MEMORANDUM

TO:	Nathan Pence
FROM:	Ed Oborny (BIO-WEST)
DATE:	**July 18, 2014**
SUBJECT:	EA HCP Biological Monitoring – **Week 14**

BIOLOGICAL MONITORING UPDATES

COMAL SYSTEM:

At the time of this memorandum, the total system discharge at Comal Springs was 116 cfs (Figure 1). This makes the fourteenth consecutive week below 150 cfs, and therefore, the required weekly habitat evaluation was conducted on July 17th. Weekly habitat evaluations and memorandums will continue to occur until total system discharge at Comal Springs/River increases and consistently stays above 150 cfs. As total system discharge declined below 120 cfs this week Comal Springs riffle beetle, Comal Springs salamander, and Comal discharge measurements/sampling were triggered. As described in previous weeks, the next Critical Period full sampling event is not triggered until the total system discharge declines below 100 cfs. The next scheduled routine monitoring is fountain darter dip netting later in July.

Discharge, cubic feet per second

Most recent instantaneous value: 116 07-18-2014 06:45 CDT

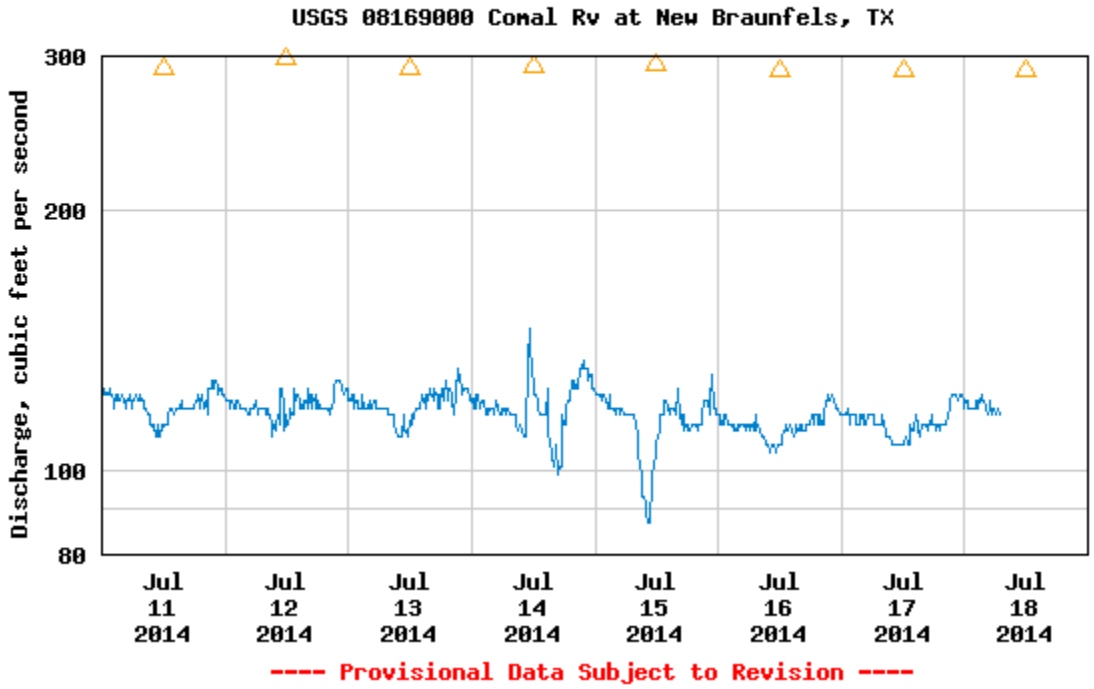

Figure 1: Screen shot of USGS webpage for the ***COMAL*** gage (08169000) showing total system discharge over the past week.

SAN MARCOS SYSTEM:
The total system discharge for San Marcos Springs/River is approximately 139 cfs. At the present total discharge conditions, the San Marcos River will not likely trigger any critical period biological monitoring this month. Annual full-system mapping of Texas wild-rice is currently underway with fountain darter dip netting scheduled later in July.

COMAL SPRINGS/RIVER - WEEK 14 CONDITIONS:
Weekly habitat observations and photo documentation associated with HCP triggered sampling were conducted on Thursday, July 17th.

OBSERVATIONS AND ACTIVITIES:
The J17 water level at the time of photo documentation this week was dipping into the 631's with a periodic decline in the 630's earlier in the week. With the nice rains through the night, aquifer levels are rising a bit this morning. During all full sampling events and select trigger events, discharge data is collected at HCP designated locations to relate directly to biological monitoring activities being conducted. On July 17th discharge conditions at the EAA HCP locations were as follows:

Table 1. Comparison of discharge (cfs) throughout Comal Springs (Fall 2013 to Summer 2014)

	Discharge (cfs)		
Date	**Sept 12, 2013**	**April 23, 2014**	**July 17, 2014**
Spring Run 1 –	1.3	3.1	0.7
Spring Run 2 –	0.9	2.5	1.4
Spring Run 3 –	11.5	16.9	10.0
Old Channel –	53.3	52.2	52.7
Upper Spring Run –	0.8	2.3	0.6
Total USGS Gage – Daily Average	111.0	143.0	113.0

Although total system discharge was slightly higher than that reported last fall, Spring Run 1, Spring Run 3, and the Upper Spring run were exhibiting the lowest discharge conditions observed since the initiation of this monitoring program back in 2000. As a result, surface habitat conditions relative to flow, water level and exposed substrate in these areas again declined this past week. Neither of the two major orifices at Spring Run 1 exhibited surface discharge this week, with Figure 2 highlighting the lowest conditions observed in 2013, conditions during the Spring Comprehensive sampling this past April, and at present (July 17, 2014). Immediately downstream of the main orifice pool, an extended portion of the Spring Run is completely dry at the surface (Figure 3). Downstream of the dry surface portion, wetted surface water habitat reappears but the channel continues to be severely laterally constricted as one proceeds downstream until the confluence with Spring Run 2 outfall. Surprisingly, Spring Run 2 continues to maintain surface flow for the main portion of the channel and actually supports greater surface discharge than Spring Run 1. This is the first time this has been observed over the course of this study. It will be interesting to see if this is just elevation differences at conditions we have not witnessed before or if the considerable amount of wall reconstruction and rock movement in Spring Run 1 the past several months has somehow forced the redistribution of some water towards Spring Run 2. Spring Run 3 continues to maintain connectivity throughout the run (Figure 4) but at the lowest discharge observed during the course of this study it is also experiencing some reductions in lateral connectivity.

Figure 2: Spring Run 1 main orifices (different dates back through last fall).

Figure 3: Spring Run 1 main channel looking downstream from main orifices).

Figure 4: Spring Run 3 looking downstream from headwaters.

Algae continues to be extremely thick in the Upper Spring Run reach. This intense coverage has eliminated most all native bryophytes at this time and continues to cover remaining rooted aquatic macrophytes (Figure 5). It is encouraging that at a present reach discharge less than 1 cfs (Table 1) and a period now of longer than 3 months of discharge less than 5 cfs, conditions show 1) upwelling flows are still being observed as upstream as the confluence of Blieder's creek, 2) rooted aquatic macrophytes, although coated in algae, continue to survive, 3) fountain darters continue to persist in this reach (documented in both dip netting efforts and results of the fountain darter movement study which has not documented any movement out of this reach at this time), and 4) water temperatures remaining for the most part below 26 °C which likely plays a major role in the continued use of this area by fountain darters. With that said, fountain darters are still being observed in Blieders creek with water temperatures approaching 29 °C. Figure 6 shows the crew conducting fountain darter movement observations in the Upper Spring Run reach. Figure 7 shows what the fluorescent marker implanted in a fountain darter looks like at night from the divers view using the specialized flashlight. Echoing all previous summertime memos, unless there is a significant change in flow conditions, algae conditions will only get worse in coming weeks with increased ambient air temperatures.

Figure 5: Extensive algal coverage continues in the Upper Spring Run reach.

Figure 6: Fountain darter movement crew evaluating the Upper Spring Run area.

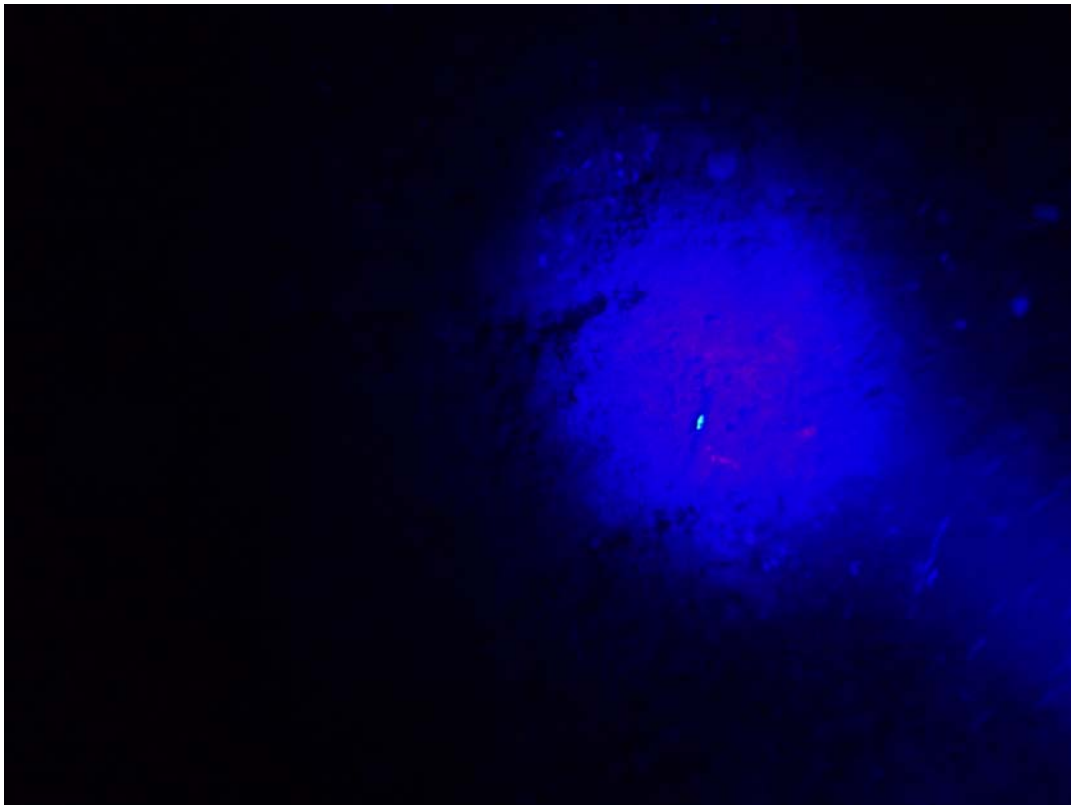

Figure 7: Fluorescent marker in fountain darter in the Upper Spring run area – as observed by a diver looking downward during night surveys with specialized flashlights.

The surface water level in the Spring Island area this week was the lowest observed since the start of the biological monitoring program in 2000. Exposed surface habitat in the area along the eastern side of the island (Figure 8) remained event and both spring runs associated with Spring Island were dry on the surface (Figure 9). Not surprisingly, although the spring runs were dry on the surface, water was still issuing from the island at the base of the spring run documenting that subsurface flow was indeed occurring. Figure 10 shows the crew conducting Comal Springs salamander surveys in the highly constricted Spring Run 1 channel on July 17th. Table 2 shows the long-term average as well as recent counts of Comal Springs salamanders in each of the sample locations. All but Spring Run 3 exhibited lower than long-term study average numbers of Comal Springs salamanders which is not surprising because of the more notable reductions in available surface habitat at these locations. It is interesting that in Spring Run 1 where reductions in surface habitat are the worst witnessed during this biological monitoring program, more salamanders were reported yesterday than during the final 3 sampling events in 2013. This may be explained by clumping in limited available habitat, but regardless, it is encouraging at this point that they are still present at the surface.

Figure 8: Continued exposed surface habitat adjacent to Spring Island.

Figure 9: Southern spring run on Spring Island nearly completely dry.

Figure 10: Comal Springs salamander surveys in Spring Run 1 (no snorkel needed).

Table 2: Comal Springs salamander timed counts

Survey Date	Salamander Counts			
	Spring Run 1	Spring Run 3	Spring Island (runs)	Spring Island – Eastern outfall
Long-term average (2002-2014)	22	13	3	9
April 18, 2013 Spring Comprehensive	17	15	0	4
August 16, 2013 Critical Period trigger	8	12	0	8
September 12, 2013 Critical Period trigger	6	13	1	11
October 29, 2013 Fall Comprehensive	7	9	2	6
April 25, 2014 Spring Comprehensive	12	23	3	7
July 17, 2014 Critical Period trigger	16	24	0	8

For the Comal Springs riffle beetle surveys, cotton lures were placed at each of the designated sampling locations 2-weeks ago in anticipation of this critical period trigger. As such, these lures will be retrieved in 2 weeks per the 4-week monitoring protocol and reported on at that time.

Similar to the last 3 months of these memorandums, aquatic vegetation within Landa Lake, the Old Channel (Figure 11), and New Channel (Figure 12) continue to support quality fountain darter habitat. With the flow-split project now complete, and the fact that over 900 m^2 of non-native *Hygrophila* was removed in key parts of the Old Channel in early June, and over 2,500 native plants were planted in the month of June alone throughout key locations in the Old Channel, we feel much better as we potentially move into springflow conditions not experienced in the Comal system for nearly 20 years. Per the previous sentence, all aquatic vegetation work performed in June was conducted during that nice window of total system discharge greater than 130 cfs.

In summary, total system discharge in the Comal System is nearing levels that have not been witnessed since 1996. These lower discharges continue to create worsening surface habitat conditions each week for the Comal Springs invertebrates. Critical period monitoring will continue to be vital to track the success of the surface dwelling invertebrates in this reduced surface habitat at Comal Springs during this period. The good news is that the overall system continues to support quality fountain darter habitat conditions throughout most of its entirety. With over 3 months of lower than average discharge (including <5 cfs in the Upper Spring Run reach) we have been provided with a great opportunity to study the resiliency of these species and educate ourselves regarding preconceived thoughts of physical habitat and water quality changes that might occur during these conditions.

As always, if you have any questions, please give me a shout. Ed

Figure 11: Restored native aquatic vegetation continues to thrive in the Old Channel.

Figure 12: New Channel *Cabomba* continues to support quality fountain darter habitat.