MEMORANDUM

TO:	Chad Furl and Kristy Kollaus
FROM:	Christa Kunkel (BIO-WEST)
DATE:	**March 24, 2026**
SUBJECT:	EAHCP Low Flow Evaluation – San Marcos River System

SAN MARCOS RIVER SYSTEM: Critical Period Sampling

This memorandum highlights the habitat and biotic conditions observed in the San Marcos River system during Critical Period sampling from January – March 2026. Activities completed as part of this low-flow evaluation include:

- Aquatic vegetation mapping of the three study reaches (Spring Lake Dam, City Park, and I-35)*
- Fountain darter presence/absence and timed dip netting
- Fountain darter drop netting
- San Marcos salamander surveys
- Texas wild-rice mapping (Full system)
- Thermistor downloads
- Suite I and II water quality sampling
- Fixed-Station Photography

A Full System Critical Period sampling event was initiated in January as the monthly median discharge was 84.3 cubic feet per second (cfs; Figure 1). Monthly median discharge declined slightly to 81.5 cfs in February. Flows continued declining into March and were 79.1 cfs on March 6th at the conclusion of Critical Period sampling. As of this memorandum (March 24th), total system discharge in the San Marcos Springs/River System is approximately 74 cfs.

* Aquatic vegetation coverages described herein are tentative at this time and subject to change. Post-processing (e.g., QA/QC) of aquatic vegetation shapefiles is ongoing and final results will be presented in the 2026 biological monitoring report.

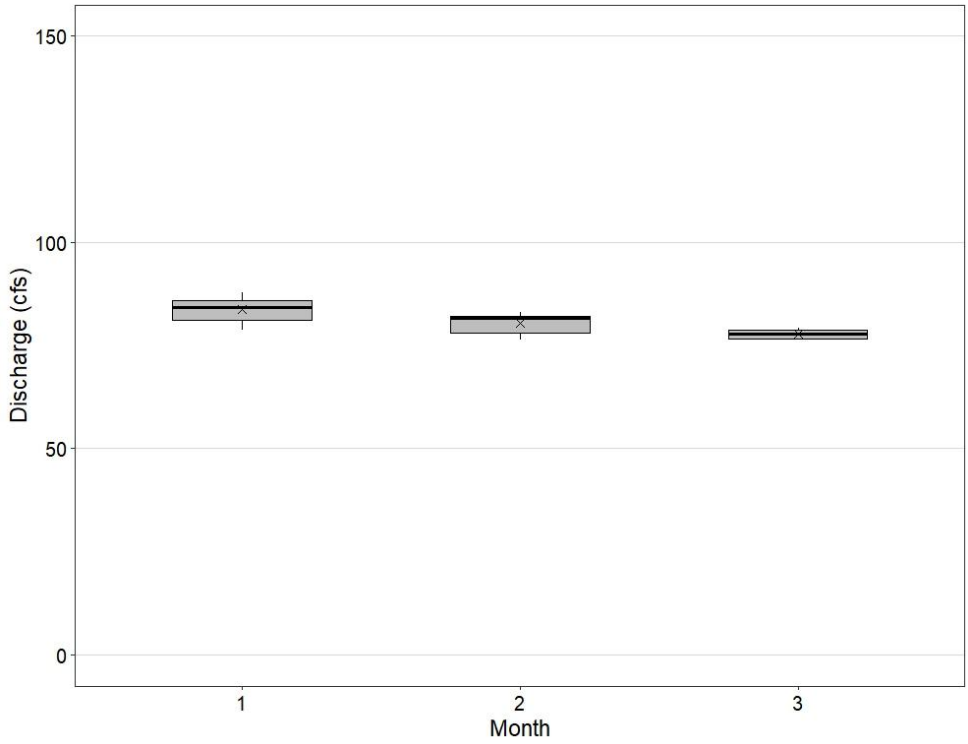

Figure 1. Boxplots displaying San Marcos River mean daily discharge among January (1), February (2), and March (3) 2026 (USGS 08170500 San Marcos River at San Marcos, Texas). The thick horizontal line in each box is the median, x represents the mean, and the upper/lower bounds of each box represent the 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.

Recent 60-day trends in water temperature (°C) were assessed using temperature data loggers (HOBO Tidbit v2 Temp Loggers) at 8 permanent monitoring stations in the San Marcos River. Trends in 2026 were examined from January 6 – March 6 for all stations except Thompson Island - Artificial (1/6 – 1/30; n = 25 days) and Wastewater Treatment Plant (1/6 – 2/17; n = 43 days). Water temperature trends at each station were compared to long-term (2000-2025) water temperature data measured from January – March. All 2026 and long-term data used were based on water temperature measurements at 4-hour intervals. For analysis, 60-day trends in 2026 were compared with long-term data using boxplots to visualize differences in central tendency (i.e., median) and variation (e.g., interquartile range). Figure 2 displays boxplots comparing recent 60-day trends with long-term data for January – March and Table 1 summarizes the descriptive statistics associated with each boxplot.

Between approximately 80-85 cfs, median water temperatures in the San Marcos River remained similar to or below long-term values at all stations except Chute. That said, all stations maintained median water temperatures below the fountain darter larval (25 °C) and egg (26 °C) production thresholds, and maximum water temperature only exceeded 25 °C at the Chute station.

Table 1. Summary of boxplot descriptive statistics comparing recent 60-day (January 6 – March 6) and long-term (2000-2025 from January - March) trends in water temperature (°C) at 8 monitoring stations in the San Marcos River.

Station	Period	Minimum	Lower Whisker	Lower Box	Median	Upper Box	Lower Whisker	Maximum	Interquartile Range
Chute	60-day	21.89	21.89	23.54	24.17	24.68	26.35	26.35	1.14
Chute	Long-term	16.96	19.08	20.84	21.53	22.06	23.71	23.71	1.22
Spring Lake Dam	60-day	18.13	18.39	20.55	21.43	22.01	24.17	24.17	1.46
Spring Lake Dam	Long-term	13.59	19.52	20.91	21.42	21.84	23.24	24.48	0.93
City Park	60-day	10.12	10.74	13.50	14.45	15.40	17.80	17.80	1.90
City Park	Long-term	15.27	19.34	20.83	21.35	21.83	23.33	24.20	1.00
Rio Vista Park	60-day	17.11	17.32	20.05	21.12	21.94	24.48	24.48	1.89
Rio Vista Park	Long-term	10.44	17.77	20.29	21.25	21.99	24.51	25.14	1.69
I-35	60-day	16.75	16.89	19.91	21.09	21.96	24.10	24.10	2.06
I-35	Long-term	10.81	18.48	20.42	21.06	21.71	23.65	24.80	1.29
Thompson Island - Natural	60-day	15.41	15.65	19.38	20.92	21.90	24.27	24.27	2.52
Thompson Island - Natural	Long-term	9.41	17.86	20.20	21.01	21.76	24.10	25.91	1.56
Thompson Island - Artificial	60-day	-1.64	2.98	12.41	16.37	19.20	22.47	22.47	6.79
Thompson Island - Artificial	Long-term	11.03	16.34	19.35	20.39	21.36	24.31	26.14	2.01
Waste Water Treatment Plant	60-day	14.36	14.36	18.33	19.65	21.04	22.94	22.94	2.71
Waste Water Treatment Plant	Long-term	9.46	17.45	19.98	20.84	21.67	24.20	25.87	1.69

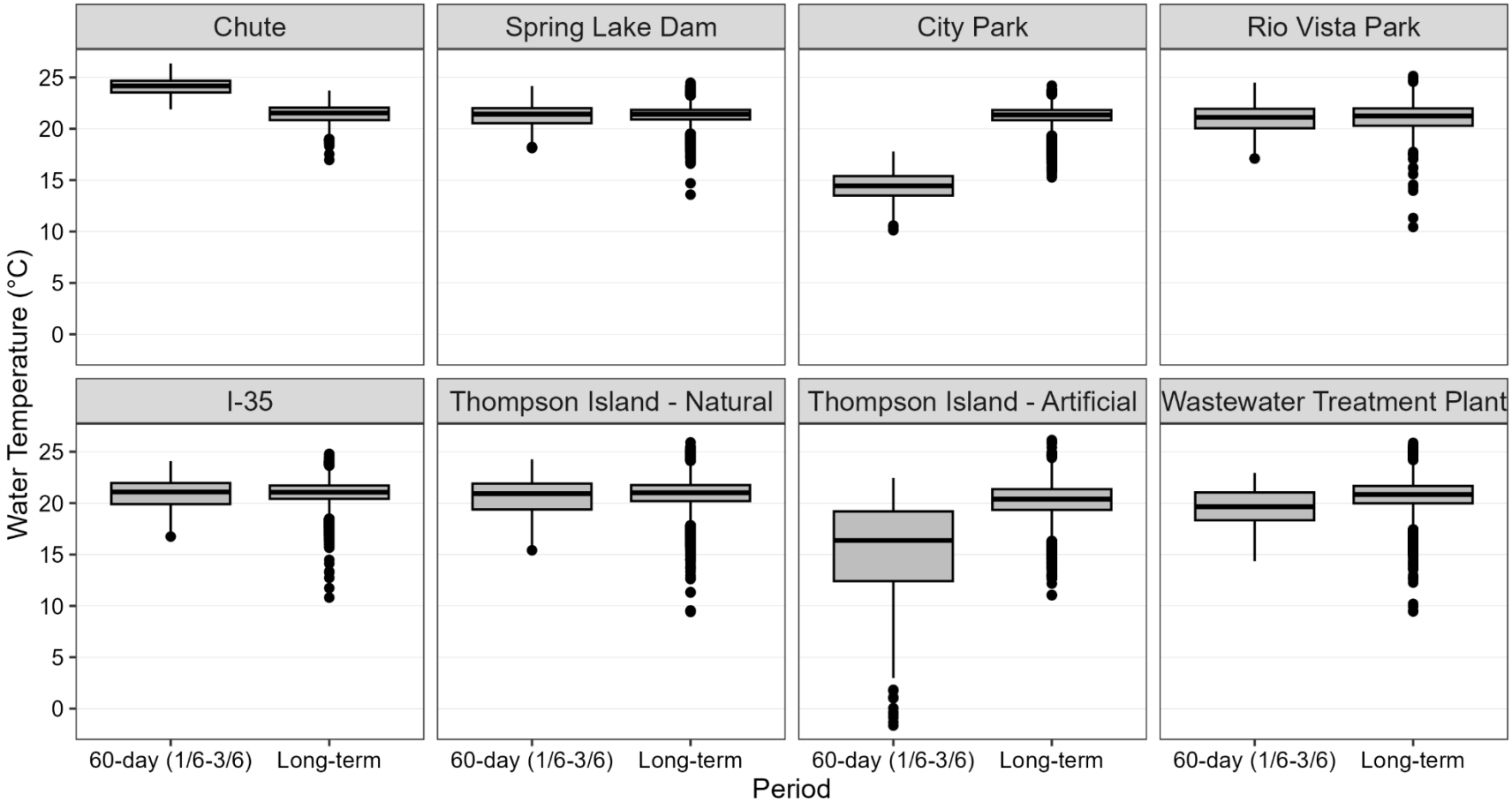

Figure 2. **Boxplots statistics comparing recent 60-day (January 6 – March 6) and long-term (2000-2025 from January - March) trends in water temperature (°C) at 8 monitoring stations in the San Marcos River. The thick horizontal line in each box is the median and the upper/lower bounds of each box represents 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.**

Water quality was analyzed at 18 sites along the San Marcos River during Critical Period sampling at ~85 cfs on January 21st. Results from water quality analysis generally demonstrated typical water quality parameters (Table 2). Nitrate concentrations across all stations were similar to historical data. However, Total Nitrogen at the Submarine site in Spring Lake (41.1 mg/L) and the I-35 site (31.6 mg/L) was much higher than previous water quality assessments and higher than the Texas Commission on Environmental Quality Surface Water Quality Standards (10 mg/L). High Total Nitrogen at these sites was not due to elevated Nitrate, Nitrite, or Ammonia concentrations as these parameters were low at both sites. This could suggest that high Total Nitrogen was due to higher levels of organic nitrogen, likely present in the form of algae and/or detritus. Ammonia and Total Phosphorus generally remained below detectable levels, and Alkalinity and Total Suspended Solids were similar to previous water quality assessments.

Table 2. Summary of water quality analysis from 18 sites along the San Marcos River on January 21st, 2026.

Site	Nitrate (mg/L)	Total Nitrogen (mg/L)	Ammonia (mg/L)	Total Phosphorus (mg/L)	Alkalinity (mg/L)	Total Suspended Solids (mg/L)
Sink Creek	0.487	<1.15U	0.051	0.123	265	4.21
DS SM Springs Dr	0.31	<1.15U	<0.0400U	0.0474	263	1.89
Hotel	1.43	1.43	<0.0400U	<0.0100U	263	<1.00U
Submarine	1.27	41.1	<0.0400U	0.0111	265	<1.00U
Boat Dock	1.19	1.19	<0.0400U	<0.0100U	264	<1.00U
Boardwalk	1.36	1.36	<0.0400U	<0.0100U	266	8.11
Loading Dock	1.41	1.41	<0.0400U	<0.0100U	264	<1.00U
Above Chute	1.46	4.04	<0.0400U	<0.0100U	264	<1.00U
Below SLD	1.37	1.37	<0.0400U	0.0104	267	1.18
Above SLD	1.37	2.49	<0.0400U	<0.0100U	261	<1.00U
Below Chute	1.45	1.45	<0.0400U	<0.0100U	266	<1.00U
Sessom Creek	1.46	1.46	<0.0400U	<0.0100U	270	<1.00U
City Park	1.45	1.45	<0.0400U	<0.0100U	262	4
Rio Vista	1.38	1.38	<0.0400U	<0.0100U	266	<1.00U
I-35	1.37	31.6	0.044	<0.0100U	271	1.05
TI Artificial	1.19	1.19	<0.0400U	<0.0100U	257	<1.00U
TI Natural	1.3	1.3	<0.0400U	<0.0100U	264	4.63
Wastewater Plant	1.36	1.36	<0.0400U	<0.0100U	263	4.84

*U denotes un-detected compound

Habitat conditions in Spring Lake remained suitable for both San Marcos salamander and fountain darters (Figure 3), though slight degradation to San Marcos salamander habitat at the Hotel reach was evident with more overgrown rooted vegetation than typical. Favorable salamander habitat conditions were present at Riverbed. San Marcos salamander sampling conducted on January 20th demonstrated typical densities at Hotel (19.37 salamanders/m^2) and Riverbed (17.36 salamanders/m^2). In contrast, San Marcos salamander density at Spring Lake

Dam was low (1.47 salamanders/m^2), continuing a general pattern of lower densities at Spring Lake Dam. In recent years, Texas wild-rice has encroached in the San Marcos salamander habitat at Spring Lake Dam, which has contributed to increased sedimentation and reduced the amount of suitable salamander habitat (Figure 4). At Sewell Park, reductions in wetted area have become more permanent as terrestrial vegetation has overtaken areas once occupied by Texas wild-rice.

Figure 3. Main body of Spring Lake highlighting abundant submerged aquatic vegetation.

Figure 4. Texas wild-rice expansion below the Eastern Spillway at Spring Lake Dam observed on January 12th, 2026.

Beginning in January at ~85 cfs, Texas wild-rice was mapped throughout the full system and all aquatic vegetation was mapped in the study reaches. Total system-wide coverage of Texas wild-rice was approximately 14,000 m^2. Despite prolonged low flows, winter 2026 coverage was ~1,400 m^2 greater than the previous system-wide mapping event in summer 2025. The largest coverage increase occurred in the City Park Study Reach segment (~600 m^2; Figure 5). This increase in system-wide coverage was expected given that the winter season allows for increased sunlight, reduced recreation, and reduced turbidity.

Figure 5. Texas wild-rice expansion in the City Park study reach at ~85 cfs.

The Spring Lake Dam aquatic vegetation assemblage was dominated by Texas wild-rice, although *Potamogeton* and *Hydrocotyle* have expanded behind the exclusion zone since fall 2025 (Figure 6). City Park has maintained complex fountain darter habitat, as *Cabomba* increased by ~50 m^2 and bryophyte patches persisted into 2026. Bryophytes were also intermixed with other taxa during drop-net sampling for Fountain Darters (Figure 7). At the I-35 study reach, coverage of Texas wild-rice increased, while coverage of other vegetation taxa decreased. That said, I-35 continued to maintain the most diverse assemblage among the study reaches, with multiple complex taxa present, such as *Cabomba*, *Hydrocotyle, and Ludwigia* (Figure 8). Reductions in wetted area were more apparent at the I-35 reach, as terrestrial vegetation has established along the river-left bank downstream of the pedestrian bridge which has been ongoing since this drought began (Figure 9).

Figure 6. Texas wild-rice expansion behind the exclusion zone at Spring Lake Dam at ~85 cfs.

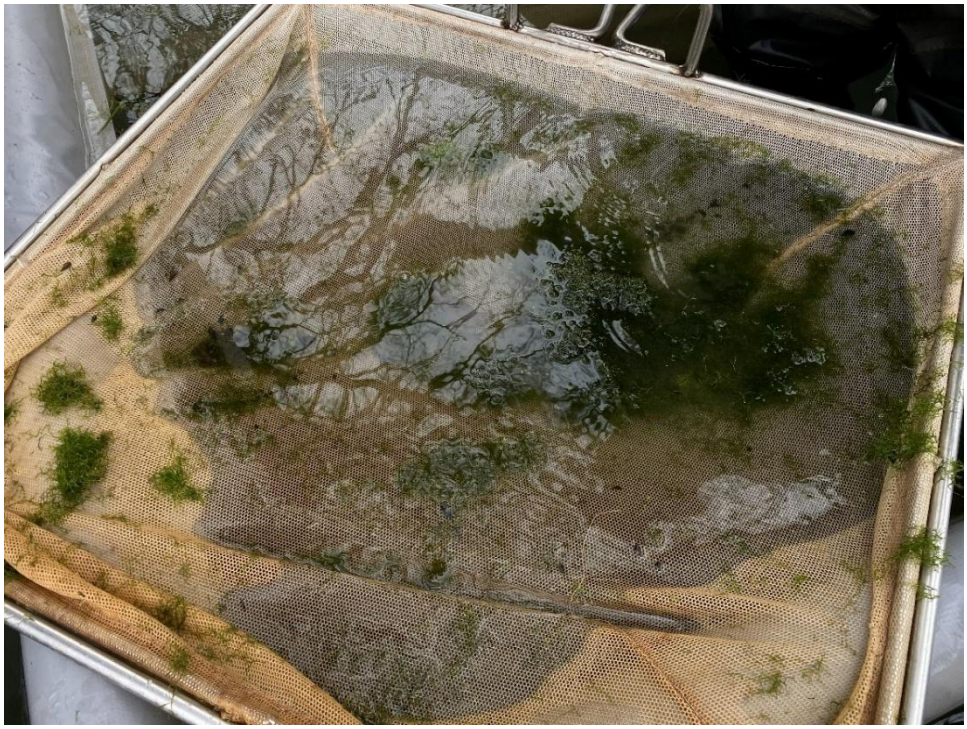

Figure 7. Bryophytes collected during drop-netting activities in City Park on January 13th, 2026.

Figure 8. *Ludwigia* and bryophytes at the I-35 study reach in January during drop-netting activities on January 14th, 2026.

Figure 9. Terrestrial vegetation established during prolonged low flows at the I-35 study reach observed during drop-net activities on January 14th, 2026.

In addition to mapping fountain darter habitat, fountain darters were sampled using timed/random dip-net and drop-net survey methods. A total of 63 fountain darters were observed during 3.5 person-hours (p-h) of effort during timed dip-netting, and median catch per unit effort was 14 darters/p-h. During random dip-netting, fountain darters were detected at 20 out of 50 (40%) stations. Across 25 drop-net sites, overall median fountain darter density was 2.0 darters/m^2. Median density was 0.5 darters/m^2 at Spring Lake Dam, 7.8 darters/m^2 at City Park, and 3.0 darters/m^2 at I-35. Lower densities observed during winter are not surprising, though greater fountain darter density at City Park continues an increasing trend at this reach observed in recent years. Additionally, recent recruits (≤20 mm) were observed during all drop-netting and dip-netting activities.

In summary, total system discharge in the San Marcos system remained approximately 80-85 cfs from January 6th through March 6th, 2026. Water quality and water temperature conditions were generally consistent with historical conditions. Spring Lake continued to maintain suitable San Marcos salamander and fountain darter habitat. Reductions in wetted area were more apparent in some locations (e.g., Sewell Park and I-35), yet overall, the three Covered Species remain resistant to the prolonged low-flow conditions. San Marcos salamander densities were high at the Spring Lake sites, Texas wild-rice continued to dominate the vegetation assemblages in the study reaches, and fountain darter habitat improved in some areas. Enhanced fountain darter habitat was most notable at City Park, as sustained low flows promoted persistence of bryophytes and expansion of *Cabomba*. At the current flow conditions, the San Marcos system appears to be relatively stable. Continued monitoring will be essential to capture responses as the year progresses or to detect degradation should this extreme drought worsen.