MEMORANDUM

TO:	Nathan Pence and Rick Illgner
FROM:	Ed Oborny (BIO-WEST)
DATE:	August 16, 2013
SUBJECT:	EA HCP Bio-monitoring Update – August 2013

Nathan and Rick,

This memorandum serves as an interim progress update regarding BIO-WEST activities relative to the 2013 HCP Bio-monitoring at Comal and San Marcos springs. As a refresher, the following section summarizes the Comprehensive, Critical Period, and Species specific sampling activities and triggers on the Comal and San Marcos systems.

COMPREHENSIVE SAMPLING:

- COMAL
  - Spring — Full Sampling Event
  - Summer — Dip net sampling – fountain darter
  - Fall — Full Sampling Event

- SAN MARCOS
  - Spring — Full Sampling Event
  - Summer — Dip net sampling – fountain darter; Full system Texas wild-rice mapping
  - Fall — Full Sampling Event

CRITICAL PERIOD SAMPLING:

- COMAL
  - < 200, 150, 100, 50, 10 cfs — Full Sampling Event

- SAN MARCOS
  - < 100, 85, 60, 25, 10 — Full Sampling Event
  - <120 cfs every 5 cfs decline — Texas wild-rice physical measurements

HCP SECTION 6.4 – SPECIES SPECIFIC LOW-FLOW:

COMAL	TRIGGER
Fountain darter	150 cfs
Comal Springs riffle beetle	120 cfs
Comal Springs salamander	120 cfs
Other endangered invertebrates	30 cfs

- SAN MARCOS
  - Fountain darter 80 cfs
  - San Marcos salamander 80 cfs
  - Texas blind salamander 50 cfs
  - Texas wild-rice 100 cfs

BIO-MONITORING TO DATE

Comal System:

A combined (Comprehensive/Critical Period) full sampling event was conducted in April/May on the Comal system when total Comal spring flow declined below 200 cfs (April 27 and May 28 memorandums to EAA).

Comprehensive Summer dip net sampling conducted in mid-July.

Critical Period Full Sampling Event – 150 cfs trigger – ***IN PROGRESS – Subject of this memo.***

Fountain Darter species specific sampling – 150 cfs trigger – ***IN PROGRESS – Subject of this memo.***

San Marcos System:

A combined Comprehensive/Critical Period) full sampling event was conducted in April/May on the San Marcos system when total San Marcos spring flow declined below 100 cfs (May 28 memorandum to EAA).

Comprehensive Summer dip net sampling conducted in mid-July. Comprehensive full system mapping of Texas wild-rice – IN PROGRESS.

In addition, four Texas wild-rice physical habitat measurements Critical Period (<120 cfs) sampling events occurred as follows (May 28 memorandum to EAA):

2013 TWR 1	21 February	<120 cfs
2013 Spring	24 April	<110 cfs
2013 TWR 2	14 May	<105 cfs
2013 TWR 4	24 May	<100 cfs

Species specific sampling - NONE

PRESENT CONDITIONS AND ACTIVITIES:

The lower than average flows in both systems during April/May were temporarily alleviated by extensive rainfall in late May / early June to the degree that the Edwards Aquifer level at J17 rose 18 feet. The rise in the aquifer resulted in a corresponding increase in spring flows at Comal to above 220 cfs and San Marcos to just above 120 cfs. Since then, the extended dry period and hot temperatures experienced in late June through the present has resulted in total spring flows declining in both systems over this period.

San Marcos: We continue to keep a close eye on San Marcos during our comprehensive summer dipnetting for fountain darters (conducted in mid-July) and full-system mapping of Texas wild-rice (in progress). However, no critical period sampling is scheduled until total spring flows decline below 95 cfs (Texas wild-rice physical measurements) or below 85 cfs (full Critical Period sampling event). The present total discharge at San Marcos is ≈ 109 cfs.

Comal: The present total discharge at Comal Springs is ≈ 131 cfs. Continued hot and dry conditions along with an adjustment to the gage by the USGS on August 5th triggered the <150 cfs full-sampling Critical Period event along with species specific fountain darter sampling on the Comal system. Over the past month, BIO-WEST has been corresponding with EAA staff on the potential for triggering a Critical Period sampling event this summer. On August 8th, BIO-WEST notified EAA regarding the need to proceed with a full sampling event per the EAA HCP and received approval from EAA to commence sampling on August 9th.

This memorandum serves as the weekly correspondence on sampling activities and preliminary results regarding the condition of the Comal system. Starting August 9th, BIO-WEST initiated the full Critical Period sampling effort which includes the following components and schedule:

- Water quality – Grab samples and standard parameters at 12 stations – August 12.
- Aquatic vegetation mapping of 4 study reaches – August 10-13.
- Fixed station photography – week of August 19.
- Fountain darter specific sampling
    - 50 sites Dipnet – August 13.
    - Timed Dipnet surveys – week of August 19.
    - Dropnet 3 study reaches – August 14-15.
    - SCUBA transects – week of August 19.
- Fish Community sampling
    - SCUBA mesohabitat and microhabitat – August 14-15.
    - Seine – August 13-15.
- Comal Spring salamander sampling – August 16.
- Comal Springs discharge measurements – August 9.
- Comal Springs invertebrate sampling – Lure placement – August 14-16.

RESULTS:

As of this memorandum, most all the Critical Period field sampling activities have been completed or are underway with the following preliminary observations. Total discharge conditions for the Comal system during the sampling period started at ≈136 cfs (August 9th) and are presently at ≈131

cfs (August 15th) with fluctuations as low as 124 cfs on a few occasions. On August 13th, Marcus Geary (EAA) sent out an email with the flow split data he collected from the Comal system on August 6th. The data per Marcus's email is as follows:

Date: August 6, 2013	Discharge (cfs)
Measured at USGS Comal Rv gauge:	137.0
Measured at Old Channel gauge:	43.4
Measured at New Channel gauge:	91.6
Total OC + NC:	135.0
Spring Run 1:	3.4
Spring Run 2:	0.8
Spring Run 3:	19.4
Upstream Spring Island	11.0
Downstream Spring Island	78.4

As Marcus stated, "From these data, we can infer the following percentages of flow:"

Spring Run 1 =	2.5%
Spring Run 2 =	0.6 %
Spring Run 3 =	14.4%
Above Spring Island =	8.1%
Spring Island Area =	49.9%
Western Shoreline =	24.4%

During all full sampling events, we also collect discharge data at HCP Bio-monitoring locations to relate directly to biological monitoring activities being conducted. On August 9th, discharge conditions at the EAA HCP bio-monitoring locations were as follows:

Date: August 9th	Discharge (cfs)
Spring Run 1 –	4.1
Spring Run 2 –	0.6
Spring Run 3 – Upper –	1.6
Spring Run 3 – Lower –	13.3
Old Channel –	57.1
Upper Spring Run –	4.8
Total USGS Gage – Daily Average	136.0

As evident in both sets of measurements, the main spring runs (1, 2, and 3) are getting quite low. This is very evident in Figures 1 and 2 below. Biological sampling activities within the main spring runs include the placement of cotton lures at 10 sites within Spring Run 3 for Comal Springs riffle beetles this week as well as Comal Springs salamander surveys in Spring runs 1 and 3 scheduled for August 16th. Salamander results will be available for next week's project update, while riffle beetle results will be available the following week as the lures must be set for two weeks to collect comparable information.

Figure 1: Spring Run 1 – looking downstream from Landa Drive bridge

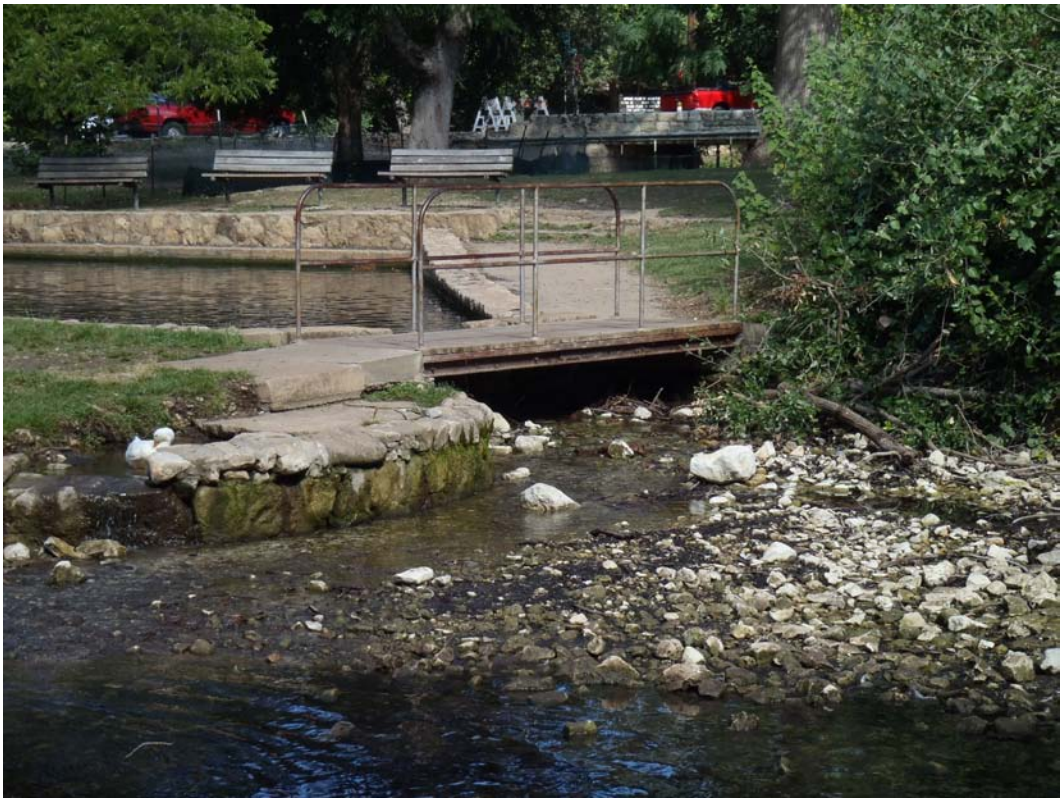

Figure 2: Confluence of Spring Run 1 and 2 – just below the kiddie pool

From the above discharge measurements, it is encouraging that spring flow is still coming from the Upper Spring Run reach (≈ 5cfs). With that said, Spring Run 5 is not flowing over the concrete outflow and has not for several weeks (Figure 3).

Figure 3: Spring Run 5 – Upper Spring Run Reach

The limited spring flow throughout this upper reach coupled with the extreme air temperatures has stimulated considerable algal production (Figure 4). As seen in the fish sampling photograph (Figure 5), the mats of algae are quite thick within this upper reach. However, even with this algal buildup, fountain darters were collected within this reach in both dip net and drop net activities this week.

As per Marcus's measurements on August 6th, nearly 75% of the discharge in the system is being provided from the Spring Island area and western shoreline. Even as such, the water level throughout the Spring Island area has declined several inches leaving exposed sediment bars just above Spring Island (Figure 6) and along the shoreline of Spring Island (Figure 7). Additionally, the northern of the two spring runs on Spring Island has retracted with only the southern of the two springs presently flowing the entire distance to the outfall (Figures 8 and 9). Biological monitoring activities conducted in the Spring Island area include the placement of cotton lures at 10 sites within the Spring Island upwellings for Comal Springs riffle beetles this week as well as Comal Springs salamander surveys in the two spring runs on the island and adjacent eastern outfall scheduled for August 16th. Salamander results will be available for next week's project update, while riffle beetle results will be available the following week as the lures must be set for two weeks to collect comparable information.

Figure 4: Green algae in Upper Spring Run Reach

Figure 5: Algae collected in seine haul in Upper Spring Run reach

Figure 6: Exposed sediment bar above Spring Island

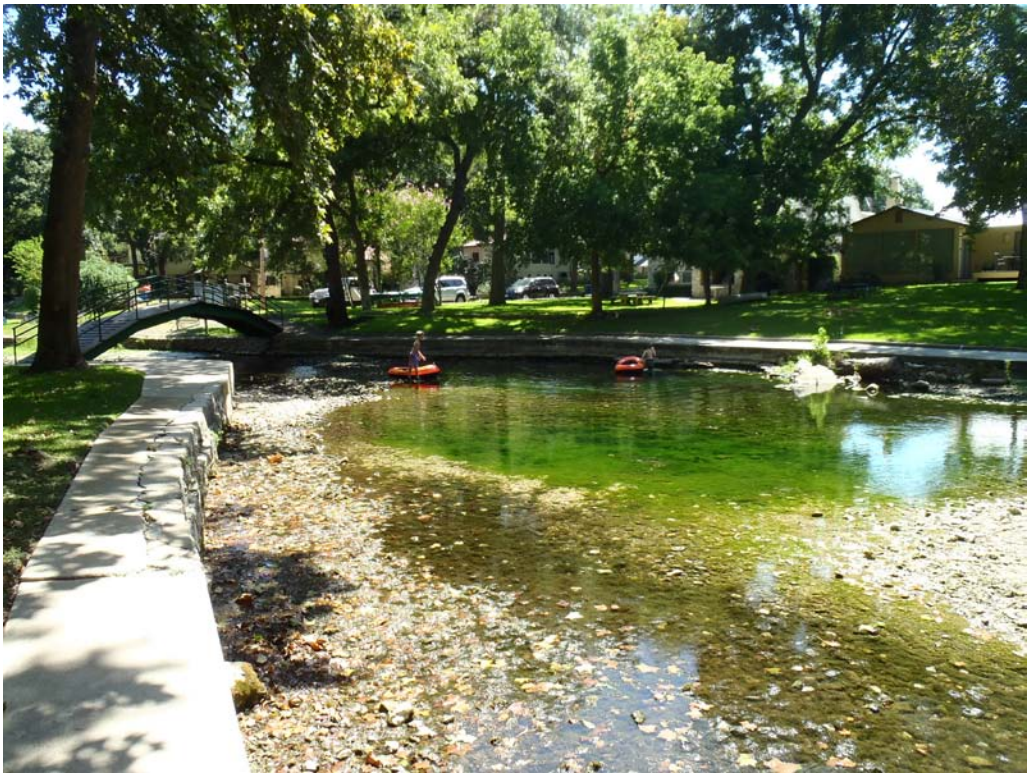

Figure 7: Exposed sediment along shore of Spring Island

Figure 8: Mostly dry northern spring run on Spring Island

Figure 9: Flowing southern spring run on Spring Island

Overall, conditions in Landa Lake, the Old and New Channels continue to support quality fountain darter habitat. Bryophytes still maintain a strong foothold within Landa Lake (Figure 10) while the aquatic vegetation restoration plants continue to prosper (Figure 11).

Figure 10: Abundant bryophytes within Landa Lake.

Figure 11: *Ludwigia* restoration plants within Landa Lake.

It is also noteworthy that discharge in the Old Channel on August 9th was nearly 14 cfs higher than reported on August 6th. The higher discharge (than what has typically been observed this summer) in the Old Channel was visually observed by me (Ed) as I did the weekly habitat evaluation on Tuesday, August 13th. The drop net crew also commented this evening that depths and velocities seemed higher than normal in the Old Channel this (Thursday, August 15th) afternoon. I will inquire with the City of New Braunfels tomorrow as to whether adjustments to the Old Channel culverts were made last week. I will also follow up with Marcus (EAA) as the USGS gage data for the Old Channel shows the same increasing trend. A culvert adjustment resulting in more water flowing down the Old Channel may explain the sudden drop in water elevation in the lake which has left exposed areas near Spring Island.

There is an abundance of aquatic vegetation in the New Channel, which complements the high quality habitat abundant in Landa Lake. The Old Channel continues to be dominated by non-native *Hygrophila* in the study reach, but still maintains bryophytes within and surrounding the non-native vegetation. Fountain darter dip netting (Figure 12) and drop netting revealed darters were still present in all reaches. Standard water quality parameters during drop netting were all in line with normal summertime conditions. Fish community sampling went very well with fish communities remaining diverse in all sections sampled.

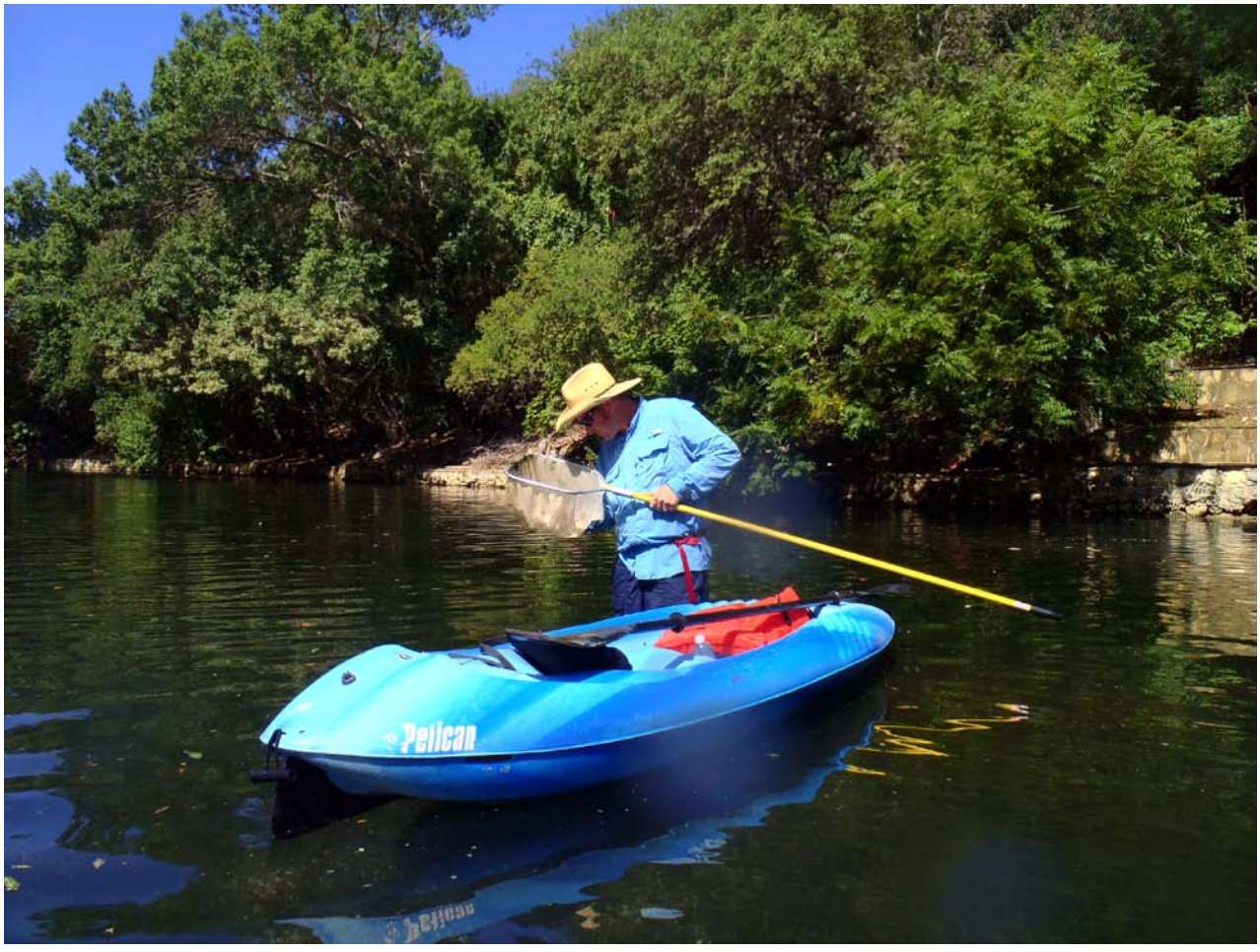

Figure 12: Dip net sampling for fountain darters in Upper Spring Run reach

To expand on the habitat assessment, Figure 13 shows the results from the presence/absence dipnetting that was conducted on the Comal River since 2005 including the July 22nd and August 12th, 2013 events. The percentage of sites in which fountain darters were present was 78% and 74%, respectively; both above the long-term average of 65%. Figure 13 demonstrates the variance observed in this metric since 2005 and the solid blue lines represent the 5th and 95th percentiles on Non-Critical Period data. Although this technique does not provide detailed data on habitat use, and does not allow for quantification of population estimates, it does provide a quick and less intrusive method of examining large-scale trends in the fountain darter population. Data collected thus far provide a good baseline for continued comparison of future critical period events.

As evident in Figure 13, the lowest percentage of fountain darters observed to date has been 52% recorded during Comprehensive sampling in Fall 2008 and Fall 2009. The August 2013 value was 74% as mentioned above. This coupled with the expanse of aquatic vegetation in Landa Lake and the Old Channel document the quality fountain darter habitat within the Comal system as this summer progresses.

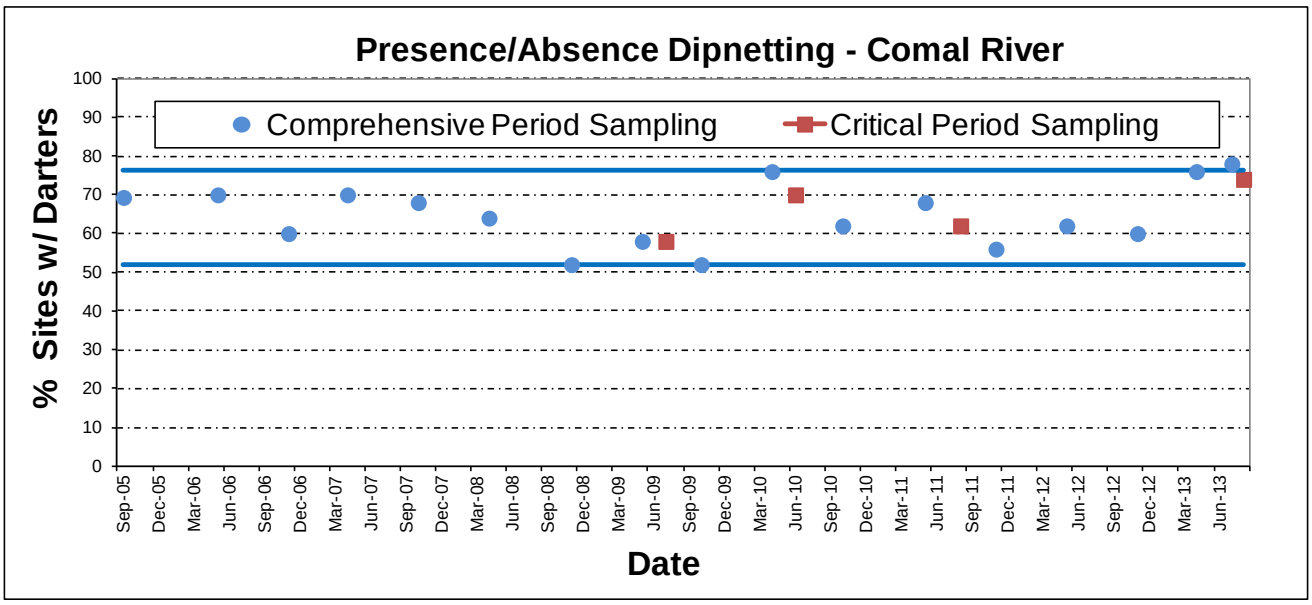

Figure 13: Percentage of sites (N = 50) in which fountain darters were present.
Solid blue lines mark 5th and 95th percentiles for Comprehensive Period Sampling.

As a reminder, the presence/absence dip net technique represents ½ of the equation for potentially triggering refugia actions for the fountain darter at Comal Springs based on Section 6.4.3.1 of the HCP. As per that section, the proposed triggers levels for off-site refugia for the fountain darter are as follows:

- *Less than 50 percent mean aquatic vegetation (Landa Lake and Old Channel) AND less than 20 percent darter presence system-wide,*
  OR
- *Less than 25 percent mean aquatic vegetation (Landa Lake and Old Channel) AND less than 30 percent darter presence system wide.*

At this time, neither condition (Aquatic vegetation nor fountain darter presence) is anywhere close

to triggering HCP sponsored refugia actions. Water quality results from grab samples and thermisters should be available for next week's update along with Comal Springs salamander information.

In summary, the majority of the Comal system is maintaining quality fountain darter habitat conditions is spite of the extreme summer time conditions and total system discharge less than 135 cfs. To have the coverage of aquatic vegetation (including bryophytes) in Landa Lake and Old and New Channels under these ambient air and discharge conditions is a real positive. Additionally, fountain darter numbers in these quality habitats remain high.

With that said, impacts to fountain darter habitat are clearly occurring in the Upper Spring Run reach and Spring Island area. The main impact in the Upper Spring Run reach is from the extensive algae build up that has blanketed the bryophytes causing them to die off in this reach. The small amount of *Hygrophila* in this reach has also been blanketed and in combination with typical summer time recreational use of this area, has led to the loss of this vegetation species in this study reach as well. It is encouraging that the other rooted vegetation (primarily *Sagittaria*) in this upper reach remains intact and fountain darters were still present in both the dip net and drop net sampling this week. Impacts to endangered Comal invertebrate habitat are also occurring in the Spring Island area as well as the main spring runs. It is premature to speculate on how this might be affecting the actual populations of the Comal invertebrates at this time.

We will complete the remaining Critical Period bio-monitoring activities through early next week. Additionally, we will continue to conduct weekly habitat evaluations and provide weekly progress updates until total discharge in the Comal system rebounds to above 150 cfs. If you have any questions or concerns, please don't hesitate to contact me at your earliest convenience.

Ed