



MEMORANDUM

TO: Chad Furl, Jamie Childers
FROM: Ed Oborny (BIO-WEST)
DATE: **August 5, 2022**
SUBJECT: EA HCP Critical Period Habitat Evaluation – 95 cfs – San Marcos System

95 cfs Habitat Evaluation

SAN MARCOS SYSTEM:

The Spring 2022 Comprehensive Biological Monitoring effort for the San Marcos System was completed in April / May 2022. As total system discharge continued to decline over the summer, the 100 cfs full Critical Period monitoring was triggered and completed in July. That monitoring effort incorporated the 100 cfs Habitat Evaluation. As of this memorandum, all activities associated with San Marcos Critical Period Biological Monitoring (**Task 2**) < 100 cfs event have been completed and are currently being processed:

- Aquatic vegetation mapping of the three (Spring Lake Dam, City Park, and I35) study reaches.
- San Marcos Salamander surveys (Spring Lake and Spring Lake Dam).
- Thermister downloads and zebra mussel lure assessment.
- Fixed-station photography.
- Fountain Darter presence/absence and timed dip netting.
- Fountain Darter drop netting in the three study reaches.
- Fish Community sampling via SCUBA and seine.
- Texas Wild-rice vulnerable stands measurements.
- Texas Wild-rice full system mapping.
- Suite I and II water quality sampling.

Habitat evaluations are required for every 5 cfs decline (not to exceed weekly) in the San Marcos system when conditions are below 100 cfs. The 95 cfs Habitat Evaluation was completed on July 27th. Per requirement, the next scheduled evaluation should occur at 90 cfs. Preliminary observations and photo documentation associated with the full system Critical Period event and 95 cfs Habitat Evaluation are presented below. As of this memorandum, the total system discharge in the San Marcos River \approx 94 cfs (see Figure to the right).

AQUIFER CONDITIONS			
Area Index	Today	Yesterday	Ten Day
Bexar (J-17)	630.4	630.6	631.6
Uvalde (J-27)	843.3	843.4	843.8
Comal Springs	100	101	105
San Marcos	94	96	98

Provisional Daily water readings as of 9:00 AM
Last Updated on August 5 2022

Key ecological information relative to the Spring 2022 routine and July Critical Period sampling are included herein to describe current conditions. Water temperature is a key component

system-wide as it is an underlying driver of spring-related aquatic assemblages.

Recent 7-day trends in water temperature (°C) for July Critical Period sampling were assessed using temperature data loggers (HOBO Tidbit v2 Temp Loggers) at 10 permanent monitoring stations in Spring Lake and the upper San Marcos River. A location map is purposely not included in this memorandum to help prevent tampering with sensitive and expensive equipment. Data for each monitoring station are based on 10-minute intervals and dates for recent trends extended from the last day that each data logger was downloaded to 7 days prior. All 7-day trends were examined from 7/23 – 7/29, except for Spring Lake Deep (7/21 – 7/27), Spring Lake (7/21 – 7/27), and Rio Vista Park (7/13 – 7/20). Recent 7-day trends were compared to long-term water temperature data measured at 4-hour intervals in July from 2001 – 2021 or to the greatest temporal extent available. For analysis, 7-day trends were compared to long-term trends using boxplots to visualize differences in central tendency (i.e., median) and variation (e.g., range, interquartile range). Results are provided in Table 1 and graphically depicted in Figures 1 and 2. Overall, it is clear the San Marcos system is in a lower flow, summer time condition but no water temperatures are noted as a concern at stations in Spring Lake or longitudinally down the system at this time.

Table 1. Summary of boxplot descriptive statistics comparing recent 7-day and long-term trends in water temperature (°C) at 10 monitoring stations in the upper San Marcos Springs/River.

Station	Period	Min	Lower Box	Median	Upper Box	Max	Interquartile Range	Range
Spring Lake Deep	7-day	21.39	21.46	21.49	21.51	21.53	0.05	0.14
Spring Lake Deep	Long-term	21.56	21.97	22.14	22.37	22.50	0.40	0.94
Spring Lake	7-day	21.84	21.84	21.87	21.87	21.87	0.02	0.02
Spring Lake	Long-term	21.51	21.58	21.62	21.68	21.82	0.09	0.31
Chute	7-day	22.39	22.59	22.85	23.42	24.68	0.84	2.28
Chute	Long-term	21.33	22.13	22.32	22.67	23.46	0.54	2.13
Spring Lake Dam	7-day	22.71	22.97	23.40	24.36	25.26	1.40	2.55
Spring Lake Dam	Long-term	21.52	22.24	22.49	22.94	23.99	0.71	2.47
City Park	7-day	22.61	23.02	23.74	25.21	26.82	2.19	4.21
City Park	Long-term	21.61	22.37	22.81	23.23	24.52	0.86	2.91
Rio Vista Park	7-day	22.71	23.09	23.62	24.56	25.60	1.47	2.89
Rio Vista Park	Long-term	21.33	22.36	22.84	23.61	25.48	1.25	4.15
I-35	7-day	22.66	23.02	23.67	24.68	25.72	1.66	3.06
I-35	Long-term	21.82	22.46	22.87	23.52	25.12	1.06	3.30
Thompson Island - Natural	7-day	22.87	23.23	23.98	25.09	25.91	1.86	3.04
Thompson Island - Natural	Long-term	20.52	22.61	23.20	24.06	26.23	1.45	5.71
Thompson Island - Artificial	7-day	23.47	24.20	24.87	25.45	26.21	1.26	2.74
Thompson Island - Artificial	Long-term	21.93	22.77	23.44	24.22	26.34	1.45	4.40
Waste Water Treatment Plant	7-day	23.16	23.59	24.36	25.36	25.99	1.76	2.83
Waste Water Treatment Plant	Long-term	21.87	22.80	23.42	24.19	26.24	1.39	4.38

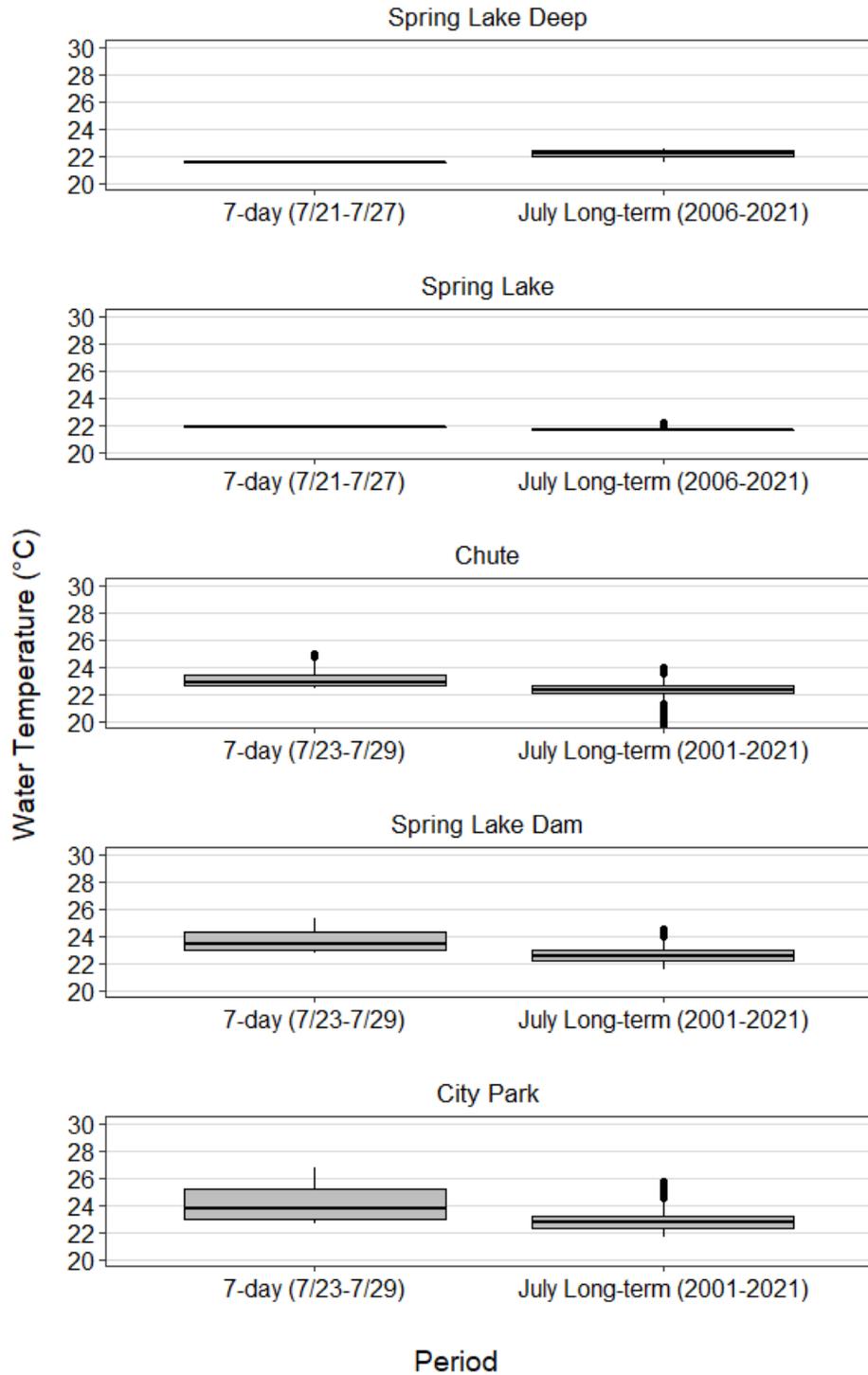


Figure 1. Boxplots comparing recent 7-day and long-term water temperature trends at five monitoring stations from Spring Lake to City Park. The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range, and outliers beyond this are designated with solid black circles.

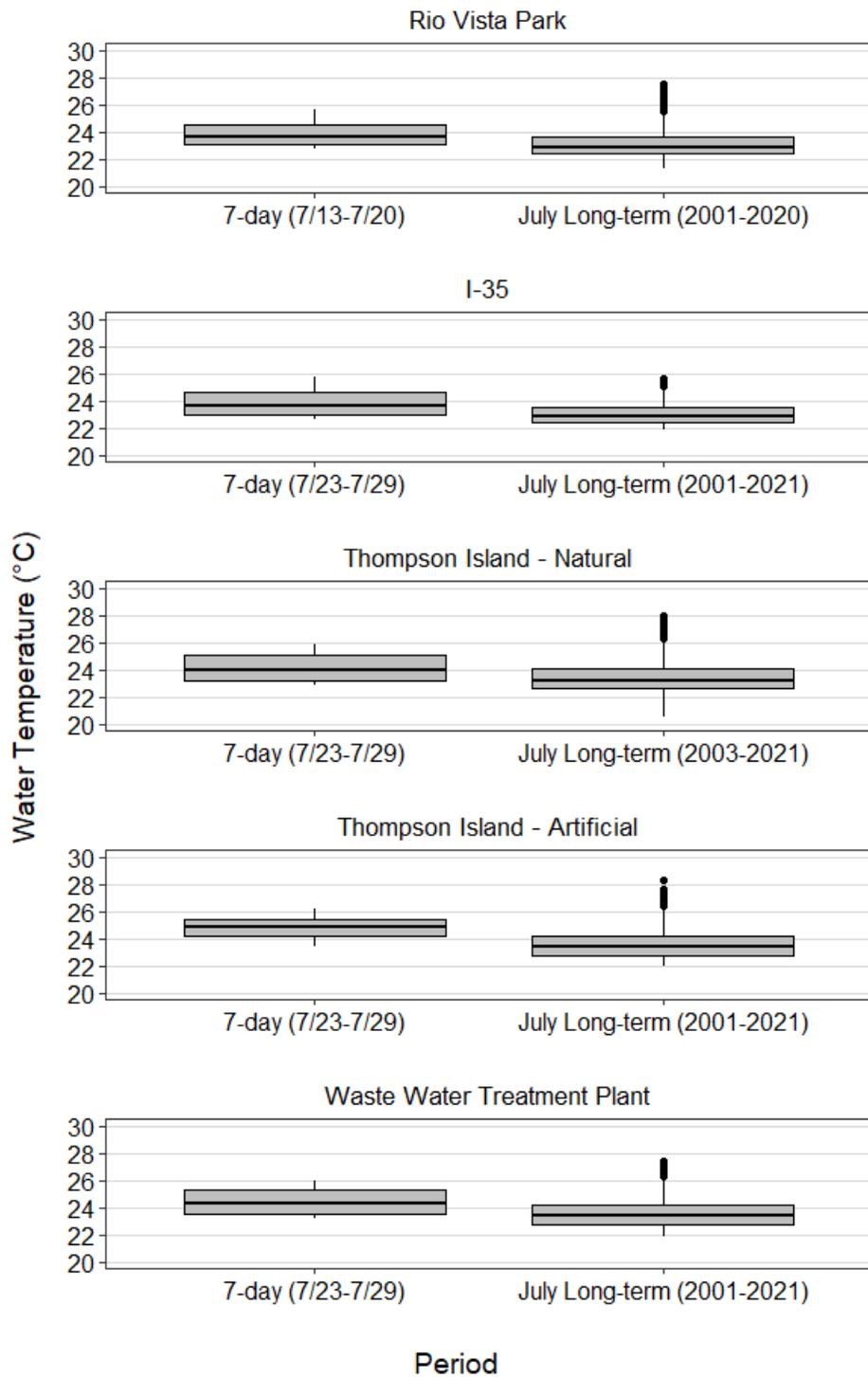


Figure 2. Boxplots comparing recent 7-day and long-term water temperature trends at five monitoring stations from Rio Vista Park to Waste Water Treatment Plant. The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represents the interquartile range. Whiskers represent minimum/maximum values up to 1.5 times the interquartile range, and outliers beyond this are designated with solid black circles.

Aquatic vegetation mapping and Fountain Darter dip netting are key monitoring components as they comprise the equation / criteria for Fountain Darter refugia salvage activities described in Section 6.4.4 (**San Marcos Springs and River Ecosystem Adaptive Management Activities**) of the EAHCP. The trigger conditions for the Fountain Darter in the San Marcos system are as follows:

- *Less than 50 percent mean aquatic vegetation (Variable Flow Study monitoring reaches including Spring Lake) AND less than 20 percent darter presence,*
OR
- *Less than 25 percent mean aquatic vegetation (Variable Flow Study monitoring reaches including Spring Lake) AND less than 30 percent darter presence.*

At present, neither of the above scenarios are close to being triggered. However, the San Marcos study reaches are experiencing summer time aquatic vegetation declines greater than average, which is typical for lower-than-average flow conditions. From April to July 2022, all three San Marcos River study reaches (Spring Lake Dam, City Park, and I35) have seen a reduction of aquatic vegetation greater than 25%. Fountain Darter dip netting results are also below average conditions as would be expected. In Spring 2022, 24% of the sites had darters present, while on July 29th 40% of the sites had darters present. With respect to Fountain Darters in both drop net and dip net sampling, the two reaches most impacted are Spring Lake Dam and City Park. Over the past several years, these reaches have become dominated by Texas Wild-rice leaving limited other aquatic vegetation of higher darter preference available. At present, the remaining native aquatic vegetation in these two reaches is unfortunately on the fringes which has started to become exposed due to declining water levels.

Throughout the system, Texas Wild-rice total coverage has experienced an approximate 10 percent decline from August 2021 to July 2022. There is approximately 13,000 m² of Texas Wild-rice in wetted areas. Currently, last summer's Texas Wild-rice footprint is still largely intact but what has been negatively impacted the most from lower water levels is the density of the top growth. The overall system-wide reduction versus reach reductions of all aquatic vegetation noted above is less, partly because of the amount of Texas Wild-rice that has been planted below Capes Dam. With no scouring pulse events the past few years in this area, these patches are currently doing exceedingly well.

Another key factor is the condition of Spring Lake as it and the Spring Lake Dam spillway are the only two locations that support the presence all three listed species (Fountain Darter, San Marcos Salamander, and Texas Wild-rice. The following pictorial habitat evaluation highlights the current condition of Spring Lake, Spring Lake Dam and longitudinally down the San Marcos River with respect to threatened and endangered species habitat conditions.

SPRING LAKE AND SPRING LAKE DAM

As evident in Figures 3, 4, and 5, water levels throughout Spring Lake are declining. Additionally, habitat conditions for San Marcos Salamanders and Fountain Darters in the lake are holding steady at this time (Figures 6, 7, and 8). The reduced water flow throughout Spring Lake with lower discharge has resulted in higher levels of algal build up and siltation within the San Marcos Salamander Spring Lake study sites. Although there is more silt depositing in these areas with less flow through the lake as is expected, that silt is not yet filtering into the under-rock crevices that support clean substrate habitat. Overall, salamander counts were consistent with years

past and adult and juvenile San Marcos Salamanders and Fountain Darters were observed at all sites.



Figure 3: Headwaters of Spring Lake looking downstream on July 27, 2022.



Figure 4: View of slough arm in Spring Lake on July 27, 2022.



Figure 5: View of Spring Lake toward Spring Lake Dam spillway on July 27, 2022.



Figure 6: Hotel Study Reach habitat surveyed on July 27, 2022.



Figure 7: Riverbed Study Reach habitat survey on July 27, 2022.



Figure 8: San Marcos Salamanders and Fountain Darters at the Hotel Reach on July 27, 2022.



Figure 9: Spring Lake Dam Spillway on July 27, 2022.

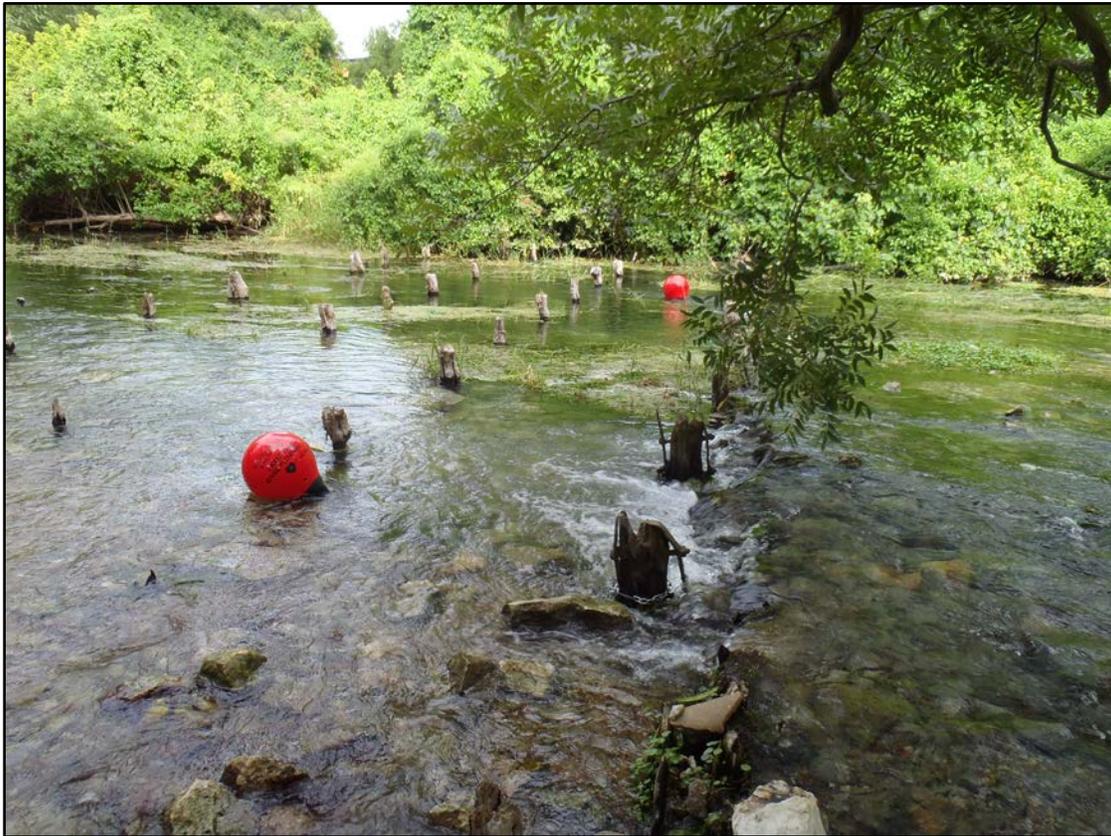


Figure 10: Spring Lake Dam water level on July 27, 2022.

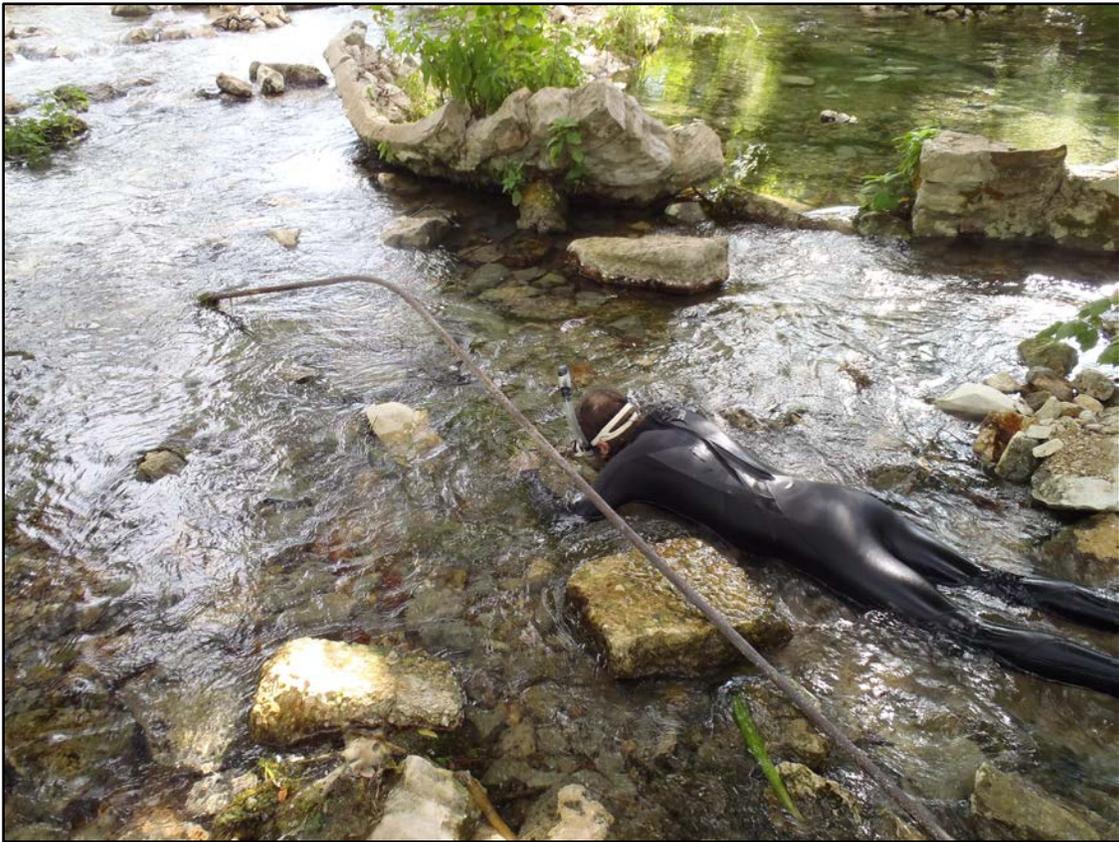


Figure 11: Spring Lake Dam Site U1 Habitat surveyed on July 27, 2022.

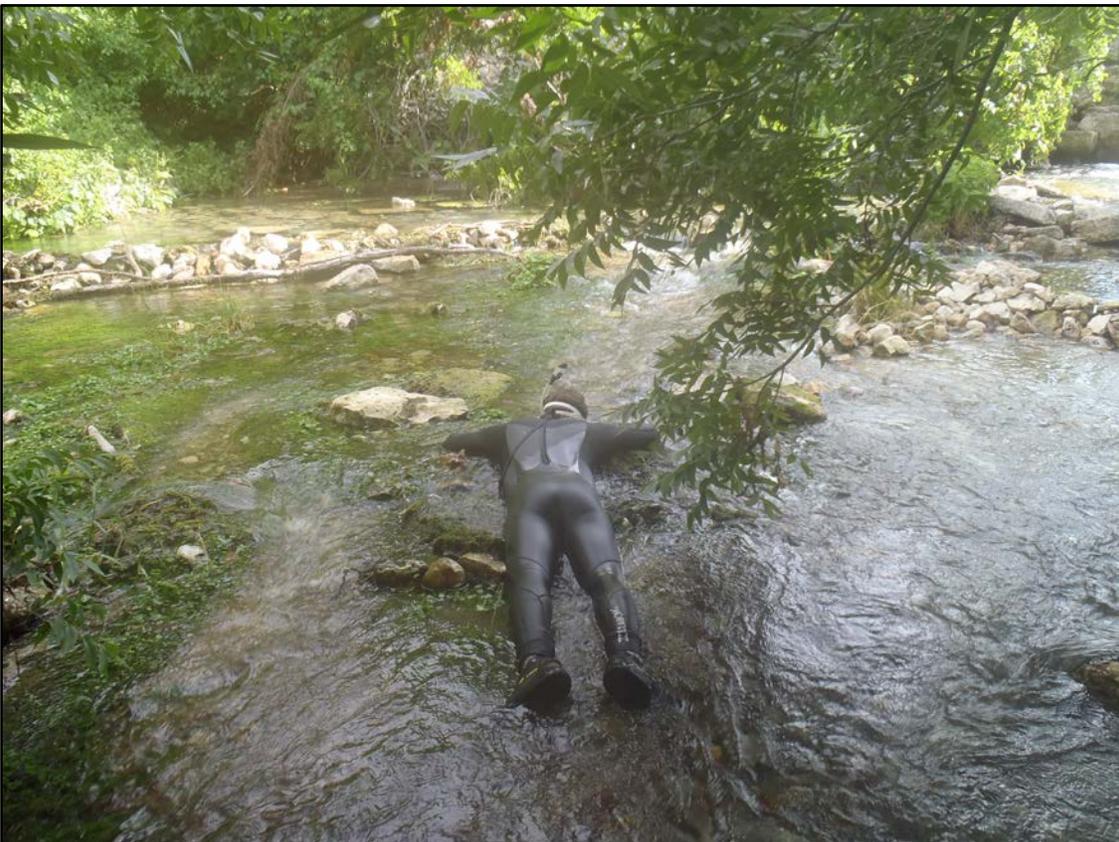


Figure 12: Spring Lake Dam Site U2 Habitat surveyed on July 27, 2022.



Figure 13: Texas Wild-rice exclusion zone below Spring Lake Dam looking downstream on July 27, 2022.

As evident in Figures 9 through 12 above, there is considerable San Marcos Salamander and Fountain Darter habitat in the spillway area. However, there has been considerable rock moving and relocating to build structures by the public which disturbs habitat in this very important area. As previously mentioned, aquatic vegetation within the Spring Lake Dam (Figure 13) and City Park (Figure 14) study reaches continue to be dominated by Texas Wild-Rice, while the I35 study reach (Figure 17) supports a more diverse aquatic vegetation community. The following photographs highlight the declining water levels and Fountain Darter habitat conditions moving downstream in the San Marcos River.



Figure 14: City Park habitat conditions on July 27, 2022.



Figure 15: City Park habitat conditions on July 27, 2022.



Figure 16: Rio Vista habitat conditions looking upstream on July 27, 2022.



Figure 17: I35 habitat conditions on July 27, 2022.



Figure 18: I35 habitat conditions on July 27, 2022.



Figure 17: Thompson Island mill race on July 27, 2022.



Figure 18: Thompson Island natural channel on July 27, 2022.

The majority of fish community study sites reported similar conditions from April to July. As expected, the water levels at the most downstream location were considerably lower than average. Presumably related to decreased depths (increased light penetration; but also decreased flow/current velocities) increased coverages of epiphytic algae and some aquatic vegetation was observed in areas typically void of vegetation. As evident in Figure 2, water temperatures are holding at the downstream locations, hence a fish community shift (spring fish community shifting to more riverine fish community) is not being observed. Instead, preliminary review of the data shows an increase in spring fish community (i.e. a greater abundance/densities of Texas Shiners and Texas Logperch). The numbers of Fountain Darters are about the same as previous collections, but it is important to note that they are still present.

Overall, water levels are noticeably down at 95 cfs, but BIO-WEST and Texas State University biologists noted no biological indicators of alarm at this time relative to historically observed conditions. As previously noted, flow through Spring Lake is presently reduced causing increased algal growth and siltation at certain locations in the lake. It should also be noted that although a diverse aquatic vegetation community is present in the I35 study reach, and scattered non-rice aquatic vegetation is present in the City Park study reach, much of this habitat is located in edge or shallow areas which will be impacted by declining water levels. Finally, declining water levels are also exposing more wetted areas to wadable conditions. As water levels continue to decline, it will be imperative to continue to track habitat conditions for HCP Covered Species during this heavy recreation season for the San Marcos River.

As always, please don't hesitate to contact me if you have any questions or concerns.

Ed