EAHCP

MARCH 2021
FINAL

EDWARDS AQUIFER
HABITAT CONSERVATION PLAN

2020 ANNUAL REPORT

HABITAT CONSERVATION PLAN EDWARDS AQUIFER

ICF

Submitted to
U.S. Fish & Wildlife Service

On behalf of
The Edwards Aquifer Habitat Conservation Plan Permittees

FINAL

Edwards Aquifer Habitat Conservation Plan

2020 ANNUAL REPORT

PREPARED FOR

U.S. Fish & Wildlife Service

ON BEHALF OF

The Edwards Aquifer Habitat Conservation Plan Permittees
Edwards Aquifer Authority
City of New Braunfels
City of San Marcos
Texas State University
City of San Antonio / San Antonio Water System Board of Trustees

PREPARED BY

ICF

March 2021

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Executive Summary

The Edwards Aquifer Habitat Conservation Plan (EAHCP) is a regional plan to protect 11 species associated with the Edwards Aquifer while helping to ensure its stability as a regional water supply. The EAHCP's Incidental Take Permit, TE-63663A-1, covers the jurisdictional boundary of the Edwards Aquifer Authority and was issued to five cooperating Permittees.

- Edwards Aquifer Authority (EAA).
- City of New Braunfels.
- City of San Marcos.
- Texas State University.
- City of San Antonio acting by and through its San Antonio Water System Board of Trustees.

In accordance with the Incidental Take Permit, the Permittees must submit an Annual Report for the preceding year to the U.S. Fish & Wildlife Service, documenting progress toward the goals and objectives of the EAHCP and demonstrating compliance with the terms and conditions of the permit. This document serves as the Annual Report for 2020, the eighth year of EAHCP implementation.

AT A GLANCE

Edwards Aquifer Habitat Conservation Plan

Incidental Take

The total amount of incidental take associated with implementation of non-mitigation/restoration Covered Activities is quantified annually and added to the incidental take calculated from disturbed areas. In 2020, take of only one Covered Species—fountain darter—occurred, and amounts were in range with previous years: 4,403 and 11,269 for the Comal and San Marcos springs systems, respectively.

Goals, Objectives, and Adaptive Management

The EAHCP's Long-Term Biological Goals and Objectives, key management objectives, and flow objectives guide the Conservation Measures implemented under the EAHCP and apply to Covered Species and their habitat in the Comal and San Marcos springs systems. These goals and objectives are subject to changes through adaptive management. There were no adaptive management changes in 2020.

EAHCP Program Activities

EAHCP Program management activities performed in 2020 included coordination with Permittees in accordance with the Incidental Take Permit, Implementing Agreement, EAHCP, Funding and Management Agreement, and other EAHCP Program documents. Program staff coordinated activities of the Implementing Committee, Adaptive Management Stakeholder Committee, Adaptive Management Science Committee, and Work Groups. Program management staff also took on special projects, including developing a geographic information system contractor tool, and provided engagement and transparency through emailed monthly reports, the EAHCP website, *EAHCP Steward* newsletter, EAA's *News Drop Magazine*, and *EAHCP Conserve* newsletter.

Contractors were retained to develop the following: an analysis of options for extending the Incidental Take Permit term beyond 2028, a summary report of the Strategic Adaptive Management Process and transition from Phase I to Phase II of EAHCP implementation, vegetation mapping of Spring Lake, a cultural resources brochure, and an application for a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers for the Sessom Creek restoration project (to be constructed in 2021).

2020 IN REVIEW

Key Highlights

All **springflow protection** Conservation Measures have been satisfied as of 2020.

The obligations to reduce uncertainty in the **groundwater modeling** have been completed, and thus this Conservation Measure has been met.

Most Long-Term Biological Goals for **Texas wild-rice** have now been achieved in the San Marcos River, excluding Spring Lake and below IH-35.

Two **Stage 1 critical periods** were triggered.

The **San Marcos River** fell below 120 cubic feet per second.

The **Phase I to Phase II transition** was documented in a Strategic Adaptive Management Process Report, and an analysis was conducted to explore options for extending the Incidental Take Permit term beyond its 2028 expiration.

The **EAHCP was updated** to include all U.S. Fish & Wildlife Service–approved changes and made available on the EAHCP website.

The City of New Braunfels designed **bioretention basins** at three locations next to the Comal Springs system intended to capture and treat stormwater runoff.

In addition to finalizing the **Sessom Creek restoration channel design**, the City of San Marcos completed construction of the **Downtown Pond** and conducted post-construction activities to ensure vegetation establishment.

Applied research was conducted on the cotton lure sampling technique used for monitoring the Comal Springs riffle beetle. **Refugia-related research** also continued.

In mid-March, Program activities shifted in response to the COVID-19 pandemic. Contractors adopted standard operating procedures to complete field work while maintaining social distance. The City of New Braunfels and City of San Marcos limited public access to recreational facilities and coordinated with EAHCP staff to ensure Conservation Measures were implemented. EAHCP committee meetings were held virtually via web conference.

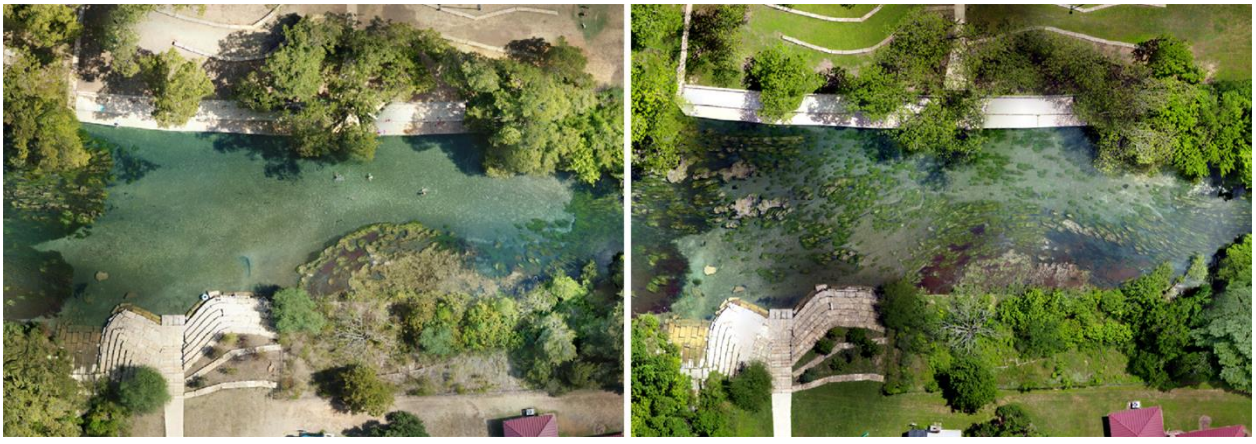
Implementation and Status of Conservation Measures

Activities carried out by the Permittees in the Permit Area as part of EAHCP implementation (Conservation Measures) encompass habitat protection, flow protection, and various supporting activities such as biological monitoring. The table on the following page summarizes progress toward fulfilling the Conservation Measures outlined in the EAHCP to comply with Incidental Take Permit requirements. All efforts to implement the Conservation Measures were conducted in accordance with the annual Work Plans. In December, flows fell below 120 cubic feet per second in the San Marcos River, temporarily suspending planting of aquatic and riparian vegetation in the river.

Fiscal Stability

The current financial projections and cost estimates indicate an overall fiscally stable EAHCP with an adequate budget for Program implementation in fiscal year 2021. The EAHCP reserve is projected to remain above the established reserve floor of $26.4 million, providing adequate funding for up to three more Voluntary Irrigation Suspension Program Option triggering events and the four worst years of the drought of record for the Aquifer Storage & Recovery program.

The 2020 EAHCP expenses total $13,159,170. These amounts can be compared to the EAA Board of Directors–approved/amended 2020 Program Funding Applications totaling $14,525,573. This total reflects five amendments to the EAHCP Program Funding Applications approved by the EAA Board of Directors in 2020.

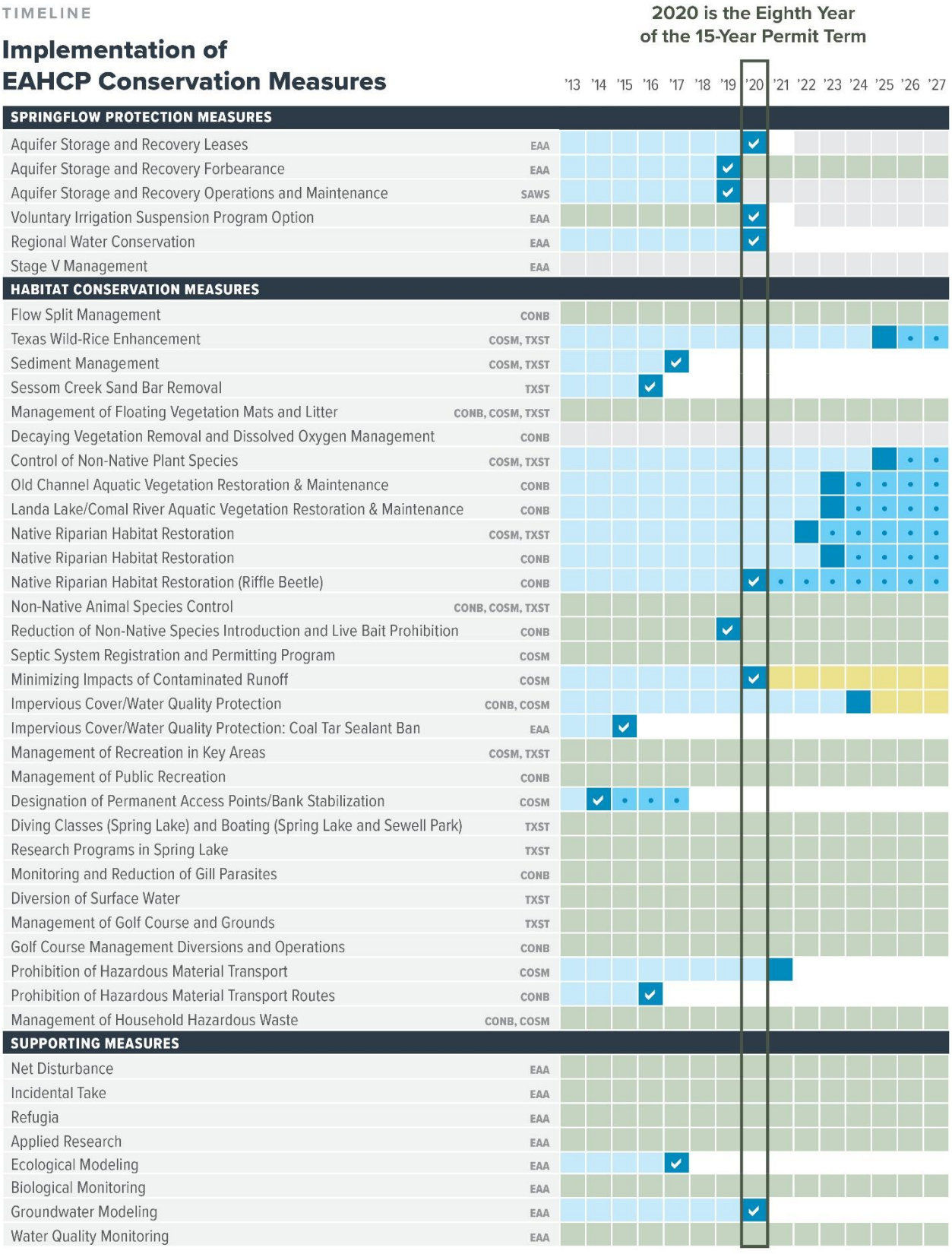


As of 2020, most of the Long-Term Biological Goals for Texas wild-rice have now been achieved in the San Marcos River. Shown above are photos of Texas wild-rice growth in City Park in 2019 (left) and in 2020 following recreation closures (right).

Imagery collected by the Meadows Center for Water and the Environment, Texas State University.

TIMELINE

Implementation of EAHCP Conservation Measures



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List of Abbreviations

Abbreviation	Term
ac-ft	acre-foot
AMP	Adaptive Management Process
ASR	Aquifer Storage & Recovery
cfs	cubic feet per second
COI	Certificate of Inclusion
CONB	City of New Braunfels
COSM	City of San Marcos
CSRB	Comal Springs riffle beetle
EAA	Edwards Aquifer Authority
EAA Act	Edwards Aquifer Authority Act
EAHCP	*Edwards Aquifer Recovery Implementation Program Habitat Conservation Plan*
EARIP	Edwards Aquifer Recovery Implementation Program
ESA	Endangered Species Act of 1973
FMA	Funding and Management Agreement
ft msl	feet mean sea level
ft^3	cubic foot
GIS	geographic information systems
HAZMAT	hazardous materials
HCP	Habitat Conservation Plan
IC	Implementing Committee
ILC	Interlocal Contract
ITP	Incidental Take Permit
lb	pound
LTBG	Long-Term Biological Goal
m	meter
m^2	square meter
N/A	not applicable
Permit Area	area covered by the Incidental Take Permit
SAMP	Strategic Adaptive Management Process
SAWS	San Antonio Water System
SC	Adaptive Management Science Committee
SH	Adaptive Management Stakeholder Committee
SSA	state scientific area
TPWD	Texas Parks & Wildlife Department
TWR	Texas wild-rice
TXST	Texas State University
USFWS	U.S. Fish & Wildlife Service
USGS	United States Geological Survey
VISPO	Voluntary Irrigation Suspension Program Option
yd^3	cubic yard

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1 | EAHCP Background and Edwards Aquifer Conditions

CHAPTER HIGHLIGHTS

- 2020 marked the eighth year of implementing the EAHCP, a regional plan to protect 11 species associated with the Edwards Aquifer while helping to ensure its stability as a regional water supply.
- This Annual Report fulfills reporting requirements of the Incidental Take Permit, a federally issued permit that authorizes incidental take resulting from Covered Activities carried out by the plan's Permittees: the Edwards Aquifer Authority, City of New Braunfels, City of San Marcos, Texas State University, and City of San Antonio/San Antonio Water System.
- Drought conditions in 2019 and 2020 led to decreased groundwater levels in the Permit Area, triggering two Stage 1 critical periods in 2020. Comal and San Marcos springflows also responded to reduced rainfall, with the San Marcos River falling below 120 cubic feet per second in December.

The *Edwards Aquifer Recovery Implementation Program Habitat Conservation Plan* (EAHCP[1]; RECON Environmental et al. 2012) was approved by the U.S. Fish & Wildlife Service (USFWS) as a regional plan to protect eight federally listed and three non-listed species (**Covered Species**[2]; **TABLE 1-1**) associated with the Edwards Aquifer while helping to ensure its stability as a regional water supply. After approval of the EAHCP, the USFWS issued an Incidental Take Permit (ITP) under the federal Endangered Species Act of 1973 (ESA). With an effective date of March 18, 2013, permit TE-63663A-1 (as amended January 21, 2015; Appendix A1) was issued to five cooperating Permittees.

- Edwards Aquifer Authority (EAA).
- City of New Braunfels (CONB).
- City of San Marcos (COSM).
- Texas State University (TXST).
- City of San Antonio acting by and through its San Antonio Water System (SAWS) Board of Trustees.

The area covered by the ITP (Permit Area) is bounded by EAA's jurisdictional boundary—i.e., the area where pumping from the Edwards Aquifer is regulated by the EAA. This boundary encompasses Uvalde, Medina, and Bexar counties and portions of Atascosa, Caldwell, Comal, Guadalupe, and Hays counties (**FIGURE 1-1**).

[1] Abbreviations in this document are defined in the *List of Abbreviations* on page xi.
[2] Terms defined in the *Glossary* appear in blue, bolded typeface on their first use in text or tables and are hyperlinked to their definitions.

Pumping, or groundwater **withdrawals**, is one of many **Covered Activities** that may lead to **incidental take** of a Covered Species. The EAHCP describes impacts that are likely to result from those Covered Activities; identifies **Conservation Measures** to minimize and mitigate those impacts; and assures funding to implement those Conservation Measures and, more broadly, the EAHCP. Amendments and clarifications made to the EAHCP and its supporting documents since ITP issuance are summarized in Appendix A2.

TABLE 1-1
Covered Species

Common Name	Scientific Name	Federal Status	Spring System
Fountain darter	*Etheostoma fonticola*	Endangered	Comal and San Marcos
San Marcos gambusia	*Gambusia georgei*	Endangered	San Marcos
Comal Springs dryopid beetle	*Stygoparnus comalensis*	Endangered	Comal
Comal Springs riffle beetle	*Heterelmis comalensis*	Endangered	Comal and San Marcos
Peck's cave amphipod	*Stygobromus pecki*	Endangered	Comal and San Marcos
Texas wild-rice	*Zizania texana*	Endangered	San Marcos
Texas blind salamander	*Eurycea (=Typhlomolge) rathbuni*	Endangered	San Marcos
San Marcos salamander	*Eurycea nana*	Threatened	San Marcos
Texas cave diving beetle	*Haideoporus texanus*	Petitioned	Comal and San Marcos
Comal Springs salamander	*Eurycea* sp.	Petitioned	Comal
Texas troglobitic water slater	*Lirceolus smithii*	Petitioned	San Marcos

1.1 Annual Reporting and Monitoring Requirements

The ITP requires that by March 31 of each year, an Annual Report for the preceding year is submitted to the USFWS Austin Ecological Services Office and to the USFWS Albuquerque Region 2 Office. As specified by Condition U of the ITP, this report "will document the Permittees' activities and permit compliance for the previous year, thus documenting progress toward the goals and objectives of the Edwards Aquifer Recovery Implementation Program (EARIP) Habitat Conservation Plan (HCP) and demonstrating compliance with the terms and conditions of this incidental take permit."

This document serves as the Annual Report for 2020, the eighth year of EAHCP implementation. Comments received on earlier drafts of this report are included in Appendix B.

TABLE 1-2 identifies the ITP's content requirements for the Annual Report and provides a chapter, section, table, or appendix reference where that content can be found in the 2020 Annual Report.

FIGURE 1-1
Edwards Aquifer Authority Jurisdiction and Permit Area

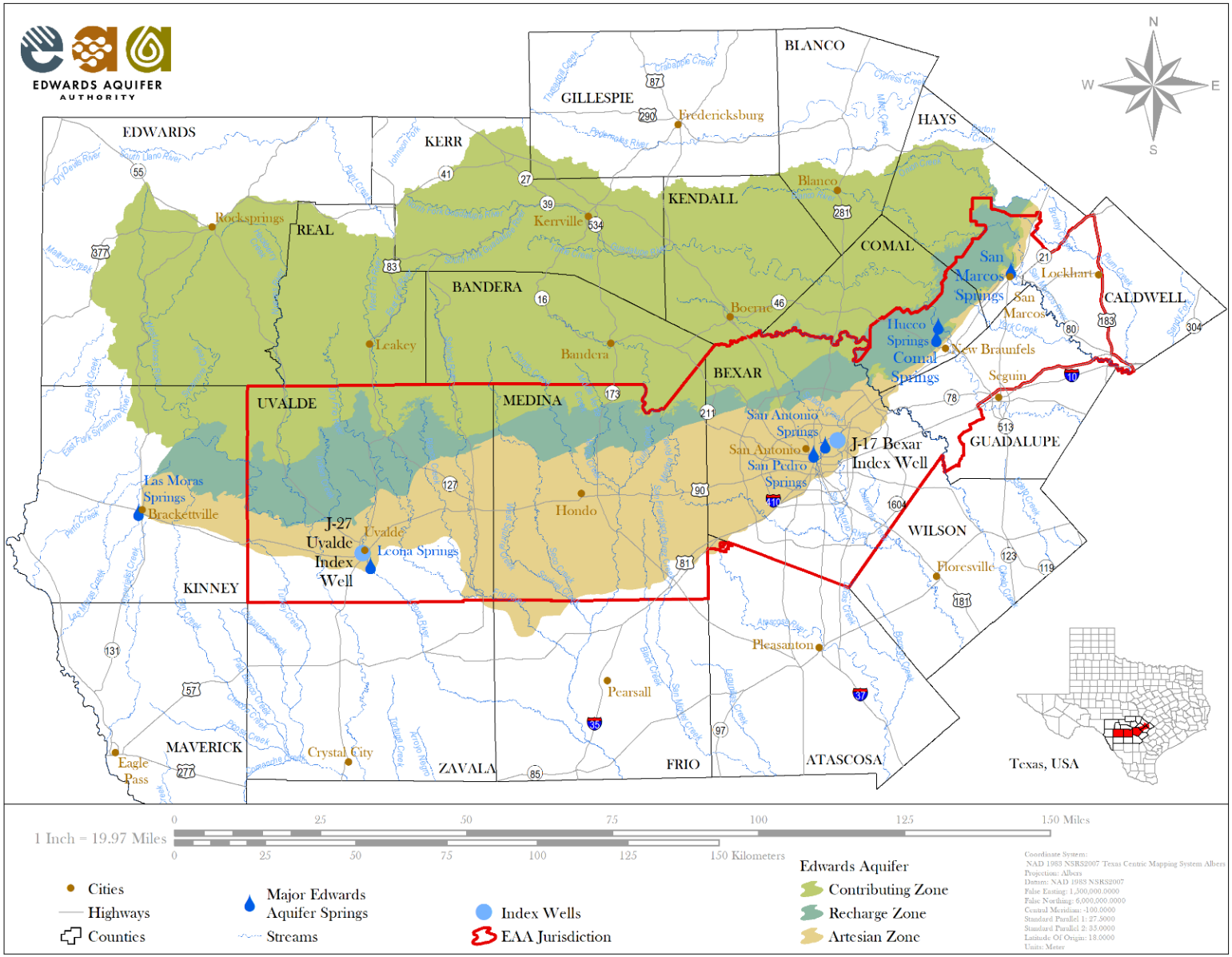


TABLE 1-2

EAHCP Annual Report Requirements and Associated 2020 Annual Report Reference

Requirement per ITP Condition U	Annual Report Reference
EAA permitted withdrawals	Appendix D
Reference well levels	Appendix C
Springflows at Comal and San Marcos springs	Appendix C
Aquifer recharge	Appendix C
Aquifer discharge from wells and springflow	Appendix C
Critical period management reductions	Section 1.2
Water quality data	Appendix F
Location of sampling sites	Appendix F
Methods for data collection and variables measured	Appendix F
Frequency, timing, and duration of sampling for the variables	Appendix F
Description of the data analysis and who conducted the analysis	Appendix F
Adaptive management activities undertaken during the year	Section 6.2
Expenditures by the EAA on implementation activities	Section 5.2
Proposed activities for the next year	Appendix E
Report on the status of implementation of minimization and mitigation measures and their effectiveness	Chapter 2
Interim updates and final copies of any research, thesis or dissertation, or published studies accomplished in association with the EARIP or EAHCP	Chapter 8 and Appendix Q
Description of species-specific research and management actions undertaken with specific reference to the Biological Goals and Objectives identified for each species	Appendix F
Any changes to the Biological Goals and Key Management and Flow-Related Objectives of the EAHCP and the reasons for such changes	N/A—no changes to report for 2020
Any changes to the objectives for the monitoring program	N/A—no changes to report for 2020
Effects on the Covered Species or Permit Area	N/A—no changes to report for 2020
Evaluation of progress toward achieving the Biological Goals and Objectives	Chapter 2 and Appendix F
Any recommendations regarding actions to be taken	Chapter 7

Abbreviations

N/A = not applicable

1.2 Edwards Aquifer Conditions, Management, Notable Conditions, and Springflows

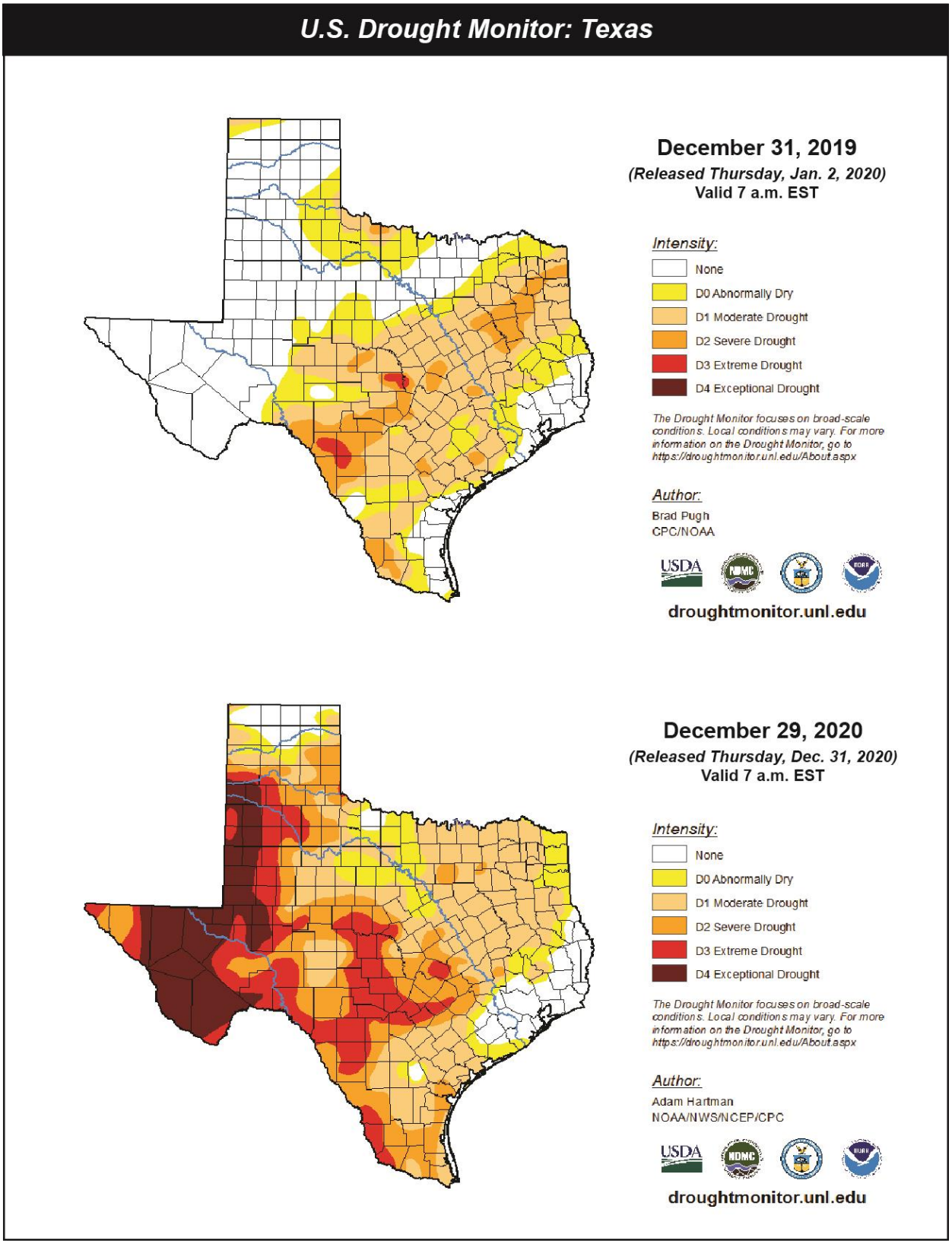
Edwards Aquifer levels fluctuated in 2020. Rainfall was below historical averages through much of 2019 and 2020. Calculated recharge for 2019 was estimated at 492,000 acre-feet, which is below the mean annual recharge of 706,000 acre-feet. Available rainfall and recharge data are included in the 2019 Hydrological Reports (Appendix C).

The EAA declares a **critical period** based on declining groundwater levels and diminished springflow. Water levels measured at the J-27 Uvalde Index Well slowly declined through August 2020 but then increased, nearing 868 feet mean sea level (ft msl) at the year's end. Water levels measured at the J-17 Bexar Index Well remained below 660 ft msl from July through September, **trigger:** a Stage 1 critical period from July 9 through September 15; low water levels at this well again triggered a Stage 1 critical period from October 16 through December 1. Water levels at J-17 ended the year just over 660 ft msl. Springflow in both the Comal and San Marcos rivers responded to reduced rainfall; reported flows at United States Geological Survey (USGS) stations in the **Comal River** (USGS 08169000) remained above critical period triggers, and **San Marcos River** (USGS 08170500) dropped below 120 cubic feet per second (cfs) in December.

The Stage 1 critical period/drought management trigger requires Edwards Aquifer **groundwater withdrawal permit** holders to reduce their annual authorized amount by 20 percent; this restriction applies only to permit holders in Atascosa, Bexar, Caldwell, Comal, Guadalupe, Hays, and Medina counties who are authorized to pump more than 3 acre-feet (ac-ft) annually. The purpose of mandatory reductions is to stabilize water levels and springflow until rainfall replenishes the aquifer. Although reductions are announced whenever triggers are met, reductions are only applied at year-end based on the number of days in a stage or stages. Appendix D lists all EAA groundwater withdrawal permits.

Drought conditions across the region began in summer 2019 and continued through 2020. **FIGURE 1-2** compares Texas drought conditions on December 31, 2019, with conditions on December 29, 2020. *The U.S. Seasonal Drought Outlook* expects drought conditions to persist into 2021 (National Oceanic and Atmospheric Administration National Weather Service Climate Prediction Center 2021).

FIGURE 1-2
Texas Drought Conditions in January 2020 and December 2020



2 | Conservation Measures

CHAPTER HIGHLIGHTS

- Conservation Measures are activities carried out by the Permittees in the Permit Area as part of the EAHCP implementation. These measures encompass habitat protection, flow protection, and various supporting activities (e.g., biological monitoring).
- Tables presented in this chapter show 2020 compliance actions undertaken by Permittees to fulfill Conservation Measures as well as compliance actions proposed for 2021.
- As of 2020, all Conservation Measures related to springflow protection have been satisfied. Edwards Aquifer Authority has transferred and San Antonio Water System has stored the EAHCP groundwater for the fulfillment of Aquifer Storage & Recovery storage (126,000 acre-feet), agreements for Aquifer Storage & Recovery (50,000 acre-feet) and Voluntary Irrigation Suspension Program Option (41,795 acre-feet) met program forbearance goals, agreements for the Regional Water Conservation Program (10,000 acre-feet) met program trust goals, and Edwards Aquifer Authority rules for Stage V of its Critical Management Program are in place and in effect.

Conservation Measures are activities carried out by the Permittees in the Permit Area as part of EAHCP implementation. These measures encompass habitat protection, flow protection, and various supporting activities such as biological monitoring. **TABLE 2-1 through TABLE 2-5** below summarize progress toward meeting the Conservation Measures outlined in the EAHCP to comply with ITP requirements. All efforts to implement the Conservation Measures were carried out according to the reviewed and approved annual Work Plans by Permittees (Appendix E).

Drop-net biomonitoring performed in the spring by BIO-WEST's Brad Littrell.

2.1 Edwards Aquifer Authority

The EAA is responsible for implementing the EAHCP Conservation Measures listed in **TABLE 2-1**. Work Plans and Program Funding Applications for 2020 Program activities and proposed 2021 Program activities are included as Appendix E1 and Appendix E2, respectively.

TABLE 2-1
Edwards Aquifer Authority 2020 EAHCP Implementation and Proposed 2021 Activities

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
Applied Research (EAHCP § 6.3.4) Intended to enhance understanding of the ecology of aquatic ecosystems and provide scientifically rigorous information needed to meet the Biological Goals and Objectives.		
Conducted applied research on the cotton lure sampling technique used for monitoring the CSRB.	Conduct the applied research recommended by the Implementing Committee in the Springflow Habitat Protection Work Group Part 2 Charge and continue the cotton lure study.	N/A
Refugia (EAHCP §§ 5.1.1, 6.4.2, 6.4.3, and 6.4.4) Operation and maintenance of two off-site refugia to house and protect adequate populations of Covered Species and expand knowledge of their biology, life histories, and effective reintroduction techniques.		
Species collections occurred and standing stocks of species were maintained. Research activities focused on increasing survival rates of Peck's cave amphipod adults and F1 offspring and continuing research on the following topics: increasing survival rates of Comal Springs dryopid beetle in captivity, San Marcos salamander reproduction, CSRB nutrition and survivorship, increasing CSRB pupation success in a captive setting, CSRB life history and factors that affect pupation rates, and evaluating three long-term tagging methods in aquatic salamander species.	Continue day-to-day operations and maintenance of refugia. Species collections and 2020 research activities are proposed to continue in 2021.	Appendix F1
VISPO (EAHCP § 5.1.2) Compensates irrigation permit holders for not pumping (a total combined volume goal of 41,795 ac-ft) from the Edwards Aquifer during certain drought conditions when the water level at the J-17 Bexar Index Well is at or below 635 ft msl on October 1.		
Conditions were not triggered, and **forbearance** was not required. VISPO agreements totaling 38,560.649 ac-ft were held in 2020. An additional 3,234.351 ac-ft in VISPO agreements were acquired in 2020 for year 2021. Therefore, the VISPO goal of 41,795 ac-ft has been achieved.	Conditions were not triggered in 2020, and forbearance will not be required in 2021. VISPO agreements totaling 41,795 ac-ft will be held in 2021, and no agreements will expire in 2021. EAA staff will continue to promote re-enrollment to those enrollees with expiring agreements in 2024 and beyond.	N/A

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
Regional Water Conservation (EAHCP § 5.1.3) Conserve 20,000 ac-ft of permitted or exempt Edwards Aquifer water: 10,000 ac-ft will be held by the EAA in trust to remain un-pumped for the permit term, and the other 10,000 ac-ft will remain available for withdrawal by the participating entities.		
Final payment was made to SAWS for its leak repairs made in 2019. The City of Universal City, City of Uvalde, and SAWS contracts to conserve water have been fulfilled.	This Conservation Measure is fulfilled.	N/A
Critical Period Management Program—Stage V (EAHCP § 5.1.4) Mandates a 44 percent reduction in the authorized groundwater withdrawal amount of EAA-issued groundwater withdrawal permits triggered when the 10-day average level at the J-17 Bexar Index Well drops below 625 ft msl, or if the springflows at **Comal Springs** decline below 45 cfs based on a 10-day rolling average, or below 40 cfs based on a 3-day rolling average, or when the J-27 Index Well Aquifer level drops below 840 ft msl.		
This Conservation Measure was not triggered in 2020.	This Conservation Measure will be enforced if triggered in 2021.	N/A
Expanded Water Quality Monitoring (EAHCP § 5.7.2) Continued historical groundwater and surface water quality monitoring along with expanded water quality monitoring efforts to include stormwater and additional groundwater and surface water sampling as necessary around Landa Lake, the Comal River, Spring Lake, and the San Marcos River.		
Expanded water quality monitoring occurred in 2020. Based on the results of historical monitoring efforts, a new water quality monitoring plan was developed in 2020 that will be implemented in 2021.	The new water quality monitoring plan will be implemented to bring costs in line with the budgeted program amounts in EAHCP Table 7.1.	Appendix F2 and Appendix F3
Biological Monitoring (EAHCP §§ 6.3.1, 6.4.3, and 6.4.4) To monitor changes to habitat availability and population abundance of the Covered Species that may result from Covered Activities, to collect data that can be used in the applied research studies, and to provide data and information for ecological model development.		
Biological monitoring occurred as outlined in the EAHCP.	Continue biological monitoring as completed in previous years, with the vegetation mapping occurring only on the **LTBG Reaches**.	Appendix F4 and Appendix F5
Groundwater Modeling (EAHCP § 6.3.2) Improve MODFLOW model to reduce uncertainty in the results for use during the Adaptive Management Process and to provide assurance/confirmation that modeling results for the Edwards Aquifer and springflows are more reliable and defensible.		
The EAHCP obligations to reduce uncertainty in the MODFLOW model and develop a new finite-USGS element model have been met. The USGS completed its MODFLOW uncertainty analysis in 2020. EAA staff evaluated Conservation Measures using a set of alternative models developed from the uncertainty analysis. Results showed minimum springflow objectives can be met with current Conservation Measures. These results were presented to the Implementing and Science committees.	No groundwater modeling is proposed in 2021 to support the ITP.	Appendix F7

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
Ecological Modeling (EAHCP § 6.3.3) Develop a predictive ecological model to evaluate, and quantify the magnitude of, potential adverse ecological effects from Covered Activities to develop alternative approaches or mitigation strategies.		
Ecological modeling was completed in 2017.	No activities are proposed.	N/A
Impervious Cover and Water Quality Protection (EAHCP § 5.7.6) EAA will put together materials regarding the value of a ban on the use of coal tar sealants and work with local governments to explore and encourage their consideration of such a ban.		
Work was completed in 2015. The EAA continues to serve as a resource for other local governments and enforces its coal tar rules.	Continue to serve as a resource for any local government that concludes future regulatory action is necessary. Additionally, continue to enforce the coal tar rules.	N/A
EAA ASR Springflow Protection (EAHCP § 5.5.1) The EAHCP requires the EAA to acquire a total of (1) 16,667 ac-ft of permitted Edwards Aquifer water through **leases** and maintain such leases on an annual basis for use in the SAWS ASR Program and (2) 33,333 ac-ft of permitted Edwards Aquifer water through **forbearance agreements** for springflow protection and maintain such agreements on an annual basis.		
Conveyed 9,957.439 ac-ft to SAWS for storage in the SAWS ASR Project as defined by the Interlocal Contract with SAWS. Acquired and maintained groundwater withdrawal rights totaling 49,670 ac-ft of which 15,924.077 ac-ft were leased groundwater withdrawal rights and 33,745.923 ac-ft were ASR springflow protection forbearance agreements. Therefore, the EAA portion of the ASR goals have been achieved.	Upon expiration of existing EAA ASR leases, future enrollments will become ASR springflow protection forbearance agreements consistent with the Interlocal Contract for the remainder of the ITP unless ASR is used. EAA has acquired a total of 50,000 ac-ft for year 2021 of which 14,561.797 ac-ft are ASR leases and 35,438.203 ac-ft are ASR forbearance agreements. This water will serve as forbearance water and will go un-pumped if the 10-year rolling average of the estimated annual recharge to the aquifer is equal to or less than 500,000 ac-ft.	N/A

Abbreviations

ac-ft = acre-foot; ASR = Aquifer Storage & Recovery; CSRB = Comal Springs riffle beetle; ft msl = feet mean sea level; LTBG = Long-Term Biological Goal; N/A = not applicable; USGS = United States Geological Survey; VISPO = Voluntary Irrigation Suspension Program Option

2.2 City of New Braunfels

The CONB is responsible for implementing the EAHCP Conservation Measures listed in **TABLE 2-2**. Work Plans and Program Funding Applications for 2020 Program activities and proposed 2021 Program activities are included as Appendix E1 and Appendix E2, respectively.

TABLE 2-2
City of New Braunfels 2020 EAHCP Implementation and Proposed 2021 Activities

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
Flow-Split Management in the Old and New Channels (EAHCP § 5.2.1) Control flow entering the Old and New channels of the Comal River from Landa Lake to maintain optimal habitat conditions for the Covered Species under varying total flow conditions.		
Continued to monitor flow rates in the Old and New channels of the Comal River. Operated the flow-control gates between Landa Lake and the Old Channel to meet the flow objectives.	Continue to monitor flow rates in the Old and New channels of the Comal River and operate the flow-control gates to meet the flow objectives defined in annual Work Plans.	Appendix E1
Native Aquatic Vegetation Restoration and Maintenance (EAHCP § 5.2.2) Implement an Aquatic Vegetation Restoration Program (removal of non-native aquatic plant species, planting of target native aquatic plant species, and maintenance of restored areas) within key, sustainable reaches of the Comal River system including Landa Lake, the Upper Spring Run area, and portions of the Old and New channels to improve habitat conditions for the fountain darter by increasing the amount of usable habitat and by improving the quality of existing habitat.		
Planted 9,531 native aquatic plants, primarily *Ludwigia* and *Cabomba*, in the **Restoration Reaches** of the Old Channel, Comal River, and Landa Lake. The planted area for the Landa Lake LTBG Reach totaled 682 m^2. The planted area for the Old Channel LTBG totaled 196 m^2, and the Old Channel Restoration Reach totaled 82 m^2. The planted area for the Upper Spring Run LTBG Reach totaled 25 m^2. The planted area for the Upper Landa Lake Restoration Reach totaled 88 m^2. Removed less than 5 m^2 of non-native *Hygrophila* from the Comal River system. Monitored and maintained previously restored native aquatic vegetation stands.	Continue efforts to increase the coverage and density of target aquatic vegetation preferred by fountain darters for habitat. Efforts will be focused in the Old Channel, Landa Lake, New Channel, and Upper Spring Run as well as in the Upper and Lower Landa Lake Restoration Reaches. Continue aquatic vegetation maintenance activities to prevent re-establishment of non-native *Hygrophila* and to encourage long-term sustainability of target submerged aquatic vegetation species in Landa Lake, Old Channel, and Upper Spring Run LTBG and Restoration Reaches.	Appendix G1

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
Management of Public Recreational Use of Comal Springs and River Ecosystems (EAHCP § 5.2.3) Enforce recreation restrictions on the Comal River to limit recreation on Landa Lake, the Spring Runs in Landa Park, and the Old Channel of the Comal River along with extending take protection to commercial outfitting businesses that voluntarily participate in the COI Program.		
Continued enforcement of CONB Code § 142-5, which restricts access to Landa Lake, the Spring Runs (except for the wading pool on Spring Run #2), and portions of the Comal River, including the Old Channel and the "Mill Race" of the New Channel. CONB park rangers routinely patrol Landa Park and enforce the ordinance. Signage is in place along the waterways to inform visitors. City parks were closed from June to September 2020, effectively restricting public access to the Comal River during this period.	CONB park rangers will continue to enforce CONB Code § 142-5. The CONB will work with Program staff and stakeholders to develop a plan to inform river recreation outfitters about the benefits of the COI Program. The CONB will recruit outfitters who operate on the Comal River and voluntarily participate in the COI Program.	N/A
Decaying Vegetation Removal and Dissolved Oxygen Management (EAHCP § 5.2.4) Monitor dissolved oxygen concentrations and related water quality parameters in Landa Lake and mitigate depressed dissolved oxygen levels (less than 4 milligrams per liter), regardless of the initiating circumstances.		
Dissolved oxygen monitoring and mitigation activities did not occur in 2020 due to above-average springflow and adequate dissolved oxygen concentrations.	Monitor dissolved oxygen concentrations in prime habitat areas of Landa Lake and the Upper Spring Run if total Comal springflow decreases below 100 cfs. Floating vegetation mats will be managed, and decaying vegetation removed if low dissolved oxygen levels are present and concentrations are found to be negatively influenced by decaying vegetation.	N/A
Control of Harmful Non-Native Animal Species (EAHCP § 5.2.5) Implement a non-native species control program that targets armored sailfin catfish, tilapia, nutria, and giant ramshorn snail.		
Performed routine removal sessions throughout the year to remove non-native fish and animal species from the Comal River system. Giant ramshorn snail removal efforts have been discontinued due to population abundance and the limited impact that removal has on the overall populations. Removed 87 armored sailfin catfish, 965 tilapia, and 23 nutria from the Comal River system.	Continue the existing program to remove target non-native species including tilapia, nutria, and armored sailfin catfish using proven and effective methods.	Appendix G2
Monitoring and Reduction of Gill Parasites (EAHCP §§ 5.2.6 and 6.3.6) Monitor the gill parasite *Centrocestus formosanus* and its intermediate host snail, red-rimmed melania, and establish a reduction program.		
Performed water column cercaria monitoring for *Centrocestus formosanus* as well as the parasitic *Haplorchis pumilio* in August.	Continue monitoring free-swimming cercaria (snail parasite larva) in the water column.	Appendix G3

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
Prohibition of Hazardous Materials Transport across the Comal River and its Tributaries (EAHCP § 5.2.7) Prohibit the transport of HAZMAT on routes crossing the Comal River and its tributaries.		
Hazardous materials transport prohibitions (CONB Code § 126-185) remained in effect and notification signs remained in place and in good condition.	Maintain HAZMAT signage installed in 2016 and monitor for the presence of trucks carrying hazardous cargo on routes crossing the Comal River and its tributaries.	N/A
Native Riparian Habitat Restoration (Riffle Beetle) (EAHCP § 5.2.8) Implement a restoration program by removing non-native vegetation and planting native vegetation to improve the riparian zone along Spring Run #3 and the western shoreline of Landa Lake and to minimize sedimentation impacts.		
Planted native grasses (20 containerized gamma grass plants) and distributed native grass seed (5 lbs of inland sea oat seed) to increase the density of vegetative cover within the riparian buffer along the southeast side of Spring Run #3. Monitored, maintained, and installed additional sediment capture structures along the northwest side of Spring Run #3. Installed a rope barrier along the edge of the riparian buffer area to prevent pedestrian access and disturbance of vegetation.	Continue to monitor the riparian vegetation and buffer area established along the southeast side of Spring Run #3 and plant native riparian species as needed; monitor and remove reemergent non-native vegetation in the riparian zone along the northwest side of Spring Run #3 and the western shoreline of Landa Lake. Monitor and maintain sediment capture structures.	Appendix G4
Reduction of Non-Native Species Introduction and Live Bait Prohibition (EAHCP § 5.2.9) Prohibit the introduction of domestic and non-native aquatic organisms, targeting bait species and aquarium trade species, and spread knowledge on the adverse impacts of aquarium dumping and use of non-native bait species.		
Educated residents and visitors about the **negative impacts** of aquarium dumping and use of specific live bait species and continued to enforce CONB Code § 142-6.	Continue to educate residents and visitors about the negative impacts of aquarium dumping and use of specific live bait species. Continue to enforce CONB Code § 142-6.	N/A
Litter Collection and Floating Vegetation Management (EAHCP § 5.2.10) Remove litter and manage floating vegetation to enhance habitat for the Covered Species. This includes dislodging vegetation mats that form on the water surface, particularly during **low flows**, to allow continued movement downstream, and removal of litter from the littoral zone and stream bottom.		
Continued to dislodge floating vegetation mats from Landa Lake where Covered Species habitat is present to minimize shading of restored aquatic vegetation, entrainment of floating vegetative material around the Landa Lake / Old Channel flow-control gates, and oxygen consumption in Landa Lake associated with decaying vegetation. Removed litter along the banks of the Old Channel of the Comal River on a bi-weekly basis from May to September. In total, 58 7-gallon mesh bags of litter were collected.	Continue efforts to remove litter and dislodge floating vegetation mats to prevent negative impacts to flow control structures, aquatic Restoration Reaches, and Covered Species habitat.	N/A

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
Management of Golf Course Diversions and Operations (EAHCP § 5.2.11) Develop and implement a Golf Course Management Plan that will include an Integrated Pest Management Plan designed to target techniques to protect water quality and minimize potential negative effects on the Covered Species. EAHCP § 2.3.4 also defines Covered Activities for spring-fed pool diversions and operation.		
Continued to implement existing Integrated Pest Management Plan and maintained vegetative buffers between the golf course and Landa Lake and the Old Channel of the Comal River to protect water quality. Continued withdrawals from the Old Channel for golf course irrigation and filling of the spring-fed pool per TCEQ permit #18-3826. Continued to maintain the spring-fed pool according to the 2003 Comal Ecosystem Management Plan.	Continue to update the Integrated Pest Management Plan and maintain a vegetative buffer between the golf course and Landa Lake and the Old Channel of the Comal River. The Integrated Pest Management Plan will be revised, as needed, to address any operational changes associated with the management of the golf course grounds. Continue withdrawals from the Old Channel for golf course irrigation and filling of the spring-fed pool per TCEQ permit #18-3826 and continue to maintain the spring-fed pool according to the 2003 Comal Ecosystem Management Plan.	N/A
Native Riparian Habitat Restoration (Old Channel Improvements) (EAHCP § 5.7.1) Initiate a riparian restoration program to enhance the riparian zone along the Old Channel, the golf course, and near Clemens Dam.		
Addressed approximately 2,250 linear feet of shoreline in 2020 including removal of non-native vegetation and the introduction of native vegetation along the banks of Landa Lake, Blieders Creek, and the Upper Spring Run. Approximately 950 non-native trees were treated and/or removed from the riparian areas, including seedlings, saplings, and mature *Ligustrum*, Chinese tallow, and Chinaberry trees. Elephant ears and other non-native littoral species were treated throughout Blieders Creek, Upper Spring Run, and Landa Lake. Transplanted 1,574 native plants into the riparian areas. Distributed approximately 18.5 lbs of native seed within riparian areas in the Upper Spring Run area. Coordinated with the Comal County Water Recreation District #1 to perform the aforementioned riparian restoration activities on its property.	Remove non-native vegetation along the banks of Landa Lake. Install erosion control berms, plant native vegetation, and disperse seed in areas where non-native vegetation is removed. Efforts in 2021 will be focused primarily along Landa Lake near Pecan Island, the Landa Park Golf Course, and on Comal County Water Recreation District #1 property.	Appendix G5

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
Management of Household Hazardous Wastes (EAHCP § 5.7.5) Continue to implement a household hazardous waste program and enhance the program to generate additional participation by the public.		
Held two household hazardous waste collection events, one in February and another in October. Overall, 659 cars/participants were recorded, and 67,310 lbs of hazardous waste was collected. Partnered with New Braunfels Utilities to hold one unused medication collection and disposal event.	Hold three household hazardous waste collection events, and partner with New Braunfels Utilities on the Operation MedSafe drug recovery and collection program.	N/A
Impervious Cover and Water Quality Protection (EAHCP § 5.7.6) Expand criteria related to desired impervious cover, provide incentives to reduce existing impervious cover on public and private property in New Braunfels, and implement stormwater runoff best management practices around Landa Lake and the Spring Runs.		
Designed bioretention basins at three locations adjacent to the **Comal Springs system** intended to capture and treat stormwater runoff. These locations are the Headwaters at the Comal facility, the intersection of Elizabeth Avenue and Landa Park Drive, and the Landa Park Aquatics Center parking lot.	Construction of the bioretention basins at the Headwaters at the Comal facility and Elizabeth Avenue is proposed for early 2021. The Landa Park Aquatics Center basin is proposed to be constructed in 2022.	Appendix G6

Abbreviations

cfs = cubic feet per second; COI = Certificate of Inclusion; HAZMAT = hazardous materials; lbs = pounds; LTBG = Long-Term Biological Goal; m^2 = square meters; N/A = not applicable; TCEQ = Texas Commission on Environmental Quality

Contractors for the City of San Marcos from Texas State University remove floating vegetation from the San Marcos River in the rain.

2.3 City of San Marcos

The COSM is responsible for implementing the EAHCP Conservation Measures listed in **TABLE 2-3**. Selected Conservation Measures have been implemented in partnership with TXST, as specified in the EAHCP, to maintain consistency with activities that jointly affect the Covered Species and their habitats in the San Marcos River. Work Plans and Program Funding Applications for 2020 Program activities and proposed 2021 Program activities are included as Appendix E1 and Appendix E2, respectively.

TABLE 2-3
City of San Marcos 2020 EAHCP Implementation and Proposed 2021 Activities

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
TWR Enhancement and Restoration (EAHCP §§ 5.3.1 and 6.3.5) Identify areas of optimal habitat for TWR and target those areas for removal of non-native submerged aquatic vegetation species, conduct propagation and planting guided by Table 34 of the *Submerged Aquatic Vegetation Analysis and Recommendations* report (BIO-WEST and Watershed Systems Group 2016), and perform continual monitoring of new and existing stands.		
Planted 512 individual plants in Spring Lake over a total area of 114 m². Existing stands of TWR were maintained by removing non-native vegetation in and around stands of TWR.	Conduct planting in Spring Lake and areas below IH-35 reaches according to the annual goals listed in Table 34 of the *Submerged Aquatic Vegetation Analysis and Recommendation* report (BIO-WEST and Watershed Systems Group 2016); focus monitoring and maintenance efforts in reaches where planting goals have been achieved.	Appendix H1

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
Management of Recreation in Key Areas (EAHCP § 5.3.2) Continue to implement recreation mitigation measures approved by COSM Resolution 2011-21, which include, but are not limited to, implementing buffer zones around designated recreation areas, developing and implementing a robust river education program, addressing the accumulation of silt in the river through watershed controls, reducing recreational impacts that harm the river (such as litter), and issuing COIs to river outfitters to extend protections of the ITP to those entities.		
Conservation Crew activities were limited because of park closures; the crew held 312 conversations with river users and removed 3,073 ft^3 of litter from the river and 4,459 ft^3 from the river parks during the recreation season. Public education activities included public service announcements, youth events, and conversations with river users. The Conservation Crew also helped dislodge floating plant mats off stands of TWR and plant native riparian vegetation.	Continue implementation of recreational management goals and continue to educate water recreationists on sustainable river use that protects the Covered Species and their habitats. To help achieve this goal, seasonal workers will also conduct continuous litter removal and EAHCP project maintenance while walking/kayaking between COSM public parks.	Appendix H2
Management of Aquatic Vegetation and Litter Below Sewell Park (EAHCP § 5.3.3) Dislodge and remove floating vegetation mats and remove inorganic litter regularly.		
Removed approximately 150.7 ft^3 of litter and large debris and dislodged 36,374 m^2 of floating vegetation mats in and around stands of TWR.	Continue to implement existing removal efforts.	Appendix H1, Appendix H3, and Appendix H10
Prohibition of Hazardous Materials Transport across the San Marcos River and Its Tributaries (EAHCP § 5.3.4) Designate routes for the transportation of HAZMAT that will minimize the potential for impacts on the San Marcos River and its tributaries.		
HAZMAT routes have been mapped. The Wonder World Drive route meets requirements for designation and will be pursued.	Mapped HAZMAT routes are not yet approved by the Texas Department of Transportation. The Wonder World Drive route will be submitted for approval to the Texas Department of Transportation as a HAZMAT route.	N/A
Reduction of Non-Native Species Introduction (EAHCP § 5.3.5) Establish an education campaign targeted at reducing the introduction of non-native species and provide people with disposal sites for unwanted aquatic animals and plants to deter aquarium dumps into waterbodies.		
Education and outreach efforts included conducting a polespear tournament to remove non-native fish, using social media (including Facebook posts), and conversations with Discovery Center visitors. The donation drop-off at the Discovery Center received 132 unwanted fish—50 percent were adopted.	Continue to implement existing efforts.	N/A

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
Sediment Management below Sewell Park (EAHCP § 5.3.6) Remove sediment from the San Marcos River between City Park and IH-35—efforts specifically targeted for TWR habitat. Funding for this measure has been transferred to the Impervious Cover and Water Quality Protection Conservation Measure (EAHCP § 5.7.6) per the Nonroutine Adaptive Management Process Proposal approved in fall 2017.		
No sediment removal activities occurred in 2020.	No activities are proposed.	N/A
Designation of Permanent Access Points and Bank Stabilization (EAHCP § 5.3.7) Stabilize banks and maintain a healthy riparian buffer in City Park, at the Hopkins Street underpass, Bicentennial Park, Rio Vista Park, Ramon Lucio Park, and at the Cheatham Street underpass using stone terraces and native vegetation along the riparian zone to include permanent access points to the river where possible.		
Monitored eight access points. Two access points exhibited undermining: Dog Beach in City Park and Hopkins Street underpass.	Access points will be monitored annually through measuring undermining and gaps between rocks. Dog Beach access point repairs, to be funded and overseen by the COSM, may occur in 2021.	Appendix H2
Control of Non-Native Plant Species (EAHCP § 5.3.8) Develop and implement a non-native plant replacement program from Spring Lake downstream to the city boundary to remove and replace aquatic, littoral, and riparian non-native plant species with native species covering a minimum of 15 m of the riparian zone, where possible.		
Removed non-native aquatic vegetation over 7,010 m^2 in Spring Lake and in the San Marcos River from City Park downstream to Snake Island. Littoral and riparian non-native plants were treated between Bert Brown Road and Capes Dam; the area included over 500 m^2 of initial treatment and 3,000 m^2 of maintenance.	Continue to remove non-native vegetation and plant native aquatic and littoral vegetation. Aquatic plant restoration efforts will seek to achieve the long-term goals of native aquatic plant species as defined by Table 34 of the *Submerged Aquatic Vegetation Analysis and Recommendation* report (BIO-WEST and Watershed Systems Group 2016).	Appendix H1 and Appendix H4
Control of Harmful Non-Native and Predator Species (EAHCP § 5.3.9) Implement a non-native species control program that targets the suckermouth armored catfish, tilapia, red-rimmed melania, and the giant ramshorn snail and conduct annual monitoring and maintenance to ensure continued control of invasive species.		
Removed 1,025.7 lbs of non-native fish and animal species in 2020, and volunteers assisted with removal efforts by participating in two bi-annual polespear tournaments.	Regular removal of the tilapia, suckermouth catfish, and snails will continue with monthly monitoring and bi-annual tournaments.	Appendix H5
Native Riparian Habitat Restoration (EAHCP § 5.7.1) Restore riparian habitats with native species on COSM and TXST property and establish a program for private landowners to implement riparian restoration with the opportunity for reimbursement.		
Removed and treated invasive re-growth from Sewell Park to Capes Dam and portions of San Marcos River tributaries. Performed initial removals down to Capes Dam.	Maintenance of riparian areas from Clear Springs to Stokes Park will continue. The COSM will continue to focus on restoration of public areas with volunteer groups.	Appendix H6

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
Septic System Registration and Permitting Program (EAHCP § 5.7.3) Establish a registration, evaluation, and permitting program for aerobic and anaerobic septic systems.		
As of October 31, 2020, 620 septic systems were registered within the COSM's jurisdiction according to the San Marcos Environmental Health Department. One new regulated septic system was added.	Continue to implement the septic system registration and permitting program (COSM Code § 86.152).	N/A
Minimizing Impacts of Contaminated Runoff (EAHCP § 5.7.4) Excavate and stabilize two areas for the construction of two water quality bioretention ponds in the vicinity of the San Marcos River and regularly monitor them.		
The COSM completed construction and retrofit of the Downtown Bioretention Pond in 2020, fulfilling the obligations of this Conservation Measure.	All activities and funds associated with this Conservation Measure have been completed.	Appendix H8
Management of Household Hazardous Waste (EAHCP § 5.7.5) Continue to expand the existing household hazardous waste program and offer collection locations available to the public.		
Accommodated, on average, 174 participants per month at the drop-off center and 15 customers per month at the reuse center. The program helped prevent improper disposal of 153,322 lbs of household hazardous waste.	Increase participation rates and continue to enhance awareness of the impact of hazardous household waste on the environment, particularly on Covered Species habitat.	Appendix H7
Impervious Cover and Water Quality Protection (EAHCP § 5.7.6) Establish a program to protect water quality and reduce the impact of impervious cover based on recommendations from the *San Marcos Water Quality Protection Plan*.		
Held one public meeting to finalize the Sessom Creek restoration channel design. Construction was completed on the Downtown Pond, and post-construction activities were performed to ensure vegetation establishment.	Bid and begin construction on Phase I of the Sessom Creek restoration project.	Appendix H8

Abbreviations

COI = Certificate of Inclusion; ft^3 = cubic yard; HAZMAT = hazardous materials; ITP = Incidental Take Permit; lbs = pounds; LTBG = Long-Term Biological Goal; m = meter; m^2 = square meters; N/A = not applicable; TWR = Texas wild-rice

2.4 Texas State University

TXST is responsible for implementing the EAHCP Conservation Measures listed in **TABLE 2-4**. Implementation of certain Conservation Measures has been accomplished in partnership with the COSM, as specified in the EAHCP, to maintain consistency with activities that jointly affect the Covered Species and their habitats in the San Marcos River. Work Plans and Program Funding Applications for 2020 Program activities and proposed 2021 Program activities are included as Appendix E1 and Appendix E2, respectively.

TABLE 2-4
Texas State University 2020 EAHCP Implementation and Proposed 2021 Activities

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
TWR Enhancement and Restoration (EAHCP §§ 5.4.1 and 6.3.5) TXST extended its EAHCP obligations for this Conservation Measure in partnership with the COSM.		
See related discussion in **TABLE 2-3** and Appendix H1 of this Annual Report.	See related discussion in **TABLE 2-3** and Appendix H1 of this Annual Report.	Appendix H1
Management of Recreation in Key Areas (EAHCP § 5.4.2) TXST extended its EAHCP obligations for this Conservation Measure in partnership with the COSM.		
See related discussion in **TABLE 2-3** and Appendix H2 of this Annual Report.	See related discussion in **TABLE 2-3** and Appendix H2 of this Annual Report.	Appendix H2
Management of Vegetation (EAHCP § 5.4.3) Hand-cutting and a harvester boat will be used to manage aquatic vegetation in Spring Lake.		
Aquatic vegetation maintenance activities by volunteers accounted for 60 dive hours in Spring Lake. A total of 1,325 yd^3 of aquatic vegetation was harvested by boat in Spring Lake.	Continue programs outlined in the EAHCP and in the 2021 TXST Work Plan.	Appendix H9
Sediment Management in Spring Lake and Sewell Park (EAHCP § 5.4.4) TXST extended its EAHCP obligations for this Conservation Measure in partnership with the COSM. Funding for this Conservation Measure has been transferred to the Impervious Cover and Water Quality Protection Conservation Measure (EAHCP § 5.7.6) per the Nonroutine Adaptive Management Process Proposal approved in fall 2017.		
No sediment removal occurred in 2020.	No activities are proposed.	N/A
Diversion of Surface Water (EAHCP § 5.4.5) Surface water diversions will be reduced when flow is less than 80 cfs.		
Permitted pumping was not reduced because total San Marcos River flows were greater than 80 cfs; 40.87 ac-ft/year (Certificate 18-3865) and 41.965 ac-ft/year (Certificate 20-3866) were diverted.	Continue to reduce or cease the diversion of surface water as required by flow conditions.	N/A

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
Native Riparian Habitat Restoration (EAHCP § 5.7.1) TXST extended its EAHCP obligations for this Conservation Measure in partnership with the COSM.		
See related discussion in **TABLE 2-3** and Appendix H6 of this Annual Report. No restoration work was completed in upper Sewell Park in 2020.	See related discussion in **TABLE 2-3** and Appendix H6 of this Annual Report. Volunteers will be used if additional planting is needed in 2021.	Appendix H6
Sessom Creek Sand Bar Removal (EAHCP § 5.4.6) TXST and the COSM will conduct a study of sand and gravel bar removal options to determine which best minimizes impacts on Covered Species. TXST will submit the study for review though the Adaptive Management Process and implement the actions coming out of that process.		
Activities were completed in 2016; this Conservation Measure is complete.	No activities are proposed.	N/A
Diving Classes in Spring Lake (EAHCP § 5.4.7) Divers must show an understanding of the Covered Species and critical habitats in Spring Lake and the laws and regulations relevant to them. Divers must exhibit good buoyancy control, avoid contact with Covered Species and critical habitat, and maintain distance from the lake bottom. Training will be conducted for check-out dives and Self-Contained Underwater Breathing Apparatus (SCUBA) classes.		
A total of 2,619 dives occurred in Spring Lake. All divers completed the Diving for Science Program and were monitored for safe diving behavior.	The Diving for Science Program will continue consistent with the protocols identified in the EAHCP.	Appendix H9
Research Programs in Spring Lake (EAHCP § 5.4.8) Research in Spring Lake needs prior review and approval by the Meadows Center for Water and the Environment to assess impacts on Covered Species, and researchers must be educated to limit take in situations where take cannot be avoided; individual permits from the USFWS may be necessary.		
Research projects and events occurred in Spring Lake covering topics that included a diversity of biota studies, EAHCP, and volunteer activities.	Research programs will be consistent with the protocols identified in the EAHCP.	Appendix H9
Management of Golf Course and Grounds (EAHCP § 5.4.9) Develop and implement a Grounds Management Plan, including an Integrated Pest Management Plan, that considers the appropriate application of environmentally sensitive chemicals to reduce negative impacts on neighboring ecosystems.		
Finished constructing recreation fields and worked toward finalizing the Grounds Management Plan and Integrated Pest Management Plan for the recreation fields.	Undertake management activities consistent with the Grounds Management Plan and Integrated Pest Management Plan.	N/A

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
Boating in Spring Lake and Sewell Park (EAHCP § 5.4.10) Restrict boating at Spring Lake to areas treated with the harvester; operators will enter and exit boats at designated access points and all boats will follow USFWS standards for proper cleaning.		
Spring Lake Programs included 4,142 glass-bottom boat tours and 107 canoe/kayak tours. All boating activities adhered to EAHCP protocol.	Continue implementing existing programs.	Appendix H9
Reduction of Non-Native Species Introduction (EAHCP § 5.4.11) TXST extended its EAHCP obligations for this Conservation Measure in partnership with the COSM.		
See related discussion in **TABLE 2-3** of this Annual Report.	See related discussion in **TABLE 2-3** of this Annual Report.	N/A
Control of Non-Native Plant Species (EAHCP § 5.4.12) TXST extended its EAHCP obligations for this Conservation Measure in partnership with the COSM.		
See related discussion in **TABLE 2-3** of this Annual Report.	See related discussion in **TABLE 2-3** of this Annual Report.	Appendix H1 and Appendix H4
Control of Harmful Non-Native and Predator Species (EAHCP § 5.4.13) TXST extended its EAHCP obligations for this Conservation Measure in partnership with the COSM.		
See related discussion in **TABLE 2-3** of this Annual Report.	See related discussion in **TABLE 2-3** of this Annual Report.	Appendix H5

Abbreviations

ac-ft = acre-foot; cfs = cubic feet per second; N/A = not applicable; TWR = Texas wild-rice; USFWS = U.S. Fish & Wildlife Service; yd^3 = cubic yard

2.5 San Antonio Water System

SAWS, in coordination with the EAA through an Interlocal Contract (ILC), is responsible for implementing the EAHCP Conservation Measures listed in **TABLE 2-5**.

TABLE 2-5
San Antonio Water System 2020 EAHCP Implementation and Proposed 2021 Activities

2020 Compliance Actions	Proposed 2021 Compliance Actions	Annual Report Reference
SAWS ASR Springflow Protection (EAHCP § 5.5.1) SAWS will inject and store EAHCP groundwater in its ASR and, under certain drought conditions, forbear withdrawals from the Edwards Aquifer under its EAA-issued permits. This measure allows SAWS the ability to use this stored water to offset the volume of water forborne during a repeat of the drought of record. The amount of forbearance during a 10-year repeat of the drought of record is no more than 126,000 ac-ft or 46,000 ac-ft annually as defined in the ILC between EAA and SAWS.		
Drought conditions that require SAWS forbearance were not triggered in 2020. In 2020, the EAA conveyed 9,957.439 ac-ft to SAWS for storage in the SAWS ASR Project. SAWS certified that the total volume of 126,000 ac-ft has been made available by the EAA and has been stored or credited by SAWS.	Enforce if triggered, withdrawals under SAWS Edwards permits will remain un-pumped when the J-17 Bexar Index Well is less than 630 ft msl and the 10-year rolling recharge average of the Edwards Aquifer is at or below 500,000 ac-ft.	Appendix I
Phase II Expanded Use of the SAWS ASR and Water Resources Integration Program Pipeline (EAHCP § 5.5.2) The presumptive action for **Phase II of the EAHCP** involves the use of SAWS ASR with a planned construction of the Water Resources Integration Program Pipeline.		
The Implementing Committee voted to approve the EAHCP Comprehensive Phase II Work Plan and a Nonroutine Adaptive Management Process Proposal in May 2019 that did not include the use of SAWS Water Resources Integration Program as the presumptive Phase II Conservation Measure because it was not needed.	N/A	N/A

Abbreviations

ac-ft = acre-foot; ASR = Aquifer Storage & Recovery; ft msl = feet mean sea level; ILC = Interlocal Contract; N/A = not applicable

2.6 Texas Parks & Wildlife Department

Texas Parks & Wildlife Department (TPWD) serves as the state agency with primary responsibility for conserving, protecting, and enhancing the state's fish and wildlife resources. In this role, TPWD has the authority to establish a state scientific area (SSA) for "the purposes of education, scientific research, and preservation of flora and fauna of scientific or educational value" (Texas Parks & Wildlife Code § 81.501). Although TPWD is not a Permittee, it implements the following Conservation Measures as a signatory to the Implementing Agreement.

- **San Marcos River State Scientific Area (EAHCP § 5.6.1)**. To minimize the impacts of recreation, TPWD has designated a 2-mile segment of the public waters of the San Marcos River as an SSA in the **San Marcos Springs** ecosystem (31 Texas Administrative Code § 57.910) to provide expanded protections to Texas wild-rice (TWR). The creation and implementation of the San Marcos River SSA was described in two presentations to the Springflow Habitat Protection Work Group in June: Cindy Loeffler (TPWD) described how the 2-mile segment of the San Marcos River was designated, and Melani Howard (COSM) described how the SSA allows the COSM to fence off stands of TWR when flows in the river are less than 120 cfs.
- **Comal River State Scientific Area (EAHCP § 5.6.1)**. To protect existing and restored fountain darter habitat, obligations under EAHCP §§ 2.1, 2.7, 5.2.2.2, and 5.6.1 indicate that TPWD will also pursue an SSA within the Comal River system. No new activities were performed in 2020 in this regard. An SSA may be established after 2023, following completion of habitat restoration for the fountain darter, as described in the Comprehensive Phase II Work Plan and EAHCP §§ 5.2.2.2 and 5.6.1.

3 | Biological Goals and Key Management Objectives

CHAPTER HIGHLIGHTS

- Biological Goals and Objectives, key management objectives, and flow objectives (1) guide the Conservation Measures implemented under the EAHCP; (2) apply to Covered Species and their habitat in the Comal Springs system and San Marcos Springs system; and (3) are established in the EAHCP and subject to changes through adaptive management.

EAHCP § 4.1 details Covered Species Long-Term Biological Goals (LTBGs), key management objectives, and flow objectives, which are defined for individual springs systems (the Comal River and Springs and San Marcos River and Springs) because of unique circumstances that define their occupied habitat. LTBGs are the rationale behind the Conservation Measures—conversely, Conservation Measures are the means for achieving the LTBGs, key management objectives, and flow objectives. Flow objectives were designed to ensure adequate water is available for Covered Species over time and during a repeat of the drought of record.

The Covered Species LTBGs, key management objectives, and flow objectives are subject to change under limited circumstances through adaptive management set out in the Funding and Management Agreement (FMA). The presentation here reflects the clarifications of, and/or amendments made to, the EAHCP through 2020.

3.1 Fountain Darter


Fountain darter

LTBGs for fountain darter in defined reaches of the Comal Springs and River (**TABLE 3-1**) and San Marcos River (**TABLE 3-2)** depend upon areal coverage of aquatic vegetation types and darter densities by vegetation type, which are used to estimate fountain darter numbers. The LTBG seeks to maintain fountain darter density greater than or equal to an established baseline—i.e., the median density of fountain darters observed per aquatic vegetation type per spring system from 2002 to 2012 during the EAA Variable Flow Study monitoring and prior to issuance of the ITP.

Two key management objectives are used to achieve the fountain darter LTBGs: one associated with restoration of native aquatic vegetation and another associated with surface water quality. Work is

being performed in each system to achieve the LTBGs through active non-native aquatic vegetation removal and subsequent native aquatic vegetation restoration and maintenance. Restoration activities have also been extended beyond the reaches defined for LTBGs to account for proportional expansion of submerged aquatic vegetation. These areas were established as Restoration Reaches through the Adaptive Management Process (AMP) in 2016 (**TABLE 3-3** for the Comal Springs and River and **TABLE 3-4** for the San Marcos River).

The second key management objective states that surface water quality in the Comal Springs and River and San Marcos River is not to exceed a 10 percent daily average deviation from historical long-term average water quality conditions measured at EAA Variable Flow Study water quality monitoring stations. Water quality includes constituents measured in the EAA Variable Flow Study with the exception of water temperature and dissolved oxygen, which have defined numerical criteria. Instantaneous water temperatures in representative study reaches should be maintained at lower than 25 °C throughout each river. Similarly, instantaneous dissolved oxygen concentrations in representative study reaches should be maintained at greater than 4.0 milligrams per liter.

TABLE 3-1
Goals for Areal Coverage of Habitat within Long-Term Biological Goal Reaches of the Comal Springs and River and the Associated Fountain Darter Densities for Each Aquatic Vegetation Type

Study Reach	Bryophytes	*Potamogeton*	*Ludwigia*	*Cabomba*	*Sagittaria*	*Vallisneria*
Fountain Darter Habitat (Aquatic Vegetation) Goal in Meters Squared (m^2)						
Upper Spring Run	1,750	0	25	25	850	0
Landa Lake	3,950	25	900	500	2,250	12,500
Old Channel	550	0	425	180	450	0
New Channel	150	0	100	2,500	0	0
TOTALS	**6,400**	**25**	**1,450**	**3,205**	**3,550**	**12,500**
Fountain Darter Median Density Goal (number/m^2)						
–	20	3.3	7	7	1	1

TABLE 3-2
Goals for Areal Coverage of Fountain Darter Habitat within Long-Term Biological Goal Reaches of the San Marcos River and the Associated Fountain Darter Median Densities for Each Aquatic Vegetation Type

Study Reach	*Ludwigia*	*Cabomba*	*Potamogeton*	*Sagittaria*	*Hydrocotyle*	*Zizania*
Fountain Darter Habitat (Aquatic Vegetation) in Meters Squared (m^2)						
Spring Lake Dam	100	50	200	200	50	700
City Park	150	90	1,450	300	10	1,750
IH-35	50	50	250	150	50	600
TOTALS	**300**	**190**	**1,900**	**650**	**110**	**3,050**
Fountain Darter Median Density Goal (number/m^2)						
–	7	7	5	1	4	5

TABLE 3-3

Goals for Fountain Darter Habitat (Aquatic Vegetation) and Median Density to Define Restoration Reaches in the Comal Springs and River

Study Reach	Bryophytes	*Potamogeton*	*Ludwigia*	*Cabomba*	*Sagittaria*	*Vallisneria*	TOTALS
Fountain Darter Habitat (Aquatic Vegetation) Goal in Meters Squared (m^2)							
Landa Lake UP[a]	5,500	0	25	250	250	0	**6,025**
Landa Lake DOWN[b]	500	0	50	125	100	22,500	**23,275**
Old Channel UP[c]	1,250	100	850	200	750	750	**3,900**
TOTALS	**7,250**	**100**	**925**	**575**	**1,100**	**23,250**	**33,200**
Fountain Darter Median Density Goal (number/m^2)							
–	20	3.3	7	7	1	1	–

[a] Landa Lake Long-Term Biological Goal reach to downstream boundary of Spring Island.

[b] Landa Lake Long-Term Biological Goal reach to weir across from City of New Braunfels Park Office.

[c] Old Channel from Long-Term Biological Goal reach upstream to Landa Lake Dam.

TABLE 3-4

Goals for Fountain Darter Habitat (Aquatic Vegetation) and Median Density to Define Restoration Reaches in San Marcos River

Study Reach	*Ludwigia*	*Cabomba*	*Potamogeton*	*Sagittaria*	*Hydrocotyle*	*Zizania*	TOTALS
Fountain Darter Habitat (Aquatic Vegetation) Goal in Meters Squared (m^2)							
Sewell Park	25	25	152	25	10	1,100	**1,335**
Below Sewell to City Park[a]	50	50	500	700	20	2,300	**3,620**
Hopkins Street–Snake Island	50	50	475	750	10	950	**2,285**
Cypress Island–Rio Vista	50	50	150	50	0	350	**650**
IH-35 Expanded[b]	50	100	250	450	50	450	**1,350**
TOTALS	**225**	**275**	**1,525**	**1,975**	**90**	**5,150**	**9,240**
Fountain Darter Median Density Goal (number/m^2)							
–	7	7	5	1	4	5	–

[a] Sewell Park to upstream boundary of City Park Long-Term Biological Goal reach.

[b] Immediately downstream of established IH-35 Long-Term Biological Goal reach to IH-35.

3.2 Comal Springs Riffle Beetle

LTBGs for the Comal Springs riffle beetle (CSRB) include habitat- and population-based goals (**TABLE 3-5**) that depend on key management objectives to maintain silt-free habitat in three sample reaches in Landa Lake: Spring Run 3, the western shoreline, and Spring Island. The habitat-based LTBG seeks to maintain silt-free habitat conditions via continued springflow, riparian zone protection, and recreation control. The population-based LTBG is maintaining CSRB median densities greater than or equal to those observed from 2006 to 2012 in the EAA Variable Flow Study.

Key management objectives guide Conservation Measures listed in **TABLE 2-2** to restore riparian habitat and maintain water quality conditions for the CSRB. Active riparian habitat restoration occurs adjacent to spring openings in Spring Run 3 and along the western shoreline of Landa Lake to limit sedimentation following rainfall events. Historically, these locations have been identified as CSRB habitat. Spring openings continue to be monitored for water quality constituents measured in the EAA Variable Flow Study to ensure Edwards Aquifer water quality does not exceed a 10 percent daily average deviation from historical long-term average water quality conditions.

TABLE 3-5
Comal Springs Riffle Beetle Long-Term Biological Goals

	Spring Run 3	Western Shoreline	Spring Island Area
Habitat	Silt-free gravel and cobble substrate ≥ 90% of each study area		
Density (# of Individuals/lure)	≥ 20	≥ 15	≥ 15

3.3 Comal Springs Dryopid Beetle and Peck's Cave Amphipod

The LTBGs for these two primarily aquatic dwelling species depend on maintaining water quality conditions consistent with historical water quality conditions. They are not dependent on key management objectives explicitly identified in the EAHCP. Similar to other LTBGs related to water quality, water quality constituents measured in the EAA Variable Flow Study are not to exceed a 10 percent daily average deviation from historically recorded long-term average conditions.

3.4 Texas Wild-Rice


Texas wild-rice

TABLE 3-6 identifies the LTBGs for TWR in segments of the San Marcos River where EAHCP mitigation and management activities occur. The TWR LTBG is accompanied by three key management objectives and Conservation Measures described in **TABLE 2-3** and **TABLE 2-4** to restore and expand TWR. The first key management objective consists of focusing EAHCP TWR restoration and expansion efforts on high-quality habitat areas that are monitored annually. The second key management objective for TWR defines a minimum coverage of TWR during **low flow conditions** (**TABLE 3-7**), and the third includes activities to promote awareness of TWR during all flows and designated controls to limit the impacts of recreation during low flows (**TABLE 3-8**). High recreational use of TWR-occupied habitat occurs throughout the San Marcos River. Signs are placed throughout the San Marcos River to educate users and promote the protection of TWR.

TABLE 3-6
Texas Wild-Rice Long-Term Biological Goals

River Segment	Areal Coverage (m^2)	Reach Percentage of Total Areal Coverage
Spring Lake	1,000–1,500	N/A
Spring Lake Dam to Rio Vista Dam	5,810–9,245	83–66
Rio Vista Dam to IH-35	910–1,650	13–12
Downstream of IH-35	280–3,055	4–22
TOTALS	**8,000–15,450**	**100**

TABLE 3-7
Key Management Objective for Minimum Texas Wild-Rice Coverage per River Segment during Conditions Similar to Drought of Record

River Segment	Areal Coverage (m^2)	Reach Percentage of Total Areal Coverage
Spring Lake	500	N/A
Spring Lake Dam to Rio Vista Dam	2,490	83
Rio Vista Dam to IH-35	390	13
Downstream of IH-35	120	4
TOTALS	**3,550**	**100**

TABLE 3-8
Texas Parks and Wildlife Department Segments with Designated Controls Implemented When the Total San Marcos River Flow is Below 100 cfs

Combined River Segment	Texas Parks & Wildlife Department Individual Segments
Spring Lake Dam to Rio Vista Dam	B, C
Rio Vista Dam to IH-35	F
Downstream of IH-35	K

3.5 San Marcos Salamander


San Marcos salamander

LTBGs for the San Marcos salamander include habitat- and population-based goals (**TABLE 3-9**) that depend on key management objectives to maintain silt-free habitat conditions through aquatic gardening of Spring Lake. A second key management objective unique to the San Marcos salamander is intended to maintain recreation control at flows less than 100 cfs in the eastern spillway below Spring Lake Dam. The habitat-based LTBG seeks to maintain silt-free habitat conditions in three sample reaches where the San Marcos salamander is known to live (the Hotel area of Spring Lake, in the riverbed area of Spring Lake, and in the eastern spillway below Spring Lake Dam). This LTBG is achieved via maintaining springflow, riparian zone protection, and recreation control. The population-based LTBG is maintaining a median density of San Marcos salamanders greater than or equal to that observed in these three sample reaches during monitoring from 2002 to 2012.

TABLE 3-9
San Marcos Salamander Long-Term Biological Goals

	Hotel Area (Spring Lake)	Riverbed Area (Spring Lake)	Eastern Spillway below Spring Lake Dam
Habitat	Silt-free gravel and cobble substrate ≥ 90% of each study area		
Density (# of individuals/m^2)	≥ 15	≥ 10	≥ 5

3.6 Texas Blind Salamander


Texas blind salamander

Achieving LTBGs for Texas blind salamanders depends on water quality constituents measured in the EAA Variable Flow Study. Water quality is not to exceed a 10 percent daily average deviation from the historical long-term average water quality conditions within the Edwards Aquifer as measured from the spring openings in Spring Lake. No specific key management objectives are listed in the EAHCP for the Texas blind salamander.

3.7 Flow Objectives

Flow protection Conservation Measures—Aquifer Storage & Recovery (ASR), Voluntary Irrigation Suspension Program Option (VISPO), the Regional Water Conservation Program, and critical period management—were developed to achieve flow objectives. **TABLE 3-10** identifies the flow objectives included in the EAHCP. The long-term average and minimum flow objectives have been achieved, as predicted through groundwater modeling that assumed drought of record conditions. The final component of these objectives was achieved in 2019 when the overall VISPO goal was increased to 41,795 ac-ft to ensure minimum springflow objectives were met at Comal Springs. In connection with that adaptive management decision, the Springflow Habitat Protection Work Group was created to

pursue a better understanding of the "average daily flows of 80 cfs for 3 months" component of the minimum flow objective (**SECTION 5.3.1.1**).

TABLE 3-10

Flow Objectives for All Covered Species–Comal and San Marcos Springs

Flow Objectives	Comal Springs	San Marcos Springs
Long-term average flow	Daily average of 225 cfs total **Comal discharge**	Daily average of 140 cfs total **San Marcos discharge**
Minimum flow	Daily average of 30 cfs total Comal discharge not to exceed a period of 6 months followed by average daily flows of 80 cfs for 3 months	Daily average of 45 cfs total San Marcos discharge not to exceed a period of 6 months followed by average daily flows of 80 cfs for 3 months

Abbreviation

cfs = cubic feet per second

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4 | 2020 Annual Take and Net Disturbance Estimates

CHAPTER HIGHLIGHTS

- The total amount of incidental take associated with implementation of non-mitigation/restoration Covered Activities is quantified annually and added to the incidental take calculated from disturbed areas. In 2020, take of only one Covered Species – fountain darter – occurred, and amounts were in range with previous years: 4,403 and 11,269 for the Comal and San Marcos springs systems, respectively.

Condition H of the ITP authorizes incidental take and explicitly defines the amount of incidental take authorized over the permit term. Condition M of the ITP limits occupied habitat disturbance, specifying that over any given year, no more than 10 percent of the occupied habitat of a Covered Species can be affected by minimization and mitigation activities intended to contribute to species recovery.

Both incidental take and net disturbance are evaluated on an annual basis and reported to the USFWS (**TABLE 4-1**). To calculate the total amount of take for 2020, incidental take associated with implementation of non-mitigation/restoration Covered Activities was characterized and quantified to the degree practical and added to the incidental take calculated from disturbed areas. The detailed description of methodologies and species-specific results of the 2020 incidental take and net disturbance assessments are included in Appendix J.

TABLE 4-1 also shows total take available for implementation of the EAHCP over the remaining permit term.

TABLE 4-1

Summary of Impacted Habitat, Net Disturbance, and Incidental Take for EAHCP Covered Species Compared against Maximum Permit Amounts

Covered Species per System	EAHCP Mitigation/ Restoration		EAHCP Measures/ Drought	Combined Impacted Habitat 2020 Total (m^2)	Incidental Take		2020 Incidental Take Total	Permitted Maximum Take	Accumulated Take to Date	Remaining Permitted Take
	Impacted Habitat (m^2)	Net Disturbance % of Total Occupied Habitat	Impacted Habitat (m^2)		EAHCP Mitigation/ Restoration	EAHCP Measures/ Drought				
Comal Springs System										
Fountain darter	633	0.6%	2,302	2,935	950	3,453	4,403	797,000	65,815	731,185
Comal Springs riffle beetle	0	0%	0	0	0	0	0	11,179	2,292	8,887
Comal Springs dryopid beetle	0	0%	0	0	0	0	0	1,543	16	1,527
Peck's Cave amphipod	0	0%	0	0	0	0	0	18,224	167	18,057
San Marcos Springs System										
Fountain darter	5,952	6.3%	1,561	7,513	8,927	2,342	11,269	549,129	99,049	450,080
San Marcos salamander	0	0%	0	0	0	0	0	263,857	2,674	261,183
Texas blind salamander	0	0%	0	0	0	0	0	10	0	10
Comal Springs riffle beetle	0	0%	0	0	0	0	0	N/A	N/A	N/A
Comal Springs dryopid beetle	0	0%	0	0	0	0	0	N/A	N/A	N/A

Abbreviations

m^2 = square meters; N/A = not applicable

5 | Program Management, Financial Report, and Committee Activities

CHAPTER HIGHLIGHTS

- In mid-March, Program activities shifted in response to the COVID-19 pandemic. Contractors adopted standard operating procedures to complete work while maintaining social distance. The City of New Braunfels and City of San Marcos limited public access to recreational facilities and coordinated closely to ensure Conservation Measures were implemented. EAHCP committee members began meeting virtually.
- Program staff completed the Strategic Adaptive Management Process Report documenting the transition from Phase I to Phase II of the Program and began to explore options for renewing the permit once it expires in 2028.
- The Program is fiscally stable with a reserve balance of $28,891,677 and $34,803,780 cash balance (unaudited). There are adequate funds for fiscal year 2021.

5.1 Program Management

EAHCP's Claire Carlson (left) and Connor Helsel (right) visit the Comal Springs.

General management and oversight of the EAHCP is administered through the EAA pursuant to Section 2.2 of the FMA. EAA's responsibilities include facilitating the employment of the Program Manager, who is responsible for managing the EAHCP Program (Program), and ensuring compliance with all relevant Program documents. Although referred to in the FMA as the *Program Manager*, the title for this position under the EAA organizational structure is *Executive Director—Threatened and Endangered Species*. Section 5.6.5 of the FMA allows for use of EAHCP monies to fund EAA administrative costs and employee salaries, so long as all incurred costs, including salaries, are not used (with certain exceptions) for the costs of non-EAA Permittees' employees or administrative costs relative to the EAHCP.

In 2020, full-time Program staff consisted of the Program Manager, Chief Science Officer (an EAA-funded position), Habitat Conservation Manager, Contract Administrator, Environmental Scientist (an EAA-funded position), and two Program Coordinators. Seasonal and volunteer staff consisted of a Trinity University work–study student (spring and fall), two TigerWorks program volunteers (summer), and an EAA intern (fall). Two Program staff positions—Senior Project Coordinator and Administrative Assistant—remained unfilled in 2020.

5.1.1 Management Activities and Special Projects

Program management activities performed in 2020 included coordination with Permittees in accordance with the ITP, Implementing Agreement, EAHCP, FMA, and other Program documents. Program staff coordinated Implementing Committee (IC), Adaptive Management Stakeholder Committee (SH), Adaptive Management Science Committee (SC), and Work Group activities (see **SECTION 5.3**) and emailed monthly reports on EAHCP activities to all committee members. To promote engagement and provide transparency, Program activities were communicated to the public and stakeholders through the EAHCP website, *EAHCP Steward* newsletter, EAA's *News Drop Magazine*, and *EAHCP Conserve* newsletter (see **SECTION 5.1.3)**.

Program staff also coordinated the activities of the work–study student, intern, and TigerWorks volunteers. These activities included updating the Covered Species webpage with recent species research, researching federal grant programs to support future Program activities, and digitizing previous riparian planting activities to update geographic information systems (GIS).

Finally, the EAHCP Program Manager and Program staff also coordinated with the USFWS Ecological Services regarding Program activities and USFWS Fisheries regarding refugia activities.

Several special projects were initiated, advanced, and/or completed in 2020. The Program Coordinators created the first Program summary using GIS technology, and several GIS elements were added to the website to increase transparency regarding Program activities. A contractor tool was also developed using GIS technology to allow CONB and COSM contractors to track their work electronically to increase transparency and make reporting work efforts easier. The development of this tool began in 2019 by conducting site visits with contractors implementing habitat protection Conservation Measures. Travel restrictions due to the COVID-19 pandemic (see below) prevented full implementation of the contractor tool, but roll-out and contractor training is expected in 2021.

Additional special projects occurred in 2020 through professional contracting services, each coordinated and managed by Program staff. Activities included an options analysis for a future ITP (see **SECTION 5.1.5**), a summary of the transition from Phase I to Phase II of EAHCP implementation (see **SECTION 6.2.3**), vegetation mapping of Spring Lake (see Appendix F6), development of a cultural resources brochure, and a permit application to the U.S. Army Corps of Engineers for a Clean Water Act Section 404 permit for the Sessom Creek restoration project that the COSM will construct in 2021 (see **SECTION 5.1.4**).

In the spring BIO-WEST mapped submerged aquatic vegetation in Spring Lake. It had not been mapped in more than a decade.

Of note, Program activities shifted in 2020 in response to the COVID-19 pandemic. Beginning in March, EAHCP committee members began meeting virtually, with Program staff coordinating these events remotely (see **SECTION 5.3**). So that Conservation Measure implementation could occur safely, contractors adopted standard operating procedures to complete work while maintaining social distance, and the CONB and COSM limited public access to recreational facilities and coordinated closely to ensure Conservation Measures were implemented.

5.1.2 Program Funding Applications and Work Plans

Program staff worked with Permittees throughout the year to reimburse and implement activities defined in annual Work Plans. **CHAPTER 2** summarizes these activities as amended and approved by the IC, and 2020 Work Plans are included in Appendix E1.

5.1.3 Outreach

Claire Carlson, 2020 fall intern, highlights the Texas wild-rice sticker give-aways.

The Program has several platforms to inform stakeholders about the Covered Species and the work performed to protect them. Program staff produce and distribute the monthly *EAHCP Steward* newsletter (Appendix K1) and accompanying podcast. The *EAHCP Steward* highlights collaborative efforts to protect the threatened and endangered species that inhabit the Edwards Aquifer and the Comal and **San Marcos springs systems**. Each newsletter features a story about a conservation activity, contractor, volunteer organization, or dedicated individual working to support and/or implement Conservation Measures or protect the Edwards Aquifer. In 2020, 12 *EAHCP Steward* newsletters and podcasts were published covering topics ranging from implementing conservation activities during the COVID-19 pandemic to educating groundwater users on critical period/drought management triggers. The EAA also publishes a quarterly magazine entitled *News Drop Magazine* (Appendix K2) and a newsletter entitled *EAHCP Conserve* (Appendix K3). In 2020 each *News Drop Magazine* included two to four EAHCP feature articles, and the six *EAHCP Conserve* newsletters distributed were intended to increase participation of groundwater withdrawal permit holders in the ASR and VISPO Conservation Measures.

Due to social distancing requirements due to the COVID-19 pandemic, an effort was made to engage stakeholders and increase *EAHCP Steward* newsletter subscriptions by offering "Summer Starter Pack Give-Away" of various EAHCP promotional items. Additionally, Program staff participated in EAA outreach by conducting recorded interviews to educate viewers on various threatened and endangered species and supporting a campaign to demonstrate smart water use.

5.1.4 Permit Oversight

Each year Program staff work with two consultants to monitor and track the status of local, state, and federal permits necessary to implement Conservation Measures. A permit tracking matrix was maintained to monitor and track the status of permits. Permit oversight in 2020 also included the development of a U.S. Army Corps of Engineers Clean Water Act Section 404 permit application for implementation of the Sessom Creek restoration project by the COSM to address the Impervious Cover and Water Quality Protection Conservation Measure. A Nationwide Permit 27 for Aquatic Habitat

Restoration, Enhancement, and Establishment Activities was approved July 7, 2020 (Appendix L1). To ensure compliance with other state and federal permit requirements, contractors also reviewed engineering designs and riparian restoration plans, and they coordinated with the Texas Historical Commission to develop a brochure for contractors and volunteers working in the Comal and San Marcos springs systems. The Texas Historical Commission coordination letters and cultural resources brochure are provided in Appendix L2.

5.1.5 Permit Options Report

With the EAHCP in its eighth year of implementation, Program staff have begun to look ahead and explore options for renewing the permit once it expires in 2028. ICF, a nationally recognized firm for developing and implementing HCPs, was retained to complete an EAHCP Permit Options Report. The report reviewed the options available to the Permittees with respect to renewing the HCP and ITP. Five options are available: allowing the permit to expire, extending the ITP's expiration date, making changes administratively (i.e., without a permit amendment), formally amending the ITP, or replacing the EAHCP with a new plan. EAA staff coordinated with ICF through a 4-day workshop to discuss implementation of the EAHCP and identify potential changes to consider in the permit renewal process. In developing the report, ICF also interviewed IC members and conducted virtual workshops with the IC and SH to present preliminary findings of the report. The report provided recommendations for how the Permittees should consider potential changes to the EAHCP in the context of the remainder of the permit term and in preparation for a permit renewal in 2028.

- Continue to make administrative changes through the remainder of the permit term, as needed.
- Complete an assessment of the effects of climate change on the effectiveness of the conservation strategy for the Covered Species at least 3–4 years prior to permit expiration (i.e., by 2024).
- Start a major permit amendment at least 2–3 years prior to permit expiration (i.e., by 2025) to (1) extend the permit duration for another 20–30 years, and (2) address those changes that cannot be addressed via administrative changes or adaptive management.
- Coordinate early with USFWS and EAHCP committees to design the permit amendment process to ensure its success.
- Complete the major permit amendment before the end of the permit term.

5.2 Financial Report

The current financial projections and cost estimates indicate an overall fiscally stable EAHCP with an adequate budget for the Program in fiscal year 2021. Triggering drought for ASR and VISPO forbearance payments is the largest expense. Triggers for these programs are not likely to occur in 2021, as indicated by modeling performed for the 2020 Budget Work Group. However, there is a 43 percent chance of VISPO triggering between 2021 and the end of the permit term, 2028. The EAHCP reserve is projected to remain above the established reserve floor of $26.4 million, providing adequate funding for up to three

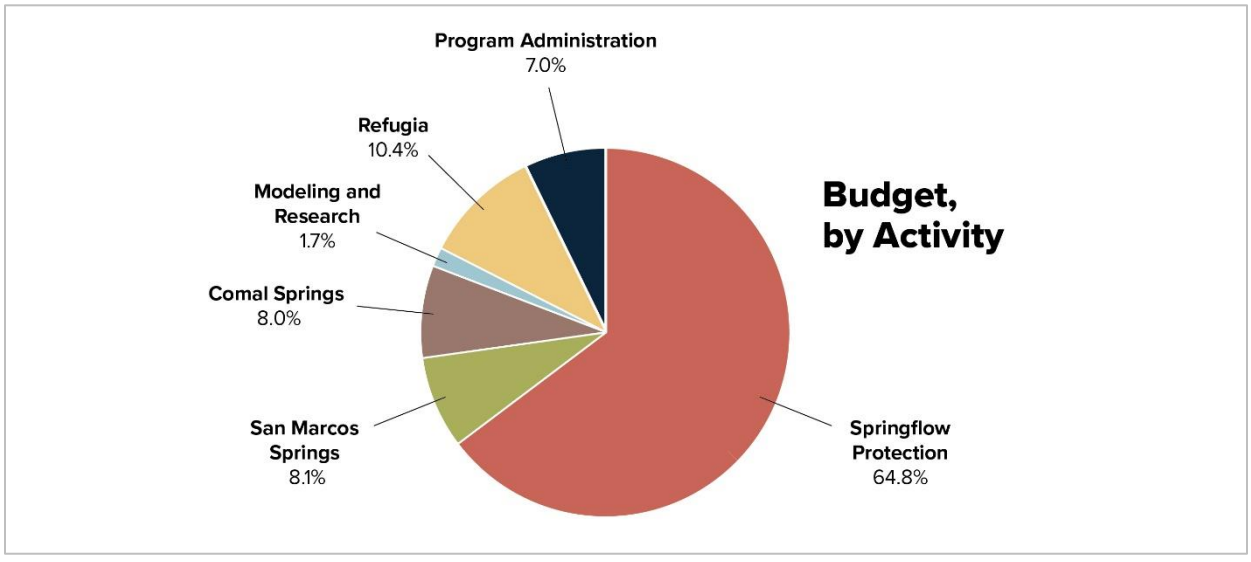
more VISPO triggering events and the 4 worst years of the drought of record for the ASR Program. (This is detailed further in the EAHCP Budget Work Group findings; see **SECTION 5.3.1.2**).

Section 4.6 of FMA specifies that the EAA Board of Directors approves each Permittee's Program Funding Application budget in October each year. A Program Funding Application is the mechanism by which a Permittee requests funding to implement the Conservation Measures or other Program-related activities. The EAA Board of Directors approved the 2020 Program Funding Applications for all Permittees at its meeting on November 12, 2019.

Five amendments to the EAHCP Program Funding Applications were approved by the EAA Board of Directors in 2020. Specifically, amendments were made to the COSM Control of Non-Native Plant Species, COSM Texas Wild-rice Enhancement, COSM Management of Floating Vegetation Mats and Litter, COSM Control of Harmful Non-Native and Predator Species, COSM Impervious Cover and Water Quality Protection, CONB Impervious Cover and Water Quality Protection, CONB Native Riparian Habitat Restoration, and National Fish Hatchery and Technology Center Refugia program budgets. The COSM had a net increase of $54,986, the CONB had a net increase of $25,000, and the EAA had a net increase of $361,967. Collectively, this amounted to a cumulative net increase of $441,953 for the Program in 2020. Other transfers between various accounts for reclassification of expenditure needs had a net impact of $0 on the budget and did not require approval from the EAA Board of Directors. The amendments and transfers are identified in the EAHCP Expense Report (Appendix L).

The EAHCP Expense Report shows Table 7.1 of the EAHCP funding amounts for 2020 totaling $17,337,597. These amounts can be compared to the EAA Board of Directors–approved/amended 2020 Program Funding Applications totaling $14,525,573. **FIGURE 5-1** reflects the unaudited 2020 EAA Board of Directors–approved/amended 2020 Program Funding Applications, by budget and EAHCP activity. New projects were identified for available funds by the CONB, but no new funding needs were identified in 2020.

FIGURE 5-1
2020 EAA Board of Directors–Approved/Amended Program Funding Applications by Budget and EAHCP Activity



5.3 Committee Activities

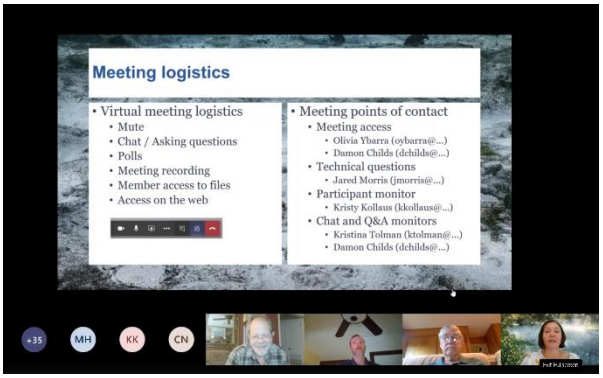
Mark Enders, City of New Braunfels Implementing Committee representative.

As noted above, social distancing guidelines associated with the COVID-19 pandemic caused Program activities to shift, including those of EAHCP committees. Following in-person meetings in January and February, committees began to meet virtually, with Program staff providing coordination. Virtual meetings maintained accountability and transparency to the public in accordance with the following.

- The FMA.
- *Operational Procedures of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan Program* (March 2012).
- *Parliamentary Rules of Conduct of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan Program* (March 2012).
- *Program Operational Rules for EAHCP Program Adaptive Management Stakeholder Committee Members and Participants* (October 2012).
- *Operational Procedures of the Science Committee of the Edwards Aquifer Habitat Conservation Plan Program* (April 2014).

Agendas and notices for all meetings were emailed to a stakeholder listserv at least 1 week in advance of the meetings, and opportunities for public comment were provided. Meeting minutes and video recordings were posted on the EAHCP website and/or EAA Granicus System.

The first virtual meeting of the IC was held March 19 using Skype. Learning from the first virtual meeting, Program staff began using Microsoft Teams for the remaining committee meetings, Work Group meetings, and workshops held in 2020. In total, six IC meetings, three SC meetings, and three SH meetings were successfully facilitated; of these, two were joint meetings of the SH and IC, and one was a joint committee meeting of the IC, SH, and SC (**TABLE 5-1**). Additionally, Program staff organized the meetings of four Work Groups and held workshops informing committee members of future ITP options.



Nearly 20 EAHCP Work Group and committee meetings were held virtually beginning in March.

Videos of all IC and SH meetings were made viewable online through the EAA Granicus System, and all virtual SC meetings and Work Group meetings were recorded and provided to stakeholders as requested.

TABLE 5-1
2020 EAHCP Committee Meetings

Date	Committee(s)	Location	Actions, Reports, or other Notable Items
January 30	IC	EAA Office	• Report on the draft Springflow Habitat Protection Work Group charge • Approved amendments to the 2020 COSM Work Plan
February 26	SC	San Marcos Activity Center	• Update on the CSRB and Research Work Groups • Election of committee officers • Presentation on the results of the Sessom Creek sediment export study and the history and current application of the Expanded Water Quality Monitoring Program
March 19	IC	Virtual	• Approved submission of the 2019 EAHCP Annual Report to the USFWS, amendments to 2020 COSM Program Funding Application and Work Plan, and the Springflow Habitat Protection Work Group charge
May 21	IC and SH	Virtual	• Approved 2021 CONB, COSM, and EAA Work Plans and amendments to the 2020 EAA Program Funding Application and Work Plan • Report from Guadalupe-Blanco River Authority on its plan to develop a Habitat Conservation Plan • Reports on the 2019 EAHCP Annual Report story map and the Springflow Habitat Protection Work Group
August 20	IC	Virtual	• Report on the Interlocal Agreement renewals between CONB and EAA and COSM/TXST and EAA, 2019 Edwards Aquifer authorized pumping withdrawals, United States Geological Survey uncertainty analysis, and Springflow Habitat Protection Work Group • Approved amendments to the 2020 CONB and COSM Program Funding Applications and Work Plans
September 10	SC	Virtual	• Update on the Springflow Habitat Protection Work Group and 2021 EAHCP water quality monitoring changes • Presentation on the results of the MODFLOW uncertainty analysis and the CSRB applied research project status update
October 8	IC and SH	Virtual	• Reports from the 2020 EAHCP Budget Work Group and Springflow Habitat Protection Work Group • Report on the final third-party Permit Options Analysis • Approved amendments to the 2021 CONB, COSM, and EAA Program Funding Applications and Work Plans and submission of an updated EAHCP to the USFWS
December 17	IC, SH, and SC	Virtual	• Approved amendments to 2021 EAA and CONB Program Funding Applications and Work Plans • Reports on recreational impacts on Texas wild-rice, the CSRB Work Group, the refugia program and Research Work Group, the Permit Options Analysis and next steps, a future funds analysis, and the status of the Springflow Habitat Protection Work Group • Approved 2021 IC and SH officers

Abbreviations

CSRB = Comal Springs riffle beetle; IC = Implementing Committee; SH = Adaptive Management Stakeholder Committee; SC = Adaptive Management Science Committee

5.3.1 Implementing Committee

Implementation of the EAHCP is supervised by the IC to ensure compliance with the ITP, EAHCP, and FMA. Five voting members represent the five Permittees, and in 2020 one non-voting member from the Guadalupe-Blanco River Authority served on the IC. **TABLE 5-2** lists 2020 IC members.

In 2020 the IC met once in-person and five times virtually. Meeting dates and action items are listed in **TABLE 5-1;** agendas and meeting minutes are provided in Appendix N1.

TABLE 5-2
2020 Implementing Committee Members

Committee Member	Entity	Alternate
Roland Ruiz [Chair]	EAA	Brock Curry
Mark Enders [Vice Chair]	CONB	Phillip Quast
Robert Mace, Ph.D. [Secretary]	TXST	Kimberly Meitzen, Ph.D.
Tom Taggart	COSM	Melani Howard
Darren Thompson	SAWS	Donovan Burton
Nathan Pence	Guadalupe-Blanco River Authority	Mike Urrutia

5.3.1.1 Springflow Habitat Protection Work Group

The Springflow Habitat Protection Work Group is charged with identifying technical evaluations to address the discussion document circulated to the SH members by Myron Hess on May 22, 2019, that identified several topics for evaluation, including those listed below.

1. The IC should ensure a technical evaluation is undertaken of water quality impacts of predicted extended periods of flow below 80 cfs in both spring systems, either using the Hardy water quality model but calibrated and validated using data from recent low flow periods or using an alternative approach.
2. The IC should ensure a technical evaluation is undertaken of potential impacts of predicted extended periods of flow below 80 cfs on CSRB populations.
3. The IC should ensure that a technical evaluation is undertaken of potential impacts of predicted extended periods of flow below 80 cfs on San Marcos salamander populations, particularly for populations in the area below Spring Lake Dam, and on TWR and other vegetation serving as habitat for fountain darters downstream of Spring Lake Dam, including consideration of impacts from recreation.
4. The IC should ensure that a rigorous review process, involving input from qualified experts in addition to the SC, is undertaken, as soon as is reasonably possible, to inform study design for each of the above-listed technical evaluations and to assess the extent to which adaptive management study commitments included in the EAHCP that are related to flow impacts have been met, will be met, or should be adjusted.

Eleven virtual meetings were held in 2020 to address Part 1 of the Springflow Habitat Protection Work Group charge, which included clarifying and refining the topics listed above to identify the technical expertise and analysis needed to inform the deliberations of the Work Group during Part 2.

Members of the Work Group included Myron Hess—Chair (Texas Living Waters Project), Patrick Shriver (SAWS), Adam Yablonski (Agriculture Permit Holder), Doris Cooksey (City Public Service [CPS]), Cindy Loeffler (TPWD), Ryan Kelso (New Braunfels Utility), Melani Howard (COSM), Kimberly Meitzen (TXST), Charles Ahrens (EAA), Jacquelyn Duke (SC representative), Charles Kreitler (SC representative), and Tom Arsuffi (SC representative). Work Group efforts are on-going through the preparation of a Part 1 report and proposed Part 2 charge for submission to the IC. The Part 2 charge, as approved by the IC, will guide the next phase of the Work Group's efforts. Appendix N2 includes the Part 1 charge and meeting materials.

5.3.1.2 EAHCP Budget Work Group

The Budget Work Group's two-part charge for the duration of the ITP from the IC is to (1) collaborate with and inform the EAA budget process, as it relates to the EAHCP, EAHCP reserve, and EAHCP Aquifer Management Fee, and (2) address fiscal issues as they arise and are referred by the IC.

Members of the Budget Work Group for 2020 were Tom Taggart (IC), Brock Curry (EAA designee), Myron Hess (SH), Mary Bailey (SAWS designee), and Adam Yablonski (Medina County Farm Bureau). The Work Group met on August 19, 2020, to review and discuss the EAA 2021 budget process and to monitor the management of EAHCP revenue and expenses.

The Work Group's report (Appendix N3) describes the current financial projections and cost estimates for the EAHCP program for fiscal year 2021; acknowledges the ASR and VISPO trends; notes that Aquifer Management Fee would not increase in 2021 but that there would be a $1 reduction in the amount of funding devoted to the EAHCP compared to EAA operations; and recommends that the IC, EAA Board of Directors, and Program staff continue to monitor the potential drought of record and the impact it would have on the EAHCP reserve funds. The report also encourages the IC and EAA to understand that decisions on Program funding and reserve amounts may dramatically affect the financial footing of the Program approaching the end of the current ITP.

5.3.2 Adaptive Management Stakeholder Committee

The SH's role is to consult with, advise, and make recommendations on adaptive management decisions (see **SECTION 6.2**); the design of studies related to the LTBGs and key management objectives; and any other matter at the request of the Program Manager or IC. The SH also coordinates with the IC to appoint members to the SC. The **Edwards Aquifer Authority Act** (EAA Act) identifies the organizational makeup of the SH; membership is also addressed in Section 7.8.1 of the FMA. **TABLE 5-3** lists the 27 SH representatives, their affiliations, and their alternates as of the end of 2020.

In 2020 the SH met three times virtually. Meeting dates and action items are listed in **TABLE 5-1**; agendas and meeting minutes are provided in Appendix N4.

TABLE 5-3
2020 Stakeholder Committee Members

Committee Member	Entity	Affiliation	Alternate
Myron Hess [Chair]	Texas Living Waters Project	Environmental interest from the Texas Living Waters Project	Jennifer Walker
Doris Cooksey [Vice Chair]	City Public Service Energy (CPS Energy)	CPS Energy	Matthew Schwartz
Patrick Shriver [Secretary]	SAWS	SAWS	Brandon Payne
Carl Adkins	Texas BASS Federation Nation	Recreational interest in the Guadalupe River Basin	Tim Cook
Chuck Ahrens	EAA	EAA	Javier Hernandez
Bruce Alexander	East Medina County Special Utility District	Holder of an **initial regular permit** issued by the EAA for a retail public utility located west of Bexar County	
Buck Benson	Alamo Cement/Barton Benson Jones PLLC	Holder of an initial regular permit issued by the EAA for industrial purposes	Shanna Castro/Paul Hunt
Roger Biggers	New Braunfels Utilities	Retail public utility in whose service area the Comal Springs or San Marcos Springs is located	Ryan Kelso
Jim Bower/ Dave Heier	City of Garden Ridge	Holder of an EAA initial regular permit issued to a small municipality (population under 50,000) located east of San Antonio	Dave Heier/ Un-named
James Dodson	City of Victoria	Holder of a municipal surface water right in the Guadalupe River Basin	No alternate named
Rader Gilleland	Gilleland Farms	Holder of an initial regular permit issued by the EAA for irrigation	Adam Yablonski
Renee Green	Bexar County	Bexar County	Kerim Jacaman
Cindy Hooper	Texas Commission on Environmental Quality	Texas Commission on Environmental Quality	Cary Betz
Melani Howard	COSM	COSM	Laurie Moyer
Dan Hunter	Texas Department of Agriculture	Texas Department of Agriculture	David Villarreal
Cindy Loeffler	Texas Parks & Wildlife Department	Texas Parks & Wildlife Department	Colette Barron
Glenn Lord	DOW Chemical	Holder of an industrial surface water right in the Guadalupe River Basin	Dwaine Schoppe
Mark Enders	CONB	CONB	Phillip Quast
Kimberly Meitzen, Ph.D.	TXST	TXST	Robert Mace, Ph.D.
Gary Middleton	South Central Texas Water Advisory Committee	South Central Texas Water Advisory Committee	No alternate named
John Byrum	Nueces River Authority	Nueces River Authority	Sky Lewey
Carol Patterson	Regional Clean Air and Water	Edwards Aquifer Region municipal ratepayers/general public	Kirk Patterson

Committee Member	Entity	Affiliation	Alternate
Nathan Pence	Guadalupe-Blanco River Authority	Guadalupe-Blanco River Authority	Mike Urrutia
Ray Joy Pfannstiel	Guadalupe County Farm Bureau	Agricultural producer from the Edwards Aquifer Region	Gary Schlather
Brian Mast	San Antonio River Authority	San Antonio River Authority	Allison Elder
Humberto Ramos	Guadalupe Basin Coalition	Guadalupe River Basin municipal ratepayers/general public	Mike Dussere
Rachel Sanborn	San Marcos River Foundation	Conservation organization	Virginia Condie

5.3.3 Adaptive Management Science Committee

The SC is made up of 11 experts with technical expertise in one or more of the following areas: the Edwards Aquifer or its management, the Comal Springs and Comal River, the San Marcos Springs and San Marcos River, the Covered Species, or experimental design and data. The SC serves as an independent scientific panel to advise, consult, and provide recommendations to the SH and IC. The SC members for 2020 are listed in **TABLE 5-4**.

In 2020 the SC met once in person and once virtually. Meeting dates and action items are listed in **TABLE 5-1**; agendas and meeting minutes are provided in Appendix N5.

TABLE 5-4
2020 Science Committee Members

Committee Member	Entity	Expertise	Nominating Entity
Jacquelyn Duke, Ph.D. [Chair]	Baylor University	Stream Ecology–Riparian Ecohydrology	IC
Chad Norris, M.S. [Vice Chair]	Texas Parks & Wildlife Department	Aquatic Biology–Aquatic Invertebrate Specialist	SH
Floyd Weckerly, Ph.D.	TXST	Population Ecology–Experimental Design	SH
Tom Arsuffi, Ph.D.	Texas Tech University	Aquatic Biology–Stream Ecology	IC
Janis Bush, Ph.D.	University of Texas at San Antonio	Plant Ecology–Experimental Design	SH
Charlie Kreitler, Ph.D.	LBG-Guyton Associates (Retired)	Hydrogeology–Groundwater Science	IC
Conrad Lamon, Ph.D.	Statistical Ecology Associates LLC	Ecological Modeling	IC
Glenn Longley, Ph.D.	Edwards Aquifer Research and Data Center (Retired)	Biologist–Edwards Aquifer Specialist	SH
Jack Sharp, Ph.D.	University of Texas at Austin	Hydrology–Hydrogeology	Joint IC and SH
Doyle Mosier, M.S.	Texas Parks & Wildlife Department (Retired)	Instream Flows–Aquatic Habitats	IC
Jackie Poole, M.A.	Texas Parks & Wildlife Department (Retired)	Botany/Taxonomy–Texas wild-rice Specialist	SH

5.3.3.1 Comal Springs Riffle Beetle Work Group

The CSRB Work Group's charge is to review and provide input on monitoring the CSRB as part of the implementation of the EAHCP. The Work Group members—Conrad Lamon (SC), Chad Norris (SC and TPWD), Floyd Weckerly (SC), Ken Ostrand (USFWS), and Tom Arsuffi (SC)—met December 9, 2020, to review 2020 CSRB collections associated with the EAHCP biomonitoring and refugia programs. Also discussed were the results of an on-going applied research study that assesses the efficacy of the cotton lure method for collection of CSRB; this study will continue into 2021 to complete a third experimental run, and the final report will be included in the 2021 EAHCP Annual Report.

The CSRB Work Group's meeting agenda and supporting materials are provided in Appendix N6.

5.3.3.2 Research Work Group

The Research Work Group is charged with suggesting, while operating on a consensus-basis, specific applied research projects to be conducted as part of the Applied Research Program and suggesting refinements to the methodology proposed for refugia research projects. Refugia research projects are considered in light of the research prioritization need of each Covered Species and what is known about each for the five research topics necessary to establish fully functional refugia, as noted in the original 2018 *Refugia Research Plan* (San Marcos Aquatic Resources Center 2018) and illustrated in **FIGURE 5-2**. Progress on refugia research projects is documented annually in a report from the USFWS to the EAA (Appendix F1).

FIGURE 5-2
Refugia Research Prioritization and Information Status

PRIORITIZATION		RESEARCH TOPIC				
Covered Species	Ranking	Collection Methods and Techniques	Husbandry	Propagation	Genetics	Species Reintroduction Methods
Comal Springs riffle beetle	1	5	3	2	2	0
Comal Springs dryopid beetle	1	3	2	0	2	0
Peck's cave amphipod	1	3	3	2	2	0
Texas blind salamander	2	4	5	2	1	0
San Marcos salamander	2	5	4	3	3	0
Fountain darter	3	5	5	5	4	5
Texas wild-rice	3	5	5	5	4	5
Comal Springs salamander	4	5	4	2	2	0
Texas troglobitic water slater	4	1	1	0	0	0
Texas cave diving beetle	4	1	0	0	0	0

Darker = Higher Priority for Research
(1 indicates highest priority for research; 4 indicates the lowest priority)

Darker = More Information Exists
(5 indicates documented procedures exist; 0 indicates that no information currently exists in a form usable for refugia management)

Source

San Marcos Aquatic Resources Center 2018

The Work Group meets on an as-needed basis and is expected to be in existence for the duration of the ITP. The Work Group members are derived from the SC membership. The Work Group members are Chad Norris (TPWD), Tom Arsuffi (Texas Tech University), Floyd Weckerly (TXST), and Conrad Lamon (Statistical Ecology Associates, LLC).

The Research Work Group met virtually December 8, 2020, and discussed the initiation/continuation of the following research as part of the EAHCP refugia program.

- Texas wild-rice genetic enhancement (USFWS).
- Continuation of factors affecting pupation in the endangered CSRB (TXST).
- Continuation of identifying conditions affecting pupation rates in the endangered CSRB (BIO-WEST).
- F1 level production of CSRB in refugia (USFWS).

The meeting agenda and minutes are provided in Appendix N7.

5.4 Other Work Groups

5.4.1 San Antonio Water System Aquifer Storage & Recovery Regional Advisory Group and Staff Work Group

The EAHCP and ILC provide for continued discussion and interaction through two groups, both of which met in 2020 in compliance with the EAHCP and the ILC.

The first group, the SAWS ASR Regional Advisory Group, is a 12-person Regional Advisory Group that provides advice to SAWS regarding the implementation of the program. **TABLE 5-5** lists the members of the SAWS ASR Regional Advisory Group who met September 25, 2020.

The second group, the Staff Work Group, consists of four SAWS staff members and four EAA staff members who provide advice to each agency regarding drought conditions, aquifer levels and springflows at Comal Springs, meteorology, and aquifer and springflow modeling.

TABLE 5-5

San Antonio Water System Aquifer Storage & Recovery Regional Advisory Group 2020 members

Appointee	Affiliation	Alternate
Darren Thompson	SAWS	Patrick Shriver/Roger Placencia
Shawn Dorn	SAWS	Patrick Shriver/Roger Placencia
Karen Guz	SAWS	Patrick Shriver/Roger Placencia
Roger Placencia	SAWS	Patrick Shriver
Roland Ruiz	EAA	Marc Friberg
Rader Gilliland	Irrigator	Adam Yablonski
Bruce Alexander	Small Municipal	No alternate named
Ryan Kelso	Springs Communities	Mike Short
Cindy Loeffler	Environmental interest	Chad Norris
Buck Benson	Industry	Doris Cooksey
Nathan Pence	Downstream interest	Charlie Hickman
Scott Storment	EAHCP Program Manager	Jamie Childers

6 | Plan Changes and Correspondence

CHAPTER HIGHLIGHTS

- No Adaptive Management Process decisions were made in 2020.

6.1 Administrative Changes

The EAHCP uses four categories of changes that are administrative in nature: annual report, informational memoranda, Clarifications, and Minor Administrative Amendments. Clarifications and Minor Administrative Amendments are defined in the EAHCP; the annual report and informational memoranda categories of changes were established in 2013 via a Program Manager memorandum to the IC.

The *annual report* can be used to report a change that is temporary or caused by current conditions, with the intent in the future to adhere to the HCP.

Informational memoranda can be used to report a change that was very minor and has not substantively affected the species or objectives and did not rise to the level of needing scientific consideration.

Clarifications are defined as changes that "do not change the substantive portions of any of the documents in any way but merely clarify and make more precise the provisions as they exist." The 2013 Program Manager memorandum noted above further defines Clarifications, noting that they are used when "the HCP is not clear on a specific issue and the issue could be interpreted differently depending on perspective [and] confirmation from USFWS [is needed] that the interpretation chosen ... is accepted/agreed to by USFWS." Clarifications are implemented by submitting a proposed change to the USFWS for its approval within a requested 30-day period. According to the EAHCP, Clarifications must be provided in writing through a letter agreement or substituted plan documents between the Permittees and the USFWS.

Minor Administrative Amendments are defined as changes that do not make substantive changes to any of the provisions of the documents but which may be necessary to represent more fully the overall intent of the Permittees and the USFWS. The 2013 Program Manager memorandum noted above further defines Minor Administrative Amendments, noting that they are used when "the change is very minor and has no substantive [effect on] the species or objectives [and] could require some minimal level of justification, possibly scientific in nature." The process for executing Minor Administrative Amendments is more extensive than that used for Clarifications. Minor Administrative Amendments require submitting in writing to the USFWS a description of the proposed amendment, explanation of why the amendment is necessary or desirable, and an explanation of why the proposed amendment will not

change the effects described in the EAHCP. These changes require public noticing and posting the proposed amendment on the EAHCP website for public comment. The proposed Minor Administrative Amendment must then be approved by the USFWS Field Supervisor, documented by written authorization within 30 days.

No plan Administrative Amendments were made in 2020.

6.2 Adaptive Management Process

Article 7 of the FMA outlines the procedural steps and responsibilities of the Permittees for adaptive management. It also identifies three AMP decisions the Permittees may make—Routine AMP, Nonroutine AMP, and **Strategic AMP** (SAMP) decisions. *Routine AMP decisions* are those involving on-going, day-to-day matters related to the management and administration of existing Conservation Measures and Phase II Conservation Measures implemented through the SAMP that do not require an amendment to the ITP. *Nonroutine AMP* decisions are those related to existing Conservation Measures but which are not Routine AMP decisions. *SAMP decisions* are decisions that relate to the selection of Phase II Conservation Measures that are to be implemented by the Permittees from 2020 through the end of the ITP (2028).

6.2.1 Routine Adaptive Management Decisions

No Routine AMP decisions were made in 2020.

6.2.2 Nonroutine Adaptive Management Decisions

No Nonroutine AMP decisions were made in 2020.

6.2.3 Strategic Adaptive Management Process Decisions

There were no SAMP decisions. The SAMP represents the transition between implementation of Phase I and Phase II of the ITP. Approval of the Comprehensive Phase II Work Plan in May 2019 officially defined Conservation Measures for Phase II of the ITP. Many factors influenced the transition process, including determinations of the National Academy of Sciences Report 3 that highlighted the success of the EAHCP Conservation Measures and prompted the creation of a Phase II Work Group and a CSRB Work Group in 2018. The process and resulting activities of the transition from Phase I to Phase II was documented in a report summarizing EAHCP activities finalized in March 2020 (Appendix O).

6.3 Changed Circumstances

The EAHCP describes 12 changed circumstances that, if they occur during the permit term, would require remedial measures to address. No changed circumstances occurred in 2020, and no remedial actions were on-going to address changed circumstances that occurred prior to 2020.

6.4 Other USFWS Correspondence

Other memoranda, clarifications, or amendments not related to Conservation Measures or Biological Goals and Objectives as defined by AMP decisions may be necessary to address changes to the EAHCP, Implementing Agreement, FMA, or ITP. Such correspondence was issued in 2020 as a memorandum announcing the availability of an updated EAHCP (Appendix P).

The Program Manager submitted an updated EAHCP to the USFWS in October 2020 (transmittal letter in Appendix P) that includes all USFWS-approved changes up to that point in a single document (i.e., all past approved Routine AMP, Nonroutine AMP, and SAMP decisions that affect the text or tables of the EAHCP). This is the first updated EAHCP to include USFWS-approved changes. The EAHCP will be updated with each approved change going forward. This updated EAHCP is available to the public on the EAHCP website. The updated EAHCP includes a table listing all changes and their approval date. Program staff will continue to maintain and update this table with any approved changes in the future.

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7 | Future Priorities

CHAPTER HIGHLIGHTS

- Future priorities will build on 2020 activities.
  - Technical evaluations are expected to be conducted by contractors or Edwards Aquifer Authority technical staff as an outcome of the Springflow Habitat Protection Work Group Part 2 charge.
  - Planning next steps of the Incidental Take Permit beyond 2028 will continue.
  - The City of New Braunfels and City of San Marcos will construct projects to improve water quality, and portions of the EAHCP will be amended to reflect Program changes.

Permittees and partners continue to gain perspective and practical insights into implementation of the EAHCP in the eighth year. The following new or on-going priorities are recommended based on this knowledge and experience.

- Program staff will continue to take steps to improve communication with stakeholders and other users of water resources in the Permit Area.
- Vegetation mapping of Spring Lake is expected to occur during 5-year mapping efforts based on the illustrated value gained for the 2020 effort.
- Sessom Creek channel stabilization and riparian restoration in the city of San Marcos will be prioritized for the next 5 years of funding from the Impervious Cover and Water Quality Protection Conservation Measure (EAHCP § 5.7.6).
  - Construction of Phase 1 of Sessom Creek rehabilitation will begin in 2021 and mark the start of a multi-year project that will conclude around 2025.
  - Grants will be pursued to help offset the costs of construction of Phase 1 and Phase 2.
- Recreational impacts in the San Marcos River have and will continue to affect habitat for the endangered species. The COSM will work with TXST faculty to better understand those impacts and make recommendations for future implementation.
- The CONB will continue efforts to construct stormwater treatment infrastructure per the designs that were developed in 2020 and included in the Impervious Cover and Water Quality Protection Conservation Measure (EAHCP § 5.7.6).
  - Project 1: Complete the bioretention basin at the Headwaters at the Comal facility.

  - Project 2: Construct a stormwater treatment facility at the intersection of Landa Park Drive and Elizabeth Avenue.
  - Project 3: Begin construction of the stormwater treatment infrastructure within the Landa Park Aquatics Center parking lot.
- The CONB will also continue to make strides toward improving the riparian zones along Landa Lake and the Upper Spring Run area as part of the Native Riparian Habitat Restoration Conservation Measure (EAHCP § 5.7.1).
- Minor amendments to EAHCP § 7.1.2 and Section 7.7.1 (b) of the FMA are anticipated in 2021 to incorporate the 2020 Joint Funding Agreement revisions.
- Other future Minor Administrative Amendments are anticipated to reflect the following.
  - The removal of the Phase II Expanded Use of the SAWS ASR and Water Resources Integration Program Pipeline (EAHCP § 5.5.2).
  - An SSA may be pursued in the Comal River following completion of habitat restoration protective of the fountain darter, whereas EAHCP §§ 5.2.2.2 and 5.6.1 state that an SSA will be considered.

8 | Literature Review

Appendix Q lists recent literature (e.g., journal articles, study reports, theses, and dissertations) related to the Covered Species, habitat, and other pertinent topics associated with the EAHCP. To coincide with the development schedule of the Annual Report, this review includes literature published or approved from December 1, 2019, to November 30, 2020, as well as any earlier literature not documented in an Annual Report. The literature search was accomplished by conducting online searches of academic data bases (such as EBSCO and JSTOR), Google Scholar, TXST dissertations and theses, and the EAA document library.

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9 | References

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Species of Interest

The species listed in the table below are managed by the EAHCP program or referenced in this annual report or its appendices.

EAHCP Species of Interest

Common Name	Scientific Name
Covered Species	
Comal Springs dryopid beetle	*Stygoparnus comalensis*
Comal Springs riffle beetle	*Heterelmis comalensis*
Comal Springs salamander	*Eurycea* sp.
Fountain darter	*Etheostoma fonticola*
Peck's cave amphipod	*Stygobromus pecki*
San Marcos gambusia	*Gambusia georgei*
San Marcos salamander	*Eurycea nana*
Texas blind salamander	*Eurycea (=Typhlomolge) rathbuni*
Texas cave diving beetle (or Edwards Aquifer diving beetle)	*Haideoporus texanus*
Texas troglobitic water slater	*Lirceolus smithii*
Texas wild-rice	*Zizania texana*
Comal Springs dryopid beetle	*Stygoparnus comalensis*
Submerged Aquatic Vegetation Species for Fountain Darter Habitat	
Delta arrowhead	*Sagittaria platyphylla*
Creeping primrose-willow	*Ludwigia repens*
Carolina fanwort (or Cabomba)	*Cabomba caroliniana*
Grassleaf mudplantain	*Heteranthera dubia*
Illinois pondweed	*Potamogeton illinoensis*
Mosses, liverworts, and allies	Bryophytes
Whorled pennywort	*Hydrocotyle verticillata*
Texas wild-rice	*Zizania texana*
Native Species	
Big claw river shrimp	*Macrobrachium carcinus*
Non-Native Animal and Plant Species Removed or Monitored	
Suckermouth armored catfishes (suckermouth and sailfin)	Loricariidae: *Hypostomus Plecostomus* and *Pterygoplichthys* spp.
Chinaberry	*Melia azedarach*
Chinese privet	*Ligustrum sinense*
Chinese tallow	*Triadica sebifera*
Elephant ear (or coco yam, or taro)	*Colocasia esculenta*

Common Name	Scientific Name
Giant ramshorn snail	*Marisa cornuarietis*
Giant reed	*Arundo donax*
Gill parasite (no common name)	*Centrocestus formosanus*
Hydrilla (or water thyme)	*Hydrilla verticillate*
Indian swampweed	*Hygrophila polysperma*
Intestinal fluke	*Haplorchis pumilio*
Japanese honeysuckle	*Lonicera japonica*
Japanese privet (or Japanese ligustrum)	*Ligustrum japonicum*
Nutria	*Myocastor coypus*
Red-rimmed melania	*Melanoides tuberculata*
Tapegrass (or eelgrass)	*Vallisneria spiralis*
Tilapia (or blue tilapia)	*Oreochromis* spp.
Watercress	*Nasturtium officinale*
Water hyacinth	*Eichhornia crassipes*
Water lettuce	*Pistia stratiotes*
Water sprite	*Ceratopteris thalictroides*
White mulberry	*Morus alba*
Zebra mussels	*Dreissena polymorpha*

Glossary

Comal discharge: The volume of water passing a defined location in the Comal River; in the HCP this location is often referenced at the USGS station number 08169000, which is below the confluence of the Old and New channels of Comal River.

Comal River: A 2-mile natural watercourse originating from the Comal Springs in New Braunfels, Texas, at Landa Lake to its confluence with the Guadalupe River in New Braunfels, Texas.

Comal Springs: A collection of artesian springs in New Braunfels, Texas, emanating from the Edwards Aquifer and creating the headwaters of the Comal River including areas of Landa Lake and Spring Runs that feed Landa Lake.

Comal Springs system: The aquatic area containing the Comal Springs, Landa Lake, and Comal River.

Conservation Measures: Projects specified in Chapter 5 of the EAHCP to be implemented by the assigned Permittees in order to minimize and mitigate to the maximum extent practicable and will not appreciably reduce the likelihood of the survival and recovery of the Covered Species due to the performance of the Covered Activities by the Permittees during the term of the ITP.

Covered Activities: Those activities identified in Condition L of the ITP and Chapter 2 of the EAHCP and performed by the Permittees within the Permit Area, including recreation, regulation, and management of groundwater pumping from the Edwards Aquifer, for which incidental take coverage has been provided over the permit term.

Covered Species: The 11 federally listed or petitioned species "covered" by the ITP and HCP and conserved and managed through the implementation of the EAHCP.

critical period: Generally, a period characterized by defined lower aquifer levels and which is primarily managed by the triggering of specific withdrawal restrictions from the Edwards Aquifer. Specifically, a *critical period* is defined in Section 702.1(52) of the EAA's rules to mean "[a]ny day of a calendar year when a critical period stage is in effect." A critical period is in effect when so declared by the EAA General Manager pursuant to Section 715.212 of the EAA's rules based on the aquifer level triggers found in Appendix Table 1 to Subchapter E, Chapter 715 of the EAA's rules.

curtail or curtailment: The act of reducing or restricting something. In the case of a forbearance agreement, the right to withdrawal under an EAA groundwater withdrawal permit would be reduced or restricted.

defined period of extreme drought, drought, drought conditions, extreme drought conditions: In the EAHCP, the "springflow protection" Conservation Measures are based on the specific drought triggers that are tailored for each measure, except for the Regional Water Conservation Program, which

has no drought triggers. These measures are designed to prevent springflows at Comal Springs and San Marcos Springs from being reduced below certain levels stated in the EAHCP during a repeat of the *drought of record*, which refers to the 6-year drought that occurred from 1951 through 1956, and specifically to a drought characterized by an average recharge for any 7-year period of less than 168,700 ac-ft as derived from the period 1950–1956. Reference to drought or extreme drought is in perspective of similar experiences. For the purposes of the SAWS ASR Program, Section 1.9 of the SAWS–EAA ASR contract defines the *drought of record* as "the period of time declared by the [EAA] General Manager pursuant to Section 3 [of the SAWS–EAA ASR contract] characterized as a period of lower than normal precipitation and recharge to the Aquifer resulting in a drought of record–like event as provided therein." Section 3(a) of the SAWS–EAA ASR contract provides that the EAA General Manager is to issue a "notice of commencement of a drought of record" when the 10-year rolling average of the estimated annual recharge to the aquifer is equal to or less than 500,000 ac-ft per annum.

Edwards Aquifer Authority Act: The Act of May 30, 1993, 73rd Leg., R.S., ch. 626, 1993 Tex. Gen. Laws 2350, as amended.

EAA groundwater withdrawal permit: An Initial Regular Permit or Regular Permit issued by the EAA.

forbearance: The complete curtailment of all or part of a right to make withdrawals under a specific EAA groundwater withdrawal permit.

forbearance agreement: As used in the SAWS ASR and VISPO, a contractual agreement whereby a permit holder agrees to the complete curtailment of all or part of the permit holder's right to make withdrawals in the future under a specific EAA groundwater withdrawal permit when certain conditions—commonly referred to as *triggers*—are met in exchange for compensation.

high flow: Referencing a flood event or severe storm event that could have negatively impacted the Covered Species and their habitat. System monitoring association with high flow must be approved by EAA staff and is not quantitatively defined in the EAHCP.

incidental take: Unintentional taking of a species that results from, but is not the purpose of, carrying out an otherwise lawful activity. *Taking* is defined in the ESA as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting any threatened or endangered species.

Initial Regular Permit: An EAA groundwater withdrawal permit originally issued by the EAA under Subsection 1.16(d) of the EAA Act.

lease: As used in the SAWS ASR Program, a lease is a contractual arrangement to presently grant the exclusive possession of the right to make withdrawals from the Edwards Aquifer under an EAA groundwater withdrawal permit.

Long-Term Biological Goal reach: River segments in both the Comal and San Marcos rivers that are specified in the EAHCP and hold quantitative goals associated with specific plants regarded as fountain darter habitat.

low flow(s), low flow conditions, extreme low flow: A period of springflow below the long-term average and the minimum averages identified in Tables 4-2 and 4-13 of the EAHCP. Low flow may also

be specified as 130 cfs or lower at the Comal discharge and 120 cfs or lower at the San Marcos discharge based on Condition M in the ITP.

negative impacts: Generic term associated with impacts on the Covered Species and their habitat through reduced springflow, flood, contaminated runoff, excess recreation in protected areas, and other potentially threatening activities to the Comal Springs and San Marcos Springs ecosystems.

Phase I—EAHCP Implementation: Phase I of the EAHCP occurred between 2013 and 2020, during which the Permittees implemented the habitat restoration, springflow protection, research, modeling, monitoring, and refugia Conservation Measures required by the EAHCP and the ITP to determine their effectiveness in achieving the EAHCP Biological Goals and Objectives.

Phase II—EAHCP Implementation: Phase II of the EAHCP spans 2020–2028 and consists of continued implementation of existing, or modifications to existing, Conservation Measures, or implementation of new Conservation Measures that may be necessary to achieve the Biological Goals and Objectives in the EAHCP as a result of the SAMP.

Regular Permit: An EAA groundwater withdrawal permit issued by the EAA after August 12, 2008, resulting from the sale or amendment of an initial Regular Permit or the consolidation of two or more such permits.

Restoration Reach: River segments in both the Comal and San Marcos rivers created out of the 2016 AMP to satisfy the EAHCP key management objective of proportionally expanding submerged aquatic vegetation restoration beyond the LTBG Reaches.

riparian: Land adjacent to a river or stream.

San Marcos discharge: The volume of water passing a defined location in the San Marcos River; in the HCP this location is referenced at the USGS station number 08170500, which is located in Sewell Park.

San Marcos River: A 75-mile natural watercourse originating from the San Marcos Springs in San Marcos, Texas, at Spring Lake to its confluence with the Guadalupe River near Gonzales, Texas.

San Marcos Springs: A collection of artesian springs in San Marcos, Texas, emanating from the Edwards Aquifer and creating the headwaters of the San Marcos River including areas of Spring Lake, Sink Creek, and Sessom Creek; generally, refers to artesian springs in Spring Lake.

San Marcos Springs system: The aquatic area containing the San Marcos Springs, Spring Lake, and San Marcos River.

Strategic Adaptive Management Process: The SAMP formalized adaptive management during the transition from Phase I (2013–2020) to Phase II (2020–2028) of the EAHCP and the ITP as defined in Sections 7.13 and potentially 7.14 of the FMA. No SAMP decisions were needed during the transition from Phase I to Phase II.

trigger: To cause an event or situation to happen or exist. In the case of the VISPO, Critical Period Management Program, and SAWS ASR springflow protection programs, including the associated

forbearance agreements, a trigger would be a condition that causes or requires the curtailment of all or part of the right to make withdrawals under a specific EAA groundwater withdrawal permit.

withdrawal: Taking groundwater from the Edwards Aquifer by or through human-made facilities, including pumping.