

Comal Springs Riffle Beetle (CSRB), *Heterelmis comalensis*

- Species described from Comal Springs in 1988 (Bosse et al.)
- 1st reported in San Marcos Springs in 1993 (Barr)



Characteristics of *H. comalensis*

- Do not swim or fly
- Adults and larvae found living together
- Adults respire through plastron, larvae have gills
- Require the near-saturated oxygen levels associated with cool, fast-flowing shallow streams (Brown 1987)
- Presumably feed on fungus, algae, and bio-films
- Mostly found in substrate of the direct spring area (<80 cm), in gravel, on woody debris or roots, and under rocks (Gibson et al 2008, Cooke 2012)
- Subterranean habitat use not well-understood



Historical Collections of CSRB

- **Various methods employed:**
 - **Hand-picking**
 - **Meter Quadrat (Bowles)**
 - **Hess Sampler (Arsuffi)**
 - **Drift Nets (Arsuffi, Norris, Gibson)**
 - **Mop heads**
 - **Various cloth materials**
 - **Cotton cloth lures**

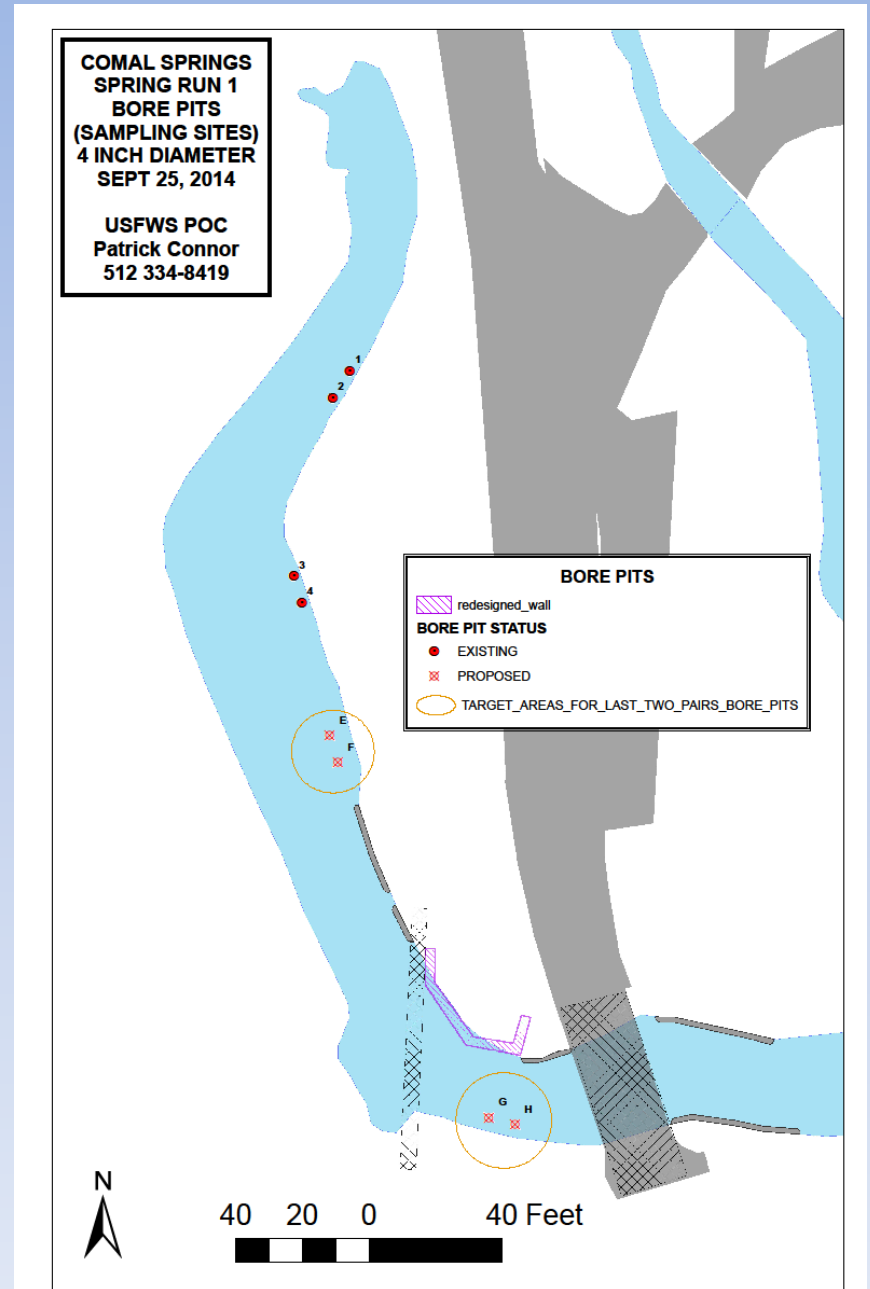
Comal Springs Run 1 - Bore Hole Sampling

- CSRB “may have survived ...by retreating into the spring-heads, aquifer, or the hyporheos as spring-flows diminished” (Bowles et al. 2003).
- \approx 4 times more CSRB on lures than from surface sampling (BIO-WEST monitoring 2003-2004)
- CSRBs presumed interstitial habitat associated with spring sources (Cooke et al. 2012)



Comal Springs Run 1 - Bore Hole Sampling

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- Stainless steel screen 4" diameter, ca. 2' deep, 5 mm pore size



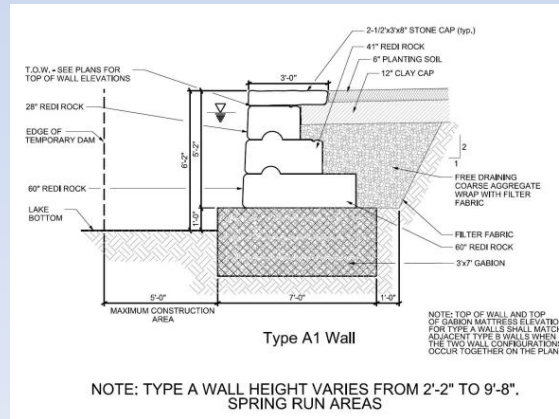
Comal Springs Run 1 - Bore Hole Sampling

- USGS/ES installed 4 pairs of sampling ports in Spring Run 1 from Sept to Oct 2014
- Stainless steel screen 4' diameter, ca. 2' deep, 5 mm pore size
- Tractor and auger restricted to 1-2' from walls



Comal Springs Run 1 - Bore Hole Sampling

- Spring Run 1 wall portions collapsing
- Wall construction along roadside



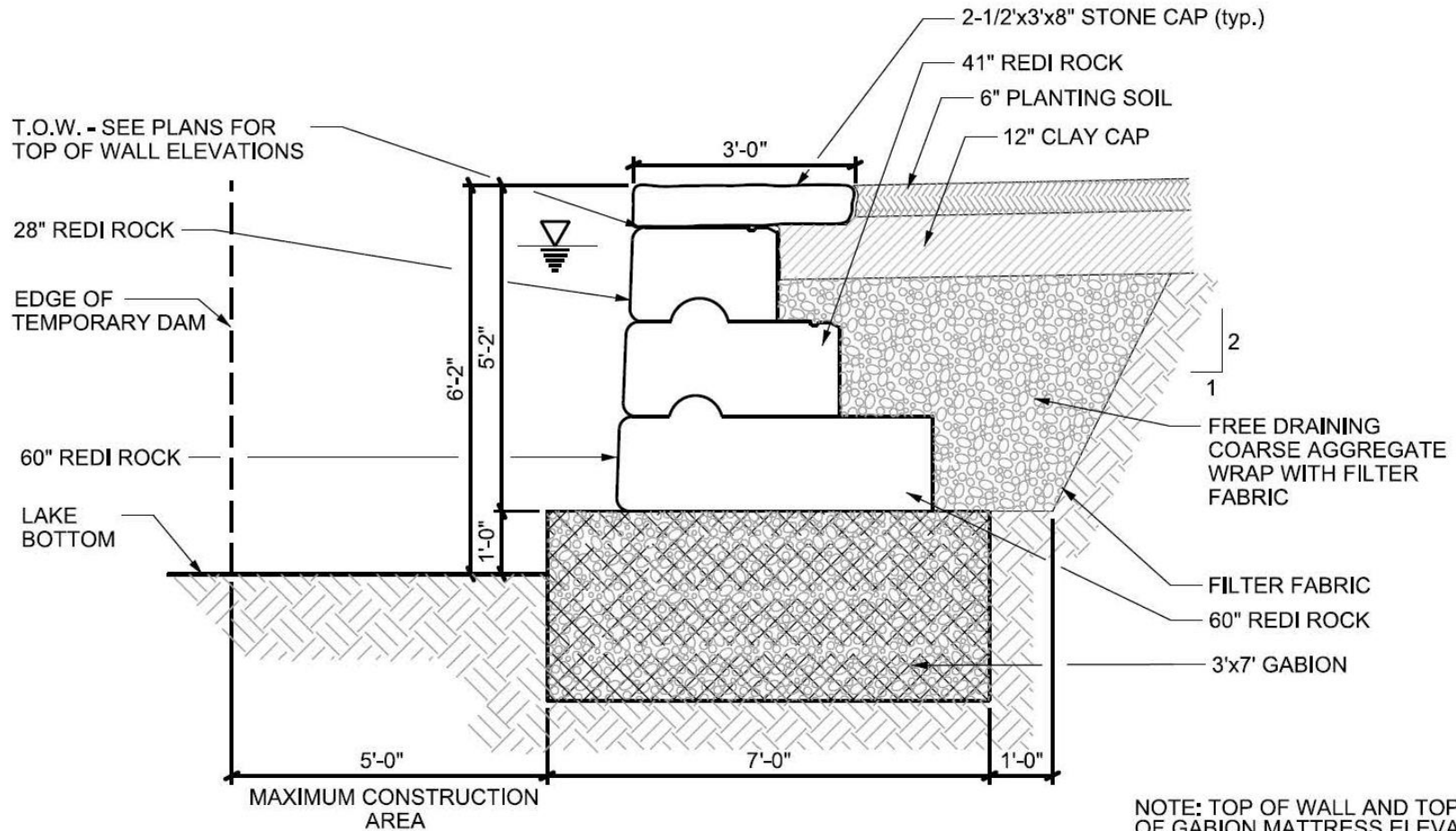
Comal Springs Run 1 - Bore Hole Sampling



Comal Springs Run 1 - Bore Hole Sampling



Comal Springs Run 1 - Bore Hole Sampling



Type A1 Wall

NOTE: TOP OF WALL AND TOP OF GABION MATTRESS ELEVATIONS FOR TYPE A WALLS SHALL MATCH ADJACENT TYPE B WALLS WHEN THE TWO WALL CONFIGURATIONS OCCUR TOGETHER ON THE PLANS.

NOTE: TYPE A WALL HEIGHT VARIES FROM 2'-2" TO 9'-8".
SPRING RUN AREAS

Comal Springs Run 1 - Bore Hole Sampling

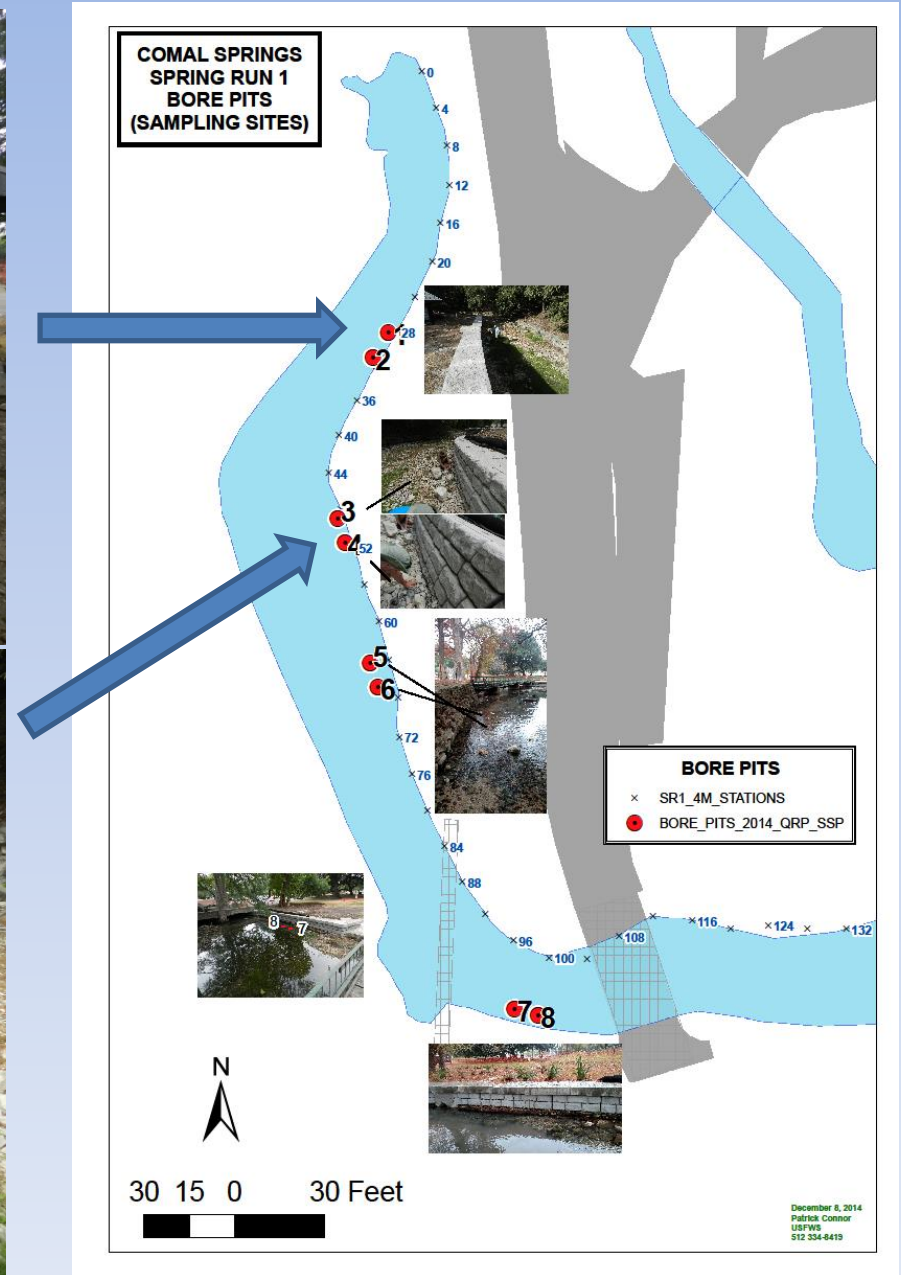


Comal Springs Run 1 - Bore Hole Sampling

- Run 1 wall portions collapsing
- Wall construction along roadside
- Bore pits installed near disturbed habitat



Comal Springs Run 1 - Bore Hole Sampling



Comal Springs Run 1 - Bore Hole Sampling

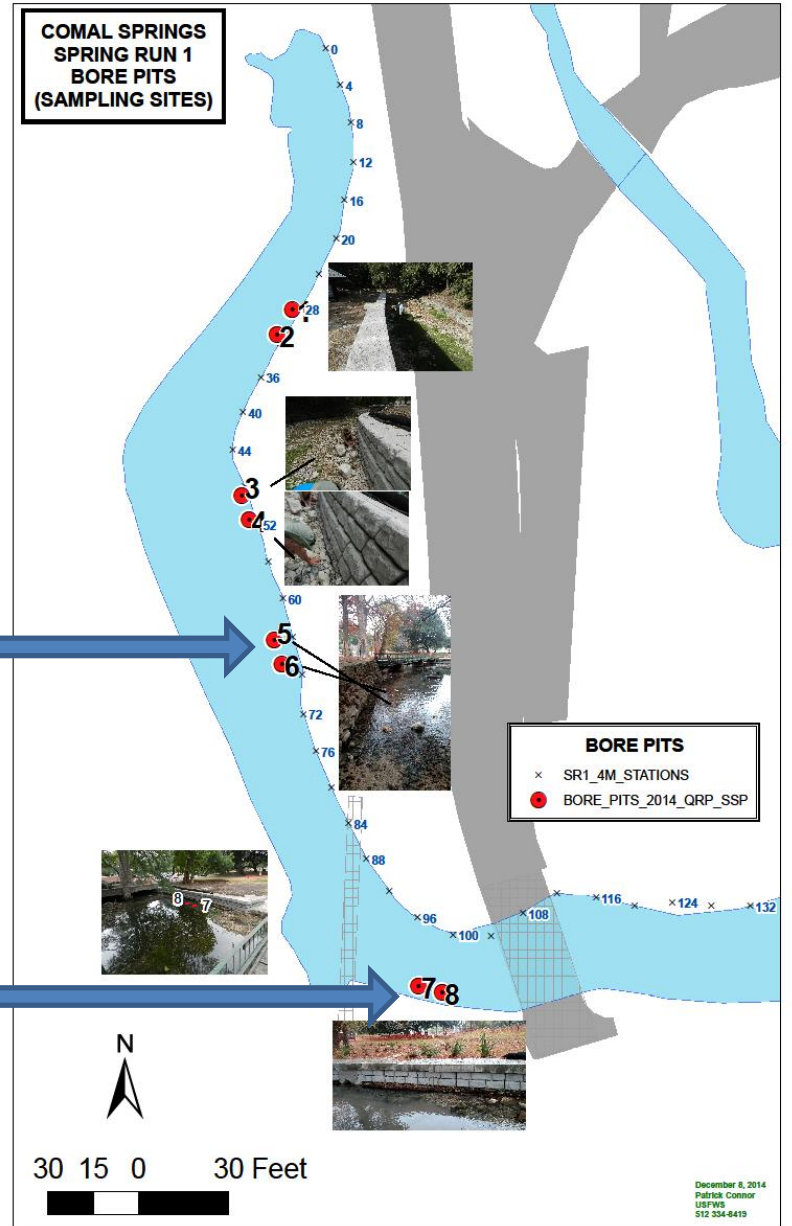


TABLE 2 — Vertical habitat parameters of each trap. Negative numbers are estimates of dry space inside a trap, estimated as vertical difference at stream surface equal to zero.

Trap #	Distance (m) from Primary Spring	Trap depth (cm)	Difference of water depth to trap top (cm)	Total depth from stream surface to trap bottom (cm)
1	29	71.12	-17.78	53.34
2	32.5	75.565	-16.51	59.055
3	49.3	71.12	-3.81	67.31
4	51.8	81.28	-2.54	78.74
5	78.8	66.04	15.24	81.28
6	80.9	62.23	7.62	69.85
7	83.3	92.71	0	92.71
8	84.6	83.82	31.75	115.57

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Comal Springs Run 1 - Bore Hole Sampling

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Comal Springs Run 1 - Bore Hole Sampling

- Inserts with lure material and spacers to prevent mixing.
- Sediment influx, removed by electric and hand pumps.
- WQ relatively constant: Temperature decreased and pH increase slightly downstream.

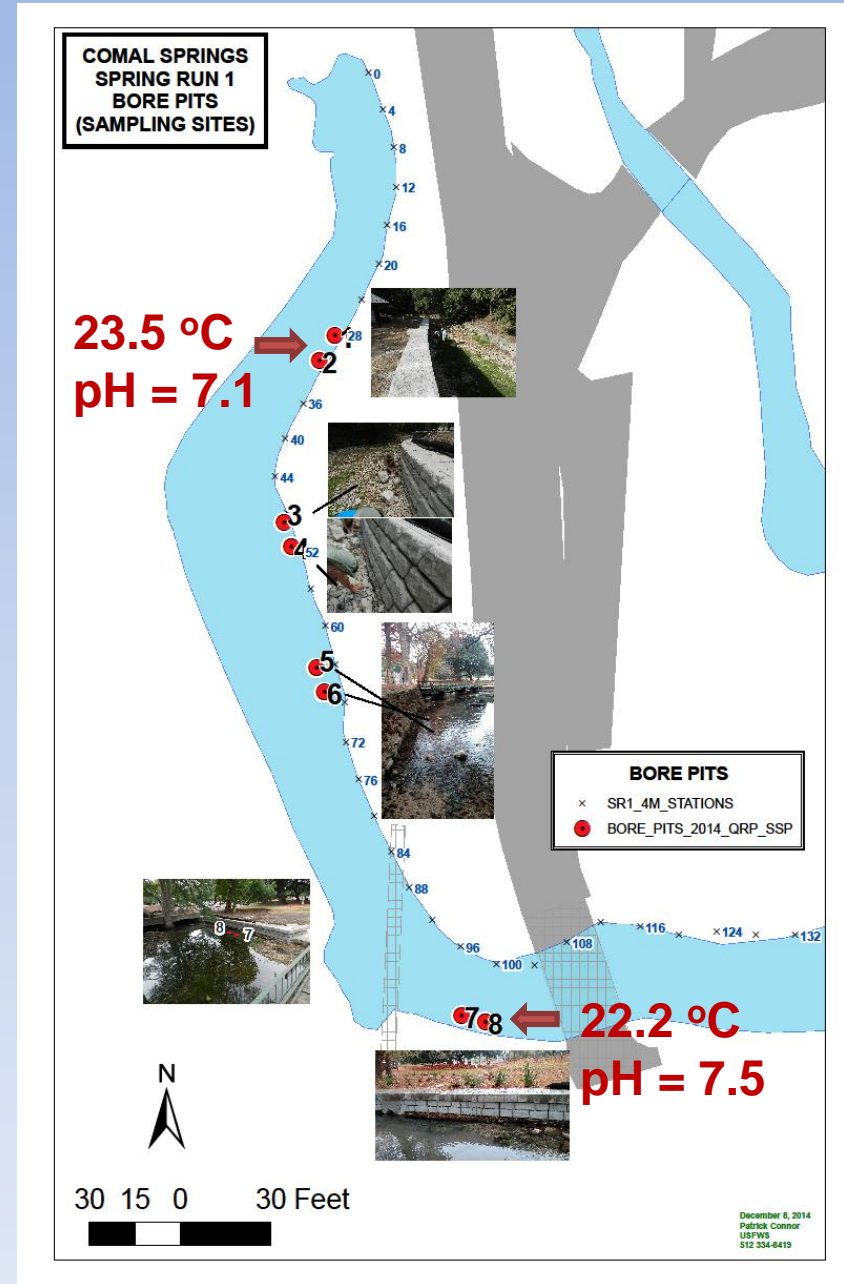
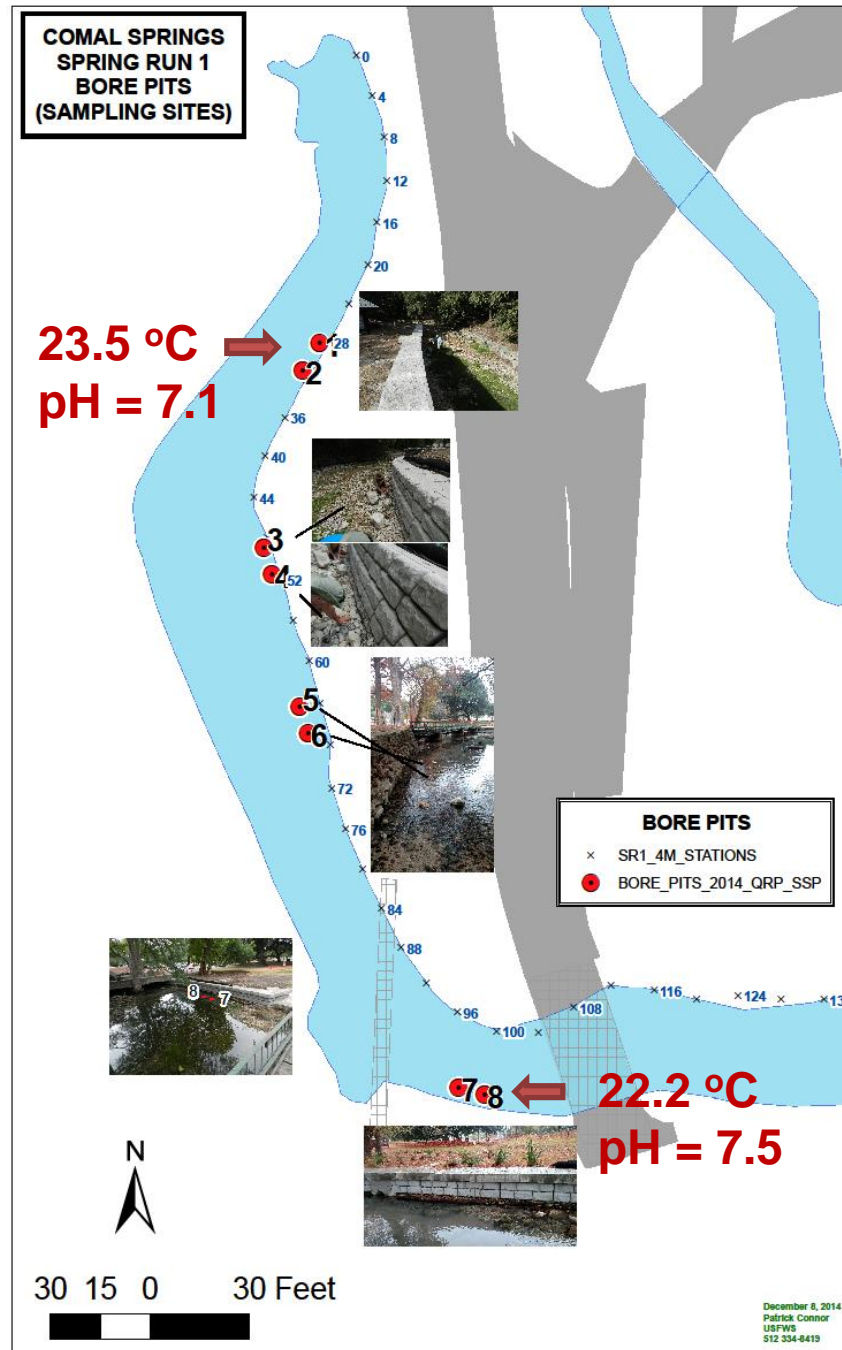


TABLE 1 — Summary of water quality data for each trap from September 2014 to February 2015 (min, and max) for the single sample.

Trap #	Temperature (°C)			
	MN	SE	MIN	MAX
1	23.5	0.10	23.4	23.7
	≈ 23 °C			
2	23.1	0.26	22.2	23.7
3	23.5	0.11	23.3	23.7
4	23.1	0.21	22.4	23.7
5	23.6	-	-	-
6	23.1	0.28	22.6	23.6
7	23.7	-	-	-
8	22.2	0.12	22.1	22.4





min, and max) for the single sample.

Trap #	Specific Conductivity (µS/cm)		
	SE	MIN	MAX
1	1.07	544	547.7
2	8.91	546	592
3	12.8	540	580
4	7.60	541	582
5	-	-	-
6	18.7	500	563
7	-	-	-
8	28	500	556

mS/cm

TABLE 3 — Number and identification of fauna removed from traps during 26 Sept - 8 Oct 2014.

Taxa	Trap # 3			Trap # 4		
	Upper	Mid	Lower	Upper	Mid	Lower
Gastropoda						
Thiaridae						
<i>Tarebia</i> sp.	30			20	9	3
Insects						
Coleoptera						
Elmidae						
<i>Microcyloepus</i> sp. larval				1		
Psephenidae						
<i>Psephenus</i> sp.				2		1
Trichoptera						
Helicopsychidae						
<i>Helicopsyche</i> sp.						1
						

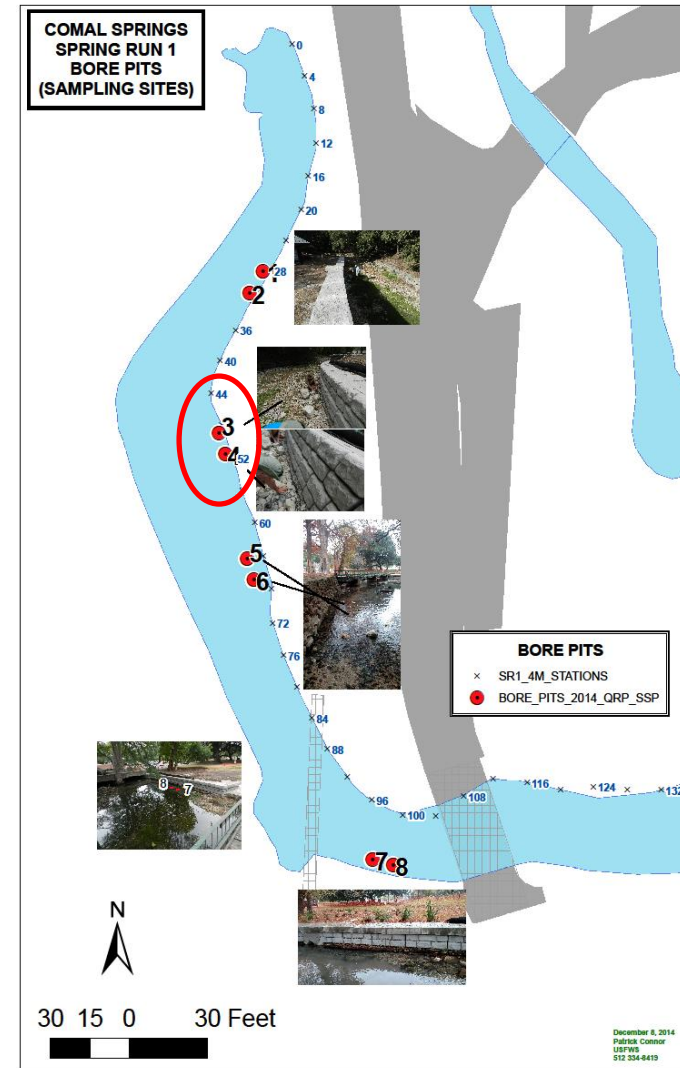


TABLE 3 — Number and identification of fauna removed from traps during 6-26 Nov 2014.

Taxa	Trap # 1		Trap # 3		Trap # 5		Trap # 7	
	Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom
Gastropoda								
Physidae			12					
Thiaridae								
<i>Tarebia</i> sp.		1	4		2		2	
<i>Melanoides</i> sp.	2							
Decapoda								
Crayfish	1			1				
Insects								
Coleoptera								
Elmidae								
<i>Microcylloepus</i> sp.								
adult			1					
larva				1				
Diptera								
Chironomidae		2						

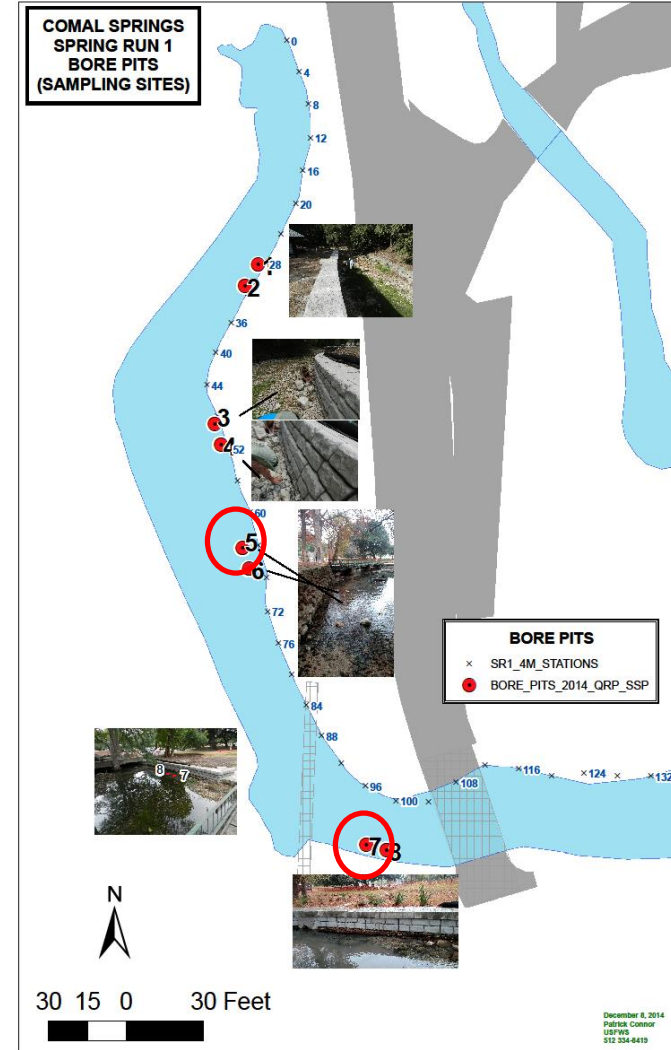
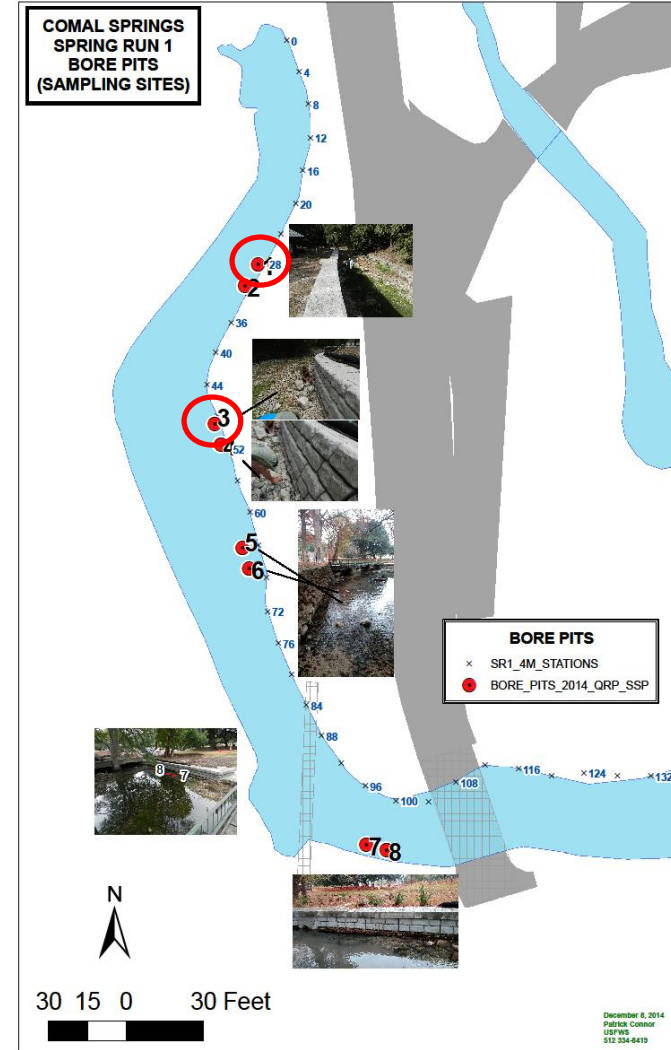


TABLE 3 — Number and identification of fauna removed from traps during phase one.

Taxa	Trap # 1		Trap # 3		Trap # 5		Trap # 7	
	Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom
Gastropoda								
Physidae			12					
Thiaridae								
<i>Tarebia</i> sp.		1	4		2		2	
<i>Melanooides</i> sp.	2							
Decapoda								
Crayfish	1			1				
Insects								
Coleoptera								
Elmidae								
<i>Microcylloepus</i> sp.								
adult			1					
larva				1				
Diptera								
Chironomidae		2						



Comal Springs Run 1 - Bore Hole Sampling

- Inserts with lure material and spacers to prevent mixing.
- Sediment influx, removed by electric and hand pumps.
- WQ: Temperature decreased 2 °C at furthest point.
- No CSRB captured. Adults and larvae of *Microcylloepus* captured in upstream pits. Downstream pits anoxic.



Comal Springs Run 1 - Bore Hole Sampling

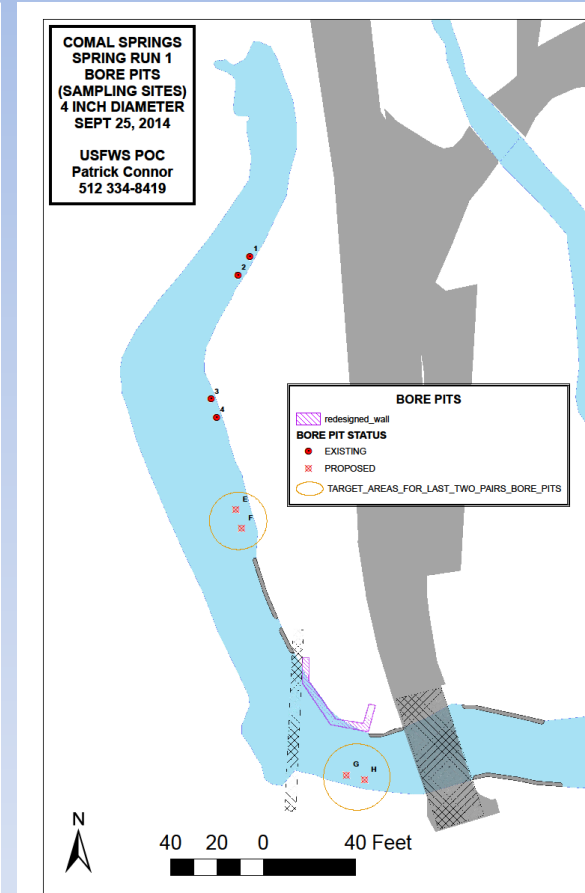
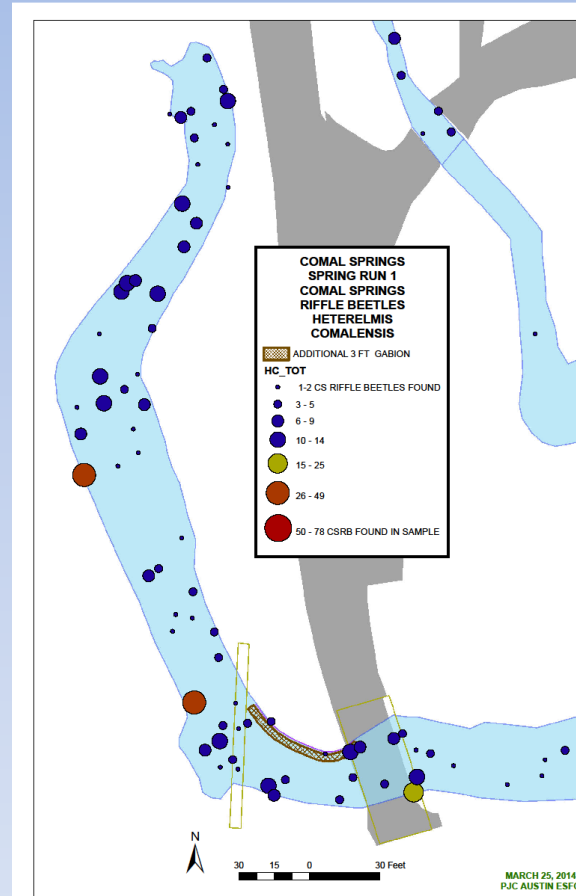
- Sampling during 2015
- Repeating procedure during higher flows for comparison (60's vs. 180's cfs)
- Refine sampling methods
- Note possible community development/establishment associated with pits
- Monitor for riffle beetle numbers in relation to springflow levels



Comal Springs Run 1 - Bore Hole Sampling

Recommendations

- Sample in areas of typical CSRB habitat with spring outflow and low silt.
- Sample Run 3, western shore, Spring Island
- Hand bury slotted pvc pipe or drive sampling points (Bou-Rouche)
- Sample WQ from deeper section of pit while lure inserted



Excerpt from Springs of Texas (Brune 1981) describing Comal Springs

Espinosa's diary of 1716, when he accompanied the Domingo Ramon expedition, provides a more detailed description (Tous, 1930 b):

Soon we reached the passage of Guadalupe which is made of gravel and is very wide. Groves of inexpressible beauty are found in this vicinity. We stopped at the other bank of the river in a little clearing surrounded by trees, and contiguous to said river. The waters of the Guadalupe are clear, crystal and so abundant that it seemed almost incredible to us that its source arose so near. Composing this river are three principal springs of water which, together with other smaller ones, unite as soon as they begin to flow. There the growth of the walnut trees competes with the poplars. All are crowned by the wild grapevines, which climb up their trunks. They gave promise already in their blossom for the good prospect of their fruit. The white and the black mulberry trees, whose leaves were more than eight inches in length, showed in their sprouts how sharp were the frosts. Willow trees beautified the region of this river with their luxuriant foliage and there was a great variety of plants. It makes a delightful grove for recreation, and the enjoyment of the melodious songs of different birds. Ticks molested us, attaching themselves to our skin.

