



MEMORANDUM

TO: Kristy Kollaus, Chad Furl
 FROM: Ed Oborny (BIO-WEST)
 DATE: **September 1, 2023**
 SUBJECT: EAHCP Critical Period Habitat Evaluations – San Marcos System

Habitat Evaluations (70 cfs and 65 cfs)

The Spring 2023 Comprehensive Biological Monitoring effort for the San Marcos System was completed in April 2023. That monitoring event doubled for the 85 cfs full Critical Period monitoring trip since total system discharge during that routine monitoring ranged from approximately 80 cfs to 92 cfs. Mid-May rains and resulting recharge increased total system daily discharge to over 100 cfs briefly towards the end of May. However, subsequent hot and dry conditions has led to total system discharge steadily declining this summer. As total system discharge declined, the 85 cfs Habitat Evaluation was triggered, conducted on June 22nd and reported via memorandum format to EAA. Subsequently, the 70 cfs habitat evaluation was conducted on August 21st and the 65 cfs habitat evaluation was conducted on August 29th. Per contractual requirement, the next habitat evaluation for the San Marcos River is scheduled for 60 cfs which would also trigger a full Critical Period sampling event. As of this memorandum, the total system discharge in the San Marcos River is approximately 70 cfs (Figure 1).

All continued activities associated with Critical Period biological monitoring (**Task 2**) and low-flow monitoring (**Task 3**) have been completed through August. This memorandum highlights habitat conditions this summer in the San Marcos system. Figure 1 shows the total system discharge at the USGS San Marcos River gage over the past 30 days. As of September 1st, J-17 aquifer conditions are reported as 628.5 (see image to right).

AQUIFER CONDITIONS			
Area Index	Today	Yesterday	Ten Day
Bexar (J-17)	628.5	628.8	628.7
Uvalde (J-27)	841.2	841.2	841.2
Comal Springs	68	69	67
San Marcos	69	69	68

Provisional Daily water readings as of 9:00 AM
 Last Updated on September 1 2023

Key ecological information regarding study reaches and full-system sampling are included relative to Critical Period and low-flow monitoring for comparison. Recent one-month trends in water temperature (°C) for August Critical Periods were assessed using temperature data loggers (HOBO Tidbit v2 Temp Loggers) at 8 permanent monitoring stations in the upper San Marcos River. 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 the first of the month. One-month trends were examined from 8/1 – 8/31 (n = 31 days) for all stations, which were also compared to long-term water temperature data measured at 4-hour intervals in August from 2001 – 2022 or to the greatest temporal extent available. For analysis, one-month trends were compared to long-term data using boxplots to visualize differences in central tendency (i.e., median) and variation (e.g., interquartile range). Drought conditions remain evident with August 2023 water temperatures being higher than the long-term monthly average at each station. Although elevated, temperatures are not noted as a potential concern for Fountain Darters until you reach Thompson Island longitudinally down the San Marcos River (Table 1, Figure 2).

San Marcos Rv at San Marcos, TX - 08170500

August 2, 2023 - September 1, 2023

Discharge, cubic feet per second

69.6 ft³/s - Sep 01, 2023 12:45:00 PM CDT



Figure 1: Total system discharge over the past 30 days at USGS gage on the San Marcos River.

Table 1. Summary of boxplot descriptive statistics comparing recent one-month and long-term trends in water temperature (°C) at 8 monitoring stations in the upper San Marcos Springs River for the month of August.

Station	Period	Lower Whisker	Lower Box	Median	Upper Box	Upper Whisker	Interquartile Range
Chute	1-month	22.56	22.87	23.21	23.83	25.11	0.96
Chute	Long-term	21.45	22.39	22.61	23.04	24.00	0.65
Spring Lake Dam	1-month	22.42	23.28	23.93	24.92	25.94	1.64
Spring Lake Dam	Long-term	21.15	22.71	23.07	23.76	25.33	1.06
City Park	1-month	22.54	23.42	23.95	24.63	26.13	1.21
City Park	Long-term	21.67	22.77	23.21	24.24	26.45	1.47
Rio Vista Park	1-month	22.42	23.18	23.86	24.87	26.16	1.69
Rio Vista Park	Long-term	21.01	22.80	23.23	24.12	26.09	1.32
I-35	1-month	22.51	23.42	24.17	25.31	26.48	1.88
I-35	Long-term	21.70	22.78	23.33	24.12	25.74	1.34
Thompson Island - Natural	1-month	22.61	23.71	24.56	25.62	26.57	1.91
Thompson Island - Natural	Long-term	21.29	23.01	23.58	24.51	26.74	1.50
Thompson Island - Artificial	1-month	22.85	24.94	25.79	26.43	28.64	1.48
Thompson Island - Artificial	Long-term	21.61	23.23	24.21	25.09	27.72	1.86
Waste Water Treatment Plant	1-month	23.14	24.29	25.09	26.11	26.92	1.82
Waste Water Treatment Plant	Long-term	21.70	23.33	23.88	24.78	26.92	1.45

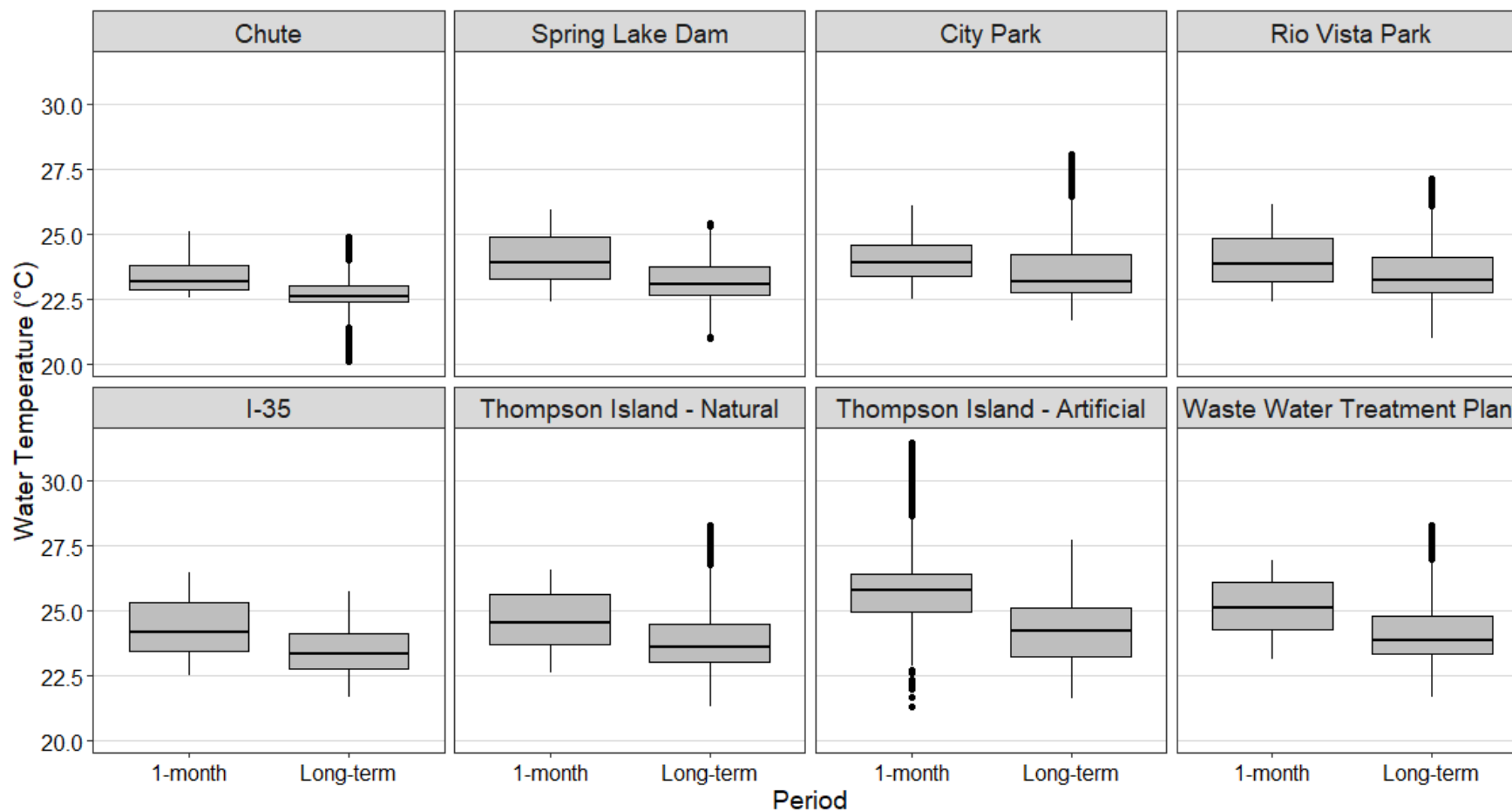


Figure 2. Boxplots comparing recent one-month and long-term water temperature trends at eight monitoring stations from Chute to Waste Water Treatment Plant for the month of August. The thick horizontal line in each box is the median and the upper/lower bounds of each box represents the interquartile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

Under current EAHCP flow-triggered conditions, Texas Wild-rice vulnerable stand surveys are being conducted weekly with the last event being conducted on August 30th. Figure 3 highlights on-going impacts occurring to Texas Wild-rice in these vulnerable areas in August. Over the course of this past month, extreme decline in plant health has been observed in most areas. However, some colonies in lesser recreated areas remain healthy.



Figure 3: Texas Wild-rice vulnerable areas in August 2023.

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

Habitat conditions for San Marcos Salamanders and Fountain Darters in Spring Lake remain suitable but slightly degraded compared to earlier this summer. The reduced water flow throughout Spring Lake coupled with summer time sunlight / day length has resulted in higher-than-average levels of algal build up and siltation within San Marcos Salamander habitat this

August. This was notably evident at the San Marcos salamander sampling location near the Hotel. Habitat in this area is still supporting small patches of clear, clean substrate directly associated with spring openings but the greater portion of the site has considerable algal and silt build-up (Figure 4).

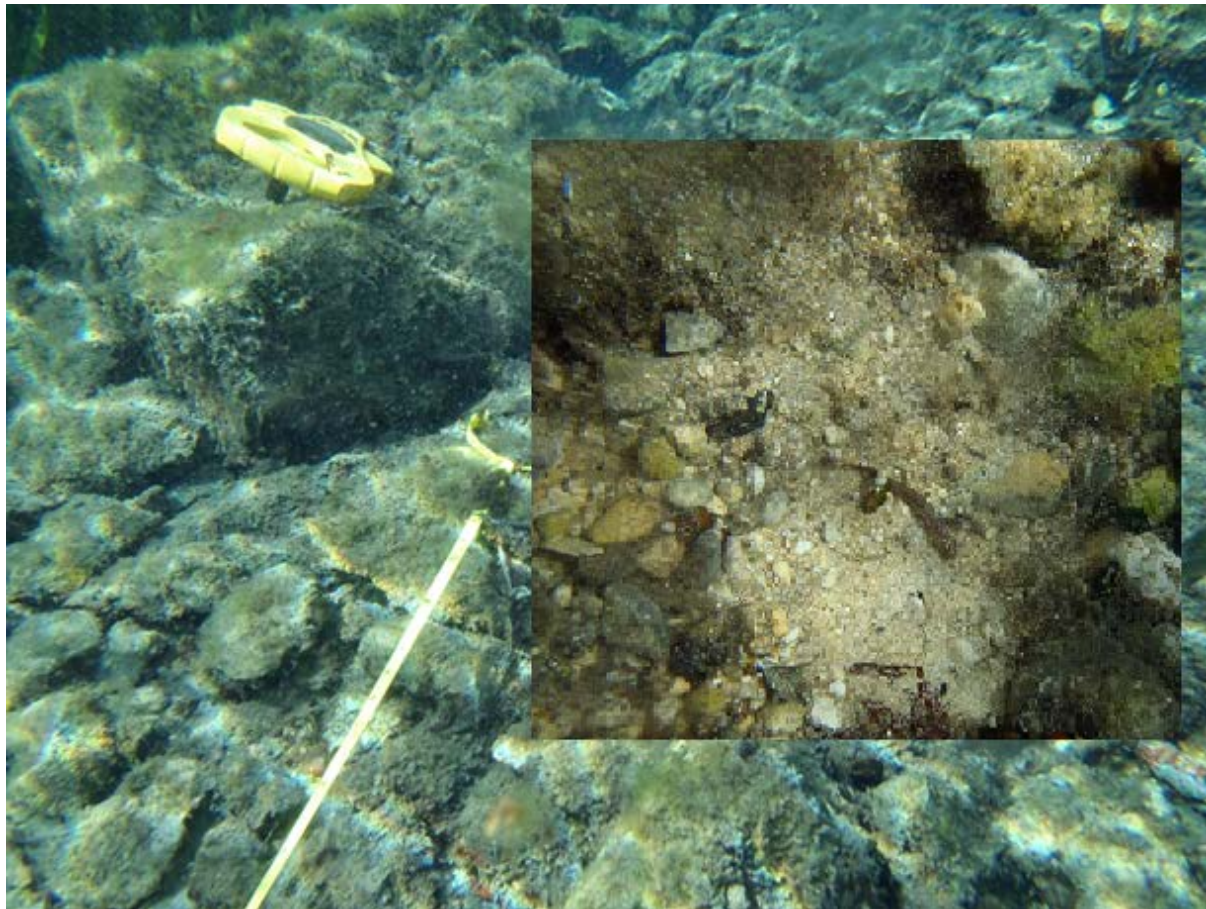


Figure 4: San Marcos salamander habitat at the Hotel Study Site on August 29, 2023. Clear substrate is still present at spring openings with salamanders of all size classes observed.

Figure 5 shows the habitat conditions for all three covered species below Spring Lake Dam. Either the salamander sign was stolen or it is not getting the love the two endangered species are 😊. The area is quite shallow, Texas Wild-rice is emergent in places and crispy brown, and floating mats of vegetation are not being moved downstream by low flow. There is a notable *Hydrocotyle* expansion in this upper area, which is suitable habitat for both the San Marcos salamander and Fountain Darter (Figure 5).





Figure 5: Covered Species habitat in the Eastern Spillway below Spring Lake Dam on August 29, 2023. Brown Texas Wild-rice and floating vegetation (top) and expansion of *Hydrocotyle* (bottom).

Figure 6 highlights the continued recreational impacts to the Spring Lake Dam reach this summer, but also the continued protection afforded by the exclusion zone.



Figure 6: Spring Lake Dam at the confluence of Sessom's Creek on August 21, 2023. Note the chairs in the water.

From Spring through August 2023, all three San Marcos Study reaches exhibited submerged aquatic vegetation declines in coverage. The decreases in aquatic vegetation has a lot to do with summer time recreational pressure but also that the system is at flow conditions that have not been experience since the inception of this biological monitoring program over 23 years ago. The extreme low flow conditions have aquatic vegetation going emergent and converting to terrestrial vegetation in river bottom areas that are no longer wet.

Aquatic vegetation 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**) in the EAHCP. Those 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 abundance, OR*
- *Less than 25 percent mean aquatic vegetation (Variable Flow Study monitoring reaches including Spring Lake) AND less than 30 percent darter abundance.*

The results of the July calculations are presented below.

JULY

Approximate* percentage aquatic vegetation of mean - 84%

Percent darter abundance - 50%

*Please note that the vegetation coverages used for the calculations below are draft at this time because we have not had time to polish them up for maps yet.

As evident above, these results are considerably above the EAHCP refugia trigger. The current trigger for this sampling is every other month, so both submerged aquatic vegetation mapping in the three study reaches and random, 50-site Fountain Darter dip netting will be conducted in September.

Overall, water levels and Covered Species habitat conditions in August are similar to slightly degraded to those observed earlier this June. Water temperature remains suitable in Spring Lake and longitudinally down the river. Lower-than-average water levels continue to expose wetted area to recreational activities that impact Covered Species habitat. Texas Wild-rice in vulnerable areas (i.e., low water depth) continues to be the Covered Species impacted to the greatest extent under these hydrological conditions. The turnover of Spring Lake continues to be reduced well below average, causing increased algal growth and siltation in most of the lake. However, San Marcos Salamander and Fountain Darter habitat within the lake and Eastern spillway remains suitable with individuals being collected and/or observed of multiple size classes in both areas on August 29th. The more diverse Fountain Darter habitat in the I35 study reach (compared to the Spring Lake Dam and City Park study reaches) remains shallow with some areas going completely dry (Figure 9), but overall, remains mostly wetted.

Should the extreme drought worsen, monitoring activities are in place to continue to track habitat conditions for EAHCP covered species in the San Marcos River. With no significant rainfall over the next two weeks, a full Critical Period monitoring event (< 60 cfs) may be triggered in September. However, with a few rains, it is likely the next full monitoring event will be conducted in conjunction with the Fall Routine sampling later in October. Meanwhile, all Task 2 and Task 3 low-flow sampling components that are actively triggered at this time will be continued throughout September.

Please don't hesitate to contact me if you have any questions or concerns. Ed



Figure 7: City Park habitat conditions looking upstream on June 22, 2023 (left ~ 85 cfs) and on August 21st (right ~ 70 cfs). Note the dry, brown vegetation (aquatic and terrestrial) during August.



Figure 8: Rio Vista habitat conditions looking upstream on June 22, 2023 (left ~ 85 cfs) and on August 21st (right ~ 70 cfs). There is no aquatic vegetation in this reach during the summer months.



Figure 9: I35 habitat conditions habitat conditions on June 22, 2023 (upper left ~ 85 cfs), August 21st (upper right ~ 70 cfs) and August 29th (lower center ~ 65 cfs).

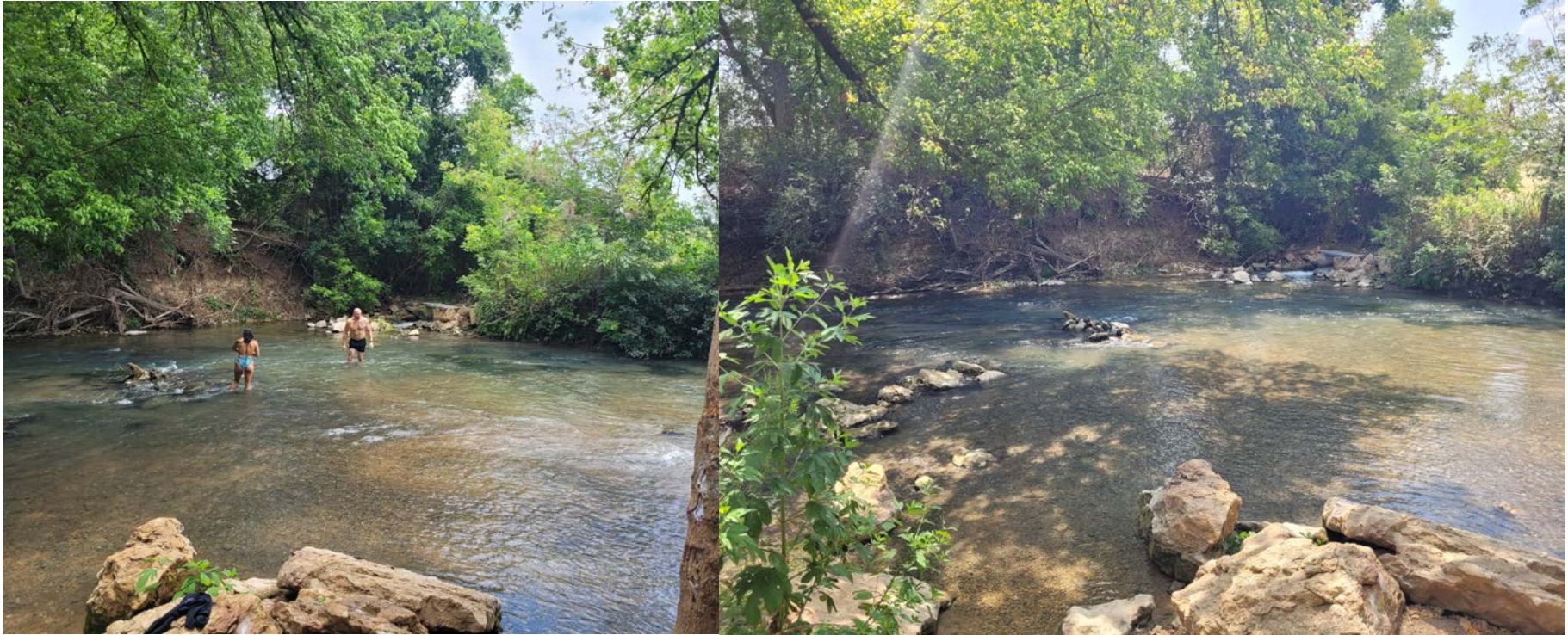


Figure 10: San Marcos River channel at TPWD outfall on June 22, 2023 (left ~ 85 cfs) and on August 21st (right ~ 70 cfs).