



**Table of Contents:**

<b>The Service Prepares for Lift-Off</b>	<b>1</b>
<b>Refugia Highlights</b>	<b>3</b>
<i>Herpetology</i>	3
<i>Fish Biology</i>	3
<i>Invertebrate Zoology</i>	4
<i>Botany</i>	5
<i>Aquatic Nuisance Species</i>	6
<b>Outreach/Leadership</b>	<b>7</b>
<b>Meetings/Reports/Publications</b>	<b>8</b>
<b>Inside the SMARC</b>	<b>9</b>

*Central Texas Drought Update:*

The current three-year drought is the third-worst multiyear dry spell recorded in Texas. Long-range climate forecasts call for near- to slightly below-normal rainfall across Texas from April through June. Despite the trend toward normal rainfall, the National Weather Service’s three-month drought outlook still calls for drought persistence across all of Central and South Texas. Temperatures this spring and summer are expected to be warmer than normal.

**SERVICE PREPARES FOR LIFT-OFF:  
TRAINING AT NASA**



*Service SCUBA Divers at NASA Neutral Buoyancy Lab training for conservation actions throughout the U.S. Pictured from left to right and front to back: Kevin Foster, Scott Yess, Mitch Osborne, Tony Brady, Patricia Morrison, Patricia Caccavale, Valentin Cantu, Joe Fries, Lorraine Fries and Randy Gibson*

*USFWS: P. Caccavale*

**Staff:**

**Administration/Facilities:**

Tom Brandt, Ph.D., Center Director  
Kenneth Ostrand, Ph.D., Deputy Center Director  
Marta Estrada, Administrative Officer  
David Phillips, Maintenance Mechanic

**Herpetology:**

Valentine Cantu

**Fish Biology:**

Patricia Caccavale, Regional Dive Officer  
Daniel Huston, SCEP

**Invertebrate Zoology:**

Randy Gibson

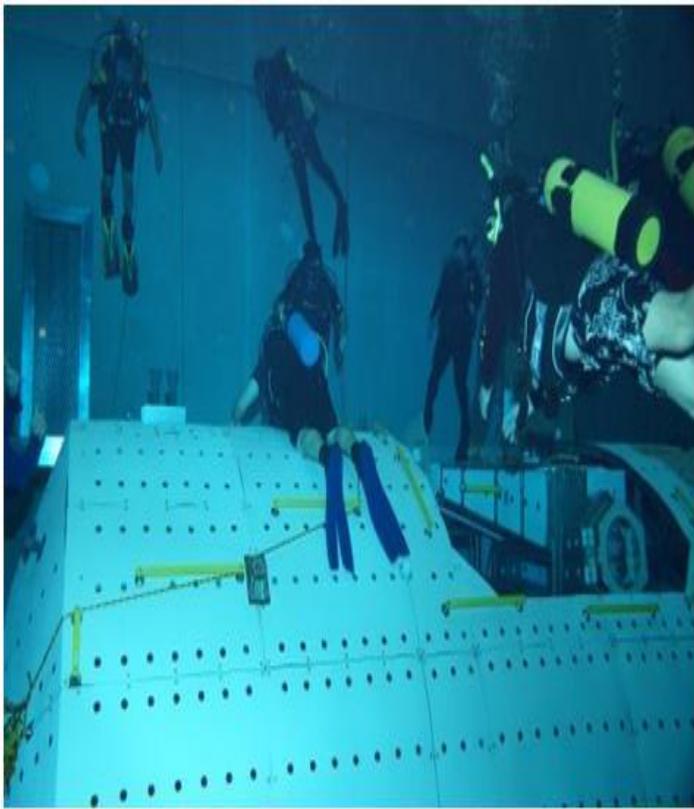
**Botany:**

Jeff Hutchinson, Ph.D.

**Volunteers:**

Allen and Judy Miles

On February 25, the representatives from each Region in the Service converged on Houston, Texas for an extremely rare opportunity to train at NASA’s Neutral Buoyancy Laboratory (NBL). The Service’s National Diving Control Board (NDCB) provides administrative oversight of USFWS diving safety program to ensure compliance with OSHA, Departmental, and Service requirements. The NDCB meets annually to discuss and update policy and safety issues, coordinate diving throughout the nation, as well as to conduct training. The Board is comprised of 8 Regional dive officers as well as the Region 9 Safety Manager. Each



*Service SCUBA divers practicing rescuing an unconscious diver at 25ft above a mockup of the international space station.*

*USFWS: P. Caccavale*

region takes its turn to host the meeting. After months of preparation and given the Service's high standards of dive protocol and safety planning, NASA granted the Service access to the NBL, something it has not allowed any other federal dive agency. The NDCB and the Region 2 dive team was able to conduct rescue training, led by Mitch Osborne (Region 7 Dive Officer) at depth with underwater obstructions, mimicking realistic diving environments, while in the safest possible conditions. The dimensions of the NBL provided an alternative challenging environment that is unavailable using conventional indoor pool venues.

This meeting was not only a great success for USFWS divers, but for NASA as well. Daniel Sedej, the NBL Facility Manager, stated that we had broken new ground for utilization of NBL resources and set a precedent for future dive training by other federal agencies. The possibilities are endless. USFWS divers were truly able to go where no other federal dive agencies have gone before...



*Service SCUBA divers observe, critique and wait as other divers complete training exercises being conducted below the surface.*

*USFWS P Caccavale*

## Refugia Highlights

### Herpetology

The San Marcos Aquatic Resources Center (SMARC) is maintaining San Marcos (N = 379) Texas blind (N = 114) and Barton Springs (727) salamanders in refugia. The salamander refugia are comprised of both wild-caught and hatchery produced individuals. Since January, 50 San Marcos, 20 Texas blind, and 635 Barton Spring salamander eggs have been produced.



Service divers collect San Marcos salamanders in Spring Lake, San Marcos Texas.

USFWS P. Caccavale.

**San Marcos Salamander**-P. Diaz (TXFWCO), J. Fries, Dr. M. Alexander, and Dr. W. Nowlin (Texas State University [TSU]) examined the relationship between submerged aquatic vegetation and the diet of the San Marcos salamander. Salamanders were associated with gravel/cobble substrates and aquatic moss. The salamanders consumed primarily ostracods and hyalella in the wild.

J. Fries and V. Cantu have completed a study examining the reproductive success of San Marcos salamanders subjected to thermal stress. While the results are still preliminary the salamanders appear to be highly sensitive to very small changes in water temperature.

**Barton Springs Salamander**-J. Fries, D. Davis (TSU), Dr. C. Gabor (TSU) and M. Edwards (TSU) are examining mosquitofish predation on

### Herpetology continued

salamander eggs and young. Mosquitofish consume eggs; however, it appears that the fish have difficulty due to its relatively tough outer membrane. Mosquito fish readily consume larval salamanders 14 mm or smaller in total length. Conversely, the fish appear to be gape limited to salamanders that are 20 mm or larger.



Salamanders developing within eggs on top of artificial incubation mats at the SMARC.

USFWS V. Cantu

### Fish Biology

**Fountain Darter**- The SMARC is maintaining 623 wild stock fountain darters in the refugia. These fish are from the upper, middle, and lower San Marcos River and from Landa Lake and the Comal River. Fountain darters are routinely shipped to the Dexter Southwest Native Aquatic Resources and Recovery Center for fish health screening. Fountain darter propagation is ongoing for research projects.



Fountain darter being maintained in refugia at the SMARC.

USFWS J. Fries

## Refugia Highlights Continued

### Fish Biology continued

**Devils River Minnow-** The SMARC is maintaining two wild stocks of Devils River minnows (DRM) in refugia, one from San Felipe Creek (N = 162) and another from Pinto Creek (N = 145). The SMARC also is maintaining F1(N = 2,500) offspring for research and restocking purposes.



*SMARC staff seining the San Felipe Creek in west Texas in an attempt to collect Devils River minnow for the SMARC refugia.*

*USFWS J. Hutchinson*

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 and used to support a draft propagation/genetic management plan for the Pinto Creek stock. A plan has been outlined and drafted by the TXFWCO and SMARC staff.

### Invertebrate Zoology

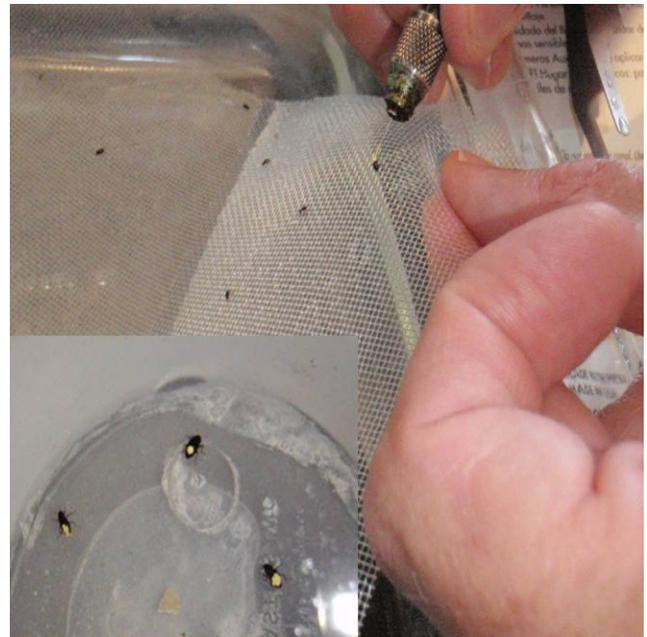
**Comal Springs Riffle Beetle-** Approximately 38 adult wild stock Comal Springs riffle beetles and 500 larvae are being maintained in refugia.

R. Gibson in collaboration with L. Lucas (TSU) is exploring the population genetics of the Comal Springs riffle beetle. The genetics project is being funded by a TPWD Section 6 grant. This work should result in information regarding

### Invertebrate Zoology continued

how many specimens should be maintained in refugia and indicate relationships among populations collected at various spring orifices.

R. Gibson, TXFWCO, and TPWD marked Comal Springs riffle beetles at Comal Spring orifices. Spring orifices were various distances from each other (3 to 44 meters apart). Out of 159 beetles retrieved during January, only one was marked but it had moved to a spring source 1.7 m upstream of original location. During February the sites were sampled again. Of the 274 captured, one was marked. The beetle was recaptured at the site where it was originally marked 2 months earlier. These preliminary trials will be used to determine movement patterns and population estimates through mark and recapture techniques.



*SMARC staff marking a surrogate species of riffle beetle with a visible tag. Tagged riffle beetles could be used for mark and recapture studies that ultimately may provide population estimates. Insert shows individual marked beetles.*

*USFWS P. Diaz*

## Refugia Highlights Continued

### Invertebrate Zoology continued

Maria Cooke (TSU) and R. Gibson are developing captive propagation techniques for the riffle beetle. They examined the habitat preference and substrate and food relationships associated with pupation. This information is needed to improve the beetle's culture environment and perhaps increase the likelihood of completing its life cycle in captivity.

**Peck's Cave Amphipod-** A single wild specimen is being maintained in the refugia.

R. Gibson in collaboration with L. Lucas (TSU) is exploring the population genetics of the Peck's cave amphipod. Her project is being funded by a TPWD Section 6 grant. This work should result in information regarding how many cave amphipods should be maintained in refugia and indicate relationships among cave amphipods at the various spring orifices.

### Botany

Currently 187 pots of Texas wild rice plants are being maintained in the SMARC refugia and Uvalde NFH. Plants within each pot are collected from different San Marcos River reaches that are defined by a particular stand's genetic make-up. In addition the ARC also maintains a seed bank. The number of Texas wild rice seeds stored at the SMARC totals 15,367 ( $N_{2009} = 715$ ,  $N_{2010} = 910$ , and  $N_{2011} = 2,448$ ,  $N_{2012} = 10,133$ ,  $N_{2013} = 491$ ).



*Texas wild rice seeds collected from SMARC refugia.*  
USFWS J. Hutchinson

### Botany continued

W. Wilson (Dexter SNARRC) and Dr. J. Hutchinson are conducting a genetic analysis of Texas wild rice that is comparing wild, refugia, and historical stands of Texas wild rice.

Dr. R. Shaw (Texas A&M's S.M. Tracy Herbarium and Department of Ecosystem Science and Management) in collaboration with Dr. J. Hutchinson obtained type specimens and has begun examining the morphology of Texas wild rice. The ongoing research is focusing on tiller and rhizome structures, comparisons of the submerged and emerged leaf blades, and comparisons with similar species of aquatic grasses.



*Dr. R. Shaw collecting Texas wild rice tissue for an examination of morphological characteristics relative to other aquatic grass species.*

USFWS J. Hutchinson

The SMARC has also been actively involved in assisting with the restoration goals that are outlined in the Edwards Aquifer Recovery Implementation Plan (EARIP) and its Habitat Conservation Plan, native plants are being produced by Dr. J. Hutchinson and J. Miles. The species being propagated include: Texas wild rice, coontail, fanwort, water stargrass, pennywort, creeping water primrose, two-leaf water-milfoil, spatterdock, Illinois pondweed, and grassy arrowhead.

## Refugia Highlights Continued

### Botany continued

Plants produced at the SMARC will be used to replace non-native plants removed during restoration efforts in the San Marcos River.



Texas wild rice seedlings being grown for the City of San Marcos. These plants will be used to replace non-native plants that are removed during restoration efforts.

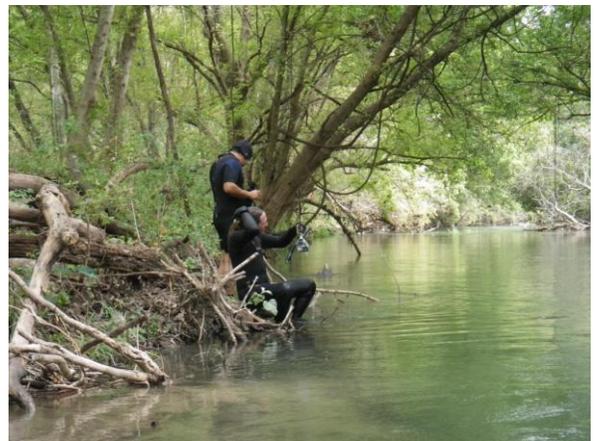
USFWS J. Hutchinson

### 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

### Aquatic Nuisance Species continued

plants by hand. During the March 2012 survey, no plants were found. Unfortunately, two plants were found during the November survey and were removed from the system. During late March the SMARC SCUBA survey was initiated; however, it will not be completed until April. During March no plants were observed.



SMARC divers preparing to survey the San Marcos River for the exotic plant *Cryptocoryne beckettii*.

USFWS P. Caccavale

The SMARC in collaboration with BIO-WEST, Inc. is examining if baits elicit a response from red-rim melania snails, an intermediate host for a gill parasite to the fountain darter, toward bait within a trap. In addition, we are determining if water turbulence can be great enough to remove cercariae tails from the gill parasite. These studies are intended to determine the utility of suggested management methods for the exotic gill trematode.

D. Huston (TSU) and Dr. K. Ostrand are examining the effect of gill parasite load on swimming performance of spring fish given that respiratory impairment will increase the likelihood of piscivory.

# Refugia Highlights Continued

## Outreach/Leadership

P. Caccavale organized the National Dive Control Board meeting/workshop that took place in Houston and San Marcos, TX on 26-28 February 2013. All Regional Dive Officers and the Region 9 Safety Manager met to discuss projects, concerns, diving updates, and safety issues. Training included a rescue refresher course, buoyancy challenge, and scientific diving for T&E species. P. Caccavale assumed the role of Chairperson for the National Diving Control Board as of 1 January 2013

R. Gibson met with Tom Ryan (Meadows Center for Water and the Environment) to review newly produced educational website pages about the groundwater ecosystem in central Texas and provide information for the production of other pages on the Blanco River system.

R. Gibson and J. Fries continue to work with Dr. G. Longley (TSU), the Edwards Aquifer Authority (EAA), and Laura McCalla (TSU), 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. It is unknown what effects the development and subsequent chemical usage 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. The SMARC continues to monitor temperature and conductivity in both wells.

On 1 February the SMARC hosted regional partners as well as past FWS employees during their annual "We're Still Here" luncheon. Approximately 30 visitors attended the pot-luck meal.

## Outreach/Leadership continued

P. Caccavale and D. Araujo (TXFWCO) hosted 665 school children from Goodnight Middle School as well as 10 teachers to learn about T&E species conservation and the role of the Service.



*P. Caccavale is explaining Texas blind salamander life history to Goodnight Middle School students that visited the facility.  
USFWS D. Araujo*

L. Digiacoimo (Audubon Society) and R. Gibson completed an Aquatic Nuisance Species poster for local distribution. The poster is intended to raise awareness about exotic species in Texas waters.



*Aquatic Nuisance Species poster produced through a partnership with the Audubon Society.  
USFWS R. Gibson*

## Meetings/Reports/Publications

### **Herpetology:**

- Gabor, C. R., J. Bosch, J. N. Fries, D. R. Davis. 2013. A non-invasive water-borne hormone assay for amphibians. *Amphibia-Reptilia* (In Press) DOI:10.1163/15685381-0000287

### **Invertebrate Zoology:**

- Johnson, M. S., P. D. Caccavale, C. R. Randklev and J. R. Gibson. 2012. New and confirmed fish host for the threatened freshwater mussel *Lampsilis bracteata* (Gould, 1855), the Texas Fatmucket (Bivalvia:Unionidae) *The Nautilus* 126:148-149.
- Jean A., N. D. Telles, J. R. Gibson, D. Foley, and K. B. Miller. 2012. Description of a new genus and species of stygobiontic diving beetle, *Psychopompopus felipi* Jean, Telles, and Miller (Coleoptera: Dytiscidae: Hydroporinae), from the Edwards-Trinity Aquifer System of Texas, USA. *The Coleopterists Bulletin* 66: 105-110.
- Ethridge, J. Z., J. R. Gibson, C. C. Nice. 2013. Cryptic diversity within and amongst spring - associated *Stygobromus* amphipods (Amphipoda: Crangonyctidae). *Zoological Journal of the Linnean Society* 167:227-242.
- Cantu, V., T. M. Brandt, and T. L. Arsuffi. 2013. An evaluation of three sampling methods to monitor a digenetic trematode *Centrocestus formosanus* in a spring-fed ecosystem. *Parasitology* (In Press) DOI:10.1017/S0031182013000085

### **Botany:**

- In February J. Hutchinson presented a talk titled "Texas Wild Rice and Aquatic Plant Propagation for Restoration Efforts in Spring-Fed Rivers" at Texas A&M University's Department of Ecosystem Science and Management.

### **Administration/Facilities:**

Dr. T. Lewis (Dexter SNARRC) completed a week long detail at the SMARC. Dr. Lewis was charged with drafting a biosecurity plan for the Center.

Dr. J. Hutchinson, V. Cantu, and D. Phillips took a 3-day training course for operating chainsaws at the Balcones Canyonlands National Wildlife Refuge, Marble Falls, Texas. They received training on chainsaw regulations, safety, maintenance, and operation.

D. Phillips, Dr. J. Hutchinson, and D. Huston attended and completed CPR training. P. Caccavale was the course instructor and the training was given at the ARC.

P. Caccavale, V. Cantu, and R. Gibson attended the National Dive Control Board meeting/workshop in Houston and San Marcos, TX on 26-28 February 2013.

R. Gibson has begun the process of scheduling regular daily system backups for station computers and replacing an older malfunctioning computer with a new laptop. Clear Lake ESFO sent an excess computer to SMARC to serve as a standalone computer for remote updating from Denver of all other station computers on "Patch Wednesday".

Routine maintenance was performed on both station backup generators in February

## Inside the San Marcos ARC



The SMARC has been lucky and appreciative that two volunteers assisting with Center duties have been with us for the last seven months. Judi and Allen are from Slaton, Texas, just outside of Lubbock, where both of their fathers worked for the railroad. They have known each other since grade school. Prior to retiring, Judi was hairstylist and Allen worked for the U.S. Postal Service. Allen is an avid golfer, while Judi enjoys kayaking, gardening, nature walks, photography, and art. Both enjoy the Texas music scene and listening to Texas music. In 2010, they retired, bought a RV and traveled for a year. On their first road trip, they volunteered for six weeks during the summer at a Fort Flagler State Park on the inlet to the Puget Sound in Washington State. Their second volunteer experience was for five and half months at Mora National Fish Hatchery in north-central New Mexico during the summer of 2012. They enjoyed the experience, and decided to search for a winter volunteer experience in a warmer climate which led them to the SMARC. Also, they have friends where they spent two winters at an RV park near New Braunfels, Texas on the Guadalupe River. In 2012, they wanted to return to this area, and now volunteer at the SMARC. They have enjoyed the people and work experience at both Mora and San Marcos, and contributing to the conservation efforts of the USFWS. At the SMARC, Judi and Allen are involved in all aspects of daily work dealing with aquatic plant, fish, and salamander culture, propagation, and maintenance, as well as administrative and maintenance work. Judi especially enjoys her work with algae control in Texas wild rice raceways, as strange as that sounds. Both Judi and Allen look forward to many more years doing similar things related to conservation of natural resources, and feel it is a great way to retire!



*Allen and Judi volunteers at the San Marcos Aquatic Resources Center  
USFWS J. Hutchinson*