

Report on Activities on Travis County Lands and Balcones Canyonlands Preserve from October 1, 2013 to September 30, 2014



Peter Diaz
Texas Fish and Wildlife Conservation Office
San Marcos Texas 78666



Background

In 2012 the Texas Fish and Wildlife Conservation Office (TXFWCO) obtained funding through a United States Geological Survey (USGS) Science Support Partnership (SSP) grant to examine the impacts of changing land uses on water quality and spring habitats of Texas salamanders.

The project focusses specifically on the two -federally listed as threatened species, the Georgetown (*Eurycea naufragia*) and Jollyville Plateau (*Eurycea tonkawae*) salamanders. The study compares water quality, species diversity and abundance, level of impervious cover, and contaminant residues in fish and salamander tissues between urban and non-urban impacted spring sites. The study, once completed, will provide some of the first information on bioaccumulation of contaminants in populations of central Texas *Eurycea*, and determine the extent these populations are affected by anthropogenic environmental stressors associated with ongoing and future development in the Edwards Plateau region. Study objectives will be accomplished through a combination of geographic watershed analysis, field surveys, and tissue analysis in the laboratory.

Preliminary results indicate a clear and distinct relationship between impervious cover and the number of contaminants in the water and the number of contaminants within the bodies of sampled salamanders. As impervious cover increases, the number of contaminants present in the water column increases (Figure 1). Salamander tissue analysis found significant relationships with organochlorines and polybrominated diphenyl ethers (PBDEs) in relationship to the number of contaminants detected and impervious cover. In addition, the amount of PBDEs (ng/g) found in the tissues was significantly correlated with impervious cover. Polychlorinated biphenyls were not significantly correlated with impervious cover in either the number detected or the amount detected. Overall, the contaminants within the tissue (ng/g) of sampled salamanders and the average age of development within the respective catchment were significantly correlated ($r = 0.66$; $p = 0.02$; Figure 2).

Travis County Lands

The TXFWCO has collected samples at Jollyville Plateau salamander sites within its known range to examine the relationship between contaminants within the salamander tissue and land use, particularly impervious cover. Aquatic invertebrates and water quality data in two forms (Hydrolab and passive water quality samplers) were also collected. The TXFWCO awaits the results from the tissue and passive water quality samplers. The aquatic invertebrate samples are being processed and should be completed by March of 2015. Table 1 shows the parameters from the Hydrolab taken at Blizzard on May 2, 2014. Within that set is a measurement of nitrate. This measurement should be used with caution, as the probe was still being tested to determine if the nitrate meter was in proper working order. Five salamanders were sacrificed from Blizzard for toxicity testing. Dietary analysis was conducted on the five salamanders collected (Table 2). Of all prey items, Ostracoda (seed shrimp) were the most common ingested item by number. Ostracoda and *Caenis* (mayfly) were both tied with in respect to frequency in the diet (0.6%).

MacDonald Well was visited during that same trip to Blizzard on the 2nd of May, but was dry. There were however wet areas. These areas were examined for trapped salamanders (Figure 3). A total of 42 salamanders were capture during this event. Of the 42 salamanders, 20 were sent off for toxicity analysis; the remainder will be used for dietary analysis.

Balcones Canyonlands Preserve

During fiscal year 14 (FY 14), the TXFWCO partnered with Nate Bendik to sample additional sites for the Jollyville Plateau salamander. Lanier was resampled in 2014. During this sampling event a passive water sampler was deployed, water quality was measured (Table 1), and crayfish were taken for toxicity analysis. Results are due soon.

During FY 13, three sites on the preserve were sampled: Lanier spring, Barrow, and Tributary No 6. Two composite salamander samples were taken from both Lanier and Tributary 6, while one sample was taken from Barrow. Passive water samplers were deployed at Lanier and Tributary 6. Aquatic invertebrates were sampled from all three sites. All results from the passive water sampler (Table 4), salamander tissue (Tables 5 and 6) and aquatic invertebrates (Table 7) are presented below. Dietary analysis was conducted on the five salamanders captured at Lanier (Table 8). Ostracoda was the most consumed item by number, while the Heptageniid mayfly (*Stenonema/Stenacron*) was the most consumed by frequency.

Table 1. Water quality readings taken from Blizzard and Lanier springs during May 2014.

	Blizzard	Lanier
Temperature (C°)	20.89	17.55
Dissolved Oxygen (mg/L)	7.27	7.46
pH	7.46	7.79
Conductivity (µs)	752	539
Nitrates	5.69	0.05
Impervious Cover (percentage of catchment)	9.57	0.00

Table 2. Dietary analysis on salamanders collected at Blizzard spring on May 2, 2014

Class/Order	Family	Genus	1	2	3	4	5	Totals
Ephemeroptera	Caenidae	<i>Caenis</i>		1		1	1	3
Odonata	Coenagrionidae	<i>Argia</i>					1	1
Trichoptera	Calamoceratidae	<i>Phyllocius</i>			1			1
Diptera	Chironomidae	Tanytarsini	1					1
Diptera	Chironomidae	Tanypodinae	1					1
Ostracoda			35	7		2		44
Acari		Mite		1				1

Table 3. Sites from the Barton Creek Habitat Preserve and what was taken from these sites.

Spring Sites	Salamander tissue	Fish tissue	Crayfish	WQ (SPMD/POCIS)	Aquatic Inverts	% IMP Cover
Trib 6	2	3		1	Yes	18
Lanier	2	3	X	1	Yes	0
Barrow	1	0		0	Yes	22

Table 4. The number of total detections from the semipermeable membrane device and the polar organic chemical integrative sampler (POCIS).

	Lanier	Tributary 6
PAH	0	1
PCBs	2	3
Estrol	0	1
POCIS	4	6

Table 5. Results from tissue analysis in salamander collections from 2013. Presented are the percent lipids, and the number detected for each contaminant (#) along with the ng/g in the following column.

Site	Percent Lipid	Organochlorines #	Organochlorines (ng/g)	PCB #	PCB (ng/g)	PBDE #	PBDE (ng/g)	Impervious Cover
Lanier	7.7	3	3	12	4.5	1	1.9	0
Lanier	6.3	4	4	9	5.7	1	2.4	0
Tributary 6	7.7	13	31.58	6	2.2	2	3.3	18.6
Tributary 6	6.0	9	27.58	9	3.5	1	1.2	18.6
Barrow	5.3	14	36.96	30	13.4	3	6.5	22.96

Table 6. Results from heavy metal analysis on salamander tissue from Balcones Canyonlands Preserve.

	Barrow	Lanier	Lanier	Tributary 6	Tributary 6
Be	< 0.002	0.006	< 0.002	< 0.002	< 0.002
B	0.57	0.58	0.67	0.83	4.58
Mg	1470.	939.	1380.	1050.	1140.
Al	37.4	80.4	40.3	34.7	57.1
V	0.49	0.63	0.76	0.60	0.84
Cr	0.38	0.31	0.33	0.25	0.38
Fe	137.	107.	137.	90.1	92.1
Mn	39.6	32.0	47.9	30.5	29.6
Ni	0.20	0.18	0.17	0.12	0.22
Cu	2.77	1.95	3.18	2.87	4.03
Zn	147.	51.4	94.0	81.3	84.1
As	0.34	0.46	0.59	0.37	0.42
Sr	220.	25.0	46.2	37.8	42.4
Mo	0.13	0.13	0.23	0.089	0.11
Cd	0.067	0.038	0.15	0.036	0.057
Ba	26.0	8.14	22.1	18.8	23.1
Pb	0.49	0.091	0.15	0.072	0.083
Hg dry	0.24	0.19	0.21	0.21	0.23
Hg wet	0.059	0.048	0.052	0.052	0.058
Se	8.82	4.20	3.42	2.50	2.82

Table 7. Aquatic invertebrate metrics and aquatic life use score from sites on Balcones Canyonlands Preserve.

Metric	Lanier	Barrow	Tributary 6
Taxa Richness	30	14	28
Diptera Taxa	6	2	8
Ephemeroptera Taxa	5	1	3
Intolerant Taxa	10	1	11
Percent EPT	45.30	29.15	30.87
Percent Chironomidae	32.52	47.77	36.27
Percent Tolerant	0.19	3.64	0.00
Percent Grazers	14.76	2.03	18.75
Percent Gatherers	28.79	45.28	28.90
Percent Filterers	28.88	17.54	27.33
Percent Dominant (3)	61.09	88.26	61.36
Aquatic Life Use Score	High	Intermediate	Exceptional

Table 8. Dietary analysis on salamanders collected at Lanier Spring on April 30, 2013.

Class/Order	Family	Genus	1	2	3	4	5	Totals
Ephemeroptera	Heptageniidae	Stenacron/Stenonema	1		1	1		3
"	Baetidae	Callibaetis					1	1
Odonata	Ceonagrionidae	Argia		E			1	1
Trichoptera	Calamoceratidae	Phyllocius		M		1		1
"	Hydroptilidae			P			1	1
Diptera	Tabanidae	Tabanus		T		1		1
Amphipoda	Hyalellidae	Hyalella		Y			1	1
Copepoda			1				1	2
Ostracoda						2	2	4

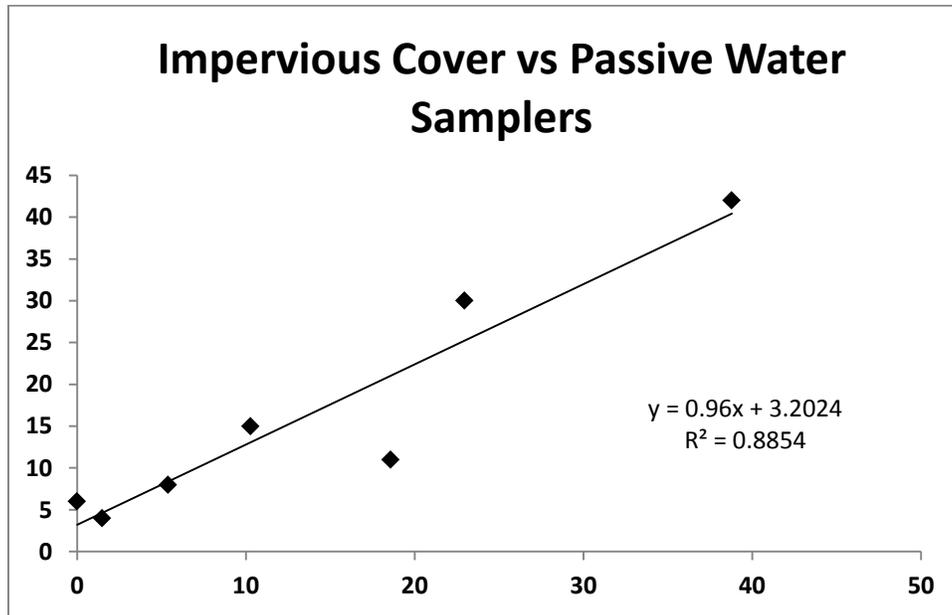


Figure 1. Results from the total data set displaying the number of contaminants detected (y-axis) and the relationship with impervious cover (x-axis).

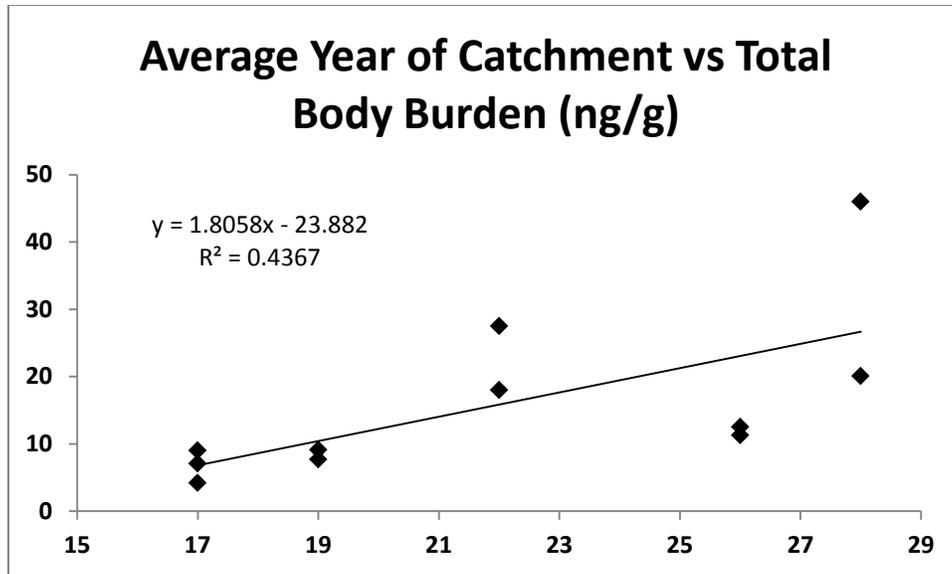


Figure 2. The average year of development in each catchment sampled (x-axis) in respect to the total amount of contaminants present within salamander tissue (ng/g; y-axis).

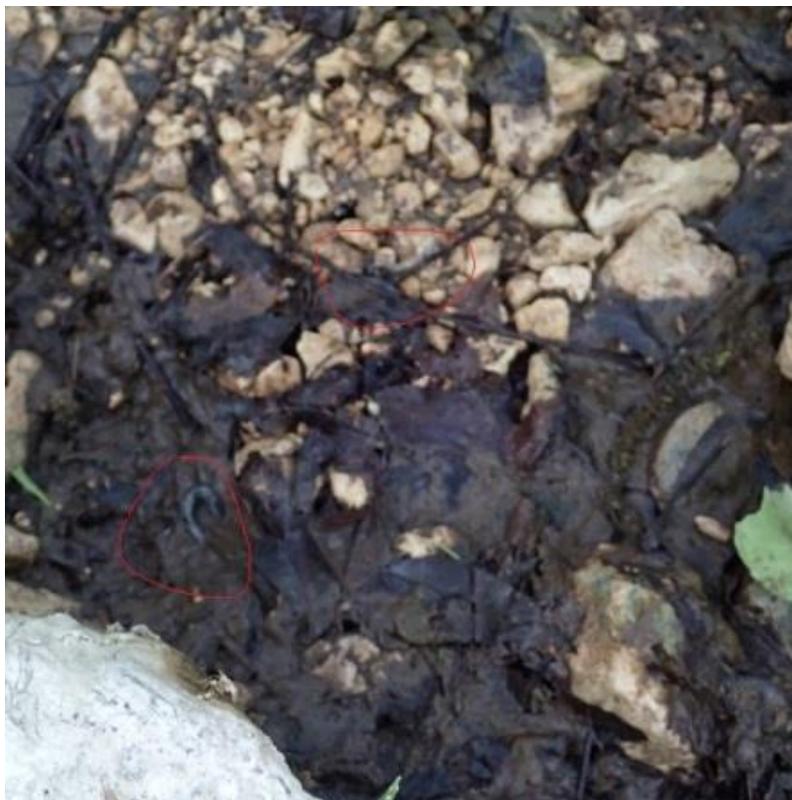


Figure 3. Trapped salamanders at MacDonald Well.