

The City of San Marcos and Texas State University 2018 Work Plan Summaries

Presented for update:

- Texas wild-rice Enhancement and Restoration
- Control of Non-native Plants
- Non-native species control

No scientific review necessary:

- Sediment Removal
- Management of Recreation in Key Areas
- Management of Floating Vegetation Mats and Litter
- Designation of Permanent Access Points/Bank Stabilization
- Riparian Restoration
- Impervious Cover/Water Quality Protection
- Management of Household Hazardous Waste
- Prohibition of Hazardous Materials Transport
- Septic System Registration and Permitting Program
- Minimizing Impacts of Contaminated Runoff
- Diversion of Surface Water
- Diving Classes in Spring Lake
- Research Programs in Spring Lake
- Boating in Spring Lake and Sewell Park
- Management of Golf Course and Grounds

5.3.1/5.4.1 Texas Wild-Rice Enhancement and Restoration

Measure summary:

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.

2018 Goals:

In 2018, TWR enhancement (removal of non-natives and planting of TWR) focus on achieving the coverage shown below.

Reaches	EAHCP Cumulative Goals (m ²) (Table 4-10)	Restoration Goals for 2018 (m ²)	Approximate range of individuals needed to meet annual goal
Spring Lake	1,000 – 1,5000	100	1,800 – 2,200
Spring Lake Dam to Rio Vista Dam	5,810 – 9,245	140	2,500 – 2,900
Rio Vista Dam to IH-35	910 – 1,650	125	2,300 – 2,700
Downstream of IH-35	280 – 3,055	-	-
TOTAL	8,000 – 15,450	365	5,000 – 5,400

Achieved to date:

Reaches	EAHCP Cumulative Goals (m ²) (Table 4-10)	Existing coverage (Oct. 2016)
Spring Lake	1,000 – 1,5000	47
Spring Lake Dam to Rio Vista Dam	5,810 – 9,245	6,370
Rio Vista Dam to IH-35	910 – 1,650	276
Downstream of IH-35	280 – 3,055	0
TOTAL	8,000 – 15,450	6,693

What has worked?

TWR enhancement has proven to be a highly successful program in the reaches planted thus far and no reportable changes have been made in 2016/17 in methodology. Texas wild rice tillers are propagated at the raceways at Freeman Aquatic Building and SMARC generates plants from seeds gathered from San Marcos River stands.

What has not worked?

Producing large quantities of Texas wild rice from seeds has proven difficult. SMARC is currently investigating different strategies to improve germination rates of Texas wild rice. In Spring Lake, the only locations thus far that provide successful growth conditions for TWR are

above the two spillways possibly because faster flow and firmer substrate. Plantings below IH-35 have not survived the floods over the past two years.

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

Measure Summary:

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 city limits. Non-native species of aquatic, littoral, and riparian plants will be replaced with native species to enhance Covered Species habitat.

2018 Goal:

Non-native aquatic plants will be removed and replaced with native aquatic plants in association with Texas wild rice enhancement as described in conservation measure 5.3.1/5.4.1. Non – native plants will also be removed in the littoral and riparian zones. The littoral zone will be replanted as needed to stabilize the bank. 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. Monitoring and maintenance of all sites will be an ongoing requirement until invasive plant seed sources are eliminated.

Annual aquatic vegetation restoration goals, in meters squared (m²) within San Marcos LTBG reaches and newly defined restoration reaches.

Reaches	Species	Aquatic vegetation (m ²)	Restoration Goal	Approximate # of individuals per m ² needed to meet annual goal
		Goal	2018	2018
LTBG Reaches				
Spring Lake Dam	<i>Ludwigia repens</i>	200	10	270 - 310
	<i>Cabomba caroliniana</i>	25	5	230 - 270
	<i>Potamogeton illinoensis</i>	1000	25	790 - 830
	<i>Sagittaria platyphylla</i>	100	20	210 - 250
	<i>Hydrocotyle verticillata</i>	50	5	125 - 165
	<i>Zizania texana</i>	700	15	280 - 320
City Park	<i>Ludwigia repens</i>	1000	20	560 - 600
	<i>Cabomba caroliniana</i>	50	10	470 - 510
	<i>Potamogeton illinoensis</i>	2000	100	3100 - 3300
	<i>Sagittaria platyphylla</i>	300	15	150 - 190
	<i>Hydrocotyle verticillata</i>	10	0	-
	<i>Zizania texana</i>	1750	75	1300 - 1700
IH-35	<i>Ludwigia repens</i>	200	5	125 - 165
	<i>Cabomba caroliniana</i>	300	5	230 - 270

	<i>Potamogeton illinoensis</i>	300	25	790 - 830
	<i>Sagittaria platyphylla</i>	100	10	90 - 130
	<i>Hydrocotyle verticillata</i>	50	10	270 - 310
	<i>Zizania texana</i>	600	75	1300 - 1700
Restoration Reaches				
Sewell Park	<i>Ludwigia repens</i>	25	0	-
	<i>Cabomba caroliniana</i>	25	0	-
	<i>Potamogeton illinoensis</i>	150	0	-
	<i>Sagittaria platyphylla</i>	25	0	-
	<i>Hydrocotyle verticillata</i>	10	0	-
	<i>Zizania texana</i>	0	0	-
Below Sewell to City Park	<i>Ludwigia repens</i>	50	0	-
	<i>Cabomba caroliniana</i>	50	0	-
	<i>Potamogeton illinoensis</i>	500	0	-
	<i>Sagittaria platyphylla</i>	700	0	-
	<i>Hydrocotyle verticillata</i>	20	0	-
	<i>Zizania texana</i>	2300	0	-
Hopkins St to Snake Island	<i>Ludwigia repens</i>	50	0	-
	<i>Cabomba caroliniana</i>	50	0	-
	<i>Potamogeton illinoensis</i>	475	0	-
	<i>Sagittaria platyphylla</i>	750	0	-
	<i>Hydrocotyle verticillata</i>	10	0	-
	<i>Zizania texana</i>	950	0	-
Cypress Island to Rio Vista Falls	<i>Ludwigia repens</i>	50	10	270 - 310
	<i>Cabomba caroliniana</i>	50	5	-
	<i>Potamogeton illinoensis</i>	150	10	-
	<i>Sagittaria platyphylla</i>	50	5	-
	<i>Hydrocotyle verticillata</i>	0	0	-
	<i>Zizania texana</i>	350	50	-
IH-35 expanded	<i>Ludwigia repens</i>	50	10	270 - 310

	<i>Cabomba caroliniana</i>	100	25	1000 - 1400
	<i>Potamogeton illinoensis</i>	250	25	790 - 830
	<i>Sagittaria platyphylla</i>	450	25	265 - 305
	<i>Hydrocotyle verticillata</i>	50	0	-
	<i>Zizania texana</i>	450	50	970 - 1010

Achieved to date:

The below data below does not represent the whole river, only the study reaches. These figures represent goals prior to the SAV amendment process (as reported in the 2016 Annual Report).

Species/Type	Estimated Area Removed (m ²)
Hydrilla	1,590
Hydrilla/Hygrophila	306
Hygrophila	335
Vegetation mat	1,136
Total	3,367

Spring Lake Dam Reach Native Veg. Distribution (m ²)			
Species	Table 4-21	Oct. 2016	Remainder
Ludwigia	200	0	200
Cabomba	25	2.25	22.75
Potamogeton	1,000	109.75	898.25
Sagittaria	100	7.8	92.2
Vallisneria	125	2.5	122.5
Total	1,450	122.3	1,335.7

City Park Reach Native Veg. Distribution (m ²)			
Species	Table 4-21	Oct. 2016	Remainder
Ludwigia	200	1.25	198.75
Cabomba	50	0	50
Potamogeton	2,000	133	1,867
Sagittaria	300	112.7	187.3
Vallisneria	50	0	50
Total	2,600	246.95	2,353.05

IH-35 Reach Native Veg. Distribution (m ²)			
Species	Table 4-21	Oct. 2016	Remainder
Ludwigia	50	103.25	(53.25)
Cabomba	300	28	272
Potamogeton	300	0	300
Sagittaria	100	429.75	(329.75)
Vallisneria	25	0	25

Total	775	561	25*
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What has worked?

A new challenge in 2016 was determining a way to remove non-native aquatic vegetation in large, deep-water areas. Previously, large bag seines were used to collect removed non-native aquatic vegetation. However, in deeper water, the seines were difficult to use. The solution developed was building large nets out of lightweight material. Using the nets were particularly useful when removing non-native aquatic vegetation from Spring Lake and near Rio Vista Dam where water depths reached up to 10 feet.

Beginning in 2016, Texas State University initiated restoration work in the IH35 reach of the San Marcos River. A small patch of *Ludwigia* was observed in this reach so Texas State began removing nonnative aquatic vegetation surrounding the patch and replanting the denuded area with propagated *Ludwigia*. During 2016, Texas State observed an estimated expansion of 163 m² of *Ludwigia* within the IH35 reach and this is the first substantial increase of *Ludwigia* in the San Marcos River since 2013.

Some observations during 2016 included increases of *Ludwigia* patches close to or downstream of *Sagittaria* patches. Therefore in 2017, Texas State started planting *Ludwigia* near *Sagittaria* patches in other areas of the San Marcos River, particularly in the reach just upstream of City Park.

Ludwigia repens, *Potamogeton illinoensis*, and *Cabomba caroliniana* have proven less successful to plant, therefore existing stands of these species are monitored and weeded to encourage expansion. This strategy has been more successful than growing in raceways and planting.

Loss in areal coverage was observed for native species including *Potamogeton illinoensis*, *Cabomba caroliniana*, and *Hydrocotyle*, which is attributed partially to riverbed scouring and sediment deposition that occurred during the October 30, 2015 flood event.

What has not worked?

Since Fall 2015, discharge levels of the San Marcos River have been higher than the long-term average (176 cfs) ranging between 235 and 350 cfs. Therefore, working in certain areas of the river have proven difficult. Attempts to work in deep areas with swift current velocities resulted in damaging large nets that Texas State University constructed to remove nonnative vegetation. In higher current velocities, the nets could not hold up to the force of the water once vegetation was in the net and connection points on the nets tore apart and parts of the nets broke. Efforts to reinforce parts of the net proved labor intensive and largely unsuccessful. One example of a site with greater depths and swift current velocities is the Cypress Island reach just upstream of Rio Vista Dam.

5.3.5/5.3.9 Non-native Species Control

Measure summary:

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.

2018 Goal:

The targeted species include suckermouth catfish, tilapia, nutria and two snail species, *Melanoides* and *Marisa cornuarietis*. Contractor will use methods that have proven to be successful in efficient removal of invasive species from Spring Lake to IH-35. Contractor will continue to measure length and weight with the additional measurement of gender determination for fish species. These measurements assist in determining methodology effectiveness.

Achieved to date:

Annual Non-Native Species Removal Totals for 2016.

Species	Total Biomass (lbs.)	Total No.	Average biomass/individual (lbs.)
Tilapia	2,732.24	839	3.27
Catfish (Suckermouth & Sailfin)	2,715.81	4,460	0.61
Nutria	120.74	14	8.62
Red-rimmed snail	3.42	N/A	N/A
Giant ramshorn snail	3.08	N/A	N/A

N/A – Not applicable as data not recorded.

Methods to achieve 2018 goals:

Suckermouth catfish and tilapia in San Marcos River: Tournaments are by far the most productive method.

- Tilapia in Spring Lake: Continue methods described above.
- Nutria in Spring Lake: live trapping has been successful with large Havahart style traps, using apples sweet potatos and carrots as bait, with apple juice sprayed on top as an attractant.
- Snails: One of the prize categories in the semi-annual tournaments is the most snails. Snails are also hand-picked while contractor is spearfishing.

What has worked?

Tilapia in Spring Lake: Using net/bowfish methods works well during spawning season (Feb to June). During summer they are too far up the slough arm and don't come down into clearer portions of the slough until October. From October to February, spearing is the most productive method. It is best to run the net and bowfish when the sun is highest the sky during midday, although it has been difficult to get scheduled out at Spring Lake during midday.

What has not worked?

Tilapia in River: It is very difficult to spear tilapia in the river as they have an abundance of vegetation to hide in and flee if a diver gets too close. The tournaments have helped increase

removal numbers of tilapia because participants are competitive. Hunting tilapia requires high spearfishing skills as compared to hunting suckermouth catfish. Netting has been unproductive in river for tilapia and suckermouth catfish.