STAFF NOTES
Short Version
February 2014
Aquatic Resources Center
San Marcos, Texas

Aquatic Species Conservation and Management: Refugium Activities

San Marcos Salamander- Nine San Marcos salamanders were collected in February but were returned immediately to Spring Lake given that the refugia at the SMARC is at capacity for this species (Table 1). Six salamander mortalities were observed this month. Wild stock San Marcos salamanders did not oviposit this month, but their offspring oviposited 12 eggs. (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		November 2013			December 2013			January 2013			February 2014		
		JA	OV	EG	JA	OV	EG	JA	OV	EG	JA	OV	EG
San Marcos salamander	RWS	379	0	0	371	0	0	369	0	0	363	0	0
	FX	73	0	0	71	0	0	69	0	0	67	1	12
Quarantine	WS	0	-	-	0	-	-	0	-	-	0	-	-
Texas blind salamander	RWS	71	0	0	80	1	15	82	4	53	96	2	35
	FX	56	2	31	55	0	0	55	1	4	55	0	0
Quarantine	WS	5	-	-	3	-	-	10	-	-	10	1	31
Texas (Comal) salamander	RWS	2	0	0	2	0	0	2	0	0	1	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	43	0	0	42	0	0	42	0	0	42	0	0
	FX	702	0	0	699	1	30	696	0	0	695	8	370

Texas Blind Salamander- SMARC staff collected 15 live and two dead Texas blind salamanders in February (Table 1). The live salamanders were collected from Sessom's Springs (N = 2), Rattlesnake Cave (N = 3), Rattlesnake Well (N=1), and Diversion Springs (N = 9). The two mortalities were collected from nets at the Diversion Spring and the Spring Lake outflow. The SMARC lost one older adult salamander in February. The ten salamanders collected last month and five of the fifteen live salamanders collected this month were incorporated into the refugia (Table 1). No salamanders were transferred from the Edwards Aquifer Research and Data Center (EARDC) even though the staff continues to sample the TSU artesian well. Wild stock Texas blind salamanders oviposited 35 eggs and their offspring produced 31 eggs this month. (CSF 7.12.5.4)

Barton Springs Salamander- No salamanders were collected from Barton Springs in February (Table 1). Wild stock Barton Springs salamanders did not oviposit eggs this month; however, their offspring oviposited 370 eggs. No wild stock salamander mortalities were observed this

month. The Texas A&M University health team received histopathology results from Dr. Reavill; however, they are waiting to provide the SMARC with their recommended disease treatments and husbandry and dietary suggestions until the final tissue sample examination has been completed. (CSF 7.12.5.4)

Fountain Darter- A total of 597 wild stock fountain darters were in the SMARC refugia on 25 February. Eleven mortalities were recovered during February. These fish were from the San Marcos (Upper = 2, Middle = 6, Lower = 1) and Comal (Landa = 1 and Lower = 1) stocks. On 3 February, five fountain darters collected from the Comal River were shipped to the Dexter FHC. It was recently determined that the exotic trematode, *Haplorchis pumilio*, can kill fish. All five fish sent to Dexter FHC were found to be infected with *H. pumilio*. On 10 February, 19 fountain darters (10 from San Marcos River and 9 from Comal River) were shipped to Dexter FHC to be examined for the gill parasite *Centrocestus formosanus*. These darters and all future darters collected from both rivers and sent to Dexter FHC will be examined for *H. pumilio.* (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 = 198) and another from Pinto Creek (N = 86). The SMARC is also maintaining F1 (N ≈ 1,500) offspring. Some of these fish 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 used to develop a propagation/genetic management plan for the Pinto Creek stock. A plan has been outlined and drafted by FWCO and SMARC staff. During February, the SMARC transferred 50 San Felipe Devils River minnows to Uvalde NFH. These fish were the progeny of wild caught fish being maintained at the SMARC and will be used to evaluate how well the newly constructed holding systems at Uvalde NFH operate before wild caught brood stock are brought to the facility. (CSF 7.12.5.4)

Comal Springs Riffle Beetle- Approximately, 151 adult wild stock Comal Springs riffle beetles, seven F1 adult offspring, and 168 larvae are being maintained in the SMARC refugia. On 28 February, 100 riffle beetles were collected from lures in Comal Springs (spring run 3). These beetles were split into two separate groups. Fifty of these beetles went into the existing rearing system that contained 51 beetles. The other 50 beetles went into a newly setup system. This was done in order to reduce crowding in individual tanks and to prevent the loss of the whole refugium if a rearing system malfunction occurred.
(CSF 7.12.5.4)

Peck's Cave Amphipod- A total of 130 adult Peck's cave amphipods are being maintained in refugia at the SMARC. The 151 juvenile *Stygobromus* species that were collected in May are still being maintained at the SMARC. These juveniles are being raised to maturity; thereby, allowing reliable identification to species before being incorporated into the refugia. It can take more than a year for some cave amphipods to reach maturity. (CSF 7.12.5.4)

Texas Wild Rice- The 2014 count of potted Texas wild rice plants in refugia at the SMARC is

158 in greenhouse raceways, 76 in outdoor raceways, 8 in quarantine, along with an additional 86 plants at Uvalde NFH (Table 2). (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 ± 1SE = 61 ± 6 stems per pot). The research stock is comprised of clones and plants produced from various river segments.

	Number of Potted Plants				
		SMARC Refugia		Uvalde NFH	
	Greenhouse	Outdoor Raceway	Quarantine	Refugia	Total
A	6	23	0	18	47
B	46	49	8	19	122
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	8	86	328

The 2013 number of Texas wild rice seeds stored at the SMARC totals 19,618 (N_{2009} = 309, 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. (CSF 7.12.5.4)

From September 2012 to January 2013, 4,355 (N_{Sept12} = 174, N_{Oct12} = 2,850, N_{Nov12} = 865, N_{Dec12} = 349, and N_{Jan13} = 117) Texas wild rice seeds were mass-potted to monitor germination rates and to produce seedlings for restoration work and greenhouse experiments. All seeds were collected from experimental plants (~50 plants of unknown origin on the SMARC) and from Raceway 1 sediments (~158 plants). As of May 2013, 3,137 Texas wild rice seedlings have been potted from germinated seeds. These seeds had a germination rate of 72%. (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

Barton Springs Salamander-

A goal of the SMARC is to develop a captive breeding program for listed salamanders that employs protocols that yield predictable numbers of offspring. Valentin Cantu and Justin Crow initiated a study during November. The laboratory data collection ended in February. Data analyses are ongoing. (CSF 7.12.5.4)

Texas wild rice- SMARC staff have reviewed and commented on the results of the genetic analysis of Texas wild rice comparing wild, refugia, and historical stands of Texas wild rice analyzed by Wade Wilson (Dexter SNARRC). The report has been sent back to Wade Wilson for a final review, at which time a decision will be made on how many Texas wild rice plants should be maintained in the refugia. The report will be sent to both ecologists and geneticists for outside review before submitting for publication. (CSF 7.12.5.4)

Jeff Hutchinson is co-advising Michelle Crawford (Ph.D. student at Texas State University) on a project that is examining the effects of light attenuation and siltation on Texas wild rice at Uvalde NFH. A field component was added to her dissertation that will be conducted in the San Marcos River and use Texas wild rice plants produced at the SMARC. She had her first committee meeting in February. The committee approved her experimental design and draft proposal. She is scheduled to complete her full proposal by May. (CSF 7.12.5.4)

Aquatic Nuisance Species- Kenneth Ostrand is a committee member for Dan Huston, a Master's degree student at TSU. His project initially was to determine the relationship between *Centrocestus formosanus,* an exotic digenetic trematode, infection rates and the swimming performance of *Dionda* species. After completing swim tunnel experimental trails, Dan found *C. formosanus* had no significant effect on the swimming performance of his test fish. When collecting *C. formosanus* infected snails *Melanoides tuberculatus* from the Comal River, *Haplorchis pumilio* infected *M. tuberculatus* also were collected. Dan exposed a few blacktail shiners *Cyprinella venusta* to *H. pumilio* cerariae. Since one of the shiners died from the exposure, Dan decided to run swim tunnel test on uninfected and *H. pumilio* infected shiners and minnows. The swim tunnel trials were completed during December. Since before 2000, *H. pumilio* has been known to exist in the Comal River. Until Dan exposed the shiners to *H.*

pumilio cercariae, we did not know the parasite could kill fish. Dan has examined fountain darters from both the Comal and San Marcos rivers for *H. pumilio* during December and found them to be infected. Conversations with Dexter FHC have resulted in future fountain darter health diagnostics to include quantification of *H. pumilio* infection rates. (CSF 12.2.4)

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

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

Publications- 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 the last week of February. (CSF 5.3.7)

Extension activities/meetings- During February SMARC staff met with the Texas Master Naturalists from Hays County to develop a birding trail at the facility. Twenty birding sites are being developed in Hays County through the program and the SMARC may be one of them.

On 19 February, Patricia Echo-Hawk hosted a conference call for FWS National Diving Control Board. The team is working with NOAA and developing a new diving reciprocity agreement. In addition, the team is working with Marc Blouin, Dive Safety Program Manager for USGS, to organize a DOI Work Group for diving operations between agencies. Lastly, the team discussed holding the 2014 annual meeting in Region 4 to coincide with the retirement of Region 4's Dive Officer.

In February, Valentin Cantu began working with Texas Parks and Wildlife (Andy Gluesenkamp) and Edwards Aquifer Authority (EAA; Gary Schindel and David Gregory) to gain access to additional EAA sampling sites in Hays (Old SWT Farm, Crystal Clear Water Supply, San Marcos Baptist Academy, and the TSU Bad Water Line Wells) and Comal (Garden Ridge, Bracken, HWY 306, Loop 337, Panther Canyon, and Mission Valley wells) counties. In February, SMARC staff began trapping efforts for Texas blind salamanders from Panther Canyon and Mission Valley wells.

Personnel development: **Training**

In February, Valentin Cantu completed a SMARC formaldehyde program to comply with OSHA standard 29 CFR 1910.1048 and USFWS 242 FW9. The program was sent to Patrick McDermot, the Regional Safety Officer, and Jeff Hutchinson, SMARC Collateral Duty Safety Officer, to be reviewed. The SMARC formaldehyde program was presented to staff members at a station safety meeting.

In February, staff from the Balcones Canyonlands NWR (Brett Idol and Rob Vernachio) helped SMARC cut down dead trees at risk of falling over. The trees posed a hazard to personnel and volunteers working along the property fence line as well as the property fence and overhead

power lines. Although the trees were outside the scope of SMARC training (trees less than 10' high and less than 8" trunk diameter), Jeff Hutchinson and Valentin Cantu worked under the direct supervision of Brett and Rob to cut down the larger trees to refresh and enhance their chainsaw skills.

On 19 and 20 February, Patricia Echo-Hawk, Randy Gibson and Valentin Cantu completed Search and Recovery Dive Training.

Facilities and equipment

Randy Gibson is working with Dr. Glenn Longley (TSU), the Edwards Aquifer Data Research Center (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 on19 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. (CSF 7.12.5.4)

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

Water from the Edwards Aquifer flows year-round from a well and pipe that used to feed an Aquarena show area in Spring Lake. In February, Lee Ash-Cantu (Valentin Cantu's wife) increased the perimeter of an existing net to fit the outflow pipe. In February, the SMARC SCUBA dive team installed this collection net over the Spring Lake outflow pipe in order to capture Texas blind salamanders. While in Spring Lake the dive team also adjusted existing sand bags at the base of the Diversion Springs outflow pipe to increase flows into the collection net.

In February, SMARC staff, working with EARDC, made modifications to the TSU artesian well collection net for easier accessibility. Texas blind salamander collection efforts continue at this site with the assistance of EARDC staff.

In February, CSR volunteers assisted the SMARC with the repair of a broken 4" pipe that feeds well water into one of the facility's ponds (C-10). In addition, the volunteers helped pick up

trash along the property line, repair and replace damaged property fence line, water young trees using reuse water, find and collect live food (amphipods), helped set up experimental and refugia tank systems, and potted native plants for restoration along the upper San Marcos River.

Visitors

On 10, 11, and 18 February, Tom Brandt gave tours of the facility to applicants for a TSU academic position.

During February, Patricia Echo-Hawk conducted two facility tours for a total of three adults.