

EDWARDS AQUIFER HABITAT CONSERVATION PLAN

2018 Annual Report

Submitted to
THE U.S. FISH & WILDLIFE SERVICE

MARCH 26, 2019

On behalf of
**THE EDWARDS AQUIFER HABITAT
CONSERVATION PLAN PERMITTEES**



Prepared by

Blanton & Associates, Inc.

ENVIRONMENTAL CONSULTING • PLANNING • PROJECT MANAGEMENT

Photo Courtesy of
Scott Bauer

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EXECUTIVE SUMMARY

Edwards Aquifer Habitat Conservation Plan

The Edwards Aquifer Habitat Conservation Plan (EAHCP)¹ is the primary document that establishes the cooperative effort to protect the water of the Southern Segment of the Edwards Aquifer (“Edwards” or “Aquifer”) both for people in the region and the threatened and endangered species² that inhabit the Aquifer, and aquatic spring environments whose water largely emanates from the Aquifer. This effort began when regional stakeholders and the U.S. Fish & Wildlife Service (Service or USFWS) initiated the Edwards Aquifer Recovery Implementation Program (EARIP) in 2006. The Texas Legislature mandated participation in the process by the Edwards Aquifer Authority (EAA), Texas Commission on Environmental Quality, Texas Department of Agriculture, Texas Parks & Wildlife Department (TPWD), and Texas Water Development Board (TWDB). The EARIP planning group led to the creation of the process known as the EAHCP Program, which has now been fully transitioned from the EARIP. The EAHCP was completed in November 2012 and led to the approval of an Incidental Take Permit (ITP) under the federal Endangered Species Act of 1973 (ESA) issued in February 2013 by the USFWS to be effective in March 2013. The ITP has been amended once, and a copy of the amended ITP is included in **Appendix A1** of this Annual Report. This Annual Report has been prepared for submittal to the USFWS, as required by the ITP. Because of EAHCP implementation efforts, there have been various amendments and clarifications made to the EAHCP, or its supporting documents, since the issuance of the ITP. **Appendix A2** is a table summarizing the amendments and clarifications from November 2012 through December 2018.

The Permittees under the ITP are the EAA, the City of New Braunfels (CONB), the City of San Marcos (COSM), Texas State University (Texas State), and the City of San Antonio acting by and through its San Antonio Water System (SAWS) Board of Trustees.

Covered Species Protected by the EAHCP

The EAHCP addresses the conservation needs of seven endangered species, one threatened species, and three species that have been petitioned for listing, as shown below in **Table ES-1**. Under the EAHCP, the Covered Species are protected by the ITP issued by the USFWS. The ITP authorizes “take” of the Covered Species listed in **Table ES-1**, as that term is defined in the ESA.³

¹ All acronyms and abbreviations in this Annual Report are defined in the **LIST OF ACRONYMS AND ABBREVIATIONS** located on pages xxiv - xxvi.

² All aquatic animal and plant species referenced in this Annual Report are listed in the **LIST OF ALL SPECIES OF MANAGEMENT INTEREST REFERENCED** located on pages xxvii - xxviii.

³ “Take,” as defined by the ESA, means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” “Harm” is also defined in the implementing regulations as “an act which actually kills or injures wildlife; such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly interfering with essential behavioral patterns including breeding, feeding and sheltering” (50 CFR 17.3). Plants (e.g., Texas wild-rice) are treated differently under the ESA and are not subject to the take rules.

Table ES-1. Covered Species Under the EAHCP ITP

Common Name	Scientific Name	Federal Status	Associated Springs in the EAHCP
Fountain Darter	<i>Etheostoma fonticola</i>	Endangered	Comal & San Marcos
San Marcos Gambusia	<i>Gambusia georgei</i>	Endangered	San Marcos
Comal Springs Dryopid Beetle	<i>Stygoparnus comalensis</i>	Endangered	Comal
Comal Springs Riffle Beetle	<i>Heterelmis comalensis</i>	Endangered	Comal & San Marcos
Peck's Cave Amphipod	<i>Stygobromus pecki</i>	Endangered	Comal
Texas Wild-Rice	<i>Zizania texana</i>	Endangered	San Marcos
Texas Blind Salamander	<i>Eurycea (+Typhlomolge) rathbuni</i>	Endangered	San Marcos
San Marcos Salamander	<i>Eurycea nana</i>	Threatened	San Marcos
Texas Cave Diving Beetle*	<i>Haideoporus texanus</i>	Petitioned	Comal & San Marcos
Comal Springs Salamander	<i>Eurycea sp.</i>	Petitioned	Comal
Texas Troglotic Water Slater	<i>Lirceolus smithii</i>	Petitioned	San Marcos

* Also known as the "Edwards Aquifer Diving Beetle."

The Texas Cave Diving Beetle, Comal Springs Salamander, and Texas Troglotic Water Slater are "petitioned" species and are not yet subject to the "take" prohibition in the ESA.

Geographic Area Covered by the EAHCP

As shown in **Figure ES-1**, the ITP provides incidental take coverage for authorized activities in all or parts of Uvalde, Medina, Atascosa, Bexar, Comal, Guadalupe, Hays and Caldwell counties, Texas that are within the EAA's jurisdictional boundary. This region is the Plan Area in which pumping from the Edwards Aquifer is regulated by the EAA and affects the springs and spring ecosystems inhabited by the Covered Species. The Plan Area also includes the recreational areas associated with the Comal Springs and the San Marcos Springs that are managed under the EAHCP by the CONB, and the COSM and Texas State, respectively. As shown in **Figure ES-1**, the Contributing Zone is part of the Edwards Aquifer *system* but is not technically a part of the Edwards Aquifer itself.

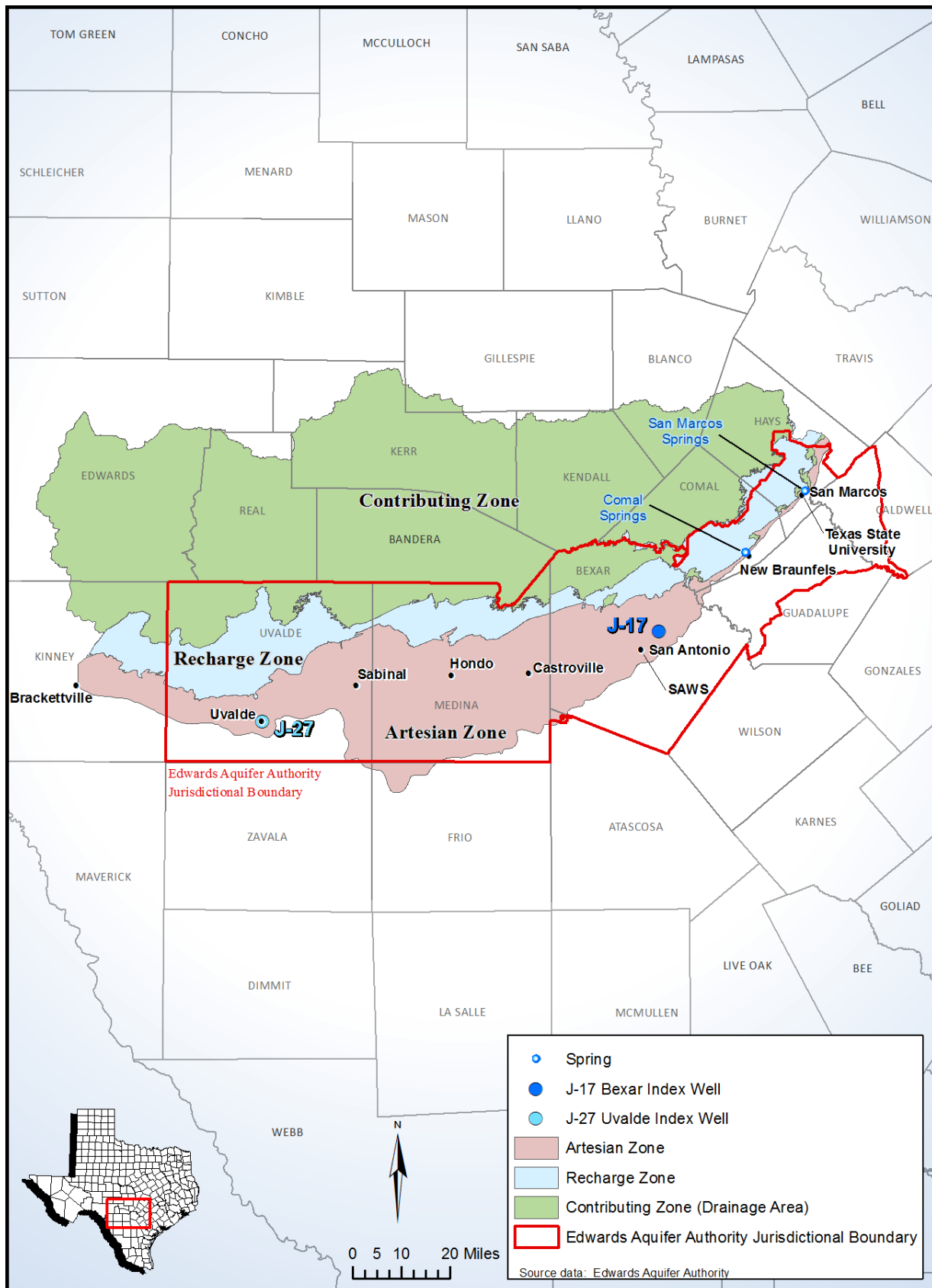


Figure ES-1. Incidental Take Coverage Area for ITP No. TE-63663A-1 (EAA Jurisdictional Boundary).

Effects on Covered Species in 2018

Chapter 5.0 – 2018 ANNUAL TAKE ESTIMATES and **Appendix N** of the Annual Report provide an overview of net disturbance percentages and a summary of incidental take for 2018 (**Table ES-2**). As shown in **Table ES-2**, only the fountain darter in the Comal system had a net disturbance when considering the project footprint for EAHCP Conservation Measure activities overlaid on occupied habitat. The net disturbance was approximately 2 percent of the total occupied habitat for the fountain darter in the Comal system. In the San Marcos system, only the fountain darter and San Marcos salamander had net disturbances calculated at approximately 5 percent and less than 1 percent, respectively, of their total occupied habitat. In summary, the net disturbance in 2018 was under the 10 percent disturbance rule as outlined in ITP Condition M.1.a and 2.a.

Table ES-2 also shows the calculated incidental take on the Comal system with respect to the EAHCP Covered Species. The calculated value of incidental take for the fountain darter in the Comal system was slightly higher in 2018 than observed during 2017. The primary cause for the increase in fountain darter take was due to lower discharge conditions in 2018, which resulted in larger spring to fall aquatic vegetation (habitat) reductions primarily in the Upper Spring Run section. In 2018, all invertebrate restoration activities occurred in the riparian zone resulting in no calculated incidental take for the listed Comal invertebrates. For the San Marcos system, incidental take for the fountain darter also went up slightly in 2018 compared to 2017. The slight increase in the San Marcos system was due to a larger footprint for EAHCP mitigation of primarily native aquatic vegetation restoration in 2018 relative to 2017. The Texas wild-rice exclusion zone implemented for 21 days in the summer below Spring Lake Dam resulted in the minor amount of incidental take calculated for the San Marcos salamander.

2018 Edwards Aquifer Conditions, Management, and Notable Conditions

After above average rainfall conditions in 2015 and 2016, and below average conditions in 2017, the Edwards Aquifer region experienced below average rainfall conditions during the spring and summer of 2018. By late July, some parts of the Edwards Aquifer region were categorized by the National Drought Mitigation Center as in extreme to severe drought. Comal springflow reached a low of 161 cubic feet per second (cfs) on August 30, 2018 and San Marcos springflow reached a low of 117 cfs on August 29, 2018. Due to prolonged low-flow conditions below 120 cfs in the San Marcos River, Condition M of the ITP was enacted on August 28, 2018, thus suspending aquatic vegetation restoration activities. After San Marcos' springflow stabilized above 120 cfs, the Condition M restoration restrictions were officially lifted on September 20, 2018. Rainfall during the fall of 2018 helped replenish the aquifer and improved springflow within the Comal and San Marcos systems.

Table ES-2. Summary of Impacted Habitat and Net Disturbance and Incidental Take for EAHCP Covered Species Compared Against ITP Maximum Permit Amounts

Covered Species Per System	EAHCP Mitigation/Restoration		EAHCP Measures/ Drought	Combined Impacted Habitat 2018TOTAL (m²)	Incidental Take		2018 Incidental Take Total	ITP Maximum Permit Amount	ITP Permit Maximum Minus (Combined First Six Years)
	Impacted Habitat (m²)	Net Disturbance % Of Total Occupied Habitat	Impacted Habitat (m²)		EAHCP Mitigation/ Restoration	EAHCP Measures/ Drought			
COMAL SYSTEM									
Fountain Darter	1,599	1.5%	3,356	4,955	2,399	5,034	7,432	797,000	736,334
Comal Springs Riffle Beetle	0	0%	0	0	0	0	0	11,179	8,887
Comal Springs Dryopid Beetle	0	0%	0	0	0	0	0	1,543	1,527
Peck's Cave Amphipod	0	0%	0	0	0	0	0	18,224	18,057
SAN MARCOS SYSTEM									
Fountain Darter	4,763	5%	3,188	7,951	7,145	4,783	11,927	549,129	474,024
San Marcos Salamander	15	< 1%	0	15	45	0	45	263,857	261,183
Texas Blind Salamander	0	0%	0	0	0	0	0	10	10
Comal Springs Riffle Beetle	0	0%	0	0	0	0	0	N/A	N/A
Comal Springs Dryopid Beetle	0	0%	0	0	0	0	0	N/A	N/A

EAHCP 2018 Budget and Expenditures

The EAHCP Expense Report located in **Appendix H** of this Annual Report shows Table 7.1 of the EAHCP funding amounts for 2018 totaling \$17,912,597, as compared to the EAA Board-approved/amended 2018 Program Funding Applications totaling \$22,571,454. The 2018 actual expenses were \$21,354,428. Unspent funds in the Program Administration, ASR Operations and Maintenance, LID/BMP Management, Applied Environment Research, and Refugia budgets account for most of the difference between total approved budget and actual expenses.

The report also breaks down the adopted budget, Program Funding Applications budget, and actual expenses. By the end of 2018, the reserve balance for the EAHCP was \$31,354,603, which includes unspent funds accumulated since the inception of the EAHCP.

The EAHCP Expense Report also shows the actual revenue for 2018 of \$16,733,938 compared to the budgeted revenue of \$16,516,190, which is a variance of \$217,748. Approximately 92 percent of the actual revenue comes from Aquifer Management Fees (AMFs).

EAHCP Activities Completed in 2018

As stated above, the five Permittees under the ITP are the EAA, CONB, COSM, Texas State, and SAWS. Under the Implementing Agreement (IA), the TPWD is an additional cooperating agency. These are the agencies working to implement the EAHCP. The Permittees are each tasked with certain responsibilities for implementation of the EAHCP, as directed by the ITP. During Phase I of implementing the EAHCP, the Permittees are undertaking 38 Conservation Measures for springflow protection, habitat protection, and other measures identified in the EAHCP.

The ITP requires an annual report be submitted to the USFWS to show progress towards permit implementation. **Chapter 3.0 – PLAN IMPLEMENTATION IN 2018**, of this 2018 Annual Report describes actions by the Permittees and the TPWD, including subsections discussing their *EAHCP Obligations*, *2018 Compliance Actions*, and *Proposed Activities for 2019*.

In Year 2018, EAHCP completed an ambitious year, from securing a sound understanding of EAHCP data and modeling, to ensuring increased establishment of native aquatic habitat in both the Comal and San Marcos ecosystems. Overall, the EAHCP work falls into items that are more programmatic, while other functions deal mainly with field work associated with habitat and species protection. Both components of the program are building on work and research accomplished over the last five years, along with regional stakeholder guidance and recommendations from the National Academy of Sciences (NAS).

In addition, the EAHCP began discussions regarding the Strategic Adaptive Management Process (SAMP) outlined in the Funding and Management Agreement (FMA) as the transition from Phase I (Years 2013 – 2020) to Phase II (Years 2020 – 2028) of the EAHCP and ITP.

Highlights of major EAHCP accomplishments for 2018 are summarized below.

Springflow Protection Measures –

With regard to the four EAHCP springflow protection elements (the Voluntary Irrigation Suspension Program Option [VISPO], the Regional Water Conservation Program [RWCP], the Critical Period Management Program [CPMP] – Stage V, and the SAWS Aquifer Storage and Recovery [ASR] program), the EAHCP continues to make headway to complete all four of these elements prior to Year 2023, which is the tenth year of the ITP and five years in advance of the Year 2028.

- a. *VISPO* – In 2018, EAHCP staff⁴ did not initiate efforts to enroll new participants in the VISPO as the goal of 40,000 acre-feet (ac-ft) was achieved in 2014 and no more water was needed at this time.
- b. *RWCP* – In 2018, SAWS continued its Leak Detection and Repair Program, including a portion of the program funded by the EAA through an agreement between the EAHCP and SAWS, which completes the RWCP goals of conserving 20,000 ac-ft of water. This five-year agreement with SAWS guarantees approximately 10,000 ac-ft of Edwards Aquifer water will be left unpumped through the term of the ITP.
- c. *CPMP – Stage V* – This element was approved by the EAA Board of Directors in early 2012 and has been implemented as necessary. Due to decreased Aquifer levels and springflows, Stage I of the CPMP in the San Antonio Pool was triggered on May 20, 2018, July 14, 2018, and September 13, 2018, for a total of 36 days. Stage II in the San Antonio Pool was triggered on June 20, 2018 and July 27, 2018, for 82 days.
- d. *SAWS ASR Program* – This Conservation Measure (EAHCP §5.5) supports the SAWS operation of the ASR for the EAHCP to ensure that the Comal Springs continue to flow during a repeat of the drought of record (DOR), and consists of three basic components: (1) the injection (recharge), storage, and recovery of EAHCP Groundwater at the SAWS ASR; (2) the acquisition by lease and lease options of EAHCP Groundwater by the EAA; and (3) forbearance of Edwards pumping by SAWS under its EAA-issued groundwater withdrawal permit during certain drought conditions stated in the EAHCP and the SAWS-EAA Interlocal Contract (ILC). From the effective date of the ITP in 2013 through 2018, SAWS has injected 99,375 ac-ft of EAHCP Groundwater. Additionally, because the drought triggers under the EAHCP and the SAWS-EAA ILC were not satisfied at any time during 2018, SAWS did not recover any EAHCP Groundwater in storage from the SAWS ASR.

Once the program goal for the storage component of the SAWS ASR Program is achieved, there is intended to be as much as 126,000 ac-ft stored and available to ease the effects of a DOR. From the effective date of the ITP in 2013 through 2018, the EAA has acquired 39,984 ac-ft in leases. In 2018, the EAHCP completed a Nonroutine Adaptive Management Process (AMP) Proposal initiated by the EAA to resolve some of the program's structural issues regarding the "tiering" of leases/lease options and creating market products that will be better received.

⁴ As used in this Annual Report, "EAHCP staff" is used to refer to EAA employees who are assigned to the Threatened and Endangered Species Team.

Habitat Restoration: Comal and San Marcos Spring Systems –

a. *Comal Springs Systems –*

Vegetative Restoration in the Old Channel, Landa Lake, and Upper Spring Run – Aquatic vegetation restoration activities in 2018 included removal of non-native aquatic vegetation and planting of target native aquatic plants as well as monitoring, mapping, and maintenance of restored areas. A summary of 2018 restoration results follows.

- i. *Old Channel* – In 2018, a total of 497 m² was planted in seven restoration plots in the Old Channel Long-Term Biological Goal (LTBG) and Restoration reaches. A total of 5,460 plants were installed in 2018 within the Old Channel Restoration Reach and the LTBG Reach combined.
- ii. *Landa Lake* – In 2018, 302 m² of area was planted in five restoration plots in Landa Lake. A total of 4,053 plants were planted into the Landa Lake LTBG Reach in 2018.
- iii. *Upper Spring Run* – Although submerged aquatic vegetation (SAV) plantings were a goal for the Upper Spring Run in 2018, construction activities surrounding the New Braunfels Utilities environmental education facility at the headwaters altered this plan. As such, more resources were devoted to completing the removal of all *Hygrophila* and installing restoration plantings in the Old Channel LTBG Reach and Landa Lake than originally anticipated. This adjustment highlighted the importance of flexibility in the restoration plan and goals to best use resources in an economically responsible fashion.

Control of Harmful Non-Native Animal Species – CONB efforts in 2018 involved five removal sessions, each for three days, between February and September. In 2018, approximately 1,844 pounds (lbs.) of invasive species biomass was removed from Landa Lake, that consisted of armored catfish, tilapia, and nutria. Between 2013 and 2018, CONB staff reported that a total of 16,100 lbs. (or approximately 8 tons) of invasive biomass has been removed from the Comal River system.

b. *San Marcos Springs Systems –*

Texas wild-rice Enhancement and Restoration – Restoration activities in 2018 involved removal of non-native plant species, propagation of new Texas wild-rice plants, and continued monitoring of new stands. Since 2013, Texas wild-rice has expanded an estimated 5,914 m², or 240 percent, through planting and natural expansion. Since 2017, Texas wild-rice coverage has decreased by an estimated 2,049 m². Texas wild-rice stands have been lost in areas that have high rates of recreation.

Riparian Restoration – The COSM focused riparian vegetation treatment (e.g., removal and planting) efforts at the following work sites throughout 2018: Purgatory Creek in Bicentennial Park; Crook Park and Wildlife Annex; Rio Vista Park; and Sessom Natural Area.

Control of Harmful Non-Native and Predator Species – COSM hosted two spearfishing tournaments in 2018 to remove non-native invasive species. From 2015 – 2018, COSM staff reported that 1,613 lbs. of invasive species biomass have been removed through spearfishing tournaments.

- c. *Refugia* – In 2017, the EAA contracted with the USFWS to operate off-site refugia operations at the San Marcos Aquatic Resource Center (SMARC) and the Uvalde National Fish Hatchery (UNFH). The primary activities occurring in 2018 were related to species collection, species research, and facility construction. Covered Species were collected throughout the year by both USFWS facilities, in accordance with their 2018 Work Plan, and held at these two facilities.

In 2018, four research projects in support of a successful refugia were completed:

- 1) Life-history study of Comal Springs dryopid beetles (*Stygoparnus comalensis*);
- 2) Life-history study of Peck's Cave Amphipod (*Stygobromus pecki*);
- 3) Continuation of Comal Springs riffle beetle (CSRB) (*Heterelmis comalensis*) life history and captive propagation techniques; and
- 4) Testing a non-invasive trigger to induce reproduction in both pair-wise and group mating of San Marcos salamander.

The 2018 Refugia Annual Report (*Implementation of the Refugia Program under the Edwards Aquifer Habitat Conservation Plan Annual Report 2018*) can be found in **Appendix K3a** and contains details of all the activities described above, monthly progress reports, and reports and work plans related to the Peck's cave amphipod, CSRB, and San Marcos salamander.

- d. *Hydrological Model: MODFLOW Model* – During 2018, the updated and recalibrated MODFLOW model was used to repeat the “bottom-up” analysis cited in the EAHCP to demonstrate the effectiveness of the springflow protection Conservation Measures. Two separate sets of bottom-up analyses were conducted in support of the SAMP. Other groundwater modeling activities conducted during 2018 included an uncertainty analysis conducted by the U.S. Geological Survey (USGS) under a joint funding agreement with the EAA. A goal of this analysis was to identify whether there are alternative ways to calibrate the MODFLOW model that could give equally good calibration results, and the extent to which such alternative models may differ from the version used to demonstrate the effectiveness of the EAHCP springflow protection measures. These efforts are ongoing and results will be available in 2019.
- e. *Applied Research* – The Applied Research Program in 2018 primarily focused on two studies. The Sessom Creek Sediment Export Study was developed to establish a sediment loading curve for Sessom Creek, comprised of a fitted relationship between flow and entrained constituent concentration, and to assess what factors are contributing to the sediment exports in the San Marcos River and sediment deposition on Texas wild-rice as a recurring issue (**Appendix K1**). The Sessom Creek Sediment Export Study will continue in 2019 and results will be available in 2020. The second study was focused on addressing identified several shortcomings noted in the *National Academy of Sciences – Review of the Edwards Aquifer Habitat Conservation Plan: Report 1 (NAS Report 1)* and the *National Academy of Sciences – Review of the Edwards Aquifer Habitat Conservation Plan: Report 2 (NAS Report 2)* of the current methodologies to assess densities and population estimates of the CSRB. The CSRB Work Group was formed and conducted a literature review focused on

specific areas in need of more research (**Appendix K2**). The CSRB literature review will be available in 2019 and will help inform the CSRB Work Group's decisions.

- f. *Strategic Adaptive Management Process* – The Year 2018 marked the first year of SAMP activities as the program transitions from Phase I (2013 – 2020) into Phase II (2020 – 2028). SAMP activities in 2018 revolved around four sources: lessons learned from implementation of Phase I Conservation Measures, MODFLOW DOR simulations, recommendations from the NAS *Report 3* and the Phase II Work Plan Work Group (Phase II Work Group). The Permittees continued to implement monitoring, research and modeling activities to provide information that help inform SAMP decisions.

EAHCP Program Activities –

The EAHCP completed another active year. As discussed above, EAHCP staff managed and facilitated one Nonroutine AMP resulting in amendment to the EAHCP, and one clarification of an EAHCP element. EAHCP program staff also facilitated more than 20 public meetings. These meetings included regular meetings of the IC, Adaptive Management Science Committee (SC), and the Adaptive Management Stakeholder Committee (SH), topical based Work Groups to inform program decisions, and a meeting of the National Academy of Sciences/Science Review Panel (SRP/NAS).