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Memorandum

DATE: 27 June 2023
TO: Chris Lee and Alex Rabidoux, Solano County Water Agency
FROM: Tim Salamunovich, TRPA Fish Biologists
RE: November 2022 Ulatis Flood Control Project Fish Survey – Final Report

Introduction

The Ulatis Flood Control Project is located in Solano County in the lowland agricultural and grazing lands east of Vacaville and south of Dixon. The Ulatis Project consists of 43.5 miles of stream channels that have been widened, deepened, straightened, and in some cases realigned, to alleviate recurring floods in the Ulatis Creek basin. The Ulatis Creek watershed is comprised of approximately 150 square miles in the northwestern portion of Solano County, California. The Project was constructed from 1962 to 1972 by the Federal Soil Conservation Service (now the Natural Resource Conservation Service). The primary purpose of the Ulatis Project is to protect agricultural land downstream of Vacaville from storms with a 10-year recurrence level, though portions of the Project within the City of Vacaville have been upgraded to a 100-year storm protection level (SCWA 2019). After completion of the Ulatis Project, daily operational responsibility was turned over to the Solano County Water Agency (SCWA), who is responsible for all maintenance and capital improvements within the Project area.

The Ulatis Project area ranges from the hills to the northwest of Vacaville to the Liberty Island area in the Delta. Since the project was designed for flood control, the stream channels in this area typically have very little natural character, but rather consist of a series of dikes and levees devoid of riparian vegetation. The channels are mostly unlined earth channels and vegetation is cleared annually to ensure adequate flood control capacity. Channels are dredged as needed and some plant growth is controlled by chemical herbicides (SCWA 2019).

Some of the channels are jointly used by Solano Irrigation District and Maine Prairie Water District to convey agricultural water during the irrigation season. The two districts annually install a total of eleven temporary dams in the Ulatis Project channels to store water during the irrigation season, usually in April of each year. The temporary dams are typically removed in late October at the end of the irrigation season and prior to the rainy season to ensure that the channels perform their flood control function during the winter and early spring periods.

The major creeks located within the watershed are: Ulatis Creek and its flood control channel, New Alamo Creek Flood Control Channel, Horse Creek, Gibson Canyon Creek, Sweeney Creek, and McCune Creek (Figure 1). The Ulatis Creek Flood Control Channel and contributing tributary channels drain to Cache Slough, which drains into the Sacramento River.

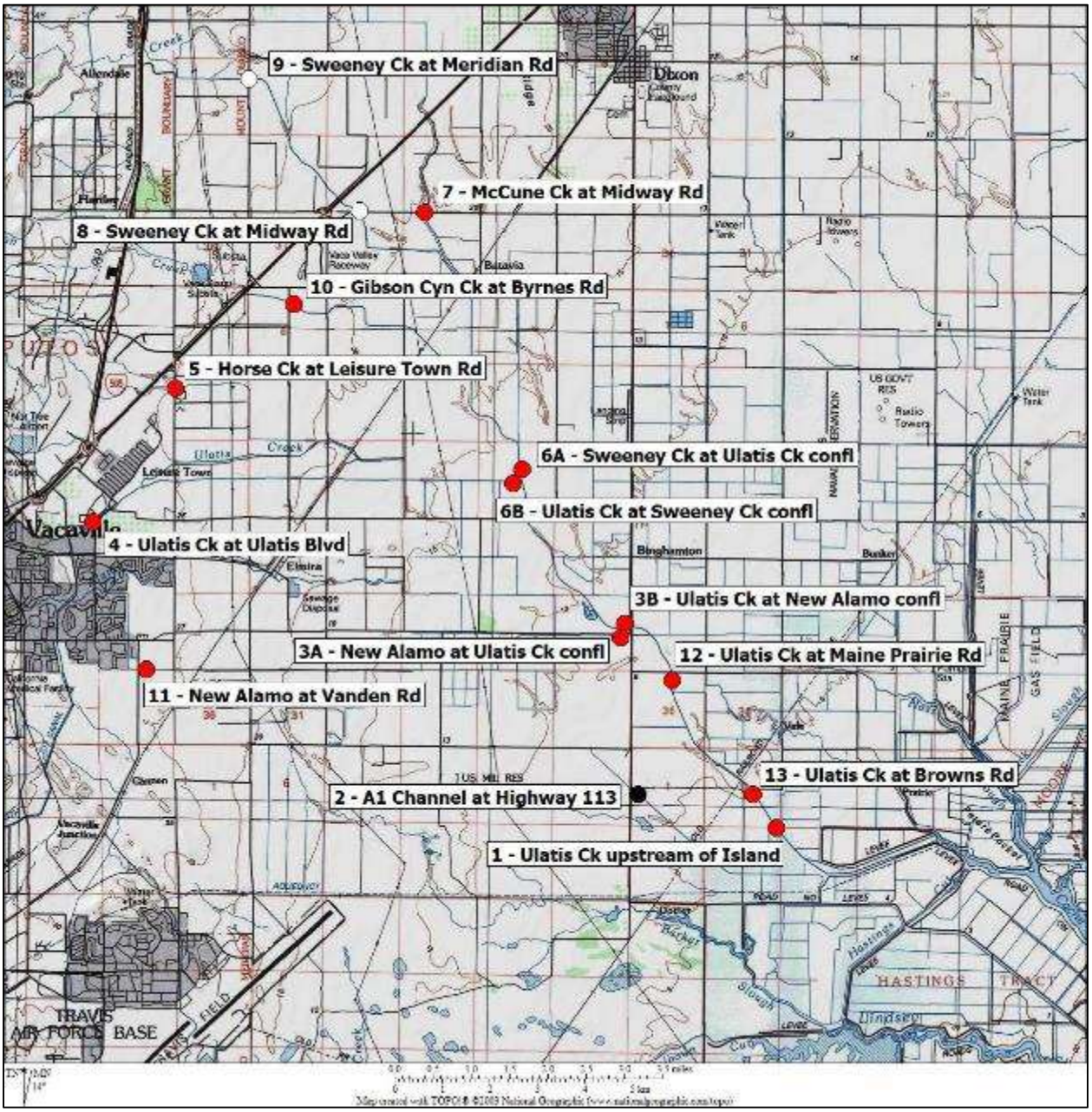

Figure 1. Map showing fish sampling sites in the Ulatis Flood Control Project, 7-10 November 2022. Red dots denote sites where non-native fish were dominant; white dots are sites where native fish dominated the catch. Black dot denotes no sampling.

To help inform ongoing management, planning and operation of the Ulatis Project, SCWA has had TRPA Fish Biologists conduct annual reconnaissance level surveys of the aquatic resources present in the Project area. The object of the surveys was to provide basic information on the existing distributions and relative abundances of fish in the Ulatis Project area.

This report will present the results of the latest surveys conducted in the Fall of 2022 and compare results to previous surveys conducted in 2000-2002, 2018, 2019, 2020, and 2021 (Thomas R. Payne & Associates 2000; Normandeau Associates 2019; TRPA Fish Biologists 2020, 2021, and 2022). The Fall 2022 survey followed a second consecutive critically dry water year in the Sacramento Valley according to the Sacramento Valley 40-30-30 Hydrologic Classification Index (DWR California Data Exchange Center, Water Supply Index WSIHIST).

Methods

Fifteen study sites in the Ulatis Flood Control Project were visited and sampling was conducted at fourteen of those sites during the early November 2022 survey (Figure 1). No sampling was conducted at the A1 Channel Site since the channel was choked with dense bulrush growth with little open water area that could be surveyed. The remaining fourteen sampled study sites were widely distributed throughout the Project area and included most of the major channels within the Project. Sample sites were located from the Allendale area in the northern portion of the Project area south to Cache Slough, and included Ulatis, Alamo, Sweeney, McCune, Horse and Gibson Canyon creeks. Most of the sites were earthen or rip-rap channels with little or no natural vegetation along banks (Appendix A).

The fish surveys were conducted using a backpack electrofisher to stun and capture fish at each of the sites. Captured fish were held in a bucket equipped with a small aerator until completion of the survey, at which time they were identified and measured to the nearest millimeter fork length (FL), or total length (TL) for fish with non-forked caudal fins. All fish were released back to the site of capture after being counted and measured.

The length of sample reaches at each site varied based upon the length of individual habitat units (i.e., pool, riffle, run). Generally, 150-350 feet of channel was sampled at each site and typically this included at least one riffle-pool sequence. Several water quality parameters such as water temperature, dissolved oxygen, salinity, conductivity, and pH were measured with

hand-held meters at the time of sampling. A small hand-held global positioning system was used to determine latitude/longitude coordinates at both downstream and upstream ends of each sample site. The waypoints were plotted on Google Earth and endpoints were used to estimate the survey reach distances.

It should be noted that this survey provided data on the presence/absence and relative abundance of fishes at each study site and the results are not indicative of absolute population levels. It was not possible to capture every fish within the study reaches, and capture success varied by species, life stage, and environmental conditions at each site (e.g., conductivity, visibility, and depth).

Results

Fourteen separate sites within the Ulatis Project area were sampled by electrofishing over four days between 7-10 November 2022 immediately following the removal of the irrigation season dam structures (Table 1). A total of 4,725 feet (0.89 miles) of flood control channel were sampled during the surveys. The Fall 2022 sampling occurred during and immediately following a regional storm (Figure 2) with significant runoff that resulted in streamflow at all the survey sites (Appendix Photographs A-17 and A-19).

Water temperatures at most of the survey sites were cool and ranged from 10.1° to 16.9°C (50.2° to 62.4°F), with most less 12.8°C (55°F) [Table 1]. Dissolved oxygen concentrations varied by site and ranged from 5.8 to 13.6 milligrams per liter and exceeded 70% saturation at ten of the fourteen sites (Table 1). Conductivity is a measure of water's capability to pass electrical flow. Water conductivity affects effectiveness of electrofishing gear and generally declines at water conductivities >500 µS/cm (Temple and Pearsons 2007). Water conductivities during the 2022 surveys varied by site, but were generally fair for backpack electrofishing, ranging from 163 to 868 µS/cm.

A total of 2,568 fish from seventeen different species were captured during the mid-November 2022 surveys of the Ulatis Project (Table 2). Exotic (i.e., non-native) fish made up most of the catch at twelve of the fourteen sample sites. The two upper Sweeney Creek sites (Sites 8 and 9; Figure 1) were the only places in the Project area where native fish comprised a majority of the total fish captures. Overall, exotic, or non-native, fishes made up over 86 percent of the

Table 1. Survey site location, identification number, site length, sample date, survey time, estimate of discharge, water temperature, dissolved oxygen, conductivity, and salinity at time of survey for the 2022 Ulatis Flood Control Project fish monitoring surveys.

Location	Site	Length (ft)	Date	Time	Discharge (cfs)	Water Temp (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat.)	Conductivity (µS/cm)	Salinity (ppt)	pH
Ulatis Cr above Island	1	355	11/7	0836	50.0	12.8	7.96	79.5	868	0.6	8.3
A1 Channel at Hwy 113	2	NS[1/]									
New Alamo Cr at Ulatis Cr	3A	250	11/9	1218	15.0	16.9	10.47	108.1	716	0.4	8.5
Ulatis Cr at New Alamo Cr	3B	250	11/9	1048	30.0	11.1	9.59	88.0	291.3	0.2	8.1
Ulatis Cr at Ulatis Blvd	4	395	11/10	0750	0.3	10.3	6.38	57.2	179.8	0.1	7.7
Horse Cr at Leisure Town	5	130	11/9	1538	3.0	12.5	8.81	81.9	163.0	0.1	7.5
Sweeney Cr at Ulatis Cr	6A	250	11/10	1210	10.0	12.1	---	---	487.0	0.3	8.8
Ulatis Cr at Sweeney Cr	6B	310	11/10	1003	10.0	10.1	13.51	122.0	278.4	0.2	8.1
McCune Cr at Midway Rd	7	455	11/8	1348	3.0	13.9	11.31	110.1	335.5	0.2	8.6
Sweeney Cr at Midway	8	400	11/8	1150	3.0	11.9	13.58	126.2	413.8	0.3	8.9
Sweeney Cr at Meridian	9	395	11/8	1012	3.0	11.2	7.27	66.9	363.1	0.2	7.8
Gibson Cyn Cr at Byrnes	10	400	11/8	0810	4.0	11.9	9.44	87.3	512	0.3	7.8
New Alamo at Vanden Rd	11	390	11/9	1413	5.0	11.3	5.75	52.5	190.2	0.1	7.9
Ulatis Cr at Maine Prairie	12	375	11/9	0830	50.0	11.1	11.70	106.6	416.7	0.3	8.2
Ulatis Cr at Browns Rd.	13	370	11/7	1010	50.0	13.4	7.54	72.8	866	0.6	8.3

[1/] Not Sampled – too reedy/no open water

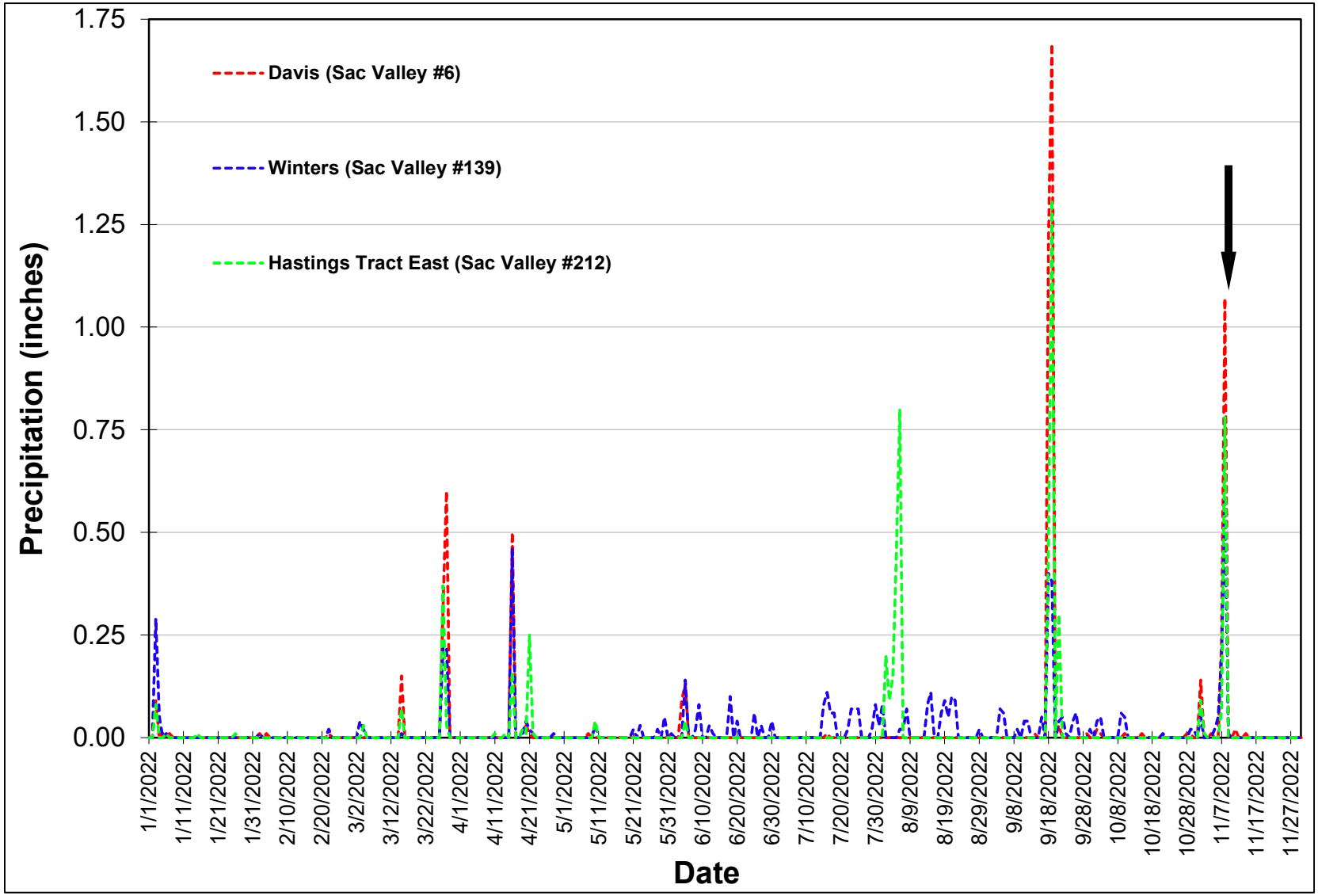

Figure 2. Daily precipitation data for calendar year 2022 recorded at three nearby DWR California Irrigation Management Information System gages bracketing the Ulatis Project area. The black arrow denotes the time of the early November Fall Survey.

Table 2. Capture data for the Ulatis Flood Control Project fish monitoring survey, 7-10 November 2022.

	Site 1 ULA@ISL	Site 2 A1@113	Site 3A NALA@ULA	Site 3B ULA@NALA	Site 4 ULA@ULB	Site 5 HOR@LT	Site 6A SWY@ULA	Site 6B ULA@SWY	Site 7 MCC@MID	Site 8 SWY@MID	Site 9 SWY@MER	Site 10 GIB@BYR	Site 11 NALA@VAN	Site 12 ULA@MPR	Site 13 ULA@BRD	Total
Native Fishes																
Hitch			1 (132 FL)						2 (55-76 FL)							3
California roach							1 (91 FL)	2 (95-109 FL)								3
Sacramento sucker	10 (426-520 FL)		6 (140-172 FL)	5 (138-196 FL)			3 (112-158 FL)	1 (144 FL)	2 (169-184 FL)	74 (83-255 FL)	1 (128 FL)	8 (136-162 FL)		11 (121-215 FL)	6 (172-453 FL)	127
Threespine stickleback								1 (44 TL)	1 (37 TL)	22 (28-70 TL)	92 (20-60 TL)					116
Prickly sculpin			7 (48-102 TL)	44 (42-87 TL)			20 (42-90 TL)	18 (39-77 TL)						7 (64-88 TL)		96
Non-Native Fishes																
Fathead minnow			26 (19-70 FL)	29 (35-72 FL)	58 (30-65 FL)		35 (23-64 FL)	63 (20-68 FL)	304 (25-62 FL)	75 (39-72 FL)		204 (27-78 FL)	52 (30-62 FL)	14 (27-68 FL)	3 (49-64 FL)	863
Common carp		NOT SAMPLED							24 (148-231 FL)			13 (166-231 FL)			1 (120 FL)	38
Goldfish															6 (124-172 FL)	6
Black bullhead							3 (78-159 TL)		21 (53-195 TL)			1 (180 TL)	3 (45-67 TL)		2 (57-61 TL)	30
Mississippi silverside	14 (25-86 FL)		1 (72 FL)	19 (50-86 FL)			84 (30-71 FL)	131 (27-74 FL)	11 (35-69 FL)					232 (29-88 FL)	13 (60-85 FL)	505
Western mosquitofish	3 (22-49 TL)		14 (19-52 TL)	8 (24-45 TL)	65 (17-51 TL)	2 (22-32 TL)	3 (24-42 TL)	16 (21-48 TL)	136 (17-42 TL)	1 (20 TL)	1 (23 TL)	25 (24-52 TL)	2 (27 TL)	4 (24-34 TL)	3 (22-41 TL)	283
Bluegill sunfish				1 (40 FL)			3 (32-58 FL)	1 (52 FL)	12 (82-202 FL)			2 (119-123 FL)				19
Green sunfish	1 (112 FL)		29 (41-76 FL)	30 (43-122 FL)	87 (30-131 FL)		35 (31-138 FL)	61 (24-94 FL)	2 (23-42 FL)			22 (69-153 FL)	40 (22-110 FL)	5 (48-130 FL)	3 (49-82 FL)	315
Redear sunfish	3 (125-130 FL)													1 (110 FL)	3 (113-137 FL)	7
Largemouth bass	10 (95-156 FL)			2 (155-181 FL)										18 (76-171 FL)	24 (66-209 FL)	54
Bigscale logperch			12 (77-92 TL)	42 (76-91 TL)			25 (69-97 TL)	12 (78-91 TL)	2 (73-77 TL)					9 (75-92 TL)		102
Yellowfin goby															1 (161 TL)	1
Total # Individuals	41		96	180	210	2	212	306	517	172	94	275	97	301	65	2,568
# native fish	10		14	49	0	0	24	22	5	96	93	8	0	18	6	345
# exotic fish	31		82	131	210	2	188	284	512	76	1	267	97	283	59	2,223
Total # species	6		8	9	3	1	10	10	11	4	3	7	4	9	11	17
# native species	1		3	2	0	0	3	4	3	2	2	1	0	2	1	5
# exotic species	5		5	7	3	1	7	6	8	2	1	6	4	7	10	12
Shannon's Diversity (ln)	1.528		1.715	2.197	1.083	0.000	1.703	1.203	1.018	0.118	0.945	0.945	0.887	0.970	1.933	2.007
Eveness (H'/Hmax)	0.853		0.825	0.833	0.986	0.000	0.739	0.502	0.734	0.107	0.486	0.486	0.640	0.441	0.806	0.708

Site 1 = Ulatis above Island; Site 2 - A1 Channel @ Highway 113; Site 3A - New Alamo @ Ulatis confluence; Site 3B - Ulatis @ New Alamo confluence; Site 4 - Ulatis @ Ulatis Blvd.;
Site 5 = Horse @ Leisure Town Rd.; Site 6A - Sweeny @ Ulatis Cr confluence; Site 6B - Ulatis Cr @ Sweeny Cr confluence; Site 7 - McCune @ Midway Rd.; Site 8 - Sweeny @ Midway Rd.;
Site 9 = Sweeny @ Meridian Rd.; Site 10 - Gibson Cyn @ Byrnes Rd.; Site 11 = New Alamo @ Vanden Rd.; Site 12 = Ulatis @ Maine Prairie Rd. ; Site 13 - Ulatis @ Browns Rd.

total catch for the entire Fall 2022survey. The four most abundant fish, fathead minnow (*Pimephales promelas*), Mississippi silverside (*Menidia audens*), green sunfish (*Lepomis cyanellus*) and western mosquitofish (*Gambusia affinis*), all non-native fish, made up over 76 percent of the total catch (Table 2). Mosquitofish were the most widely distributed fish and were captured at all fourteen Ulatis Project sample sites. Fathead minnow and green sunfish were also widely distributed and were noted at eleven of the fourteen surveys sites.

Sacramento sucker (*Catostomus occidentalis*) was the most abundant native fish, and it contributed less than five percent of the total catch but was present at eleven (79 percent) of the sites sampled during the November 2022 surveys. (Table 2).

A comparison of the fall 2022 surveys to those conducted in prior years shows a consistent trend in decline in the percentage of native fish. In the Fall 2022 survey, native fish made up only 13.4 percent of the total catch, which is nearly identical with the percentage noted in November 2021 when native fish made up 13.3 percent of the total catch. This figure is consistent with the 10.2 percent value we noted in the fall 2020 survey but remains considerably lower than the 20.7 percent in 2019 and 17.3 percent in 2018. The percentage of native fish noted in 2022 remains well below levels noted in the 2000-2002 surveys, when native fish averaged almost 30 percent of the catch. The decline in the percentage of native fish noted in 2022 compared to the earlier surveys was due largely to a decrease in the numbers of native suckers, hitch, and Sacramento blackfish.

These changes suggest that the fishes using these highly modified and highly managed flood control channels in the Ulatis Project area are subject to seasonal and episodic changes to habitat and hydrology at the various study sites that affect their overall distribution and abundance.

Adult Chinook salmon (*Oncorhynchus tshawytscha*) were observed throughout the lower Project area during the early November 2022 survey area. Five live adult salmon were observed, but not captured, at four of the survey sites (Sites 1, 5, 6, and 12; Table Figure 1). One partially eaten carcass was noted at Site 6B (Appendix Photograph A-9). This salmon had an adipose fin clip, which is indicative of hatchery origin (Appendix Photograph A-10). The adult salmon were likely responding to flow cues following the recent rainfall and Ulatis basin run-off.

All the live salmon observed appeared to be moving through the sites and actively migrating upstream seeking suitable spawning areas upstream of the Ulatis Flood Control Project area. Given the low flows that normally prevail in the fall in the Project area and the obstacles and barriers present, it is unlikely there is a native Chinook salmon population in the Ulatis Flood Control Project area stream basins. It is more likely that the adult Chinook salmon we observed during the November 2021 surveys were stray hatchery fish that were present in the lower Sacramento River/Cache Slough complex and were able to take advantage of the high flows in the Ulatis Project provided by the recent early fall rains. Putah Creek is a nearby basin that drains into the Toe Drain and Prospect Slough and ultimately into the Cache Slough Complex and supports fall run Chinook salmon. Most of the fall-run Chinook salmon entering Putah Creek to spawn appear to be stray fish originating from several Sacramento-San Joaquin basin hatcheries (Chapman et al. 2018; Miner et al. 2019; and Willmes et al. 2021). Coded wire tag recoveries indicate that many of the adult Chinook in Putah Creek are stray hatchery fish from the California Department of Fish and Wildlife's Mokelumne, Nimbus, and Feather River hatchery propagation programs (Chapman et al. 2018). These hatcheries rely on trucking smolts to either temporary pen rearing facilities or direct release sites in the Delta and San Pablo Bay to increase survival and fishery contribution rates and avoid in-river mortality associated with releases closer to the hatchery. However, recent evaluations have strongly indicated that offsite release strategies generally increase the rate of straying (Palmer-Zwahlen and Kormos 2015 and 2019). Hatchery salmon transported and released (or reared) at locations in the Delta are straying into basins with and without hatcheries at rates eight times greater than background rates and are leading to the emergence of a new life-history type that now comprised almost entirely of the estuary releases (Huber & Carlson 2015). Sturrock et al. (2019) supports this observation and found that transport distance was strongly associated with straying rate, averaging 0–9 percent straying rates for salmon released at the hatchery versus a straying rate of 7–89 percent for salmon smolts transported and released in the delta and bay upstream of Golden Gate Bridge. Given that the Feather and Nimbus hatcheries are large producers of Chinook salmon smolts that currently release a large fraction of fish off-site, these two hatcheries are likely generating a disproportionate number of strays, including strays to systems without hatcheries, including both Putah Creek and the upstream drainages of the Ulatis Flood Control Project area.

Conclusion

The 2022 surveys confirmed that non-native fish continue to dominate the fish populations in the Ulatis Project area. The 2022 survey documented the presence of adult Chinook salmon opportunistically migrating into and through the Ulatis Project area. Adult Chinook salmon were also noted in the Ulatis Project area in 2000, 2002, and 2021.

Literature Cited

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Appendix A

Selected Photographs of Study Sites from the 7-10 November 2022 Ulatis Project Fish Survey

Photograph A-1. Survey Site 1, Ulatis Creek above Island.

Photograph A-2. Survey Site 2, A1 Channel at Highway 113.

Photograph A-3. Survey Site 3A, New Alamo Creek at Ulatis Creek confluence.

Photograph A-4. Survey Site 3B, Ulatis Creek at New Alamo Creek confluence.

Photograph A-5. Survey Site 4, Ulatis Creek at Ulatis Boulevard.

Photograph A-6. Survey Site 5, Horse Creek at Leisure Town Road.

Photograph A-7. Survey Site 6A, Sweeney Creek at Ulatis Creek confluence.

Photograph A-8. Survey Site 6B, Ulatis Creek at Sweeney Creek confluence.

Photograph A-9. Partially eaten salmon carcass at Site 6B, Ulatis Creek at Sweeney Creek confluence.

Photograph A-10. Detail of Site 6B salmon carcass showing clipped adipose fin.

Photograph A-11. Survey Site 7, McCune Creek at Midway Road.

Photograph A-12. Survey Site 8, Sweeney Creek at Midway Road.

Photograph A-13. Survey Site 9, Sweeney Creek at Meridian Road.

Photograph A-14. Survey Site 10, Gibson Canyon Creek at Byrnes Road.

Photograph A-15. Survey Site 11, New Alamo Creek at Vanden Road.

Photograph A-16. Survey Site 12, Ulatis Creek at Maine Prairie Road.

Photograph A-17. Survey Site 12, Ulatis Creek at Maine Prairie Road.

Photograph A-18. Survey Site 13, Ulatis Creek at Browns Road.

Photograph A-19. Survey Site 13, Ulatis Creek at Browns Road.