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## Memorandum

**DATE:** 20 May 2020  
**TO:** Roland Sanford and Chris Lee, Solano County Water Agency (SCWA)  
**FROM:** Tim Salamunovich, TRPA Fish Biologists  
**RE:** Results of the November 2019 Ulatis Project Fish Survey (**FINAL**)

### 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 used by Solano Irrigation District and Maine Prairie Water District to convey agricultural water during the irrigation season, which typically occurs between April and October (Roland Sanford, personal communication). 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 removed, typically 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.

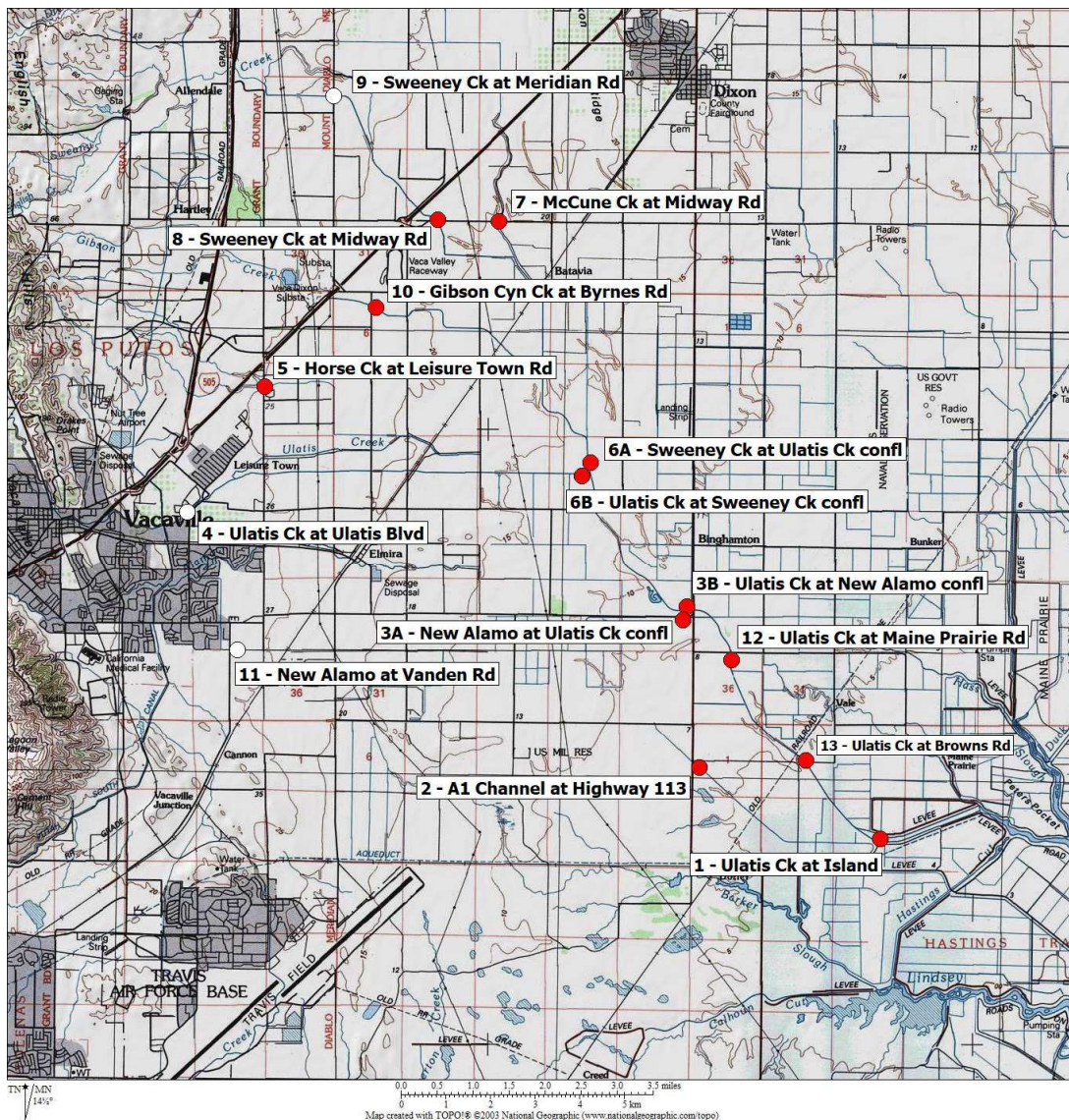


Figure 1. Map showing fish sampling sites in the Ulatis Flood Control Project, 6-8 November 2019. White dots denote sites where native fish dominated the catch; red dots are sites where non-native fish were dominant.



To help inform ongoing management, planning and operation of the Ulatis Project, SCWA had TRPA Fish Biologists conduct a reconnaissance level survey of the aquatic resources present in the Project area. The object of the survey 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 2019 and compare results to previous surveys conducted in 2018 (Salamunovich 2019) and 2000-2002 (TRPA 2000 and unpublished data). The fall 2019 survey followed a wet 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). The 2019 Water Year was the second wet water year in the Sacramento Valley in the past three years.

## Methods

Fifteen study sites in the Ulatis Flood Control Project were sampled during the early November 2019 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 150-450 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 in early November 2019 immediately following the removal of the irrigation season dam structures (Table 1). A total of 4,660 feet (0.88 miles) of flood control channel were sampled during the surveys. Sample sites were located from the Allendale area south to Maine Prairie 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-1 through A-14). The only exceptions were Sites 1 and 4, which both were natural stream channels and both had normal riparian trees and shrubs growing along the banks (Appendix A Photographs A-1 and A-5). Several beaver dams were present in the upper Ulatis site (Site 4), which helped create some habitat diversity within the riparian corridor (Appendix A Photograph A-6).

Water temperatures at most of the survey sites were cool and ranged from 11.1° to 21.2°C (52.0° to 70.2°F), with most less 15.5°C (60°F). Dissolved oxygen concentrations varied by site and ranged from 3.3 to 12.2 milligrams per liter and exceeded 80% saturation at eight 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 2019 surveys varied by site and tended to be high, ranging from 372 to 1,021 µS/cm.

A total of 2,429 fish from twenty different species were captured during the early November 2019 surveys of the Ulatis Project (Table 2). At only two of the fourteen sample sites, Ulatis Creek at Ulatis Boulevard (Site 4) and Sweeney Creek at Meridian Road (Site 9), did native fish make up the majority of the catch. Overall, exotic, or non-native, fishes made up over 79 percent of the total catch for the entire survey period. The three most abundant fish, fathead minnow (*Pimephales promelas*), western mosquitofish (*Gambusia affinis*) and bigscale logperch





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 2019 Ulatis Flood Control Project fish monitoring surveys.

Location	Site	Length (ft)	Date	Time	Water Temp (*C)	Dissolved Oxygen (mg/L)	(% saturation)	Conductivity (μS/cm)	Salinity (ppt)
Ulatis Cr above Island	1	317	11/6/19	0815	12.9	6.91	67.0	833	0.5
A1 Channel at Hwy 113	2	329	11/6/19	1103	11.4	8.75	82.3	724	0.5
New Alamo Cr at Ulatis Cr	3A	227	11/6/19	1550	19.9	12.21	136.9	1,021	0.6
Ulatis Cr at New Alamo Cr	3B	140	11/6/19	1508	16.5	9.12	95.7	840	0.5
Ulatis Cr at Ulatis Blvd	4	459	11/7/19	0925	11.2	4.93	46.0	652	0.4
Horse Cr at Leisure Town	5	268	11/7/19	1044	11.1	9.05	84.8	815	0.6
Sweeney Cr at Ulatis Cr	6A	279	11/8/19	0940	14.7	4.40	44.4	626	0.4
Ulatis Cr at Sweeney Cr	6B	284	11/8/19	1103	14.8	4.83	48.9	951	0.6
McCune Cr at Midway Rd	7	379	11/7/19	1615	21.2	9.99	114.9	646	0.3
Sweeney Cr at Midway	8	384	11/7/19	1425	16.1	10.88	112.9	477	0.3
Sweeney Cr at Meridian	9	343	11/8/19	0720	11.4	3.32	30.8	372	0.2
Gibson Cyn Cr at Byrnes	10	292	11/7/19	1200	15.3	8.72	89.1	623	0.4
New Alamo at Vanden Rd	11	384	11/7/19	0838	13.0	8.09	78.6	471	0.3
Ulatis Cr at Maine Prairie	12	382	11/6/19	1257	17.4	9.88	105.4	881	0.5
Ulatis Cr at Browns Rd.	13	193	11/6/19	0945	13.9	3.97	39.4	855	0.5



Table 2. Capture data for the Ulatis Flood Control Project fish monitoring survey, 6-8 November 2019.

	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 GB@BYR	Site 11 NALA@VAN	Site 12 ULA@MPR	Site 13 ULA@BRD	Total
<b>Native Fishes</b>																
Sacramento pikeminnow											6 (50-73 FL)					6
Hitch								20 (64-147 FL)						28 (75-130 FL)		48
California roach					57 (31-84 FL)		2 (52-73 FL)						40 (18-62 FL)	3 (76-87 FL)		102
Sacramento sucker	2 (130-162 FL)	1 (123 FL)	16 (89-167 FL)				26 (78-140 FL)	2 (99-104 FL)	40 (83-140 FL)	77 (62-154 FL)	32 (55-126 FL)			6 (105-162 FL)		202
Threespine stickleback										5 (31-57 TL)	129 (20-56 TL)					134
Prickly sculpin	2 (72-106 TL)			2 (81-110 TL)	5 (42-64 TL)					2 (83-117 TL)				1 (86 TL)		12
<b>Non-Native Fishes</b>																
Fathead minnow		1 (62 FL)				70 (37-68 FL)		5 (27-62 FL)		91 (38-68 FL)	106 (32-64 FL)	359 (29-66 FL)	28 (16-53 FL)	6 (50-63 FL)		666
Common carp									146 (59-160 FL)	1 (86 FL)						147
Black bullhead			1 (139 TL)										3 (99-197 TL)			4
Yellow bullhead								8 (98-252 TL)								8
White catfish															2 (70-73 FL)	2
Mississippi silverside	2 (48-62 FL)	5 (50-66 FL)						2 (65-69 FL)						130 (25-93 FL)		139
Western mosquitofish	1 (24 TL)	35 (23-42 TL)				96 (14-43 TL)			4 (25-33 TL)	1 (15 TL)		217 (12-46 TL)	2 (26TL)		18 (21-38 TL)	374
Bluegill sunfish	2 (37-42 FL)														5 (39-64 FL)	7
Green sunfish				1 (125 FL)	4 (40-122 FL)	162 (27-143 FL)	3 (51-100 FL)		11 (52-139 FL)			2 (89-120 FL)	3 (27-63 FL)		1 (61 FL)	187
Redear sunfish															1 (153 FL)	1
Largemouth bass	1 (96 FL)			1 (181 FL)				1 (150 FL)	1 (240 FL)					1 (120 FL)		5
Spotted bass			2 (79-106 FL)	6 (61-70 FL)			19 (58-82 FL)	28 (60-121 FL)						7 (64-106 FL)	1 (71 FL)	63
Striped bass	5 (230-279 FL)															5
Bigscale logperch	23 (72-103 TL)		56 (64-88 TL)	61 (71-97 TL)			45 (65-101 TL)	23 (66-98 TL)						93 (63-117 TL)	16 (68-92 TL)	317
Total # Individuals	36	43	60	87	66	328	95	61	230	177	273	578	76	275	44	2,429
# native fish	2	2	1	18	62	0	28	2	60	84	167	0	40	38	0	504
# exotic fish	34	41	59	69	4	328	67	59	170	93	106	578	36	237	44	1,925
Total # species	7	4	4	6	3	3	5	6	7	6	4	3	5	9	7	20
# native species	1	1	1	2	2	0	2	1	2	3	3	0	1	4	0	6
# exotic species	6	3	3	4	1	3	3	5	5	3	1	3	4	5	7	14
Shannon's Diversity (ln)	1.241	0.648	0.314	1.138	0.492	1.038	1.221	1.161	0.914	1.057	0.683	0.683	1.057	1.304	1.379	2.233
Evenness (H'/Hmax)	0.638	0.467	0.227	0.707	0.448	0.945	0.759	0.597	0.510	0.762	0.622	0.622	0.656	0.593	0.709	0.746

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.



(*Percina macrolepida*), all non-native fish, made up almost 56 percent of the total catch (Table 2). The native Sacramento sucker (*Catostomus occidentalis*) was the fourth most abundant fish, and it contributed another 8 percent of the total catch.

In terms of spatial distribution in the Project area, native suckers were the most widely distributed fish in our surveys and were captured at nine of the fifteen sample sites (Table 2). The non-native fathead minnow and mosquitofish, and green sunfish (*Lepomis cyanellus*) were the next most common, being captured at eight of the sample sites.

A comparison of the fall 2019 surveys to those conducted in 2018 shows a slight increase in the percentage of native fish (20.7 percent off the total catch in 2019 versus 17.3 percent in 2018), primarily due to an increase in the numbers of native suckers captured in the November 2019 surveys. Despite this increase in native fish compared to 2018, the percentage of native fish in 2019 still remains below levels noted in the 2000-2002 surveys, when native fish averaged almost 30 percent of the catch. While there has been little change in the number of native species captured in the project area since 2000, the numbers of exotic species captured has increased, fourteen non-native species in 2019, compared to an average of only ten exotic species in the prior surveys (2000-2002 or 2018).

No salmonids, nor any federal or state-listed fish species, were captured or observed during the 2019 surveys. Adult Chinook salmon (*Oncorhynchus tshawytscha*) were observed, but not captured, in both 2000 (n=1) and 2002 (n=4). These salmon were probably stray fall-run from the Sacramento River that migrated into the Project area via Cache Slough. Chinook salmon have been infrequently reported in the Ulatis Flood Control Project in the past (Roland Sanford, SCWA, personal communication) and were last noted in November 2002 (TRPA unpublished data). Salmon that migrate into the project area probably have little chance to successfully reproduce in the Project area based on:

- 1) the limited numbers and infrequency of adult fish that have been reported;
- 2) the presence of energy-dissipating concrete drop structures 6 to 8 feet in height located at various locations in the project area that would block upstream migration to natural creek channels except during the highest flows; and
- 3) poor spawning habitat available within the project area.



One big change in notable difference in the 2019 survey sites compared to the earlier surveys was the change at Study Site 4. In the 2000-2002 surveys this urban stream site (Ulatis Creek at Ulatis Boulevard in downtown Vacaville) was a flowing stream within an urban greenbelt, dominated by a variety of native species: hitch (*Lavinia exilicauda*), California roach (*Hesperoleucus symmetricus*), Sacramento blackfish (*Orthodon microlepidotus*) and suckers (TRPA 2000 and unpublished data). In 2018, Ulatis Creek at this site was an intermittent series of isolated and stagnant pools with near anoxic conditions (Salamunovich 2019), while in 2019 the site was a series of low flow pools controlled by a series of beaver dams (Table 1; Photographs A-5 and A-6). The native fish population at this site in both 2018 and 2019 still outnumbered the non-native fish, but was composed almost exclusively by a single species, California roach, a native minnow known to be tolerant of low oxygen levels (<2 mg/L; Cech et al. 1990; Moyle 2002).

Other notable changes observed in the 2019 surveys compared to previous surveys included the presence of striped bass (*Morone saxatilis*) at Site 1, absence of fathead minnows at Sites 3A, 3B, absence of hitch at Site 8, and the presence and dominance of carp (*Cyprinus carpio*) at Study Site 7, where they had never been captured before 2018. All 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.

## Conclusion

The 2019 surveys confirmed that non-native fish still make up most of the fish in the Project area. No listed or sensitive species have been captured or noted during the surveys to date.





## Literature Cited

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## Appendix A

### Selected Photographs from the 6-8 November 2019 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 4, Ulatis Creek at Ulatis Boulevard, note beaver dam.





Photograph A-7. Survey Site 5, Horse Creek at Leisure Town Road.



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





Photograph A-9. Survey Site 6B, Ulatis Creek at Sweeney Creek confluence.



Photograph A-10. Survey Site 7, McCune Creek at Midway Road.



Photograph A-11. Survey Site 8, Sweeney Creek at Midway Road.

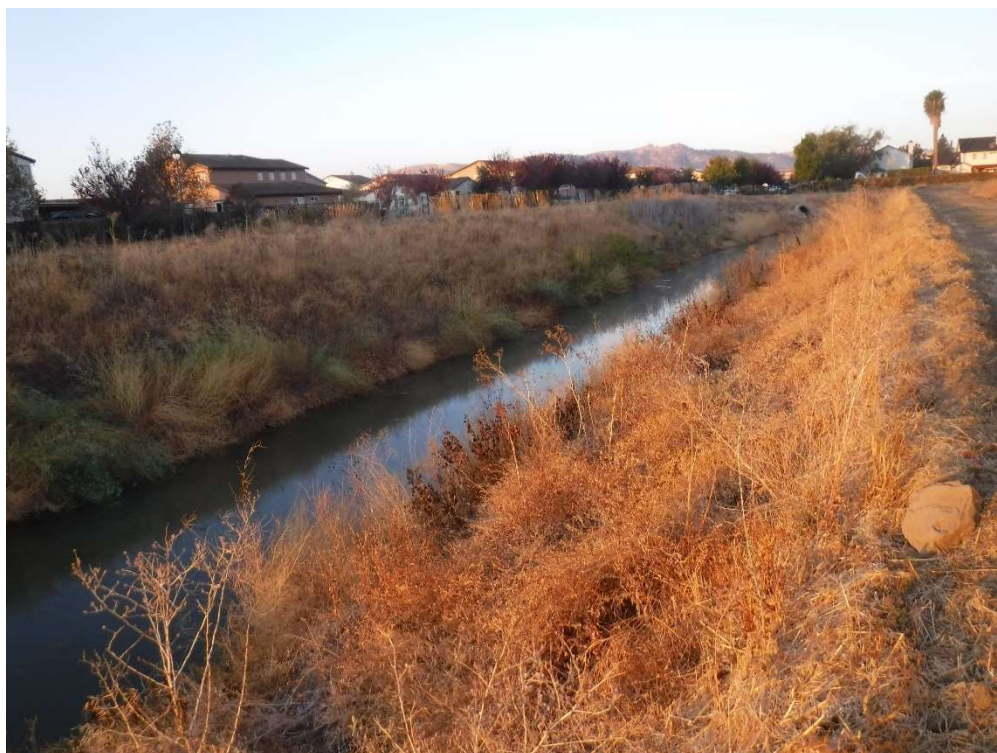


Photograph A-12. Survey Site 9, Sweeney Creek at Meridian Road.





Photograph A-13. Survey Site 10, Gibson Canyon Creek at Byrnes Road.



Photograph A-14. Survey Site 11, New Alamo Creek at Vanden Road.



Photograph A-15. Survey Site 12, Ulati Creek at Maine Prairie Road.



Photograph A-16. Survey Site 13, Ulati Creek at Browns Road.