

San Marcos Aquatic Resources Center
Staff notes
July 2014

Aquatic Species Conservation and Management: Refugium Activities

San Marcos Salamander- As of 31 July, five San Marcos salamanders were collected. The salamanders were returned immediately to Spring Lake given that the SMARC refugium is at capacity for this species (Table 1). Twelve salamander mortalities were observed in the refugium population this month and an additional ten were missing after the July inventory count. As of 31 July, wild stock San Marcos salamanders oviposited 62 eggs while their offspring did not oviposit any during July. (CSF 7.12.5.4)

Table 1.- Four-month summary of the number of salamanders held in and number of eggs produced for the refugia at the San Marcos Aquatic Resources Center. Abbreviations are as follows: RWS= refugium wild stock, WS=wild stock (specimens in quarantine), FX=offspring, JA=juveniles/adults, OV=ovipositions, and EG=eggs.

Species		April 2014			May 2014			June 2014			July 2014		
		JA	OV	EG	JA	OV	EG	JA	OV	EG	JA	OV	EG
San Marcos salamander	RWS	350	2	55	341	4	132	331	4	124	309	2	62
	FX	59	0	0	58	0	0	49	0	0	40	0	0
Quarantine	WS	0	-	-	0	-	-	0	-	-	0	-	-
Texas blind salamander	RWS	106	3	67	117	3	83	115	0	0	115	0	0
	FX	54	1	16	53	1	16	52	0	0	51	0	0
Quarantine	WS	7	-	-	0	-	-	5	-	-	0	-	-
Texas (Comal) salamander	RWS	1	0	0	1	0	0	1	0	0	0	0	0
	FX	0	0	0	0	0	0	0	0	0	0	0	0
Quarantine	WS	0	-	-	0	-	-	0	-	-	0	-	-
Barton Springs salamander	RWS	40	0	0	40	0	0	40	0	0	37	0	0
	FX	642	1	23	641	0	0	639	0	0	639	0	0

Texas Blind Salamander- As of 31 July, SMARC staff did not collect any Texas blind salamanders. Edwards Aquifer Research and Data Center (EARDC) staff transferred one salamander from the Texas State University (TSU) artesian well to the SMARC refugia in July (Table 1). Five salamanders that were in quarantine last month were incorporated into the refugia. There were no observed wild stock adult salamander mortalities this month; however, five were missing after the July inventory count. No wild stock Texas blind salamanders or their offspring oviposited eggs this month. (CSF 7.12.5.4)

Barton Springs Salamander- No salamanders were collected from Barton Springs in July (Table 1). As of 31 July, wild stock Barton Springs salamanders and their offspring did not oviposit eggs. One wild stock salamander mortality was observed this month, while an additional two were missing after the July inventory count. The Texas A&M University health team has provided the SMARC with a preliminary disease treatment in the event of a disease outbreak and it is being considered by the Dexter SNARRC Fish Health Unit. (CSF 7.12.5.4)

Comal Springs Salamander- In July, no Comal Springs salamanders were collected from Comal Springs. No salamanders remain in refugium after the last one was lost this month (Table 1). (CSF 7.12.5.4)

Fountain Darter- On July 28th there were 681 wild stock fountain darters in the SMARC refugia. Twenty-one mortalities were recovered during July from the wild stock tanks. These fish were from the San Marcos (Upper = 4, Middle = 13, and Lower = 1) and Comal (Landa Lake = 2, Comal River =1) stocks. All darters were treated with formalin this month after several dying fish were observed with hemorrhaging gills caused by costia (*Ichthyobodo*), a protozoan parasite. Formalin treatments have been utilized at the SMARC in the past to treat costia outbreaks and it is considered a SOP. Water volume was calculated for all fountain darter tanks in the holding house and formalin was added resulting in a dosage rate of 0.175 ml formalin per liter of water. While being monitored the fish were bathed in the treatment for 1 hour. Although this is the correct treatment for adult fountain darters the F1's should have been treated with a slightly lower dose (0.1 ml formalin/L) given their smaller size. A communication error occurred and staff mistakenly treated all F1's in the lower section of the holding house at the adult dosage even though instructions were given to treat F1's at of the lower dose (0.1ml formalin/L). The error was noted the morning of the 9th of July, 2014 with the loss of 150 of the 800 F1 Comal River fountain darters that were treated. (CSF 7.12.5.4)

Devils River Minnow- The SMARC is maintaining two stocks of wild caught Devils River minnows (DRM) in refugia, one from San Felipe Creek (N = 192) and another from Pinto Creek (N = 90). The SMARC is also maintaining F1 (N ≈ 1,500) offspring. No Devils River minnows were collected from Pinto Creek in July. Approximately 350 Pinto Creek offspring were produced during July. Some fish at the SMARC are being maintained in an outdoor raceway to evaluate if this is a less labor intensive method of producing genetically diverse fish for restocking purposes. The genetic analysis of wild stock San Felipe Creek and Pinto Creek DRM is ongoing at the Dexter SNARRC. As the genetic information becomes available, it will be incorporated into a propagation/genetic management plan for DRM. (CSF 7.12.5.4)

Peck's Cave Amphipod- Approximately, 121 adult Peck's cave amphipods and 100 *Stygobromus* juveniles are being maintained at the SMARC. In order to overcome cannibalism and track individual growth and development, 22 juvenile amphipods were maintained in individual growth chambers. During July, only 2 of the 22 amphipods survived in the growth chambers. Alternate versions of individual growth chambers are being considered. (CSF 7.12.5.4)

Texas Wild Rice- The 2014 count of potted Texas wild rice plants in refugium at the SMARC is 158 in greenhouse raceways, 76 in outdoor raceways, 40 in quarantine, along with an additional 86 plants at Uvalde NFH (Table 2). No plants or tillers were collected from the San Marcos River during July. Additional collection of tillers will be made throughout 2014-2015 based on the recommendations outlined in the Texas wild rice genetics report. (CSF 7.12.5.4)

Table 2.- Current number of Texas wild rice plants being maintained in refugia at the SMARC and Uvalde NFH. San Marcos River segments are defined in accordance with the USFWS 1996 Contingency Plan where each segment represents a particular stand's genetic make-up. The number of plants within each pot varies (Mean \pm 1SE = 61 \pm 6 stems per pot). The research stock is comprised of clones and plants produced from various river segments.

	Number of Potted Plants					Total
	Greenhouse	SMARC Refugia		Quarantine	Uvalde NFH	
		Outdoor Raceway			Refugia	
A	6	23	26	18	73	
B	46	49	14	19	128	
C	26	4	0	10	40	
D	3	0	0	6	9	
E	8	0	0	0	8	
F	19	0	0	4	23	
G	1	0	0	8	9	
H	3	0	0	0	3	
I	0	0	0	0	0	
J	13	0	0	2	15	
K	6	0	0	4	10	
Research Stock	27	0	0	15	42	
Total	158	76	40	86	360	

The 2014 number of Texas wild rice seeds stored at the SMARC totals 19,618 ($N_{2009} = 390$, $N_{2010} = 585$, and $N_{2011} = 1,941$, $N_{2012} = 10,152$, $N_{2013} = 6,550$) (Table 3). No additional seeds have been collected since November 2013 for storage. Although seeds have not been collected for storage, 2,520 seeds were collected from refugium plants and potted in raceways to provide Texas wild rice for restoration efforts in the San Marcos River. As of 31 July, 1,031 Texas wild rice plants produced from these seeds have been transferred to City of San Marcos contractors for replanting efforts in the San Marcos River. Currently, ca. 2,500 Texas wild rice seedlings are being maintained at the SMARC for additional restoration efforts this summer and fall. (CSF 7.12.5.4)

Table 3.- Number of Texas wild rice seeds stored at the SMARC. Seeds are stored by month and year.

Month	2009	2010	2011	2012	2013	Total
Jan					491	491
Feb						
Mar						
Apr						
May					264	264
June			433		2,307	2,740
July			650		1,172	1,822
Aug					2,316	2,316
Sept				3,428		3,428

Oct		325	273	1,785		2,383
Nov	390	260	585	3,267		4,502
Dec				1,672		1,672
Total	390	585	1,941	10,152	6,550	19,618

Research and Restoration Activities

Texas Blind Salamander- In July, Valentin Cantu and Justin Crow assisted Andy Gluesenkamp (Texas Parks and Wildlife Department, TPWD) collect non-lethal tissue samples (i.e. tail-clips) from 50 wild stock *E. rathbuni* specimens (≥ 50 mm, TL) for genetic analysis. Dr. Chippindale and Philip Hejduk (University of Texas, UT at Arlington), Nathan Bendik (City of Austin), and Andy Gluesenkamp (TPWD) are using the tissue to investigate the genetic relationships among the Texas blind salamander *Eurycea rathbuni*, *E. waterlooensis*, and troglobitic *Eurycea* species collected in Comal County. In addition, they intend to investigate if hybridization has occurred among these three species and the Barton Springs salamander (*E. sosorum*) and San Marcos salamander (*E. nana*) using Next-Generation sequencing. It is anticipated that the results will provide the SMARC with information about what sites are or are not genetically unique and thus maintained separately. (CSF 7.12.5.4)

Comal Springs riffle beetle- Randy Gibson is collaborating with Professors Benjamin Schwartz and Weston Nowlin (TSU) on an EAA funded project determining the limitations of Comal Springs riffle beetles to lowered dissolved oxygen and elevated temperature levels. During June and July, SMARC and TSU staff collected over 1000 *Heterelmis glabra*, surrogates for the Comal Springs riffle beetle, from springs of the upper Devils River (Texas Parks and Wildlife State Natural Area and The Nature Conservancy’s Dolan Falls Preserve). These surrogates are closely related genetically and appear to have similar ecology as the Comal Springs riffle beetle. During August, collections of *Heterelmis glabra* will take place from Plum Creek, 25 miles east of San Marcos. This riverine species is found throughout the Guadalupe River water shed including just downstream of Comal Springs riffle beetle critical habitat. Limitations and comparisons of respiratory structures will be made with all three species of *Heterelmis*. (CSF 5.3.7)

Texas wild rice- During July 21 to 28, the annual Texas wild rice survey was conducted in the San Marcos River. Approximately 38 people representing USFWS, TPWD, City of San Marcos, Hays County Master Naturalist, TSU, San Marcos River Foundation, and local volunteers participated in the survey. Texas wild rice was recorded using GPS and area coverage and depth were measured. Based on preliminary observation and the extra day it took to complete the survey this year, it is estimated that the area coverage of Texas wild rice increased by ca. 50% from 2013 to 2014. The GPS files have been converted to shapefiles and maps. The data will be entered into an Excel spreadsheet to determine the area coverage for 2014. The data taken for 2014 will be compared to the historical annual surveys conducted by TPWD (Jackie Poole) during 1989 to 2012. (CSF 7.12.5.4)

On April 29, a 0.1-acre outdoor pond (C-7) was stocked with Texas wild rice tillers from San Marcos River sections A (N = 20) and B (N = 30). The pond was designed and modified with a

terrace system to provide additional flow and algae control. Currently, tillers are recovering from being planted in pots. The modifications to the pond do not appear to be operating as planned. Algae has become established and it is likely that the tillers will die due to a combination of inadequate flow, excessive algae, and extreme heat above 90F. (CSF 7.12.5.4)

During April 2014, mass-flowering and seed production of Texas wild rice was observed in Section B of the San Marcos River below University Drive Bridge downstream to the river bend before the Lion's Club Tub Rental. Given that mass-seed production in the San Marcos River is uncommon, a seed germination experiment was initiated to test the viability of wild-stock seeds, compare wild and refugia produced seed germination rates, and evaluate two seed storage protocols. On April 24, 2014, a total of 1,390 Texas wild rice seeds were collected and potted. Seeds from Sections A and B have recently germinated, indicating that some percentage of the seeds is viable. Germination counts began in early June and additional seeds were collected from the river in June for replicates of the treatments. At the end of June, germination rates for river collected seeds ranged from 7 to 55%. At the end of July, germination rates for river collected seeds ranged from 10 to 55%. An additional 1,680 Texas wild rice seeds were collected to evaluate seed storage protocols. Two methods of storage (i.e. moist paper towel or in water) at 3 to 4 °C will be evaluated by removing the seeds from storage and potting a subset from each group monthly for one year. Each month over one year, a subset of the seeds will be taken out of the refrigerator and potted, and monitored for germination to determine the optimum storage time and inhibition rates for Texas wild rice seeds under refrigeration. The goals of the experiment are to determine if one storage methods maintains the viability of the seeds longer than the other and to determine the I_{50} (inhibitory concentration) value of Texas wild rice seeds based on storage time and method. Additional seeds from the storage methods were potted during July and germination counts will be made in August. (CSF 7.12.5.4)

During January 2014, a study was initiated to evaluate the effects of varying flow rates on the phenology of Texas wild rice. Growth rates of Texas wild rice will be measured every 2 weeks, and the plants monitored for flowering, seed production, tiller formation, and senescence. This study is on-going and currently flowering characteristics are being measured weekly. To date, the mean total lengths of plants were 10.7 m when grown in water with no flow, 23.2 to 21.2 m for those grown in low to medium flow and 38.8 m for high flow. A single plant grown in high flow grew up to 80 m in total length during the first 14 weeks. Since flowering has begun, pistil and stamen growth, seed production and flower senescence is being recorded weekly. Senescence of flowers was documented in June and some stem senescence was also recorded. Seeds from the experimental plants are collected 2-3 times per week and monitored for germination. As of July 28, a total of 11,737 seeds have been collected, potted, and monitored for germination rates for this study. During the last germination count on July 1, germination rates ranged from 2 to 100%. (CSF 7.12.5.4)

Jeff Hutchinson has initiated a study to evaluate several Texas wild rice planting patterns in the San Marcos River with individual and groups of Texas wild rice. Five plots were set up in the San Marcos River on 19 May to evaluate planting methods of Texas wild rice tillers, seedlings, and mature plants. The plots were setup to be monitored monthly for 6 months and, if successful, supplemental planting will occur in each plot and every 6 months thereafter. The

goal is to develop a method to establish Texas wild rice in lower sections of the San Marcos River where it is uncommon. A 4-inch rainfall event on 25 May resulted in a 7 to 8 foot rise in water level that caused the loss of 10% of the newly planted Texas wild rice. On May 29, all Texas wild rice plants that were scoured out during the May 25 flood were replaced. Two additional plots of Texas wild rice were established in the same general area on June 12 by Jeff Hutchinson and Josh Roberts. In these plots, 25 and 20 Texas wild rice seedling ca. 3 months old and 0.75 m in length were planted in a 0.25 m² clump. During monitoring on June 21, all the Texas wild rice, regardless of planting pattern, in each of the seven plots was intact and looked robust. During July, the plots were checked twice and all of the seedlings had not survived and a single Texas wild rice plant from a 2 ½ gallon pot had washed out. It appears the plants that did survive (the tillers and mature plants) had doubled in size based on length and width. The plots were measured during the Texas wild rice survey and comparison will be made with the area coverage from initial plantings. (CSF 7.12.5.4)

A study to examine the potential for Texas wild rice propagation from stem tissue nodes using auxin was initiated 5 May. The study evaluates four common commercially available products, Hormodin 1, Hormodin 2, Hormodin 3, and Dip-N-Grow, in which the nodes of Texas wild rice were dipped in the solution or powder for 5 seconds and then potted in soil. After 2 weeks, root development and some new leaf tissue was observed. During June, about 60-70 of the treated nodes had developed roots, indicating that auxin compounds may be a successful tool for cloning Texas wild rice for genetic purposes. In July, all the live plants were repotted and survival appears to be highest for submerged nodes treated with the lower rate of auxin. (CSF 7.12.5.4)

Native Aquatic Plants -To meet the restoration goals outlined in the Edwards Aquifer Habitat Conservation Plan, native plant production is needed. The SMARC has been contracted by the City of San Marcos to produce native aquatic plants for their restoration efforts. Plant transfers to the City of San Marcos began in March 2013. From January to April 2014, the SMARC provided a total of 3,019 aquatic and terrestrial plants to the City of San Marcos (Table 4). No plants were provided in May because low spring flows triggered a suspension of all planting activities under the City's 10(a)(1)(B) permit. In June the City of San Marcos was given permission to resume planting activities. During June, the SMARC provided 1,048 aquatic and terrestrial plants to the City of San Marcos. During July, the SMARC provided 756 aquatic plants to the City of San Marcos. The staff at SMARC will continue to provide plants for the restoration work in the upper section of the San Marcos River through 2019. Two terrestrial tree planting days organized by the City of San Marcos and SMARC were held on March 8 and 22, and the SMARC provided plants for these events. Additional planting events are planned for late summer, early fall 2014. On June 14, Jeff Hutchinson and Randy Gibson participated in and provided 487 terrestrial plants for a volunteer planting day on the banks of the San Marcos River in areas where non-native wild taro and Ligustrum trees had been removed. Approximately 18 people participated in the event including six members of the City of San Marcos Conservation Crew. (CSF 7.12.5.4)

Table 4.- List of plants species, common name, and number of plants provided from January to June of 2014 for aquatic and terrestrial restoration work in the San Marcos River.

Plant Species	Common Name	Number of Plants
Aquatic		
<i>Sagittaria platyphylla</i>	Arrowhead	214
<i>Ludwigia repens</i>	Creeping primrose willow	1,864
<i>Heteranthera liebmannii</i>	Water stargrass	923
<i>Zizania texana</i>	Texas wild rice	1,031
		Σ aquatic = 4,032
Terrestrial		
<i>Berberis trifoliolata</i>	Agarito	1
<i>Bouteloua gracilis</i>	Blue grama	8
<i>Sambucus canadensis</i>	Elderberry	42
<i>Taxodium distichum</i>	Bald cypress	18
<i>Salix nigra</i>	Black willow	20
<i>Acer negundo</i>	Box elder	2
<i>Cyperus setigerus</i>	Lean flatsedge	2
<i>Equisetum hyemale</i>	Horsetail	37
<i>Pluchea odorata</i>	Purple pluchea	10
<i>Panicum virgatum</i>	Switchgrass	44
<i>Morus rubra</i>	Red mulberry	19
<i>Marsilea macropoda</i>	Water clover	11
<i>Carex emoryi</i>	Emory's sedge	83
<i>Chasmanthium latifolium</i>	Inland sea oats	54
<i>Platanus occidentalis</i>	Sycamore	5
<i>Justicia americana</i>	American water willow	200
<i>Eleocharis montevidensis</i>	Sand spikerush	12
<i>Bacopa caroliniana</i>	Water hyssop	55
<i>Leersia oryzoides</i>	Rice cut grass	44
<i>Carex crus-corvi</i>	Crow-foot caric sedge	6
<i>Ulmus crassifolia</i>	Cedar elm	5
<i>Populus deltoides</i>	Cottonwood	1
<i>Hydrocotyle umbellata</i>	Water- pennywort	40
		Σ terrestrial = 719
		$\Sigma\Sigma$ Total = 4,751

Jeff Hutchinson initiated the development of a base layer for a GIS map of the San Marcos River. The GIS data and map are intended to be used as the main layer for evaluating the success or failure for future restoration and research work in the river. Components of the map will include river sections, roadways, railroad tracks, bridges, power lines, and other landmarks. Texas wild rice locations and areal coverage will be included. Jeff Hutchinson with the

assistance of Patrick Connor (Austin ESFO) has developed GIS shape files of Texas wild rice populations in the San Marcos River from the 2014 survey. The data will be comparable to data collected the last 20 years of the Texas wild rice survey by Jackie Poole (TPWD). (CSF 7.12.5.4)

Aquatic Nuisance Species-The SMARC is responsible for the removal of the 5% residual exotic plant *Cryptocoryne beckettii* from the San Marcos River that Dredge America was not required to remove. We are removing missed plants and re-growth resulting from small pieces of plant rhizomes not removed by the dredge. This removal requires surveying approximately 2 miles of river bottom and removing rooted and loose plants by hand. During the March 2012 survey, no plants were found. Unfortunately, two plants were found during the November 2012 survey and were removed from the system. Beginning in late March to 3 June 2013 the SMARC staff using SCUBA surveyed the river. No plants were observed during the survey. The second biannual survey was conducted in September 2013 and again no plants were observed. A survey was conducted in July 2014 by Region 2 SCUBA divers (Patricia Echo-Hawk, Randy Gibson and Valentin Cantu). The SMARC SCUBA dive team found no evidence of *Cryptocoryne beckettii* within the San Marcos River. As a result, future surveys for the plant and other exotics will be conducted annually as opposed to biannually. (CSF 12.2.4)

Leadership in Science and Technology: Publications, extension activities/meetings, and presentations

During July, all SMARC biological staff were involved with data analysis and manuscript preparation or revision. So far this fiscal year, eight articles have been published by peer-reviewed journals, two other articles have been accepted for publication and five articles have been submitted but not yet accepted. (CSF 5.3.7)

Publications- Maria Cooke, a former graduate student at TSU, in collaboration with Randy Gibson, worked on developing captive propagation techniques for the riffle beetle for her Master's project. Her research included examining habitat preference and substrate and food relationships associated with pupation. Her goal with these tests was to provide information needed to improve the beetle's culture environment and perhaps increase the likelihood of completing its life cycle in captivity. She defended her thesis on 2 July 2012. Randy is working with Maria to produce a draft manuscript that includes portions of her thesis. Internal USFWS review was completed in April and revisions were completed in August. During September 2012, external peer reviews were sent to Maria to consider changes to the manuscript before submission. During March, the most recent version of the manuscript was sent to Randy for review. During May, Randy sent edits to the other authors for consideration. The final version of the manuscript was completed during July. The authors plan to submit the manuscript to *The Southwestern Naturalist*. (CSF 5.3.7)

The manuscript titled "Tolerance of *Lygodium microphyllum* and *L. japonicum* Spores and Gametophytes to Freezing Temperature" authored by Jeffery Hutchison was accepted in *Invasive Plant Science and Management* during February 2014 and was published in the April-June volume. The cover photograph of the journal also included a photo of *Lygodium microphyllum* taken by Jeffery Hutchinson. (CSF 5.3.7)

Extension activities/meetings- On 2 July, Tom Brandt, Jennifer Fowler-Propst, Adam Zerrenner (Austin ES), Kevin Connally (Austin ES) and Kenneth Ostrand met with the Edwards Aquifer Authority to address outstanding contractual issues with the Edwards Aquifer Habitat Conservation Plan refugia.

On 9 July, Randy Gibson joined Patrick Connor for a meeting at New Braunfels Utilities offices on future restoration plans for the headwaters of the Comal River including spring restoration beneficial to the Edwards Aquifer endangered invertebrates.

On July 8th, a tour of the SMARC was given to representatives from the Joint Military Base Command in San Antonio. Representatives from the Air Force, Army, TXFWCO, and Austin ES attended the meeting. A primary item discussed was the use of DOD end of the year funding to support USFWS activities important to the military branches.

On July 24th, Kenneth Ostrand went to a meeting at the Austin ESFO to discuss current and future issues facing Houston toad recovery. Refugia and annual production for stocking was discussed.

Valentin Cantu and Randy Gibson continue to work with TPWD (Andy Gluesenkamp) and EAA (Gary Schindel and David Gregory) to gain access to additional EAA sampling sites in Hays (SWT Farms, Crystal Clear, San Marcos Baptist Academy, and the SM Bad Water Line wells) and Comal (Garden Ridge, Bracken, HWY 306, Loop 337, Panther Canyon, and Mission Valley wells) counties. In July, SMARC staff continued trapping efforts at Garden Ridge well.

Personnel

Patricia Echo-Hawk completed Divemaster Professional Training on July 8 and is now a certified Divemaster

Patricia Echo-Hawk, Randy Gibson and Valentin Cantu participated in under water full face mask training with communicators on July 8.

Scott Davis resigned his position at the SMARC. Scott was a valuable staff member and he will be missed.

Facilities and equipment

Randy Gibson is working with Dr. Glenn Longley (TSU), the EARDC and a graduate student, Laura McCalla, to monitor the SMARC water wells and other water wells upstream and downstream of the site of the Paso Robles housing development and golf course. This large-scale development will occur near two wells that supply all the water for the SMARC. Although initial land clearing was planned to start in December 2010, the project has been delayed, allowing us to obtain baseline information on water quality prior to any development. It is unknown what effects the development and subsequent chemical usage (herbicides, pesticides,

reuse water) by the golf course and home owners will have on the water quality of the aquifer and on listed aquatic species held at the SMARC. Water quality sampling began during February 2011. Water samples from Hunter well collected during March, June, and September 2011 contained relatively high levels of total coliform. This may indicate the influence of nearby recharge features that needs further investigation. The last samples for this project were taken on 19 July 2012. During August, all sample analyses were completed. Laura McCalla's thesis was completed in December 2012. The SMARC continues to constantly (every 15 min.) monitor temperature and conductivity in both wells. Monitoring has not detected any substantial changes that could represent possible pollution events. The EARDC has received funding from TCEQ-SEP program to continue periodic monitoring of SMARC and City of San Marcos wells for two years. During 2-9 June, water quality sampling took place in SMARC and city of San Marcos wells. During July, the laboratory report was completed by Amplified Geochemical Imaging, LLC and EARDC for this event (Table 6). (CSF 7.12.5.4)

Table 6. Water quality analysis of SMARC and nearby City of San Marcos wells during 2-9 July 2014.

Factor, units	SMARC, Hunter Well	SMARC, McCarty Well	San Marcos City, McCarty Well	San Marcos City, Soyers Well
TPH, ug	0.98	0.79	1.38	11.35
NAPH, ug	bdl	bdl	bdl	0.07
CHCl3, ug	bdl	bdl	bdl	0.07
PCE, ug	0.06	0.07	bdl	0.05
TCB, mpn/100ml	297	bdl	bdl	57

bdl - below detection limit; compound was observed at level below the method detection limit

µg - micrograms, relative mass value

mpn/100ml - most probably number per 100 milliliters (drinking water standard = 1)

TPH - total petroleum hydrocarbons

NAPH - Naphthalene

CHCl3 - Chloroform

PCE - Tetrachloroethene

TCB - Total Coliform Bacteria

During July, Randy Gibson continued to manage computer software and troubleshoot computer operating issues at the SMARC.

In July, Valentin Cantu led a crew of ten Community Service Restitution volunteers to trim and cut grass at the SMARC. In addition the volunteers watered trees with reused water, picked up trash along McCartney road, acid washed the Center's drum filter pump and screens, cut down shrubs, collected amphipods, built removable aquarium partitions to separate salamanders by

sex, and built fiberglass aquarium supports for aquaria.

Val Cantu and Jeffrey Hutchinson performed the annual safety inspections for the SMARC (July 30), TXFWCO (July 30), and Uvalde NFH (July 31). Reports for the three facilities will be written and sent to the Project Leaders and Regional Safety Officer.

Visitors

On July 30th Patricia Echo-Hawk gave a tour to cub scouts troop 218 and its chaperones (approximately 25 people).

On July 29, Jeffrey Hutchinson gave a tour of the facility to Tom Roach. Tom volunteered three days during the Texas wild rice survey and took over 150 photos.