. Long-term annual monitoring provides essential baseline information for assessing population trends and habitat conditions in this regulated river system.

In 2025, a total of 4,115 fish representing nine species were collected. Native species strongly dominated the assemblage, comprising 99.5% of total abundance and 95.9% of total biomass. The fish community remained characteristic of a low-elevation, low-gradient valley floor system dominated by Sacramento sucker, cyprinid species, and sculpin, consistent with long-term monitoring patterns.

Juvenile life stages were observed for all native taxa except three-spine stickleback, indicating successful reproduction across most native species. The absence of juvenile stickleback is consistent with the species' short lifespan, as individuals from the annual cohort would be expected to have reached adulthood by the time of the survey.

Rainbow trout comprised less than one percent of the overall assemblage, as expected given thermal and geomorphic conditions in the lower Kings River. Hatchery rainbow trout were captured primarily near stocking locations, while "wild" rainbow trout were detected only at sites upstream of Fresno Weir. Both hatchery and "wild" trout exhibited good overall condition during the survey period.

Species composition varied among sites, reflecting localized habitat conditions rather than system-wide changes. Only five of six historic survey sites were sampled due to ongoing access and safety concerns at one location.

Overall, results indicate a stable, native-dominated fish assemblage consistent with long-term trends in the lower Kings River below Pine Flat Dam. Continued annual monitoring will support evaluation of population dynamics, identification of emerging management concerns, and informed stewardship of the Kings River fishery.

INTRODUCTION

The Kings River Conservation District (KRCD), in coordination with the California Department of Fish and Wildlife (CDFW) and the Kings River Water Association (KRWA), has conducted annual population surveys of rainbow trout (*Oncorhynchus mykiss*) and other fish species in the lower Kings River downstream of Pine Flat Dam since 1983. These surveys were originally initiated to meet Federal Energy Regulatory Commission (FERC) requirements under Item 4 of the Memorandum of Agreement for Project No. 2741 and are now an integral component of the Kings River Fisheries Management Program (KRFMP). Established in 1999, the KRFMP is a cooperative effort between the KRCD, KRWA, and CDFW focused on improving the Kings River watershed and enhancing fishery habitat while supporting its beneficial uses.

Numerous fish species occur in the river reach below Pine Flat Dam. A full list of species documented since 1983 is provided in Appendix A, Table A1. Monitoring has included electro-fishing, edge-shocking for young-of-the-year trout, and snorkeling surveys between Pine Flat Dam and Highway 180. Native species consistently dominate the fish assemblage. Introduced fish make up less than 3% of the total capture and frequently make up less than 1% (Appendix A, Table A2) of the total capture of any year since 2007. The fish assemblage is best described as the low-elevation valley floor assemblage characterized by the pikeminnow-hardhead-sucker complex described by Moyle (2002); Sacramento sucker and Sacramento pikeminnow are generally the most abundant species, hardhead occur only in cooler, deeper habitats, while other native species, such as tule perch, speckled dace, California roach, riffle sculpin, and rainbow trout, are also present. Although bass and sunfish occur in the Kings River, only a single bass was collected in the 2025 survey, as these introduced species only become abundant when dams stabilize flow regimes as native fish are better adapted for survival during periods of extreme high flows and extended cool flows (Moyle 2002).

Since 1983, electro-fishing surveys have been conducted at multiple locations along the Kings River (Appendix B: Table B1). Survey methods, reach lengths, and data collection procedures are summarized in Appendix B: Table B2. From 1983–1989, surveys used a multi-pass mark-and-recapture approach. In 1990, the method shifted to a single-pass survey using one upstream block net and an expanded reach length due to the absence of trout detected during the late 1980s, a decline attributed to extreme drought conditions (KRCD 1993). Because of this methodological change, single-pass data collected from 1990–2006 represent an index of relative abundance rather than true population density and resulting density estimates are not suitable for rigorous statistical analysis.

In 2007, the KRFMP's Technical Steering Committee revised the electro-fishing protocol to a three-pass depletion method with upstream and downstream block seines. This approach improved statistical rigor, allowing calculation of 95% confidence intervals and providing a more accurate assessment of species composition and abundance. The resulting data supports evaluation of population trends and fish condition.

METHODS

Survey Area

Since 2007, when conditions permit, surveys have been conducted in the same sites at each of the three uppermost management reaches of the Kings River (Figure 1).

Reach One, extending from Pine Flat Dam to Cobbles (Alta) Weir, is managed as a put-and-take trout fishery with a five-trout daily limit. The reach excludes the area above the USACE Bridge, which has been closed to fishing since 2001 under Homeland Security regulations. The Thorburn Spawning Channel and a 200-foot radius around its outlet are also closed to fishing under CDFW regulations. The Thorburn Channel is part of an ongoing special study initiated in 2023; 2025 results are provided in Appendix O. No KRWA diversions occur within Reach One, which also receives unmanaged inflows from Mill and Hughes creeks.

Reach Two extends from Cobbles (Alta) Weir to Fresno Weir and Reach Three continues downstream to the Reedley Narrows gauging station. Reach Two and the portion of Reach Three above Highway 180 are managed as catch-and-release trout fisheries, with regulations prohibiting trout harvest, bait, and barbed hooks between Cobbles (Alta) Weir and Highway 180. Reach Three is considered an opportunistic trout fishery, as water temperatures downstream of Fresno Weir often become unsuitable for trout during summer and fall, and trout stocking is limited.

Several water diversions occur within Reach Two. At Cobbles (Alta) Weir, the Alta Irrigation District diverts water into the '76 Channel. Downstream, Dennis Cut Weir diverts water into Dennis Cut, and Gould Weir diverts water into the Gould and Enterprise Canals. At Fresno Weir, additional diversions occur into the Fresno and Consolidated Canals, the latter being the largest diversion on the Kings River. The Friant-Kern Canal also crosses beneath the river upstream of Fresno Weir, and at times delivers water into the Kings River above the weir.

Within Reach One, electro-fishing was conducted only at the Winton site, located downstream of Winton County Park and adjacent to the Thorburn Spawning Channel. This site represents a partial subset of the historic Winton Park Boulder sampling area. The Alta site, formerly part of the annual survey, was retired in 2023 due to ongoing safety concerns. Alta was characterized by a wide channel with large cobble, placed boulders, and streamside vegetation. The site also included a narrow lower section with a deep run (three to four feet) and shallow riffle, transitioning upstream into a moderately deep glide (two to three feet) with shading from tree canopy. Persistent issues, with illegal dumping, steep and slick access slopes, bank erosion following the 2023 water year, and a fallen oak tree blocking river access and block-net placement, made the site unsafe for continued use. Alta was a partial subset of the historic Alta Weir/Site A sampling area.

Within Reach Two, electro-fishing was conducted at the Avo Boulder and Avo Side sites. Avo Boulder, a subset of the historic Avocado Lake Boulder site, is located in the middle channel behind Avocado Lake Park and is characterized by large cobbles, placed boulders, and limited tree cover. Since 2024 this site experienced an observed change to the channel, likely driven by high flows in 2023. These changes include increased depth along the right bank, faster velocities, and a gradual shift of the channel toward the right bank. Avo Side, a subset of the historic Avocado Lake Side Channel site, is situated on private property downstream of Avocado Lake Park. This site also contains large cobbles and placed boulders, with extensive canopy cover from adjacent trees.

Within Reach Three, electro-fishing was conducted at the Greenbelt and Wildwood sites. Greenbelt, a subset of the historic County Park Land Boulder site, features a wide channel with small- to medium-sized cobble and a few placed boulders. Canopy cover is provided primarily along the left bank, with minimal cover on the right. The site contains moderately deep water throughout, a small riffle near the upper right bank, and a small deeper pool along the left bank. Wildwood, a subset of the historic Wildwood site, underwent substantial channel changes following the high flows of 2023. Although still characterized by small- to medium-sized cobble and extensive canopy cover, the channel has shifted from shallow glides and riffles to two faster channels divided by a cobble bar during low flows. Immediately upstream of the survey reach, development of a new riffle and channel shift has occurred with continued erosion of the left bank.

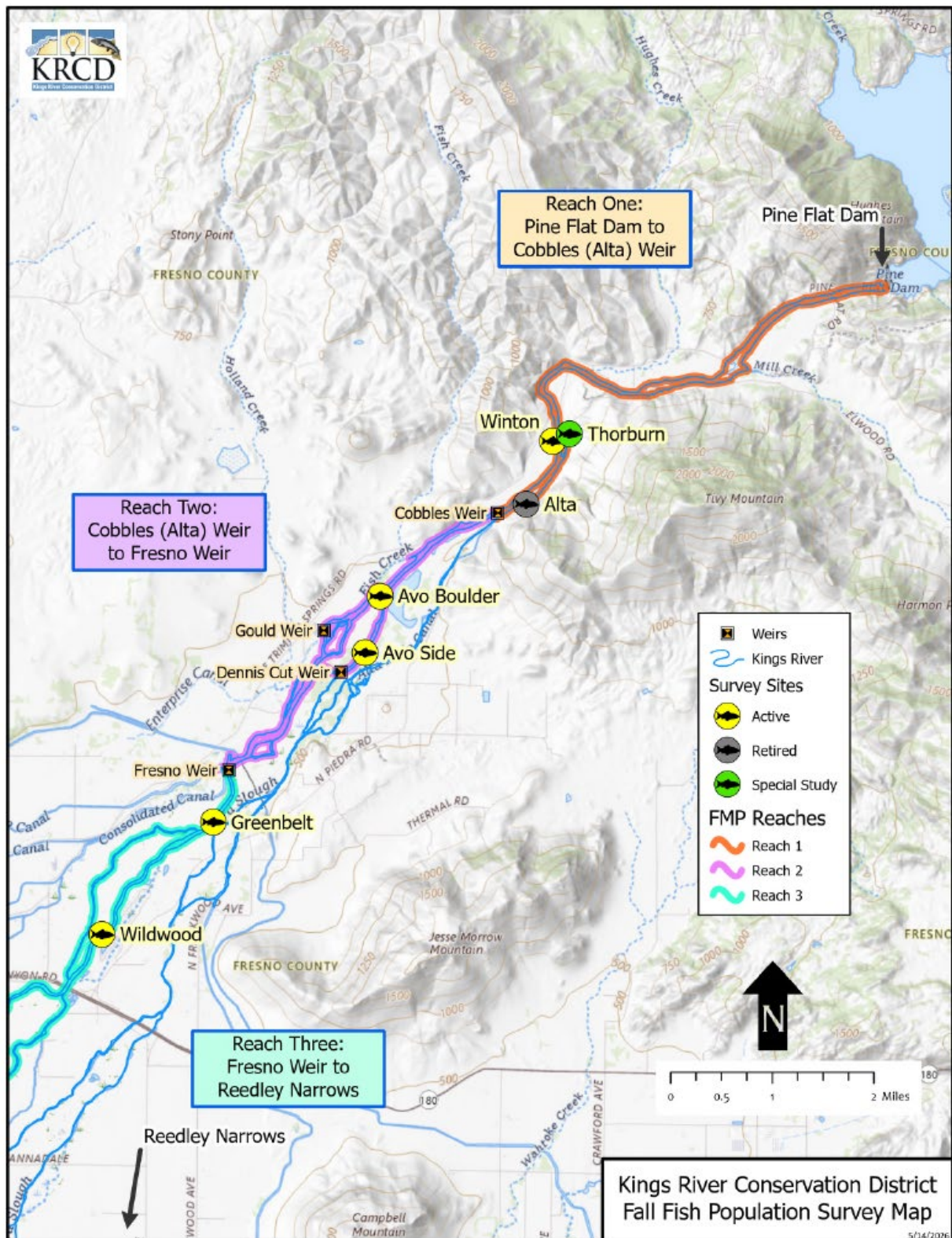


Figure 1. Fish Population Survey sites in the Kings River since 2007. Historic sites surveyed in 2025 are marked in yellow, retired historic sites in gray, and the special study site in green.

Survey Methods

In 2025, sampling was conducted over five days between November 18 and December 4 using standard three-pass depletion electro-fishing methods (Reynolds 1996). Each survey reach was approximately 300 feet long, with upstream and downstream ¼-inch mesh block seines installed to prevent fish movement into or out of the survey reach. Smith-Root LR-24 and LR-20B backpack electro-fishers operating with pulsed direct current were used at all sites.

From 2007 to 2011, electro-shocker settings were standardized at 350 volts, 10% duty cycle, and 50 Hz. Prior to the 2012 survey, LR-24 testing showed these settings did not provide sufficient power for effective fish capture based on Power Transfer Theory (Kolz 1989). Because power transfer is maximized when fish and water conductivities align, the previous settings resulted in a mismatch and reduced capture efficiency. Adjusting and standardizing the power curve allowed consistent power density ($\mu\text{W}/\text{cm}^3$) delivery (Kolz and Reynolds 1989) and improved fish response.

Adjusting the electro-fisher settings allows the voltage to match conductivity differences between the fish and the water. Data from the LR-24 internal voltmeter were used to develop a peak-voltage chart (Table 1) based on ambient water conductivity, which has guided voltage settings used since 2012. A duty cycle of 20% and a frequency of 30 Hz have also been adopted, as they provide high capture efficiency, quick recovery, and minimal mortality.

Table 1. Peak voltage goals for Smith-Root electro-shockers used for the Kings River Fish Population Surveys since 2012.

Ambient Conductivity (μS/cm)	Peak Voltage Goal	Ambient Conductivity (μS/cm)	Peak Voltage Goal
10	1892	120	315
20	1032	130	304
30	745	140	295
40	602	150	287
50	516	170	273
60	459	200	258
70	418	250	241
80	387	300	229
90	363	400	215
100	344	600	201
110	328	800	194

Electro-fishing was conducted with seven to nine field crews and one to three data-processing teams. Each crew included a backpack electro-fisher operator, one or two netters, and a bucket tender. Data-processing teams consisted of a recorder and one or two biologists. Staff from KRCD, CDFW, KRWA, and volunteers from local colleges, flood and irrigation districts, anglers, and community members participated. After processing, all fish were released outside the netted reach. A minimum 30-minute break was taken between passes.

During electro-fishing surveys, dam releases are typically maintained between 100 and 150 cubic feet per second (cfs) (Appendix B: Table B3) to ensure safe wading conditions and effective capture of stunned fish. When downstream water demand exceeds safe survey flows, releases may be temporarily reduced following the ramping schedule outlined in the Framework Agreement, then increased again to meet delivery needs (KRFMP 1999). This approach maintains safety, minimizes impacts on the fishery, and allows KRWA to meet operational obligations. Flow ramping was not required during the 2025 survey.

Instream measurements were collected daily by KRWA staff. Flow at the survey sites above Fresno Weir was measured using the USGS mid-section method (Nolan and Shields 2000) with a SonTek Flowtracker2 ADV, or in the case of the two survey sites below Fresno Weir, by referencing rated flow from an upstream gauge. Measurements are summarized in Table 2.

Table 2. Date, survey site, instream site flow as measured by KRWA on day of survey, and daily average instream flow from Pine Flat Reservoir.

Date	Site	Measured (cfs)	Pine Flat Release (cfs daily avg)
18-Nov	Avo Side	39	105
19-Nov	Avo Boulder	73	105
2-Dec	Wildwood	55	101
3-Dec	Greenbelt	55	101
4-Dec	Winton	118	101

Data Collection

In the field, each fish was identified to the lowest practical taxonomic level, weighed to the nearest 0.1 g, and measured for total length in millimeters; trout were measured to fork length and photographed. Rainbow trout were classified as hatchery-origin or “wild” based on fin condition. CDFW (2010) defines a wild trout as “A trout that was born in the wild and lives its life cycle in the wild, regardless of the origin of its parents.” Since 1983 KRCD has used visual inspection of fin condition as the primary means to distinguish between “wild” and hatchery origin rainbow trout. Fish with intact fins were classified as “wild,” while those with worn or missing fins were recorded as hatchery-origin. Because fin condition can vary among naturally produced trout, incubator-reared fish, and hatchery fish that have overwintered in the river, some misclassification is possible.

Biological data were recorded on waterproof field sheets, and raw capture data were entered into an Excel spreadsheet. MicroFish 3.0 (Van Deventer 2006) was then used to calculate total catch, biomass, maximum population estimates, and confidence intervals.

Catch-Per-Unit Effort

Catch-per-unit effort (CPUE) is a standard index of relative abundance used to evaluate temporal changes in fish populations (Reynolds 1996; Chipps and Garvey 2007). CPUE is calculated as:

$$CPUE = C/f$$

where C is the number of individuals of a given species captured at a site, f is the amount of sampling effort expended, and CPUE represents the catch rate expressed as number of fish per hour. For this survey, effort (f) was defined as the total time each backpack electro-fisher

was energized across three sampling passes at each site. Recorded electrofishing time (in seconds) was converted to hours, and CPUE was calculated for each species as fish per hour.

Population Estimate

Maximum population estimates and 95% adjusted confidence intervals (CI) for each species were calculated for each survey site using MicroFish 3.0. Estimates are influenced by removal patterns (number of fish of each species removed in each depletion pass) and sample size, with non-descending removals or small samples producing wider intervals. When the lower confidence bound is negative, MicroFish 3.0 applies an adjusted lower limit.

Fish per Mile

Fish per mile is calculated using the maximum population estimate generated by MicroFish 3.0 for each species at the surveyed sites. Each site represents approximately 300 feet of river. This metric serves as an index for tracking changes in fish density over time.

Condition Factor

Fulton's condition factor (K-factor) is an index used to assess a salmonid's body condition, calculated from its length and weight. The score is based upon a mathematical formula (Fulton 1904) which utilizes length (mm) and weight (g) parameters to determine the fitness of individuals within a population.

$$K = (W/L^3) \times 100,000$$

Fulton's K-factor provides a quantitative measure of fish condition within or among populations (Barnham and Baxter 1998), based on the assumption that heavier fish at a given length are in better condition (Bolger and Connolly 1989, Shah et al. 2011). Values greater than 1.0 indicate above-average condition, while values below 1.0 indicate poorer condition (Shah et al. 2011).

Fulton's condition factor assumes isometric growth and can vary with fish length. To complement the K-factor results, a length-weight relationship analysis was conducted by log-transforming trout length and weight data using log base 10 (Log10), plotting the data, and applying a linear trendline. The slope of this trendline indicates fish condition, with expected values between 2.5 and 3.5, typically near 3.0 for fish populations in good condition (Sharma and Baht 2015). Values below 3.0 indicate slower weight gain relative to length,

while values above 3.0 reflect faster weight gain (Sharma and Baht 2015). The R-squared (R^2) value was used to assess the goodness of fit.

Reporting of Results

Electro-fishing reports, prior to 2021, presented results in a way which suggests surveyed sites represent the 12.5-mile stretch of the Kings River below Pine Flat Dam, when these sites may not be representative. For this reason, results pertaining to CPUE, population estimates, and estimated fish per mile are presented based on the individual survey sites rather than extrapolated to apply to the Kings River below Pine Flat Dam. However, results showing the overall fish assemblage, length-frequency of captured fish, and overall condition factor (K-factor) of captured trout have been combined for the survey covered in this report. Further, metric measurements for overall biomass by species and individual length data were entered into Excel and converted to the English system due to the increased familiarity of that system with American readers, the target audience, of this report. Conversion to the English system also ensured all measurements within this report were standardized. Past electro-fishing reports generated by the KRCD have typically used some combination of English and metric units, with fish per mile consistently reported while biomass measurements were in either metric units and/or metric and English units.

RESULTS AND DISCUSSION

A total of 4,115 fish were collected during the 2025 Fish Population Survey, with complete data recorded for 4,063 individuals and entered into MicroFish 3.0 for analysis. Species composition and CPUE reflect the full catch, while all other metrics are based on the fish entered into MicroFish 3.0.

Native species continued to dominate the survey, comprising 99.5% of total abundance and 95.9% of biomass. The assemblage between Highway 180 and Pine Flat Dam was primarily composed of Sacramento sucker (35.2%), Sacramento pikeminnow (20.9%), sculpin (19.5%), and California roach (12.5%) (Figure 2). Introduced species accounted for only 0.5% of total abundance, represented mainly by hatchery rainbow trout. Overall, the species composition reflects the pikeminnow–hardhead–sucker assemblage typical of low-elevation, low-gradient systems described by Moyle (2002). Trout were present but constituted a very small portion of the assemblage, consistent with conditions of a low-elevation, low-gradient reach.

The collected species represented seven families (Table 3). Results for each species are summarized by family. Figures and tables are included for families comprising more than one percent of the total catch or for Salmonidae, which are of particular interest to Kings River

anglers. Species without figures or tables are summarized in the text and provided in the appendix.

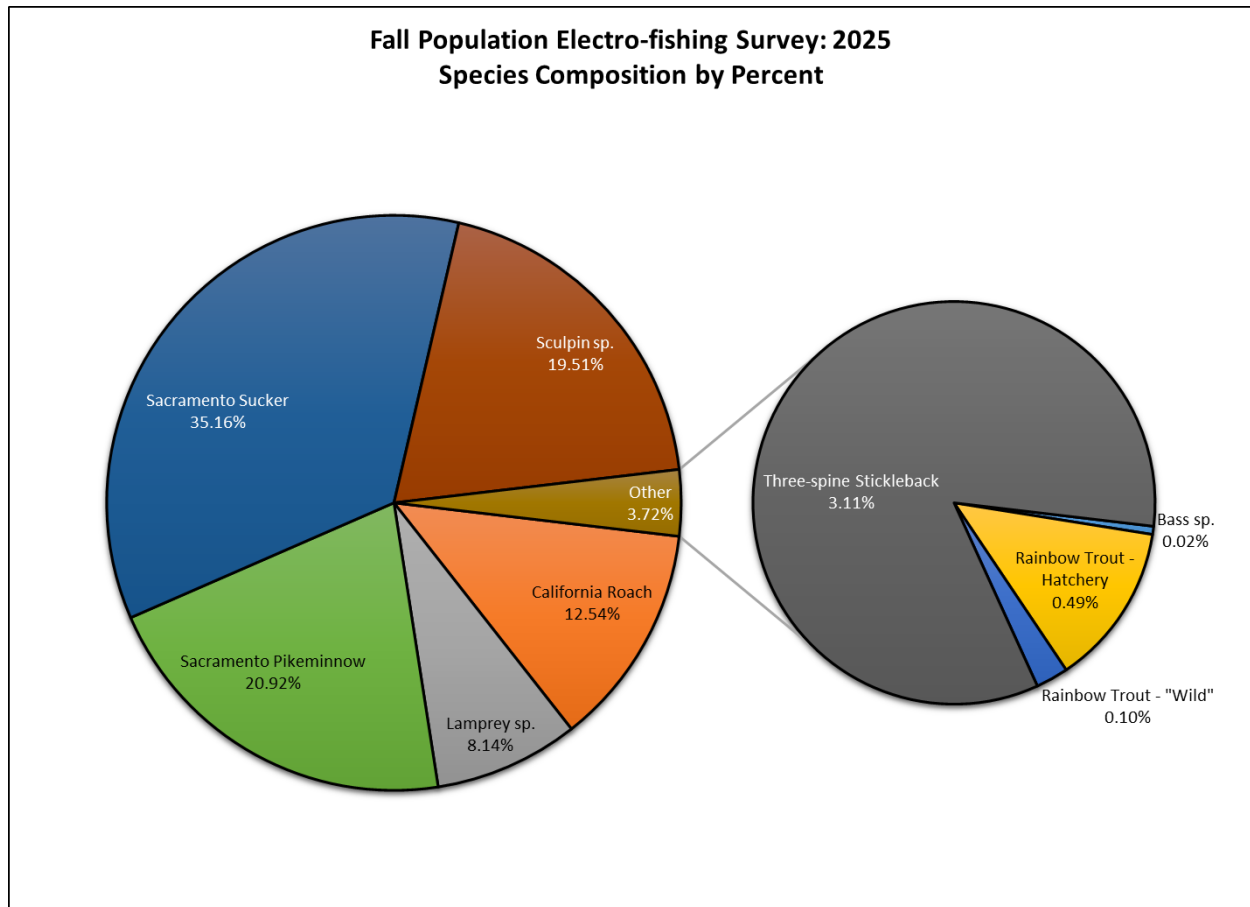


Figure 2. Species Composition by percent abundance for fish collected during the Fish Population Survey.

Table 3. Families represented and species collected during the 2025 Fish Population Survey.

Family	Species Collected
Catostomidae (Suckers)	Sacramento Sucker
Centrarchidae ("Black Basses")	Bass sp. ^a
Cottidae (Sculpins)	Sculpin sp.
Cyprinidae (Minnows)	California Roach Sacramento Pikeminnow
Gasterosteidae (Sticklebacks)	Three-spine Stickleback
Petromyzontidae (Lampreys)	Lamprey sp.
Salmonidae (Trout)	Rainbow Trout - Hatchery ^a Rainbow Trout - "Wild"

^a Introduced (non-native to the watershed or hatchery reared trout)

Catostomidae – Sucker Family

A total of 1,447 Sacramento suckers were captured (Appendix C), with data for 1,420 individuals entered into MicroFish 3.0. Results are summarized in Table 4.

Table 4. Catch-per-unit effort, population estimate, fish per mile, and biomass for Sacramento sucker collected during the Fish Population Survey.

	Sacramento Sucker, November-December 2025				
	Winton	Avo Boulder	Avo Side	Greenbelt	Wildwood
Catch-per-unit Effort (per hour)	21.7	30.4	42.5	14.6	15.8
Population Estimate (95% CI, Lower Adjusted)	443 (406-480)	431 (378-484)	379 (325-433)	288 (261-315)	287 (162-419)
Fish per Mile (Estimated)	7,797	7,586	6,670	5,069	5,051
Biomass (Pounds)	8.8	90.6	42.7	21.1	2.4

Catch rates varied between sites, with the highest catch rate at Avo Side. Fish per mile estimates ranged from 5,051 fish per mile at Wildwood to a high of 7,797 fish per mile at Winton. The lowest recorded total biomass was 2 pounds at Wildwood, and the heaviest was 91 pounds at Avo Boulder.

Captured Sacramento suckers were most frequently juveniles; length at maturity is typically around 8 inches (Moyle 2002). Length ranged from 1 to 22 inches with 90% captured fish

smaller than 8 inches (Figure 3), providing evidence Sacramento suckers have been successfully reproducing in the Kings River.

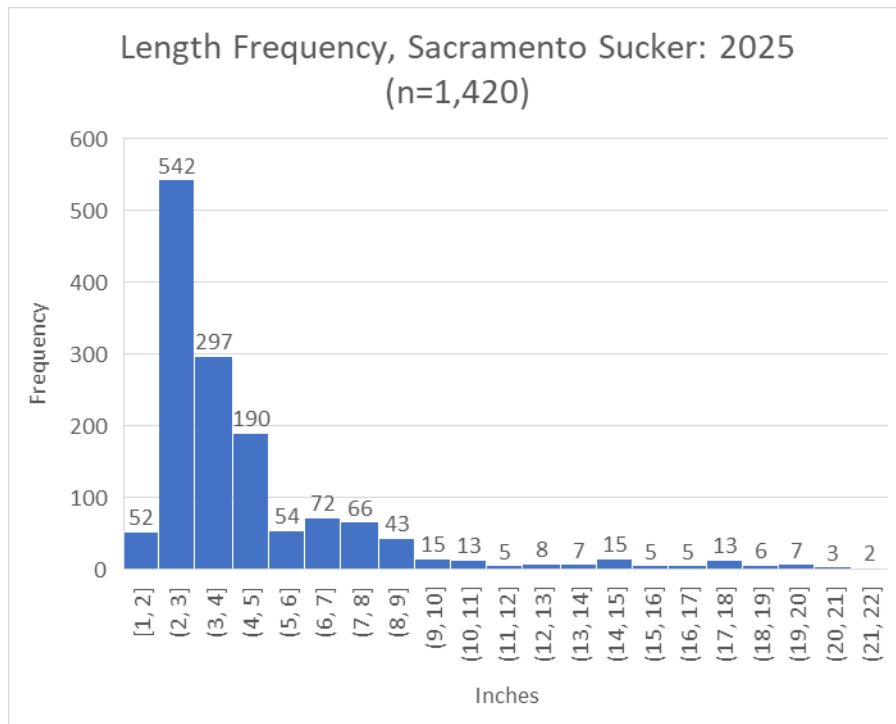


Figure 3. Length-frequency of Sacramento sucker captured during the Fish Population Survey. The number of fish in each size class is shown.

Sacramento suckers may be an important keystone species in the Kings River as they may also affect the invertebrate community, and juveniles may be an important food source for piscivorous fish and wildlife (Moyle 2002). They may also function as ecosystem engineers through their foraging behavior. Studies of the related Sonoran sucker (*C. insignis*) show that foraging can alter benthic sediments, increasing streambed heterogeneity, resuspending and redistributing sediment and organic matter, and influencing the distribution and density of benthic invertebrates (Booth et al. 2019). In addition, intraspecific interactions with rainbow trout may affect trout spawning success; the related bridgelip sucker (*C. columbianus*) has been observed spawning in trout redds, significantly modifying the substrate prior to trout spawning (Murdoch et al. 2005).

Centrarchidae – “Black” Bass Family

A single centrarchid, a juvenile “black” bass, was collected at Winton in 2025 (Appendix C) and entered into MicroFish 3.0. Catch-per-unit effort was 0.1 fish per hour. The population estimate was 1 fish (95% CI = 1-1; lower confidence interval adjusted), corresponding to an estimated 18 fish per mile. Recorded biomass was 0.005 pounds, and the individual measured

2.2 inches in length. Bass are generally considered to reach maturity at approximately 6 inches in length (Moyle 2002).

The observed individual may have entered the river from Pine Flat Reservoir, via overflow from off-channel stock ponds, or through instream production. Anecdotal observations by KRCD biologists indicate that bass are known to hold position over areas of cleared substrate in the Kings River between Pine Flat Dam and Cobbles Weir, a condition commonly associated with spawning nest construction in centrarchid species. The individual was not identified to species; however, largemouth, spotted, and smallmouth bass are known to occur in the Kings River.

Cottidae – Sculpin Family

A total of 803 cottids were captured, represented by prickly sculpin, riffle sculpin, or their hybrids (Appendix C), with data for 802 individuals entered into MicroFish 3.0. Results are summarized in Table 5.

Table 5. Catch-per-unit effort, population estimate, fish per mile, and biomass for sculpin collected during the Fish Population Survey.

	Sculpin sp., November-December 2025				
	Winton	Avo Boulder	Avo Side	Greenbelt	Wildwood
Catch-per-unit Effort (per hour)	19.6	4.9	6.8	13.2	11.9
Population Estimate (95% CI, Lower Adjusted)	365 (350-380)	58 (56-63)	48 (48-50)	255 (235-275)	169 (128-210)
Fish per Mile (Estimated)	6,424	1,021	845	4,488	2,974
Biomass (Pounds)	5.4	1.2	0.5	4.1	2.5

Catch rates varied between sites, with the highest catch rate at Winton. Fish per mile estimates ranged from 845 fish per mile at Avo Side to a high of 6,424 fish per mile at Winton. The lowest recorded total biomass was 0.5 pounds at Avo Side, and the heaviest was 5.4 pounds at Winton. Winton, Greenbelt, and Wildwood likely offer more suitable cobble habitat for sculpin than Avo Boulder and Avo Side, which are narrower and provide less surface area. Detection at Avo Boulder may be reduced due to its depth, as stunned sculpin often settle into cobbles rather than float. Avo Side also contains silty deposits that sculpin generally avoid. Prickly sculpin rely on cover within streams, while riffle sculpin depend on rocky substrates for shelter from strong currents (Moyle 2002). Cobbles also support sculpin by providing ambush sites, spawning habitat, and habitat for their invertebrate prey (McGinnis 2006).

Captured sculpin ranged from 2 to 7 inches (Figure 4). Sculpin typically reach maturity when they are between 1.6 to 2 inches long and breed at the end of their second year (Moyle 2002). This suggests all captured sculpin were mature adults. Young-of-the-year sculpin may have been present but missed during sampling as their small size may cause them to be undetected, consumed by piscivorous fish while in the holding container, or evade capture by slipping through the netting mesh.

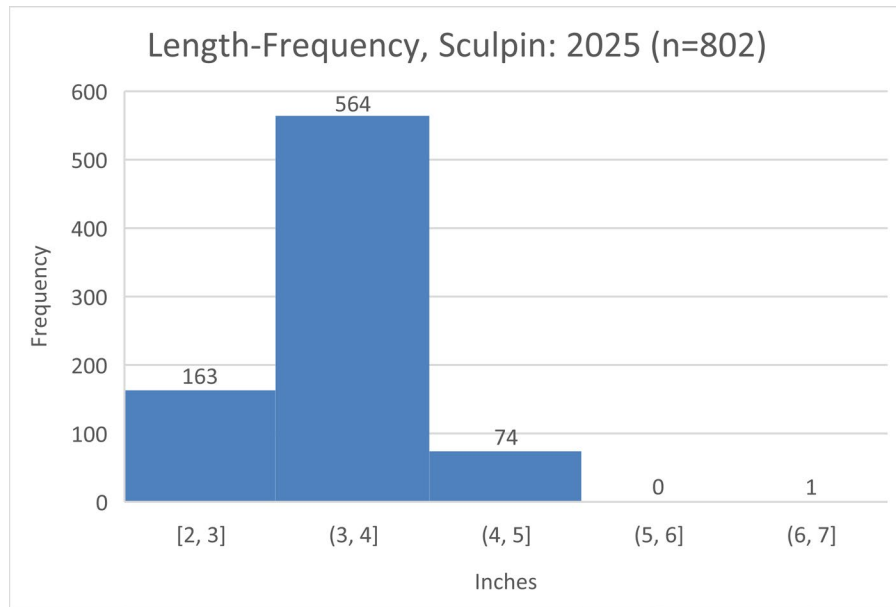


Figure 4. Length-frequency of sculpin captured during the Fish Population Survey. The number of fish in each size class is shown.

Cyprinidae – Minnow Family

A total of 1,377 cyprinids were captured, represented by 516 California roach and 861 Sacramento pikeminnow (Appendix C). Data for 509 roach and 848 pikeminnow were entered into MicroFish 3.0. Results are summarized in Table 6 for roach and in Table 7 for pikeminnow.

Table 6. Catch-per-unit effort, population estimate, fish per mile, and biomass for California roach collected during the Fish Population Survey.

	California Roach, November-December 2025				
	Winton	Avo Boulder	Avo Side	Greenbelt	Wildwood
Catch-per-unit Effort (per hour)	2.5	7.0	8.1	11.2	13.2
Population Estimate (95% CI, Lower Adjusted)	51 (44-63)	103 (78-135)	79 (57-113)	224 (200-248)	218 (137-304)
Fish per Mile (Estimated)	898	1,813	1,390	3,942	3,837
Biomass (Pounds)	0.2	0.8	0.4	1.6	0.9

Table 7. Catch-per-unit effort, population estimate, fish per mile, and biomass for Sacramento pikeminnow collected during the Fish Population Survey.

	Sacramento Pikeminnow, November-December 2025				
	Winton	Avo Boulder	Avo Side	Greenbelt	Wildwood
Catch-per-unit Effort (per hour)	8.3	6.1	31.8	6.8	28.6
Population Estimate (95% CI, Lower Adjusted)	201 (145-257)	111 (65-186)	336 (336-336)	137 (117-157)	560 (349-771)
Fish per Mile (Estimated)	3,538	1,954	5,914	2,411	9,856
Biomass (Pounds)	0.9	1.3	0.5	0.9	0.9

California roach were captured at each of the sites surveyed with the highest catch rate at Wildwood. Fish per mile estimates ranged from 898 fish per mile at Winton to a high of 3,942 fish per mile at Greenbelt. The lowest recorded total biomass was 0.2 pounds at Winton, and the heaviest was 1.6 pounds at Greenbelt.

Sacramento pikeminnow were captured at each of the sites surveyed with the highest catch rate at Avo Side. Fish per mile estimates ranged from 1,954 fish per mile at Avo Boulder to a high of 9,856 fish per mile at Wildwood. The lowest recorded total biomass was 0.5 pounds at Avo Side, and the heaviest was 1.3 pounds at Avo Boulder.

Captured cyprinids were California roach of all age classes and immature Sacramento pikeminnow. For California roach, length ranged from 1 to 6 inches (Figure 5). Maturity is usually reached at the end of their second year when they are around 2 inches long (Moyle 2002), indicating 16% of the roach collected were immature. For Sacramento pikeminnow, length ranged from 1 to 9 inches (Figure 6). Sacramento pikeminnow reach maturity at the end of their third or fourth year at a length of 9 inches (Moyle 2002), suggesting all the pikeminnow collected in 2025 were immature.

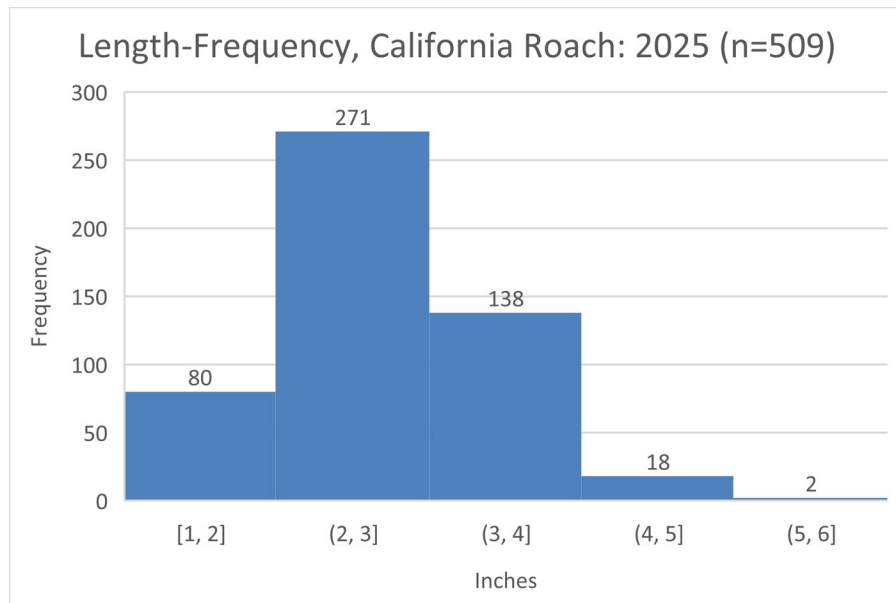


Figure 5. Length-frequency of California roach captured during the Fish Population Survey. The number of fish in each size class is shown.

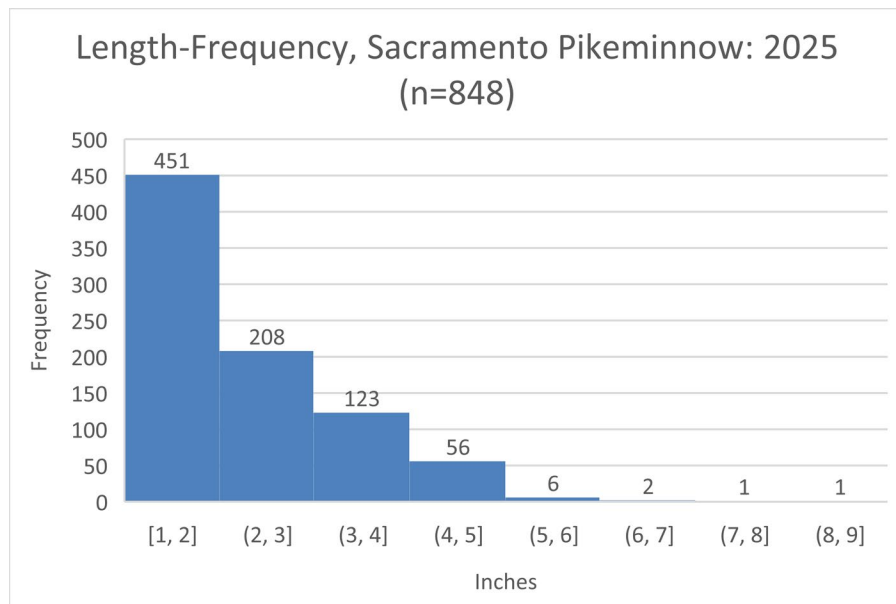


Figure 6. Length-frequency of Sacramento pikeminnow captured during the Fish Population Survey. The number of fish in each size class is shown.

Diet in Sacramento pikeminnow varies with size. Individuals under 4 inches primarily consume aquatic insects, shift to fish and crayfish at 4–8 inches, and become almost exclusively piscivorous once they exceed 8 inches (Moyle 2002). Based on these size-based patterns, approximately 92% of the pikeminnow captured in 2025 likely fed on similar prey

as other insectivorous fish in the Kings River unless niche partitioning was occurring. Studies indicate limited dietary overlap between Sacramento pikeminnow and salmonids due to habitat partitioning (Merz and Vanicek 1996), and pikeminnow are not always significant salmonid predators when movement is unrestricted (Vondracek and Moyle 1982, Moyle 2002). However, predation on juvenile salmonids, particularly in the summer, can increase when movement is constrained by anthropogenic barriers (Tucker et al. 1998). This suggests diet is a function of what is available where Sacramento pikeminnow are present.

Gasterosteidae – Stickleback Family

A total of 128 three-spine stickleback were captured (Appendix C), with data for all individuals entered into MicroFish 3.0. Results are summarized in Table 8.

Table 8. Catch-per-unit effort, population estimate, fish per mile, and biomass for three-spine stickleback collected during the Fish Population Survey.

	Three-spine Stickleback, November-December 2025				
	Winton	Avo Boulder	Avo Side	Greenbelt	Wildwood
Catch-per-unit Effort (per hour)	3.5	0.9	3.4	1.4	0.8
Population Estimate (95% CI, Lower Adjusted)	267 (61-1,109)	14 (10-32)	97 (24-543)	36 (36-36)	10 (9-16)
Fish per Mile (Estimated)	4,699	246	1,707	634	176
Biomass (Pounds)	0.12	0.01	0.04	0.05	0.01

Catch rates varied between sites, with the highest catch rate at Winton. Fish per mile estimates ranged from 176 fish per mile at Wildwood to a high of 4,699 fish per mile at Winton. The lowest recorded total biomass was 0.01 pounds at each Avo Boulder and Wildwood, and the heaviest was 0.12 pounds at Winton. High population estimates at Winton indicate favorable habitat conditions. Although site-specific habitat data are unavailable, the area contains extensive shallow edge habitat with large cobbles that slow instream flow and limit access by larger piscivorous fish.

Length of captured three-spine stickleback ranged from 1 to 3 inches (Figure 7). Two inches is the typical size for freshwater sticklebacks, which rarely live longer than 1 year and shoal with similar sized cohorts (Moyle 2002). All members of the annual cohort would have reached adulthood at the time of the survey.

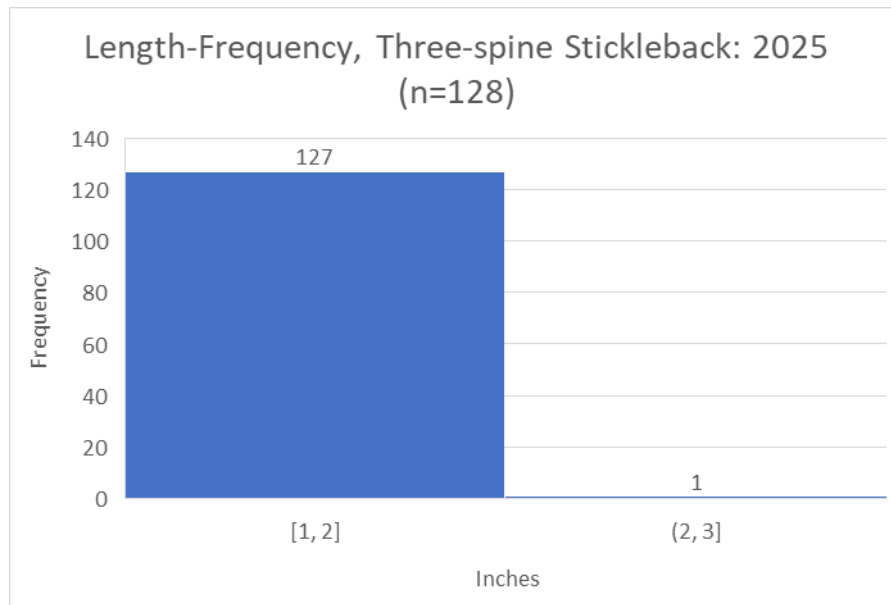


Figure 7. Length-frequency of three-spine stickleback captured during the Fish Population Survey. The number of fish in each size class is shown.

Petromyzontidae – Lamprey Family

A total of 335 lamprey were captured (Appendix C), represented by Kern brook lamprey and possibly other species. Data for 333 individuals were entered into MicroFish 3.0. Results are summarized in Table 9.

Table 9. Catch-per-unit effort, population estimate, fish per mile, and biomass for lamprey collected during the Fish Population Survey.

	Lamprey sp., November-December 2025				
	Winton	Avo Boulder	Avo Side	Greenbelt	Wildwood
Catch-per-unit Effort (per hour)	0.1	3.4	29.5	0.8	6.9
Population Estimate (95% CI, Lower Adjusted)	2 (2-26)	111 (38-368)	310 (310-310)	14 (13-19)	152 (73-297)
Fish per Mile (Estimated)	35	1,954	5,456	246	2,675
Biomass (Pounds)	0.01	0.31	1.28	0.08	0.41

Catch rates varied between sites, with the highest catch rate at Avo Side. Fish per mile estimates ranged from 35 fish per mile at Winton to a high of 5,456 fish per mile at Avo Side. The lowest recorded total biomass was 0.01 pounds at Winton, and the heaviest was 1.28 pounds at Avo Side. The Avo Side site lies within a side channel that may offer suitable habitat for spawning adults and rearing lamprey ammocetes. Ammocetes prefer low-velocity

areas with accumulated sand and mud, while adults require riffles with spawning gravel and rubble for cover (Moyle 2002).

Captured lamprey ranged from 1 to 6 inches (Figure 8). Non-parasitic adult lamprey, such as those found in the Kings River, are generally smaller following metamorphoses from the ammocetes stage (McGinnis 2006). It is unclear how many lamprey were adults, as the survey did not distinguish between ammocetes and adults.

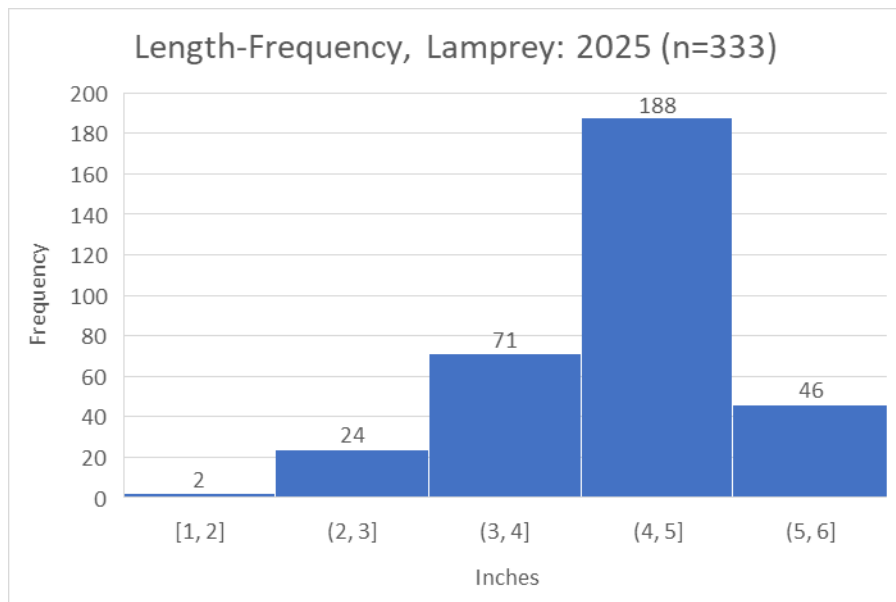


Figure 8. Length-frequency of lamprey captured during the Fish Population Survey. The number of fish in each size class is shown.

Salmonidae – Trout Family

A total of 24 rainbow trout were captured (Appendix C), including 20 classified as hatchery-origin and 4 as “wild.” Data for all but one hatchery and one “wild” trout were entered into MicroFish 3.0. Results are summarized in Table 10 for hatchery rainbow trout and in Table 11 for “wild” rainbow trout.

Some hatchery rainbow trout may have been misclassified as “wild.” Fin condition, used in the field to distinguish hatchery from wild trout, can regenerate in hatchery fish that become resident, reducing its reliability. Additionally, no phenotypic differences exist between incubator-hatched trout and those spawned instream. Because incubator-reared trout are released at an early age and develop under the same conditions as naturally spawned fry, fin condition alone may lead to misclassification.

Table 10. Catch-per-unit effort, population estimate, fish per mile, and biomass for hatchery rainbow trout collected during the Fish Population Survey.

	Rainbow Trout - Hatchery, November-December 2025				
	Winton	Avo Boulder	Avo Side	Greenbelt	Wildwood
Catch-per-unit Effort (per hour)	1.1	0.0	0.0	0.0	0.0
Population Estimate (95% CI, Lower Adjusted)	28 (28-28)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
Fish per Mile (Estimated)	493	0	0	0	0
Biomass (Pounds)	8.0	0.0	0.0	0.0	0.0

Table 11. Catch-per-unit effort, population estimate, fish per mile, and biomass for “wild” rainbow trout collected during the Fish Population Survey.

	Rainbow Trout - "Wild", November-December 2025				
	Winton	Avo Boulder	Avo Side	Greenbelt	Wildwood
Catch-per-unit Effort (per hour)	0.1	0.1	0.3	0.0	0.0
Population Estimate (95% CI, Lower Adjusted)	1 (1-1)	1 (1-1)	2 (2-7)	0 (0-0)	0 (0-0)
Fish per Mile (Estimated)	18	18	35	0	0
Biomass (Pounds)	0.1	No Data	0.2	0.0	0.0

To evaluate potential influences on observed catch, fish stocking records for the approximately six weeks preceding sampling and through the conclusion of the survey were reviewed (Table 12).

Hatchery rainbow trout were captured only at Winton. Fish per mile was estimated at 18, and total recorded biomass was 8 pounds. Trout are stocked at Winton Park at locations ranging from 0.3 to 0.7 miles from the survey site, depending on driver’s discretion.

A total of 11 stocking events, consisting of catchable, super-catchable, and trophy trout were recorded by CDFW and Calaveras Trout Farm (CTF) between October 6 and December 2. As most trout captured at Winton were catchable-sized (see Figure 9), they were most likely introduced with the November 21, November 25, or December 2 stocking events. Detailed length-frequency distributions are presented below.

Table 12. Fish stocking events by date during the six weeks preceding and through the conclusion of the Fish Population Survey.

Date	Number of Fish	Pounds Stocked (lb)	Fish per lb	Size Class	Supplier
10/6/2025	1,520	800	1.90	Catchable	CDFW
10/16/2025	6,600	1,100	6.00	Catchable	CDFW
10/16/2025	201	500	0.40	Super-catchable	CDFW
10/20/2025	1,440	800	1.80	Catchable	CDFW
10/30/2025	105	1,000	0.11	Trophy	CDFW
11/6/2025	128	500	0.26	Trophy	CDFW
11/20/2025	132	500	0.26	Trophy	CDFW
11/21/2026	1,500	500	3.00	Catchable	CTF
11/24/2025	110	500	0.22	Trophy	CDFW
11/25/2025	3,000	1,000	3.00	Catchable	CTF
12/2/2025	4,500	1,500	3.00	Catchable	CTF

CDFW provides an annual trout allotment for the Kings River. In 2017, the KRFMP developed a supplemental rainbow trout stocking plan, approved by the Executive Committee in 2018. Implemented in fall 2018, the program stocks up to 16,000 pounds (approximately 48,000 fish) of catchable or super-catchable rainbow trout annually between October and March. In 2020, KRCD began purchasing additional fish to augment this effort. These supplemental stockings occur weekly and are in addition to the regular CDFW allotment. KRFMP supplemental fish are stocked at a 75/25% ratio between the put-and-take zone (USACE Bridge to Cobbles Weir) and the catch-and-release zone behind Avocado Lake, while KRCD stocks at a 60/40% ratio in the same zones.

Catch-per-unit effort for hatchery rainbow trout may be influenced by proximity to stocking locations and time since stocking. Stocking sites above Fresno Weir are located 0.1 to 0.7 miles from survey reaches, while below Fresno Weir the nearest stocking point is at Highway 180, approximately 0.6 miles downstream of the southernmost survey site. CDFW typically stocks trout weekly or biweekly when water temperatures remain below 70°F.

Population estimates for hatchery rainbow trout may be lower than expected given the frequency of stocking.

“Wild” rainbow trout were captured only at the three sites upstream of Fresno Weir, with the highest catch rate at Avo Side. Fish per mile estimates ranged from 0 fish per mile at Greenbelt and Wildwood, to a high of 35 fish per mile at Avo Side. The lowest recorded total

biomass was 0.1 pounds at Winton, and the heaviest was 0.2 pounds at Avo Side. No weight was recorded for the single “wild” trout captured at Avo Boulder, but visual assessment indicated it was similar in size and appearance to “wild” trout collected at the other sites.

Trout are rarely collected below the weir, as downstream summer and fall temperatures are typically unsuitable for them (Appendix L). The Greenbelt site also provides poor trout habitat due to its extensive shallow water. In contrast, Wildwood contains deeper water within and adjacent to the survey reach, offering potential thermal refuge with minimal movement.

Estimates for “wild” trout may be inflated because incubator-hatched fry cannot be reliably distinguished from naturally produced fish. Although some natural production may occur, much of the available substrate is unsuitable for successful spawning due to its large size and armoring (Cramer Fish Sciences 2019).

Length-frequency distributions of captured salmonids were within expected ranges. Hatchery rainbow trout ranged from 8 to 13 inches in length (Figure 9), with 95% classified as catchable-sized (7-12 inches) and 5% as super-catchable-sized (12-19 inches). Catchable, super-catchable, and trophy-sized trout were stocked during the October-December period (Table 12). The predominance of catchable-sized fish in the sample suggests that most individuals were associated with recent stocking events, while the single super-catchable individual may reflect either growth following stocking or inclusion of slightly larger individuals in catchable releases during size grading. “Wild” rainbow trout ranged in length from 6 to 7 inches (Figure 10).

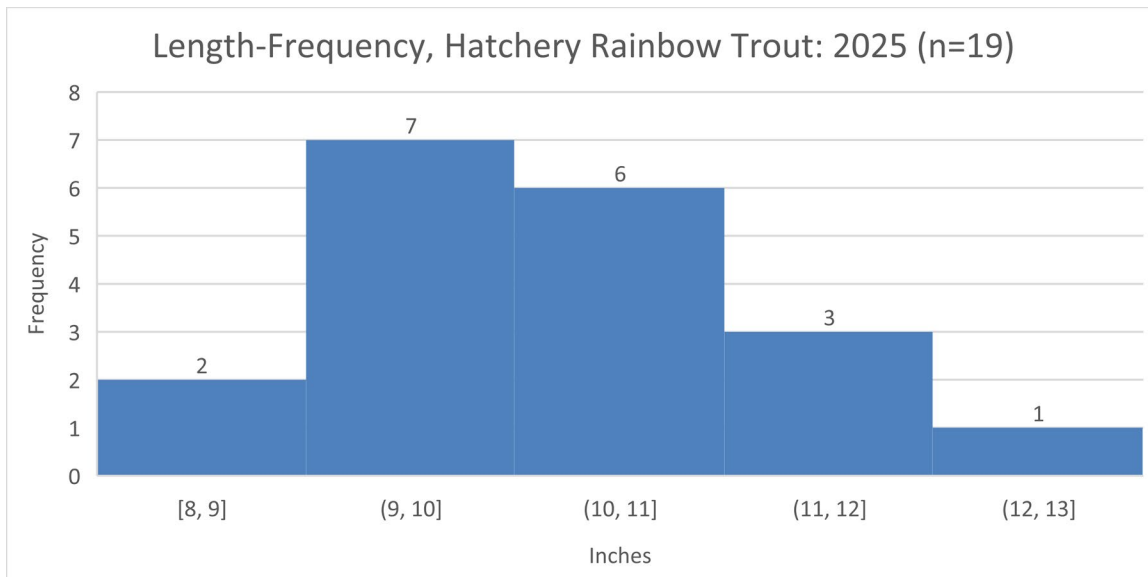


Figure 9. Length-frequency of hatchery rainbow trout captured during the Fish Population Survey. The number of fish in each size class is shown.

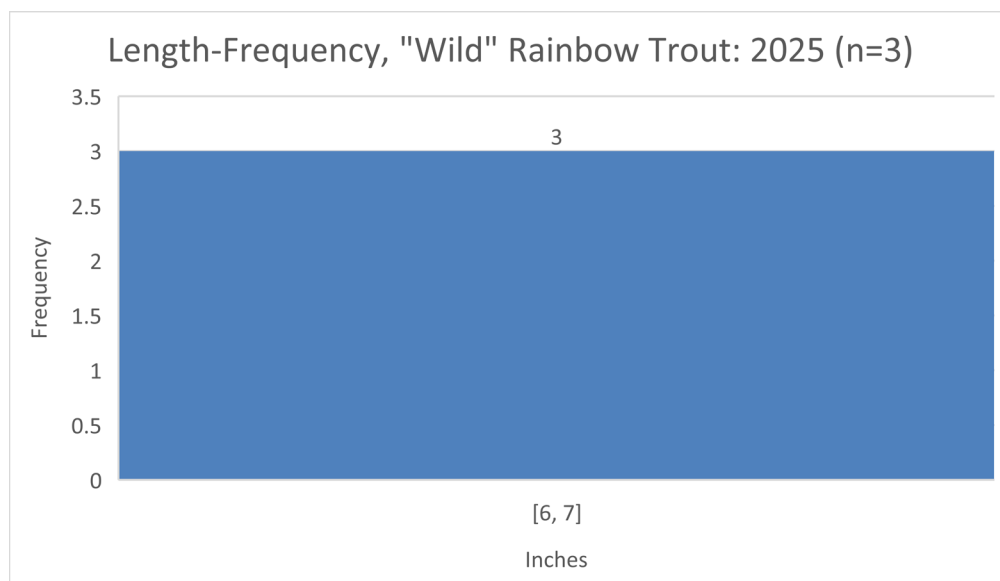


Figure 10. Length-frequency of “wild” rainbow trout captured during the Fish Population Survey. The number of fish in each size class is shown.

Among trout with available length and weight data, 95% of hatchery rainbow trout and all “wild” rainbow trout had Fulton’s condition factors (K-factors) above 1.0. Summary statistics for hatchery trout are provided in Table 13, with a mean and median K-factor of 1.1, indicating good overall condition. K-factors for “wild” trout, shown in Figure 11, averaged 1.2, with Avo Side producing the highest values.

Table 13. Minimum, maximum, mean, and median calculated Fulton’s condition factor (K-factor) for trout captured during the Fish Population Survey.

Species	Fulton's Condition Factor (K-factor)				
	Sample Size (n=)	Minimum	Maximum	Mean	Median
Hatchery Rainbow Trout	19	0.9	1.8	1.1	1.1
"Wild" Rainbow Trout	3	1.2	1.2	1.2	1.2

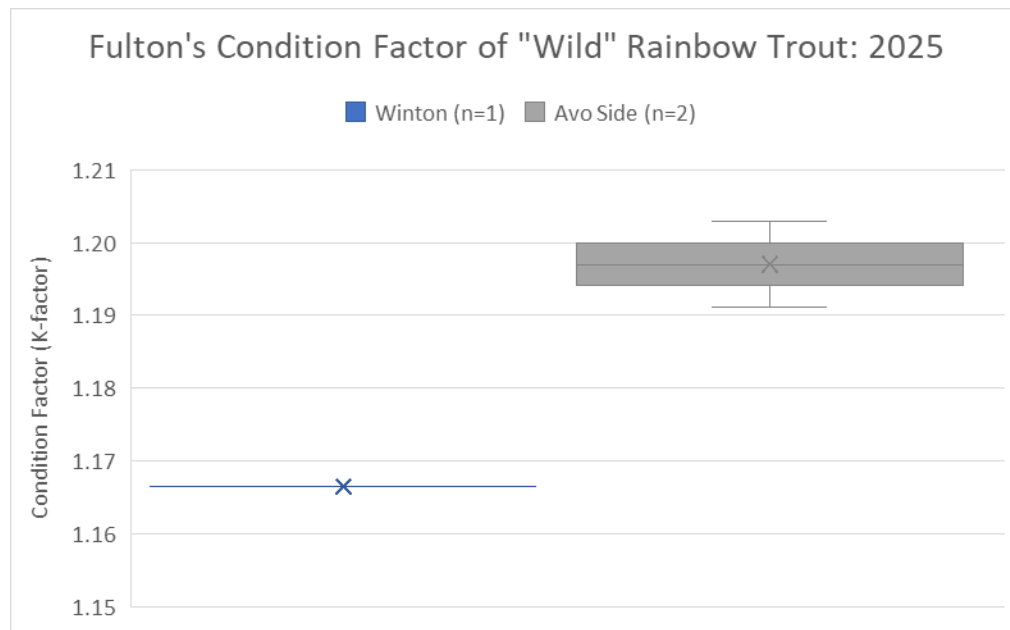


Figure 11. Box plot of the calculated Fulton’s K-factor by site for “wild” rainbow trout collected during the Fish Population Survey. Outliers, mean, and median are indicated for each site.

Regression analysis of available length-weight data provided an additional assessment of trout condition. Both hatchery and “wild” rainbow trout showed strong positive length-weight relationships (Figure 12), with regression slopes of 2.66 ($R^2 = 0.83$) and 2.86 ($R^2 = 0.99$), respectively, indicating good overall condition.

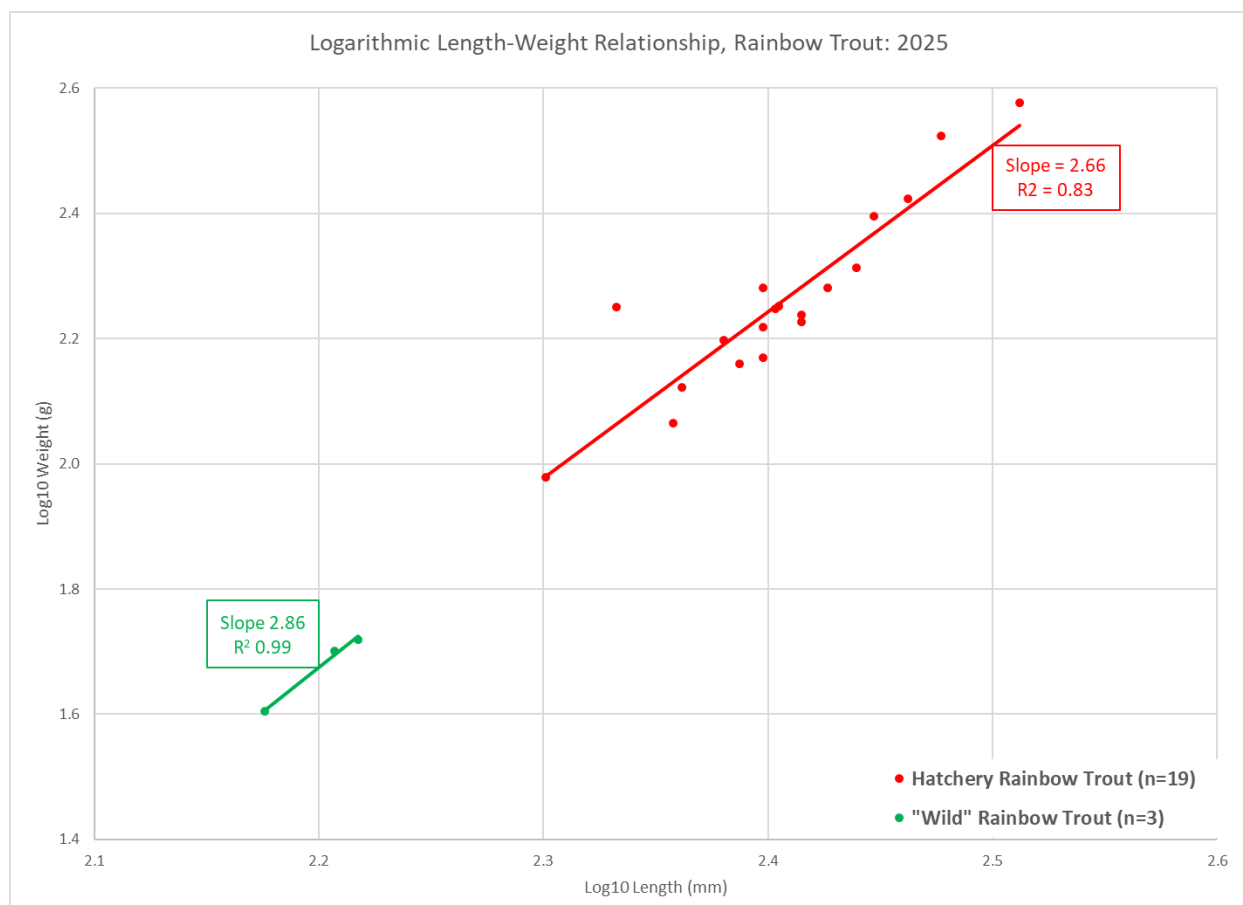


Figure 12. Logarithmic length-weight relationship for hatchery rainbow trout and “wild” rainbow trout captured during the Fish Population Survey.

Hatchery-reared trout are expected to exhibit good condition due to consistent feeding prior to release. Lower condition values in some individuals may reflect the time elapsed between stocking and capture, as recently stocked fish can be less adapted to river conditions (Araki et al. 2008, Araki & Schmid 2010, Olla et al. 1998). In contrast, “wild” trout are fully acclimated to local habitat conditions, and their condition at capture likely reflects recent environmental factors such as temperature, prey availability, energetic demands, and predator or angling pressure. The good condition observed in “wild” rainbow trout indicates that instream conditions were adequate in 2025.

DISCUSSION

Data collected during the 2025 Fish Population Survey were used to estimate fish populations within the lower Kings River survey reach, from Pine Flat Dam to Highway 180. Fish species were collected, identified, and counted, providing a snapshot of the assemblage present during the survey period. Available annual instream flow and temperature data from the

USACE Bridge and Fresno Weir, as well as unmeasured in-situ habitat conditions, were not included in this analysis.

In 2025, a total of 4,115 fish representing nine species were collected, seven of which are native to the watershed. Native species dominated both abundance (99.5%) and biomass (95.9%), with introduced species comprising the remainder. Due to ongoing safety concerns, one historic site was not surveyed, resulting in coverage of five of six sites. Electro-fisher voltage was adjusted by site to match water conductivity; however, the effect of these adjustments on catch efficiency is uncertain. Although species composition varied by site, the assemblage was consistently dominated by native Sacramento suckers, cyprinids, and sculpin, characteristic of the pikeminnow–hardhead–sucker assemblage described by Moyle (2002) for low-gradient California rivers, including the lower Kings River below Pine Flat Dam. “Wild” trout were present but comprised less than one percent of the assemblage, as expected for a low-elevation, low-gradient system.

Catch results indicated successful reproduction of native species, as juvenile life stages were observed for all taxa except three-spine stickleback. This species typically has a lifespan of one year or less, and individuals from the annual cohort would be expected to have reached adulthood by the time of the survey.

A summary of the 2025 Fish Population Survey results is presented in Table 14.

Table 14. Summary results, Fish Population Survey.

Species Collected	Species Composition (%)	Range across Survey Sites ¹			Length (in)
		Population Estimates*	Fish per Mile (estimated)	Biomass (lb)	
Sacramento Sucker	35.16	287-443	5,051-7,797	2.4-90.6	1-22
Sacramento Pikeminnow	20.92	111-560	1,954-9,856	0.5-1.3	1-9
Sculpin sp.	19.51	48-365	845-6,424	0.5-5.4	2-7
California Roach	12.54	51-224	898-3,942	0.2-1.6	1-6
Lamprey sp.	8.14	2-310	35-5,456	0.01-1.3	1-6
Three-spine Stickleback	3.11	10-267	176-4,699	0.01-0.1	1-3
Rainbow Trout - Hatchery ^a	0.49	0-28	0-493	0-8.0	8-13
Rainbow Trout - "Wild"	0.10	0-2	0-35	0-0.2	6-7
Bass sp. ^a	0.02	0-1	0-18	0-0.005	2.2

¹Range of values across sampled reaches between Pine Flat Dam & Highway 180, this should not be interpreted as all the fish between Pine Flat Dam and Highway 180

*Confidence intervals for each site are provided in the Results and Discussion section of this report

^a Introduced (non-native to the watershed or hatchery reared trout)

Distinguishing trout origin can be challenging, and some hatchery rainbow trout may be misclassified as “wild.” Fin condition is the primary indicator used; however, resident hatchery trout can develop fin characteristics similar to wild fish as fins regenerate over time. In addition, no phenotypic differences exist between incubator-hatched trout and those spawned instream. Because incubator-hatched fry are released at four to six weeks post-hatch and rear under conditions similar to wild fry, fin condition becomes an unreliable indicator of origin, increasing the potential for misclassification.

Rainbow trout in the Kings River below Pine Flat Dam include hatchery-produced fish stocked according to management practices that influence species composition, abundance, density, and size. These trout are most commonly observed at survey sites near regularly stocked areas upstream of Fresno Weir. In 2025, both hatchery and “wild” rainbow trout captured during the survey were in good overall condition.

The KRFMP should remain vigilant regarding invasive species. Live bait released by anglers may become established in the Kings River, increasing competition with native and already-introduced species. The presence of golden shiner (*Notemigonus crysoleucas*, Appendix A) and anecdotal observations of threadfin shad (*Dorosoma petenense*) indicate the potential for these bait species to occur in the Kings River below Pine Flat Dam.

Invasive mollusks pose an additional threat to the Kings River and may be introduced through recreational use of Pine Flat Reservoir or the river itself, as well as via water transfers. Asian clams (*Corbicula fluminea*) are the only invasive mollusk currently documented in the watershed. Quagga mussels (*Dreissena rostriformis bugensis*), zebra mussels (*D. polymorpha*), and golden mussels (*Limnoperna fortunei*) have not been detected, but remain a risk via illegal bait use, contaminated fishing gear, or trailered watercraft. Quagga mussels are established in parts of southern California, zebra mussels have been detected in San Justo Reservoir (San Benito County), and golden mussels are established in the Sacramento–San Joaquin Delta and waters receiving California Aqueduct deliveries. In December 2025, golden mussels were detected in the Friant–Kern Canal following water delivery through the Cross Valley Canal. As of February 2026, the lower 20–30 miles of the canal were confirmed infested; scheduled dewatering in 2026 is expected to reduce the current infestation, although the canal remains at risk of reinfestation through future water deliveries.

New Zealand mudsnails (*Potamopyrgus antipodarum*) have not been detected in the Kings River but pose a potential threat due to their widespread presence in California waterways. Their small size makes them difficult to detect and increases the likelihood of accidental transfer between watersheds by anglers and other recreational users.

All invasive mollusks can disrupt existing food webs, and severe mussel infestations may damage or impair infrastructure within a waterbody or systems dependent on its water supply (CDFW 2021; USDA 2021a, 2021b; USGS 2021). All Kings River users should take precautions to prevent the spread of these species by inspecting gear used in other watersheds and by properly drying or decontaminating equipment before use in the Kings River or Pine Flat Reservoir.

Fluctuations in fish abundance and species composition are a normal characteristic of river systems. Although native species currently dominate the assemblage below Pine Flat Dam, periods of warmer release temperatures and reduced or prolonged instream flows may favor introduced non-native fishes. Changes in species composition cannot be attributed to a single factor and likely reflect a combination of environmental conditions and human influences. The KRCD and KRFMP will continue to monitor fish populations and evaluate environmental and biological variables within the tailwater fishery.

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APPENDIX A

Fish Species Detected in the Kings River Between Pine Flat Dam and
Highway 180

Table A1. Comprehensive list of fish species detected during monitoring activities of the Kings River below Pine Flat Dam since 1983. Fish collected in the 2025 Fish Population Survey are highlighted below.

Species (Scientific Name)	Native	Introduced ^a
Bluegill (<i>Lepomis macrochirus</i>)	-	Y
Black Bullhead (<i>Ameiurus melas</i>)	-	Y
Brook Trout (<i>Salvelinus fontinalis</i>)	-	Y
Brown Bullhead (<i>Ameiurus nebulosus</i>)	-	Y
Brown Trout (<i>Salmo trutta</i>)	-	Y
Central California Roach ^b (<i>Hesperoleucus symmetricus symmetricus</i>)	Y	-
Common Carp (<i>Cyprinus carpio</i>)	-	Y
Golden Shiner (<i>Notemigonus crysoleucas</i>)	-	Y
Goldfish (<i>Carassius auratus</i>)	-	Y
Green Sunfish (<i>Lepomis cyanellus</i>)	-	Y
Hardhead ^b (<i>Mylopharodon conocephalus</i>)	Y	-
Kern Brook Lamprey ^b (<i>Lampetra hubbsi</i>)	Y	-
Largemouth Bass (<i>Micropterus salmoides</i>)	-	Y
Prickly Sculpin (<i>Cottus asper</i>)	Y	-
Rainbow Trout ^c (<i>Oncorhynchus mykiss</i>)	Y	Y
Riffle Sculpin ^b (<i>Cottus gulosus</i>)	Y	-
Sacramento Hitch ^b (<i>Lavinia exilicauda exilicauda</i>)	Y	-
Sacramento Pikeminnow (<i>Ptychocheilus grandis</i>)	Y	-
Sacramento Sucker (<i>Catostomus occidentalis</i>)	Y	-
Smallmouth Bass (<i>Micropterus dolomieu</i>)	-	Y
Spotted Bass (<i>Micropterus punctulatus</i>)	-	Y
Three-spine Stickleback (<i>Gasterosteus aculeatus</i>)	Y	-
Western Mosquitofish (<i>Gambusia affinis</i>)	-	Y
White Catfish (<i>Ameiurus catus</i>)	-	Y

^a Introduced (species non-native to the watershed or hatchery reared trout)

^b CDFW species of special concern

^c Phenotypic distinction between native and hatchery origin rainbow trout is not possible; abraded fins, typical from rearing in crowded raceways used to distinguish hatchery rainbow trout from "wild" rainbow trout in this study

Table A2. Species Composition, showing percent abundance by species, for fish collected during the fall Fish Population Surveys, 2007-2025.

Species Composition by Percent (%)																		
Species	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2021	2022	2023	2024	2025
Bass sp. ^a	0.0	0.0	0.1	0.0	0.0	0.0 ^f	0.1	0.7	1.4	0.3	0.2	0.0 ^f	0.0	0.3	0.6	0.2	0.0	0.0 ^f
Bluegill ^a	0.0	0.0	0.0 ^f	0.0	0.0	0.0	0.0	0.0	0.0	0.0 ^f	0.0	0.0	0.0	0.0	0.0 ^f	0.3	0.0	0.0
Brook Trout ^a	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Brown Trout ^a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0 ^f	0.0	0.0
California Roach	4.5	23.2	19.2	21.0	16.3	9.9	19.0	25.7	35.3	25.9	19.8	8.6	7.3	16.8	17.0	17.2	8.5	12.5
Catfish sp. ^a	0.0	0.1	0.1	0.0	0.0	0.0 ^f	0.0 ^f	0.5	0.0 ^f	0.0	0.0	0.0 ^f	0.3	0.0 ^f	0.0 ^f	0.0 ^f	0.1	0.0
Green Sunfish ^a	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0 ^f	0.4	0.0	0.0	0.0	0.0	0.8	0.0	0.0
Hardhead ^b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0 ^f	0.0	0.0	1.0	0.1	0.0	0.0
Lamprey sp. ^c	6.5	5.0	5.3	3.7	8.5	4.8	2.5	8.9	4.4	5.0	9.4	4.8	10.5	6.0	4.9	10.5	15.0	8.1
Rainbow Trout - Hatchery ^a	0.9	0.0 ^f	0.1	0.2	0.5	0.1	0.1	0.0 ^f	0.0 ^f	0.2	0.4	0.3	1.9	1.0	0.2	1.1	0.2	0.5
Rainbow Trout - "Wild" ^d	0.4	1.0	0.7	0.4	0.5	0.7	0.2	0.0	0.0 ^f	0.1	0.2	0.3	0.8	0.2	0.0 ^f	0.7	0.6	0.1
Saramento Hitch ^b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0 ^f	0.0
Sacramento Pikeminnow	17.7	19.4	14.2	7.2	4.7	10.0	31.0	23.1	18.7	6.6	2.9	4.3	3.5	29.9	22.9	6.1	4.9	20.9
Sacramento Sucker	37.6	26.0	18.5	17.9	19.7	39.6	19.2	13.0	31.0	47.5	36.0	40.4	33.1	29.0	36.6	47.6	37.3	35.2
Sculpin sp. ^e	30.9	21.2	37.8	44.4	46.2	32.5	24.4	17.6	4.9	5.1	22.6	39.5	40.3	10.6	7.6	8.5	30.1	19.5
Three-spine Stickleback	1.4	4.0	3.9	4.8	3.5	2.1	3.5	10.0	2.8	8.7	8.2	1.8	2.3	6.0	8.6	6.7	3.2	3.1
Western Mosquitofish ^a	0.0	0.1	0.0	0.0	0.0	0.2	0.0 ^f	0.5	1.3	0.5	0.0	0.3	0.0	0.1	0.4	0.0	0.0	0.0
% Introduced	0.9	0.2	0.3	0.5	0.6	0.3	0.2	1.7	2.7	1.0	1.0	0.6	2.2	1.5	1.3	2.4	0.3	0.5
% Native	99.0	99.8	99.6	99.4	99.4	99.6	99.8	98.3	97.1	98.9	99.1	99.7	97.8	98.5	98.6	97.4	99.6	99.4

^a introduced (anthropogenic introductions non-native to the watershed and hatchery trout)

^b CDFW species of special concern

^c Kern Brook lamprey only species confirmed present, others possible; Kern brook is CDFW species of special concern

^d "wild" trout can not be phenotypically distinguished from incubator-hatched trout, thus may include trout of incubator origin

^e two species present, ruffle sculpin and prickly sculpin; ruffle sculpin is CDFW species of special concern

^f captured but represents less than 0.1% of total fish captured

APPENDIX B

Electro-fishing Sites, Survey Methods, and Reported Sampling Flows:
1983-2025

Table B1. Electro-fishing survey sites in the Kings River, length of survey reach, year, and sample methodology utilized.

Reach Name	Location	Length (ft)	Mark-Recapture ¹	Method & Year(s) Sampled	
				Single Pass Census ²	Multi-Pass Depletion ³
Alta Weir (aka Site A)	Upstream of Alta Weir in side channel along south bank, separated from main channel by island	1,368	1983-1989	1990-2002, 2004-2006	-
Wonder Valley (aka Site B)	Halfway between Piedra Bridge & Mill Cr Confluence in a side channel along south bank	682	1983-1989	1990-2002, 2004-2006	-
Site C	Between Pine Flat (ACOE) Bridge and dam	869	1983	-	-
Avocado Lake Boulder	Behind Avocado Lake on south side of main fork	656	-	1989-2002, 2004-2006	-
County Park Land Boulder	Greenbelt Parkway	1,122	-	1989-2002, 2004-2006	-
Winton Park Boulder	Downstream of Winton Park	1,578	1989	1989-2000, 2002, 2004-2006	-
Avocado Lake Side Channel	Downstream of Avocado Lake and upstream of Dennis Cut diversion	820	-	1995-2002, 2004-2006	-
Wildwood Site	Off Trout Lake Drive in Wildwood Subdivision	820	-	1995-2002, 2004-2006	-
Alta	Subset of historic Alta Weir site (aka Site A)	300	-	-	2007-2016, 2018, 2021-2022
Avo Boulder	Subset of Avocado Lake Boulder site	300	-	-	2007-2016, 2018-2019, 2021-2022, 2024-2025
Avo Side	Subset of Avocado Lake Side Channel site	300	-	-	2007-2019, 2021-2025
Avocado Test	Located behind northwest corner of Avocado Lake, upstream of Avocado Boulder site	300	-	-	2007 & 2010
Doyal's Test	Located behind Piedra Library, upstream of Piedra Bridge	300	-	-	2007 & 2010
Greenbelt	Subset of historic County Park Land Boulder site	300	-	-	2007-2019, 2021-2025
Large Woody Debris (LWD) Control	Located near Winton Park but upstream of Winton Park Boulder site	330	-	-	2007
Wildwood	Subset of historic Wildwood site	300	-	-	2007-2016, 2018-2019, 2021-2025
Winton	Subset of historic Winton Park Boulder site, west of Thorburn Spawning Channel	300	-	-	2007-2016, 2018-2019, 2021-2022, 2024-2025

¹ sampling methodology used to determine population estimates, requires at a minimum 1 marking pass & 1 recapture pass

² sampling methodology used to obtain indices of abundance for a population

³ sampling methodology used to determine population estimates through the removal of all biomass present within the sample reach

Table B2. Electro-fishing surveys in the Kings River, number of sites sampled, sampling method, electro-fishing crews, passes, seine placement, determination of trout origin, species recorded, and species measured. A dash indicates no data, and NA denotes information was not available.

Year ^{1,2}	Number of Sites	Total Distance Sampled (ft)	Sampling Method Utilized	Number of Electro-fishing Crews	Number of Passes	Block Seine Net Placement	"Wild" Trout Determinator	Species Recorded	Species Measured
1983	3	2,919	single census mark-recapture	3	2-3	Upstream & Downstream	fin condition	all trout	wild rainbow trout ≥ 10 cm FL
1984	2	2,050	single census mark-recapture	2	2	Upstream & Downstream	fin condition	all trout	wild rainbow trout ≥ 10 cm FL
1985	2	2,050	single census mark-recapture	2	1-2	Upstream & Downstream	color & fin condition	all trout	wild rainbow trout ≥ 10 cm FL
1986	2	2,050	single census mark-recapture	2-3	2	Upstream & Downstream	color & fin condition	all trout	wild rainbow trout ≥ 10 cm FL
1987	2	2,050	single census mark-recapture	3	1-2	Upstream & Downstream	color & fin condition	all trout	wild rainbow trout ≥ 10 cm FL
1988	2	2,050	single census mark-recapture	2-3	2-3	Upstream & Downstream	color & fin condition	all trout	wild rainbow trout ≥ 10 cm FL
1989	3	3,628	single census mark-recapture	3-4	2	Upstream & Downstream	color & fin condition	all trout, others noted	wild rainbow trout ≥ 10 cm FL
1989	3	3,356	single pass census	3-4	1	Upstream & Downstream	color & fin condition	all trout, others noted	wild rainbow trout ≥ 10 cm FL
1990	5	5,406	single pass census	2-3	1	Upstream & Downstream	color & fin condition	all species	wild rainbow trout ≥ 10 cm FL
1991	5	5,406	single pass census	3-4	1	Upstream & Downstream	color & fin condition	all species	wild rainbow trout ≥ 10 cm FL
1992	5	5,406	single pass census	2-4	1	Upstream & Downstream	color & fin condition	all species	wild rainbow trout ≥ 10 cm FL
1993	5	5,406	single pass census	3-4	1	Upstream & Downstream	color & fin condition, absence of tags/dyes	all species	all rainbow trout
1994	5	5,406	single pass census	4-5	1	Upstream & Downstream	color & fin condition, absence of tags/dyes	all species	all rainbow trout
1995	7	7,046	single pass census	3-5	1	Upstream Only	color & fin condition, absence of tags/dyes	all species	all rainbow trout
1996	7	7,046	single pass census	4-6	1	Upstream Only	color & fin condition, absence of tags/dyes	all species	all rainbow trout
1997	7	7,046	single pass census	3-5	1	Upstream Only	color & fin condition, absence of tags/dyes	all species	all rainbow trout
1998	7	7,046	single pass census	3-5	1	Upstream Only	color & fin condition, absence of tags/dyes, size	all species	all rainbow trout
1999	7	7,046	single pass census	3-5	1	Upstream Only	color & fin condition	all species	all rainbow trout
2000	7	7,046	single pass census	4-6	1	Upstream Only	color & fin condition	all species	all rainbow trout
2001	6	5,468	single pass census	5-6	1	Upstream Only	color & fin condition	all species	all rainbow trout
2002	7	7,046	single pass census	3-7	1	Upstream Only	color & fin condition	all species	all rainbow trout
2003	0	0	not sampled	-	-	-	-	-	-
2004	7	7,046	single pass census	3-6	1	Upstream Only	color & fin condition	all species	all rainbow trout
2005	7	7,046	single pass census	NA	1	Upstream Only	color & fin condition	all species	all rainbow trout
2006	7	7,046	single pass census	NA	1	Upstream Only	color & fin condition	all species	all rainbow trout
2007	9	2,730	mutli-pass depletion survey	5-7	3	Upstream & Downstream	fin condition	all species	all species
2008	6	1,800	mutli-pass depletion survey	6-7	3	Upstream & Downstream	fin condition	all species	all species
2009	6	1,800	mutli-pass depletion survey	6-8	3	Upstream & Downstream	fin condition	all species	all species
2010	8	2,400	mutli-pass depletion survey	5-7	3	Upstream & Downstream	fin condition	all species	all species
2011	6	1,800	mutli-pass depletion survey	4-6	3	Upstream & Downstream	fin condition	all species	all species
2012	6	1,800	mutli-pass depletion survey	5-8	3	Upstream & Downstream	fin condition	all species	all species
2013	6	1,800	mutli-pass depletion survey	5-6	3	Upstream & Downstream	fin condition	all species	all species

¹ from 2007-2011 shocker settings were standardized at 350 volts, 10% duty cycle, and 50 Hz frequency

² from 2012 onward shocker settings were set such that voltage utilized matched water conductivity, and were standardized with a 20% duty cycle, and 30 Hz frequency

Table B2. Continued from previous page.

Year ^{1,2}	Number of Sites	Total Distance Sampled (ft)	Sampling Method Utilized	Number of Electro-fishing Crews	Number of Passes	Block Seine Net Placement	"Wild" Trout Determinator	Species Recorded	Species Measured
2014	6	1,800	mutli-pass depletion survey	7-9	3	Upstream & Downstream	fin condition	all species	all species
2015	6	1,800	mutli-pass depletion survey	5-7	3	Upstream & Downstream	fin condition	all species	all species
2016	6	1,800	mutli-pass depletion survey	5-7	3	Upstream & Downstream	fin condition, diploid blood cells	all species	all species
2017	2	600	mutli-pass depletion survey	8	3	Upstream & Downstream	fin condition, diploid blood cells	all species	all species
2018	6	1,800	mutli-pass depletion survey	6-7	3	Upstream & Downstream	color & fin condition	all species	all species
2019	5	1,500	mutli-pass depletion survey	6-7	3	Upstream & Downstream	color & fin condition	all species	all species
2021	6	1,800	mutli-pass depletion survey	5-6	3	Upstream & Downstream	fin condition	all species	all species
2022	6	1,800	mutli-pass depletion survey	6-8	3	Upstream & Downstream	fin condition	all species	all species
2023	3	900	mutli-pass depletion survey	7-9	3	Upstream & Downstream	fin condition	all species	all species
2024	5	1,500	mutli-pass depletion survey	8-9	3	Upstream & Downstream	fin condition	all species	all species
2025	5	1,500	mutli-pass depletion survey	7-9	3	Upstream & Downstream	fin condition	all species	all species

¹ from 2007-2011 shocker settings were standardized at 350 volts, 10% duty cycle, and 50 Hz frequency

² from 2012 onward shocker settings were set such that voltage utilized matched water conductivity, and were standardized with a 20% duty cycle, and 30 Hz frequency

Table B3. Fall Fish Population Survey dates and reported river flows in the Kings River at the Army Corps of Engineer Bridge. NA denotes the survey occurred but the timeframe within the year is not available.

Year	Survey Period	Flow (cfs) ¹	Notes
1983	Nov. 13 - Nov. 21	15 -47	flows reached 138 cfs during survey
1984	Nov. 20 - Nov. 21	41-45	
1985	Oct. 15 - Oct. 16	51-52	
1986	Nov. 5 - Nov. 14	72-73	
1987	Sep. 30 - Nov. 16	49-134	
1988	Nov. 1 - Nov. 2	54-59	
1989	Oct. 17 - Dec. 19	51-54	releases were at 761 cfs above survey reach
1990	Nov. 19 - Nov. 21	74-100	
1991	Nov. 18 - Nov. 22	49-59	
1992	Nov. 5 - Nov. 11	54-103	
1993	Nov. 22 - Dec. 1	39-92	
1994	Nov. 21 - Nov. 29	53-89	
1995	Nov. 27 - Dec. 1	98-100	
1996	Nov. 26 - Dec. 3	58-70	
1997	Nov. 13 - Nov. 18	100-196	
1998	Nov. 3 - Nov. 11	96-762	flows at 40 cfs at Greenbelt & Wildwood
1999	Nov. 9 - Nov. 15	132-156	
2000	Nov. 30 - Dec. 5	112-115	
2001	Nov. 27 - Nov. 30	101-102	
2002	Dec. 4 - Dec. 9	102	
2004	Feb. 13 - Feb. 19	101-126	
2005	NA	-	
2006	NA	-	
2007	Nov. 5 - Nov. 16	107	
2008	Nov. 12 - Nov. 19	100-105	
2009	Nov. 9 - Nov. 17	100-268	flows ramped daily during e-fishing in order to achieve safe wading conditions
2010	Nov. 8 - Nov. 19	101-136	decreased flows by 35 cfs for shocking above Fresno Weir, all sampling at ~100 cfs
2011	Nov. 28 - Dec. 1	105	flows ramped daily during e-fishing in order to achieve safe wading conditions
2012	Nov. 11 - Nov. 20	100-115	
2013	Nov. 12 - Nov. 19	100	
2014	Nov. 12 - Nov. 19	100-150	
2015	Nov. 3 - Nov. 10	108	
2016	Nov. 9 - Nov. 18	105-116	
2017	Nov. 28 - Nov. 29	281-285	
2018	Nov. 1 - Nov. 8	124-149	
2019	Dec. 2 - Dec. 10	100-184	flows ramped daily during e-fishing in order to achieve safe wading conditions
2021	Nov. 29 - Dec. 7	100	
2022	Nov. 29 - Dec. 8	100-101	
2023	Nov. 28 - Dec. 6	152-358	flows ramped Nov 29, Dec 5 & Dec 6 in effort to achieve safe wading conditions
2024	Nov. 19 - Dec. 5	139-141	
2025	Nov. 18 - Dec. 4	101-105	

¹ reported flows at ACOE Bridge (0.5 miles below Pine Flat Dam) as reported in the power plant morning report

APPENDIX C

Fall Fish Population Survey, Species Composition: 2007-2025

Table C1: Species Composition 2007

Species Composition, November 2007*								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total	% of Total
California Roach	3	3	20	22	143	53	244	4.5%
Lamprey sp.	1	202	5	136	3	4	351	6.5%
Rainbow Trout -	9	32	2	5	0	0	48	0.9%
Rainbow Trout - "Wild"	7	4	8	0	3	0	22	0.4%
Sacramento Pikeminnow	93	20	75	156	226	378	948	17.7%
Sacramento Sucker	326	454	390	248	288	315	2,021	37.6%
Sculpin sp.	375	450	175	211	209	242	1,662	30.9%
Three-spine Stickleback	8	31	7	16	0	13	75	1.4%
Total Fish Captured	822	1,196	682	794	872	1,005	5,371	
% of Total	15%	22%	13%	15%	16%	19%		100%

* nine sites sampled, but data shown represents only that from the six core sites sampled annually

Table C2: Species Composition 2008

Species Composition, November 2008								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total	% of Total
California Roach	0	6	84	16	226	277	609	23.2%
Catfish sp.	0	0	1	0	1	0	2	0.1%
Lamprey sp.	2	47	5	75	2	0	131	5.0%
Rainbow Trout -	0	0	1	0	0	0	1	0.0%
Rainbow Trout - "Wild"	7	4	7	8	1	0	27	1.0%
Sacramento Pikeminnow	56	15	143	47	154	94	509	19.4%
Sacramento Sucker	82	157	227	99	103	16	684	26.0%
Sculpin sp.	151	133	133	71	29	39	556	21.2%
Three-spine Stickleback	0	36	20	19	0	31	106	4.0%
Western Mosquitofish	0	2	0	0	0	0	2	0.1%
Total Fish Captured	298	400	621	335	516	457	2,627	
% of Total	11%	15%	24%	13%	20%	17%		100%

Table C3: Species Composition 2009

Species Composition, November 2009								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total	% of Total
Bass sp.	0	0	0	1	3	0	4	0.1%
Bluegill	0	0	0	0	1	0	1	0.0%
California Roach	0	93	30	6	52	347	528	19.2%
Catfish sp.	0	0	0	0	2	0	2	0.1%
Lamprey sp.	4	57	5	79	1	1	147	5.3%
Rainbow Trout -	3	1	0	0	0	0	4	0.1%
Rainbow Trout - "Wild"	5	1	11	2	0	0	19	0.7%
Sacramento Pikeminnow	14	48	60	29	88	152	391	14.2%
Sacramento Sucker	29	122	232	54	53	19	509	18.5%
Sculpin sp.	276	275	244	109	85	51	1,040	37.8%
Three-spine Stickleback	1	39	21	17	5	23	106	3.9%
Total Fish Captured	332	636	603	297	290	593	2,751	
% of Total	12%	23%	22%	11%	11%	22%		100%

Table C4: Species Composition 2010

Species Composition, November 2010*								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total	% of Total
Brook Trout	1	7	0	1	0	0	9	0.3%
California Roach	6	19	51	5	69	401	551	21.0%
Lamprey sp.	0	57	7	28	1	5	98	3.7%
Rainbow Trout -	1	1	2	0	0	0	4	0.2%
Rainbow Trout - "Wild"	8	0	0	3	0	0	11	0.4%
Sacramento Pikeminnow	11	13	30	7	46	83	190	7.2%
Sacramento Sucker	41	189	122	42	14	62	470	17.9%
Sculpin sp.	439	272	195	96	78	87	1,167	44.4%
Three-spine Stickleback	17	59	4	0	0	46	126	4.8%
Total Fish Captured	524	617	411	182	208	684	2,626	
% of Total	20%	23%	16%	7%	8%	26%		100%

* eight sites sampled, but data shown represents only that from the six core sites sampled annually

Table C5: Species Composition 2011

Species Composition, November-December 2011								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total	% of Total
California Roach	6	7	23	25	26	212	299	16.3%
Green Sunfish	1	0	0	0	0	0	1	0.1%
Lamprey sp.	0	48	17	90	0	0	155	8.5%
Rainbow Trout - Hatchery	0	0	6	3	0	0	9	0.5%
Rainbow Trout - "Wild"	0	3	5	2	0	0	10	0.5%
Sacramento Pikeminnow	33	22	9	2	12	8	86	4.7%
Sacramento Sucker	62	98	68	44	13	77	362	19.7%
Sculpin sp.	253	213	85	144	60	93	848	46.2%
Three-spine Stickleback	9	38	9	4	1	3	64	3.5%
Total Fish Captured	364	429	222	314	112	393	1,834	
% of Total	20%	23%	12%	17%	6%	21%		100%

Table C6: Species Composition 2012

Species Composition, November 2012								
	Winton	Alta	Avo Boulder	AvoSide	Greenbelt	Wildwood	Total	% of Total
Bass sp.	0	0	0	0	0	1	1	0.0%
California Roach	0	37	77	30	121	156	421	9.9%
Catfish sp.	0	0	0	0	1	1	2	0.0%
Lamprey Sp.	0	103	23	76	4	0	206	4.8%
Rainbow Trout - Hatchery	1	0	3	0	0	0	4	0.1%
Rainbow Trout - "Wild"	6	3	12	6	1	0	28	0.7%
Sacramento Pikeminnow	1	17	44	169	64	133	428	10.0%
Sacramento Sucker	107	396	336	244	98	510	1,691	39.6%
Sculpin Sp.	336	391	275	182	104	99	1,387	32.5%
Three-spine Stickleback	0	36	6	24	4	20	90	2.1%
Western Mosquitofish	0	0	0	9	0	0	9	0.2%
Total Fish Captured	451	983	776	740	397	920	4,267	
% of Total	11%	23%	18%	17%	9%	22%		100%

Table C7: Species Composition 2013

Species Composition, November 2013								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total	% of Total
Bass sp.	0	0	0	0	5	0	5	0.1%
California Roach	0	52	179	248	220	444	1,143	19.0%
Catfish sp.	0	0	0	0	3	0	3	0.0%
Lamprey sp.	3	35	7	102	3	0	150	2.5%
Rainbow Trout - Hatchery	2	1	1	1	0	0	5	0.1%
Rainbow Trout - "Wild"	3	0	4	4	0	0	11	0.2%
Sacramento Pikeminnow	170	98	333	130	375	759	1,865	31.0%
Sacramento Sucker	355	257	256	73	51	162	1,154	19.2%
Sculpin sp.	493	188	291	188	176	130	1,466	24.4%
Three-spine Stickleback	15	64	6	10	15	101	211	3.5%
Western Mosquitofish	0	1	0	0	0	0	1	0.0%
Total Fish Captured	1,041	696	1,077	756	848	1,596	6,014	
% of Total	17%	12%	18%	13%	14%	27%		100%

Table C8: Species Composition 2014

Species Composition, November 2014								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total	% of Total
Bass sp.	0	1	1	0	26	1	29	0.7%
California Roach	23	101	184	100	178	463	1,049	25.7%
Catfish sp.	2	0	2	2	15	0	21	0.5%
Lamprey sp.	2	109	40	207	3	1	362	8.9%
Rainbow Trout - Hatchery	0	0	1	0	0	0	1	0.0%
Sacramento Pikeminnow	173	48	261	57	117	284	940	23.1%
Sacramento Sucker	114	89	148	67	34	80	532	13.0%
Sculpin sp.	360	54	129	81	34	59	717	17.6%
Three-spine Stickleback	31	219	31	58	4	63	406	10.0%
Western Mosquitofish	0	1	0	2	3	14	20	0.5%
Total Fish Captured	705	622	797	574	414	965	4,077	
% of Total	17%	15%	20%	14%	10%	24%		100%

Table C9: Species Composition 2015

Species Composition, November 2015								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total	% of Total
Bass sp.	0	1	0	1	55	4	61	1.4%
California Roach	33	183	292	211	73	720	1,512	35.3%
Catfish sp.	0	0	0	0	2	0	2	0.0%
Lamprey sp.	2	107	25	54	0	1	189	4.4%
Rainbow Trout - Hatchery	0	0	1	0	0	0	1	0.0%
Rainbow Trout - "Wild"	1	0	1	0	0	0	2	0.0%
Sacramento Pikeminnow	126	50	200	158	108	158	800	18.7%
Sacramento Sucker	422	371	289	200	24	23	1,329	31.0%
Sculpin sp.	160	7	27	4	7	6	211	4.9%
Three-spine Stickleback	48	31	14	20	0	9	122	2.8%
Western Mosquitofish	2	23	0	0	13	19	57	1.3%
Total Fish Captured	794	773	849	648	282	940	4,286	
% of Total	19%	18%	20%	15%	7%	22%		100%

Table C10: Species Composition 2016

Species Composition, November 2016								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total	% of Total
Bass sp.	0	0	0	0	15	1	16	0.3%
Bluegill	0	0	0	0	1	0	1	0.0%
California Roach	11	327	359	167	89	580	1,533	25.9%
Green Sunfish	0	0	0	0	2	0	2	0.0%
Lamprey sp.	3	130	26	138	2	0	299	5.0%
Rainbow Trout - Hatchery	2	0	7	2	0	0	11	0.2%
Rainbow Trout - "Wild"	0	0	2	4	0	1	7	0.1%
Sacramento Pikeminnow	52	72	175	10	40	44	393	6.6%
Sacramento Sucker	539	391	634	207	488	556	2,815	47.5%
Sculpin sp.	210	27	24	4	37	1	303	5.1%
Three-spine Stickleback	92	78	95	129	6	118	518	8.7%
Western Mosquitofish	0	15	0	0	1	16	32	0.5%
Total Fish Captured	909	1,040	1,322	661	681	1,317	5,930	
% of Total	15%	18%	22%	11%	11%	22%		100%

Table C11: Species Composition 2017

Species Composition, November 2017*								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total	% of Total
Bass sp.	-	-	-	0	3	-	3	0.2%
California Roach	-	-	-	99	170	-	269	19.8%
Green Sunfish	-	-	-	0	5	-	5	0.4%
Lamprey sp.	-	-	-	119	8	-	127	9.4%
Rainbow Trout - Hatchery	-	-	-	4	1	-	5	0.4%
Rainbow Trout - "Wild"	-	-	-	3	0	-	3	0.2%
Sacramento Pikeminnow	-	-	-	14	25	-	39	2.9%
Sacramento Sucker	-	-	-	322	166	-	488	36.0%
Sculpin sp.	-	-	-	150	156	-	306	22.6%
Three-spine Stickleback	-	-	-	29	82	-	111	8.2%
Total Fish Captured	-	-	-	740	616	-	1,356	
% of Total	-	-	-	55%	45%	-		100%

* only two sites sampled due to unsafe flows for surveying at other sites

Table C12: Species Composition 2018

Species Composition, November 2018								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total	% of Total
Bass sp.	0	0	0	1	1	0	2	0.0%
California Roach	0	5	44	10	64	324	447	8.6%
Catfish sp.	0	0	0	0	1	0	1	0.0%
Hardhead	0	0	0	0	1	0	1	0.0%
Lamprey sp.	2	71	10	153	6	6	248	4.8%
Rainbow Trout - Hatchery	4	4	4	3	0	0	15	0.3%
Rainbow Trout - "Wild"	1	2	7	8	0	0	18	0.3%
Sacramento Pikeminnow	6	11	12	5	142	47	223	4.3%
Sacramento Sucker	422	390	387	375	174	360	2,108	40.4%
Sculpin sp.	713	651	142	172	239	143	2,060	39.5%
Three-spine Stickleback	13	10	16	32	15	10	96	1.8%
Total Fish Captured	1,161	1,144	622	759	643	890	5,219	
% of Total	22%	22%	12%	15%	12%	17%		100%

Table C13: Species Composition 2019

Species Composition, December 2019*								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total	% of Total
California Roach	0	-	11	25	8	84	128	7.3%
Catfish sp.	3	-	0	2	1	0	6	0.3%
Lamprey sp.	4	-	5	166	2	8	185	10.5%
Rainbow Trout - Hatchery	0	-	26	8	0	0	34	1.9%
Rainbow Trout - "Wild"	1	-	3	10	0	0	14	0.8%
Sacramento Pikeminnow	23	-	6	4	21	8	62	3.5%
Sacramento Sucker	44	-	174	155	53	158	584	33.1%
Sculpin sp.	339	-	67	168	69	68	711	40.3%
Three-spine Stickleback	8	-	13	9	5	5	40	2.3%
Total Fish Captured	422	-	305	547	159	331	1,764	
% of Total	24%	-	17%	31%	9%	19%		100%

* only five sites sampled due to adverse weather at Alta creating unsafe survey conditions

Table C14: Species Composition 2021

Species Composition, November-December 2021								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood ¹	Total	% of Total
Bass sp.	0	0	0	0	14	5	19	0.3%
Brook Trout	3	0	0	0	0	0	3	0.1%
California Roach	3	34	40	59	88	738	962	16.8%
Catfish sp.	0	0	0	0	2	0	2	0.0%
Lamprey sp.	4	167	32	124	7	11	345	6.0%
Rainbow Trout - Hatchery	2	10	12	26	4	1	55	1.0%
Rainbow Trout - "Wild"	3	1	8	1	0	0	13	0.2%
Sacramento Pikeminnow	293	221	139	76	238	749	1,716	29.9%
Sacramento Sucker	538	459	298	138	37	194	1,664	29.0%
Sculpin sp.	287	77	22	39	77	109	611	10.6%
Three-spine Stickleback	9	70	9	5	39	212	344	6.0%
Western Mosquitofish	0	0	0	0	0	4	4	0.1%
Total Fish Captured	1,142	1,039	560	468	506	2,023	5,738	
% of Total	20%	18%	10%	8%	9%	35%		100%

¹ net went partially down during the 2nd pass, reach integrity may have been compromised if fish entered/exited reach

Table C15: Species Composition 2022

Species Composition, November-December 2022								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt ¹	Wildwood ¹	Total	% of Total
Bass sp.	3	0	0	0	24	5	32	0.6%
Bluegill	0	0	0	0	1	0	1	0.0%
Brown Trout	2	0	4	1	0	0	7	0.1%
California Roach	2	88	174	217	43	423	947	17.0%
Catfish sp.	0	0	0	0	1	0	1	0.0%
Hardhead	0	0	0	0	2	55	57	1.0%
Lamprey sp.	4	123	39	94	13	2	275	4.9%
Rainbow Trout - Hatchery	0	0	4	7	0	0	11	0.2%
Rainbow Trout - "Wild"	1	0	0	1	0	0	2	0.0%
Sacramento Pikeminnow	137	115	205	119	322	381	1,279	22.9%
Sacramento Sucker	518	184	279	172	455	438	2,046	36.6%
Sculpin sp.	279	31	26	9	35	47	427	7.6%
Three-spine Stickleback	158	71	35	67	59	88	478	8.6%
Western Mosquitofish	1	3	0	0	7	11	22	0.4%
Total Fish Captured	1,105	615	766	687	962	1,450	5,585	
% of Total	20%	11%	14%	12%	17%	26%		100%

¹ net went partially down during the 1st pass, reach integrity may have been compromised if fish entered/exited reach

Table C16: Species Composition 2023

Species Composition, November-December 2023*								
	Winton	Alta	Avo Boulder	Avo Side ¹	Greenbelt	Wildwood	Total	% of Total
Bass sp.	-	-	-	0	0	4	4	0.18%
Bluegill	-	-	-	0	1	6	7	0.32%
Brown Trout	-	-	-	1	0	0	1	0.05%
California Roach	-	-	-	111	17	250	378	17.24%
Catfish sp.	-	-	-	1	0	0	1	0.05%
Green Sunfish	-	-	-	0	2	16	18	0.82%
Hardhead	-	-	-	0	2	0	2	0.09%
Lamprey sp.	-	-	-	187	12	32	231	10.54%
Rainbow Trout - Hatchery	-	-	-	25	0	0	25	1.14%
Rainbow Trout - "Wild"	-	-	-	7	4	5	16	0.73%
Sacramento Pikeminnow	-	-	-	63	48	22	133	6.07%
Sacramento Sucker	-	-	-	557	192	294	1,043	47.58%
Sculpin sp.	-	-	-	25	50	112	187	8.53%
Three-spine Stickleback	-	-	-	28	52	66	146	6.66%
Western Mosquitofish	-	-	-	0	0	0	0	0.00%
Total Fish Captured	0	0	0	1,005	380	807	2,192	
% of Total	0%	0%	0%	46%	17%	37%		100%

* only three sites sampled due to unsafe survey conditions

¹ bottom net went partially down toward the end of the 2nd pass, and top net partially down prior to beginning 3rd pass, reach integrity may have been compromised if fish entered/exited reach

Table C17: Species Composition 2024

Species Composition, November-December 2024*								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood ¹	Total	% of Total
California Roach	38	-	54	102	17	124	335	8.50%
Catfish sp.	1	-	0	1	0	0	2	0.05%
Lamprey sp.	4	-	31	405	4	148	592	15.03%
Rainbow Trout - Hatchery	1	-	6	2	0	0	9	0.23%
Rainbow Trout - "Wild"	12	-	4	4	0	3	23	0.58%
Sacramento Hitch	0	-	0	1	0	0	1	0.03%
Sacramento Pikeminnow	75	-	50	27	18	23	193	4.90%
Sacramento Sucker	324	-	298	439	107	303	1,471	37.34%
Sculpin sp.	585	-	29	64	91	416	1,185	30.08%
Three-spine Stickleback	68	-	5	22	7	26	128	3.25%
Total Fish Captured	1,108	0	477	1,067	244	1,043	3,939	
% of Total	28%	0%	12%	27%	6%	26%		100%

* only five sites sampled due to unsafe survey conditions

¹ bottom net approximately 30% down for about 5 minutes between 1st and 2nd pass

Table C18: Species Composition 2025

Species Composition, November-December 2025*								
	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total	% of Total
Bass sp.	1	-	0	0	0	0	1	0.02%
California Roach	44	-	80	57	194	141	516	12.54%
Lamprey sp.	2	-	39	208	13	73	335	8.14%
Rainbow Trout - Hatchery	20	-	0	0	0	0	20	0.49%
Rainbow Trout - "Wild"	1	-	1	2	0	0	4	0.10%
Sacramento Pikeminnow	145	-	69	224	118	305	861	20.92%
Sacramento Sucker	381	-	346	299	253	168	1,447	35.16%
Sculpin sp.	344	-	56	48	228	127	803	19.51%
Three-spine Stickleback	61	-	10	24	24	9	128	3.11%
Total Fish Captured	999	0	601	862	830	823	4,115	
% of Total	24%	0%	15%	21%	20%	20%		100%

* only five sites sampled due to unsafe survey conditions

APPENDIX D

Catostomidae – Sucker Family

Multi-pass Depletion Summary Data: Fall, 2007-2025

For the following tables, a dashed line indicates the site was not surveyed.

Table D1: Catch-per-unit Effort – Sacramento Sucker

Catch-per-Unit Effort (CPUE), Sacramento Sucker							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	42.8	50.5	52.4	34.7	32.7	44.7	43.0
2008	12.0	26.8	34.4	17.5	13.5	2.4	17.4
2009	3.8	18.0	25.6	9.1	5.9	3.1	11.4
2010	4.8	29.7	17.7	10.1	2.7	8.4	12.2
2011	7.5	20.9	8.0	9.8	2.0	10.4	9.1
2012	13.7	34.2	39.6	32.6	12.3	65.4	33.1
2013	51.0	40.5	37.3	11.4	6.6	19.9	27.2
2014	10.7	11.3	19.7	7.6	4.8	10.4	10.7
2015	50.1	51.1	35.7	36.8	3.4	2.8	29.9
2016	73.8	73.7	95.0	40.2	78.4	91.7	76.7
2017	-	-	-	40.6	17.4	-	27.9
2018	34.5	52.3	61.1	58.8	23.6	41.3	43.5
2019	5.0	-	28.7	22.3	7.0	23.3	16.1
2021	54.4	53.6	49.1	25.6	4.5	21.7	35.4
2022	50.0	28.3	34.8	24.2	45.4	38.7	38.4
2023	-	-	-	64.0	20.3	25.8	35.3
2024	24.3	-	29.2	46.0	14.8	21.9	27.2
2025	21.7	-	30.4	42.5	14.6	15.8	22.6

Table D2: Population Estimates – Sacramento Sucker

Population Estimate (95% CI, Lower CI Adjusted), Sacramento Sucker						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2007	838 (326-1,373)	535 (494-576)	573 (466-680)	372 (372-372)	344 (309-379)	368 (336-400)
2008	107 (82-138)	231 (162-300)	261 (236-286)	112 (99-127)	119 (103-136)	25 (16-55)
2009	35 (29-48)	141 (122-160)	257 (238-276)	64 (54-79)	64 (53-81)	28 (19-54)
2010	42 (41-46)	207 (192-222)	162 (122-202)	45 (42-51)	14 (14-15)	133 (62-278)
2011	93 (93-93)	112 (98-128)	88 (68-115)	54 (44-71)	14 (13-19)	156 (77-293)
2012	128 (107-150)	466 (428-504)	415 (369-461)	319 (267-371)	109 (98-122)	765 (765-765)
2013	450 (396-504)	268 (258-278)	296 (269-323)	88 (73-107)	69 (51-98)	202 (168-236)
2014	121 (114-130)	100 (89-113)	174 (151-197)	71 (67-78)	34 (34-36)	93 (80-109)
2015	538 (477-599)	536 (438-634)	366 (317-415)	268 (215-321)	24 (24-26)	25 (23-31)
2016	844 (685-1,003)	556 (462-650)	1034 (836-1,232)	291 (225-357)	574 (532-616)	827 (639-961)
2017	-	-	-	361 (337-385)	197 (171-223)	-
2018	595 (500-690)	510 (444-576)	517 (445-589)	552 (446-658)	215 (182-248)	506 (420-592)
2019	66 (66-66)	-	210 (181-239)	201 (161-241)	102 (53-201)	401 (158-762)
2021	444 (419-469)	549 (504-594)	367 (321-413)	171 (140-202)	39 (37-44)	63 (50-84)
2022	697 (609-785)	208 (184-232)	403 (309-497)	213 (179-247)	486 (464-508)	231 (230-234)
2023	-	-	-	810 (680-940)	309 (198-420)	348 (309-387)
2024	351 (273-429)	-	359 (314-404)	791 (552-1,030)	139 (106-174)	383 (326-440)
2025	443 (406-480)	-	431 (378-484)	379 (325-433)	288 (261-315)	287 (162-419)

Table D3: Estimated Fish per Mile – Sacramento Sucker

Estimated Fish per Mile, Sacramento Sucker							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	14,749	9,416	10,085	6,547	6,054	6,477	8,888
2008	1,883	4,066	4,594	1,971	2,094	440	2,508
2009	616	2,482	4,523	1,126	1,126	493	1,728
2010	739	3,643	2,851	792	246	2,341	1,769
2011	1,637	1,971	1,549	950	246	2,746	1,517
2012	2,253	8,202	7,304	5,614	1,918	13,464	6,459
2013	7,920	4,717	5,210	1,549	1,214	3,555	4,027
2014	2,130	1,760	3,062	1,250	598	1,637	1,739
2015	9,469	9,434	6,442	4,717	422	440	5,154
2016	14,854	9,786	18,198	5,122	10,102	14,555	12,103
2017	-	-	-	6,354	3,467	-	4,910
2018	10,472	8,976	9,099	9,715	3,784	8,906	8,492
2019	1,162	-	3,696	3,538	1,795	7,058	3,450
2021	7,814	9,662	6,459	3,010	686	1,109	4,790
2022	12,267	3,661	7,093	3,749	8,554	4,066	6,565
2023	-	-	-	14,256	5,438	6,125	8,606
2024	6,178	-	6,318	13,922	2,446	6,741	7,121
2025	7,797	-	7,586	6,670	5,069	5,051	5,362

Table D4: Biomass (pounds) – Sacramento Sucker

Biomass (lb), Sacramento Sucker							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2007	1.6	2.1	213.7	1.3	80.3	5.1	304.1
2008	8.7	2.8	178.7	3.5	126.3	0.8	320.7
2009	7.4	3.8	198.8	4.5	48.7	3.9	267.1
2010	12.5	4.8	69.1	12.6	4.3	0.9	104.2
2011	2.9	2.1	50.1	13.2	2.8	0.8	72.0
2012	2.5	5.3	83.7	17.2	3.5	8.4	120.6
2013	8.0	2.5	64.1	18.8	1.8	6.2	101.4
2014	6.7	3.2	48.3	11.7	17.9	6.2	94.0
2015	8.7	3.6	66.8	28.4	23.2	7.8	138.4
2016	15.0	4.2	37.1	12.0	5.2	11.2	84.7
2017	-	-	-	18.3	2.7	-	21.0
2018	6.9	6.9	41.0	26.5	2.7	9.8	93.9
2019	0.5	-	95.4	10.2	1.7	6.4	114.2
2021	3.1	3.0	182.4	40.2	20.0	2.3	251.1
2022	7.3	1.7	96.0	30.4	5.5	5.5	146.4
2023	-	-	-	17.3	3.8	3.3	24.4
2024	16.2	-	153.2	54.9	4.2	9.7	238.1
2025	8.8	-	90.6	42.7	21.1	2.4	165.7

APPENDIX E

Centrarchidae – Sunfish, Crappie, and “Black” Bass Family

Multi-pass Depletion Summary Data: Fall, 2007-2025

For the following tables, a dashed line indicates the site was not surveyed.

Table E1a: Catch-per-unit Effort – Bass

Catch-per-Unit Effort (CPUE), Bass sp.							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2009	0.0	0.0	0.0	0.2	0.3	0.0	0.1
2012	0.0	0.0	0.0	0.0	0.0	0.1	0.0
2013	0.0	0.0	0.0	0.0	0.6	0.0	0.1
2014	0.0	0.1	0.1	0.0	3.6	0.1	0.6
2015	0.0	0.1	0.0	0.2	7.9	0.5	1.4
2016	0.0	0.0	0.0	0.0	2.4	0.2	0.4
2017	-	-	-	0.0	0.3	-	0.2
2018	0.0	0.0	0.0	0.2	0.1	0.0	0.0
2021	0.0	0.0	0.0	0.0	1.7	0.6	0.4
2022	0.3	0.0	0.0	0.0	2.4	0.4	0.6
2023	-	-	-	0.0	0.0	0.4	0.1
2025	0.1	-	0.0	0.0	0.0	0.0	0.0

Table E1b: Catch-per-unit Effort – Bluegill

Catch-per-Unit Effort (CPUE), Bluegill							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2009	0.0	0.0	0.0	0.0	0.1	0.0	0.0
2016	0.0	0.0	0.0	0.0	0.2	0.0	0.0
2022	0.0	0.0	0.0	0.0	0.1	0.0	0.0
2023	-	-	-	0.0	0.1	0.5	0.2

Table E1c: Catch-per-unit Effort – Green Sunfish

Catch-per-Unit Effort (CPUE), Green Sunfish							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2011	0.1	0.0	0.0	0.0	0.0	0.0	0.0
2016	0.0	0.0	0.0	0.0	0.3	0.0	0.1
2017	-	-	-	0.0	0.5	-	0.3
2023	-	-	-	0.0	0.2	1.4	0.6

Table E2a: Population Estimates – Bass

Population Estimate (95% CI, Lower CI Adjusted), Bass sp.						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2009	0 (0-0)	0 (0-0)	0 (0-0)	1 (1-1)	3 (3-4)	0 (0-0)
2012	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	1 (1-1)
2013	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	5 (5-6)	0 (0-0)
2014	0 (0-0)	1 (1-1)	1 (1-1)	0 (0-0)	27 (26-31)	1 (1-1)
2015	0 (0-0)	1 (1-1)	0 (0-0)	1 (1-1)	56 (55-59)	4 (4-6)
2016	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	15 (15-17)	1 (1-1)
2017	-	-	-	0 (0-0)	3 (3-4)	-
2018	0 (0-0)	0 (0-0)	0 (0-0)	1 (1-1)	1 (1-1)	0 (0-0)
2021	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	12 (12-14)	4 (4-6)
2022	3 (3-4)	0 (0-0)	0 (0-0)	0 (0-0)	24 (22-30)	13 (5-95)
2023	-	-	-	0 (0-0)	0 (0-0)	4 (4-5)
2025	1 (1-1)	-	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)

Table E2b: Population Estimates – Bluegill

Population Estimate (95% CI, Lower CI Adjusted), Bluegill						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2009	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	1 (1-1)	0 (0-0)
2016	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	1 (1-1)	0 (0-0)
2022	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	1 (1-1)	0 (0-0)
2023	-	-	-	0 (0-0)	1 (1-1)	9 (9-9)

Table E2c: Population Estimates – Green Sunfish

Population Estimate (95% CI, Lower CI Adjusted), Green Sunfish						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2011	1 (1-1)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
2016	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	2 (2-15)	0 (0-0)
2017	-	-	-	0 (0-0)	5 (5-6)	-
2023	-	-	-	0 (0-0)	2 (2-15)	15 (15-17)

Table E3a: Estimated Fish per Mile – Bass

Estimated Fish per Mile, Bass sp.							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2009	0	0	0	18	53	0	12
2012	0	0	0	0	0	18	3
2013	0	0	0	0	88	0	15
2014	0	18	18	0	475	18	88
2015	0	18	0	18	986	70	182
2016	0	0	0	0	264	18	47
2017	-	-	-	0	53	-	26
2018	0	0	0	18	18	0	6
2021	0	0	0	0	211	70	47
2022	53	0	0	0	422	229	117
2023	-	-	-	0	0	70	23
2025	18	-	0	0	0	0	4

Table E3b: Estimated Fish per Mile – Bluegill

Estimated Fish per Mile, Bluegill							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2009	0	0	0	0	18	0	3
2016	0	0	0	0	18	0	3
2022	0	0	0	0	18	0	3
2023	-	-	-	0	18	158	59

Table E3c: Estimated Fish per Mile – Green Sunfish

Estimated Fish per Mile, Green Sunfish							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2011	18	0	0	0	0	0	3
2016	0	0	0	0	35	0	6
2017	-	-	-	0	88	-	44
2023	-	-	-	0	35	264	100

Table E4a: Biomass (pounds) – Bass

Biomass (lb), Bass sp.							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2009	0.000	0.000	0.000	0.007	0.204	0.000	0.21
2012	0.000	0.000	0.000	0.000	0.000	0.021	0.02
2013	0.000	0.000	0.000	0.000	0.254	0.000	0.25
2014	0.000	0.014	0.006	0.000	0.617	0.024	0.66
2015	0.000	0.075	0.000	0.218	1.358	0.123	1.77
2016	0.000	0.000	0.000	0.000	0.477	0.045	0.52
2017	-	-	-	0.000	1.079	-	1.08
2018	0.000	0.000	0.000	0.002	0.139	0.000	0.14
2021	0.000	0.000	0.000	0.000	0.315	0.119	0.43
2022	0.027	0.000	0.000	0.000	0.780	0.144	0.95
2023	-	-	-	0.000	0.000	0.175	0.17
2025	0.005	-	0.000	0.000	0.000	0.000	0.01

Table E4b: Biomass (pounds) – Bluegill

Biomass (lb), Bluegill							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2009	0.00	0.00	0.00	0.00	0.04	0.00	0.04
2016	0.00	0.00	0.00	0.00	0.03	0.00	0.03
2022	0.00	0.00	0.00	0.00	0.01	0.00	0.01
2023	-	-	-	0.00	0.03	0.11	0.14

Table E4c: Biomass (pounds) – Green Sunfish

Biomass (lbs), Green Sunfish							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2011	0.01	0.00	0.00	0.00	0.00	0.00	0.01
2016	0.00	0.00	0.00	0.00	0.10	0.00	0.10
2017	-	-	-	0.00	0.48	-	0.48
2023	-	-	-	0.00	0.07	0.42	0.49

APPENDIX F

Cottidae – Sculpin Family

Multi-pass Depletion Summary Data: Fall, 2007-2025

For the following tables, a dashed line indicates the site was not surveyed.

Table F1: Catch-per-unit Effort – Sculpin

Catch-per-Unit Effort (CPUE), Sculpin sp.							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	49.2	50.1	23.5	29.5	23.7	34.3	35.3
2008	22.2	22.7	20.2	12.5	3.8	5.8	14.2
2009	35.9	40.5	26.9	18.5	9.5	8.4	23.4
2010	51.7	42.7	28.2	23.0	14.8	11.8	30.3
2011	30.7	45.3	10.0	32.1	9.3	12.6	21.3
2012	43.0	33.7	32.4	24.3	13.1	12.7	27.1
2013	70.8	29.6	42.5	29.4	22.8	16.0	34.6
2014	33.8	6.8	17.2	9.2	4.8	7.7	14.4
2015	19.0	1.0	3.3	0.7	1.0	0.7	4.8
2016	28.8	5.1	3.6	0.8	5.9	0.2	8.3
2017	-	-	-	18.9	16.3	-	17.5
2018	58.3	87.4	22.4	27.0	32.4	16.4	42.5
2019	38.2	-	11.1	24.1	9.1	10.0	19.6
2021	29.0	9.0	3.6	7.2	9.4	12.2	13.0
2022	26.9	4.8	3.2	1.3	3.5	4.1	8.0
2023	-	-	-	2.9	5.3	9.8	6.3
2024	43.9	-	2.8	6.7	12.6	30.1	21.9
2025	19.6	-	4.9	6.8	13.2	11.9	12.6

Table F2: Population Estimates – Sculpin

Population Estimate (95% CI, Lower CI Adjusted), Sculpin sp.						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2007	437 (403-471)	617 (530-704)	201 (179-223)	350 (228-472)	219 (210-228)	353 (271-435)
2008	176 (154-198)	175 (135-215)	147 (133-161)	73 (71-78)	29 (29-31)	58 (58-58)
2009	330 (295-365)	384 (310-458)	268 (250-286)	137 (109-166)	90 (85-97)	95 (51-183)
2010	528 (483-573)	332 (293-371)	239 (205-273)	101 (96-108)	85 (78-95)	93 (87-101)
2011	326 (276-376)	229 (216-242)	87 (85-91)	159 (145-173)	259 (60-1,068)	150 (93-224)
2012	372 (350-394)	469 (427-511)	302 (283-321)	214 (188-240)	130 (104-158)	125 (99-154)
2013	540 (516-564)	191 (188-195)	307 (295-319)	215 (193-237)	195 (179-211)	152 (131-173)
2014	395 (374-416)	61 (54-72)	141 (129-154)	107 (81-139)	36 (34-41)	63 (59-70)
2015	164 (160-170)	10 (10-10)	27 (27-29)	8 (4-50)	7 (7-9)	6 (6-10)
2016	230 (214-246)	30 (27-38)	26 (24-32)	4 (4-5)	37 (37-39)	1 (1-1)
2017	-	-	-	172 (152-192)	163 (156-171)	-
2018	877 (812-942)	799 (737-861)	156 (142-170)	209 (179-239)	261 (244-278)	165 (145-185)
2019	455 (386-524)	-	68 (67-71)	214 (176-252)	71 (69-75)	144 (68-291)
2021	239 (232-246)	95 (77-118)	29 (22-47)	40 (39-43)	93 (77-113)	92 (67-127)
2022	338 (300-376)	37 (31-50)	41 (26-79)	10 (9-16)	35 (35-37)	33 (33-34)
2023	-	-	-	24 (24-26)	112 (50-260)	139 (111-168)
2024	554 (507-601)	-	29 (29-30)	72 (63-85)	127 (91-170)	525 (468-568)
2025	365 (350-380)	-	58 (56-63)	48 (48-50)	255 (235-275)	169 (128-210)

Table F3: Estimated Fish per Mile – Sculpin

Estimated Fish per Mile, Sculpin sp.							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	7,691	10,859	3,538	6,160	3,854	6,213	6,386
2008	3,098	3,080	2,587	1,285	510	1,021	1,930
2009	5,808	6,758	4,717	2,411	1,584	1,672	3,825
2010	9,293	5,843	4,206	1,778	1,496	1,637	4,042
2011	5,738	4,030	1,531	2,798	4,558	2,640	3,549
2012	6,547	8,254	5,315	3,766	2,288	2,200	4,729
2013	9,504	3,362	5,403	3,784	3,432	2,675	4,693
2014	6,952	1,074	2,482	1,883	634	1,109	2,355
2015	2,886	176	475	141	123	106	651
2016	4,048	528	458	70	651	18	962
2017	-	-	-	3,027	2,869	-	2,948
2018	15,435	14,062	2,746	3,678	4,594	2,904	7,237
2019	8,008	-	1,197	3,766	1,250	2,534	3,351
2021	4,206	1,672	510	704	1,637	1,619	1,725
2022	5,949	651	722	176	616	581	1,449
2023	-	-	-	422	1,971	2,446	1,613
2024	9,750	-	510	1,267	2,235	9,240	4,601
2025	6,424	-	1,021	845	4,488	2,974	3,150

Table F4: Biomass (pounds) – Sculpin

Biomass (lb), Sculpin sp.							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2007	7.04	5.40	3.33	2.99	4.04	3.38	26.2
2008	2.80	1.67	3.40	0.98	0.48	0.80	10.1
2009	4.52	2.74	3.61	1.62	1.58	1.62	15.7
2010	8.94	3.42	4.36	1.62	2.11	2.38	22.8
2011	5.36	2.50	2.22	2.76	1.37	2.45	16.7
2012	6.08	4.23	3.51	1.89	1.84	1.99	19.5
2013	8.17	1.63	4.59	1.93	2.16	1.97	20.5
2014	5.85	0.73	1.93	1.19	0.60	1.17	11.5
2015	3.50	0.15	0.50	0.08	0.20	0.18	4.6
2016	4.27	0.33	0.55	0.08	0.77	0.04	6.0
2017	-	-	-	1.30	1.80	-	3.1
2018	9.66	4.78	2.08	2.01	3.76	3.38	25.7
2019	4.19	-	0.94	1.47	0.91	1.81	9.3
2021	2.98	0.86	0.35	0.47	1.45	1.79	7.9
2022	4.37	0.29	0.52	0.12	0.77	0.71	6.8
2023	-	-	-	0.32	1.01	2.50	3.8
2024	8.98	-	0.51	0.58	1.79	5.48	17.3
2025	5.36	-	1.23	0.55	4.13	2.50	13.8

APPENDIX G

Cyprinidae – Minnow Family

Multi-pass Depletion Summary Data: Fall, 2007-2025

For the following tables, a dashed line indicates the site was not surveyed.

Table G1a: Catch-per-unit Effort – California Roach

Catch-per-Unit Effort (CPUE), California Roach							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	0.4	0.3	2.7	3.1	16.2	7.5	5.2
2008	0.0	1.0	12.7	2.8	29.5	41.3	15.5
2009	0.0	13.7	3.3	1.0	5.8	56.9	11.9
2010	0.7	3.0	7.4	1.2	13.1	54.5	14.3
2011	0.7	1.5	2.7	5.6	4.0	28.8	7.5
2012	0.0	3.2	9.1	4.0	15.2	20.0	8.2
2013	0.0	8.2	26.1	38.7	28.5	54.6	27.0
2014	2.2	12.8	24.5	11.4	25.0	60.3	21.1
2015	3.9	25.2	36.1	38.9	10.5	87.6	34.1
2016	1.5	61.6	53.8	32.4	14.3	95.7	41.8
2017	-	-	-	12.5	17.8	-	15.4
2018	0.0	0.7	6.9	1.6	8.7	37.1	9.2
2019	0.0	-	1.8	3.6	1.1	12.4	3.5
2021	0.3	4.0	6.6	11.0	10.7	82.7	20.4
2022	0.2	13.5	21.7	30.6	4.3	37.3	17.8
2023	-	-	-	12.8	1.8	22.0	12.8
2024	2.9	-	5.3	10.7	2.4	9.0	6.2
2025	2.5	-	7.0	8.1	11.2	13.2	8.1

Table G1b: Catch-per-unit Effort – Hardhead

Catch-per-Unit Effort (CPUE), Hardhead							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2018	0.0	0.0	0.0	0.0	0.1	0.0	0.0
2022	0.0	0.0	0.0	0.0	0.2	4.9	1.1
2023	-	-	-	0.0	0.2	0.0	0.1

Table G1c: Catch-per-unit Effort – Sacramento Hitch

Catch-per-Unit Effort (CPUE), Sacramento Hitch							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2024	0	-	0.0	0.1	0.0	0.0	0.02

Table G1d: Catch-per-unit Effort – Sacramento Pikeminnow

Catch-per-Unit Effort (CPUE), Sacramento Pikeminnow							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	12.2	2.2	10.1	21.8	25.6	53.6	20.2
2008	8.2	2.6	21.7	8.3	20.1	14.0	13.0
2009	1.8	7.1	6.6	4.9	9.8	24.9	8.8
2010	1.3	2.0	4.3	1.7	8.7	11.3	4.9
2011	4.0	4.7	1.1	0.4	1.9	1.1	2.2
2012	0.1	1.5	5.2	22.6	8.0	17.1	8.4
2013	24.4	15.4	48.6	20.3	48.6	93.4	44.0
2014	16.2	6.1	34.7	6.5	16.4	37.0	18.9
2015	15.0	6.9	24.7	29.1	15.5	19.2	18.0
2016	7.1	13.6	26.2	1.9	6.4	7.3	10.7
2017	-	-	-	1.8	2.6	-	2.2
2018	0.5	1.5	1.9	0.8	19.3	5.4	4.6
2019	2.6	-	1.0	0.6	2.8	1.2	1.7
2021	29.6	25.8	22.9	14.1	28.9	83.9	36.5
2022	13.2	17.7	25.6	16.8	32.1	33.6	24.0
2023	-	-	-	7.2	5.1	1.9	4.5
2024	5.6	-	4.9	2.8	2.5	1.7	3.6
2025	8.3	-	6.1	31.8	6.8	28.6	13.5

Table G2a: Population Estimates – California Roach

Population Estimate (95% CI, Lower CI Adjusted), California Roach						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2007	3 (3-3)	3 (3-3)	20 (20-21)	82 (22-437)	177 (146-208)	57 (53-64)
2008	0 (0-0)	6 (6-8)	126 (126-126)	46 (16-211)	253 (233-273)	504 (317-691)
2009	0 (0-0)	150 (93-224)	45 (45-45)	6 (6-7)	58 (52-68)	440 (386-494)
2010	6 (6-7)	22 (19-31)	79 (51-127)	5 (5-6)	75 (69-84)	564 (473-655)
2011	18 (6-140)	7 (7-7)	24 (23-28)	39 (25-75)	41 (26-79)	390 (220-560)
2012	0 (0-0)	39 (37-44)	116 (116-116)	45 (45-45)	146 (121-171)	514 (156-1203)
2013	0 (0-0)	54 (52-58)	198 (182-214)	263 (251-275)	297 (240-354)	479 (459-499)
2014	26 (23-34)	152 (152-152)	255 (196-314)	104 (100-110)	240 (189-291)	522 (492-552)
2015	34 (33-38)	189 (183-196)	350 (314-386)	253 (222-284)	113 (73-170)	1060 (914-1,206)
2016	11 (11-12)	376 (347-405)	491 (414-568)	283 (167-399)	114 (89-143)	922 (748-1,096)
2017	-	-	-	118 (99-139)	197 (174-220)	-
2018	0 (0-0)	6 (5-15)	70 (44-120)	11 (10-16)	96 (96-96)	513 (385-641)
2019	0 (0-0)	-	12 (11-18)	105 (25-601)	10 (8-21)	154 (84-261)
2021	3 (3-3)	34 (34-36)	50 (39-70)	58 (57-61)	144 (83-233)	307 (300-314)
2022	2 (2-15)	96 (86-108)	182 (168-196)	342 (238-446)	42 (42-43)	246 (242-251)
2023	-	-	-	117 (110-126)	17 (17-20)	270 (250-290)
2024	51 (51-51)	-	63 (52-80)	393 (100-1,231)	17 (17-19)	276 (118-528)
2025	51 (44-63)	-	103 (78-135)	79 (57-113)	224 (200-248)	218 (137-304)

Table G2b: Population Estimates – Hardhead

Population Estimate (95% CI, Lower CI Adjusted), Hardhead						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2018	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	1 (1-1)	0 (0-0)
2022	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	2 (2-15)	32 (32-33)
2023	-	-	-	0 (0-0)	2 (2-15)	0 (0-0)

Table G2c: Population Estimates – Sacramento Hitch

Population Estimate (95% CI, Lower CI Adjusted), Sacramento Hitch						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2024	0 (0-0)	-	0 (0-0)	1 (1-1)	0 (0-0)	0 (0-0)

Table G2d: Population Estimates – Sacramento Pikeminnow

Population Estimate (95% CI, Lower CI Adjusted), Sacramento Pikeminnow						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2007	113 (93-136)	27 (20-46)	112 (112-112)	170 (157-183)	381 (248-514)	1,441 (378-2,952)
2008	91 (56-151)	15 (15-17)	389 (143-800)	53 (47-63)	160 (154-167)	141 (141-141)
2009	14 (14-15)	65 (48-93)	154 (60-385)	31 (29-37)	114 (88-145)	181 (155-207)
2010	14 (11-26)	13 (13-15)	40 (30-62)	7 (7-9)	59 (46-81)	108 (83-138)
2011	50 (50-50)	23 (22-27)	10 (9-16)	2 (2-7)	18 (18-18)	8 (8-10)
2012	1 (1-1)	21 (17-33)	46 (44-51)	254 (254-254)	69 (64-77)	531 (133-1,533)
2013	239 (179-299)	164 (98-250)	370 (347-393)	183 (130-236)	1,255 (375-2,630)	908 (851-965)
2014	214 (181-247)	55 (48-67)	324 (282-366)	86 (86-86)	150 (117-183)	329 (300-358)
2015	141 (126-156)	247 (50-1,250)	501 (200-893)	185 (162-208)	175 (108-256)	161 (158-166)
2016	78 (78-78)	78 (72-87)	232 (185-279)	10 (10-11)	56 (40-86)	66 (66-66)
2017	-	-	-	25 (14-69)	29 (25-39)	-
2018	6 (6-8)	14 (11-26)	27 (12-105)	5 (5-8)	156 (142-170)	59 (47-79)
2019	59 (23-205)	-	8 (6-22)	8 (4-50)	22 (21-26)	9 (8-15)
2021	368 (368-368)	464 (221-719)	198 (198-198)	114 (114-114)	334 (262-406)	421 (388-454)
2022	250 (134-391)	120 (112-130)	242 (207-277)	168 (119-219)	334 (320-348)	243 (231-255)
2023	-	-	-	63 (62-66)	54 (47-66)	20 (19-24)
2024	118 (63-217)	-	50 (48-55)	30 (27-37)	26 (18-50)	34 (23-63)
2025	201 (145-257)	-	111 (65-186)	336 (336-336)	137 (117-157)	560 (349-771)

Table G3a: Estimated Fish per Mile – California Roach

Estimated Fish per Mile, California Roach							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	53	53	352	1,443	3,115	1,003	1,003
2008	0	106	2,218	810	4,453	8,870	2,743
2009	0	2,640	792	106	1,021	7,744	2,050
2010	106	387	1,390	88	1,320	9,926	2,203
2011	317	123	422	686	722	6,864	1,522
2012	0	686	2,042	792	2,570	9,046	2,523
2013	0	950	3,485	4,629	5,227	8,430	3,787
2014	458	2,675	4,488	1,830	4,224	9,187	3,810
2015	598	3,326	6,160	4,453	1,989	18,656	5,864
2016	194	6,618	8,642	4,981	2,006	16,227	6,445
2017	-	-	-	2,077	3,467	-	2,772
2018	0	106	1,232	194	1,690	9,029	2,042
2019	0	-	211	1,848	176	2,710	989
2021	53	598	880	1,021	2,534	5,403	1,748
2022	35	1,690	3,203	6,019	739	4,330	2,669
2023	-	-	-	2,059	299	4,752	2,370
2024	898	-	1,109	6,917	299	4,858	2,816
2025	898	-	1,813	1,390	3,942	3,837	2,376

Table G3b: Estimated Fish per Mile – Hardhead

Estimated Fish per Mile, Hardhead							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2018	0	0	0	0	18	0	3
2022	0	0	0	0	35	563	100
2023	-	-	-	0	35	0	12

Table G3c: Estimated Fish per Mile – Sacramento Hitch

Estimated Fish per Mile, Sacramento Hitch							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2024	0	-	0	18	0	0	4

Table G3d: Estimated Fish per Mile – Sacramento Pikeminnow

Estimated Fish per Mile, Sacramento Pikeminnow							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	1,989	475	1,971	2,992	6,706	25,362	6,582
2008	1,602	264	6,846	933	2,816	2,482	2,490
2009	246	1,144	2,710	546	2,006	3,186	1,640
2010	246	229	704	123	1,038	1,901	707
2011	880	405	176	35	317	141	326
2012	18	370	810	4,470	1,214	9,346	2,705
2013	4,206	2,886	6,512	3,221	22,088	15,981	9,149
2014	3,766	968	5,702	1,514	2,640	5,790	3,397
2015	2,482	4,347	8,818	3,256	3,080	2,834	4,136
2016	1,373	1,373	4,083	176	986	1,162	1,525
2017	-	-	-	440	510	-	475
2018	106	246	475	88	2,746	1,038	783
2019	1,038	-	141	141	387	158	373
2021	6,477	8,166	3,485	2,006	5,878	7,410	5,570
2022	4,400	2,112	4,259	2,957	5,878	4,277	3,981
2023	-	-	-	1,109	950	352	804
2024	2,077	-	880	528	458	598	908
2025	3,538	-	1954	5914	2411	9856	4734

Table G4a: Biomass (pounds) – California Roach

Biomass (lb), California Roach							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2007	0.003	0.003	0.284	0.168	1.668	0.352	2.5
2008	0.000	0.065	1.056	0.136	2.098	1.447	4.8
2009	0.000	1.288	0.420	0.078	0.411	2.513	4.7
2010	0.021	0.593	0.802	0.116	0.548	3.076	5.2
2011	0.061	0.127	0.595	0.527	0.493	2.660	4.5
2012	0.000	0.632	0.968	0.217	0.917	1.062	3.8
2013	0.000	0.204	1.468	1.774	2.013	2.877	8.3
2014	0.038	0.319	2.131	0.483	1.752	3.827	8.5
2015	0.120	0.416	2.929	1.686	0.529	4.413	10.1
2016	0.031	1.083	4.154	1.482	0.599	3.237	10.6
2017	-	-	-	0.919	0.886	-	1.8
2018	0.000	0.056	0.508	0.150	0.322	3.196	4.2
2019	0.000	-	0.171	0.235	0.084	0.850	1.3
2021	0.010	0.211	0.338	0.346	0.663	2.403	4.0
2022	0.002	0.312	1.764	2.236	0.369	1.941	6.6
2023	-	-	-	0.795	0.177	2.883	3.9
2024	0.282	-	0.624	0.931	0.157	1.330	3.3
2025	0.227	-	0.771	0.436	1.578	0.867	3.9

Table G4b: Biomass (pounds) – Hardhead

Biomass (lbs), Hardhead							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2018	0.00	0.00	0.00	0.00	0.03	0.00	0.03
2022	0.00	0.00	0.00	0.00	0.01	0.12	0.13
2023	-	-	-	0.00	No Data	0.00	No Data

Table G4c: Biomass (pounds) – Sacramento Hitch

Biomass (lb), Sacramento Hitch							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2024	0.0	-	0.00	0.07	0.00	0.00	0.1

Table G4d: Biomass (pounds) – Sacramento Pikeminnow

Biomass (lb), Sacramento Pikeminnow							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2007	0.252	0.052	1.617	0.271	0.939	1.161	4.3
2008	0.308	0.215	9.991	0.330	2.368	0.830	14.0
2009	0.324	1.556	4.803	0.642	1.167	2.556	11.0
2010	0.230	0.591	3.262	0.098	0.769	0.939	5.9
2011	0.187	0.084	0.381	0.135	0.231	0.192	1.2
2012	0.003	0.368	1.215	0.178	0.302	0.617	2.7
2013	0.550	0.833	7.842	0.963	1.976	5.568	17.7
2014	1.201	1.321	9.415	0.755	1.294	4.208	18.2
2015	0.547	0.394	3.243	1.370	1.056	1.786	8.4
2016	0.327	0.718	6.043	0.249	0.414	0.488	8.2
2017	-	-	-	0.056	0.309	-	0.4
2018	0.028	0.310	0.859	0.028	0.380	0.554	2.2
2019	0.106	-	1.139	0.021	0.257	0.111	1.6
2021	0.671	0.603	2.812	0.919	1.668	3.915	10.6
2022	0.769	0.652	4.612	1.867	2.476	3.517	13.9
2023	-	-	-	0.230	0.232	0.106	0.6
2024	0.980	-	0.721	0.369	0.326	0.164	2.6
2025	0.883	-	1.273	0.509	0.931	0.914	4.5

APPENDIX H

Gasterosteidae – Stickleback Family

Multi-pass Depletion Summary Data: Fall, 2007-2025

For the following tables, a dashed line indicates the site was not surveyed.

Table H1: Catch-per-unit Effort – Three-spine Stickleback

Catch-per-Unit Effort (CPUE), Three-spine Stickleback							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	1.0	3.5	0.9	2.2	0.0	1.8	1.6
2008	0.0	6.1	3.0	3.3	0.0	1.9	2.2
2009	0.1	5.7	2.3	2.9	0.6	3.8	2.4
2010	2.0	9.3	0.6	0.0	0.0	6.2	3.3
2011	1.1	8.1	1.1	0.9	0.2	0.4	1.6
2012	0.0	3.1	0.7	3.2	0.5	2.6	1.8
2013	2.2	10.1	0.9	1.6	1.9	12.4	5.0
2014	2.9	27.7	4.1	6.6	0.6	8.2	8.2
2015	5.7	4.3	1.7	3.7	0.0	1.1	2.8
2016	12.6	14.7	14.2	25.0	1.0	19.5	14.1
2017	-	-	-	3.7	8.6	-	6.4
2018	1.1	1.3	2.5	5.0	2.0	1.1	2.0
2019	0.9	-	2.1	1.3	0.7	0.7	1.1
2021	0.9	8.2	1.5	0.9	4.7	23.8	7.3
2022	15.3	10.9	4.4	9.4	5.9	7.8	9.0
2023	-	-	-	3.2	5.5	5.8	4.9
2024	5.1	-	0.5	2.3	1.0	1.9	2.4
2025	3.5	-	0.9	3.4	1.4	0.8	2.0

Table H2: Population Estimates – Three-spine Stickleback

Population Estimate (95% CI, Lower CI Adjusted), Three-spine Stickleback						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2007	12 (12-12)	46 (46-46)	7 (7-10)	21 (16-37)	0 (0-0)	22 (13-58)
2008	0 (0-0)	36 (36-37)	27 (20-46)	25 (19-42)	0 (0-0)	101 (31-405)
2009	1 (1-1)	58 (58-58)	33 (21-67)	21 (17-33)	5 (5-7)	25 (23-31)
2010	20 (17-29)	122 (59-250)	4 (4-9)	-	0 (0-0)	69 (69-69)
2011	40 (9-360)	50 (38-72)	9 (9-11)	4 (4-7)	1 (1-1)	3 (3-8)
2012	0 (0-0)	54 (54-54)	6 (6-10)	36 (36-36)	4 (4-4)	30 (30-30)
2013	15 (15-17)	64 (64-64)	6 (6-6)	10 (10-11)	28 (15-79)	150 (101-208)
2014	46 (46-46)	258 (230-286)	55 (31-115)	60 (58-64)	6 (6-6)	151 (63-349)
2015	75 (48-124)	31 (31-32)	21 (21-21)	20 (20-21)	0 (0-0)	40 (9-390)
2016	158 (92-249)	117 (78-170)	142 (142-142)	559 (129-1,750)	6 (6-10)	175 (118-237)
2017	-	-	-	57 (152-192)	116 (82-159)	-
2018	20 (20-20)	10 (10-12)	24 (24-24)	107 (32-436)	28 (15-79)	12 (10-21)
2019	9 (8-15)	-	13 (13-15)	14 (14-14)	5 (5-5)	6 (5-15)
2021	6 (6-7)	102 (70-147)	12 (9-26)	5 (5-7)	87 (37-233)	221 (171-271)
2022	551 (156-1,364)	85 (70-105)	52 (52-52)	168 (67-398)	66 (59-77)	45 (45-47)
2023	-	-	-	30 (28-35)	89 (51-161)	183 (66-478)
2024	99 (99-99)	-	6 (5-15)	32 (32-32)	7 (7-9)	56 (26-154)
2025	267 (61-1,109)	-	14 (10-32)	97 (24-543)	36 (36-36)	10 (9-16)

Table H3: Estimated Fish per Mile – Three-spine Stickleback

Estimated Fish per Mile, Three-spine Stickleback							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	211	810	123	370	0	387	317
2008	0	634	475	440	0	1,778	554
2009	18	1,021	581	370	88	440	419
2010	352	2,147	70	0	0	1,214	631
2011	704	880	158	70	18	53	314
2012	0	950	106	634	70	528	381
2013	264	1,126	106	176	493	2,640	801
2014	810	4,541	968	1,056	106	2,658	1,690
2015	1,320	546	370	352	0	704	549
2016	2,781	2,059	2,499	9,838	106	3,080	3,394
2017	-	-	-	1,003	2,042	-	1,522
2018	352	176	422	1,883	493	211	590
2019	158	-	229	246	88	106	165
2021	106	1,795	211	88	1,531	3,890	1,270
2022	9,698	1,496	915	2,957	1,162	792	2,837
2023	-	-	-	528	1,566	3,221	1,772
2024	1,742	-	106	563	123	986	704
2025	4,699	-	246	1707	634	176	1,492

Table H4: Biomass (pounds) – Three-spine Stickleback

Biomass (lb), Three-spine Stickleback							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2007	0.015	0.045	0.008	0.018	0.000	0.022	0.1
2008	0.000	0.091	0.043	0.017	0.000	0.061	0.2
2009	0.000	0.064	0.058	0.022	0.003	0.037	0.2
2010	0.025	0.101	0.006	0.000	0.000	0.087	0.2
2011	0.021	0.071	0.033	0.006	0.002	0.008	0.1
2012	0.000	0.042	0.011	0.023	0.004	0.023	0.1
2013	0.021	0.080	0.008	0.010	0.022	0.159	0.3
2014	0.043	0.317	0.050	0.059	0.009	0.085	0.6
2015	0.096	0.038	0.022	0.027	0.000	0.018	0.2
2016	0.189	0.059	0.175	0.365	0.007	0.242	1.0
2017	-	-	-	0.065	0.136	-	0.2
2018	0.015	0.014	0.028	0.048	0.024	0.016	0.1
2019	0.013	-	0.024	0.018	0.009	0.006	0.1
2021	0.008	0.097	0.015	0.005	0.065	0.268	0.5
2022	0.233	0.115	0.065	0.114	0.111	0.077	0.7
2023	-	-	-	0.054	0.090	0.127	0.3
2024	0.103	-	0.009	0.037	0.011	0.048	0.2
2025	0.118	-	0.011	0.039	0.049	0.011	0.2

APPENDIX I

Ictaluridae – Catfish Family

Multi-pass Depletion Summary Data: Fall, 2007-2025

For the following tables, a dashed line indicates the site was not surveyed.

Table I1: Catch-per-unit Effort – Catfish

Catch-per-Unit Effort (CPUE), Catfish sp.							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2008	0.00	0.00	0.15	0.00	0.13	0.00	0.05
2009	0.00	0.00	0.00	0.00	0.22	0.00	0.04
2012	0.00	0.00	0.00	0.00	0.13	0.13	0.04
2013	0.00	0.00	0.00	0.00	0.39	0.00	0.07
2014	0.19	0.00	0.27	0.23	2.10	0.00	0.42
2015	0.00	0.00	0.00	0.00	0.29	0.00	0.05
2018	0.00	0.00	0.00	0.00	0.14	0.00	0.02
2019	0.34	-	0.00	0.29	0.13	0.00	0.17
2021	0.00	0.00	0.00	0.00	0.24	0.00	0.04
2022	0.00	0.00	0.00	0.00	0.10	0.00	0.02
2023	-	-	-	0.11	0.00	0.00	0.03
2024	0.08	-	0.00	0.10	0.00	0.00	0.04

Table I2: Population Estimates – Catfish

Population Estimate (95% CI, Lower CI Adjusted), Catfish sp.						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2008	0 (0-0)	0 (0-0)	1 (1-1)	0 (0-0)	1 (1-1)	0 (0-0)
2009	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	2 (2-15)	0 (0-0)
2012	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	1 (1-1)	1 (1-1)
2013	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	3 (3-8)	0 (0-0)
2014	2 (2-26)	0 (0-0)	2 (2-15)	2 (2-15)	15 (15-17)	0 (0-0)
2015	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	2 (2-7)	0 (0-0)
2018	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	1 (1-1)	0 (0-0)
2019	3 (3-4)	-	0 (0-0)	2 (2-2)	1 (1-1)	0 (0-0)
2021	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	2 (2-15)	0 (0-0)
2022	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	1 (1-1)	0 (0-0)
2023	-	-	-	1 (1-1)	0 (0-0)	0 (0-0)
2024	1 (1-1)	-	0 (0-0)	1 (1-1)	0 (0-0)	0 (0-0)

Table I3: Estimated Fish per Mile – Catfish

Estimated Fish per Mile, Catfish sp.							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2008	0	0	18	0	18	0	6
2009	0	0	0	0	35	0	6
2012	0	0	0	0	18	18	6
2013	0	0	0	0	53	0	9
2014	35	0	35	35	264	0	62
2015	0	0	0	0	35	0	6
2018	0	0	0	0	18	0	3
2019	53	-	0	35	18	0	21
2021	0	0	0	0	35	0	6
2022	0	0	0	0	18	0	3
2023	-	-	-	18	0	0	6
2024	18	-	0	18	0	0	7

Table I4: Biomass (pounds) – Catfish

Biomass (lb), Catfish sp.							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2008	0.000	0.000	0.005	0.000	0.004	0.000	0.009
2009	0.000	0.000	0.000	0.000	0.777	0.000	0.777
2012	0.000	0.000	0.000	0.000	0.002	0.032	0.034
2013	0.000	0.000	0.000	0.000	0.012	0.000	0.012
2014	0.007	0.000	0.004	0.004	0.120	0.000	0.136
2015	0.000	0.000	0.000	0.000	0.017	0.000	0.017
2018	0.000	0.000	0.000	0.000	0.871	0.000	0.871
2019	0.039	-	0.000	0.023	0.011	0.000	0.073
2021	0.000	0.000	0.000	0.000	0.392	0.000	0.392
2022	0.000	0.000	0.000	0.000	0.793	0.000	0.793
2023	-	-	-	0.014	0.000	0.000	0.014
2024	0.006	-	0.000	0.022	0.000	0.000	0.027

APPENDIX J

Petromyzontidae – Lamprey Family

Multi-pass Depletion Summary Data: Fall, 2007-2025

For the following tables, a dashed line indicates the site was not surveyed.

Table J1: Catch-per-unit Effort – Lamprey

Catch-per-Unit Effort (CPUE), Lamprey sp.							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	0.1	22.5	0.7	19.0	0.3	0.6	7.5
2008	0.3	8.0	0.8	13.2	0.3	0.0	3.3
2009	0.5	8.4	0.6	13.4	0.1	0.2	3.3
2010	0.0	9.0	1.0	6.7	0.2	0.7	2.5
2011	0.0	10.2	2.0	20.1	0.0	0.0	3.9
2012	0.0	8.9	2.7	10.2	0.5	0.0	4.0
2013	0.4	5.5	1.0	15.9	0.4	0.0	3.5
2014	0.2	13.8	5.3	23.6	0.4	0.1	7.3
2015	0.2	14.7	3.1	9.9	0.0	0.1	4.3
2016	0.4	24.5	3.9	26.8	0.3	0.0	8.1
2017	-	-	-	15.0	0.8	-	7.3
2018	0.2	9.5	1.6	24.0	0.8	0.7	5.1
2019	0.5	-	0.8	23.8	0.3	1.2	5.1
2021	0.4	19.5	5.3	23.0	0.9	1.2	7.3
2022	0.4	18.9	4.9	13.3	1.3	0.2	5.2
2023	-	-	-	21.5	1.3	2.8	7.8
2024	0.3	-	3.0	42.4	0.6	10.7	10.9
2025	0.1	-	3.4	29.5	0.8	6.9	5.2

Table J2: Population Estimates – Lamprey

Population Estimate (95% CI, Lower CI Adjusted), Lamprey sp.						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2007	1 (1-1)	407 (202-624)	5 (5-6)	204 (204-204)	3 (3-6)	8 (4-50)
2008	2 (2-2)	70 (70-70)	6 (5-15)	112 (112-112)	2 (2-7)	0 (0-0)
2009	4 (4-5)	86 (86-86)	5 (5-8)	118 (118-118)	1 (1-1)	1 (1-1)
2010	0 (0-0)	141 (57-346)	7 (7-10)	42 (42-42)	1 (1-1)	13 (5-95)
2011	0 (0-0)	49 (48-52)	27 (17-60)	135 (135-135)	0 (0-0)	0 (0-0)
2012	0 (0-0)	154 (154-154)	24 (23-28)	114 (114-114)	4 (4-4)	0 (0-0)
2013	3 (3-4)	35 (35-35)	7 (7-8)	104 (102-108)	5 (3-32)	0 (0-0)
2014	3 (3-3)	164 (164-164)	43 (40-50)	210 (207-215)	5 (3-32)	1 (1-1)
2015	2 (2-15)	160 (160-160)	38 (38-38)	54 (54-54)	0 (0-0)	1 (1-1)
2016	3 (3-6)	165 (132-198)	35 (26-56)	386 (138-819)	2 (2-7)	0 (0-0)
2017	-	-	-	362 (119-858)	10 (8-21)	-
2018	2 (2-2)	81 (71-94)	10 (10-11)	181 (157-205)	6 (6-10)	9 (9-9)
2019	6 (6-6)	-	8 (8-8)	228 (174-282)	2 (2-15)	12 (12-12)
2021	4 (4-7)	249 (249-249)	48 (48-48)	164 (122-206)	11 (7-35)	4 (4-9)
2022	4 (4-9)	262 (121-469)	58 (58-58)	136 (136-136)	31 (13-125)	2 (2-7)
2023	-	-	-	452 (185-805)	14 (12-22)	101 (31-405)
2024	4 (4-7)	-	47 (30-87)	1,174 (403-1,990)	8 (4-50)	219 (219-219)
2025	2 (2-26)	-	111 (38-368)	310 (310-310)	14 (13-19)	152 (73-297)

Table J3: Estimated Fish per Mile – Lamprey

Estimated Fish per Mile, Lamprey sp.							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	18	7,163	88	3,590	53	141	1,842
2008	35	1,232	106	1,971	35	0	563
2009	70	1,514	88	2,077	18	18	631
2010	0	2,482	123	739	18	229	598
2011	0	862	475	2,376	0	0	619
2012	0	2,710	422	2,006	70	0	868
2013	53	616	123	1,830	88	0	452
2014	53	2,886	757	3,696	88	18	1,250
2015	35	2,816	669	950	0	18	748
2016	53	2,904	616	6,794	35	0	1,734
2017	-	-	-	6,371	176	-	3,274
2018	35	1,426	176	3,186	106	158	848
2019	106	-	141	4,013	35	211	901
2021	70	4,382	845	2,886	194	70	1,408
2022	70	4,611	1,021	2,394	546	35	1,446
2023	-	-	-	7,955	246	1,778	3,326
2024	70	-	827	20,662	141	3,854	5,111
2025	35	-	1,954	5,456	246	2,675	2,073

Table J4: Biomass (pounds) – Lamprey

Biomass (lb), Lamprey sp.							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2007	0.009	1.761	0.051	0.880	0.030	0.040	2.8
2008	0.019	0.676	0.173	0.558	0.036	0.000	1.5
2009	0.038	0.501	0.035	0.681	0.007	0.006	1.3
2010	0.000	0.608	0.062	0.291	0.003	0.044	1.0
2011	0.000	0.437	0.218	1.068	0.000	0.000	1.7
2012	0.000	0.746	0.276	0.524	0.035	0.000	1.6
2013	0.030	0.262	0.063	0.904	0.023	0.000	1.3
2014	0.016	0.785	0.348	1.713	0.028	0.028	2.9
2015	0.022	0.647	0.295	0.434	0.000	0.008	1.4
2016	0.028	0.679	0.260	1.437	0.015	0.000	2.4
2017	-	-	-	0.997	0.039	-	1.0
2018	0.004	0.634	0.128	1.132	0.047	0.038	2.0
2019	0.025	-	0.065	1.326	0.006	0.039	1.5
2021	0.012	0.685	0.316	0.733	0.049	0.018	1.8
2022	0.022	0.544	0.325	0.570	0.099	0.020	1.6
2023	-	-	-	1.948	0.147	0.263	2.4
2024	0.030	-	0.253	2.184	0.025	0.402	2.9
2025	0.013	-	0.306	1.279	0.076	0.408	2.1

APPENDIX K

Poecillidae – Livebearer Family

Multi-pass Depletion Summary Data: Fall, 2007-2025

For the following tables, a dashed line indicates the site was not surveyed.

Table K1: Catch-per-unit Effort – Western Mosquitofish

Catch-per-Unit Effort (CPUE), Western Mosquitofish							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2008	0.0	0.3	0.0	0.0	0.0	0.0	0.1
2012	0.0	0.0	0.0	1.2	0.0	0.0	0.2
2013	0.0	0.2	0.0	0.0	0.0	0.0	0.0
2014	0.0	0.1	0.0	0.2	0.4	1.8	0.4
2015	0.2	3.2	0.0	0.0	1.9	2.3	1.3
2016	0.0	2.8	0.0	0.0	0.2	2.6	0.9
2021	0.0	0.0	0.0	0.0	0.0	0.4	0.1
2022	0.1	0.5	0.0	0.0	0.7	1.0	0.4

Table K2: Population Estimates – Western Mosquitofish

Population Estimate (95% CI, Lower CI Adjusted), Western Mosquitofish							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	
2008	0 (0-0)	2 (2-2)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	
2012	0 (0-0)	0 (0-0)	0 (0-0)	9 (9-11)	0 (0-0)	0 (0-0)	
2013	0 (0-0)	1 (1-1)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	
2014	0 (0-0)	1 (1-1)	0 (0-0)	2 (2-7)	3 (3-8)	14 (14-14)	
2015	2 (2-2)	23 (23-24)	0 (0-0)	0 (0-0)	20 (20-20)	19 (19-20)	
2016	0 (0-0)	17 (15-24)	0 (0-0)	0 (0-0)	1 (1-1)	21 (16-37)	
2021	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	2 (2-7)	
2022	1 (1-1)	3 (3-6)	0 (0-0)	0 (0-0)	11 (7-35)	11 (11-13)	

Table K3: Estimated Fish per Mile – Western Mosquitofish

Estimated Fish per Mile, Western Mosquitofish							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2008	0	35	0	0	0	0	6
2012	0	0	0	158	0	0	26
2013	0	18	0	0	0	0	3
2014	0	18	0	35	53	246	59
2015	35	405	0	0	352	334	188
2016	0	299	0	0	18	370	114
2021	0	0	0	0	0	35	6
2022	18	53	0	0	194	194	76

Table K4: Biomass (pounds) – Western Mosquitofish

Biomass (lbs), Western Mosquitofish							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2008	0.0000	0.0007	0.0000	0.0000	0.0000	0.0000	0.0007
2012	0.0000	0.0000	0.0000	0.0053	0.0000	0.0000	0.0053
2013	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0002
2014	0.0000	0.0004	0.0000	0.0013	0.0049	0.0117	0.0183
2015	0.0004	0.0137	0.0000	0.0000	0.0119	0.0163	0.0423
2016	0.0000	0.0082	0.0000	0.0000	0.0002	0.0060	0.0143
2021	0.0000	0.0000	0.0000	0.0000	0.0000	0.0020	0.0020
2022	0.0004	0.0040	0.0000	0.0000	0.0037	0.0172	0.0254

APPENDIX L

Salmonidae – Trout & Salmon Family

Multi-pass Depletion Summary Data: Fall, 2007-2025

For the following tables, a dashed line indicates the site was not surveyed.

Table L1a: Catch-per-unit Effort – Brook Trout

Catch-per-Unit Effort (CPUE), Brook Trout							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2010	0.1	1.1	0.0	0.2	0.0	0.0	0.2
2021	0.3	0.0	0.0	0.0	0.0	0.0	0.1

Table L1b: Catch-per-unit Effort – Brown Trout

Catch-per-Unit Effort (CPUE), Brown Trout							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2022	0.2	0.0	0.5	0.1	0.0	0.0	0.13
2023	-	-	-	0.1	0.0	0.0	0.03

Table L1c: Catch-per-unit Effort – Hatchery Rainbow Trout

Catch-per-Unit Effort (CPUE), Rainbow Trout - Hatchery							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	1.2	3.6	0.3	0.7	0.0	0.0	1.0
2008	0.0	0.0	0.2	0.0	0.0	0.0	0.0
2009	0.4	0.1	0.0	0.0	0.0	0.0	0.1
2010	0.1	0.2	0.3	0.0	0.0	0.0	0.1
2011	0.0	0.0	0.7	0.7	0.0	0.0	0.2
2012	0.1	0.0	0.4	0.0	0.0	0.0	0.1
2013	0.3	0.2	0.1	0.2	0.0	0.0	0.1
2014	0.0	0.0	0.1	0.0	0.0	0.0	0.0
2015	0.0	0.0	0.1	0.0	0.0	0.0	0.0
2016	0.3	0.0	1.0	0.4	0.0	0.0	0.3
2017	-	-	-	0.5	0.1	-	0.3
2018	0.3	0.5	0.6	0.5	0.0	0.0	0.3
2019	0.0	-	4.3	1.1	0.0	0.0	0.9
2021	0.2	1.2	2.0	4.8	0.5	0.1	1.2
2022	0.0	0.0	0.5	1.0	0.0	0.0	0.2
2023	-	-	-	2.9	0.0	0.0	0.5
2024	0.1	-	0.6	0.2	0.0	0.0	0.2
2025	1.1	-	0.0	0.0	0.0	0.0	0.3

Table L1d: Catch-per-unit Effort – “Wild” Rainbow Trout

Catch-per-Unit Effort (CPUE), Rainbow Trout - "Wild"							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	0.9	0.4	1.1	0.0	0.3	0.0	0.5
2008	1.0	0.7	1.1	1.4	0.1	0.0	0.7
2009	0.7	0.1	1.2	0.3	0.0	0.0	0.4
2010	0.9	0.0	0.0	0.7	0.0	0.0	0.3
2011	0.0	0.6	0.6	0.4	0.0	0.0	0.3
2012	0.8	0.3	1.4	0.8	0.1	0.0	0.6
2013	0.4	0.0	0.6	0.6	0.0	0.0	0.3
2015	0.1	0.0	0.1	0.0	0.0	0.0	0.1
2016	0.0	0.0	0.3	0.8	0.0	0.2	0.2
2017	-	-	-	0.4	0.0	-	0.2
2018	0.1	0.3	1.1	1.3	0.0	0.0	0.4
2019	0.1	-	0.5	1.4	0.0	0.0	0.4
2021	0.3	0.1	1.3	0.2	0.0	0.0	0.3
2022	0.1	0.0	0.0	0.1	0.0	0.0	0.0
2023	-	-	-	0.8	0.4	0.4	0.5
2024	0.9	-	0.4	0.4	0.0	0.2	0.4
2025	0.1	-	0.1	0.3	0.0	0.0	0.1

Table L2a: Population Estimates – Brook Trout

Population Estimate (95% CI, Lower CI Adjusted), Brook Trout						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2010	1 (1-1)	7 (7-7)	0 (0-0)	1 (1-1)	0 (0-0)	0 (0-0)
2021	3 (3-4)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)

Table L2b: Population Estimates – Brown Trout

Population Estimate (95% CI, Lower CI Adjusted), Brown Trout						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2022	2 (2-7)	0 (0-0)	8 (4-50)	1 (1-1)	0 (0-0)	0 (0-0)
2023	-	-	-	1 (1-1)	0 (0-0)	0 (0-0)

Table L2c: Population Estimates – Hatchery Rainbow Trout

Population Estimate (95% CI, Lower CI Adjusted), Hatchery Rainbow Trout						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2007	9 (9-10)	40 (32-56)	2 (2-15)	8 (8-8)	0 (0-0)	0 (0-0)
2008	0 (0-0)	0 (0-0)	1 (1-1)	0 (0-0)	0 (0-0)	0 (0-0)
2009	3 (3-3)	1 (1-1)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
2010	1 (1-1)	1 (1-1)	2 (2-2)	0 (0-0)	0 (0-0)	0 (0-0)
2011	0 (0-0)	0 (0-0)	6 (6-7)	3 (3-6)	0 (0-0)	0 (0-0)
2012	1 (1-1)	0 (0-0)	3 (3-4)	0 (0-0)	0 (0-0)	0 (0-0)
2013	2 (2-7)	1 (1-1)	1 (1-1)	1 (1-1)	0 (0-0)	0 (0-0)
2014	0 (0-0)	0 (0-0)	1 (1-1)	0 (0-0)	0 (0-0)	0 (0-0)
2015	0 (0-0)	0 (0-0)	1 (1-1)	0 (0-0)	0 (0-0)	0 (0-0)
2016	2 (2-2)	0 (0-0)	7 (7-8)	2 (2-2)	0 (0-0)	0 (0-0)
2017	-	-	-	4 (4-6)	1 (1-1)	-
2018	4 (4-4)	4 (4-4)	4 (4-6)	3 (3-4)	0 (0-0)	0 (0-0)
2019	0 (0-0)	-	41 (26-79)	13 (8-40)	0 (0-0)	0 (0-0)
2021	2 (2-26)	10 (10-12)	11 (11-14)	27 (25-33)	4 (4-9)	1 (1-1)
2022	0 (0-0)	0 (0-0)	4 (4-4)	7 (7-8)	0 (0-0)	0 (0-0)
2023	-	-	-	22 (22-23)	0 (0-0)	0 (0-0)
2024	1 (1-1)	-	18 (6-140)	3 (3-3)	0 (0-0)	0 (0-0)
2025	28 (28-28)	-	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)

Table L2d: Population Estimates – “Wild” Rainbow Trout

Population Estimate (95% CI, Lower CI Adjusted), "Wild" Rainbow Trout						
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood
2007	24 (7-200)	4 (4-5)	8 (8-10)	0 (0-0)	3 (3-8)	0 (0-0)
2008	7 (7-10)	4 (4-7)	7 (7-9)	8 (8-10)	1 (1-1)	0 (0-0)
2009	5 (5-6)	1 (1-1)	11 (11-13)	2 (2-26)	0 (0-0)	0 (0-0)
2010	8 (8-10)	0 (0-0)	0 (0-0)	3 (3-8)	0 (0-0)	0 (0-0)
2011	0 (0-0)	3 (3-8)	5 (5-8)	2 (2-7)	0 (0-0)	0 (0-0)
2012	18 (6-140)	3 (3-8)	12 (12-14)	9 (9-9)	1 (1-1)	0 (0-0)
2013	3 (3-8)	0 (0-0)	4 (4-6)	4 (4-6)	0 (0-0)	0 (0-0)
2015	1 (1-1)	0 (0-0)	1 (1-1)	0 (0-0)	0 (0-0)	0 (0-0)
2016	0 (0-0)	0 (0-0)	2 (2-2)	4 (4-6)	0 (0-0)	1 (1-1)
2017	-	-	-	3 (3-8)	0 (0-0)	-
2018	1 (1-1)	2 (2-2)	7 (7-10)	8 (8-9)	0 (0-0)	0 (0-0)
2019	1 (1-1)	-	3 (3-8)	10 (10-11)	0 (0-0)	0 (0-0)
2021	3 (3-6)	1 (1-1)	8 (8-10)	1 (1-1)	0 (0-0)	0 (0-0)
2022	1 (1-1)	0 (0-0)	0 (0-0)	1 (1-1)	0 (0-0)	0 (0-0)
2023	-	-	-	6 (6-9)	4 (4-6)	5 (5-5)
2024	13 (12-18)	-	3 (3-8)	4 (4-7)	0 (0-0)	3 (3-4)
2025	1 (1-1)	-	1 (1-1)	2 (2-7)	0 (0-0)	0 (0-0)

Table L3a: Estimated Fish per Mile – Brook Trout

Estimated Fish per Mile, Brook Trout							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2010	18	123	0	18	0	0	26
2021	53	0	0	0	0	0	9

Table L3b: Estimated Fish per Mile – Brown Trout

Estimated Fish per Mile, Brown Trout							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2022	35	0	141	18	0	0	32
2023	-	-	-	18	0	0	6

Table L3c: Estimated Fish per Mile – Hatchery Rainbow Trout

Estimated Fish per Mile, Rainbow Trout - Hatchery							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	158	704	35	141	0	0	173
2008	0	0	18	0	0	0	3
2009	53	18	0	0	0	0	12
2010	18	18	35	0	0	0	12
2011	0	0	106	53	0	0	26
2012	18	0	53	0	0	0	12
2013	35	18	18	18	0	0	15
2014	0	0	18	0	0	0	3
2015	0	0	18	0	0	0	3
2016	35	0	123	35	0	0	32
2017	-	-	-	70	18	-	44
2018	70	70	70	53	0	0	44
2019	0	-	722	229	0	0	190
2021	35	176	194	475	70	18	161
2022	0	0	70	123	0	0	32
2023	-	-	-	387	0	0	129
2024	18	-	317	53	0	0	77
2025	493	-	0	0	0	0	99

Table L3d: Estimated Fish per Mile – “Wild” Rainbow Trout

Estimated Fish per Mile, Rainbow Trout - "Wild"							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Overall
2007	422	70	141	0	53	0	114
2008	123	70	123	141	18	0	79
2009	88	18	194	35	0	0	56
2010	141	0	0	53	0	0	32
2011	0	53	88	35	0	0	29
2012	317	53	211	158	18	0	126
2013	53	0	70	70	0	0	32
2015	18	0	18	0	0	0	6
2016	0	0	35	70	0	18	21
2017	-	-	-	53	0	-	26
2018	18	35	123	141	0	0	53
2019	18	-	53	176	0	0	49
2021	53	18	141	18	0	0	38
2022	18	0	0	18	0	0	6
2023	-	-	-	106	70	88	88
2024	229	-	53	70	0	53	81
2025	18	-	18	35	0	0	14

Table L4a: Biomass (pounds) – Brook Trout

Biomass (lbs), Brook Trout							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2010	2.0	16.4	0.0	1.3	0.0	0.0	19.7
2021	2.2	0.0	0.0	0.0	0.0	0.0	2.2

Table L4b: Biomass (pounds) – Brown Trout

Biomass (lbs), Brown Trout							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2022	0.12	0.00	0.26	0.04	0.00	0.00	0.4
2023	-	-	-	0.41	0.00	0.00	0.4

Table L4c: Biomass (pounds) – Hatchery Rainbow Trout

Biomass (lb), Rainbow Trout - Hatchery							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2007	0.56	2.35	0.16	0.44	0.00	0.00	3.5
2008	0.00	0.00	0.87	0.00	0.00	0.00	0.9
2009	1.54	0.48	0.00	0.00	0.00	0.00	2.0
2010	0.53	0.60	1.63	0.00	0.00	0.00	2.8
2011	0.00	0.00	7.39	2.47	0.00	0.00	9.9
2012	0.58	0.00	0.93	0.00	0.00	0.00	1.5
2013	0.85	0.64	0.14	0.15	0.00	0.00	1.8
2014	0.00	0.00	0.19	0.00	0.00	0.00	0.2
2015	0.00	0.00	1.18	0.00	0.00	0.00	1.2
2016	1.59	0.00	5.67	0.95	0.00	0.00	8.2
2017	-	-	-	3.37	1.58	-	4.9
2018	2.66	1.32	4.61	0.84	0.00	0.00	9.4
2019	0.00	-	9.03	2.47	0.00	0.00	11.5
2021	0.12	2.53	6.77	1.49	0.37	0.05	11.3
2022	0.00	0.00	2.37	4.49	0.00	0.00	6.9
2023	-	-	-	10.56	0.00	0.00	10.6
2024	0.28	-	16.96	0.58	0.00	0.00	17.8
2025	8.04	-	0.00	0.00	0.00	0.00	8.0

Table L4d: Biomass (pounds) – “Wild” Rainbow Trout

Biomass (lb), Rainbow Trout - "Wild"							
Year	Winton	Alta	Avo Boulder	Avo Side	Greenbelt	Wildwood	Total
2007	0.53	0.21	5.33	0.00	0.14	0.00	6.2
2008	0.72	0.20	0.72	0.80	0.06	0.00	2.5
2009	1.01	0.11	2.84	0.51	0.00	0.00	4.5
2010	0.89	0.00	0.00	0.73	0.00	0.00	1.6
2011	0.00	0.38	5.79	0.51	0.00	0.00	6.7
2012	0.54	0.18	1.36	1.15	1.65	0.00	4.9
2013	0.42	0.00	0.53	0.45	0.00	0.00	1.4
2015	0.59	0.00	0.06	0.00	0.00	0.00	0.7
2016	0.00	0.00	0.74	0.62	0.00	0.66	2.0
2017	-	-	-	0.99	0.00	-	1.0
2018	0.07	0.18	1.28	0.88	0.00	0.00	2.4
2019	0.10	-	4.46	2.11	0.00	0.00	6.7
2021	0.17	0.05	0.45	0.06	0.00	0.00	0.7
2022	0.05	0.00	0.00	0.16	0.00	0.00	0.2
2023	-	-	-	1.54	2.08	2.82	6.4
2024	1.84	-	0.62	0.71	0.00	1.46	4.6
2025	0.12	-	No Data	0.20	0.00	0.00	0.3

APPENDIX M

Trout Stocking Information: 2007-2025

Table M1. Number of trout stocked by CDFW in the Kings River below Pine Flat Dam, per year and size class, since 2007. Rainbow trout are most stocked, but brook trout, brown trout, and golden trout may be stocked.

Year	Fingerling	Sub-Catchable	Catchable	Super-Catchable	Trophy	Total Fish
2007	0	25,000	31,264	1,891	1,127	59,282
2008	14,592	2,410	25,328	2,610	1,980	46,920
2009	0	34,579	30,680	2,658	1,492	69,409
2010	10	26,720	34,666	3,775	210	65,381
2011	2,774	27,848	31,088	3,863	0	65,573
2012	22,654	0	33,615	3,655	439	60,363
2013	0	50,219	23,706	3,959	930	78,814
2014	0	30,960	24,967	5,124	0	61,051
2015	0	27,092	11,080	2,509	0	40,681
2016	60	0	36,396	5,822	0	42,278
2017	8,736	0	8,310	5,127	543	22,716
2018	0	0	27,647	833	1,029	29,509
2019	0	43,485	52,303	2,373	0	98,161
2020	0	34,031	53,635	695	0	88,361
2021	0	24,990	23,080	1,625	789	50,484
2022	80,031	0	26,310	2,962	0	109,303
2023	0	25,000	19,970	373	248	45,591
2024	0	52,734	37,073	660	3,147	93,614
2025	0	34,380	40,377	663	1,163	76,583

Table M2. Number of supplemental trout stocked in the Kings River below Pine Flat Dam, per year and size class, since 2018. The KRFMP began stocking in 2018 and KRCD in 2021.

Year	Catchable		Super-Catchable		Total Fish
	KRFMP	KRCD	KRFMP	KRCD	
2018	26,400	NA	0	NA	26,400
2019	52,440	NA	0	NA	52,440
2020	42,730	NA	1,008	NA	43,738
2021	24,804	5,064	0	4,184	34,052
2022	25,478	13,850	0	0	39,328
2023	21,432	22,141	0	0	43,573
2024	33,792	39,000	0	0	72,792
2025	30,000	34,500	670	0	65,170

Table M3. Stocking information for the Trout Incubator Program since 2006. Shows number of eggs incubated by fiscal year and estimated number of fry released. A question mark indicates no information is available. From 2007-2012 rainbow trout eggs were hatched in streamside incubators. Since 2012 they have been hatched in the incubator building.

Fiscal Year	Eggs Incubated (#)	Fry Released (Minimum Est #)
2006-2007	166,000	87,500
2007-2008	150,000	?
2008-2009	300,000	?
2009-2010	300,000	?
2010-2011	150,000	?
2011-2012	150,000	?
2012-2013	482,000	?
2013-2014	300,000	?
2014-2015	300,000	?
2015-2016	304,000	90,000 ^a
2016-2017	324,000	210,000
2017-2018	370,000	214,000
2018-2019	232,000	149,000
2019-2020	331,000	202,000
2020-2021	205,000	123,000
2021-2022	220,000	167,000
2022-2023	242,000	147,000
2023-2024	285,000	169,000
2024-2025	277,000	155,000

^a - actual release higher, estimate provided is from only one of three incubation runs

APPENDIX N

Water Year Information: 2007-2025

Table N1. Annual runoff in the Kings River watershed and percentage of average per water year. The water year runs from October 1 through September 30.

Water Year	Annual Runoff (Acre Feet)	Water Year (%)
2007	679,000	40
2008	1,216,000	72
2009	1,348,000	80
2010	2,062,000	122
2011	3,318,000	196
2012	826,000	49
2013	691,000	41
2014	537,000	32
2015	361,000	21
2016	1,253,000	74
2017	4,096,000	242
2018	1,275,000	75
2019	2,177,000	171
2020	913,000	54
2021	396,000	23
2022	786,000	47
2023	4,510,000	265
2024	1,615,000	95
2025	1,234,000	73

APPENDIX O

Special Study: 2025

Thorburn Channel

The Thorburn Channel is a 2,200-foot engineered channel located on private property under a 50-year KRCD easement. Fishing is prohibited within the channel and within 200 feet of its confluence with the Kings River. Constructed in 2000 to enhance spawning and rearing habitat, the channel includes a headgate to regulate instream flows, placed spawning gravel, large woody debris, and a k-rail that forms a rearing pool before the channel reenters the river. Since construction, multiple high-flow events have led to substantial sediment deposition within the channel.

The survey was conducted within the portion of the channel identified for future habitat enhancement under the KRFMP. The resulting data will support pre-project monitoring for planned improvements, which include removing the headgate, accumulated sediment, and the existing k-rail, along with other channel modifications intended to improve flow and reduce future sediment deposition.

The 300-foot survey reach had an instream flow of 0.12 cfs at the time of sampling on November 20, 2025. The site was characterized by shallow water (1–8 inches deep), a channel width of approximately 1–10 feet, and the presence of emergent vegetation, large woody debris, and scattered boulders. Fine sediment dominated the substrate, with occasional pockets of small gravel in the thalweg and some larger cobble.

A total of 539 fish, representing seven species, were collected, with corresponding data entered in MicroFish 3.0 for analysis. Results are found below in Tables O1 and O2. Native fish dominated the survey in both abundance (84.0%) and biomass (90.1%). The species assemblage was dominated by native three-spine stickleback (60.3%) (Table O1).

Table O1: *Species collected, species composition, and catch-per-unit effort, Thorburn Channel.*

Thorburn Channel: November 20, 2025			
Species Collected	Captured (#)	Species Composition (%)	Catch-per-unit Effort (per hour)
Three-spine Stickleback	325	60.3	116.9
Sacramento Sucker	83	15.4	29.9
Western Mosquitofish ^a	76	14.1	27.3
Sacramento Pikeminnow	22	4.1	7.9
Lamprey sp.	20	3.7	7.2
Bass sp. ^a	10	1.9	3.6
Sculpin sp.	3	0.6	1.1

^a Introduced (non-native to the watershed)

Table O2: *Population Estimate, Fish per Mile, Biomass, and lengths of fish collected at the Thorburn Channel.*

Thorburn Channel: November 20, 2025				
Species Collected	Population Estimate (95% CI, Lower Adjusted)	Fish per Mile (Estimated)	Biomass (Pounds)	Lengths (in)
Three-spine Stickleback	387 (350-424)	6,811	0.306	1-3
Sacramento Sucker	84 (83-87)	1,478	0.236	1-4
Western Mosquitofish ^a	92 (76-112)	1619	0.047	1-2
Sacramento Pikeminnow	23 (22-27)	405	0.054	1-4
Lamprey sp.	20 (20-20)	352	0.097	1-7
Bass sp. ^a	10 (10-11)	176	0.031	2-3
Sculpin sp.	3 (3-6)	53	0.020	2-3

^a Introduced (non-native to the watershed)

The species observed indicate that the Thorburn Channel provided suitable habitat for juvenile bass, Sacramento pikeminnow, Sacramento suckers, lamprey, sculpin, three-spine stickleback, and western mosquitofish during the survey. Shallow, slow-moving water and emergent vegetation supported juvenile fish by offering cover and reducing predation risk. The detection of sculpin, absent from previous surveys, suggests a possible reduction in sediment deposition, as the species prefers gravel and cobble substrates over fine sediments.

Lamprey life stage was not determined, though habitat conditions were suitable for both larvae and adults, with soft sediments favoring larval development. Multiple size classes of stickleback indicate that spawning habitat was adequate. Western mosquitofish captured

were likely adults; their presence may represent either an emerging resident population or introductions through mosquito-abatement activities.

Continued annual monitoring at this site will document changes in the fish assemblage over time. These data will support evaluations of pre- and post-project conditions as channel improvements modify streamflow and influence channel function in subsequent years.