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Memorandum

DATE: 11 June 2021
TO: Roland Sanford and Chris Lee, Solano County Water Agency (SCWA)
FROM: Tim Salamunovich, TRPA Fish Biologists
RE: Results of the November 2020 Ulatis Flood Control Project Fish Survey

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 [NRCS]). 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 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 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.

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.

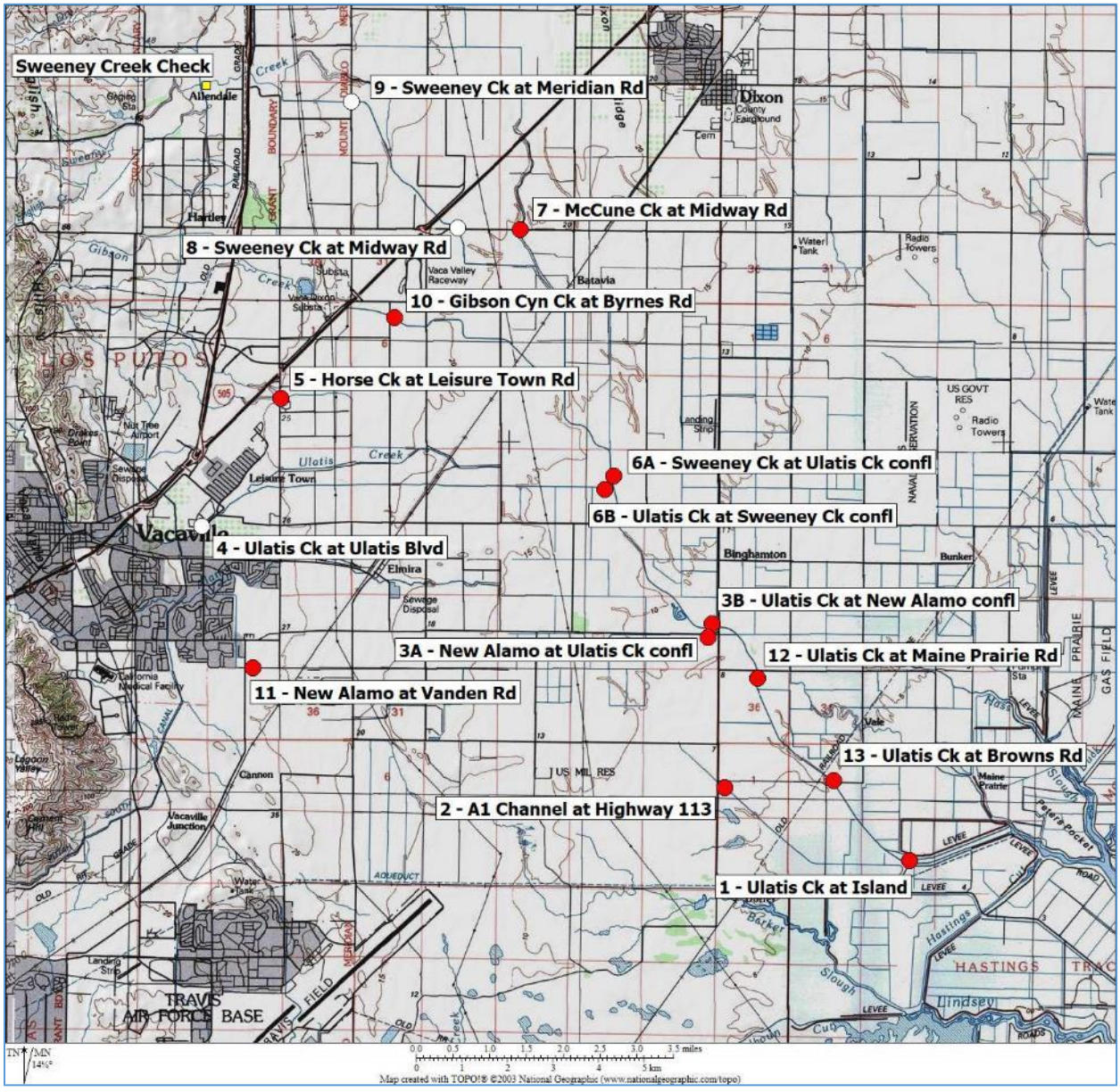

Figure 1. Map showing fish sampling sites in the Ulatis Flood Control Project, 11-13 November 2020. Red dots denote sites where non-native fish were dominant; white dots are sites where native fish dominated the catch. Note location of Sweeney Creek Check (yellow square) in upper left of figure.

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 some basic information on the existing distribution and relative abundance of fish in the Ulatis Project area.

This report will present the results of the latest surveys conducted in the fall of 2020 and compare results to previous surveys conducted in 2018, 2019, and 2000-2002 (Salamunovich 2019, 2020; TRPA 2000; and unpublished data). The fall 2020 survey followed a 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 sampled during the mid-November 2020 survey (Figure 1). The study sites were widely distributed throughout the Project area and included most of the major channels within the Project.

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, a distance of 150-350 feet of stream channel was sampled at each site and typically this included at least one riffle-pool sequence. A number of water quality parameters such as water temperature, dissolved oxygen, conductivity, and salinity 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

Fifteen separate sites within the Ulatis Project area were electrofish-sampled over three days between 11-13 November 2020 immediately following the removal of the irrigation season dam structures (Table 1). A total of 3,742 feet (0.71 miles) of flood control channel were sampled during the surveys. 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 (Figure 1). Most of the sites were earthen or rip-rap channels with little or no natural vegetation along banks (Appendix A Photographs A-2 through A-14). The only exceptions was Site 1, which was largely a natural stream channel that had normal riparian trees and shrubs growing along the banks (Appendix A Photograph A-1).

Water temperatures at most of the survey sites were cool and ranged from 7.2° to 16.2°C (45.0° to 61.2°F), with most less 13.9°C (57°F). Dissolved oxygen concentrations varied by site and ranged from 2.2 to 13.8 milligrams per liter and exceeded 70% saturation at seven of the fifteen 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 2020 surveys varied by site and tended to be high, ranging from 379 to 1,547 µS/cm.

A total of 2,373 fish from eighteen different species were captured during the mid-November 2020 surveys of the Ulatis Project (Table 2). Exotic (i.e., introduced) fish made up the majority of the catch at thirteen of the fifteen sample sites. The two upper Sweeney Creek sites (Site 8 and 9; Figure 1) were the only places in the Project area where native fish dominated the total fish captures. Overall, exotic, or non-native, fishes made up over 89 percent of the total catch for the entire Fall survey. The four most abundant fish, fathead minnow (*Pimephales promelas;* Appendix B Photograph B-1), western mosquitofish (*Gambusia affinis*), green sunfish (*Lepomis cyanellus*), and bigscale logperch (*Percina macrolepida;* Appendix B Photograph B-2), all non-native fish, made up almost 75 percent of the total catch (Table 2).

Table 1. Survey site location (from upstream to downstream), identification number, site length, sample date, survey time, and the air temperature, water temperature, dissolved oxygen, conductivity, and salinity at time of survey for the 2020 Ulatis Flood Control Project fish monitoring surveys.

Location	Site	Length (ft)	Date	Time	Water Temp (*C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% saturation)	Conductivity (µS/cm)	Salinity (ppt)
Ulatis Cr above Island	1	150	11/11/20	0740	5.6	---	---	712	0.5
A1 Channel at Hwy 113	2	225	11/11/20	0930	14.4	3.52	31.3	1,547	1.2
New Alamo Cr at Ulatis Cr	3A	220	11/11/20	1425	17.8	9.89	102.9	845	0.5
Ulatis Cr at New Alamo Cr	3B	185	11/11/20	1335	15.6	8.03	75.7	646	0.4
Ulatis Cr at Ulatis Blvd	4	100	11/12/20	0713	6.1	2.16	19.0	378.8	0.3
Horse Cr at Leisure Town	5	175	11/12/20	0850	12.2	4.41	37.6	618	0.5
Sweeney Cr at Ulatis Cr	6A	217	11/13/20	0855	13.3	6.40	60.4	509	0.3
Ulatis Cr at Sweeney Cr	6B	295	11/13/20	0845	12.2	7.38	65.6	838	0.6
McCune Cr at Midway Rd	7	365	11/12/20	1330	20.6	13.80	143.5	542	0.3
Sweeney Cr at Midway	8	340	11/12/20	1207	17.8	10.70	93.9	402.2	0.3
Sweeney Cr at Meridian	9	280	11/12/20	1518	21.1	9.17	83.2	387.5	0.3
Gibson Cyn Cr at Byrnes	10	335	11/12/20	1030	15.0	7.88	70.5	561	0.4
New Alamo at Vanden Rd	11	260	11/11/20	1545	16.7	3.70	39.0	459	0.3
Ulatis Cr at Maine Prairie	12	370	11/11/20	1135	14.4	7.25	70.7	750	0.5
Ulatis Cr at Browns Rd.	13	225	11/11/20	0832	10.6	6.86	63.3	753	0.5

Table 2. Capture data for the Ulatis Flood Control Project fish monitoring survey, 11-13 November 2020.

	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																
Rainbow trout				1 (195 FL)						1 (158 FL)						2
Sacramento pikeminnow										3 (139-212 FL)						3
Hitch			1 (131 FL)				4 (110-117 FL)	2 (96-104 FL)	6 (96-152 FL)					2 (109-114 FL)		15
California roach			1 (92 FL)		59 (33-83 FL)		5 (84-92 FL)			1 (54 FL)			37 (28-70 FL)	1 (84 FL)		104
Sacramento sucker							2 (112-126 FL)	1 (314 FL)	7 (147-265 FL)	5 (77-229 FL)	2 (42-213 FL)	1 (181 FL)		1 (227 FL)		19
Threespine stickleback			1 (46 TL)						2 (32-42 TL)	51 (23-66 TL)	33 (23-55 TL)					87
Prickly sculpin				3 (57-70 TL)			8 (69-105 TL)	1 (103 TL)								12
Non-Native Fishes																
Golden shiner							1 (110 FL)		7 (88-122 FL)			1 (81 FL)				9
Fathead minnow		1 (58 FL)	9 (46-67 FL)	1 (54 FL)	9 (43-69 FL)	98 (58-83 FL)			171 (34-60 FL)	36 (40-73 FL)	1 (51 FL)	130 (34-70 FL)	227 (28-71 FL)	4 (22-72 FL)		687
Common carp									4 (160-246 FL)							4
Black bullhead						30 (72-177 TL)			7 (67-145 TL)			2 (78-86 TL)	30 (66-197 TL)			69
Mississippi silverside			1 (37 FL)	12 (41-56 FL)					3 (32-36 FL)					149 (40-86 FL)		165
Western mosquitofish		371 (12-40 TL)	5 (29-38 TL)			59 (17-50 TL)			5 (23-31 TL)			20 (22-52 TL)	192 (18-44 TL)		1 (32 TL)	653
Bluegill sunfish				2 (66-74 FL)			1 (80 FL)		10 (51-76 FL)			1 (83 FL)		1 (53 FL)		15
Green sunfish				9 (61-115 FL)	67 (23-142 FL)	56 (37-158 FL)	5 (71-106 FL)	10 (38-94 FL)	13 (43-122 FL)			7 (83-145 FL)	96 (23-165 FL)	2 (59-67 FL)		265
Redear sunfish							1 (134 FL)								1 (117 FL)	2
Largemouth bass			1 (53 FL)	11 (76-163 FL)			15 (64-105 FL)	42 (62-132 FL)						21 (53-141 FL)		90
Bigscale logperch			14 (83-103 TL)	20 (71-98 TL)			57 (75-108 TL)	15 (79-93 TL)						63 (73-112 TL)	3 (79-99 TL)	172
Total # Individuals	0	372	33	59	135	243	99	71	235	97	36	162	582	244	5	2,373
# native fish	0	0	3	4	59	0	19	4	15	61	35	1	37	4	0	242
# exotic fish	0	372	30	55	76	243	80	67	220	36	1	161	545	240	5	2,131
Total # species	0	2	8	8	3	4	10	6	11	6	3	7	5	9	3	18
# native species	0	0	3	2	1	0	4	3	3	5	2	1	1	3	0	7
# exotic species	0	2	5	6	2	4	6	3	8	1	1	6	4	6	3	11
Shannon's Diversity (ln)		0.019	1.534	1.138	0.890	1.306	1.456	1.181	1.014	0.340	0.719	0.719	1.358	1.076	0.950	2.002
Eveness (H'/Hmax)		0.027	0.738	0.707	0.810	0.942	0.632	0.492	0.630	0.309	0.370	0.370	0.844	0.490	0.865	0.693

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.

California roach (*Hesperoleucus symmetricus*) was the most abundant native fish, and it contributed less than five percent of the total catch.

In terms of spatial distribution in the Project area, fathead minnow were the most widely distributed fish in our surveys and were captured at eleven of the fifteen sample sites (Table 2). The non-native green sunfish were the next most common, being captured at nine of the sample sites. Sacramento sucker (*Catostomus occidentalis;* Appendix B Photograph B-3) was the most widespread native fish and was captured at seven of the sample sites.

Two rainbow trout (*Oncorhynchus mykiss*) were captured in the Ulatis Project study area during the November 2020 surveys (Table 2). This is the first document case for the capture of *O. mykiss* in the Project are since our surveys began in 2000. The first trout (198 mm FL) was captured in the Ulatis channel near the New Alamo confluence (Site 3B), while the second trout (158 mm FL), was captured at the Sweeney Creek at Midway Road Site (Site 8; Figure 1). While both trout may have originated in either the Ulatis or Sweeney creek basins upstream of the Project area, they may have been resident trout transported from Putah Creek (Solano Lake) via the Putah South Canal, which delivers water to the Maine Prairie Water District at the Sweeney Creek Check near Allendale (Figure 1).

Both rainbow trout had the robust body shape and coloration of resident trout with distinct parr marks and spotting, and brick red lateral line (Appendix B Photograph B-4). Anadromous *O. mykiss*, commonly called steelhead, will typically undergo physiological changes where young trout (and salmon) adapt from living in fresh water to living in seawater as they emigrate downstream toward the ocean. Part of the external transformation includes sleek body shape, silvery coloration, black edges to caudal fins, and loose scales (Appendix C Photograph C-1). The first trout, captured at the Ulatis 3B Site, had a missing left pectoral fin and surrounding tissue that visibly exposed part of its stomach and pyloric caeca. The wound appeared to be result of a bird or otter bite. Unfortunately, our camera battery was depleted, and no photo was acquired. Despite the injury, the trout was in good condition and was behaving normally and swimming vigorously at the time of capture and release (as was second trout released at Site 8).

A comparison of the fall 2020 surveys to those conducted in prior years shows a decline in the percentage of native fish. In the 2020 surveys, native fish made up only 10.2 percent of the

total catch, compared to 20.7 percent in 2019 and 17.3 percent in 2018. The decline in the percentage of native fish noted in 2020 was due both to a decrease in the numbers of native suckers and an increase in the numbers of non-native green sunfish and largemouth bass throughout the Project area. The percentage of native fish noted in the 2020 remains below levels noted in the 2000-2002 surveys, when native fish averaged almost 30 percent of the catch.

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.

Conclusion

The 2020 surveys confirmed that non-native fish continue to dominate the fish populations in the Ulatis Project area. The 2020 survey documented the first capture of *O. mykiss* in the Ulatis Flood Control Project area.

Literature Cited

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Appendix A

Selected Photographs of Study Sites from the 11-13 November 2020 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. Survey Site 7, McCune Creek at Midway Road.

Photograph A-10. Survey Site 8, Sweeney Creek at Midway Road.

Photograph A-11. Survey Site 9, Sweeney Creek at Meridian Road.

Photograph A-12. Survey Site 10, Gibson Canyon Creek at Byrnes Road.

Photograph A-13. Survey Site 11, New Alamo Creek at Vanden Road.

Photograph A-14. Survey Site 12, Ulatis Creek at Maine Prairie Road.

Photograph A-15. Survey Site 13, Ulatis Creek at Browns Road.

Appendix B

Selected Photographs of Fish Captured During the 11-13 November 2020 Ulatis Project Fish Survey

Photograph B-1. Fathead minnow (73 mm FL) captured at Site 8.

Photograph B-2. Bigscale logperch (99 mm TL) captured at Site 13.

Photograph B-3. Sacramento sucker (134 mm FL) captured at Site 8.

Photograph B-4. Rainbow trout (158 mm FL) captured at Site 8.

Photograph B-5. Sacramento pikeminnow (212 mm FL) captured at Site 8.

Photograph B-6. Threespine stickleback (53 mm TL) captured at Site 8.

Photograph B-6. Common carp (246 mm FL) captured at Site 7.

Appendix C

Comparative Photo of Juvenile Steelhead

Photograph C-1. Steelhead trout captured in rotary screw trap on Redwood Creek, Humboldt County during anesthetization and prior to handling.