NORMANDEAU ASSOCIATES
Environmental Consultants

Memorandum

DATE: 19 June 2018
TO: Rich Marovich, Roland Sanford, and Chris Lee, Solano County Water Agency (SCWA)
FROM: Tim Salamunovich, Normandeau Associates
RE: Results of October 2017 lower Putah Creek fish surveys (**FINAL**)

Normandeau Associates Arcata Office staff has been sampling the fish fauna of lower Putah Creek using tote barge electrofishing since August 1991. Students from the University of California at Davis (UCD) have been regularly sampling the creek near campus using a combination of boat/backpack electrofishing, seining, and gill netting each fall since 1978. Following the May 2000 Putah Creek Accord, Normandeau continued surveying multiple sites along the creek each October as part of an annual fish monitoring program under the aegis of the Lower Putah Creek Coordinating Committee. Part of the Accord required releases of late fall supplemental flows to attract anadromous fish into lower Putah Creek to spawn. Another stipulation requires elevated natural or managed flows in the late winter or spring to enhance native fish spawning opportunities in the lower basin. A database containing all the raw data (individual fish lengths and weight data by site and survey date) for the entire period of record is regularly updated and managed by SCWA. The data through 2008 was the focus of a scientific publication that demonstrated the recovery of native fishes in the upper 12.5 miles of the creek (upstream of Pedrick Road [County Road 98]) following the native fish rearing and spawning flows instituted under the Accord (Kiernan et al. 2012).

Normandeau crews, assisted by SCWA staff, sampled nine sites along 19 miles of the lower creek between Putah Diversion Dam (PDD) and Mace Boulevard (County Road 104; Figure 1) on 17-19 October 2016. Two additional sites near the UCD campus (Figure 1) were sampled on 4 November 2017 by a UCD fisheries class, and the results were generously provided for review. This memo report will present the results of both of these two most recent sampling efforts.

The objective of the electrofishing survey was to determine the distribution and relative abundance of fish populations in lower Putah Creek. Normandeau crews captured fish using a Smith-Root gas powered generator and pulsator (model 2.5 GPP) operated out of a small pram. Two biologists wading alongside the pram used electrofishing probes to attract and stun fish. Two additional biologists netted and captured stunned fish and transferred them to buckets located in the front of the pram. A fifth person rowed or pulled the pram and was primarily responsible for shutting off the electric current in the event of a mishap. Sampling effort was emphasized along the margins of the creek around instream cover and overhead vegetation, but additional effort was still allocated to open water portions of the creek. Total effort expended at each site was made approximately equal by a combination of measurements of stream area and shocking seconds. Less effort was expended at the Winters Putah Creek Park site due to extreme

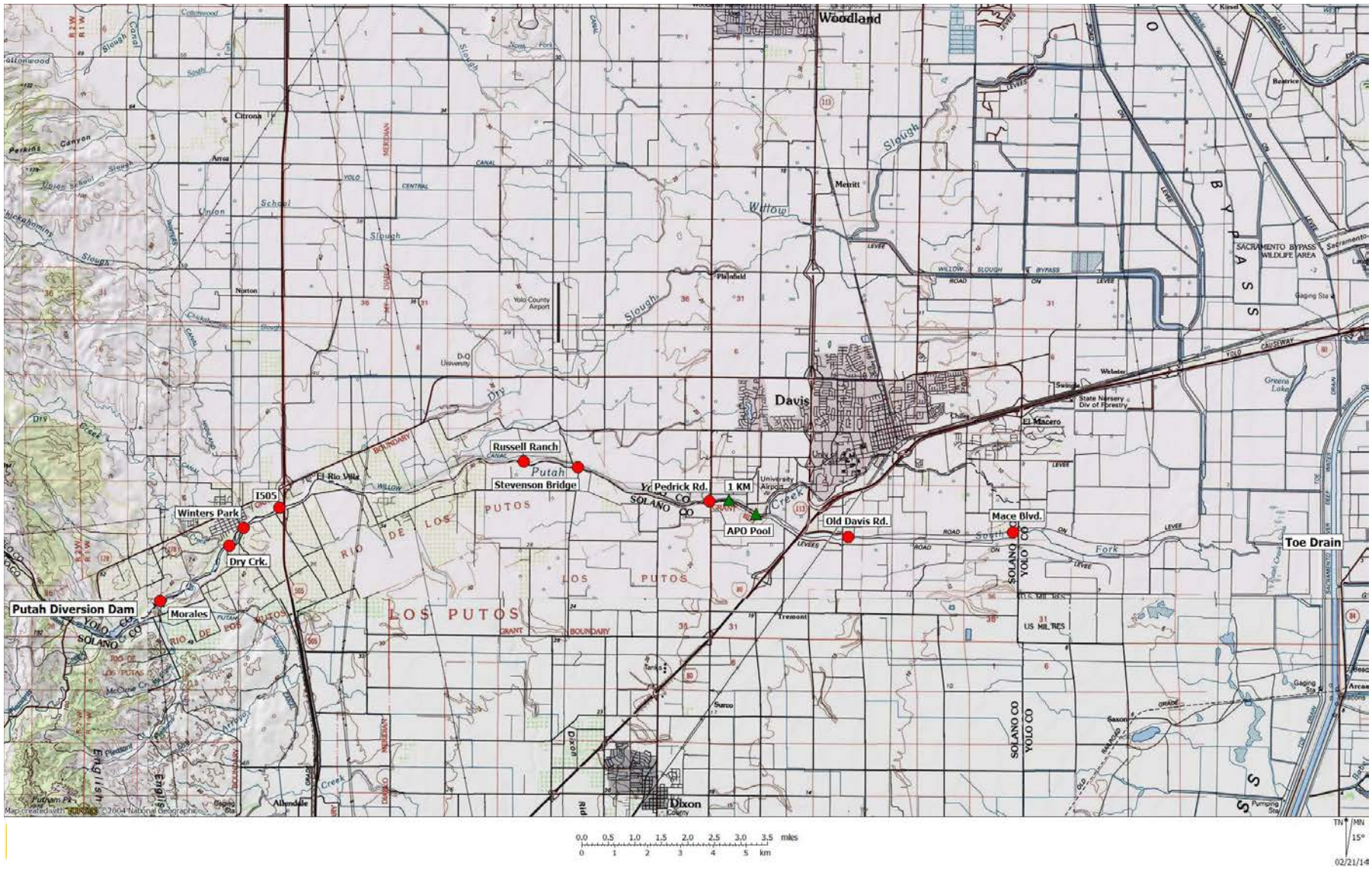

Figure 1. Map showing the nine Normandeau sample sites (red circles) and two UCD sample sites (green triangles) surveyed along lower Putah Creek in October 2017.

depths between riffle habitats. At this site sampling was concentrated at 75-125 feet of shallow water habitats associated with two boulder weir structures.

All stunned fish were netted and held in 5-gallon buckets of creek water equipped with small bait-bucket aerators. Captured fish were periodically transferred to a live cart until the completion of sampling, at which time the fish were identified and measured to nearest millimeter using either fork length (FL) or total length (TL). A sub-sample of the catch was also weighed to nearest 0.1 gram to determine condition factors (length-weight ratios) prior to release. All rainbow trout captured during the surveys were weighed to evaluate condition factor. The trout were anesthetized in weak CO_2 solution prior to handling to reduce movement and injury during the measurement and weighing process. After handling, all trout were allowed to recover in an aeration bucket until fully mobile prior to their release back into the creek.

Two additional sites (the Alpha Phi Omega [APO] pool and the 1 Kilometer [1 KM] sites) were sampled by students of the UCD Wildlife, Fish, & Conservation Biology class on 4 November 2017 (Figure 1). UCD sampling used a variety of capture gear including beach seines, gillnets, minnow traps and a boat shocker (equipped with a 5.0 GPP) at the APO Site; and backpack electrofishers at the 1 KM Site. All fish were identified, enumerated, and most were measured to standard length (SL) and released.

As specified in the Accord, flows in Putah Creek at Interstate 80 Bridge near Davis are monitored and dam releases to the lower creek are adjusted to maintain minimum flows of at least 5 cfs (or higher) at that location throughout the year (Table 1). This flow requirement ensures maintenance of a live stream throughout 15.5 miles of the lower basin, even during dry and critically dry water years. In addition, the Accord includes supplemental flow releases into the lower basin to attract anadromous salmonids in the late fall and early spring releases to promote native fish spawning (if they do not occur naturally).

The 2017 Water Year, which ended three weeks prior to sampling, was classified as a wet water year for the Sacramento basin according the Sacramento Valley 40-30-30 Hydrologic Classification Index (DWR California Data Exchange Center, Water Supply Index WSIHIST (04/02/18 1537)). Water Year 2017 was only the second normal or above water year in the last decade. Eight of the past ten years in the Sacramento Valley have been classified as below normal, dry, or critical. Mean daily flows in lower Putah Creek (as measured at the Putah Diversion Dam release point) during the period of fish spawning and rearing for the year prior to sampling is shown in Figure 2.

Unlike the past several years when dry periods have prevailed, 2017 had extended periods of high flow (Figure 2; Table 2). The maximum daily flow for the water year immediately prior to sampling was 9,326 cfs cubic feet per second (cfs) and extended periods of high flow throughout the winter and spring were the result of a wet winter (35.4 inches of rain recorded at SCWA's PDO during December through February [BOR 2017]) which filled Lake Berryessa and caused spill from the Monticello Dam glory hole into Putah Creek for much of the late winter and spring (Figure 3). Monticello spill, plus accretion from Cold Canyon, Pleasants, McCune and Dry creeks, contributed to the extended period of high flow in lower Putah Creek during the winter and spring of 2017.

Table 1. Mean daily flow requirements for Putah Creek at Interstate 80.

Month	Minimum Flow Requirement (cfs)
October	5
November	10
December	10
January	15
February	15
March	25
April	30
May	20
June	15
July	15
August	10
September	5

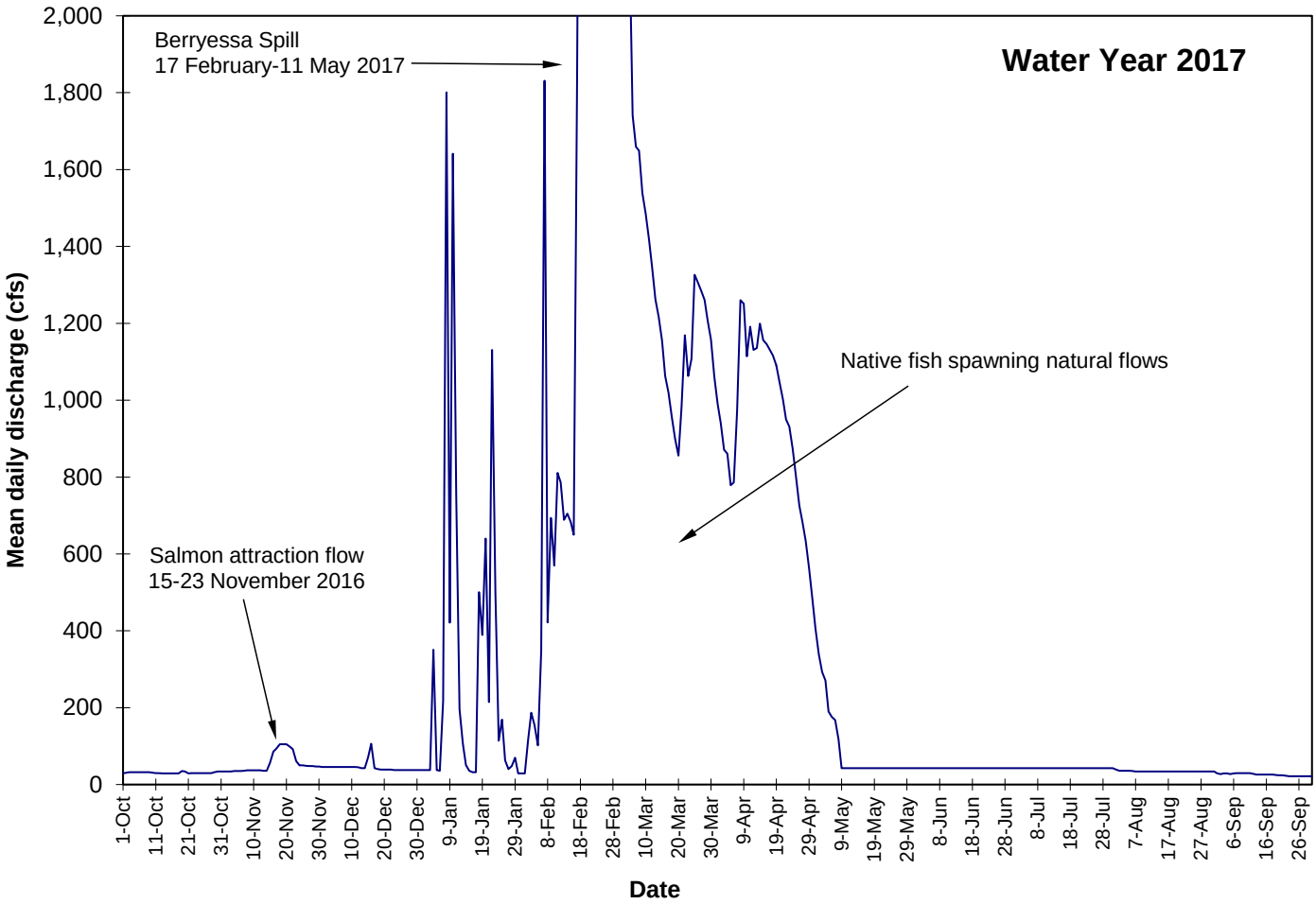

Figure 2. Mean daily discharge released into lower Putah Creek at the Putah Diversion Dam during the 2017 Water Year and prior to the October 2017 survey. Note that the sixteen days of peak flows above 2,000 cfs are not shown.

Table 2. Number of days that mean daily releases from Putah Diversion Dam exceeded certain values during the 2017 water year (1 October 2016–30 September 2017). Data from USBR Mid-Pacific Region, Central Valley Operations Website.

Exceedance (cubic feet per second)	Number of Days
≥ 7,500 cfs	2
≥ 5,000 cfs	6
≥ 2,500 cfs	14
≥ 1,000 cfs	57
≥ 500 cfs	88
≥ 250 cfs	98
≥ 100 cfs	116
≥ 50 cfs	128
≥ 25 cfs	354

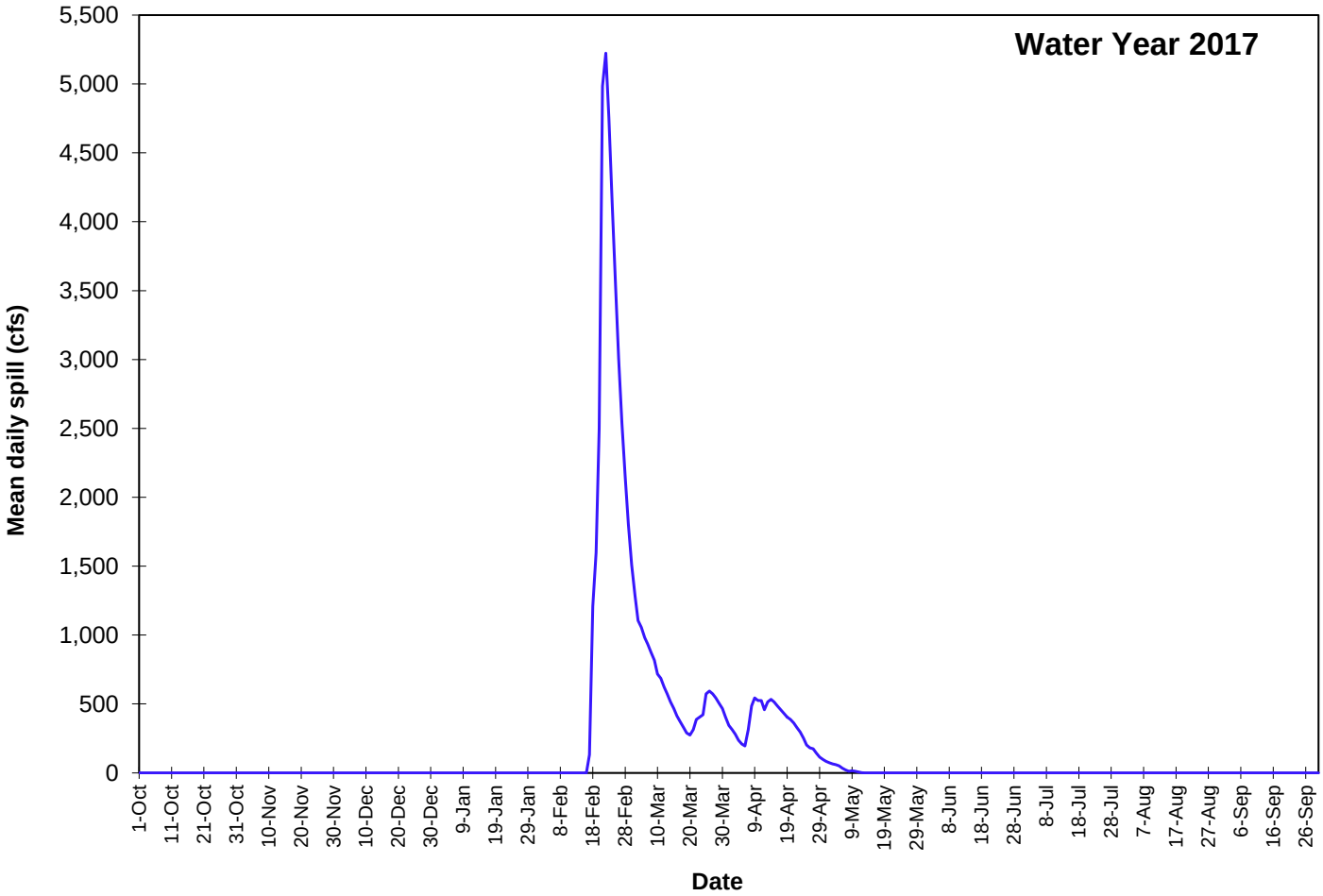

Figure 3. Mean daily spill from Lake Berryessa into Putah Creek during the 2017 Water Year and prior to the October 2017 survey.

Early springtime native fish spawning occurred during this extended runoff and did not require the use of managed flow releases. The mean annual flow below Putah Diversion Dam for the 2017 Water Year was 469 cfs, which was ten times higher than the average mean annual flow of 46 cfs for the previous ten water years (2007-2016). Stream flows during the October 2017 Normandeau surveys varied by site, but were relatively stable, ranging from 22 cfs at the Putah Diversion Dam to 19 cfs at Stevenson Bridge (Table 3). The UCD surveys occurred during the early November salmon attraction flows and were around 50 cfs at the I80 gage at the time (Table 3).

Table 3. River mile location, sample date, survey time, stream flow, water temperature, conductivity, and salinity at time of survey for the eleven lower Putah Creek study sites during the October/November 2017 fish monitoring surveys. River mile notation is based upon USBR convention where RM 0.0 is point where creek enters the Yolo Bypass.

Site	River Mile	Date	Time	Flow [1/] (cfs)	Temp (°C)	DO (mg/L)	Cond (µS/cm)	Salinity (ppt)
Putah Diversion Dam	22.6	10/19/17	1253	22.0	13.7	10.14	239	0.1
Dry Creek confluence	20.3	10/19/17	1535	22.0	14.8	10.69	242	0.1
Winters Park (upper weir)	19.8	10/19/17	1005	22.3	13.5	9.60	238	0.1
Winters Park (lower weir)	19.6	10/19/17	0855	22.3	13.2	9.50	237	0.1
Interstate 505 Bridge (I505)	18.9	10/18/17	1720	19.8	14.5	9.63	243	0.1
Russell Ranch	13.7	10/18/17	1335	19.4	14.8	9.35	310	0.2
Stevenson Road Bridge	12.8	10/18/17	0930	19.4	14.1	9.06	314	0.2
Pedrick Road Bridge	9.9	10/17/17	1537	20.1	15.8	9.97	322	0.2
1 Kilometer Site (1 KM)	9.4	11/04/17	1045	48.3	---	---	---	---
Alpha Phi Omega (APO) Pool	9.1	11/04/17	1045	50.0	14.8	8.70	400	---
Old Davis Road Bridge	7.2	10/17/17	1230	19.7	14.8	9.91	317	0.2
Mace Boulevard Bridge	3.8	10/17/17	1015	19.7	13.6	9.64	318	0.2

1/ Flow data provided by Solano County Water Agency

Water temperatures measured during the October surveys varied by site as a function of both the time of day and the distance downstream of the Putah Diversion Dam release point (Table 3). The temperatures ranged from 13.2° to 15.8°C (55.8° to 60.4°F). Water conductivity (a measure of total dissolved solids) did not vary in the upper four miles of the project area, then remained higher (but stable) in the lower fifteen miles downstream of the I505 Site. Dissolved oxygen levels were relatively high and exceeded 8.5 mg/L at all the sites. No water quality data was recorded at the 1 KM Site during the UC Davis surveys.

The fall 2017 fish surveys of eleven sites along lower Putah Creek captured a total of 4,680 fish representing 24 species (Table 4). Four California native fish species: Sacramento sucker (*Catostomus occidentalis*), Sacramento pikeminnow (*Ptychocheilus grandis*), tule perch (*Hysterocarpus traskii*), and prickly sculpin (*Cottus asperi*) made up over seventy-four percent of the total catch in the lower basin (Figure 4). The most abundant non-native species included bluegill sunfish (*Lepomis macrochirus*), threadfin shad (*Dorosoma petenense*), largemouth bass (*Micropterus salmoides*) and redear sunfish (*L. microlophus*), which contributed almost nineteen percent of the total catch.

Table 4. Capture data for the October/November 2017 fish monitoring surveys on lower Putah Creek.

Fish	PDD	DRY	WPK	I505	RR	STEVE	PED	1KM	APO	OLD	MACE	Total
Native Fishes												
Sacramento pikeminnow (PKM)	38 (43-265 FL)	5 (98-306 FL)	10 (42-64 FL)	101 (37-140 FL)	248 (31-312 FL)	510 (38-238 FL)	268 (48-391 FL)	16 (53-98 SL)	3 (219-420 SL)	3 (67-97 FL)		1,202
Hitch (HTC)	1 (75 FL)											1
Sacramento sucker (SKR)	137 (48-418 FL)	36 (47-327 FL)	71 (49-311 FL)	385 (40-135 FL)	340 (54-337 FL)	323 (55-191 FL)	118 (72-372 FL)	2 (181-420 SL)	7 (59-460 SL)			1,419
Rainbow trout (RBT)	33 (146-315 FL)		9 (116-388 FL)	1 (182 FL)								43
Threespine stickleback (TSB)	10 (22-55 TL)	1 (43 TL)	1 (47 TL)									12
Prickly sculpin (PKS)	52 (46-95 TL)	34 (38-85 TL)	71 (43-117 TL)	101 (34-111 TL)	13 (47-115 TL)	10 (42-68 TL)	9 (45-77 TL)	2 (46-70 SL)	1 (41 SL)	3 (45-77 TL)		296
Riffle sculpin (RFS)	14 (62-98 TL)	1 (117 TL)	7 (70-123 TL)	1 (110 TL)								23
Tule perch (TP)	1 (107 FL)	20 (56-105 FL)	16 (56-87 FL)	106 (50-97 FL)	220 (65-130 FL)	178 (60-132 FL)	9 (95-118 FL)	1 (71 SL)	1 (81 SL)			552
Exotic Fishes												
Threadfin shad TFS)								131 (60-92 SL)	65 (55-87 SL)			196
Common Carp (CRP)									4 (470-620 SL)			4
Red shiner (RSH)							1 (63 FL)			2 (66-85 FL)		3
Fathead minnow (FHM)							1 (60 FL)	1 (56 SL)				2
Channel catfish (CCF)									1 (243 SL)			1
White catfish (WCF)										1 (102 FL)		1
Mississippi silverside (MSS)						1 (24 FL)	2 (50-55 FL)	1 (35 SL)	19 (37-70 SL)	18 (44-79 FL)	2 (51-60 FL)	43
Western mosquitofish (MSQ)								10 (23-37 SL)	51 (12-35 SL)	1 (17 TL)		62
Bluegill (BGS)							5 (38-73 TL)	17 (27-138 SL)	186 (18-145 SL)	109 (26-140 FL)	52 (38-145 FL)	369
Redear sunfish (RES)							3 (75-86 FL)	4 (50-168 SL)	80 (24-221 SL)	8 (67-202 FL)	27 (52-146 FL)	122
Green sunfish (GSF)				1 (108 FL)	1 (111 FL)	1 (94 FL)	6 (57-111 FL)	13 (33-113 FL)	8 (35-106 SL)	16 (34-116 FL)	3 (44-118 FL)	49
Unidentified sunfish								2 (23-36 SL)	1 (40 SL)			3
Redear sunfish X bluegill											1 (1115 FL)	1
Black crappie (BCR)									1 (140 SL)			1
Smallmouth bass (SMB)							4 (90-208 FL)	5 (90-230 SL)	3 (63-77 SL)	3 (97-206 FL)		15
Spotted bass (SPB)									3 (64-81 SL)	3 (88-142 FL)		6
Largemouth bass (LMB)		4 (84-173 FL)			2 (67-149 FL)	8 (107-247 FL)	41 (69-230 FL)	17 (47-84 SL)	57 (54-450 SL)	41 (58-295 FL)	17 (69-225 FL)	187
Bigscale logperch (BLP)					4 (73-91 TL)			1 (85 SL)	25 (64-85 SL)	24 (82-119 TL)	13 (82-117 TL)	67
Total # Individuals	286	101	185	696	828	1,031	467	223	516	232	115	4,680
# native fish	286	97	185	695	821	1,021	404	21	12	6	0	3,548
# exotic fish	0	4	0	1	7	10	63	202	504	226	115	1,132
Total # species	8	7	7	7	7	7	12	14	17	13	6	24
# native species	8	6	7	6	4	4	4	4	4	2	0	8
# exotic species	0	1	0	1	3	3	8	10	13	11	6	16
Shannon's Diversity (ln)	1.484	1.423	1.404	1.203	1.192	1.111	1.259	1.586	1.969	1.708	1.397	2.275
Eveness (H'/Hmax)	0.714	0.731	0.721	0.618	0.613	0.571	0.507	0.601	0.695	0.666	0.780	0.716

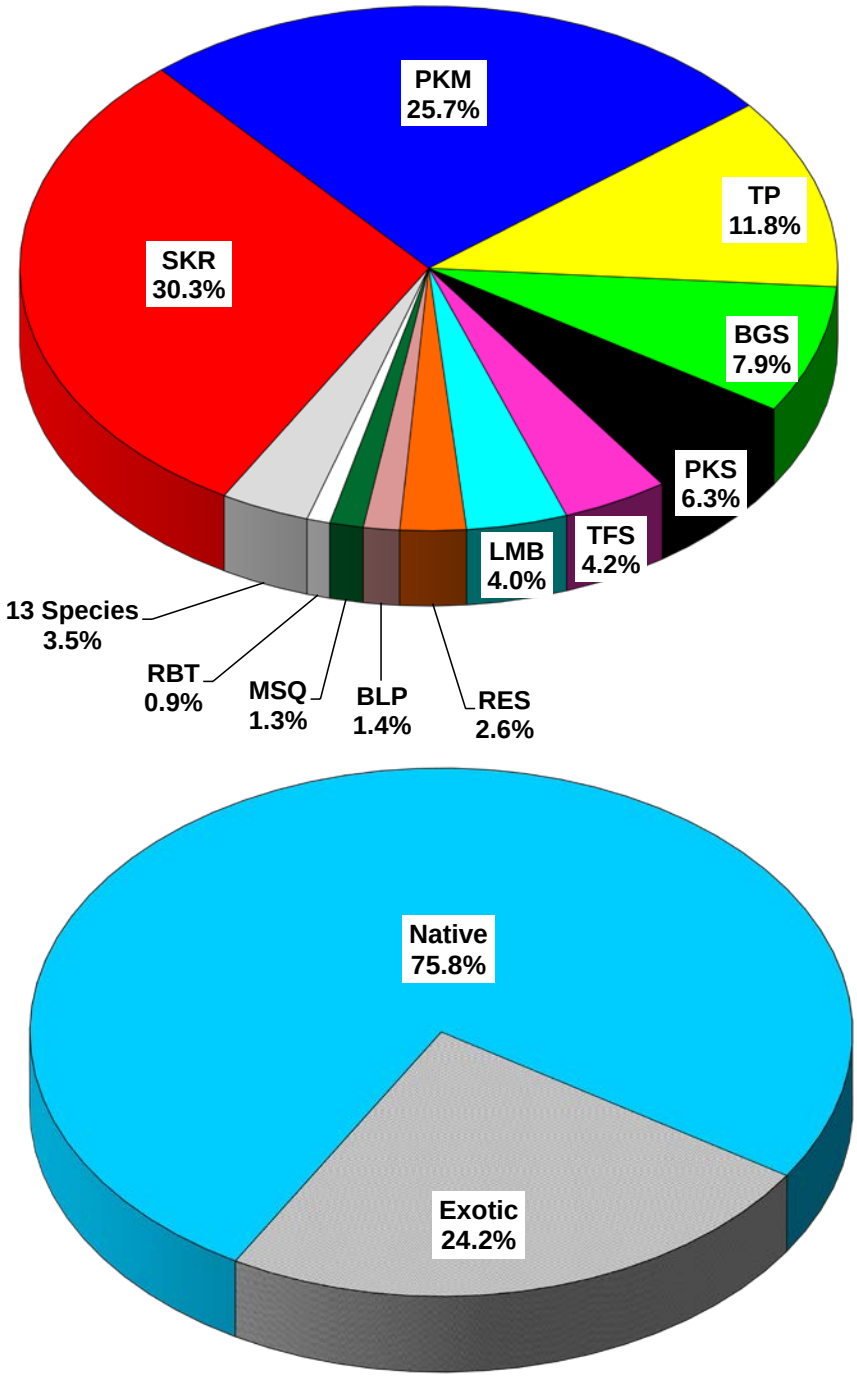

Figure 4. Percentage of total catch by fish species (top) and by native versus non-native (or exotic) species (bottom) for the Fall 2017 lower Putah creek fish surveys. Data includes both Normandeau and UCD surveys

Only forty-three rainbow trout were captured in the fall surveys and made up less than one percent of the total catch (Table 4; Figure 4).

Of the total fish captured in the October 2016 survey, 75.8 percent (3,548 fish from eight species) were native, or endemic Sacramento River basin fish, while 24.2 percent (1,132 fish from 16 species [not counting hybrids]) were non-native, or exotic fishes (Table 4; Figure 4).

The overall spatial distribution of fishes from the October/November 2017 survey remains similar to recent prior surveys and continues to demonstrate that lower Putah Creek supports a highly diverse fish fauna. Native fish continue to dominate the 12.7 miles of the lower basin between the Putah Diversion Dam at Winters and the Pedrick Road Bridge Site near Davis (Table 4; Figures 5 and 6). Downstream of Pedrick Road non-native fish dominate Putah Creek. One year of extended high flows did not appear to change the fish population distribution in lower Putah Creek. Despite the prolonged periods of high flows in the Putah Creek basin during 2017, by October, native fish still remain relatively rare in the lower ten miles of the basin. This unvarying and consistent pattern for native fish dominance at Pedrick Road and non-native fish dominance about a half mile downstream at the 1KM Site is likely a result some environmental factor such as summer water temperatures that appear to limit the downstream extent of the native fish fauna, which tend to prefer and thrive in cooler water temperatures compared to the non-native fishes.

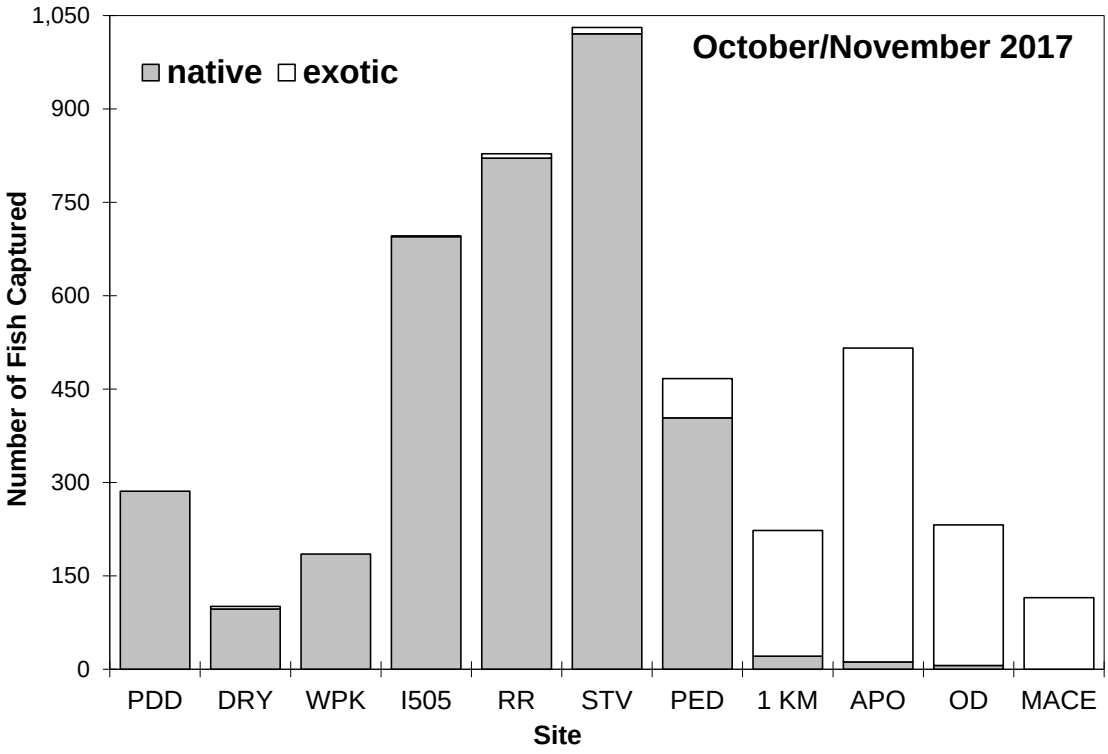

Figure 5. Number of native and exotic fish captured at each of the lower Putah Creek study sites during the October 2017 fish surveys.

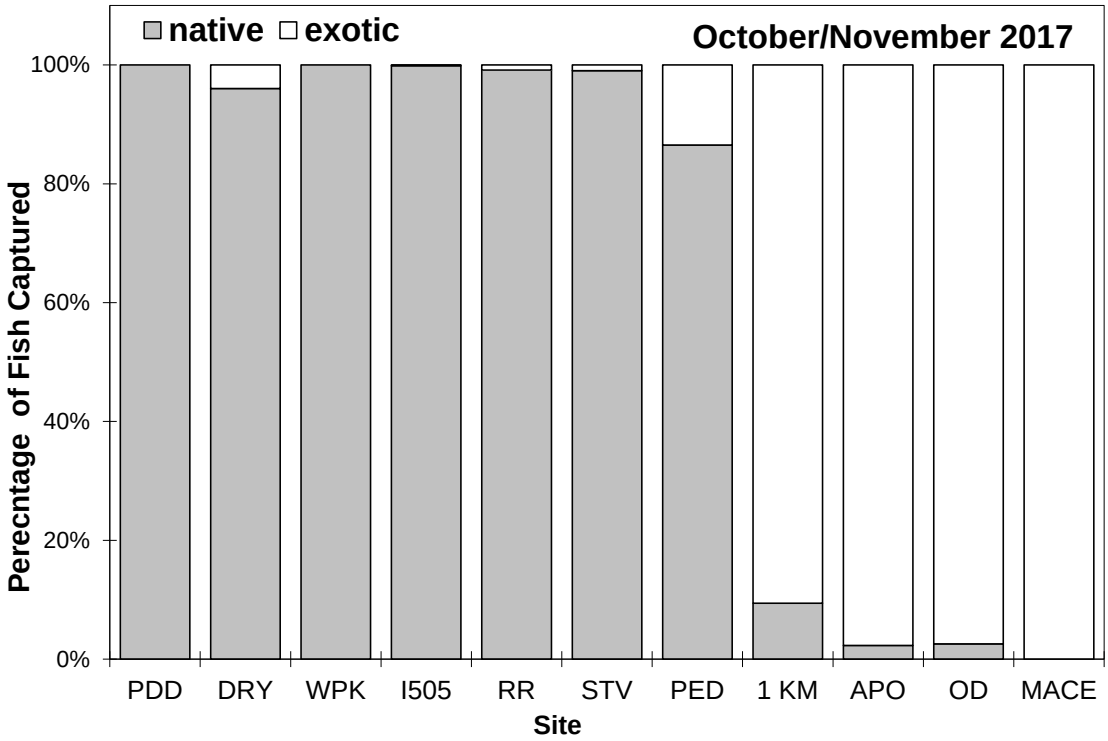

Figure 6. Percentage of native and exotic fish captured at each of the lower Putah Creek study sites during the October 2017 fish surveys.

Despite the relative stability of the local fish populations over the past six years, five of which included drought conditions, the recent data following the wet winter and spring of 2017 does indicate a gradual increase in the numbers and percentage of native fish at the Pedrick site (Figure 7). The Pedrick and 1 KM sites are at the interface where the native/exotic species meet and interact. Largemouth bass, bluegill, and bigscale log perch, all warm water exotic species, were less abundant at the Pedrick site in 2017. Despite the wet winter, no such increase in native fish was noted at the 1KM site (Figure 6). In fact, non-native fish abundance increased at this downstream site in the fall of 2017. The catch data show that native fish dominated the catch in the upper 12.7 miles of the study area between the Putah Diversion Dam and Pedrick Bridge (Table 4). In fact, only four non-native fish (all largemouth bass) were captured in the upper 3.0 miles of the study area and native fish made up over 99 percent of the total catch at the six study sites located in the upper ten miles of the study area from PDD to Stevenson Road (Figure 4).

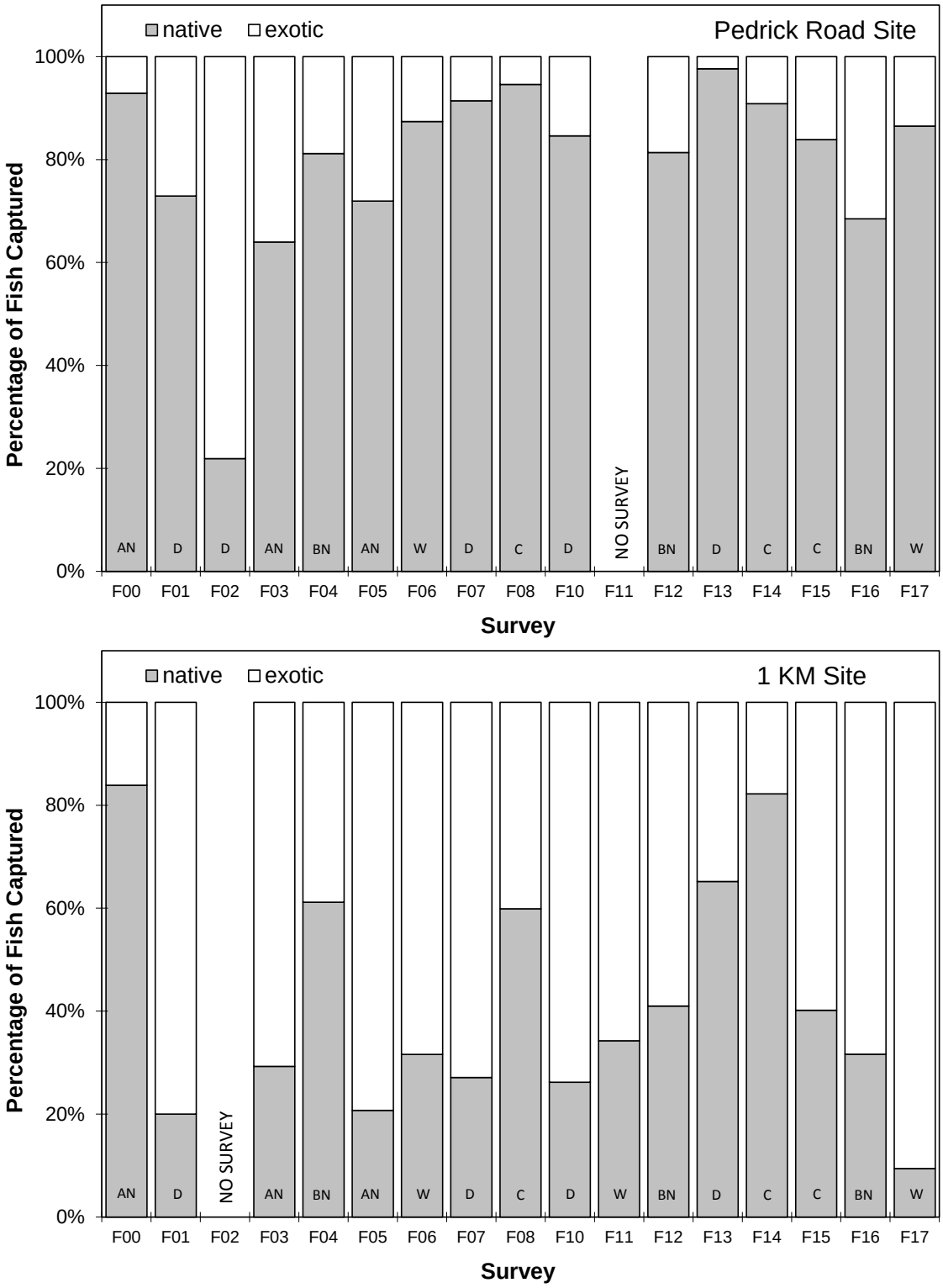

Figure 7. Percentage of native and exotic fish captured at the Pedrick Road Bridge Site (top) and 1 KM Site (bottom) during Fall fish surveys since 2000. Sacramento Valley Water Year Types shown above years: W = wet; AN = above normal; BN = below normal; D = dry; C = critical.

Of the native species captured during the October survey, some species, such as rainbow trout (*Oncorhynchus mykiss*) and threespine stickleback (*Gasterosteus aculeatus*) were limited to the upper half of the study area (Table 4). The native pikeminnow, sucker, prickly sculpin, and tule perch were more widely distributed, and were found throughout the lower basin.

Despite the wet winter and spring in 2017, no rainbow trout were captured at either the Dry Creek or Russell Ranch sites. This was the first time in 17 years of sampling at the Dry Creek site that no rainbow trout were captured. It should be noted that landowner concern about after-hours access to this site resulted in an abbreviated sampling effort at this site. It was also the first time in five years (since 2012) that we did not capture any rainbow trout at the Russell Ranch site. In fact, the total of 43 rainbow trout captured in the fall 2017 surveys was the fewest trout captured since the Fall 2010 survey when only a total 39 trout were captured at 11 sites.

The 2017 surveys did not capture any juvenile Chinook salmon that might have over-summered in the cooler water areas of lower Putah Creek, despite the record number of adult salmon estimated to have spawned in lower Putah Creek in the fall of 2016 prior to sampling. UCD staff estimated that 1,500 to 1,700 adult Chinook salmon spawned in lower Putah Creek in the late fall and winter of 2016 prior to our early fall 2017 survey (Chapman 2018). Despite the large spawning population, we did not find any evidence for extended over-summer residence by juvenile salmon, something we noted in our early fall 2016 survey (Salamunovich 2017). The high flows associated with the Lake Berryessa spill during the winter of 2017 prevented reliable assessments of the resulting juvenile population distribution, abundance or outmigration patterns form either from Normandeau snorkel surveys or UCD/SCWA rotary screw trap operations (Chapman 2018).

The spatial distribution of exotic fishes in the lower basin also varied by species (Table 4). Channel catfish (*Ictalurus punctatus*), white catfish (*Ameiurus catus*) and black crappie (*Pomoxis nigromaculatus*) were limited to single locations in the lower basin. Largemouth bass and green sunfish (*Lepomis cyanellus*) were widely distributed in the 2017 surveys and were captured at eight of the eleven survey sites. While these two exotic sunfish had a relatively wide distribution, their highest densities occurred along the lower 5.5 miles of the survey area, at the 1 KM site and downstream (Table 4).

The relatively low percentage contribution by non-native “panfish” to the total catch of fish in lower Putah Creek that was documented for the 2010-2016 surveys was not noted for 2017. This “panfish” group is comprised of the smaller sunfish of the genus *Lepomis* and includes bluegill, green sunfish, redear sunfish, warmouth (*L. gulosus*), and various hybrids forms. Prior to 2010, green sunfish and bluegills were among the most common species of fish found in lower Putah Creek. In the six fall surveys conducted between 2003 and 2008, “lepomids” made up 28.1 percent of the total fish captures, and averaged 1,462 lepomids per survey. In the six complete, basin-wide surveys between 2010 and 2016, lepomids had declined to only 4.4 percent of the total captured fish, and averaged only 199 lepomids per survey. During the 2017 survey, a total of 544 lepomid panfish were captured, or almost 12 percent of the total catch (Table 4). The scarcity of lepomids in 2012 through 2016 is especially surprising since these five

water years were all classified as below normal (or less) in the Sacramento Valley with few periods of natural high flows, that might disrupt sunfish spawning. These non-native sunfish species usually thrive during these low and warm water conditions. The increase in 2017 was also surprising given the higher than normal winter and spring flows which would have been expected to disrupt lepomids spawning. Future surveys may show if these exotic sunfish abundances rebound to former levels, or perhaps this suite of species is finding conditions in lower Putah Creek no longer suitable to sustain abundant population levels.

Conversely, recent surveys saw increases in larger centrarchids, such as the "micropterid" basses or black bass (especially largemouth bass). During the six surveys conducted from 2003 to 2008, bass (i.e., largemouth, smallmouth, and spotted bass) made up 6.8 percent of the total fish captures, and averaged 353 black bass per fall survey. In the six complete basin-wide surveys conducted from 2010 to 2016, black bass made up 11.8 percent of the captures and averaged 401 bass per survey. This is an increase of 13.6 percent in black bass per survey from the 2003-2008 and the 2010-2016 survey periods. In 2017 only 208 bass were captured, which accounted for only 4.4 of the total catch (Table 4). So, the bass populations in lower Putah creek had returned to pre-2010 levels. In summary, the fall 2017 surveys documented an increase in the smaller lepomids sunfish populations, while the larger basses showed a decrease. Perhaps some species interactions are operating where black bass are helping to suppress the smaller sunfish in the lower basin through predation, and this predators decline has allowed the smaller sunfish to expand their abundance.

It is unknown how the presence of black bass in the lower basin may impact the recently-resurgent Chinook fry outmigration in the winter and spring. Adult fall-run Chinook salmon escapement estimates for Putah Creek have ranged from 500-700 adult salmon in the fall of 2015, 1,500-1,700 salmon in the fall of 2016, and 700 salmon in the fall of 2017 (Chapman et al. 2018). Snorkel surveys conducted in the winter and spring of 2016 and 2018 indicated successful emergence and emigration of fry from upper basin (Salamunovich 2017; 2018 surveys still in progress). As of mid-May 2018, juvenile salmon are still present in in the Winters area of Putah Creek even after the 21 April 2018 re-installation of the Los Rios irrigation flashboard dam in the Yolo Bypass area of Putah Creek (Normandeau snorkel and UCD RST unpublished data). Once in place, the dam effectively blocks emigration to the Toe drain and subsequent passage movement to the ocean. It also creates large warm deep water pools that harbor large predatory largemouth bass.

The 2017 fish electrofishing survey included the Winters Putah Creek Nature Park site, which represents a relatively new sample site along lower Putah Creek that has been surveyed only since 2012. In November 2011, a channel realignment and floodplain restoration project (Winters Park Project) was completed along a 3,700 foot-long section of Putah Creek. This project was designed to restore natural channel form and function, enhance habitat of native species and improve public access in a reach that had been mined extensively for gravel and otherwise enlarged, straightened and dammed for flood conveyance and seasonal water storage. This project included removing an historic concrete low flow barrier (Winters Percolation Dam built in 1938 [Sears 2010]), reconfiguring the creek channel to a narrower and shallower meandering form, restoring

the functional floodplain, and replanting native plant species along the riparian corridor. Three existing riffles were augmented and 14 new riffles were created at 200 foot intervals by importing 2,000 tons of salmon spawning gravel mix (Rich Marovich, personal communication). It was anticipated that this channel realignment project would eliminate the extensive areas of large deep pool habitat that acted as a heat sink and harbored large predatory non-native basses, and instead create hydraulically diverse and cooler water habitat that would benefit native fish, including salmonids. Fish salvage and relocation efforts conducted in the project area in September 2011 (prior to construction) included only one rainbow trout in this section of Putah Creek (Peter Moyle, personal communication). Since channel restoration, rainbow trout have regularly been captured in this area. During the October 2017 survey nine rainbow trout were captured in this area of Putah Creek (Table 4).

In conclusion, despite a wet water year and periods of extended high flow, native fish populations continue to thrive in the thirteen miles of Putah Creek from the Putah Diversion Dam to downstream of Pedrick Road and non-native fishes continue to dominate the six miles between Pedrick Road and Mace Boulevard. The high flows did not appear to result in a downstream extension of the native fish distribution or a downstream retreat of the non-native warm water fish fauna. Continued fall fish monitoring should indicate how the fish populations respond to the changing water year types and the continuing benefits of the Accord flow regime.

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