

**APPENDIX M**  
**CITY OF SAN MARCOS (COSM) / TEXAS STATE UNIVERSITY (TEXAS STATE), AND**  
**TEXAS PARKS AND WILDLIFE DEPARTMENT (TPWD) REPORTS/DOCUMENTS**

**Appendix M1** – 2019 San Marcos Aquatic Vegetation Restoration and Floating Vegetation Management Report

**Appendix M2** – 2019 Management of Recreation in Key Areas

**Appendix M3** – 2019 Designation of Permanent Access Points and Bank Stabilization

**Appendix M4** – 2019 San Marcos Aquatic Vegetation Intern Report

**Appendix M5** – 2019 Littoral Plant Removal

**Appendix M6** – 2019 Riparian Restoration

**Appendix M7** – 2019 Management of Hazardous Household Waste

**Appendix M8** – Impervious Cover and Water Quality Protection

**Appendix M1**  
**CITY OF SAN MARCOS (COSM) / TEXAS STATE UNIVERSITY (TEXAS STATE), AND**  
**TEXAS PARKS AND WILDLIFE DEPARTMENT (TPWD) REPORTS/DOCUMENTS**  
**2019 San Marcos Aquatic Vegetation Restoration and Floating Vegetation Management Report**

*EAAHCP Obligations:*

The COSM, in partnership with Texas State, will identify areas of optimal habitat for *Zizania texana* (Texas wild-rice) and target those areas for restoration. Restoration will include the removal of non-native submersed aquatic vegetation (SAV) species, propagation and planting of Texas wild-rice and continual monitoring of new and existing stands.

*2019 Compliance Actions:*

Texas wild-rice was increased through maintenance of existing stands and planting efforts with a focus on reaches that have not already exceeded the 2027 goal from EAAHCP Table 34. Existing stands throughout the river were maintained by gardening non-native regrowth within stands combined with clearing adjacent suitable habitat of non-native SAV to allow for expansion. New stands were established by clearing non-natives SAV from areas of suitable habitat followed by replanting with both seed germinated (USFWS SMARC) and tiller propagated (TSU Freeman Aquatic Building raceways) Texas wild-rice.

Prior to clearing, non-native vegetation was fanned to displace fountain darters (*Etheostoma fonticola*) or any other aquatic fauna. Removal was performed manually by hand with vegetation being captured in nets to minimize non-native propagation by fragmentation downstream. After removal the collected material was sorted, any native biota caught within was returned to the river, and all remaining vegetation was disposed of at either the COSM or Spring Lake composting facility.

Geographic area and number of Texas wild-rice individuals planted were tracked through polygons created in ArcMap overlaid on georeferenced aerial imagery of the river. Using this data, estimates of area planted within the reaches were generated throughout the year to evaluate work progress. [Table 3.3-1](#) details the Texas wild-rice planting data tracked throughout the year.

Refer to [Fig. 3.3-28](#) and [Fig. 3.3-31](#) illustrate the areas planted with Texas wild-rice in 2019.

Texas wild-rice was not planted in Spring Lake due to construction work on Spring Lake Dam, which required relocating a portion of the Texas wild-rice that was already present near the western spillway. As *Hygrophila polysperma* (Hygrophila) removal efforts progress within Spring Lake, more suitable habitat for Texas wild-rice should become available in the future.

**Table 3.3-1.** Number of Texas wild-rice individuals planted, estimated area (m<sup>2</sup>) of Texas wild-rice planted, and days spent planting Texas wild-rice in the San Marcos River by reach in 2019.

Reach	Individuals Planted	Estimated Area Planted (m <sup>2</sup> )	Effort (days worked)
<b>City Park</b>	600	25.1	1
<b>I-35 Upper LTBG</b>	660	44.4	1
<b>Total River</b>	1260	69.5	2

*Proposed Activities for 2020:*

To continue with the top-down strategy and allow maximum available habitat for native SAV in all reaches, Hygrophila will be included in the 2020 removal effort. The starting point will be in Spring Lake and will continue in the river once the lake becomes a recovery zone. This will likely provide more suitable habitat for Texas wild-rice within Spring Lake as well as remove a large source population of

Hygrophila that is establishing in areas in the river where Hydrilla removal is taking place. Hydrilla removal will continue at a maintenance level for the 2019 work zones, which will become recovery zones for 2020. Downstream removal of Hydrilla will continue into the Hopkins to Snake Island reach in 2020 and will be considered a designated work zone.

### **3.22 Control of Non-native Plant Species (EAHCP 3.3.8)**

#### *EAHCP Obligations:*

The COSM will partner with Texas State to develop and implement a non-native plant removal program reaching from Spring Lake downstream to the city boundary. Aquatic, littoral, and riparian non-native plant species will be removed and replaced with native species. The riparian zone will be re-planted to cover a minimum of 15 meters in width where possible. The COSM will install fencing to protect the new plantings while they mature. Appropriate permits will be obtained for the removal of non-native plants.

#### *2019 Compliance Actions:*

#### **Non-Native Aquatic Plant Removal**

The strategy of non-native removal shifted to a top-down methodology in 2019 to include non-designated reaches that have not been worked in the past. This minimizes the spreading of non-native plants from upstream sources. The primary focus is manual removal of *Hydrilla verticillata* (Hydrilla) with all visible sources being removed from the designated work zone for 2019. *Hygrophila polysperma* (Hygrophila) was not a focus species due to the upstream sources in Spring Lake but large areas in the river continue to be maintained to prevent further expansion. Upstream areas of the work zone and the current work zone are maintained with hydrilla sweeps until no regrowth is evident. Any patches of *Zizaniopsis miliacea* (cutgrass) present in a work area were removed.

Floating vegetation that accumulated on native SAV stands was cleared or removed as needed. *Nasturtium officinale* (watercress), *Eichhornia crassipes* (water hyacinth), *Ceratopteris thalictroides* (water sprite), *Pistia stratiotes* (water lettuce) and vegetation mats interfere with photosynthetic processes by blocking sunlight to underlying SAV. This can eventually lead to die off, therefore, removing floating vegetation and clearing vegetation mats covering native SAV is necessary to maintain the health and continued expansion of stands.

Prior to clearing, non-native vegetation was fanned to displace fountain darters (*Etheostoma fonticola*) or any other aquatic fauna. Removal was then performed manually by hand with vegetation being captured in nets to minimize non-native propagation by fragmentation. After removal collected material was sorted, any native biota caught within was returned to the river, and vegetation was disposed of at either the COSM or Spring Lake composting facility. [Table 3.3-3](#) itemizes the species found and returned to the river during the sorting of captured vegetation.

Denuded areas with suitable habitat were replanted with native SAV species grown at the TSU raceways at Freeman Aquatic building. At the end of each month the number of individuals for each native SAV being maintained at the TSU raceways were recorded to track inventory and assess stock in relation to work plans ([Table 3.3-4](#)). Native SAV species were selected for replanting based on habitat preference and corresponding suitability of denuded area. Efforts in the river were aimed at allowing for natural expansion of native stands, but if a native species is not present in an appropriate area, then raceway stocks will be used to introduce those species to that area.

Geographic area of removal, planting, and number of individuals of each species planted were tracked with polygons created in ArcMap and overlaid on georeferenced aerial imagery of the river. Using this data, estimates of area planted for each native SAV species were generated throughout the year to evaluate work progress ([Table 3.3-5](#) and [Table 3.3-6](#)).

**Table 3.3.3.** Animal species collected and returned to the San Marcos River during non-native vegetation removal.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Totals
<b>Cambaridae (crayfish)</b>	18	8	18	25	56	76	25	5	25	75	<b>331</b>
<b>Lepomis sp. (sunfish)</b>	1	0	1	5	7	15	4	0	6	8	<b>47</b>
<b>Etheostoma fonticola (fountain darter)</b>	0	0	0	0	0	0	0	0	0	0	<b>0</b>
<b>Eurycea nana (salamander)</b>	0	0	0	0	0	0	0	0	0	0	<b>0</b>
<b>Ameiurus sp. (bullhead catfish)</b>	0	0	0	0	0	0	0	0	0	0	<b>0</b>
<b>Ambloplites rupestris (rockbass)</b>	0	0	0	0	0	3	0	0	0	0	<b>3</b>
<b>General turtle sp.</b>	0	0	1	3	2	7	0	0	5	1	<b>9</b>
<b>Micropterus sp. (largemouth bass)</b>	1	0	0	0	3	0	0	0	0	3	<b>7</b>

**Table 3.3.4.** Number of individual plants per species maintained each month in the raceways at the Freeman Aquatic Building through October 31<sup>st</sup>, 2019.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct
<b>Zizania</b>	0	0	95	890	890	890	890	890	890	890
<b>Ludwigia</b>	1910	1230	3000	4000	4000	3664	3664	3468	3468	3468
<b>Potamogeton</b>	3552	1200	2368	2436	3036	3036	3036	3036	1026	1026
<b>Sagittaria</b>	208	180	180	180	180	0	0	0	0	0
<b>Cabomba</b>	984	500	320	320	320	0	0	0	0	0
<b>Hydrocotyle</b>	0	0	0	0	0	0	0		0	0

## Native Planting and Non-Native Removal

**Table 3.3.6.** Number of individuals of each native species planted in the San Marcos River and planting effort (days) per reach in 2019. \* denotes reaches that were designated as work zones in 2019.

River reach	Designation	Species	N (individuals planted)	Area planted (m <sup>2</sup> )	Effort (days worked)
Spring Lake	Restoration	<i>No Planting</i>	0	0	0
Spring Lake Dam	LTBG	<i>No Planting</i>	0	0	0
Sewell Park	Restoration	<i>Potamogeton</i>	800	21.1	1
		<i>Sagittaria</i>	52	4.4	
Below Sewell*	Restoration	<i>Cabomba</i>	528	4.2	5
		<i>Ludwigia</i>	608	20.2	
		<i>Potamogeton</i>	750	15.1	
		<i>Sagittaria</i>	519	35.4	
City Park*	LTBG	<i>Potamogeton</i>	2,610	28.9	2
Below City to Hopkins*	None	<i>No Planting</i>	0	0	0
Hopkins/Snake Island	Restoration	<i>No Planting</i>	0	0	0
Bicentennial	None	<i>No Planting</i>	0	0	0
Cypress Island	Restoration	<i>No Planting</i>	0	0	0
Rio Vista	None	<i>No Planting</i>	0	0	0
I-35 Upper	LTBG	<i>No Planting</i>	0	0	0
I-35 Lower	Restoration	<i>No Planting</i>	0	0	0
Total River		<i>Cabomba</i>	528	4.2	9
		<i>Hydrocotyle</i>	0	0	
		<i>Ludwigia</i>	608	20.2	
		<i>Potamogeton</i>	4,160	65.1	
		<i>Sagittaria</i>	571	39.8	

**Table 3.3.7.** Estimated area (m<sup>2</sup>) of non-native vegetation and floating non-native vegetation removed by reach in 2019. \* denotes reaches that were designated as work zones in 2019.

River reach	Species	Area Removed (m <sup>2</sup> )	Effort (days worked)
Spring Lake	<i>Hygrophila</i>	1745.5	6
	<i>Hydrilla</i>	10.9	
	<i>Hygrophila</i>	20.4	
Spring Lake Dam LTBG	Maintenance Sweep	1.3	8
	<i>Nasturtium</i>	17.2	
	<i>Ceratopteris</i>	21.5	
	<i>Hydrilla</i>	10.3	
Sewell Park	<i>Hygrophila</i>	27.5	11
	Maintenance Sweep	1.8	
	<i>Nasturtium</i>	2.1	
	<i>Ceratopteris</i>	5.2	
Below Sewell*	<i>Hydrilla</i>	844.6	33
	<i>Hygrophila</i>	1001.9	
	Maintenance Sweep	44.7	
	<i>Nasturtium</i>	121.7	
	<i>Ceratopteris</i>	709.0	
	<i>Eichhornia</i>	1.4	
	<i>Zizaniopsis</i>	2.8	
City Park LTBG*	<i>Hydrilla</i>	1063.7	32
	<i>Hygrophila</i>	106.4	
	Maintenance Sweep	51.9	
	<i>Nasturtium</i>	2.8	
	<i>Ceratopteris</i>	7.4	
Below City to Hopkins*	<i>Hydrilla</i>	1987.2	32
	<i>Hygrophila</i>	174.1	
	Maintenance Sweep	40.4	
	<i>Zizaniopsis</i>	41.3	
Hopkins	<i>Hydrilla</i>	404.0	4
	<i>Hygrophila</i>	5.0	
Bicentennial	No Removal	0	0
Cypress Island	No Removal	0	0
Rio Vista	No Removal	0	0
I-35 LTBG	<i>Hydrilla</i>	43.5	3
	<i>Hygrophila</i>	3.1	
I-35 Lower	<i>Hydrilla</i>	18.2	3
	<i>Hygrophila</i>	48.9	
Total River	<i>Hydrilla</i>	4382.3	132
	<i>Hygrophila</i>	3132.8	
	Maintenance Sweep	140.0	

<i>Nasturtium</i>	143.8
<i>Ceratopteris</i>	743.1
<i>Eichhornia</i>	1.4
<i>Zizaniopsis</i>	44.1

### 2019 LTBG and Restoration Reaches (Submersed Aquatic Vegetation Non-Native Removal and Native Planting Sites)

In 2019, aquatic vegetation treatment work plans were developed based on the new top-down strategy with a focus on thorough non-native removal, starting with the upper most sources. Vegetation treatment efforts included both the non-native removal and native planting starting in the upper most reaches, with planting being limited to LTBG and restoration reaches. Native species approved for planting were *Ludwigia repens* (Ludwigia), *Cabomba caroliniana* (Cabomba), *Sagittaria platyphylla* (Sagittaria), *Potamogeton illinoensis* (Potamogeton), and *Hydrocotyle verticillata* (Hydrocotyle). The non-designed reaches that has historically not been worked are now part of the removal effort. [Fig. 3.3-22](#) shows all the reaches within the EAAHCP area of responsibility.

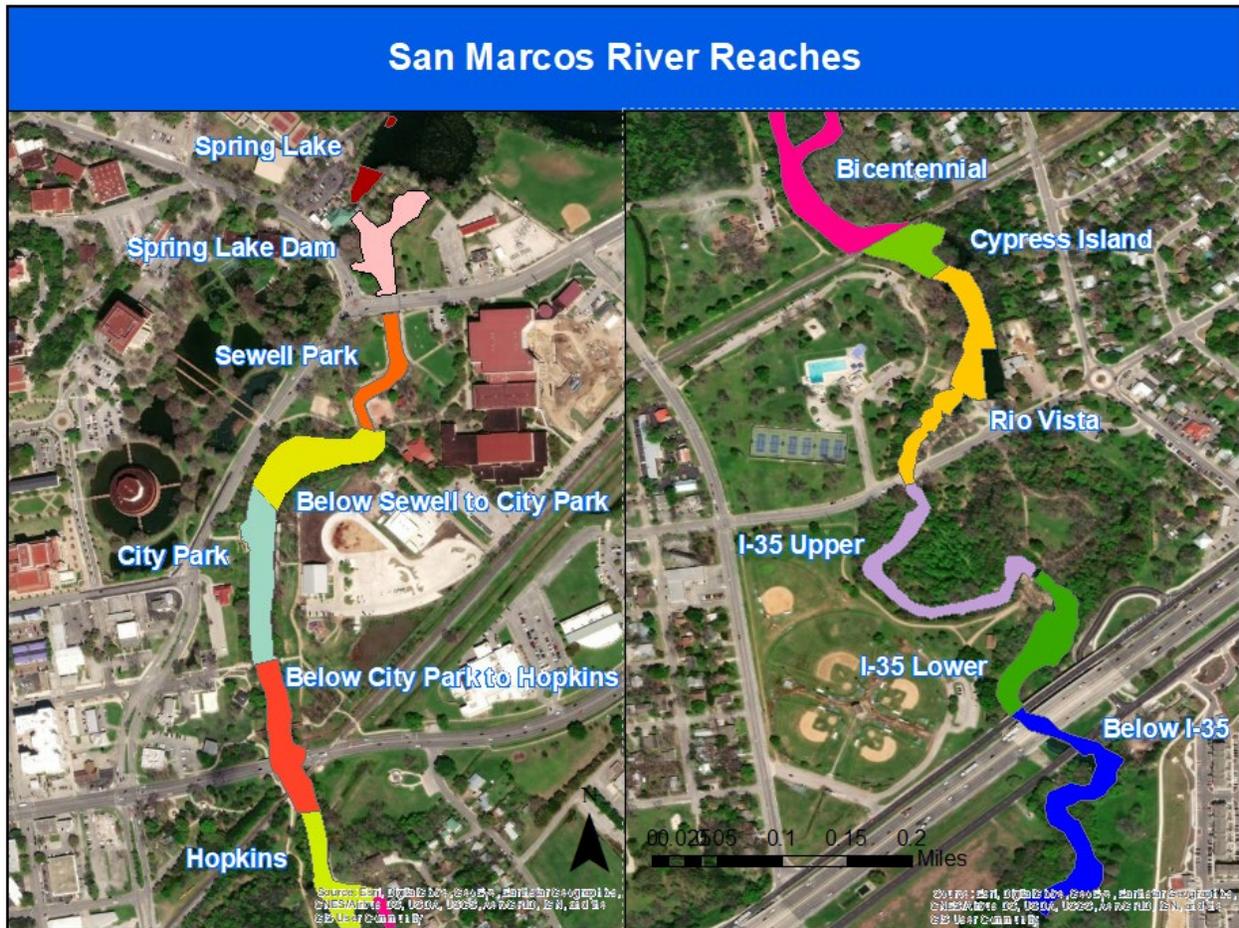
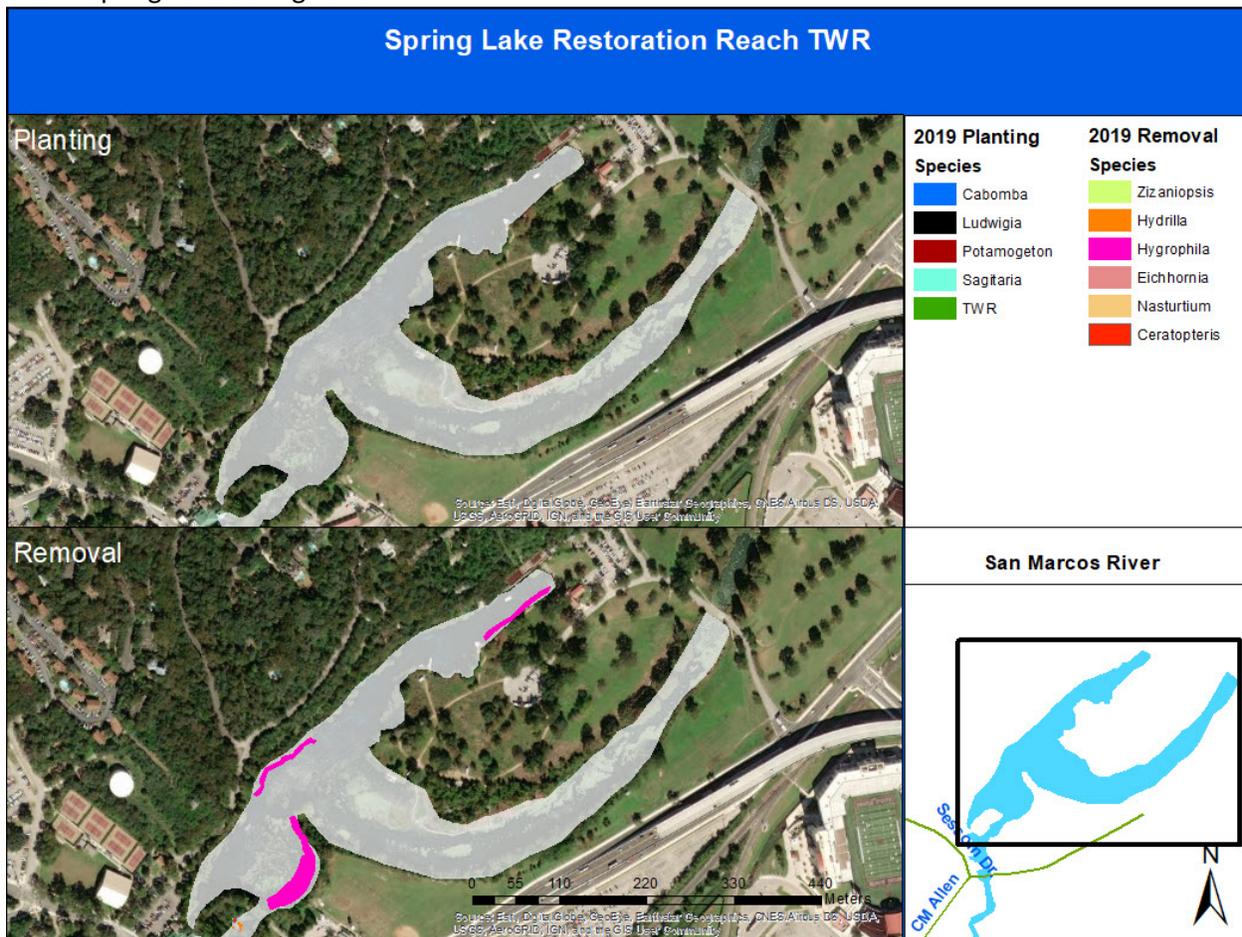


Figure 3.3-22. LTBG, restoration, and non-designated reaches for the 2019 work year.

## Spring Lake

In Spring Lake, vegetation treatment efforts in 2019 were limited due to repair efforts for Spring Lake Dam. This required the MCWE team relocate Texas wild-rice away from the construction areas near the western spillway. Approximately 300 *Sagittaria* individuals were salvaged from the area above the eastern spillway before construction took place and were planted in the Below Sewell reach. The proposed 2020 workplan will shift a large portion of effort to the removal of *Hygrophila* from Spring Lake. In 2019, divers spent six days developing and testing removal methods within Spring Lake following the top-down removal strategy. This allowed for setting up of communication and processes with Spring Lake Management and Dive Coordinator and to build a strategy and timeline for removal efforts. These test days resulted in 1,745.5 m<sup>2</sup> of *Hygrophila* removal (Fig. 3.3.23). No planting occurred within Spring Lake during 2019.



**Figure 3.3.23.** Locations of vegetation removal in Spring Lake restoration reach (2019).

### Spring Lake Dam LTBG Reach

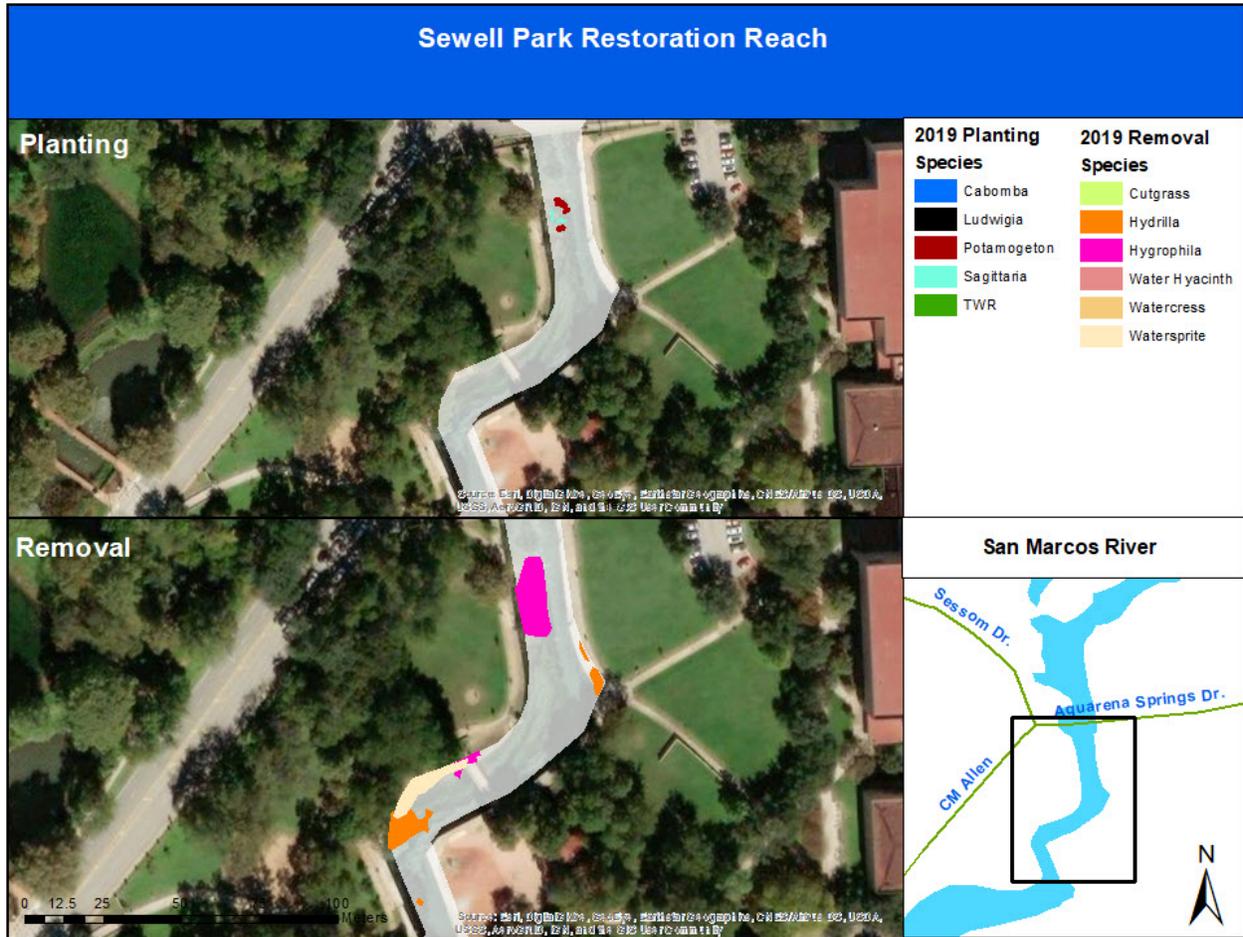
Spring Lake Dam LTBG reach was not a designed work zone for 2019. Vegetation treatment efforts occurred on 8 days during which approximately 11m<sup>2</sup> of Hydrilla, 20m<sup>2</sup> Hygrophila, 17m<sup>2</sup> of watercress, and 22m<sup>2</sup> of water sprite were removed (Fig. 3.3.25). No planting of native species occurred. Natural expansion of existing patches of Ludwigia, Cabomba or Sagittaria were observed throughout the reach, but primarily near the outflow from Sessom Creek drainage. Potamogeton and Hydrocotyle expansion were also observed in areas of higher flow, possible due to higher current velocities and less recreation damage as compared to 2018.



**Figure 3.3.25.** Locations of aquatic vegetation removal in Spring Lake Dam LTBG reach in 2019.

### Sewell Park Restoration Reach

For 2019, the Sewell Park Restoration reach was not an active work zone but did require gardening to remove non-native vegetation regrowth within existing patches of native SAV along with planting of both Potamogeton and Sagittaria to help fill in denuded areas from recreation. Non-native removal occurred on a total of 11 days during which approximately 10m<sup>2</sup> of Hydrilla, 28m<sup>2</sup> of Hygrophila, 2m<sup>2</sup> of watercress, and 5m<sup>2</sup> of water sprite were removed (Fig. 3.3.26). A more thorough removal of Hydrilla in 2018 allowed for natural expansion of both Texas wild-rice and Potamogeton into previously unestablished areas.



**Figure 3.3.26.** Locations of non-native vegetation removal and native SAV planting in Sewell Park restoration reach in 2019.

### Below Sewell Restoration Reach

For 2019, the Below Sewell restoration reach was designated a work zone with a focus on removal of Hydrilla and to decrease the amount of Hygrophila. Non-native removal was performed on a total of 33 days during which approximately 845m<sup>2</sup> of Hydrilla, 1,002m<sup>2</sup> of Hygrophila, 122m<sup>2</sup> of water cress, 709m<sup>2</sup> of water sprite, 1.4m<sup>2</sup> of water hyacinth, and 2.8m<sup>2</sup> of cutgrass was removed (Fig. 3.3.27). An additional 45m<sup>2</sup> of Hydrilla was removed during maintenance sweeps. Planting of native SAV occurred in the areas where Hydrilla removal began at the end of 2018. A total of five planting days occurred in 2019 with 528 Cabomba, 608 Ludwigia, 750 Potamogeton, and 519 Sagittaria individuals being planted within the reach. Areas in the main river channel that had dense patches of hydrilla removed allowed for the expansion of Texas wild-rice and hygrophila. This supports the shift to the top-down removal of hygrophila.



**Figure 3.3.27.** Locations of non-native vegetation removal and native SAV planting in Below Sewell restoration reach in 2019.

### City Park LTBG Reach

The City Park LTBG reach was designated a work zone for 2019 with a focus on removal of Hydrilla and to keep patches of native SAV free from encroaching Hygrophila. Non-native removal was performed on a total of 32 days during which approximately 1,064m<sup>2</sup> of Hydrilla, 106m<sup>2</sup> of Hygrophila, 3m<sup>2</sup> of water cress, and 7m<sup>2</sup> of water sprite was removed (Fig. 3.3.28). Maintenance sweeps resulted in an additional 52m<sup>2</sup> of Hydrilla removal. The planting of native SAV that occurred in this reach was an attempt to create a wall around an area of Ludwigia and Cabomba to keep non-natives from being continually introduced into that area from upstream sources. An area of Potamogeton was planted in the lower section to introduce that species and promote downstream expansion. A total of two planting days occurred in 2019 with 600 Texas wild-rice, and 2,610 Potamogeton individuals being planted (Fig. 3.3.28).

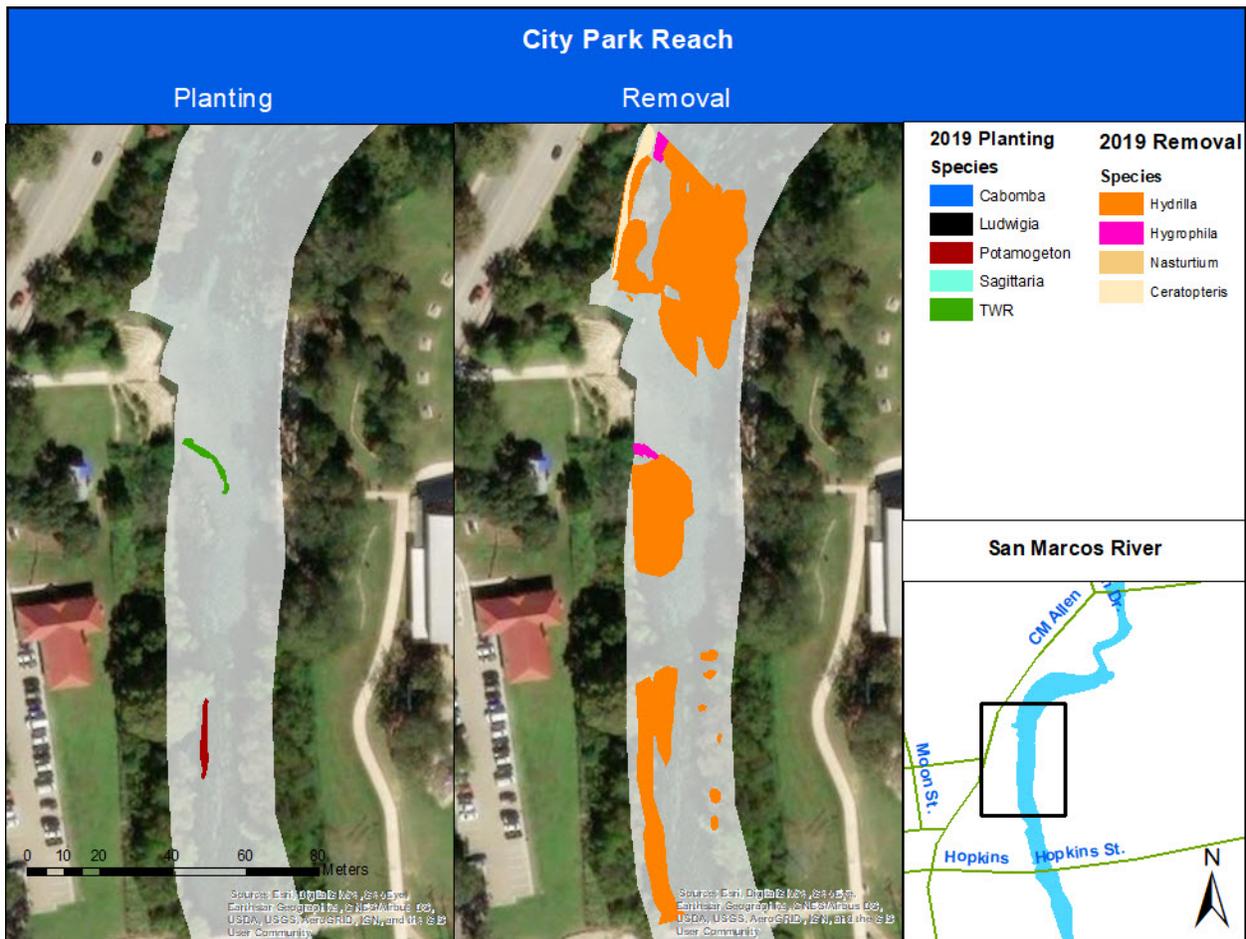


Figure 3.3.28. Locations of removal and planting within City Park LTBG Reach 2019.

### Below City to Hopkins

For 2019, the Below City to Hopkins is a non-designated reach that was a work zone for the MCWE crew. Very little effort was put into this reach historically with only a few removal and planting days prior to 2019. The primary focus was on removal of Hydrilla and to promote the natural expansion of native SAV already present in the reach. There was a large percent of Hydrilla within the reach at the start of 2019 that had been present for over a decade. This required a shift in the removal method to include more frequent maintenance sweeps to locate and remove regrowth from the large number of tubers present within the substrate. Non-native removal was performed on a total of 32 days during which approximately 1,987m<sup>2</sup> of Hydrilla, 174m<sup>2</sup> of Hygrophila, and 41m<sup>2</sup> of cutgrass was removed (Fig. 3.3.29). Additionally, 40m<sup>2</sup> Hydrilla was removed during the maintenance sweeps. No planting of native SAV occurred in this reach due to the quantity of Hydrilla present at the start and there are no goals for this reach. Regrowth will be maintained through maintenance sweeps into 2020. Once no regrowth occurs for a period of at least a few months then planting can occur.

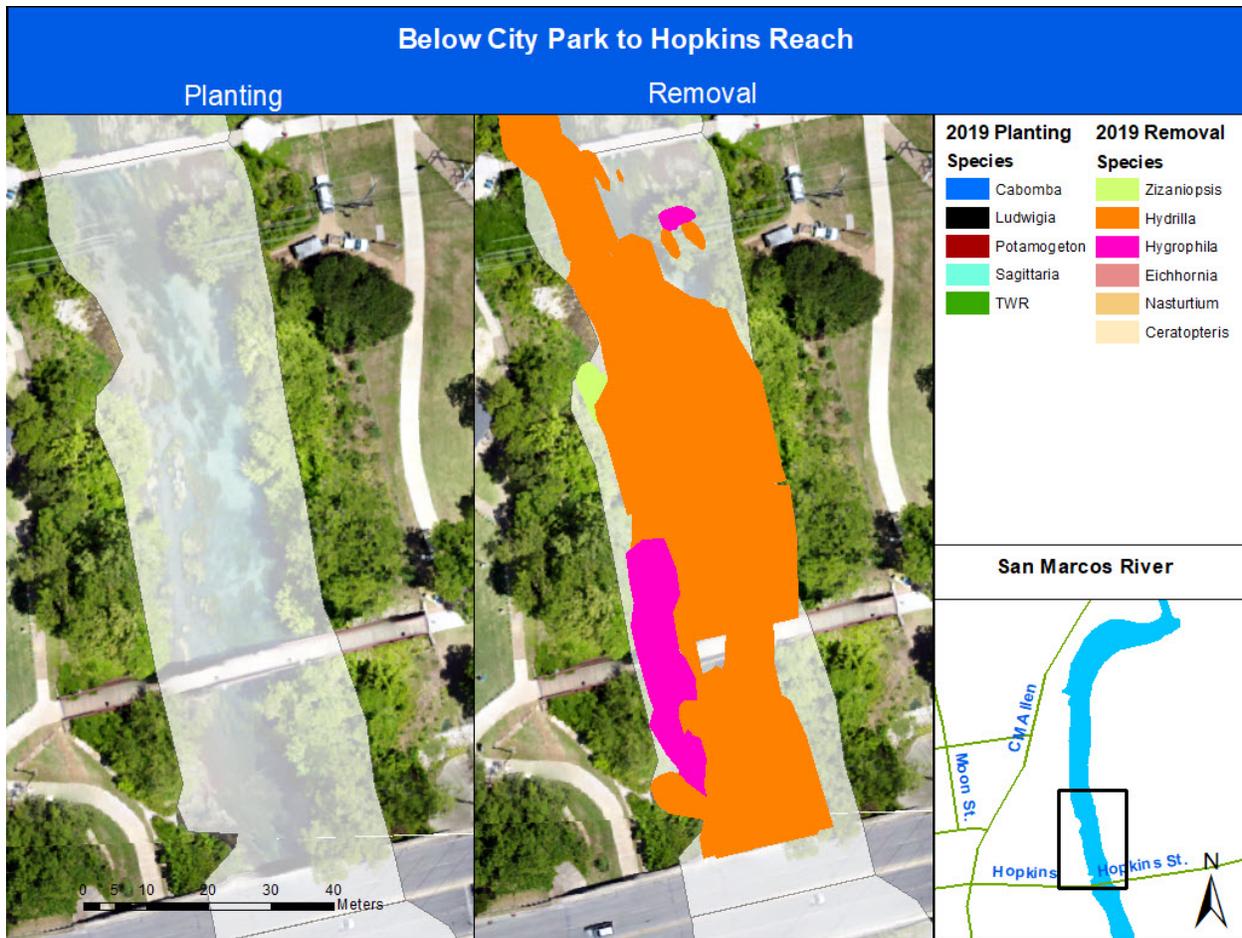


Figure 3.3.29. Locations of removal and planting within Below City to Hopkins reach 2019.

### Hopkins to Snake Island

The section of river from Hopkins street to Snake Island includes both a restoration reach and stretch of non-designated area immediately below Hopkins. This reach was not assigned as a work zone in 2019, but some removal effort began in October to further utilize warmer weather and to test some new methodology for areas with such large quantities of Hydrilla. Non-native removal was performed on a total of 4 days during which approximately 404m<sup>2</sup> of Hydrilla and 5m<sup>2</sup> of Hygrophila was removed (Fig. 3.3.30). No planting effort occurred in this reach due to potential reestablishment of non natives.

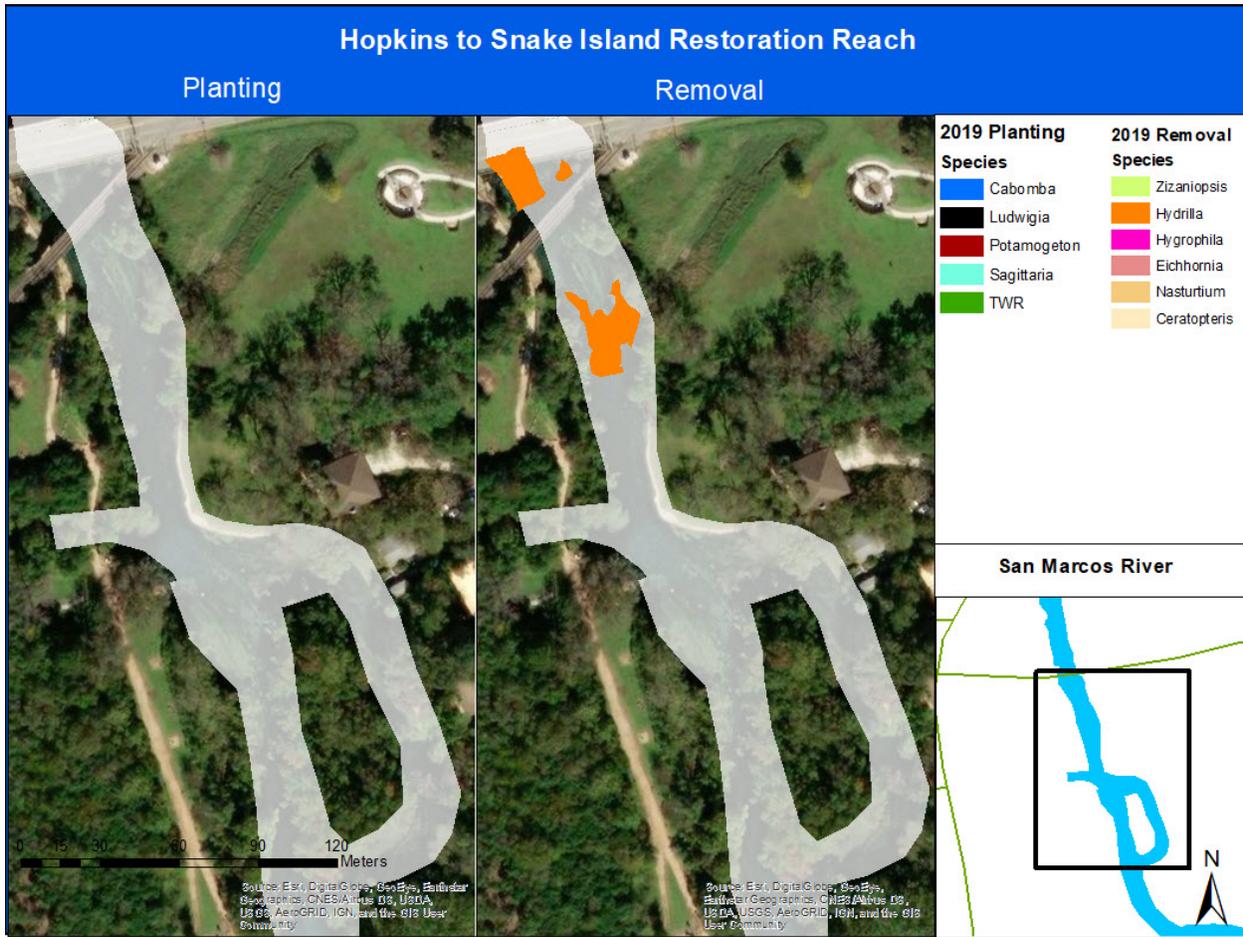


Figure 3.3.30. Locations of removal within the Hopkins to Snake Island reach 2019.

**Bicentennial**

No removal or planting effort went into Bicentennial reach in 2019. This reach will be designated as a work zone in the future.

**Cypress Island**

Cypress Island reach is a restoration reach but was not a designated work zone in 2019. While no efforts were made to this section of the river during the 2019 work season, observations regarding native SAV were noted throughout this period. Such observations included the expansion of Texas wild-rice alongside *Heteranthis*; where both appear to be inhibiting the expansion of *Hydrilla* in this reach. *Ludwigia* and *cabomba* populations have been significantly reduced in size and density throughout areas where previously planted, with *Hydrilla* reestablishing in areas that were not filled by native SAVs.

**Rio Vista**

No removal or planting effort went into Rio Vista reach in 2019. This reach will be designated as a work zone in the future.

### IH-35 Upper LTBG Reach

The upper section of the I-35 reach is a LTBG reach. It was not a designated work zone for 2019, but minor efforts were conducted in the IH-35 LTBG reach over this work season, as our primary goals were directed almost entirely at the upper reaches within this river system. Vegetation treatment efforts took place over 3 days with roughly 44m<sup>2</sup> of Hydrilla and 3m<sup>2</sup> Hygrophila being removed from areas immediately downstream from Cheatham Bridge and towards the lower end of this reach (Fig. 3.3.31). One effort day went into planting Texas wild-rice with 660 individuals being planted, but no other native SAV was planted. It was also observed that Texas wild-rice and Potamogeton have maintained aerial coverage in areas previously planted. Populations of Hydrocotyle, Ludwigia, and Sagittaria have all been reduced in number throughout this reach possibly due to disturbance from recreation or potential bank erosion.



Figure 3.3.31. Locations of non-native SAV removal in IH-35 LTBG reach (2019).

### IH-35 Expanded Restoration Reach

The downstream section of I-35 reach is a Restoration reach. Again, this reach was not a 2019 work zone; however, efforts to maintain native SAVs were taken in order to avoid potential losses due to Hydrilla expansion. A total of 18m<sup>2</sup> of Hydrilla and 49m<sup>2</sup> of Hygrophila were removed from this reach over the course of 3 treatment days (Fig. 3.3.32). No planting effort occurred in this reach for 2019. It appears that the Sagittaria population in this reach has maintained its foothold and possibly increased its aerial coverage in the upstream direction. Ludwigia and Hydracotyle have also maintained patches throughout this location, though Hydrocotyle is only established below the island. In addition to the vegetation observation, it was noted that flow conditions above the island have shifted due to a large pecan tree that has fallen in on river right: this tree is currently covering a small portion of Texas wild-rice that is located in the immediate vicinity.

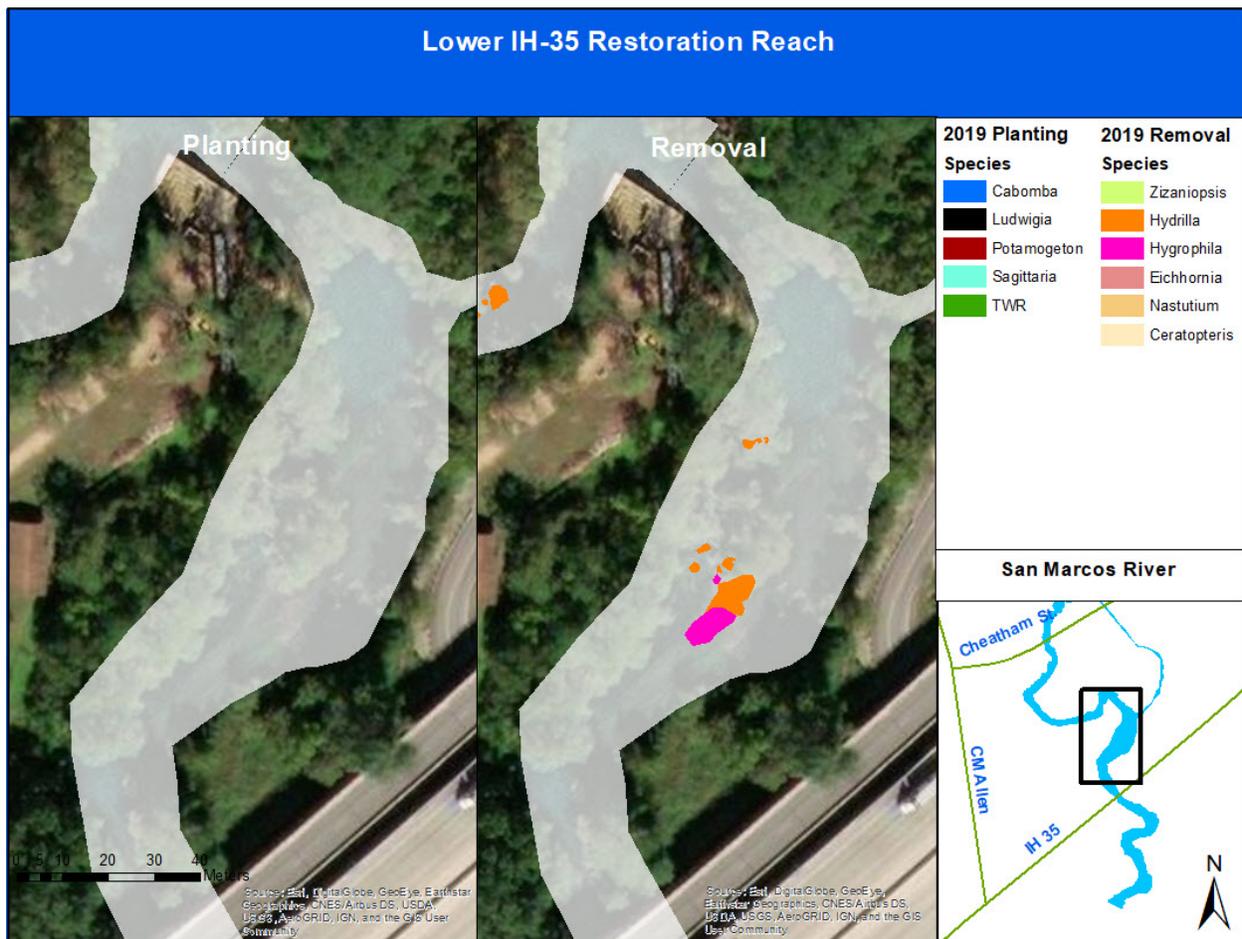


Figure 3.3.32. Locations of non-native SAV removal in IH-35 expanded restoration reach (2019).

## **Below IH-35 Reach**

No removal or planting effort went into Below IH-35 reach in 2019. This reach will be designated as a work zone in the future.

## **Vegetation Mat Removal**

### *EAHCP Obligations:*

The COSM will partner with Texas State to develop and implement a floating vegetation mat removal program reaching from Spring Lake downstream to the city boundary. Floating vegetation mats will be removed primarily from Texas wild-rice stands to keep the mats from interfering with photosynthesis and slowing current velocity.

### *2019 Compliance Actions:*

#### **----Vegetation Mat Removal**

Vegetation mats were removed primarily from Texas wild-rice stands in Spring Lake Dam reach, Sewell Park reach, and Below Sewell reach in 2019. This was the first year to fully remove the vegetation mats from the river instead of pushing them downstream, which was done to prevent them from building up on Texas wild-rice stands downstream. A total of 17,272.6 m<sup>2</sup> were removed from in and around Texas wild-rice over 762.3 labor hours throughout 2019 ([Fig. 3.3.33](#)). Additionally, vegetation mats downstream of these reaches were pushed when vegetation treatment work occurred within Texas wild-rice stands. The removed vegetation mats were also quantified by volume to give a better representation of how much vegetation was being removed, which could vary significantly in thickness and density, as opposed to estimating the area of vegetation mat coverage. This also allowed the collection of consistent data for the Spring Lake aquatic vegetation boom study. The area of removal consisted on approximately 2600m<sup>2</sup> Texas wild-rice stands within the three focus reaches. A total of 216.7m<sup>3</sup> was removed from the San Marcos river, in 45 effort days, through the collaboration of the MCWE and conservation crews from mid-May through mid-October.

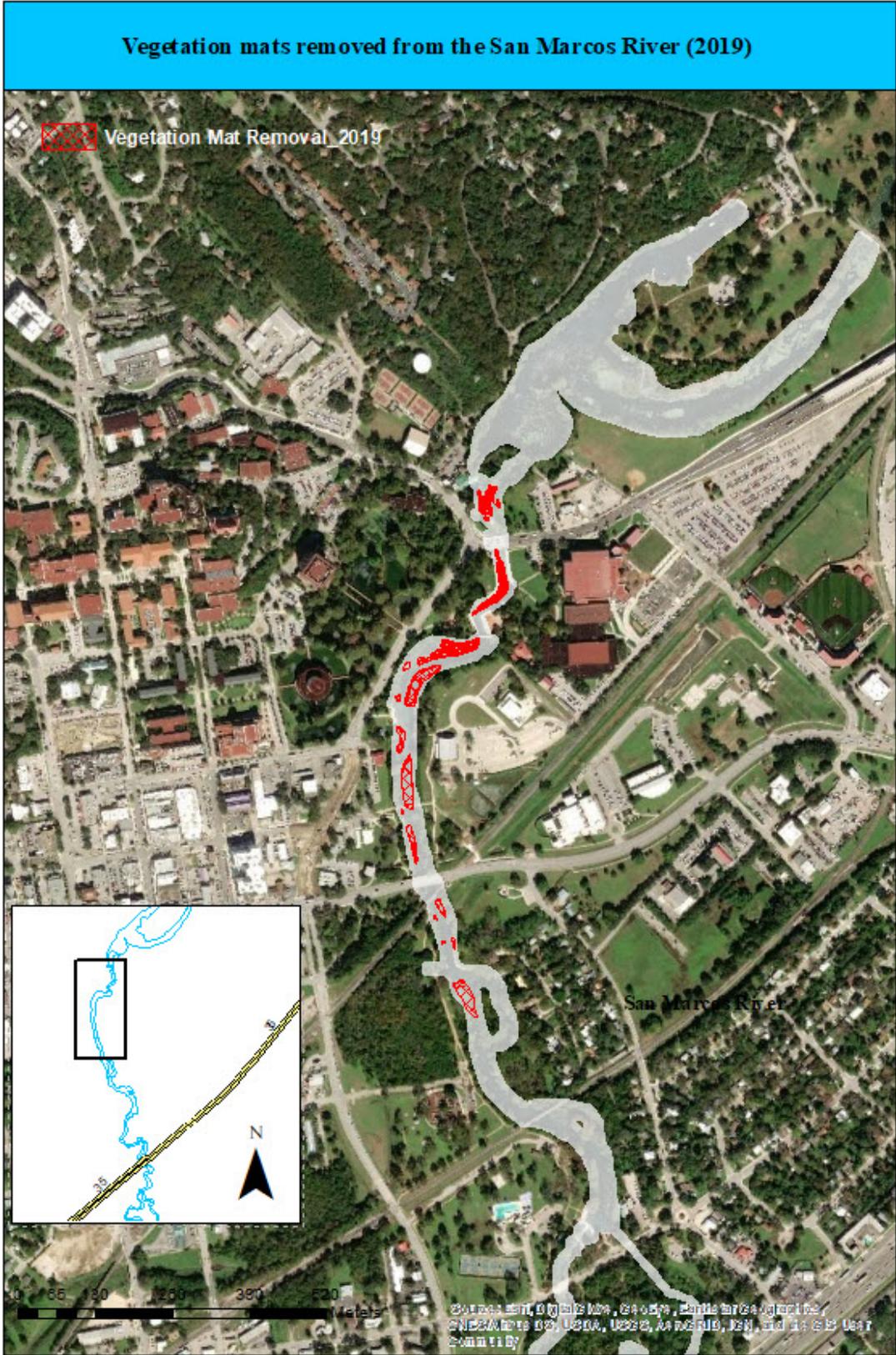


Figure 3.3-x. Upper three reaches, including polygons, where vegetation mat removal efforts were focused.

### Removal and Planting Data from Oct 1, 2018 – Dec 31, 2018

All effort for non-native removal and native planting for the months of Oct-Dec 2018 were not reported in the 2018 annual report due to the timing of the report due date.

**Table 3.3-7.** Native planting data for Oct 1, 2018-Dec 31, 2018 for all reaches that was not included in the 2018 Annual Report.

River reach	Designation	Species	N (individuals planted)	Area planted (m <sup>2</sup> )	Effort (days worked)
Spring Lake		<i>No Planting</i>	0	0	0
Spring Lake Dam	LTBG	<i>No Planting</i>	0	0	0
Sewell Park	Restoration	<i>Potamogeton</i>	288	10.5	1
		<i>Ludwigia</i>	880	12.5	
		<i>Sagittaria</i>	64	8	
Below Sewell	Restoration	<i>Potamogeton</i>	612	25.3	2
		<i>Ludwigia</i>	2,615	49.9	
		<i>Cabomba</i>	128	3.3	
City Park	LTBG	<i>Potamogeton</i>	1,584	25.8	5
		<i>Ludwigia</i>	2,460	75	
		<i>Cabomba</i>	800	39	
Below City to Hopkins	None	<i>No Planting</i>	0	0	0
Hopkins/Snake Island	Restoration	<i>No Planting</i>	0	0	0
Bicentennial	None	<i>No Planting</i>	0	0	0
Cypress Island	Restoration	<i>Potamogeton</i>	3,168	40.1	3
		<i>Cabomba</i>	666	9.3	
Rio Vista	None	<i>No Planting</i>	0	0	0
I-35 Upper	LTBG	<i>No Planting</i>	0	0	0
I-35 Lower	Restoration	<i>No Planting</i>	0	0	0
		<i>Potamogeton</i>	5,652	101.7	
		<i>Ludwigia</i>	5,955	137.4	
		<i>Sagittaria</i>	64	8	
		<i>Cabomba</i>	1,594	51.6	
Total River		<i>Hydrocotyle</i>	0	0	11

**Table 3.3-8.** Non-native removal data for Oct 1, 2018-Dec 31, 2018 for all reaches that was not included in the 2018 Annual Report.

River reach	Species	Area Removed (m <sup>2</sup> )	Effort (days worked)
<b>Spring Lake</b>	<i>No Removal</i>	0	0
<b>Spring Lake Dam LTBG</b>	<i>Hydrilla</i>	2.4	2
	<i>Hygrophila</i>	0.2	
	<i>Eichhornia</i>	18.4	
<b>Sewell Park</b>	<i>Hydrilla</i>	0	6
	<i>Hygrophila</i>	164.3	
	<i>Ceratopteris</i>	3.1	
	<i>Zizaniopsis</i>	2.6	
<b>Below Sewell</b>	<i>Hydrilla</i>	241.9	11
	<i>Hygrophila</i>	265.8	
	<i>Nasturtium</i>	153.3	
	<i>Ceratopteris</i>	6.1	
	<i>Zizaniopsis</i>	10	
<b>City Park LTBG</b>	<i>Hydrilla</i>	14.6	2
	<i>Hygrophila</i>	24.9	
	<i>Nasturtium</i>	2.8	
<b>Below City to Hopkins</b>	<i>No Removal</i>	0	0
<b>Hopkins</b>	<i>No Removal</i>	0	0
<b>Bicentennial</b>	<i>No Removal</i>	0	0
<b>Cypress Island</b>	<i>No Removal</i>	0	0
<b>Rio Vista</b>	<i>No Removal</i>	0	0
<b>I-35 LTBG</b>	<i>No Removal</i>	0	0
<b>I-35 Lower</b>	<i>Hydrilla</i>	0.8	1
	<i>Hygrophila</i>	59.3	
<b>Total River</b>	<i>Hydrilla</i>	259.8	22
	<i>Hygrophila</i>	747.7	
	<i>Nasturtium</i>	183.5	
	<i>Ceratopteris</i>	9.2	
	<i>Eichhornia</i>	18.4	
	<i>Zizaniopsis</i>	12.6	

### *Proposed Activities for 2020*

In 2020, the aquatic vegetation treatment work plans are developed based on the new approved strategy of top-down removal for non-native SAV. The primary focus will be to begin *Hygrophila* removal from within Spring Lake, which is acting as a source population that feeds into the San Marcos River. This will occur while forward progress of *Hydrilla* removal within the river is slowed down and the maintenance of the 2019 work zones is fine-tuned. Areas within the Spring Lake that have been successfully cleared of *Hygrophila* will receive test planting of Texas wild-rice to find more areas with suitable habitat.

The 2019 work zones within the river will shift to recovery zones and will continue to be maintained for *Hydrilla* through use of scuba divers performing regular maintenance sweeps. This will include Below Sewell Park, City Park, and Below City Park reaches. Effort will be put to towards maintaining areas of native SAV to keep *Hygrophila* from encroaching until these removal efforts catch up to *Hydrilla* removal progress near Hopkins Bridge.

Any areas within the recovery zone that show no *hydrilla* regrowth for a sustained period can be planted with appropriate native SAV that are best suited to that habitat type. Since it has shown to be more efficient to foster natural expansion of native SAV already present within a reach, more effort will go towards that than actively planting.

**Appendix M2**  
**CITY OF SAN MARCOS (COSM) / TEXAS STATE UNIVERSITY (TEXAS STATE), AND**  
**TEXAS PARKS AND WILDLIFE DEPARTMENT (TPWD) REPORTS/DOCUMENTS**  
**2019 Management of Recreation in Key Areas**

**Recreational presence:** Conservation Crew observed a large amount of river users on weekends in the parks. Noted the river parks post Memorial Day weekend are the cleanest we have seen in many years! The combined efforts of Conservation Crew litter removal and education, Parks Crew, City Contractors, Leave No Trace educational booths and enforcement of park rules by rangers have successfully managed recreational litter in the parks. Conservation Crew observed a large amount of river users on the weekend of July 4<sup>th</sup> (See Figures 1-3). The city park rules have deterred the use of charcoal grills and pop up tents. The LNT booths help manage consistent education outreach for litter at City Park and Rio Vista.

**Conservation Crew tasks:**

- Spoke to river users about listed species protection, HCP projects, park rules, etc. Number of conversations: 1101.
- Installed Lion's Club TV video loop.
- Participated in TxState Aquatic Camp (weekly during June and July) presenting watershed model and SMR Interpretive Card Deck. See Figures 4 & 5.
- Kept eye out for zebra mussels on recreational watercraft – nothing to report.
- Pushed floating veg mats off TWR stands primarily at City Park, and Bicentennial where accumulation persisted due to low flow. Regularly worked with the Meadows Crew removing veg mats from headwaters to lower Sewell Park as part of the Spring Lake boom study. See Figures 6-9.
- Removed litter from river (3,073 cu ft) and the parks (4459 cu ft). See Figures 10-14.
- Installed litter boats – (2) at Rio Vista railroad bridge; (1) at Hopkins St. bridge.
- Performed trash dives from Bicentennial to Ramon Lucio Parks.
- Removed litter from Rio Vista to Stokes Park multiple times.
- Repaired riparian fence gate and replaced TWR SSA sign.
- Noted isolated stands of elephant ear and reported to contractor for treatment.
- Mulched recently planted cypress trees and sedges and pulled ligustrum seedlings
- Rio Vista gardens and watered plantings at Rio Vista, Wildlife Annex and Crook Parks.

Summary: Conservation Crew worked primarily during the recreation season to educate the public about endangered species and EAHCP projects through PSA, youth events and conversations with river users. Conservation Crew also remove river litter and report items related to the EAHCP that require action.



Figure 1: Rio Vista crowds



Figure 2: Rio Vista crowds



Figure 3: City Park crowds

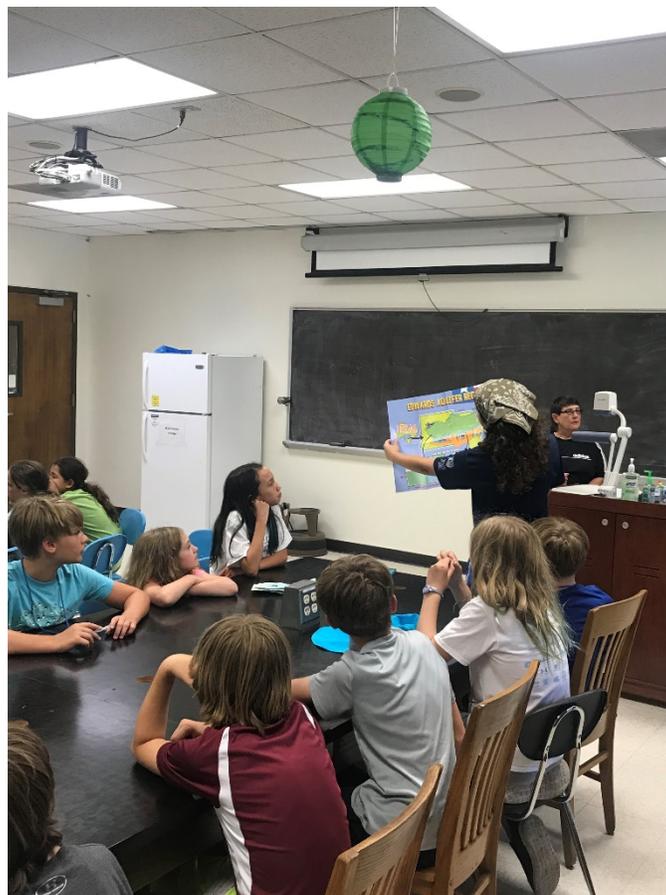


Figure 4: TxState Aquatic Camp



Figure 5: TxState Aquatic Camp



Figure 6: Veg mats before removal at Sewell.



Figure 7: Veg mats after removal at Sewell.



Figure 8: Veg mats before removal at Bicentennial.



Figure 9: Veg mats after removal at Bicentennial.



Figure 10: Litter pile at Rio Vista Falls.



Figure 11: Sand bags removed. Suspect they washed off street leftover from road construction work.



Figure 12: concentrated litter under IH35.



Figure 13: Very busy holiday weekend with overflowing trash cans.



Figure 14: Cans removed primarily from litter boats after a busy recreation day.

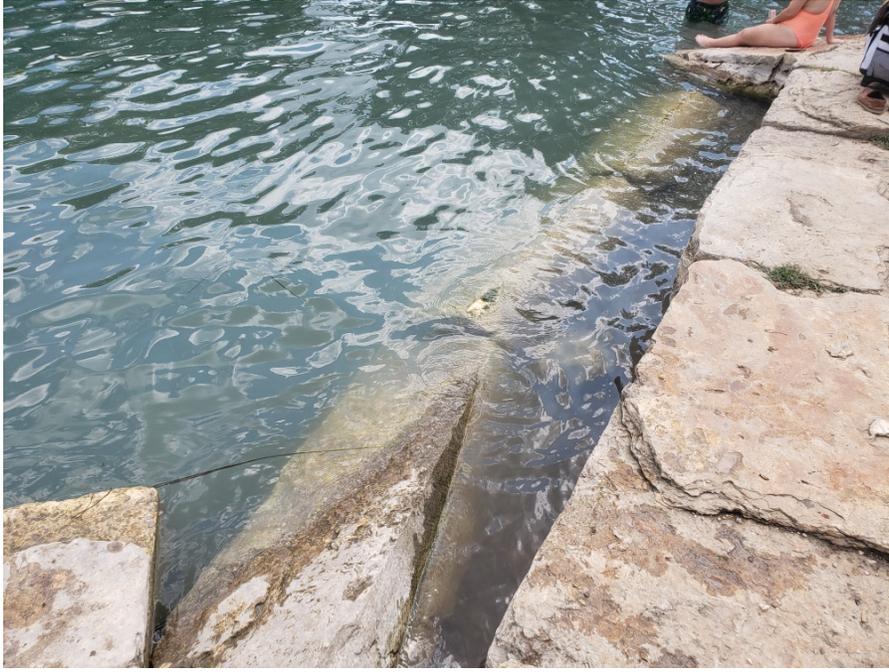


Figure 15: Bottom row of Dogbeach access point settled considerably, but remains stable.



Figure 16: Bottom row of Dogbeach access point settled considerably, but remains stable.

**Appendix M3**  
**CITY OF SAN MARCOS (COSM) / TEXAS STATE UNIVERSITY (TEXAS STATE), AND**  
**TEXAS PARKS AND WILDLIFE DEPARTMENT (TPWD) REPORTS/DOCUMENTS**  
**2019 Designation of Permanent Access Points and Bank Stabilization**

### Designation of Permanent Access Points and Bank Stabilization (EAHCP §5.3.7)

The eight existing access point locations were monitored twice during 2019. Four of the access points showed notable undermining as shown below in **Table 1**.

**Table 1.** Undermining Measured (in Inches) at Four Access Point Locations – February and October 2019

Sites	Dog Beach	Hopkins	Bicentennial	Rio Vista
Depth 1	5	1		
Length 1	7	1		
Depth 2	5	5	3	
Length 2	4	10	7.5	
Depth 3	8		4	
Length 3	11		4	
Depth 4	8			1
Length 4	11			2.5
Depth 5	11			3
Length 5	12			4.5
Depth 6	6			1.5
Length 6	8			4
Depth 7	5			
Length 7	8			
Depth 8	6			
Length 8	10			

**Appendix M4**  
**CITY OF SAN MARCOS (COSM) / TEXAS STATE UNIVERSITY (TEXAS STATE), AND**  
**TEXAS PARKS AND WILDLIFE DEPARTMENT (TPWD) REPORTS/DOCUMENTS**  
**2019 San Marcos Aquatic Vegetation Intern Report**

## **Intern Map Report of the Below Sewell to City Park and Below City Park to Hopkins Reaches of the San Marcos River**

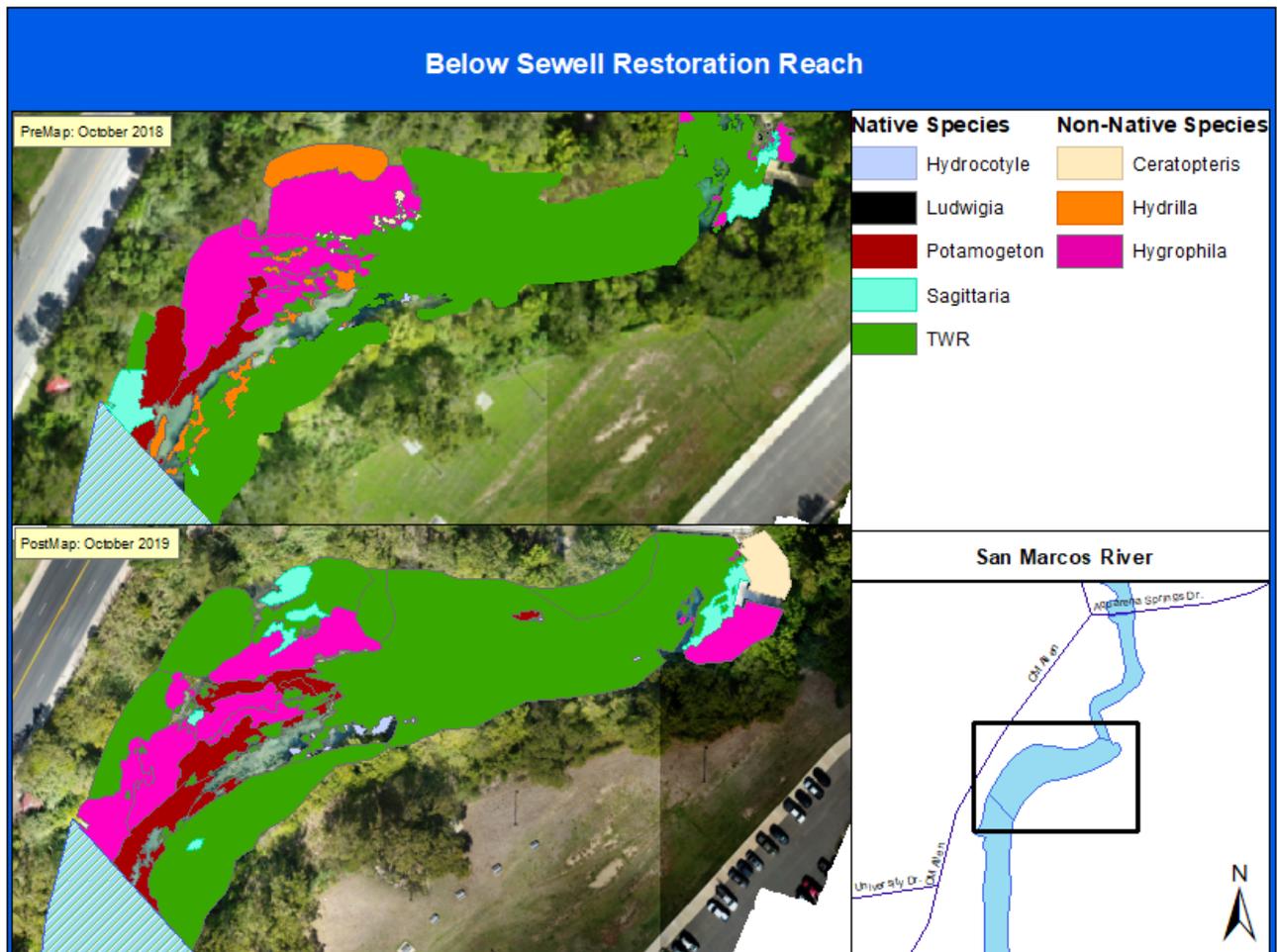
Authors: Elizabeth Davila and Noah Taylor

Acknowledgements: Tom Heard, Chris Riggins, and Collin Garoutte

**Abstract:** The objective of this map report is to display the progress made by the Habitat Conservation Plan crew in the effort of removing non-native vegetation and encouraging the growth of native vegetation in two particular reaches of the San Marcos River. This effort is important in order to preserve, protect, and enhance the environment in and around the river. The two reaches exhibited are the Below Sewell to City Park reach and the Below City Park to Hopkins reach. The evaluation of the progress for each reach respectively includes a completed map of the aquatic vegetation cover from both October of 2018 and October of 2019. By placing the two maps side by side, it is easy to visualize the efforts made in a year's time. Also included in the evaluation of both reaches is a table that displays the coverage area in m<sup>2</sup> as well as the coverage percentage for each species for 2018 and 2019. The table also provides the change in coverage percentage between the two years for every represented species. Lastly, each reach evaluation contains a paragraph explaining the efforts and the impact made.

### Below Sewell to City Park Restoration Reach

For 2019, the Below Sewell restoration reach was designated as a work zone with a focus on removing Hydrilla and decreasing the amount of Hygrophila. The process of removing non-native species and the subsequent growth of native species over the course of a year (between October 2018-2019) is visualized in the following map and table. The removal of Hydrilla was particularly successful as its coverage was reduced from 751.2 m<sup>2</sup> to near zero, resulting in 15.12% coverage decrease throughout the year. Hygrophila's coverage was reduced from 1103.9 m<sup>2</sup> to 682.9 m<sup>2</sup> resulting in a 9.6% coverage decrease when referencing the total area with vegetation. Another non-native species' coverage, Ceratopteris, was reduced from 44.7 m<sup>2</sup> to near zero as well. The most prominent and ecologically significant native species, Texas Wild Rice, saw a substantial increase in coverage from 2432.956 m<sup>2</sup> to 3535.1 m<sup>2</sup>. That growth results in a 16.33% increase throughout the year. Other notable native species that experienced growth throughout the year are Sagittaria and Potamogeton. Sagittaria increased its coverage by 4.32% while Potamogeton increased its coverage by 2.63%.



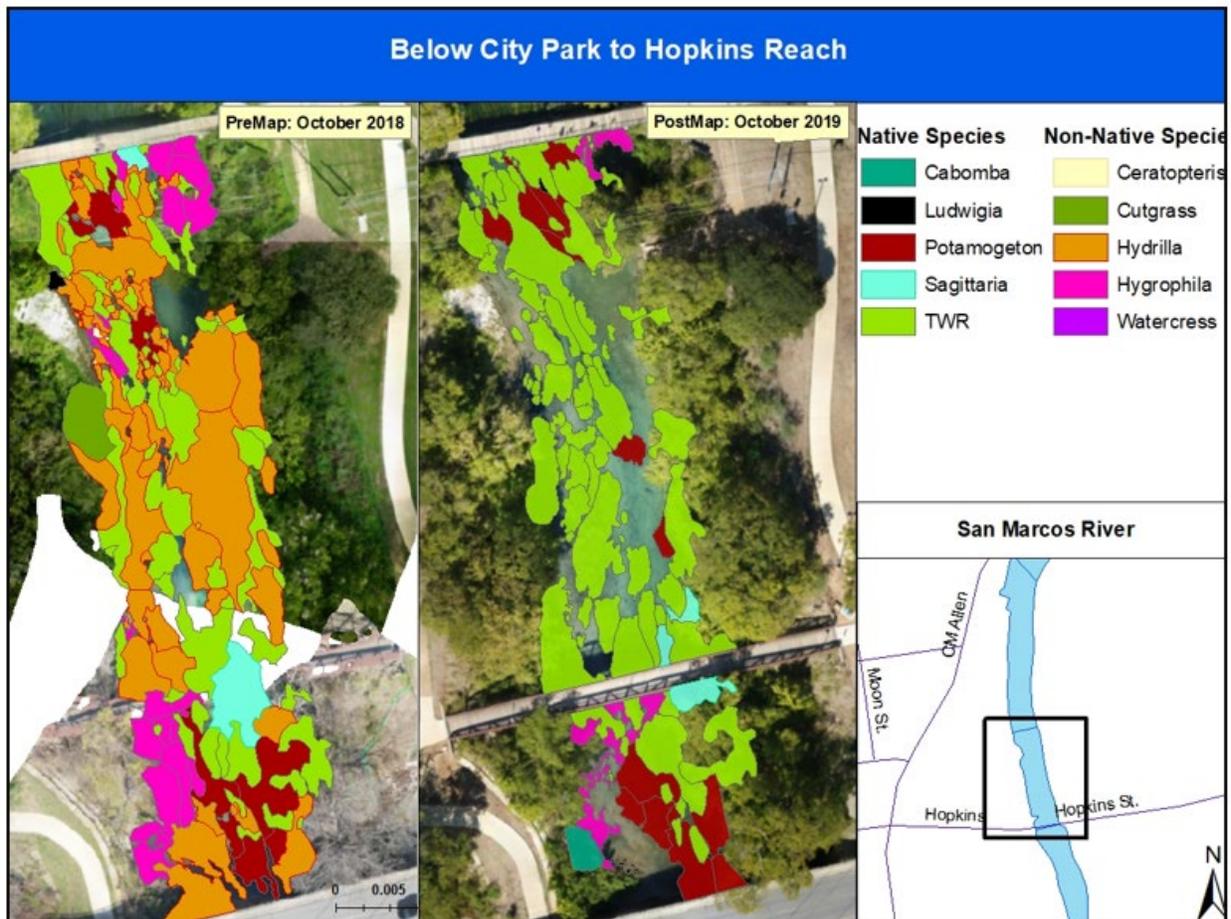
**Figure 1.1.** Locations of native and non-native aquatic vegetation species within the Below Sewell to City Park restoration reach, PreMap (Top, Oct. 2018), PostMap (Bottom, Oct. 2019).

Species	2018 (m <sup>2</sup> )	2018 (%)	2019 (m <sup>2</sup> )	2019 (%)	% Change
Cabomba	4.5	0.09%	12	0.22%	0.13%
Ceratopteris	44.7	0.90%	0	0.00%	-0.90%
Hydrilla	751.2	15.12	0	0.00%	-15.12%
Hydrocotyle	6.2	0.12%	43.5	0.80%	0.68%
Hygrophila	1103.9	22.21%	682.9	12.61%	-9.60%
Ludwigia	1.7	0.03%	34	0.63%	0.59%
Potamogeton	400.3	8.06%	578.8	10.69%	2.63%
Sagittaria	223.8	4.50%	478	8.83%	4.32%
TWR	2432.96	48.96%	3535.1	65.29%	16.33%
Watercress	0	0.00%	42	0.78%	0.78%
Water Hyacinth	0	0.00%	8.1	0.15%	0.15%
<b>Total Area (m<sup>2</sup>)</b>	4969.26	100.00%	5414.4	100.00%	

**Table 2.1** Estimated areas (m<sup>2</sup>) of vegetation as well as their percent change within the Below Sewell to City Park restoration reach in October of 2018 compared to October 2019.

### Below City Park to Hopkins Restoration Reach

In 2019, the Below City Park to Hopkins restoration reach was designated as a work zone with a focus on removing and decreasing the amount of non-native species such as Hydrilla and Hygrophila. The following map and table depict the process of non-native species removal and the subsequent growth of native species over the course of a year from October 2018 to October 2019. Hydrilla removal was successful as the total coverage was reduced from 1,007.51 m<sup>2</sup> to 6.21 m<sup>2</sup>, resulting in a 44.55% decrease throughout the year. The coverage of Hygrophila was reduced from 259.17 m<sup>2</sup> down to 67.92 m<sup>2</sup> resulting in an overall 7.28% decrease. Species with coverage that decreased to near zero in 2019 were Ceratopteris, Cutgrass, and Watercress. The endangered Texas Wild Rice coverage saw a substantial increase from 628.27 m<sup>2</sup> to 1084.59 m<sup>2</sup>, a difference of 40.42%. This species now represents approximately 68.45% of the total aquatic vegetation of the restoration reach.



**Figure 1.2.** Locations of native and non-native aquatic vegetation species within the Below City Park to Hopkins restoration reach, PreMap (Left, Oct. 2018), PostMap (Right, Oct. 2019).

Species	2018 (m <sup>2</sup> )	2018 (%)	2019 (m <sup>2</sup> )	2019 (%)	% Change
Cabomba	1.91	0.09%	11.81	0.75%	0.66%
Ceratopteris	1.32	0.06%	0	0.00%	-0.06%
Cutgrass	41.22	1.84%	0	0.00%	-1.84%
Hydrilla	1007.51	44.95%	6.21	0.39%	-44.55%
Hygrophila	259.17	11.56%	67.92	4.29%	-7.28%
Ludwigia	3.98	0.18%	4.88	0.31%	0.13%
Potamogeton	228.6	10.20%	358.03	22.60%	12.40%
Sagittaria	63.49	2.83%	51.09	3.22%	0.39%
TWR	628.27	28.03%	1084.59	68.45%	40.42%
Watercress	6.15	0.27%	0	0.00%	-0.27%
<b>Total Area (m<sup>2</sup>)</b>	<b>2241.62</b>	<b>100.00%</b>	<b>1584.53</b>	<b>100.00%</b>	

**Table 2.2** Estimated areas (m<sup>2</sup>) of vegetation and open substrate and the percent change within the Below City Park to Hopkins restoration reach in October of 2018 compared to October 2019.

**Appendix M5**  
**CITY OF SAN MARCOS (COSM) / TEXAS STATE UNIVERSITY (TEXAS STATE), AND**  
**TEXAS PARKS AND WILDLIFE DEPARTMENT (TPWD) REPORTS/DOCUMENTS**  
**2019 Littoral Plant Removal**

## **Non-Native Littoral Plant Removal (REMOVAL OF LITTORAL AND RIPARIAN INVASIVE VEGETATION) 2019 – Annual Report – EBR Enterprises**

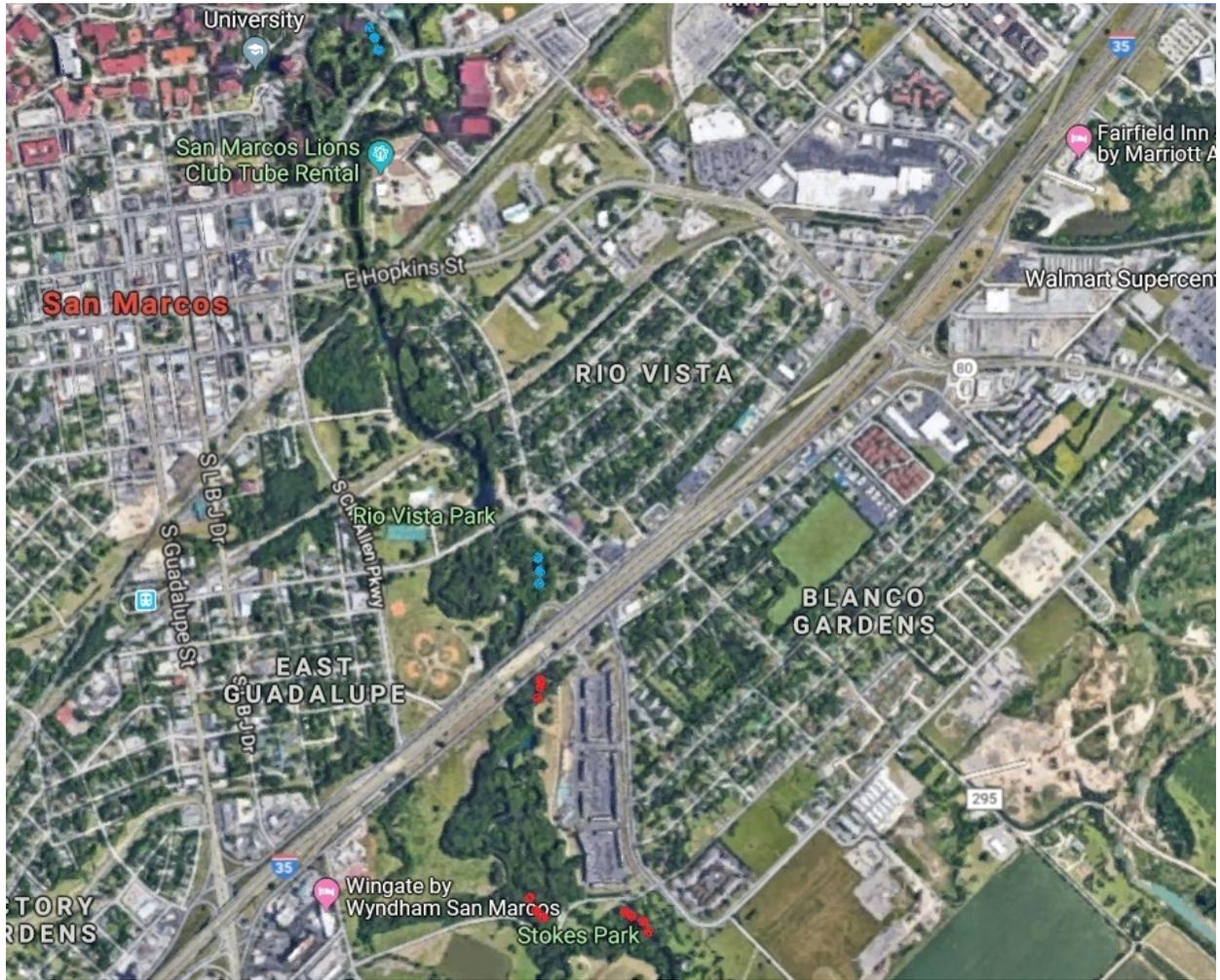
In 2019, removal efforts consisted of treating invasive, exotic plants from above Bert Brown Road to Cape's Dam. The majority of the work was along Sink Creek, running through the Texas State Property. Elephant Ears were the main target, but Water Hyacinth, Chinaberry, Chinese Tallow, Japanese Honeysuckle, Ligustrum, and Vitex were also targeted for removal. The west bank of Sink Creek is mostly in a maintenance state at this time. The only exceptions are a handful or two of Chinese Tallow trees and some Japanese Honeysuckle at the Wetland Boardwalk area. The east bank of Sink Creek has woody species that will continue to be targeted. Over 100 yards of new territory was worked on this year along the east bank. Invasive, exotic, woody species also still exist along the lower portions of the east and west banks of Spring Lake.

All of the littoral areas from Sink Creek to Capes Dam are now under control in regard to littoral invasive, exotic plants. The exceptions are still the large stands of Elephant Ears on private property just downstream of IH-35. Otherwise, the public and semi-public lands along Sink Creek, Spring Lake, and the San Marcos River, are all in good shape. All of the Elephant Ears that could be found in Spring Lake and the spillway island have now been treated. Water Hyacinth removal was stepped up in 2019, and they were narrowed down to a few small stands and a large mat in Sink Creek at and near the Wetland Boardwalk area. A portion of this mat has been treated as well. Mop up activities are becoming shorter and shorter, allowing for new areas to be attended to.

The contractor used Aquaneat (glyphosate-based herbicide) for elephant ears and other non-native plants encountered in the littoral zone (10 ounces (oz.) per gallon maximum, 8 oz. per gallon towards the end of the year). This herbicide was mixed with Aqua King Plus Surfactant (1 oz. per gallon) and Turf Mark Blue, Blue Dye. On the upland tree and shrub stumps and root buttresses, EBR used Relegate (Triclopyr-based herbicide, or Remedy Ultra) at 10 oz. per gallon. The Relegate/Remedy Ultra was mixed with glyphosate (10 oz. per gallon maximum), Drexel Surf Ac 820 Surfactant (1 oz. per gallon) and Turf Mark Blue, a blue dye. Chemicals were applied with a 1.5-gallon pump-up sprayer set on a steady stream for a more precise target hit, to minimize leaching and non-target plant damage. The sides of stumps and root flares of woody plants were scarred up with a machete or axe blade to expose more of the cambium layer and then treated with an herbicide mix.



Figure 7. Remaining San Marcos River headwater areas to be treated after 2019 removal efforts. Red = Elephant Ears, Blue = Chinese Tallow, Chinaberry, Ligustrum, Chinese Privet



**Appendix M6**  
**CITY OF SAN MARCOS (COSM) / TEXAS STATE UNIVERSITY (TEXAS STATE), AND**  
**TEXAS PARKS AND WILDLIFE DEPARTMENT (TPWD) REPORTS/DOCUMENTS**  
**2019 Riparian Restoration**

### **6.1.7 Native Riparian Habitat Restoration (EAHCP §5.7.1)**

The COSM's contractor, staff and volunteers performed riparian area non-native invasive plant removal. Targeted species include: Chinese tallow, chinaberry, ligustrum, Chinese privet, paper mulberry, tree of heaven, giant reed, Japanese honeysuckle, catclaw vine, heavenly bamboo, red-tipped photinia, golden bamboo, Chinese pistache, johnsongrass, bastard cabbage, and lilac chaste tree.

### **SUMMARY OF 2019 ACTIVITIES**

**JANUARY** - In January of 2019 Cuda Conservation started working at dog beach on river right. Throughout the month we worked upstream in that area pushing into Sewell Park. The removals in this area primarily consisted of Ligustrum, China Berry, and Chinese Tallow. Once we made it to Sewell Park, we had to haul off much of the biomass removed because leaving berms in Sewell Park was not very beneficial to the flattened area. **Figure 1** shows a map of the area worked in January 2019.

**FEBRUARY** - In February of 2019 we finished working through Sewell Park and then began to work on the SMRF property just below I-35. The area near the volleyball courts at Sewell Park was opened up a lot after we were done with our removals there. The SMRF property, unlike most other areas we have worked, had much larger non-native trees for us to remove as well as a very wide riparian area to work. See **Figure 2** for a map of the area completed on the SMRF property in February 2019.

**MARCH** - In March of 2019 we continued working through the SMRF property below I-35. As stated before, the work in this area was slower due to the widened riparian zone and large quantity of very large non-native trees. Even though there were many non-natives in this area, there was still a lot of plant diversity, which made working here special for us because of how beautiful the area is. We also worked in City Park on river left. Beginning near Lions Club, we worked upstream towards Sewell Park. This area was primarily regrowth removals apart from some Chinese Tallows directly on the bank. At a certain point as we got closer to Sewell Park, the poison ivy became too thick and hazardous to work through. For this reason, we must come back and touch up this area again. See **Figure 3** and **Figure 4** for a map of the area worked in March 2019.

**APRIL** - In April of 2019 we continued our work through the SMRF property. We reached the point where Willow Creek merges with the San Marcos River and at that point we turned up Willow Creek and started working our way upcreek. The riparian area was not as wide this month, but the trees removed were massive. In the wildlife annex there were a number of large native trees (mostly Pecan and Box Elder) that were covered in Catclaw vine. We took time to remove these vines and treat with herbicide so that the large natives would remain healthy. See **Figure 5** and **Figure 6** for maps of the work completed in April 2019.

**MAY** – In May of 2019 we continued our work in SMRF property along Willow Creek. As we worked through SMRF property the last few months, we encountered days where the weather was inappropriate for using herbicide. In May, we retraced our steps on SMRF property to find all the flagged stumps left behind so that we could treat them. **Figure 7** and **Figure 8** show maps of the areas worked in May of 2019. The dotted red line is representative of the area we came back to retreat flagged stumps left behind.

**JUNE** – In June of 2019 we continued work on the SMRF property. This area had many non-native trees that were hanging directly over the river. It was inevitable that these trees would fall into the river. For this reason, we waited until June (warmer weather) to take these trees down. Some of these trees can be a lengthy process from start to finish because much of the time we would need to get into the river to pull out the removed trees. With enough flow and depth, this can be very challenging. **Figure 9** shows the area worked in May of 2019. The dotted line is representative of an area that we had worked already but had to come back to finish.

**SEPTEMBER** – In September of 2019 we worked 2 locations in the San Marcos watershed. First we removed pockets of Giant Reed in Schulle Canyon. Next we removed primarily Ligustrum along Sessom Creek. **Figure 10** and **Figure 11** show maps of the areas worked this month.

Summary: Over the spring and fall of 2019, City of San Marcos located and removed invasive re-growth in the EAHCP areas riparian areas along the San Marcos River and along a portion of Willow Creek. Starting at the banks just below the last foot bridge in Sewell Park and finishing just below Capes Dam, the City of San Marcos mechanically or chemically treated Chinese tallow, chinaberry, ligustrum, Chinese privet, paper mulberry, tree of heaven, giant reed, Japanese honeysuckle, catclaw vine, heavenly bamboo, red-tipped photinia, golden bamboo, Chinese pistache, johnsongrass, bastard cabbage, and lilac chaste tree. Trunks are placed onsite along contours to slow down storm water and enhance infiltration.

Table: Removed and treated invasive re-growth from Sewell Park to Capes Dam and portions of San Marcos River tributaries.

## **FIGURES FOR 2019 ANNUAL REPORT – CUDA CONSERVATION**



FIGURE 1. Area treated during January 2019



FIGURE 2. Area treated during FEBRUARY 2019

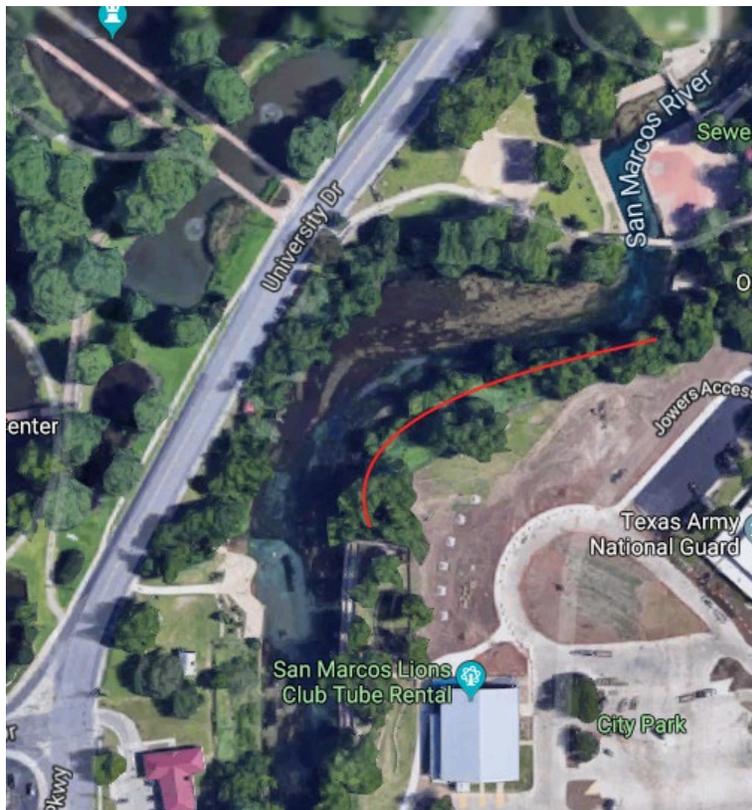
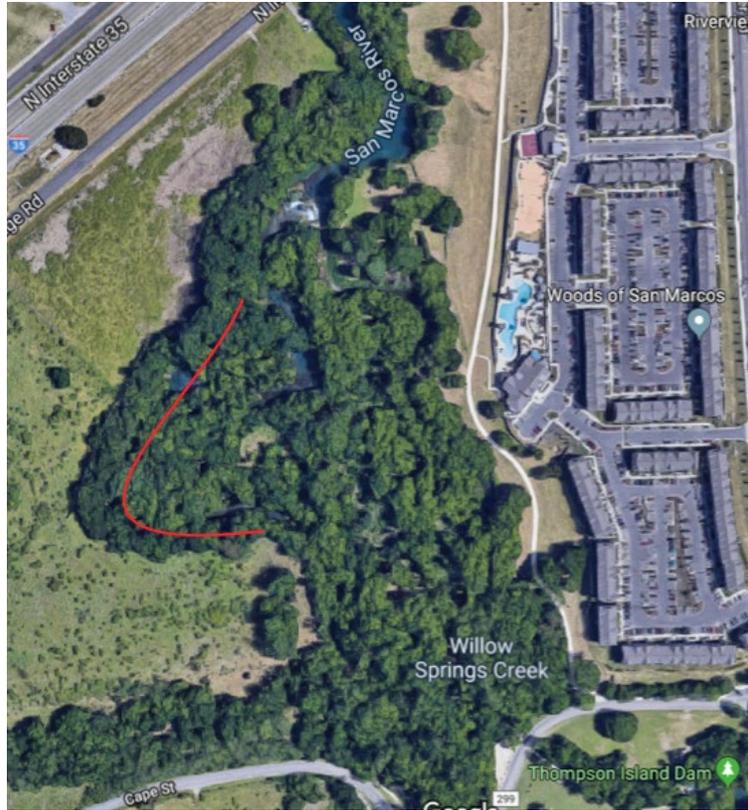


FIGURE 4. Area treated during MARCH 2019

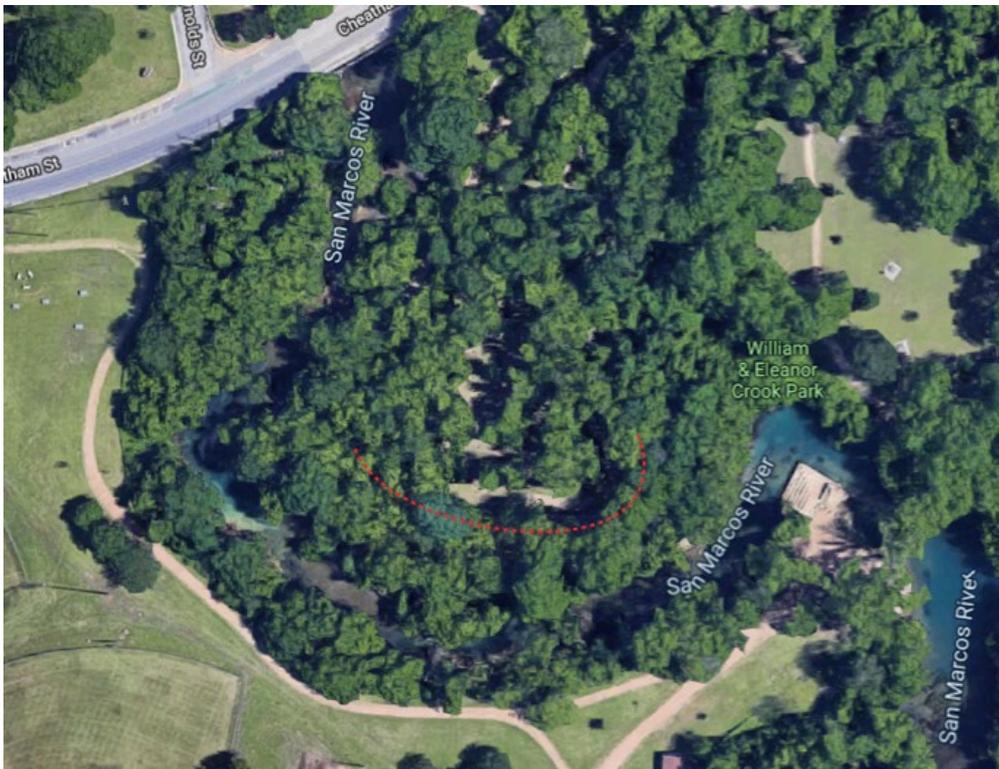


FIGURE 6. Areas treated during APRIL 2019



FIGURE 8. Area treated during MAY 2019



FIGURE 9 –area treated during JUNE 2019

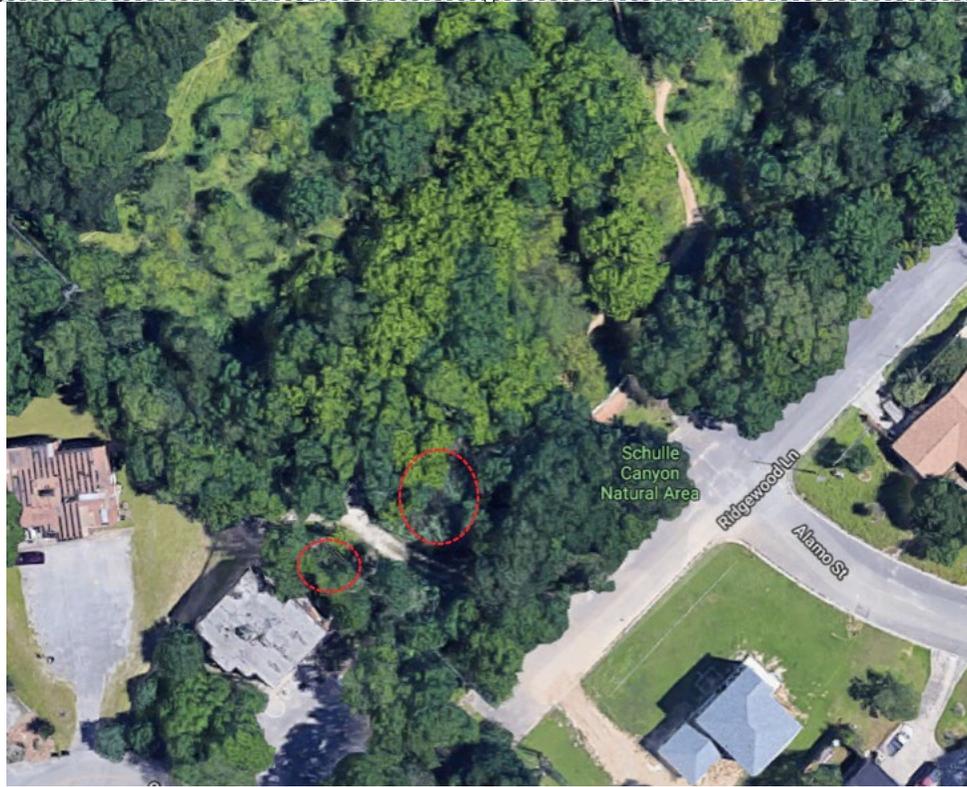
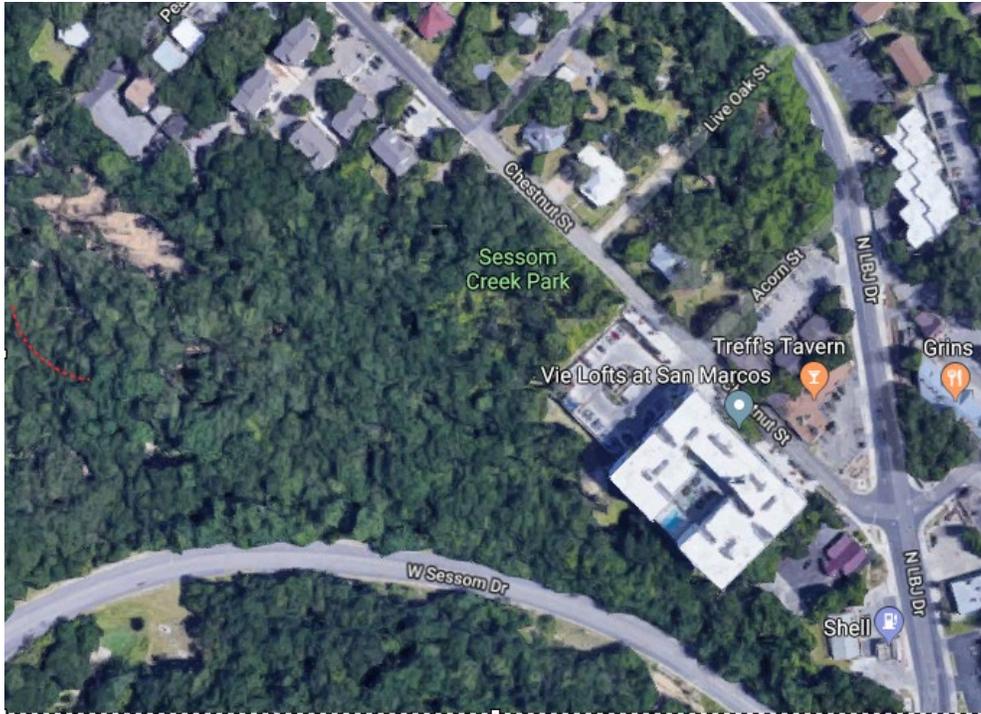


Figure 11. Area treated during SEPTEMBER 2019

**Appendix M7**  
**CITY OF SAN MARCOS (COSM) / TEXAS STATE UNIVERSITY (TEXAS STATE), AND**  
**TEXAS PARKS AND WILDLIFE DEPARTMENT (TPWD) REPORTS/DOCUMENTS**  
**2019 Management of Hazardous Household Waste**

As a member of the EAHCP, the COSM operates an HHW collection program. This program is available free of charge for all Hays County residents. Visitors are able to drop off household chemicals and paint that are hazardous for the environment. This facility also operates a reuse program for items that are in good condition. Labor for the facility is contracted to Green Guy Recycling. HHW is open to the public every Tuesday and Friday from 12:00 p.m. to 3:30 p.m. It is located at 630 E. Hopkins, San Marcos, TX 78666.

The majority of participants come from the cities of San Marcos, Kyle, Wimberley, and areas outside of the city limits. These areas are home to environmentally sensitive watersheds and the Edwards Aquifer Contributing and Recharge Zones. Offering a safe alternative to improper or illegal dumping of hazardous household chemicals is paramount to improving water quality and regional sustainability.

### **Drop-Off Center Participation**

The primary function of the HHW program is the drop-off center. Residents drive into the unloading area, where they are met by an HHW worker. The participants remain in their vehicle as the worker unloads the containers onto a cart. Each participant fills out a survey and provides their address. From these surveys, monthly participation rates are tracked for each community. The average number of participants for 2019 was 175 per month compared to 2018 at 181 per month.

The HHW facility is open to all residents of Hays County. The majority of the residents come from the COSM and areas outside of municipal jurisdictions. The San Marcos region is an environmentally sensitive area for the San Marcos River. Preventing illegal dumping and pollution in this region makes great strides towards improving water quality.

### **Reuse Program Participation**

The reuse program supports the drop-off center by attracting residents and diverting reusable items from the disposal stream. When chemicals are unloaded, the worker segregates new and slightly used containers that are ready for use. Many visitors with items eligible for reuse are in the moving process. Rather than moving all of their cleaning supplies, they have the option to deliver them to the HHW. These items are taken to the reuse building and are sorted on shelves. This building is open to the public during regular operating hours. Reuse participants fill out a form documenting the materials they pick up. This form explains that unused items are to be returned to HHW and not to be thrown into the regular waste stream. Participation for the reuse program has grown over time. The program also serves to educate the public about safe disposal and alternatives to harmful chemicals.

The monthly average participation for 2019 was 62 participants. Participants save money by collecting reuse items at no cost and the HHW program saves money by reducing disposal expenses.

The annual outreach goal for HHW is 1400 total participants. In 2019, this goal was exceeded by 103% with an annual total of 2,524 participants. The popularity of the reuse program and increased exposure through public outreach contributed to the program's success.

## The Chemicals

The household hazardous materials accepted by HHW include a wide-range of common chemicals and waste products. After the household waste is unloaded from the vehicle, the material is sorted and weighed. Each item is sorted based on chemical type. HHW facility workers collaborate with the chemical disposal company to evaluate the waste stream and finding storage and shipping options that reduce the expense. For example, oil based and latex paint, liquid flammables, used motor oil, cooking oil, and anti-freeze are bulked into 55-gallon drums. The remaining chemicals are sorted into either 55-gallon drums or lined gaylord boxes. Each container is stored in a chemical building or under cover until they are shipped to recycling facilities and a chemical landfill.

HHW disposed of approximately 160,000 pounds of HHW in 2019. Without this program, much of this waste would have been improperly disposed of in the municipal waste stream or illegally dumped. The amount of household hazardous waste diverted from the waste stream and distributed by the Reuse Program in 2019 totaled 9,020 pounds. Not only does this save on costs, it also decreases the demand for new products. The program helps with both material reuse and waste reduction.

Summary: City of San Marcos HHW serves the region and runs collection events, a drop-off center and reuse/resale facility. In 2019, the average number of participants at the drop-off was 175 per month and 62 customers per month at the reuse center. In 2019, the program exceeded their annual outreach goal. Additionally, HHW disposed of approximately 160,000 pounds of HHW in 2019, thus diverting approximately 9000 pounds of HHW from the waste stream.

Table: Drop-off center hosted 175 participants per month

Reuse center hosted 62 customers per month

Disposed of 160,000 pounds of HHW

**Appendix M8**  
**CITY OF SAN MARCOS (COSM) / TEXAS STATE UNIVERSITY (TEXAS STATE), AND**  
**TEXAS PARKS AND WILDLIFE DEPARTMENT (TPWD) REPORTS/DOCUMENTS**  
**Impervious Cover and Water Quality Protection**

## John Gleason LLC

### Information for the Annual EAHCP Report – 2019

Date: November 6, 2019

HCP Measure(s) Addressed: Section 5.7.6 Impervious Cover/Water Quality Protection

Project Name: Edwards Aquifer Habitat Conservation Plan (EAHCP)

Invoice Period: 1/1/2019 to 12/31/2019

Information by: John Gleason, RLA

San Marcos is following through on three water quality protection projects that were identified in the Water Quality Protection Plan (WQPP), published earlier. The San Marcos WQPP is a locally-developed plan that provides an integrated, holistic approach to minimizing the impacts of impervious cover in the city and on the campus of Texas State University.

The following activities are being conducted in support of the annual targets:

- The City of San Marcos completed the City Park biofiltration project. John Gleason LLC designed the pond and provided construction oversight. M2Federal served as the contractor. The drainage area is about 20 acres and includes 12 highly impervious off-site acres owned by Texas State University (Bobcat parking lot). The pond is expected to remove ~27 lbs of Total Phosphorus annually from drainage area.
- John Gleason LLC (JGLLC) has completed 100% contract documents for the C.M. Allen biofiltration pond rehabilitation. Construction began in October and completion is expected early next year.
- After several changes in our scope, JGLLC has completed 90% plans for the Sessom Creek Middle Reach Stream Restoration design. Comments from EAA and COSM on the 90% plans were numerous and JGLLC has refined their engineering and landscape restoration designs per the feedback. They are currently completing 100% plans, specifications and an opinion of probable construction costs (OPCC) by the end of 2019. The permitting process, along with public outreach is expected to be complete by the middle of 2020. The bidding phase will be complete by the end of 2020, with construction occurring throughout 2021. Project closeout is expected by the end of 2021. The goal of the stream restoration project is to reduce by 50% the sediment load from this reach of Sessom Creek to the Upper San Marcos River.

Summary: City of San Marcos completed the City Park biofiltration pond and the Downtown Pond retrofit will be completed by December 31, 2019. Design plans for Phases 1 & 2 will be at 99% and 90% respectively by December 31, 2019.

**John Gleason LLC**



**John Gleason LLC**

