



June 24, 2016

Roland Ruiz  
General Manager  
Edwards Aquifer Authority  
900 East Quincy  
San Antonio, Texas 78215

Re: 2017 Work Plans and Budget for the Edwards Aquifer Habitat Conservation Plan (EAHCP)

Mr. Ruiz,

On behalf of the Implementing Committee for the EAHCP, I am attaching the Work Plans and Budgets for 2017 to support your Board's review and approval of the 2017 EAHCP budget.

In accordance with Article 4 of the Funding and Management Agreement, Work Plans and Budgets must be submitted for each of the conservation measures by their respective Implementing Committee member. Work Plans were initially drafted in mid-March and the Implementing Committee has reviewed and discussed these plans at their May and June meetings. Additionally, the Science Committee reviewed all Work Plans with scientific components and provided comments that were incorporated into the final versions of the Work Plans. All of the Work Plans were approved by consensus by the Implementing Committee on June 23, 2016.

In the coming weeks, the Permittees will use their internal procurement process to identify contractors for the activities listed in these Work Plans in order to assemble a Funding Application that will be submitted to the Edwards Aquifer Authority Board of Directors by October 1, 2016 for approval. The Funding Application budgets will be based on the selected contractors for the work.

Please let me know if you have any questions or require any additional information.

Sincerely,

Nathan Pence  
Program Manager  
Edwards Aquifer Habitat Conservation Plan

2017 Edwards Aquifer Authority Workplan Budget (as of 6/15/2016)					
Workplan	Required by HCP	2017 Table 7.1	2017 Table 7.1A	2017 Work Plans	Δ 7.1 to Work Plans
Aquifer Storage and Recovery **					
Obtaining Leases & Options	Yes	\$4,759,000	\$4,759,000	\$4,000,000	\$759,000
ASR O&M	Yes	\$2,194,000	\$2,194,000	\$800,000	\$1,394,000
Regional Water Conservation	Yes	\$1,973,000	\$4,533,175	\$4,533,175	(\$2,560,175)
VISPO	Yes	\$4,172,000	\$4,172,000	\$4,172,000	\$0
Biological Monitoring	Yes	\$400,000	\$400,000	\$437,000	(\$37,000)
Water Quality Monitoring	Yes	\$200,000	\$200,000	\$343,750	(\$143,750)
Ecological Modeling	Yes	\$175,000	\$0	\$0	\$175,000
Applied Research					\$0
Research and Facility	Yes	\$450,000	\$450,000	\$450,000	\$0
Refugia	Yes	\$1,678,597	\$1,678,597	\$1,678,597	\$0
Program Management	Yes	\$750,000	\$750,000	\$910,000	(\$160,000)
Science Review Panel	Yes	\$100,000	\$269,750	\$269,750	(\$169,750)
<b>Program Total</b>		<b>\$16,851,597</b>	<b>\$19,406,522</b>	<b>\$17,594,272</b>	<b>(\$742,675)</b>
**unexpended ASR budget will transferred to reserves					
2017 City of San Marcos/Texas State Workplan Budget (as of 6/15/2016)					
Workplan	Required by HCP	2017 Table 7.1	2017 Table 7.1A	2017 Work Plans	Δ 7.1 to Work Plans
Texas Wild Rice Enhancement/Restoration	Yes	\$125,000	\$125,000	\$100,000	\$25,000
Sediment Removal	Yes	\$25,000	\$25,000	\$25,000	\$0
Non-Native Plant Species Control	Yes	\$75,000	\$75,000	\$170,000	(\$95,000)
Management - Floating Vegetation Mats & Litter	Yes	\$80,000	\$80,000	\$51,298	\$28,702
Non-Native Animal Species Control	Yes	\$35,000	\$35,000	\$27,960	\$7,040
Bank Stabilization/Permanent Access Points	Yes	\$20,000	\$20,000	\$0	\$20,000
Native Riparian Habitat Restoration	Yes	\$20,000	\$20,000	\$55,743	(\$35,743)
Management - Key Recreation Areas	Yes	\$56,000	\$56,000	\$56,000	\$0
LID/BMP Management	Yes	\$200,000	\$200,000	\$150,000	\$50,000
Household Hazardous Waste Management	Yes	\$30,000	\$30,000	\$30,000	\$0
Sessom Creek Sand Bar	Yes	\$0	\$0	\$0	\$0
Education	No				\$0
<b>Program Total</b>		<b>\$666,000</b>	<b>\$666,000</b>	<b>\$666,000</b>	<b>(\$1)</b>



# **Edwards Aquifer Authority 2017 Work Plan**

### **5.5.1 Edwards Aquifer Authority and San Antonio Water System Aquifer Storage and Recovery Work Plan**

Section 5.5.1 of the Edwards Aquifer Habitat Conservation Plan (EAHCP) assigns acquiring leases and options of water permits for use in the San Antonio Water System (SAWS) Aquifer Storage and Recovery (ASR) to the Edwards Aquifer Authority (EAA). SAWS will operate the ASR infrastructure and retain control of day-to-day operations of the ASR facility related to EAHCP water injection and recovery. The EAA will ensure compliance with EAHCP requirements through management of the Interlocal Contract between the EAA and SAWS for the Use of the Twin Oaks Aquifer Storage and Recovery Project for Contribution to Springflow Protection, which became effective August 14, 2013. The contract outlines the responsibilities of both parties, including administration and implementation.

#### **Long-term Objective:**

To acquire 50,000 acre-feet of Edwards Aquifer unrestricted agricultural, municipal, and industrial permits to be made available to SAWS for the purposes of physical storing or crediting the Regional ASR balance; or as forbearance options.

#### **Target for 2017:**

The ASR contract between EAA and SAWS will continue to be implemented. EAA is the leasing agent for ASR leases and will continue providing SAWS with notices of availability of HCP groundwater. To encourage greater participation, EAA staff pursued two initiatives in 2015. First, EAA secured a rate adjustment and then worked aggressively to inform permit holders of the new prices and determine interest; even scheduling targeted small group meetings. Second, EAA staff closely reviewed 2013 and 2014 authorization and annual groundwater use reporting to identify additional leasing opportunities, and debuted a program to enlist permit holders to pool together un-pumped authorization to make additional ASR regional contributions. The 10-year recharge average triggered Tier 2 acquisition situation for 2016. The EAA began development of a Tier 2 product in 2015; however, the vagaries of triggering and payment conditions limited acceptance of the Tier 2 and Tier 3 agreements. The success of 2015 and 2016 in acquiring ASR leases merits consideration of a different strategy that still includes a goal of 50,000 acre-feet, but may include utilization of forbearance options.

#### **ASR Program:**

*Description of the SAWS ASR:* The SAWS Twin Oaks ASR is an underground storage reserve in the Carrizo sand aquifer in southern Bexar County. As a SAWS water management project, it is designed to store Edwards water when demand is less than available supply. The stored water is returned to San Antonio for use when demand is high and Edwards supply is restricted by Critical Period Management and other drought-related limitations.

The capacity and capabilities of the SAWS ASR are such that it can be used to meet SAWS ratepayer expectations and, if operated as described in the EAHCP, will play a significant role as a Phase I activity to protecting the Covered Species at Comal and San Marcos Springs.

*Operations:* The significant action of approval of the Edwards Aquifer Habitat Conservation Plan Program Interlocal Contract between the Edwards Aquifer Authority and The San Antonio Water

System for the Use of the Twin Oaks Aquifer Storage and Recovery Project for contribution to Springflow Protection Interlocal Contract effective August 14, 2013 takes elements of the HCP's ASR flow protection strategy into an operations contract.

*Injection:* Storage of HCP groundwater shall be at the discretion of SAWS and will be dependent on operating conditions. All HCP groundwater made available to SAWS before June 30<sup>th</sup>, 2016 will be physically stored or credited as in storage, with the accompanying forbearance from the Aquifer, should triggers defined in the Interlocal Contract occur in 2017.

*Forbearance and Recovery:* Forbearance, and possible recovery from ASR, of Edwards Aquifer pumping from certain wells will occur when the ten-year rolling recharge average is less than 500,000 acre-feet and the ten-day average of aquifer levels measured at the J-17 index well drop below 630 feet mean sea level (MSL). The annual amount of water recovered during a repeat of the drought of record is outlined in Exhibits E & F of the Interlocal Contract. Changes to the Presumptive Forbearance Schedule outlined in Exhibit E may be approved as outlined in Section 5.3 of the Interlocal Contract.

*Leasing:* The EAA will continue to acquire Tier 1 leases for the ASR program in 2017. with the acquisition goal of aggressively filling the ASR. As the ASR storage goal nears fulfillment, and current market conditions are assessed, operational strategies will be developed and discussed with the Implementing Committee for the remaining acre-feet required by the HCP; either as leases or forbearance options.

**Monitoring:**

The EAA will actively manage the Interlocal Contract with SAWS. Status reports and updates will be provided regularly to the Implementing Committee.

*ASR Regional Advisory Group:* Per section 5.5.1 of the HCP, a 12-person SAWS ASR Regional Advisory Group will meet to advise SAWS as it makes decisions relating to the operation of the ASR facility relevant to the EAHCP. Membership on the Regional Advisory Group will include: four representatives from the San Antonio Water System, the EAHCP Program Manager; one representative each from the EAA, EAA permit holder for irrigation purposes, small municipal pumpers, the spring cities, environmental interests, industrial pumpers, and downstream interests.

**Budget:**

Table 7.1

\$4,759,000 – lease options

\$2,194,000 – O&M

\$6,953,000 – total

Estimated 2017 budget\*

\$ 4,000,000– leases

\$ 800,000 – O&M (this amount may vary)

\$ 4,800,000 – total

\*Actual expenditures for 2017 will be determined by the terms of the Interlocal Contract depending on the quantity of HCP groundwater physically stored, the amount of active water leases, and the cost of eligible operation and maintenance activities. Budgeted money that is not spent will be placed in the reserve fund.

### 5.1.3 Regional Water Conservation Program

#### Long Term Objective:

To reduce withdrawals from the Edwards Aquifer by 10,000 acre-feet, realized through implementation of conservation measures that will conserve 20,000 acre-feet of water.

*Background:* Conservation is one of four springflow protection measures of the Edwards Aquifer Habitat Conservation Plan (EAHCP) intended to reduce aquifer withdrawals, and subsequently increase aquifer level and springflow. The concept is to reduce aquifer withdrawals by 10,000 acre-feet and the EAHCP contemplates using a Regional Water Conservation Program (RWCP) to achieve the goal in the following manner:

- An Initial Commitment of 10,000 acre-feet was solicited from EAA permit holders to remain in the EAA Groundwater Trust for a period of ten years.
- The Initial Commitment is returned to the permit holders through the implementation of conservation initiatives and technical assistance provided by the EAHCP. As conservation savings accrue, one-half of the savings are realized by the party participating in the RWCP and the other half is placed in the Groundwater Trust for the remaining term of the EAHCP ITP; allowing the original donors to have their donated water returned on a pro-rata basis. Consequently, 20,000 acre-feet of conservation savings are necessary for full return of the Initial Commitments.

In order to provide an immediate benefit to the aquifer and springflow, several entities within the EAA jurisdictional area have agreed to make Initial Commitments to the EAA Groundwater Trust. As of January 2015, the initial donations to the program were 8,400 acre-feet. The initial contribution of water rights was placed in the Groundwater Trust for a period of ten years (see Table below):

Table 1: Initial Commitment Contracts.

Entity	Acre-Feet of Water Donated
San Antonio Water System	8,000
City of San Marcos	300
Texas State University	100
TOTAL	8,400

These Initial Commitments are to be returned to the permit holder at the end of 10 years or when an equal amount is identified as conserved and in reserve by the RWCP. Initial Commitments will be returned to the permit holder in a proportion equal to their contribution.

At the September 18, 2014, Implementing Committee, a RWCP work group was appointed to review the progress of conservation initiatives and make recommendations to achieve the goal of reducing aquifer withdrawals by 10,000 acre-feet. The work group had an initial meeting on October 15 and met five times, concluding on December 11. A final report was presented to the January 15, 2015, Implementing Committee with nine recommendations:

1. Implement an outreach program to ensure all permit holders are aware of the RWCP.
2. Look for opportunities to pay permit holders for permanent conservation of historically unused permitted water.
3. Expand the search for reuse and industrial technology opportunities in the EA Region and offer incentives for their excess capacity.
4. Look for opportunities to create flexible agreements with program participants (i.e. varying terms).
5. Provide settlement opportunities for permit holders who over-pump their permit.
6. Offer incentives and assistance to encourage municipalities to promote landscape conservation, especially during peak demand.
7. Create a conservation incentive program for exempt well owners.
8. Explore partnerships with land trusts.
9. Target conservation measures to producers that use flood irrigation.

In 2013 and 2014, twenty communities and utilities within the EAA jurisdiction were ranked, based on Gallons per Capita per Day, and thirteen were contacted about potential participation in the RWCP. Only two agreed to participate with the EAHCP and their total savings, and commitment to the Groundwater Trust reached approximately 200 acre-feet.

In late 2015, a leak repair program with SAWS was negotiated and executed, that will fulfill the goal of the 10,000 acre-feet in the EAA Groundwater Trust by 2020. The contract covers the remainder of the ITP and is estimated to conserve almost 20,000 acre-feet accrued over the first five years.

Table 2: SAWS – EAA 5-year water savings commitment and fiscal obligation.

Water	2016	2017	2018	2019	2020	Total
Estimated Savings (AF)	4,745	4,745	4,745	4,745	632	19,612
Commitment to the Groundwater Trust (AF)	2,372.5	2,375.5	2,372.5	2,372.5	316	9,806
Payment	\$4,507,750	\$4,507,750	\$4,507,750	\$4,507,750	\$600,400	\$18,631,400

With the payment of \$950 per acre-foot of water conserved that has been used as a standard for other RWCP participants, the contract will cost \$18,631,400 while sharing the remaining 9,800 acre-feet into the Groundwater Trust necessary to complete the 10,000 acre-foot goal.

**Target for 2017:**

With the execution and implementation of the contract with SAWS in 2016, the RWCP will have effectively met its conservation goal by 2020. Nevertheless, with approximately \$280,000 remaining in the RWCP budget, the EAA will evaluate conservation initiatives that could result in additional water saved above and beyond what is required by the EAHCP within the funds available, if it is deemed beneficial within the overall EAHCP program goals.

Accordingly, six performance measures and/or activities have been identified for 2017, as follows:

1. Convene a meeting of the RWCP monitoring committee.
2. Explore measures that could further reduce aquifer withdrawals.
3. Explore improved communication with the US Department of Defense to effectuate improved and measurable conservation results on local military installations.
4. Continue to explore conservation opportunities with industrial users.
5. Continue to explore ways to leverage existing EAA conservation efforts with EAHCP springflow conservation programs for enhanced results.
6. Maintain and administer EAHCP water conserved in the EAA Groundwater Trust.

**Methodology:**

This work plan will be implemented by EAA staff with limited assistance from other contractors as needed.

**Monitoring:**

As part of this contact, SAWS is obligated to transfer to the EAA groundwater trust half of the water saved under this program. SAWS will provide a total of three summary reports capturing and quantifying yearly milestones.

**Budget:**

Table 7.1:

\$1,973,000

Estimated 2017 budget:

\$4,533,174.55

\*The requested budget for the Regional Water Conservation work plan is \$4,533,174.55 (see Table 3). The increase in funds from Table 7.1 of the EAHCP for this effort will be provided from the EAHCP fund balance for 2013-2015 as well as redistributing the program budget for the remainder of the ITP (to 2027). There will be approximately \$25,000 per year remaining to be utilized for other RWCP initiatives after the funding obligation to SAWS and others is fulfilled.

Table 3: Final 2017 Budget Breakdown

Table 7.1	SAWS Year-2 Contract Costs	2017 Budget for Additional Performance Measures	Total 2017 Budget
\$1,973,000	\$4,507,750	\$25,424.55	\$4,533,174.55

### 5.1.2 Voluntary Irrigation Suspension Program Option

#### Long-term Objective:

The goal of VISPO is to enroll 40,000 acre-feet (AF) of permitted irrigation rights (base and/or unrestricted) that will remain unused in years of severe drought. Permit holders have the option of enrolling in a five – year or ten – year program and will be compensated based on the amount of water enrolled and the program selected. Table 1 below shows the payments for the five and ten year VISPO programs. If the water level at the J-17 index well in San Antonio is at or below 635 feet on October 1 of any year, program participants are contractually obligated to suspend the use of their enrolled water for the following year - beginning on January 1.

Table 1: VISPO Enrollment Options

Years	Fee	1	2	3	4	5
5*	Stand-by	50.00	50.75	51.51	52.28	53.06
	Suspension**	150.00	152.25	154.53	156.84	159.18
10	Stand-by	57.50	57.50	57.50	57.50	57.50
	Suspension**	172.50	172.50	172.50	172.50	172.50

Years	Fee	6	7	8	9	10
5*	Stand-by	N/A	N/A	N/A	N/A	N/A
	Suspension**	N/A	N/A	N/A	N/A	N/A
10	Stand-by	70.20	70.20	70.20	70.20	70.20
	Suspension**	210.60	210.60	210.60	210.60	210.60

\*The amount of each payment escalates at 1.5% annually over the five years of the program.

\*\*Suspension payment is made in addition to stand-by payment.

Table 2: Enrollment concluded on October 6, 2014, with a total enrollment of 40,921 acre-feet.

Program	Atascosa (AF)	Bexar (AF)	Comal (AF)	Hays (AF)	Medina (AF)	Uvalde (AF)	Total (AF)
<b>5-year</b>	354	884	0	123	3,693	20,417	25,471
<b>10-year</b>	0	1,573	0	0	7,803	6,074	15,450
<b>Total</b>	354	2,457	0	123	11,496	26,491	40,921

Table 3: VISPO did not trigger for 2016; therefore, all enrolled water can be used by the permit holders, requiring only standby payments.

Enrollment Year	5 – year	10 – year	Total
<b>2013</b>	\$496,516	\$632,142	\$1,128,658
<b>2014</b>	\$803,480	\$256,237	\$1,059,717
		<b>Grand Total</b>	<b>\$2,188,375</b>

#### Target for 2017:

Enrollment is complete and will not need to be addressed until the end of 2018 when the term will expire for 2013 enrollees that selected the five-year option. For 2017 staff will observe J-17 on

October 1, 2016 and respond by making payments in a timely fashion and monitor pumping to confirm compliance.

**Budget:**

Table 7.1:

\$4,172,000

Estimated 2017 budget\*:

\$4,172,000

\*Since VISPO enrollment is full, expenses for 2017 will be determined by whether or not a trigger condition exists on October 1, 2016.

Table 4: If VISPO does not trigger, the 2017 expenses will be standby only:

<b>Enrollment Year</b>	<b>5 – year</b>	<b>10 – year</b>	<b>Total</b>
<b>2013</b>	\$503,963 .74	\$632,142	\$1,136,105.74
<b>2014</b>	\$815,532.20	\$256,237	\$1,071,769.20
		<b>Grand Total</b>	<b>\$2,207,874.94</b>

Table 5: If VISPO does trigger, the 2017 expenses will include standby and suspension payments as follows:

<b>Enrollment Year</b>	<b>5 – year</b>	<b>10 – year</b>	<b>Total</b>
<b>2013</b>	\$2,015,854.96	\$2,528,568	\$4,544,422.96
<b>2014</b>	\$3,262,128.80	\$1,024,948	\$4,287,076.80
		<b>Grand Total</b>	<b>\$8,831,499.76</b>

#### **5.1.4 Edwards Aquifer Authority Stage V Critical Period Management**

Stage V Critical Period Management was developed and included in the Edwards Aquifer Habitat Conservation Plan to help decrease withdrawals and maintain adequate spring flows at both Comal and San Marcos Springs during times of drought. On February 14, 2012, the Edwards Aquifer Authority (EAA) Board of Directors voted to amend its Critical Period Management (CPM) Program to include the new emergency Stage V. Implementation of Stage V results in a reduction of 44% to municipal, industrial and irrigation permit holders in both pools of the Edwards Aquifer who are authorized to withdraw more than 3 acre-feet per year. Stage V became effective as a rule on March 18, 2013 when the Incidental Take Permit was issued by the U.S. Fish and Wildlife Service. Stage V was first triggered in the Uvalde Pool on March 28, 2013, when the 10-day average at the J-27 index well dropped below 840 feet mean sea level. Stage V reductions remained in effect for 798 days and expired on June 4, 2015.

##### **Target for 2017:**

EAA staff monitors daily aquifer levels in both the San Antonio and Uvalde Pools of the Edwards Aquifer region. If the 10-day average for J-27 or J-17 and Comal springflow levels in reaches the designated trigger for Stage V, the EAA General Manager will issue a Notice of Commencement for implementation in five newspapers within the EAA jurisdiction. Notice will also be posted at the EAA's office and on the EAA website. All affected permit holders will also be provided written notice of implementation of Stage V and the requirement to reduce pumping by 44%.

*Permit Holder Assistance:* The EAA provides an online Critical Period Calculator to assist permit holders in calculating CPM reductions as they apply to each individual permit holder's total authorized withdrawal amount throughout the year. EAA staff also assists permit holders through "one-on-one" customer service offerings as may be necessary.

*Triggers:* The triggers for Stage V in the San Antonio Pool are as follows: the 10-day average at the J-17 index well in San Antonio falls below 625 mean sea level (msl) and the 10-day average at Comal Springs falls below 45 cubic feet per second (cfs); or the 3-day average at Comal Springs falls below 40 cfs. In the Uvalde Pool, Stage V is triggered when the 10-day average at the J-27 index well falls below 840 msl (see attachment I Critical Period Triggers Chart).

*Reporting:* By rule, permit holders are required to report their annual groundwater use to the EAA by January 31 for all groundwater used the preceding year. Permit holders who use more Edwards groundwater than authorized annually are subject to enforcement action.

##### **Budget:**

No budget allocated in Table 7.1

### 6.3.1 Biological Monitoring Program for the Comal and San Marcos Aquatic Ecosystems

Since 2000, the Edwards Aquifer Authority (EAA) has conducted an extensive biological monitoring program in the Comal and San Marcos spring systems. This program was referred to as the Variable Flow Study (VFS). In 2013, the elements of the VFS were incorporated into the Biological Monitoring Program (BioMP) for the Edwards Aquifer Habitat Conservation Plan.

The purpose of the BioMP is “to monitor changes to habitat availability and population abundance of the Covered Species that may result from Covered Activities” (EAHCP § 6.3.1). Another benefit of the BioMP is to collect data that can be used in the applied environmental research studies (EAHCP § 6.3.4) and provide data and information for the ecological model development described in EAHCP § 6.3.3. The BioMP includes: (1) Comprehensive Sampling, (2) any triggered Critical Period monitoring, (3) any high flow triggered monitoring (4) and any EAHCP-specific sampling required by Section 6.4.

In 2016, the Expanded Water Quality Monitoring Program Work Group and the Biological Monitoring Program Work Group were created by the Implementing Committee to carry out a holistic review of the EAHCP monitoring programs and make changes based on the recommendations of National Academy of Sciences (NAS), the NAS Work Group, the input of the Science Committee, the Permittees, and subject matter experts. The Work Groups’ final report – ***“Report of the 2016 Expanded Water Quality Monitoring Program Work Group and Report of the 2016 Biological Monitoring Program Work Group”***<sup>1</sup> (Report) - was presented to the Implementing Committee for approval in June 2016. This work plan reflects the recommendations found in that report.

#### **Target for 2017:**

In 2017, the BioMP will continue as established with the following modifications:

1. Replace the previously conducted macroinvertebrate food source monitoring with Texas Commission on Environmental Quality/Texas Parks & Wildlife Rapid Bio-Assessment (RBA) protocols for macroinvertebrate community health, to be conducted the same time as fixed drop-net sampling for fountain darters at five reaches in the Comal system and four reaches in the San Marcos system.
2. Flow-partitioning within Landa Lake will be conducted by the EAA, but not through the EAHCP.
3. During the “Water Quality Grab Sampling” component of the BioMP, the method detection limit (MDL) for soluble reactive phosphorus will be reduced from 50 µg/l to at least 5 µg/l.

Also, the EAA will conduct a collective analysis of data with other programs conducting monitoring within the spring systems, such as the Clean Rivers Program, currently conducted by GBRA and TCEQ in the Comal and San Marcos rivers, the EAHCP Biological and Water Quality

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<sup>1</sup> Edwards Aquifer Habitat Conservation Plan (2016). *Report of the 2016 Expanded Water Quality Monitoring Work Group and Report of the 2016 Biological Monitoring Program*. San Antonio, TX: Edwards Aquifer Habitat Conservation Plan.

Monitoring Programs and the EAA Aquifer Science Department's groundwater and spring orifice-sampling programs.

**Budget:**

Table 7.1:

\$400,000

Estimated 2017 budget:

\$437,000\*

\*2017 EAHCP BioMP will be performed by an outside contractor; estimated annual costs for the biological monitoring program is \$437,000. The cost of any Critical Period monitoring component of the BioMP, as established by the former EAA Variable Flow Study, will continue to be paid by the EAA.

### **5.7.2 Water Quality Monitoring Program Strategy for Comal Springs and San Marcos Springs**

The goal of the Water Quality Monitoring Program (WQMP), first implemented in 2013, is (1) provide early detection of water quality impairments associated with the San Marcos and Comal Spring and River systems that may negatively impact the Covered Species, and (2) identify the point and nonpoint sources of those impairments, supporting Covered Species protection by allowing for investigation and adoption of any necessary measures through the Adaptive Management Process to address the source(s) of the concerning indicators ( *EAHCP Section, 5.7.2*).

In 2016, the Expanded Water Quality Monitoring Program Work Group and the Biological Monitoring Program Work Group were created by the Implementing Committee to carry out a holistic review of the EAHCP monitoring programs and make changes based on the recommendations of National Academy of Sciences (NAS), the NAS Work Group, the input of the Science Committee, the Permittees, and subject matter experts. The Work Groups' final report – *“Report of the 2016 Expanded Water Quality Monitoring Program Work Group and Report of the 2016 Biological Monitoring Program Work Group”*<sup>2</sup> (Report) - was presented to the Implementing Committee for approval in June 2016. This work plan reflects the recommendations found in that report.

#### **Target for 2017:**

In 2017, the WQMP in both the Comal and San Marcos spring systems will continue as established, but with the following modifications:

1. Surface water (base flow) water quality sampling be removed from the WQMP.
2. Sediment sampling to be conducted once per year, only in even-numbered years.
3. One real-time monitoring data sonde will be added to each spring system and maintained by the EAA.
4. Reduce stormwater sampling to one event each year. Test only for herbicide and pesticide compounds included in the City of San Marcos and City of New Braunfels Integrated Pest Management Plans for golf courses plus atrazine in odd years; test full suite of parameters in even years. Add two additional samples per each event at each site, with priority given to locations at tributary outflows.
5. Passive diffusion sampling will include adding a pharmaceutical and personal care product (PPCP) diffusion sampler at the most downstream sampling site.
6. Groundwater (well) sampling will be conducted by the EAA, but not through the EAHCP.
7. Tissue (fish or clam) sampling will be conducted once a year, in odd-numbered years in each spring system. The tissue sampling will include a pelagic, fish apex predator, a covered benthic fish species (such as the fountain darter), and a sediment dwelling filter feeder (such as the Asian Clam).

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<sup>2</sup> Edwards Aquifer Habitat Conservation Plan (2016). *Report of the 2016 Expanded Water Quality Monitoring Work Group and Report of the 2016 Biological Monitoring Program*. San Antonio, TX: Edwards Aquifer Habitat Conservation Plan.

Also, the EAA will conduct a collective analysis of data with other programs conducting monitoring within the spring systems, such as the Clean Rivers Program, currently conducted by GBRA and TCEQ in the Comal and San Marcos rivers, the EAHCP Biological and Water Quality Monitoring Programs and the EAA Aquifer Science Department's groundwater and spring orifice-sampling programs.

Additionally, the EAA will analyze data from the WQMP as follows:

1. Compare surface (base flow) and stormwater sampling data to Texas Surface Water Quality Standards Aquatic Life Protection, (*30 TAC Ch. 307 Section 307.6*),
2. Compare real time monitoring data to historical long-term averages,
3. Continue to compare sediment data to MacDonald, Ingersoll, and Berger (2000) and TCEQ (2104),
4. Create baseline criteria for the PDS and tissue sampling methods.

**Budget:**

Table 7.1:

\$200,000

Estimated 2017 budget:

\$343,750\*

\*2017 EAHCP Sampling will be performed by an outside contractor; estimated annual costs \$300,000. Real Time Instruments (RTI): \$43,750.

### **6.3.3 Ecological Modeling**

The development of a mechanistic ecological model (Ecomodel) is assigned to the Edwards Aquifer Authority (EAA) per section 6.3.3 of the Edwards Aquifer Habitat Conservation Plan (EAHCP). The purpose of the Ecomodel is to evaluate potential adverse effects to Covered Species and their critical habitat, and to the extent such effects are determined to occur, quantify their magnitude and develop alternate strategies. The Ecomodel Contract is scheduled to be completed and all deliverables transferred to the EAA by December 31, 2016.

#### **Target for 2017:**

The EAA will train staff to operate the Ecomodel. The Ecomodel operator should be able to predict specific ecological responses of the Comal and San Marcos aquatic ecosystems, and associated Covered Species, to various environmental factors in order to assist in understanding the interrelationships between various ecological factors affecting the dynamics of these ecosystems and covered species. In addition, the Ecomodel will allow consideration of potential threshold levels for the two aquatic ecosystems relative to potential environmental stressors, and quantify impacts. This information will help with management decisions and with mitigation design, implementation and monitoring, while aiding with Phase II biological goals and strategies for achievement.

The Ecological Modeling Contract is scheduled to be completed and all deliverables transferred to the EAA by December 31, 2016. There are no contractor work products or expenditures scheduled for 2017.

#### **Budget:**

There is no proposed budget for 2017 at this time.

### 6.3.4 Applied Research

Section 6.3.4 of the Edwards Aquifer Habitat Conservation Plan (EAHCP) includes Applied Research as a “valuable” component of the Phase I package and states that the “Edwards Aquifer Authority (EAA) will contract for the research activities.”

#### **Long Term Objective:**

The experimentation done through the Applied Research program of the EAHCP will continue the study of the Comal Springs riffle beetle life history, submerged aquatic vegetation as fountain darter habitat, the effects of sedimentation on submerged aquatic vegetation, fountain darters and Comal Springs riffle beetle. The information gathered through this program may be utilized in the ecological model and will subsequently be used to inform the Adaptive Management Process and identify strategies for improved mitigation.

In early 2015, the first review of the EAHCP conducted the National Academy of Sciences (NAS) provided recommendations for the Applied Research. From these recommendations, a robust list of possible projects was presented to the NAS Recommendation Review Work Group (RRWG). Based on the recommendation of the RRWG, the Implementing Committee created the Applied Research Work Group at their August 20, 2015 meeting.

*Assumptions:* Completion of all 2016 approved Applied Research projects.

#### **Methodology:**

The purpose of the 2015 Implementing Committee Applied Research Work Group (ARWG) was to evaluate Covered Species research needs to recommend a holistic Applied Research Project Schedule that takes into account the research necessary to better understand the Covered Species in order to achieve the EAHCP’s Biological Goals and Objectives. The applied research schedule developed by the ARWG was reviewed and accepted by the EAHCP Science Committee and the Implementing Committee. This schedule will be used to develop the Work Plans for the Applied Research program in 2016 through 2019 ([http://www.eahcp.org/files/uploads/Final\\_IC-Approved\\_ARWG\\_Report.pdf](http://www.eahcp.org/files/uploads/Final_IC-Approved_ARWG_Report.pdf)).

All Covered Species collected and utilized for Applied Research may be shared with other Applied Research contractors, within United States Fish & Wildlife Service (FWS) and Texas Parks & Wildlife (TPWD) regulations. The FWS and/or TPWD may require that at the conclusion of the research projects, all Covered Species collected and utilized for Applied Research be delivered to the FWS or the TPWD for Refugia operations.

The Science Committee reviewed the proposed projects from the Applied Research Work Group Report for 2017 at their May 13<sup>th</sup> meeting. The list of projects were prioritized to be pursued as funds are available.

The ARWG developed and recommended, and the Science Committee approved the Applied Research for years 2016 – 2019. The approved approach is committed to fund the “*Evaluation of the Life History of the Comal Springs Riffle Beetle, Egg to Adult – Phase II*” (\$187,499) and to conduct as much of the highest priority research designated for 2017 as the allocated budget

(\$237,507) allows, ensuring necessary research in the time frame allocated prior to EAHCP Phase II decisions.

The Edwards Aquifer Authority will develop an RFP based on the key elements with expected deliverables and experimental design criteria for each study approved by the Implementing Committee. Where possible, all efforts will be made to match similar studies to allow for shared facility and expertise in an effort to promote fiscal stewardship.

These RFPs will each be issued through a competitive procurement process that will include publication in six print regional newspapers and direct distribution to a list of at least sixty potential qualified contractors.

**Monitoring:**

EAHCP staff will receive monthly status reports from selected contractors and will visit with selected contractors on-site to evaluate the progress and methodology compliance of Applied Research projects.

*Research Facility:* In 2016, the Edwards Aquifer Authority is entering the third year of a five-year contract (two, one-year extensions remaining) with Texas State University (TEXAS STATE) to allow researchers to use the Freeman Aquatic Building (FAB) raceways, two concrete ponds and wet lab (with living streams and aquaria) to conduct EAHCP research. The TEXAS STATE facilities meet the needs of providing source water, quarantine capabilities, endangered species handling, and infrastructure/resource needs. The EAA pays the utility costs for use of the facilities.

The FAB facilities are available to potential EAHCP contractors, and terms of use will be included in contracts between EAA and researchers. Additionally, EAHCP staff will coordinate the projects for timing and availability of resource needed (tank, living stream, trough, raceway, or pond).

**Budget:**

Table 7.1:

\$450,000

Estimated 2017 budget:

\$450,000

\*The EAA pays the utility costs for use of the facilities (\$25,000 is budgeted for facility use). There is no annual fee for the use of the FAB for Applied Research.

### 5.1.1 Refugia

#### Long-term Objective:

A series of refugia, with back-up populations at other facilities, will preserve the capacity for the Covered Species to be re-established in the event of the loss of population due to a catastrophic event such as the loss of spring flow or a chemical spill.

*Background:* Section 5.1.1 of the Edwards Aquifer Habitat Conservation Plan (EAHCP) provides for Edwards Aquifer Authority (EAA) to support a series of refugia, with back-up populations, to preserve the capacity for these species to be re-established in the event of the loss of population due to a catastrophic event such as a severe reduction or loss of spring flow, or a chemical spill.

The concept of a Refugia is to house and protect adequate populations of the Covered Species (see Table 1) and to conduct research activities to expand knowledge of their habitat requirements, biology, life histories, and effective reintroduction techniques. The use of this support will be limited to the Covered Species listed in the Edwards Aquifer Habitat Conservation Plan (EAHCP) and those associated species that have significant impact on the covered species such as predators, competitors, pathogens, parasites, food, cover, and shelter.

Table 1: Covered eleven species identified in the Edwards Aquifer Habitat Conservation Plan and listed for coverage under the ITP.

Common Name	Scientific Name	ESA Status
Fountain Darter	<i>Etheostoma fonticola</i>	Endangered
Comal Springs Riffle Beetle	<i>Heterelmis comalensis</i>	Endangered
San Marcos Gambusia	<i>Gambusia georgei</i>	Endangered*
Comal Springs Dryopid Beetle	<i>Stygoparnus comalensis</i>	Endangered
Peck's Cave Amphipod	<i>Stygobromus pecki</i>	Endangered
Texas Wild Rice	<i>Zizania texana</i>	Endangered
Texas Blind Salamander	<i>Eurycea rathbuni</i>	Endangered
San Marcos Salamander	<i>Eurycea nana</i>	Threatened
Edwards Aquifer Diving Beetle	<i>Haideoporus texanus</i>	Petitioned
Comal Springs Salamander	<i>Eurycea</i> sp.	Petitioned
Texas Troglotic Water Slater	<i>Lirceolus smithii</i>	Petitioned

\*The San Marcos gambusia was last collected in the wild in 1983 and may already be extinct.

#### Assumptions:

- A contract with a Long Term Refugia contractor will be executed;
- After contract execution, the budget and refugia workplan will be amended to reflect the actual contractual provisions including the necessary infrastructure costs;
- Information collected by the Salvage Refugia contractor on collection methods and rates will be provided to the Long Term Refugia contractor;
- The Chief Science Officer will serve as refugia program manager, the primary liaison between EAA and USFWS, and the EAA technical expert;
- Long term refugia will be operational and capable of receiving Covered Species by January 1, 2017;

- Salvage refugia contract will be terminate in December 2016 and collected animals will be transferred to the Long Term Refugia contractor.

**Target for 2017:**

Establish a captive propagation program initially focusing on the Comal Springs Riffle Beetle, the Comal Springs Dryopid Beetle, and the Pecks Cave Amphipod to include captive rearing, life history, and environmental requirement needs, as follows:

- Collect, establish, and maintain standing stocks, refugia stocks, and salvage stocks of Covered Species (when triggered);
- Ensure identification and acquisition of all required Federal, State and local permits;
- Conduct research as necessary to expand knowledge of the EAHCP Covered Species for refugia operations including, but not limited to, species’ physiology, environmental requirements, health and disease issues, life histories, genetics and effective reintroduction techniques;
- Develop and refine animal rearing methods and captive propagation techniques for the Covered Species;
- Reintroduce species and monitor recovery in the event of a loss of species in their native environment;
- Submit annual reports describing all activities completed under this project including “lessons learned;”
- Attend meetings and give presentations to the USFWS regulatory division, EAHCP Science Committee, EAHCP Implementing Committee, and EAA Board of Directors as necessary.

**Methodology:**

This work plan will be managed by EAA staff with 100% of the work being completed by Contractors.

**Monitoring:**

Monitoring will be conducted through the use of progress reports and site visits to the refugia as well as through intensive management by the EAHCP Chief Science Officer. who will spend significant time at the refugia.

**Budget:**

Table 7.1:  
\$1,678,597

Estimated 2017 budget:  
\$1,678,597

## **FMA § 2.2 EAHCP Program Management**

Section 2.2 of the Funding and Management Agreement (FMA) assigns “general management and oversight” of the Edwards Aquifer Habitat Conservation Plan (EAHCP) to the Edwards Aquifer Authority (EAA). Section 5.6.5 of the FMA allows the EAA to use EAHCP funds for administrative costs and employee salaries, so long as all incurred costs and salaries are 100% related to “general management and oversight” of the EAHCP.

### **Long-term Objectives:**

Manage and oversee day-to-day operations and administration, in coordination with the Applicants of the EAHCP, resulting in a valid and continued Incidental Take Permit (ITP) from the United States Fish and Wildlife Service (USFWS) for designated Covered Activities. Additionally, prepare for and gather information to be used in the Phase II Strategic Adaptive Management decision-making process.

*Program Management:* In 2017, EAHCP staff will continue to coordinate and monitor the work outlined in the Ecological Modeling, Biological Monitoring, Water Quality Monitoring, Applied Research, ASR, and Regional Water Conservation Program work plans. Under the direction of the Chief Science Officer, EAHCP staff will oversee the continued development and operations of the Long-term Refugia and Salvage Refugia programs. This oversight will also include all Refugia research activities. In 2017, EAHCP staff will continue a comprehensive data management system for storing, maintaining, and securing all EAHCP required data.

Additionally, in 2017, EAHCP staff will continue the following activities:

*Program Manager:* The EAHCP Program Manager will execute duties as assigned in the FMA and:

- Serve on the ASR Regional Advisory Group;
- Facilitate the Adaptive Management process;
- Serve on the Regional Water Conservation Monitoring Committee; and
- Facilitate and coordinate all meetings of the EAHCP Implementing, Science and Stakeholder Committees (and possible Subcommittees and Work Groups as created by the Implementing and Stakeholder Committees) and the meetings of the Science Review Panel – the National Academy of Sciences committee.

*EAHCP Staff:* The EAHCP staff will continue the following activities:

- Procure and execute contracts;
- Track contracted project’s compliance;
- Process and pay all invoices and mitigation reimbursements,
- Oversee City of New Braunfels and San Marcos/Texas State University work plan activities;
- Oversee and coordinate research activities at the Texas State University Freeman Aquatic Building;
- Coordinate 2017 work plan amendments and 2018 work plan development process;
- Draft and submit to the USFWS amendments, informational memorandums, and clarifications to the Incidental Take Permit and EAHCP as may be necessary;

- Participate in public outreach initiatives;
- Publish the EAHCP Steward newsletter;
- Maintain and enhance the EAHCP.org website;
- Prepare and compile all of the Permittees' information for the annual report to USFWS; and
- Track and assist EAHCP Permittees with maintaining compliance with secondary implementation permits, such as: U.S. Army Corps of Engineers, Texas Parks and Wildlife Department, Texas Commission on Environmental Quality, General Land Office, and Texas Historical Commission permits.

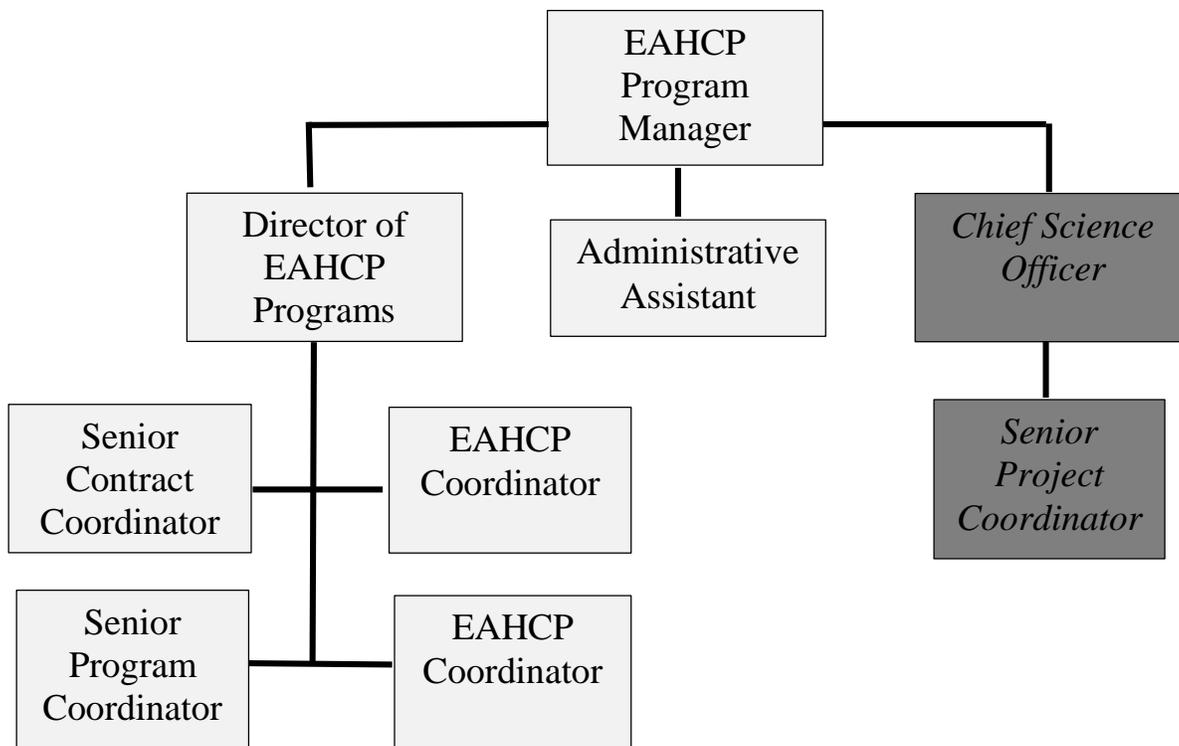
*Adaptive Management Program (AMP):* EAHCP staff, under direction of the Program Manager, will manage the adaptive management decision making process as defined in the Funding and Management Agreement. Specifically, Article 7 defines the procedures for the AMP. In 2017, EAHCP staff will compile all relevant completed research, modeling and other data to be used in the AMP. Also, EAHCP staff will serve as liaison to USFWS in the AMP process.

*EAHCP Implementing, Science and Stakeholder Committees and Work Groups and subcommittees:* EAHCP staff, under the direction of the Program Manager, will continue to manage the meetings and activities of all EAHCP Committees and any subcommittees or Work Groups. The Implementing, Science and Stakeholder Committees will meet according to approved schedules.

*Science Review Panel/National Academy of Sciences:* In 2017, EAHCP staff will continue to provide support for the meetings of the National Academy of Sciences (NAS) and will assist NAS in the development of its third report. In December 2016, the NAS committee will produce its second report on its evaluation of the Phase I conservation measures and its identification of the biological and hydrological questions to be evaluated by the ecological and hydrologic models. In 2017, EAHCP staff will evaluate the recommendations from this second report.

**Target for 2017:**

In summary, the staff, supported by EAHCP program funds, consists of the Program Manager, Director of EAHCP programs, Senior Contract Coordinator, Senior Program Coordinator, two EAHCP Coordinators, and the Administrative Assistant. Additionally, the EAA funds the Chief Science Officer and Senior Project Coordinator staff positions. The structure of the existing EAHCP staff positions and EAA-funded positions are illustrated in the chart on the next page.



 - Positions Paid from EAA General Budget

**Budget:**

The following table summarizes the estimated EAHCP Program Management budget for 2017.

	<b>Table 7.1</b>	<b>2017</b>
Program Management	\$750,000	\$910,000
Science Review Panel/National Academy of Sciences	\$100,000	\$269,750
<b>Total Budget</b>	<b>\$850,000</b>	<b>\$1,179,750</b>

Specifically, the staffing expenses and operational expenses for 2017 are set out in the tables below.

<b>Staffing Expenses</b>	
Salaries	\$518,735
Fringe/Benefits	\$169,217
<b>Total</b>	<b>\$687,952</b>

<b>Staffing and Operational Expenses</b>	
Staffing	\$687,952
Meeting Expenses <sup>3</sup>	\$20,000
Travel	\$3,000
Office Supplies	\$3,000
Professional Development / Memberships	\$3,000
Printing	\$2,000
Professional Contracted Services (PCS)	
PCS – Other	\$ 87,048
PCS – Historical/Archeological Consultation <sup>4</sup>	\$10,000
PCS – Annual Report	\$40,000
PCS – Permit Oversight <sup>5</sup>	\$19,500
PCS – Science Committee Compensation	\$18,000
PCS – Outreach/Newsletter <sup>6</sup>	\$16,500
<b>Total Expenditure</b>	<b>\$910,000</b>

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<sup>3</sup> Meeting expenses for Implementing, Stakeholder and Science Committees as well as ad-hoc work groups. Also, includes reimbursement expenses for Science Committee members travel costs.

<sup>4</sup> Contract for costs to obtain Texas Historical Commission permits for conservation and mitigation measures activities.

<sup>5</sup> Contract for costs to obtain U.S. Army Corps of Engineers, Texas Parks and Wildlife Department, and Texas Commission on Environmental Quality permits for conservation and mitigation measures activities.

<sup>6</sup> Contract to produce the EAHCP bi-monthly newsletter.

**2017 Edwards Aquifer Authority Work Plan Budget**

<b>HCP Section</b>	<b>Conservation Measure</b>	<b>Table 7.1</b>	<b>Estimated 2017 Budget</b>	<b>Difference</b>
5.5.1	Aquifer Storage and Recovery	\$6,953,000	\$4,800,000	\$2,153,000
5.1.3	Regional Water Conservation Program	\$1,973,000	\$4,533,175	(\$2,560,175)
5.1.2	Voluntary Irrigation Suspension Program Option	\$4,172,000	\$4,172,000	\$0
5.1.4	Stage V	\$0	\$0	\$0
6.3.1	Biological Monitoring	\$400,000	\$437,000	(\$37,000)
5.7.2	Water Quality Monitoring	\$200,000	\$343,750	(\$143,750)
6.3.3	Ecological Modeling	\$175,000	\$0	\$175,000
6.3.4	Applied Research	\$450,000	\$450,000	\$0
5.1.1	Refugia	\$1,678,597	\$1,678,597	\$0
FMA	Program Management	\$750,000	\$910,000	(\$160,000)
§2.2	Science Review Panel	\$100,000	\$269,750	(\$169,750)
	<b>Total</b>	<b>\$16,851,597</b>	<b>17,594,272</b>	<b>(\$742,675)</b>

**City of New Braunfels**  
**2017 Work Plan**

## **5.2.1 Flow Split Management**

### **Long-term Objective:**

To sustain flow rates in the Old Channel of the Comal River that compliment Old Channel aquatic vegetation restoration efforts, prevent channel scouring, and maximize the quality of fountain darter habitat.

### **Assumptions:**

Flow-split management is contingent upon reliable and continued access to USGS real-time streamflow data for the Old Channel, New Channel, and Comal River.

### **Target for 2017:**

Maintain flow rates in the Old and New Channels of the Comal River to meet objectives specified in Table 5-3 of the EAHCP. Flow rates in the Old Channel will not be increased to above 65 cfs (per correspondence with USFWS dated November 2015) during normal flow conditions (non-flood conditions) in order to prevent channel scouring and displacement of native aquatic vegetation. The flow rates specified in Table 5-3 are currently under review as part of the submerged aquatic vegetation analysis being conducted by the Edwards Aquifer Authority. This analysis, which is expected to be completed in 2016, may result in changes to the flow rates specified in Table 5-3. The City of New Braunfels will manage flow partitioning between the Old and New Channels based on the results of this analysis.

Priority will be given to achieving target flow rates in the Old Channel and, secondly, to flow rates in the New Channel. City of New Braunfels staff will monitor streamflow conditions via USGS streamflow gages and operate the flow-control gate between Landa Lake and the Old Channel to achieve flow targets. Maintenance activities associated with the flow-control gate will be conducted as needed to ensure continued operability.

### **Methods:**

The City of New Braunfels will manage the flow-split program according to flow rates specified in Table 5-3 (not to exceed 65 cfs in the Old Channel per HCP Science and Implementing Committee consensus and correspondence with USFWS dated November 2015). A standard operating procedure has been developed by the City of New Braunfels to guide adjustments to the flow-control gate and to achieve flow-split targets. City of New Braunfels staff will monitor real-time streamflow conditions at USGS gages in the Comal River system and adjust the flow-control gate, as needed, to meet flow-split targets. Additionally, when total Comal springflow drops below 150 cfs, City of New Braunfels staff will monitor and adjust the flow control structures more frequently, and as needed, to meet the flow-split guidelines defined in Table 5-3. Gates will be kept free of debris, to the extent practicable, and will be exercised routinely to maintain functionality of the gate.

**TABLE 5-3  
FLOW-SPLIT MANAGEMENT FOR OLD AND NEW CHANNELS**

Total Comal Springflow (cfs)	Old Channel (cfs)		New Channel (cfs)	
	Fall, Winter	Spring, Summer	Fall, Winter	Spring, Summer
350+	80	60	270+	290+
300	80	60	220	240
250	80	60	170	190
200	70	60	130	140
150		60		90
100		60		40
80		50		30
70		50		20
60		40		20
50		40		10
40		30		10
30		20		10

**Monitoring:**

Monitoring of streamflow in the Old Channel, New Channel, and Comal River will be based on real-time streamflow data provided by the USGS gages in the Comal River. Adjustments to the flow-control gate will be made on an on-going basis, and after major runoff events, to meet flow-split management objectives. When required, trash racks and vegetation barrier booms will be cleaned to prevent build-up of vegetation and debris which may present operational problems and may restrict flow to the culverts.

**Budget:**

Table 7.1

\$0

Estimated 2017 budget

\$2,500 (as needed for maintenance activities)

\*\$2,500 transferred from 2017 Impervious Cover/Water Quality Protection to fund an increase in Flow Split Management.

### 5.2.2.1/ 5.2.2.3 Old Channel Restoration and Maintenance

#### **Long-term Objective:**

To decrease the density of invasive, non-native aquatic vegetation and increase the coverage of native aquatic vegetation that has been demonstrated to provide suitable fountain darter habitat.

*Assumptions:* Aquatic vegetation restoration in certain locations of the Old Channel will be contingent upon the removal of non-native riparian vegetation that currently prohibits sunlight from reaching portions of the channel. Removal of non-native riparian vegetation in targeted locations will allow additional sunlight to penetrate to portions of the channel that currently do not favor native aquatic species due to limited solar exposure associated with shading effects. Riparian restoration along the Old Channel will be conducted as part of Task 5.7.1: Native Riparian Habitat Restoration. Riparian restoration work will be coordinated with Old Channel aquatic vegetation restoration efforts.

#### **Target for 2017:**

In late 2015, the EAA began an analysis of the submerged aquatic vegetation for the Comal River system including the Old Channel. The goal of this analysis is to establish a timeline, including annual goals, to achieve the vegetation restoration Biological Goals set forth in the EAHCP, and to use lessons learned from field experience in the first years of implementation, to modify existing methodologies. This analysis is expected to be completed in the summer of 2016. All methodologies pertaining to Old Channel aquatic vegetation restoration activities are pending until decisions are made in regards to the submerged aquatic vegetation analysis.

#### **Monitoring:**

Areas where non-native vegetation removal has occurred will be routinely monitored for the re-establishment of non-native vegetation. Previously planted areas will be monitored to assess expansion, die-off, and competition by non-native species. Once native aquatic vegetation is established in an area, monitoring will be conducted on a less frequent basis. Vegetation mapping will be conducted to assess progress of aquatic vegetation restoration efforts.

As noted in the HCP (Section 5.2.2.3), following natural disturbances such as floods, periods of limited recharge, and/or herbivory, as well as anthropogenic disturbances such as recreation or vandalism, the monitoring/maintenance schedule will be adjusted temporarily in order to provide stability for the re-establishment of native vegetation. Monitoring will include aerial coverage mapping of native and non-native vegetation within the Old Channel between Landa Lake and the Old Channel index reach. Any re-established non-native vegetation will be removed during each monitoring visit, and if deemed necessary, additional native vegetation will be planted. Removal of non-native vegetation will follow the same protocols as the original removal methodology. Removed vegetation will be disposed of according to TPWD Invasive Species Removal permit requirements.

#### **Budget:**

Table 7.1:  
\$125,000

Estimated 2017 budget:  
\$135,000

\*\$10,000 transferred from 2017 Impervious Cover/Water Quality Protection to fund an increase in Old Channel Restoration.

### 5.2.2.2/5.2.2.3 Comal River Restoration and Maintenance

#### **Long-term Objective:**

To decrease density of invasive, non-native aquatic vegetation and establish favorable native aquatic vegetation within Landa Lake and select portions of the Comal River to increase useable fountain darter habitat.

#### **Target for 2017:**

In late 2015, the EAA began an analysis of the submerged aquatic vegetation for the Comal River system including the Old Channel. The goal of this analysis is to establish a timeline, including annual goals, to achieve the vegetation restoration Biological Goals set forth in the EAHCP, and to use lessons learned from field experience in the first years of implementation, to modify existing methodologies. This analysis is expected to be completed in the summer of 2016. All methodologies pertaining to Old Channel aquatic vegetation restoration activities are pending until decisions are made in regards to the submerged aquatic vegetation analysis.

#### **Monitoring:**

Each area in which non-native vegetation has been removed will be routinely monitored for the re-establishment of non-native vegetation and effectiveness of the native vegetation plantings. Once native aquatic vegetation is established, monitoring will be conducted on a less frequent basis. However, if monitoring suggests continued gardening and/or supplemental planning is required, this will continue as needed. Vegetation mapping will be conducted to assess progress of aquatic vegetation restoration efforts.

However, as noted in the HCP (Section 5.2.2.3), following natural disturbances such as floods, periods of limited recharge, and/or herbivory, as well as anthropogenic disturbances such as recreation or vandalism, the monitoring/maintenance schedule will be adjusted temporarily in order to provide stability for the native vegetation reestablishment. Where possible, landowners immediately adjacent to Landa Lake and the Upper Spring Run area will be informed of aquatic restoration efforts in order to promote awareness and minimize negative impacts associated with recreation and/or maintenance. Any re-established non-native vegetation will be removed during each monitoring visit and if deemed necessary, additional native vegetation will be planted.

#### **Budget:**

Table 7.1:

\$100,000

Estimated 2017 budget:

\$100,000

### **5.2.3 Management of Public Recreation**

Public recreational use of the Comal River ecosystems include, but are not limited to swimming, wading, tubing, boating, canoeing, kayaking, golfing, scuba diving, snorkeling and fishing. To minimize the impacts of incidental take resulting from recreation, the City of New Braunfels will continue to implement existing recreation control measures as specified in Section 5.2.3.(1) of the HCP and will seek voluntary participation in the Certificate of Inclusion (COI) program from outfitters who facilitate recreation activities within the Comal River system.

#### **Long-term Objective:**

To minimize and mitigate the impacts of recreation on endangered species habitat within the Spring Runs, Landa Lake and the Comal River.

*Assumptions:* The success of this program will be contingent on the cooperation of river outfitters and their willingness to participate in the COI program.

#### **Target for 2017:**

Inform river recreation Outfitters on the benefits of the EAHCP COI program. Recruit Outfitters who conduct their operations in the Comal River system and wish to participate in the COI program. Monitor the status of participating outfitters to comply with the minimum outfitter standards and requirements set forth in the HCP. Continue to enforce existing restrictions that limit recreational access to Landa Lake, Spring Runs, and the Old Channel of the Comal River.

#### **Methods:**

The City will continue to work in conjunction with EAHCP program staff to develop COI program documents and program administration. The City will contact river outfitters to inform them of the COI program. The COI will include the minimum requirements as specified in Section 5.2.3 (2) a-h.

The City will continue to enforce existing recreational access restrictions on Landa Lake, Spring Runs, and the Old Channel utilizing trained Park Rangers.

#### **Monitoring:**

The City of New Braunfels staff will collaborate with all COI participants and report on the program annually.

#### **Budget:**

Table 7.1:

\$0

Estimated 2017 budget:

\$0

## **5.2.4 Decaying Vegetation Removal and Dissolved Oxygen Management**

### **Long-term Objective:**

Maintain acceptable levels of DO within Landa Lake and minimize the impacts associated with decaying vegetation (or other factors).

*Assumptions:* It is assumed that the Edwards Aquifer Authority will calibrate and maintain an index site(s) for monitoring and observing real-time dissolved oxygen levels at strategic locations within Landa Lake. DO data collected by the EAA will be shared with the City of New Braunfels to help inform management decisions. The continued dislodging of floating vegetation mats from Landa Lake is dependent on continued funding of Task 5.2.10: Litter Collection and Floating Vegetation Management.

### **Target for 2017:**

Develop a comprehensive DO management plan for Landa Lake. The management plan will include an evaluation of existing DO data and research and will identify feasible mitigation strategies that can be implemented in Landa Lake during periods of depressed DO. The City of New Braunfels will continue to operate existing aerators when DO concentrations, as measured in Landa Lake, fall below 4 mg/l. The efficiency and suitability of the existing aerators to increase DO concentrations during periods of low springflow will also continue to be evaluated in 2017.

### **Methods:**

The City of New Braunfels will solicit professional assistance for, and engage in, the development of a comprehensive DO management plan for Landa Lake. The plan will include the analysis of all existing DO data and research to help predict DO concentrations during low-flow periods based on the minimum total Comal discharge management objectives set forth in Table 4-2 of the HCP. The plan will also include an evaluation of the linkage between observed fountain darters and DO measurements collected as part of the EAHCP Biological Monitoring Program and EAA Variable Flow Study. Feasible and cost-effective DO mitigation strategies will also be researched, evaluated, and included in the management plan. The management plan will be intended to guide the City of New Braunfels in achieving compliance with Task 5.2.4 of the HCP. If predicted or observed dissolved oxygen diel patterns are trending toward less than 4 mg/l the solar-powered aeration units will be deployed by City of New Braunfels staff.

Aquatic vegetation conditions and floating vegetation mats will be visual observed for signs of stress or decay on a weekly basis. If vegetation decay is evident and floating vegetation mat coverage reaches critical levels, then removal of decaying vegetation will be considered or other comparable management strategies will be developed based on specific conditions.

### **Monitoring:**

Real-time dissolved oxygen and temperature will be monitored to evaluate projected trends indicative of problematic temperature or oxygen levels. Vegetation and floating vegetation mats in Landa Lake will be monitored on a weekly basis during the May

through September period to assess overall conditions and apparent stress levels (i.e., leaf coloration and condition).

**Budget:**

Table 7.1:

\$15,000

Estimated 2017 budget:

\$15,000

### **5.2.5/5.2.9 Non-Native Animal Species Control**

The City of New Braunfels will continue to implement a program to reduce non-native animal species in the Comal River system. The non-native animal species that will be targeted include the suckermouth armored catfish, tilapia, nutria, and ramshorn snail. Since this work plan has two components identified within the HCP, each component has been broken out to facilitate the development of the work plan and budgets.

#### **Long-term Objective:**

Reduce populations of non-native animal species to minimize their direct and indirect impacts to the Covered Species and the Comal River ecosystem.

*Assumptions:* The HCP Biological Monitoring program will continue to track populations of targeted invasive, non-native species. Data collected as part of this program will be utilized to guide and refine invasive species removal efforts.

#### **Target for 2017:**

Continue existing program to remove non-native invasive species, including tilapia, nutria, and suckermouth armored catfish from the Comal River system utilizing removal methods proven successful in previous years. Continue to record counts and biomass of removed species.

#### **Methods:**

Seasonal concentration of tilapia and other non-native fish into localized areas will be exploited for removal through seining techniques utilizing mesh sizes that are selective against impacting fountain darters and other Covered Species. Each seining effort will involve salvage of native species, which will be returned to the system. The City of New Braunfels will continue its nutria trapping program. A major focus of non-native removal will target suckermouth catfish given their overall destructive impacts on habitats within the system. Given the anticipated difficulties in control of suckermouth catfish, several different removal techniques will be attempted that include trapping with hoop nets and gigging with divers. All removed non-native species will be disposed of offsite following City of New Braunfels policies.

#### **Monitoring:**

The HCP Biological Monitoring program will assess the status of non-native species populations and the impact of non-native removal to the Covered Species.

### **Reduction of Non-Native Species Introduction and Live Bait Prohibition**

#### **Long-term Objective:**

Minimize the introduction of non-native species to the Comal River system.

*Assumptions:* The City of New Braunfels will explore the potential for implementing an education and outreach program aimed at educating and informing residents and visitors on the negative impacts of aquarium dumping and live bait usage. It is assumed education

methods will provide more benefit than the implementation of ordinances and prohibitions regarding aquarium dumping and live bait usage.

**Target for 2017:**

Develop and implement a program to educate residents and visitors on the negative impacts of aquarium dumping and usage of specific live bait species. Education and outreach will be achieved by distributing educational information and installing signage at key locations at Landa Lake and the Comal River. TPWD education materials and programs will be consulted and utilized.

**Methods:**

Distribute education and outreach materials designed to inform the public of the impacts of invasive species on the Comal River ecosystem. TPWD programs regarding the introduction of non-native, invasive species will be assessed and potentially utilized.

**Monitoring:**

It is anticipated that the HCP Biological Monitoring program will detect the presence of newly introduced species. Signage will be inspected annually for repair or replacement as necessary as well as identification of other locations that may need signage.

**Budget:**

Table 7.1:

\$75,000

\*\$20,000 transferred from the Non-Native Animal Species Control task to fund Bank Stabilization and Riparian Restoration project in 2016.

Estimated 2017 budget:

\$55,000

### 5.2.6/6.3.6 Monitoring and Reduction of Gill Parasites

The City of New Braunfels will continue to implement a monitoring program associated with the gill parasite (*Centrocestus formosanus*) and its intermediate host snail *Melanoides tuberculatus*.

#### **Long-term Objective:**

To conduct monitoring and acquire data regarding gill parasite cercariae water column concentrations, fountain darter infection rates, host snail density and distribution, and gill parasite hosts to determine potential threats to fountain darters and other Covered Species within the Comal system. Develop management measures, as needed, to minimize negative impacts to fountain darter populations caused by gill parasites.

#### **Target for 2017:**

Continue existing monitoring program including snail distribution and density monitoring, cercariae water column concentration monitoring and snail infection prevalence.

#### **Methods:**

It is anticipated that methods used in previous years (2014-2016) to conduct annual *Melanoides* distribution and density surveys will be utilized in 2017. Two fisheries biologist using dip nets will traverse the entire Comal System recording the location of dip net sweeps and number of snails collected within each sweep. Water column cercarial concentration sampling will be conducted annually across the channel at the established transects. A total of 10 samples will be targeted at each cross section unless complex hydraulics suggests a higher spatial sampling. Sampling will proceed from downstream to upstream reaches. Samples will be collected between 9 and 11 am on sunny days to minimize temporal variance in the sampling. Each water sample will be filtered using an apparatus described in Cantu (2003). The cercariae will then be stained on the filters with a 10% Rose Bengal solution. Filters will then be transported to the contractor's laboratory where the number of cercariae on each filter will be counted with the aid of a dissecting microscope. Cercarial concentrations will be monitored more frequently when spring flow declines below 100 cfs or other springflow triggers that are developed.

#### **Budget:**

Table 7.1

\$75,000

\*\$45,000 transferred from the Gill Parasite Control task to fund Bank Stabilization and Riparian Restoration project in 2016.

Estimated 2017 budget:

\$ 30,000

### **5.2.7 Prohibition of Hazardous Materials Transport Across the Comal River and Its Tributaries**

The City of New Braunfels will continue to promote the prohibition of the transport of hazardous materials on routes crossing the Comal River and its tributaries. This effort may include development of local ordinances, installation of additional signage, and TXDOT approval.

#### **Long-term Objective:**

To minimize the potential for accidental spills or releases of hazardous materials into the Comal River system that may cause negative impacts to the Covered Species.

#### **Target for 2017:**

Maintain signage installed in 2016 and monitor for the presence of trucks carrying hazardous cargo on routes crossing the Comal River and its tributaries.

#### **Methods:**

In 2016, the City of New Braunfels reviewed existing City ordinances and concluded that Ordinance No. 93-7 effectively restricts the transport of hazardous cargo within Loop 337 and IH-35 and therefore, over roadways crossing the Comal River. The installation of additional hazardous route prohibition signage at key roadways near the headwaters of Landa Lake and the Comal River is expected to have been completed by the end of 2016.

#### **Monitoring:**

The City of New Braunfels Police Department will monitor for trucks carrying hazardous cargo on prohibited routes.

#### **Budget:**

Table 7.1:

\$0

Estimated 2017 budget:

\$0

### **5.2.8 Native Riparian Habitat Restoration (Comal Springs Riffle Beetle)**

The City of New Braunfels will continue to implement a program to restore and maintain native riparian zones along Spring Run 3 and the western shoreline of Landa Lake to benefit the Comal Springs Riffle Beetle. Upon establishment of riparian zones on City of New Braunfels property, the City may develop a program to provide funding and incentives to riparian landowners who wish to establish native riparian vegetation on privately-owned lots located along the Western shoreline of Landa Lake.

#### **Long-term Objective:**

Establish a healthy, functioning riparian area along Spring Run 3 and the western shoreline of Landa Lake to benefit the Comal Springs Riffle Beetle. Establish native riparian vegetation to increase the stability of the bank, decrease erosion/ sedimentation, and increase the amount of usable habitat and food sources.

*Assumptions:* It is assumed this effort will continue to focus on the identification of target native riparian species most beneficial for the Comal Springs Riffle Beetle that also meet erosion control requirements. The target area for subsequent removal and establishment of native vegetation is the upstream 100 meters of Landa Lake and Spring Run 3 and proceeding north into private property lots (along the waters edge). It is assumed the effort will be split between the bluff and Spring Run 3 given the different characteristics in these locations and therefore differences in approaches are anticipated. Restoration of the remaining area will be accomplished in segments during future years and incorporate revisions based on monitoring of work undertaken in previous years.

#### **Target for 2017:**

Continue to maintain previously restored areas along Spring Run 3 and the Western shoreline of Landa Lake. Continue removal of non-native vegetation and planting of native riparian vegetation. Continue to monitor recently restored areas for stability and established vegetative growth.

#### **Methods:**

Continue the removal of non-native, invasive plant species within the riparian zone. Plant deer-resistant, native plant species in Spring and Fall in areas where vegetation is sparse or not present. Plantings will be focused immediately along the waters' edge and in areas immediately up gradient of the shoreline. Utilize native plant species which have been observed in the immediate area and have proven successful in previous planting efforts. Install erosion/ sediment control devices, as needed in areas lacking sufficient vegetation and stability, to control hillside erosion and resulting sedimentation to riffle beetle habitat areas. Install fencing around young plants, as needed, to control foraging and damage by wildlife. Irrigation lines were installed in previous years and will be utilized and maintained, as necessary, to increase the survivability of plantings.

#### **Monitoring:**

Monitoring will occur on a regular basis to assess the survivability of plantings and the presence of non-native vegetation. Planting plots have been mapped and are utilized to

track the success of plantings in specific locations. Methods will be revised, as needed, based on results of monitoring. In the event of heavy rainfall, the erosion and sedimentation will be assessed in the following week. Sediment control devices will be monitored to assess effectiveness and stability. Sediment captured behind the control devices will continue to be measured and total volume quantified. The HCP Biological Monitoring program will track riffle beetle populations within Spring Run 3 and along the western shoreline of Landa Lake. Data collected as part of the biological monitoring program will be utilized to determine locations for focusing riparian zone restoration activities.

**Budget:**

Table 7.1:

\$25,000

Estimated 2017 budget:

\$25,000

### **5.2.10 Litter and Floating Vegetation Control**

The City of New Braunfels will continue ongoing activities to manage floating vegetation and litter removal to enhance Covered Species and to prevent accumulations above and within aquatic vegetation restoration areas. Management activities will include dislodging of vegetation mats, to allow continued movement downstream, that form on top of the water surface and removal of litter for the littoral zone and stream bottom. The City of New Braunfels will manage aquatic vegetation in Landa Lake by dislodging floating vegetation entrained on the flow control structures, fishing piers, Landa Park Drive Bridge and other locations within Landa Lake where vegetation mats and litter accumulate.

#### **Long-term Objective:**

Minimize impacts of floating vegetation and litter on the overall aquatic community within the Comal River system.

#### **Background:**

Currently the City of New Braunfels contracts with a private contractor for the removal of litter and dislodging of floating vegetation from Landa Lake, the Comal River and the Guadalupe River. SCUBA collections on the Comal River were added in 2007 as a pilot program and in 2008 as part of the contracts. SCUBA was added to protect the underwater habitat in the Comal River. Also in 2008, litter collection in Landa Lake was added to specifically protect species habitat. The City of New Braunfels cooperated with the USFWS to implement litter collections in Landa Lake. These additional expenditures have been voluntary on the part of the City of New Braunfels in past years, but now are mandatory based on requirements in the HCP Section 5.2.10. It is possible that without funding from the HCP, this mitigation action would be unfunded in 2017.

All litter removal and vegetation dislodging in Landa Lake is associated with protection of Covered Species habitat, as there is no tubing recreation in Landa Lake. Underwater collection (SCUBA) in the Comal River is associated with resource protection (species habitat), however above water collection on the Comal River is a direct result of tubing activities. Collections on the Guadalupe River have no relevance to the HCP or species protection. Therefore, only costs associated with Landa Lake and underwater Comal River collections will be included in HCP activities and budgets.

#### **Target for 2017:**

Continue efforts to remove litter and dislodge floating vegetation mats from applicable portions of the Comal River system to prevent negative impacts to flow control structures, aquatic restoration areas, and Covered Species habitat. In the event of low-flow conditions or receipt of depressed dissolved oxygen levels in Landa Lake, the removal of, and/or increased efforts to dislodge, floating vegetation mats may be initiated to prevent oxygen consumption by decaying vegetative material.

#### **Methods:**

*Landa Lake:* (Jan 1<sup>st</sup> to December 31<sup>st</sup>). Routine vegetation maintenance and litter removal will occur from Jan 1<sup>st</sup> to December 31<sup>st</sup>. Vegetation maintenance and litter

removal will occur on a scheduled basis between March and September and on an as-needed basis during the remainder of the year. Floating vegetation mats will be dislodged from flow control structures, the Three Islands area, fishing pier and other locations where vegetation mats accumulate.

*Comal River:* (April 1<sup>st</sup> to October 30<sup>th</sup>). Vegetation maintenance and litter pickup from May 1<sup>st</sup> to September 30<sup>th</sup> is on a scheduled basis. Floating vegetation will be dislodged and inorganic litter will be picked up from the substrate, surface and littoral zone of the Old Channel. Underwater litter in the New Channel from the NBU Hydroelectric dam downstream to below the last tubers exit will be removed utilizing SCUBA.

**Monitoring:**

City of New Braunfels staff will monitor litter and floating vegetation mats in applicable areas. City staff will monitor contractor efforts and coordinate additional efforts when deemed necessary.

**Budget:**

Table 7.1:

\$0

Estimated 2017 budget:

\$30,000

\*\$30,000 transferred from 2017 Impervious Cover/Water Quality Protection to fund Litter and Floating Vegetation Management. Budget consists of contract which includes dislodging floating veg-mats (\$20,000), underwater litter collection (\$5,000), and litter removal with in the Old Channel (\$5,000).

### **5.2.11 Golf Course Management and Planning**

The City of New Braunfels will implement their existing Integrated Pest Management Plan (IPMP) for Landa Park Golf Course. This process will incorporate public input and the Golf Course Advisory Board. The golf course IPMP will incorporate environmentally sensitive techniques to minimize chemical application, continue to improve water quality, and reduce negative effects to the ecosystem. Expanded water quality sampling targeted at Golf Course operations will be conducted as described in Section of 5.7.2 of the HCP.

#### **Long-term Objective:**

Management of the golf course and grounds to minimize and reduce negative effects to aquatic ecosystem in Landa Lake and the Comal River.

*Assumptions:* The Landa Park Golf Course will continue to implement their existing IPMP and make adjustments to the plan as needed.

#### **Target for 2017:**

Continue to implement and update the existing IPMP.

#### **Methods:**

The golf course and grounds will be maintained in an aesthetically pleasing, yet environmentally sensitive manner. It is the responsibility of the Golf Course Manager to maintain the course and grounds in accordance with the new IPMP. The IPMP describes activities and materials to be used to control pests (i.e. insects, weeds, and other living organisms requiring control) on the golf course in a way that minimally impacts the environment.

#### **Monitoring:**

The EAHCP Water Quality Monitoring Program includes base flow and storm sampling at designated locations along the Comal River both up- and downstream of the Landa Park Golf Course. Samples are analyzed for various herbicides and pesticides. Detections of pesticides and herbicides utilized for golf course maintenance operations may warrant the need for revisions to the existing IPMP.

#### **Budget:**

Table 7.1:

\$0

Estimated 2017 budget:

\$0

### **5.7.1 Native Riparian Habitat Restoration**

#### **Long-term Objective:**

Increase the area and density of native riparian vegetation, reduce non-native riparian vegetation, and prevent streambank erosion in areas immediately adjacent to the Comal River to compliment aquatic vegetation restoration efforts and improve water quality.

#### **Target for 2017:**

Monitor and maintain previously restored riparian areas along the Old Channel of the Comal River between Landa Lake and the Golf Course Road bridge crossing (i.e. maintenance of riparian restoration that occurred as part of the Bank Stabilization and Riparian Restoration project in 2016). Remove non-native riparian vegetation along the Old Channel of the Comal River between Golf Course Road and the Old Channel Index Reach. Removal of non-native vegetation and select native vegetation will first be targeted to locations that will increase solar penetration and compliment aquatic vegetation restoration efforts. Install erosion control structures along channel utilizing removed non-native vegetation.

#### **Methods:**

Riparian restoration occurring in 2016 as part of the Bank Stabilization and Riparian Restoration project will be monitored and maintained to ensure success of native plantings and prevention of non-native vegetation re-emergence.

Non-native riparian vegetation (primarily *Ligustrum sp.*) will be removed utilizing herbicide applications and hand-removal methods. Removed vegetation will be utilized to form sediment capture zones in riparian areas with high erosion potential. In areas where riparian vegetation consists of only non-native species, a portion of the non-natives will be left in place until native species are planted in order to minimize the potential for erosion. Planting of native riparian vegetation is expected to occur in 2018.

#### **Monitoring:**

Monitor changes of solar exposure to the Old Channel as a result of non-native riparian plant removal. Previously restored riparian areas will be monitored for the re-emergence of non-native vegetation and success of native plantings. Sediment capture structures will be monitored for effectiveness.

#### **Budget:**

Table 7.1:

\$100,000

\*\$50,000 transferred from 2017 Native Riparian Habitat Restoration to fund Bank Stabilization and Riparian Restoration project in 2016.

Estimated 2017 budget:

\$50,000

### **5.7.5 Management of Household Hazardous Wastes**

The City of New Braunfels will continue the hazardous household waste (HHW) program through the City of New Braunfels' Solid Waste division.

#### **Long-term Objective:**

Reduction in the improper disposal of hazardous wastes and incorporation of prescription drug and Freon drop off.

#### **Target for 2017:**

Continue hazardous household waste program which will include three HHW collection events. The City of New Braunfels will tentatively hold one additional HHW collection event in 2017 pending available budget.

#### **Methods:**

Conduct HHW collection events which incorporate an education and outreach component.

#### **Monitoring:**

The volume of hazardous waste material collected during the HHW collection events will be noted and compared to previous efforts.

#### **Budget:**

Table 7.1:

\$30,000

\*\$30,000 transferred from 2017 Management of HHW to fund Bank Stabilization and Riparian Restoration project in 2016.

Estimated 2017 budget:

\$30,000

\*\$30,000 transferred from 2017 Impervious Cover/Water Quality Protection to fund Litter and Floating to HHW.

## 5.7.6 Impervious Cover/Water Quality Protection

### **Long-term Objective:**

Reduction and control of non-point source pollutant discharges to Landa Lake and the Comal River system. To increase the implementation of Low Impact Development (LID) projects and provide incentives to reduce impervious cover.

*Assumptions:* It is assumed HCP funding will be available in future years to implement a LID Rebate Program and/ or other water quality protection strategies.

### **Target for 2017:**

The City will continue to examine the LID Rebate Program, as it has been developed to date, and will consider the inclusion of specific measures, methods, and funding in the 2018 EAHCP Work Plan for implementation of a water quality protection program.

### **Methods:**

In 2016, the City of New Braunfels adopted a LID Manual. In 2017, the City will at a minimum continue to provide information about the LID Manual to individual property owners and educate them about the incentives expected to be included in the LID Rebate Program. Other water quality protection strategies will also be evaluated in order to develop a water quality protection program that will provide maximum benefit to water quality and the covered species.

### **Budget:**

Table 7.1:

\$100,000

\*\$15,000 transferred from 2017 Impervious Cover/Water Quality Protection to fund Bank Stabilization and Riparian Restoration project in 2016.

Estimated 2017 budget:

\$10,000

\*\$30,000 transferred from 2017 Impervious Cover/Water Quality Protection to fund Litter and Floating Vegetation Management, \$30,000 transferred to HHW, \$10,000 transferred to fund an increase in Old Channel Restoration, and \$2,500 transferred to fund an increase in Flow Split Management.

**2017 City of New Braunfels Work Plan Budget**

<b>HCP Section</b>	<b>Conservation Measure</b>	<b>Table 7.1</b>	<b>Estimated 2017 Budget</b>	<b>Difference</b>
5.2.1	Flow Split Management	\$0	\$2,500	(\$2,500)
5.2.2.1	Old Channel Restoration	\$125,000	\$135,000	(\$10,000)
5.2.2.2/ 5.2.2.3	Comal River Aquatic Vegetation Restoration & Maintenance	\$100,000	\$100,000	\$0
5.2.3	Management of Public Recreation	\$0	\$0	\$0
5.2.4	Decaying Vegetation Removal and Dissolved Oxygen Management	\$15,000	\$15,000	\$0
5.2.5/5.2.9	Non-native Animal Species Control	\$75,000	\$55,000	\$20,000
5.2.6/6.3.6	Monitoring and Reduction of Gill Parasites	\$75,000	\$30,000	\$45,000
5.2.7	Prohibition of Hazardous Material Transport Routes	\$0	\$0	\$0
5.2.8	Native Riparian Habitat Restoration (Riffle Beetle)	\$25,000	\$25,000	\$0
5.2.10	Litter and Floating Vegetation Management	\$0	\$30,000	(\$30,000)
5.2.11	Golf Course Management	\$0	\$0	\$0
5.7.1	Native Riparian Habitat Restoration	\$100,000	\$50,000	\$50,000
5.7.5	Management of Household Hazardous Waste	\$30,000	\$30,000	\$0
5.7.6	Impervious Cover/ Water Quality Protection	\$100,000	\$10,000	\$90,000
	<b>Totals</b>	<b>\$645,000</b>	<b>\$482,500</b>	<b>\$162,500</b>



**City of San Marcos/Texas State University  
2017 Work Plan**

### **5.3.1/5.4.1 Texas Wild-Rice Enhancement and Restoration**

Texas State University and the City of San Marcos are continuing to partner to enhance and restore Texas wild-rice (TWR) in Spring Lake and the San Marcos River to the San Marcos wastewater treatment plant.

#### **Long-term Objective:**

To restore 8000 m<sup>2</sup> of TWR (in addition to the 2013 baseline of 4000 m<sup>2</sup>) and protect existing and restored areas of TWR (as required in Table 4-10).

*Plant Source:* The production of Texas wild-rice occurs at the Freeman Aquatic Building (FAB) at Texas State University and the U.S. Fish and Wildlife Service San Marcos Aquatic Research Center (SMARC). Production of plants at the FAB and SMARC is incorporated into this work plan budget (TWR Enhancement & Removal of non-natives).

Enhancement and restoration of TWR focuses on the removal of non-native vegetation within mixed stands of TWR and removal of non-native vegetation in areas adjacent to existing TWR stands. The work plan also includes selective TWR planting areas where non-native vegetation and sediment is removed as discussed in EAHCP measures 5.3.6/5.4.4 (Sediment removal) and 5.3.8/5.4.3/5.4.12 (Control of non-native plant species). In addition, TWR areal coverage within Spring Lake is targeted for 1500 m<sup>2</sup>.

#### **Target for 2017:**

In late 2015, the EAA began an analysis of the submerged aquatic vegetation for the San Marcos springs systems. The goals of this analysis is to establish a timeline, with annual goals, to achieve the vegetation restoration Biological Goals in the EAHCP, and to use lessons learned from field experience in the first years of implementation, to modify methodologies. This analysis is expected to be completed in the summer of 2016. All methodologies and goals pertaining to this conservation measure are pending until decisions are made in regards to the submerged aquatic vegetation analysis.

#### **Monitoring:**

All planted areas are filmed via quadcopter which is then mapped and analyzed via GIS.

#### **Budget:**

Table 7.1:

\$125,000

Estimated 2017 budget:

\$100,000

\*\$25,000 transferred to Non-native Plant Removal for 2017

### **5.3.6/5.4.4 Sediment Removal**

The City of San Marcos and Texas State University are partnering to remove sediment from the river bottom in support of the native SAV planting program from Spring Lake to IH-35.

#### **Long-term Objective:**

To remove sediment in areas of planting activity to enhance success of TWR and other native SAV plantings. This long-term objective is in flux in response to the decreased funding in Table 7.1. For 2017, we will focus on sediment removal for only SAV plantings and then re-evaluate for following years. To remove 158 m<sup>3</sup>, the cost has been \$555,000 (2013 – 2015).

#### **Target for 2017:**

Remove sufficient sediment to maximize success of TWR and SAV plantings (see TWR Enhancement & Non-native Removal sections).

#### **Method:**

As specified in the HCP, hydrosuction will be used to remove accumulations of sediment. Divers will be trained on equipment operations, diving safety protocols, and recognition of all stages of listed species from larval to adult.

Divers remove all vegetation and then scan the area for the presence of listed species and other biota prior to starting dredging operations. One diver floats on surface to manage the pump and relay information to the dredge operator, one worker will be stationed by the discharge point to monitor operations and answer public questions. Disposal of removed sediment will be at the Texas State University Composting Center or Animal Shelter compost site.

#### **Monitoring:**

Turbidity is monitored during and after all removal efforts.

#### **Budget:**

Table 7.1:  
\$25,000

Estimated 2017 budget:  
\$25,000

### **5.3.8/5.4.3/5.4.12 Control of Non-Native Plant Species**

The City of San Marcos and Texas State University are partnering to implement an on-going non-native plant replacement program for the San Marcos River from Spring Lake to Stokes Island. Non-native species of aquatic, littoral, and riparian plants will be replaced with native species to enhance Covered Species habitat.

#### **Long-term Objective:**

To keep the density of invasive aquatic, littoral and riparian plants as low as possible through monitored removal in and along the San Marcos River.

*Assumptions:* Non-native aquatic plants will be removed in association with fine sediment removal and TWR enhancement as described in conservation measures 5.3.6/5.4.4 and 5.3.1/5.4.1. It is also assumed that production of native aquatic plants will continue at the FAB and the SMARC. Funding for the production of plants at the FAB and SMARC is incorporated into this work plan budget. Removal of littoral plants and other small caliper invasives is also included in this budget as a separate project.

#### **Target for 2017:**

In late 2015, the EAA began an analysis of the submerged aquatic vegetation for the San Marcos springs systems. The goals of this analysis is to establish a timeline, with annual goals, to achieve the vegetation restoration Biological Goals in the EAHCP, and to use lessons learned from field experience in the first years of implementation, to modify methodologies. This analysis is expected to be completed in the summer of 2016. All methodologies and goals pertaining to this conservation measure are pending until decisions are made in regards to the submerged aquatic vegetation analysis.

*Littoral:* The area from Spring Lake to just below IH-35 has undergone initial removal of elephant ears, so in 2017 all treated areas will be monitored for regrowth and planted with natives. Most importantly, efforts will be extended to remove hot spots that contribute to regrowth.

#### **Methods:**

*Littoral:* On the banks, elephant ear (*Colocasia esculentes*) is the focus of removal efforts. *C. esculenta* primarily reproduces by producing additional tubers beneath the soil or by sending off long runners called stolons which attempt to root in the soil or in any nearby body of water. The species also produces an inflorescence with a spathe tube that is green but the blade is orange on both sides. Hand removal will be used wherever possible. Chemical removal consists of the use of glyphosate-based aquatic herbicide and surfactant that is drip-sprayed onto the surface of the leaves and stalks to remove more “entrenched” elephant ear plants. Small caliper invasive plants in the littoral zone are also removed.

#### **Monitoring:**

*Aquatic vegetation:* Newly planted areas are monitored monthly to evaluate success rate. The planted areas will be weeded (non-native species removed) and replanted as needed to meet target areal coverage. An annual river inventory will be conducted to identify the presence and

location of new non-native vegetation establishment. Turbidity will be monitored during and after all removal efforts. Success will be measured by the surface area cleared of non-natives and increased coverage by native SAV.

**Budget:**

Table 7.1:

\$75,000

Estimated 2017 budget:

\$170,000

\*\$95,000 transferred from TWR Enhancement (\$25K) and Bank Stabilization (\$20K) and WQ/LID (\$50K) to cover the scope of this measure across three contractors annual budget.

### **5.3.3/5.4.3 Management of Floating Vegetation Mats and Litter**

The City of San Marcos and Texas State University are partnering to implement an ongoing program to manage floating vegetation and litter removal for the enhancement of listed species habitat. Management activities include removal of vegetation mats that form on top of Texas wild-rice plants, particularly during low flows, and removal of litter from the littoral zone, stream bottom and tributaries. Texas State University will manage aquatic vegetation in Spring Lake through use of its harvester boat and hand cutting of vegetation by divers authorized to dive in Spring Lake.

#### **Long-term Objective:**

Minimize impacts of floating vegetation and litter on TWR stands and overall aquatic community within the San Marcos River, as well as keep springs clear to enhance San Marcos salamander habitat.

*Assumptions:* Existing vegetation management activities in Spring Lake will continue to follow the Spring Lake Management Plan (approved by the President's Cabinet) and the EAHCP, as described under Methods. Litter and floating vegetation mat removal will follow the existing protocol and schedules currently employed by the City of San Marcos and the EAHCP, as described below under Methods.

#### **Target for 2017:**

Continued implementation of the established protocols.

#### **Methods:**

*Spring Lake:* Each week about five springs are cut, with divers returning to cut the same springs every two to three weeks. During summer algal blooms, the springs will be managed more frequently (up to four springs per day), but mostly to remove algae. Texas State employees and supervised volunteers will fin the area around the springs to remove accumulated sediment, and then clear a 1.5 meter radius around each spring opening in Spring Lake with a scythe. Over the next 1.5 meter radius around the spring opening, they will shear vegetation to a height of 30 cm, and then to one meter over the following three meter radius. Plant material will not be collected, but carried away by the current. Cumulatively, about six meters of vegetation around each spring opening will be modified. Mosses will not be cut. The volume of plant material to be removed will vary by the amount of time between cuttings, and season. The harvester boat will remove a range of 15 to 20 boatloads of plant material a month from Spring Lake. The harvester will clear the top meter of the water column, cutting vegetation from sections one, two, and three once a week (See HCP Figure 5.2). The harvested vegetation will be visually checked by driver for fauna caught in the vegetation. If the driver observes fauna, he/she will stop work and put the animal(s) back into Spring Lake if appropriate. Texas State employees and supervised volunteers are trained to recognize the Covered Species through the Diving for Science program (Section 5.4.7.1), and avoid contact with them. Vegetation mats will be removed from zones four and five on an as-needed basis (See HCP Figure 5-2). The total area cut will equal about nine surface acres. The Spring Lake Area Supervisor also schedules cleanup of nuisance floating species such as water hyacinth and water lettuce from Spring Lake. The floating plants will be collected by hand and shaken prior to removal from the river to dislodge any aquatic species caught in the

plant. The plants will be deposited into dump trucks and taken to the Meadows Center compost area. The activities described in this section are not funded by the EAHCP. They are fully supported by Texas State University.

*San Marcos River:* Floating vegetation in Texas wild-rice stands will be pushed and/or lifted off the stands and removed. Inorganic litter will be picked up weekly from the substrate, surface and littoral zones of the San Marcos River from upper Sewell Park to City Park and from IH-35 to Stokes Island during the recreational season (May 1st to September 30th) and monthly during offseason. Litter will also be picked up from public lands within the four tributaries. Monitoring of downstream Texas wild-rice stands to keep the stands clear of drifting vegetation will also be undertaken.

**Monitoring:**

Floating vegetation and litter are targeted weekly during the recreation season and then monthly during the remainder of the year. In the event of low flows, this activity will be monitored for potential impacts on listed species and will be suspended if impacts are observed. Volume of litter will be tracked.

**Budget:**

Table 7.1:

\$80,000

Estimated 2017 budget:

\$51,298.10

\*Total includes contract amount (\$48,798.10) and public outreach funds (\$2,500). \$28,701.90 will be transferred to Native Riparian Habitat Restoration

### **5.3.5/5.3.9/5.4.11/5.4.13 Non-Native Species Control**

The City of San Marcos, in partnership with Texas State University, will implement a program of invasive faunal control in the San Marcos River on a periodic basis with expanded efforts of control, if needed, at low flows. The species include suckermouth catfish, tilapia, nutria and *Melanoides* and *Marisa cornuarietis*. Educational materials will be provided to local pet shops, commercial outlets who sell aquarium species, University buildings and dorms and various public facilities. Alternatives, such as a local pet shop and discovery center release pond, will be offered to fish and snail owners.

#### **Long-term Objective:**

Reduction of non-native, invasive species in the San Marcos River to levels that minimize their possible impacts on Covered Species and the aquatic ecosystem.

#### **Target for 2017:**

Contractor will use methods that have proven to be successful in efficient capture of invasive species from Spring Lake to IH-35. Contractor will count and trend captured individuals for all targeted species.

#### **Methods:**

Methods will be undertaken in a manner that avoids impacts to resident turtles and other native species. Fyke nets, live trap cages, spear and bow fishing continue to be effective methods. Contractor uses and will continue to use volunteer spearfishing tournaments to increase total removal, while saving costs and providing an educational awareness component to the community.

Effective removal of *Melanoides* and *Marisa cornuarietis* will continue to be accomplished by determining the locations of highest snail density and using dip nets to remove the snails weekly. The species will be controlled by diving several hours after sunset to hand-pick the snails from the submergent vegetation.

#### **Monitoring:**

It is assumed that the integrated biological monitoring program will assess the status of non-native animal species to accompany trend data collected by contractor.

#### **Budget:**

Table 7.1:

\$35,000

Estimated 2017 budget:

\$27,959.20

\*Total includes contract amount (\$25,459.20) and public outreach funds (\$2,500). \$7,040.80 will be transferred to Native Riparian Habitat Restoration.

### **5.3.7 Designation of Permanent Access Points/Bank Stabilization**

The City of San Marcos has completed the construction of bank stabilization/access points at seven locations along the San Marcos River. In 2016, repairs were made to most access points as needed (anchor rocks).

#### **Long-term Objective:**

Maintain integrity of structures and control erosion in the recreation traffic areas at each structure.

#### **Target for 2017:**

Quarterly monitoring to ensure ongoing structural stability.

#### **Budget:**

Table 7.1:

\$20,000

Estimated 2017 budget:

\$0

\*\$20,000 will be transferred to Non-native Plant Removal

### **5.7.1 Native Riparian Habitat Restoration**

The City of San Marcos and Texas State University have undertaken a program to increase the area and density of the riparian and water quality buffer zone on public and private lands from the Spring Lake Dam to Stokes Park using native vegetation. Upon completion of the riparian and water quality buffer zone on public land, private landowners will be asked to voluntarily participate in the plan.

#### **Long-term Objective:**

Establish a robust native riparian and water quality buffer community that benefits Covered Species and the habitat quality adjacent to and within the San Marcos River down to IH-35 as well as prevent public access in undesirable locations which will decrease bank erosion. A zone of prohibitive vegetation along the uppermost edge of the riparian and water quality buffer community will be established to encourage river users to access the river via hardened access points. Encourage private riverside landowner participation in this program and provide the labor and plants as practical. Contractor(s) will perform invasive removal and maintenance. Native plantings and maintenance will be done by volunteers during regular planting events.

#### **Target for 2017:**

Use contractor to remove invasives from the last portion of Ramon Lucio Park (Wildlife Annex). Volunteers will replant with natives, and contractor/volunteers will maintain all treated areas from Spring Lake to IH35. *Arundo donax* removal will be researched for possible extraction. Once sediment has been removed from the channel behind Snake Island, the private landowners will be contacted to participate in this program.

#### **Monitoring:**

Monitoring will occur monthly to check for re-growth and treat as needed. HTC provided a cost proposal for water quality buffer maintenance from headwaters to IH-35 @ \$30,000 per year. So maintenance will continue to be a mix of contract work and volunteerism.

The City has provided and will continue to provide all fences to protect the sites as well as game cameras and other security measures as needed to prevent theft, vandalism and unauthorized access

#### **Budget:**

Table 7.1:

\$20,000

Estimated 2017 budget:

\$55,742.70

\*\$35,742.70 will be transferred from Litter Removal and Non-native species control to fund this measure. Budget plan includes funding the project over four years (2015 -2018) to cover expenses through the transfer of funds from other measures and the yearly allocation. This budget plan was approved during the 2015 Work Plan session.

### 5.3.2/5.4.2 Management of Recreation in Key Areas

Public recreational use of the San Marcos Springs and River ecosystems include, but are not limited to swimming, wading, tubing, boating, canoeing, kayaking, golfing, scuba diving, snorkeling and fishing. To minimize the impacts of incidental take resulting from recreation, the City of San Marcos will implement the Recreation Mitigation Measures adopted by the San Marcos City Council on February 1, 2011 (Resolution 2011-21). The City of San Marcos and Texas State University will enforce these measures (as covered in HCP Section 5.3.2.1) to ensure their success. Section 5.3.2.1 includes multiple educational and public outreach suggestions for implementation:

- a. Signage. Post signage at the City Park tube rental facility, Rio Vista Falls and at proposed hard access points along the river. Signs will have the same template and coloration so they are recognized up and down the river. Signs will cover the rules of the river and educate the public on the importance of the resource. All signs will be bilingual. Kiosk signs have been produced, but kiosks need to be built for posting at each access point. Awaiting final construction of the access points in 2016. Interpretive map has been designed and will be produced and posted in 2017.
- b. Video Loop at City Park and Rio Vista Falls offering information about the river and safety rules while people are waiting for shuttle or tubes. Video will be finished in 2016 for Lion's Club and will be updated and distributed electronically for increased exposure.
- c. Posted maps showing trail, access points, fishing access and other amenities. Include a map at Stokes Park to help inform about the San Marcos River/Blanco confluence. This map is under design by interns.
- d. Work with the Tourist Information Bureau to include information on the endangered species and ongoing HCP projects at hotels/restaurants, bed and breakfast facilities, Chamber of Commerce, Visitor's Center, City of San Marcos internet site, etc. along with the recreational information.
- e. Park Rangers. Include a section on river biology in the training of the park rangers so they can help disseminate the information.
- f. School Outreach. Implement an outreach program for San Marcos Consolidated Independent School District (SMCISD) so this information can be relayed to youth in San Marcos and indirectly to the parents. This is underway through the embedding of our interactive river habitat card game into curriculum for SMCISD elementary schools.
- g. Overall Interpretation Plan. This would pull all the informational ideas together for conformity, continuity, and implementation. This is also under development.
- h. *Additional outreach:* The San Marcos Discovery Center provides a facility dedicated to inclusion of HCP education and public outreach for the aquifer region.

- i. Provide HCP presentations to TxState Outdoor Recreation class and Wildlife Society club and partner with TxState Geography Intern Program to increase volunteer participation.
- j. Provide outreach at booths including 72 degree festival, Concert Series (Earth & Water), Passport SMTX, Business Expo, Don't Mess with Texas Litter Cleanup.
- k. Present Water Quality and Riparian Restoration outreach during volunteer planting days; most recently to the entire Texas State football team.

**Long-term Objective:**

To establish and maintain a trained seasonal conservation resource that will monitor recreational activities and monitor/maintain ongoing HCP measures in and along the San Marcos River while educating the public about the Covered Species and importance of their protection as part of our enforcement obligations under the SSA and HCP measures and establish an ongoing stream of information to increase public awareness and support. Also, to establish a program that provides incidental take coverage to third parties through the acquisition of a Certificate of Inclusion (COI).

**Target for 2017:**

Continue the implementation of recreational management goals as outlined above. Educate the public engaged in water-based recreation on sustainable river use that protects listed species and their habitats. The seasonal workers will also conduct miscellaneous cleanup and HCP project maintenance while walking/kayaking. Introduce the COI program to qualified third parties conducting recreational activities in and along the San Marcos River.

**Methods:**

The contracted conservation resource will monitor river user activities from Memorial Day weekend to Labor Day weekend on a Wednesday through Sunday schedule. They will also actively engage in public education and outreach about target species and their habitats. Finally, they will aid in the implementation of recreational management goals.

**Monitoring:**

Every few years, the public will be surveyed during the recreation season to assess the level of understanding of Covered Species, ongoing HCP Measures, effectiveness of the public outreach and education program, and the impacts of recreational activities on species and habitat. Last survey occurred in 2015.

**Budget:**

Table 7.1:

\$ 56,000

Estimated 2017 budget:

\$56,000

### **5.7.6 Impervious Cover/Water Quality Protection**

The City of San Marcos and Texas State University will implement a program to protect water quality and reduce the impacts of urbanization based upon the LID/BMP practices. Urban land development tends to increase the intensity of storm water flows and the amount of nonpoint source (NPS) pollution reaching local water resources. Buildings, roads, and other impervious surfaces shed rain more rapidly than areas covered by vegetation, and most typical urban land uses require rapid drainage of storm water. The very rapid, direct connection of developed land across paved surfaces and through drainage conveyances to waterways tends to carry more pollutants more quickly from the land surface to water resources. A number of water quality problems and impairments in Texas are attributed in full or in part to such urban storm water runoff carried through storm sewers and channelized streams. The science committee stated this measure was one of great importance to the success of the EAHCP for listed species protection (May 9, 2013). Addressing water quality is critical to protection of the listed species in a rapidly developing environment.

#### **Long-term Objective:**

Implement a program that minimizes the impacts associated with urbanization and changes in land use/cover in the Upper San Marcos watershed, manages stormwater as close to its source as possible, treats stormwater as a resource rather than a waste product, emphasizes conservation and the use of on-site features to protect water quality, and increases infiltration to groundwater and aquifer recharge for the protection of riverine integrity.

#### **Target for 2017:**

Implement the Water Quality Protection Plan (WQPP) as adopted by Texas State University and City of San Marcos incorporating all jurisdictional watershed areas that directly or indirectly impact Covered Species' critical habitat for the purpose of meeting the goals stated in the long-term objective. Includes public education, staff integration, potential changes to the City's Land Development Code and Stormwater Technical Criteria Manual, potential changes to the University's Master Plan and Construction Standards, designs for retrofit water quality projects, grant proposals, land conservation program and coordination with ongoing stormwater management plans for city and university.

#### **Methods:**

City of San Marcos and Texas State University have a contract for the implementation of the developed plan.

#### **Budget:**

Table 7.1:  
\$200,000

Estimated 2017 budget:  
\$150,000

\*\$50,000 will be transferred to Non-native Plant Removal

### **5.7.5 Management of Household Hazardous Waste**

The City of San Marcos will maintain a Household Hazardous Waste (HHW) program that involves the periodic collection of Household Hazardous Waste Collection (HHWC) and its disposal.

#### **Long-term Objective:**

Continue to provide a place for citizens of San Marcos and Hays County to safely dispose of HHW.

*Assumptions:* City of San Marcos will continue its existing program.

#### **Target 2017:**

Continue outreach and target 2750 participants for public outreach events. Staff will conduct these events and collect or dispose of the HHW between events. Fund outreach to surrounding communities within the San Marcos River watershed that cannot afford to partner in a HHWC program.

#### **Methods:**

Open drop-off opportunities two days a week (Tuesday and Friday) from 12:00 noon to 3:30 p.m. to the public. Conduct HHWC events 1 to 2 times per year on a Saturday in north central Hays County. Cover disposal costs for these events.

#### **Monitoring:**

Track the amount of HHW received and number of participants from San Marcos, Hays County, and surrounding communities. All necessary documentation will be turned in to TCEQ. Identify the HHW that comes from communities within the San Marcos River watershed and the cost of collecting, processing and disposing of HHW from these communities.

#### **Budget:**

Table 7.1:

\$30,000

Estimated 2017 budget:

\$30,000

### **5.3.4 Prohibition of Hazardous Materials Transport Across the San Marcos River and Its Tributaries**

The City of San Marcos will coordinate with the Texas Department of Transportation to designate hazardous materials routes which minimize the potential for spills into the San Marcos River. This effort will include legislation, if necessary, and additional signage.

**Long-term Objective:**

Reduce the potential of spill of hazardous materials in the San Marcos River and its tributaries.

*Assumptions:* The primary effort will involve stakeholder engagement, public meetings, and coordination with TXDOT.

**Target for 2017:**

Coordination with TxDOT for the implementation of hazardous materials restrictions and establishment of signage. Contact New Braunfels office for more rapid implementation.

**Methods:**

Complete checklist provided by TxDOT to establish a hazmat route that all transport routes that cross the San Marcos River and its primary tributaries.

**Monitoring:**

Bi-annual monitoring of hazmat traps on designated roadways to determine functionality and annual monitoring of all installed signage will be accomplished. Substandard conditions will be repaired or replaced as necessary.

**Budget:**

Table 7.1:

\$0

Estimated 2017 budget:

\$0

### **5.7.3 Septic System Registration and Permitting Program**

The City of San Marcos will undertake an aerobic and anaerobic septic system registration, evaluation, and permitting program to prevent subsurface pollutant loadings from potentially being introduced to the San Marcos Springs ecosystem within city limits.

#### **Long Term Objective:**

To continue the registration, permitting and inspection of all new or existing septic systems installed or modified in the City of San Marcos jurisdiction. This has and will continue to be done to ensure compliance of all Texas Commission on Environmental Quality (TCEQ) regulations governing septic systems.

*Assumptions:* The existing program is adequate to meet the intent of this Measure.

#### **Target for 2017:**

To have an accurate record of new and existing septic systems installed and modified in city jurisdiction. Also, by ordinance, to have all owners of septic systems connect to municipal sewer lines as they become available.

#### **Methods:**

It is required by law that all septic systems are permitted by the local Designated Representative (DR), which is the City of San Marcos Environmental Health Department. Plans are submitted with the application and reviewed by the DR for TCEQ compliance. Once these are met, the permit to construct is issued. The design, site evaluation, installation and inspections can only be performed by individual that are licensed by TCEQ. Before the installation or modification is approved, inspections are made by the DR to ensure that the system installed corresponds with the design. Once completed, a license to operate is issued to the property owner by the DR. All DRs are subject to TCEQ Compliance Reviews.

#### **Monitoring:**

The City of San Marcos Environmental Health Department reviews all applications and inspects the installations of all new and modified septic systems within the City's jurisdiction. The Department also monitors maintenance and responds to all complaints reported or observed.

#### **Budget:**

Table 7.1:

\$0

Estimated Budget:

\$0

#### **5.7.4 Minimizing Impacts of Contaminated Runoff**

The City of San Marcos will construct two sedimentation ponds along the river to help reduce the amount of contaminated material that enters the river as a result of rain events. The first pond will be located in Veramendi Park beside Hopkins Street Bridge. The second pond will be created by widening the drainage ditches that run alongside Hopkins Street and cut directly to the San Marcos River.

##### **Long-term Objective:**

Reduce the input of sediment and roadway pollutants into the San Marcos River.

*Assumptions:* Construction of the proposed sediment retention ponds are funded under Measure 5.7.6.

##### **Target for 2017:**

Continue to research funding sources for the design and construction of the Best Management Practices (BMPs) to be constructed at Veramendi Park and along Hopkins Street that will reduce total suspended solids (TSS) by 85%. Baseline water quality measurements should be taken prior to BMP installation. Storm water discharge should be re-sampled after BMP installation to measure success.

##### **Methods:**

A contractor will research applicable BMP designs and recommend the most economic and efficient methods to control contaminants.

##### **Budget:**

Table 7.1:

\$0

Estimated 2017 budget:

\*See Measure 5.7.6

### 5.4.5 Diversion of Surface Water

Texas State University will curtail its permitted surface water diversions as a function of total San Marcos spring flow to protect the aquatic resources as specified under the HCP flow management strategy. Under TCEQ Certificates 18-3865 and 18-3866, Texas State University's total diversion rate from the headwaters of the San Marcos River for consumptive use is limited to 8.1 cfs (See HCP Section 2.5.5). The total diversion rate from Spring Lake is limited to 4.88 cfs; the total diversion rate from the San Marcos River at Sewell Park is limited to 3.22 cfs (See HCP Section 2.5.5.1 and 2.5.5.2 respectively).

**Long-term Objective:**

Meet diversion restrictions specified under the HCP.

**Target for 2017:**

Restriction of surface pumping as specified under the HCP.

**Methods:**

To minimize the impacts of these diversions, when flow at the USGS gauge at the University Bridge reaches 80 cfs, Texas State University will reduce the total rate of surface water diversion by 2 cfs, *i.e.*, to a total of approximately 6.1 cfs. This reduction in pumping will occur at the pump just below Spring Lake Dam in order to maximize the benefits to salamanders, Texas wild-rice, and other aquatic resources in the San Marcos River below Spring Lake Dam. The University will reduce the total rate of surface water diversion by an additional 2 cfs when the USGS gauge reaches 60 cfs. The additional 2 cfs reduction will be made from the pumps located in the slough arm of Spring Lake, and, therefore, maximize the benefits to the aquatic resources within the main stem San Marcos River below Spring Lake Dam. When the USGS gauge reaches 49 cfs, Texas State University will reduce the total diversion rate to 1 cfs. This further reduction will be made by restricting the pumps located in the Sewell Park reach. The diversion of water will be suspended when the springflow reaches 45 cfs.

**Monitoring:**

Pumping rates will be reported on a daily basis when any of the pumping restrictions are in force.

**Budget:**

Table 7.1:

\$0

Estimated 2017 budget:

\$0

### **5.4.7 Diving Classes in Spring Lake**

Access to Spring Lake is strictly controlled and regulated in accordance to federal, state and local laws. City ordinance and state law designate the public waters of Spring Lake as restricted to activities authorized by the University. All diving activities in Spring Lake are governed by the Spring Lake Management Plan.

**Long-term Objective:**

Maintain the integrity of the ecology and cultural resources within Spring Lake.

*Assumptions:* All diving activities in Spring Lake are governed by the Spring Lake Management Plan.

**Target for 2017:**

Implement the diving protocols as outlined in the Spring Lake Management Plan and the Edwards Aquifer HCP Incidental Take Plan.

**Methods:**

The Diving Safety Officer will monitor all diving activities in Spring Lake, assuring all guidelines contained in the Diving Safety Manual for Spring Lake and the EAHCP ITP are observed.

**Monitoring:**

The Lake Manager, with assistance from the Diving Safety Officer, will compile an annual summary of diving activities conducted in Spring Lake and provide to the Diving Control Board for its review.

**Budget:**

Table 7.1:

\$0

Estimated 2017 budget:

\$0

#### **5.4.8 Research Programs in Spring Lake**

Access to Spring Lake is strictly controlled and regulated in accordance to federal, state and local laws. City ordinance and state law designate the public waters of Spring Lake as restricted to activities authorized by the University. Proposals for research projects in Spring Lake must be submitted to the Environmental Review Committee, through the Lake Manager, for review and approval.

#### **Long-term Objective:**

Maintain the integrity of the ecology and cultural resources within Spring Lake. All research activities in Spring Lake are governed by the Spring Lake Management Plan.

#### **Target for 2017:**

Implement the protocols for research as specified in the Spring Lake Management Plan and the EAHCP ITP.

#### **Methods:**

Proposals for research projects in Spring Lake must be submitted to the Environmental Review Committee, through the Lake Manager, for review and approval.

Proposals for research projects must be submitted in writing and include:

1. Name and contact information of the responsible party conducting the research,
2. Purpose and expected outcomes of the activities, including a description of how the project contributes to science,
3. Description of activities, including, if appropriate, measures to be taken to minimize any impact on endangered species or their habitat, or any cultural resources found in the lake,
4. Methodology, including literature review,
5. Type of equipment used, how much; where it will be placed, and for how long it will remain in lake (see Equipment in Lake Section E of the Spring Lake Management Plan)
6. Expected impact, and
7. Timeline of Project

#### **Monitoring:**

The Lake Manager will compile an annual summary of the research conducted in the lake, including statements on the impact of these activities on the health of the lake.

#### **Budget:**

Table 7.1:

\$0

Estimated 2017 budget:

\$0

#### **5.4.10 Boating in Spring Lake and Sewell Park**

Access to Spring Lake is strictly controlled and regulated in accordance to federal, state and local laws. City ordinance and state law designate the public waters of Spring Lake as restricted to activities authorized by the University. All activities involving access to the lake, including glass bottom boat operations, will abide by the rules and intentions of the Edwards Aquifer Recovery Implementation Program Habitat Conservation Plan.

#### **Long-term Objective:**

Maintain the integrity of the ecology and cultural resources within Spring Lake and San Marcos River. All boating activities in Spring Lake are governed by the Spring Lake Management Plan and the EAHCP ITP.

#### **Target for 2017:**

Implement the protocols for boating as specified in the Spring Lake Management Plan in support of the EAHCP ITP.

#### **Methods:**

Boats (canoe, kayak) used for educational activities, excluding glass bottom boats:

1. All boats must be properly washed/disinfected before being placed in lake and once they are removed (see Equipment in Lake in the Spring Lake Management Plan).
2. Participants must receive an orientation prior to boating including: instruction on safety, basic boat handling, and on-site rules and regulations. The orientation will cover information specific to Spring Lake's sensitivity and endangered species.
3. All boating events must be designed to keep participants away from glass bottom boat operations.

To minimize the impacts of boating on the Covered Species' habitat in Sewell Park, canoeing/kayaking classes in Sewell Park will be confined to the region between Sewell Park and Rio Vista dam. Students will enter/exit canoes/kayaks at specified access points to avoid impacting the flora and fauna along the bank. Classes will be no longer than two hours and up to three classes will be held per day. Classes will have a maximum of 20 students in 10 canoes. All classes will be supervised.

#### **Monitoring:**

The Lake Manager will compile an annual summary of boating activities conducted on the lake, including statements on the impact of these activities on the health of the lake.

#### **Budget:**

Table 7.1:

\$0

Estimated 2017 budget:

\$0

#### **5.4.9 Management of Golf Course and Grounds**

Texas State University will complete a golf course management plan that will document current practices and include an Integrated Pest Management Plan (IPMP). The golf course management plan and IPMP will incorporate environmentally sensitive techniques to minimize chemical application, improve water quality, and reduce negative effects to the ecosystem. Expanded water quality sampling targeted at Golf Course operations will be conducted as described in Section of 5.7.2. of the HCP.

#### **Long-term Objective:**

Management of the golf course and grounds to minimize and reduce negative effects to aquatic ecosystem in Spring Lake and the San Marcos River.

#### **Target for 2017:**

Continued implementation of the Golf Course Management Plan and Integrated Pest Management Plan.

#### **Methods:**

The golf course and grounds will be maintained in an aesthetically pleasing, yet environmentally sensitive manner. It is the responsibility of the Golf Course Manager to maintain the course and grounds in accordance with the Integrative Pest Management Plan (IPM). This plan will describe the activities and materials to be used to control pests (i.e. insects, weeds, and other living organisms requiring control) on the golf course in a way that minimally impacts the environment. The IPM will be developed and updated by the Golf Course Manager, in consultation with the Lake Manager and the Environmental Review Committee. The Golf Course Manager will consult with the Lake Manager on any unique situation that may arise outside of routine maintenance that could impact Spring Lake.

#### **Monitoring:**

Each year the Golf Course Manager will report to the Lake Manager detailed information on maintenance activities and materials used during the year. The water quality monitoring program performed by the Edwards Aquifer Authority will sample for runoff from the golf course.

#### **Budget:**

Table 7.1:

\$0

Estimated 2017 budget:

\$0

### **Protocol for Implementation of HCP Measures Requiring Diving and/or Boating**

All activities in Spring Lake must be submitted to the Spring Lake Environmental Review Committee and/or the Spring Lake Diving Control Board for approval as outlined in the Spring Lake Management Plan. This includes required training and orientation for any diving based activities in Spring Lake by the RSI Diving Safety Officer, using guidelines set out in the RSI Diving Safety Manual for Spring Lake and the San Marcos River. This includes an orientation that covers: instruction on safety, basic boat handling, and on-site rules and regulations. The orientation will cover information specific to Spring Lake's sensitivity, endangered species as well as cultural resources.

All personnel implementing any portion of the HCP for the City of San Marcos and Texas State University will undergo an orientation at the SMARC to ensure awareness of the listed species and safe procedures while working in and along the San Marcos River.

**2017 San Marcos/Texas State University Work Plan Budget**

<b>HCP Section</b>	<b>Conservation Measure</b>	<b>Table 7.1</b>	<b>Estimated 2017 Budget</b>	<b>Difference</b>
5.3.1/5.4.1	Texas wild-rice Enhancement	\$125,000	\$100,000	\$25,000
5.3.6/5.4.4	Sediment Removal	\$25,000	\$25,000	\$0
5.3.8/5.4.3/ 5.4.12	Control of Non-Native Plant Species	\$75,000	\$170,000	(\$95,000)
5.3.3/5.4.3	Management of Floating Vegetation Mats and Litter	\$80,000	\$51,298.10	\$28,701.90
5.3.5/5.3.9/ 5.4.11/5.4.13	Non-Native Species Control	\$35,000	\$27,959.20	(\$7,040.80)
5.3.7	Designation of Permanent Access Points/Bank Stabilization	\$20,000	\$0	\$20,000
5.7.1	Native Riparian Restoration	\$20,000	\$55,742.70	(\$35,742.70)
5.3.2/5.4.2	Management of Recreation in Key Areas	\$56,000	\$56,000	\$0
5.7.6	Impervious Cover/Water Quality Protection	\$200,000	\$150,000	\$50,000
5.7.5	Management of HHW	\$30,000	\$30,000	\$0
5.3.4	Prohibition of Hazardous Material Transport	\$0	\$0	\$0
5.7.3	Septic System Registration and Permitting Program	\$0	\$0	\$0
5.7.4	Minimizing Impacts of Contaminated Runoff	\$0	\$0	\$0
5.4.5	Diversion of Surface Water	\$0	\$0	\$0
5.4.7	Diving Classes in Spring Lake	\$0	\$0	\$0
5.4.8	Research Programs in Spring Lake	\$0	\$0	\$0
5.4.10	Boating in Spring Lake and Sewell Park	\$0	\$0	\$0
5.4.9	Management of Golf Course and Grounds	\$0	\$0	\$0
	<b>Total</b>	<b>\$666,000</b>	<b>\$666,000</b>	<b>\$0</b>