

**City of San Marcos/
Texas State University
2024 Work Plan**

2024 City of San Marcos/Texas State University Work Plan Budget

EAHCP Section	Conservation Measure	Table 7.1	Estimated 2024 Budget
5.3.1/5.4.1	Texas wild-rice Enhancement	\$100,000	\$10,000
5.3.6/5.4.4	Sediment Management	\$25,000	\$0
5.3.8/5.4.3.1/5.4.12	Control of Non-Native Plant Species	\$50,000	\$200,000
5.3.3/5.4.3	Management of Floating Vegetation Mats and Litter	\$80,000	\$57,520
5.3.5/5.3.9/5.4.11/5.4.13	Non-Native Species Control	\$35,000	\$16,200
5.3.7	Designation of Permanent Access Points/Bank Stabilization	\$20,000	\$0
5.7.1	Native Riparian Restoration	\$20,000	\$20,000
5.3.2/5.4.2	Management of Recreation in Key Areas	\$56,000	\$65,000
5.7.6	Impervious Cover/Water Quality Protection	\$200,000	\$675,000
5.7.5	Management of HHW	\$30,000	\$30,000
5.3.4	Prohibition of Hazardous Material Transport	\$0	\$0
5.3.4/5.4.5,8,9/5.7.3,4	Unfunded Measures	\$0	\$0
	Total	\$616,000	\$1,073,720

2024 City of San Marcos/Texas State University Work Plan and Funding Application Amendment

Amendment #	Date EAHCP Committee Approved	Conservation Measure Amended	Y/N Funding Application Change	Funding Application Change (\$)	Date EAA Board Approved	Comments
0	5/03/2023	Original Work Plan	NA	NA	NA	Original Work Plan
1	10/05/2023	5.3.2/ 5.4.2: Mgmt of Recreation in Key Areas	NA	NA	11/14/2023	Budget increase to support the EAHCP Conservation Crew associated with the Mgmt of Recreation conservation measure.

5.3.1/5.4.1 Texas Wild-Rice Enhancement and Restoration

Long-term Objective:

To achieve 8,000 – 15,450 m² of Texas wild-rice (TWR) in the Upper San Marcos River and to maintain existing and restored areas of TWR as required by the EAHCP.

Target for 2024:

Due to the exponential growth and expansion of TWR within the San Marcos River over the last several years, no planting of TWR is anticipated to occur in 2024. However, supplemental planting may be required if stands of TWR are denuded by flooding or impacted by low-flow conditions. Along with routine efforts to prevent regrowth of non-natives throughout the system, extra care will go towards preventing regrowth of non-natives within and immediately adjacent to existing TWR stands. TWR will be encouraged to expand naturally through the continued removal of non-native species within and around the perimeter of TWR stands. These efforts work towards attaining the EAHCP long-term biological goals for TWR as shown in **Table 1**.

Table 1. TWR areal coverage as of summer 2022 relative to TWR long-term biological goals, or EAHCP Table 4-10.

River Reach	Goal Areal Coverage (m ²) *	2022 Areal Coverage (m ²)	Goal Percent of Reach**	2022 Percent of Reach
Spring Lake	1,000-1,500	99	N/A***	0.8
Spring Lake Dam to Rio Vista Dam	5,810-9,245	11,692	83-66	89.5
Rio Vista Dam to IH-35	910-1,650	860	13-12	6.5
Downstream of IH-35	280-3,055	419	4-22	3.2
TOTALS	8,000-15,450	13,070	100	100

*Represents a range of minimum long-term biological goal areal coverage over different flow conditions.

**Represents the percent of the total TWR coverage within that reach

***N/A is the goal reach percentage of total TWR coverage for Spring Lake as defined in EAHCP Table 4-10.

Methodology: The optimal conditions for TWR are sandy to coarse soils with water depths generally greater than 1 meter within areas of higher current velocity and with minimal to open canopy cover. In stands of TWR where non-native plant species are intermixed, the non-natives are removed by hand and the original TWR stand is monitored for natural expansion. Natural expansion refers to a native species’ capacity to become reestablished in denuded areas following the removal of non-native species, of which success is largely dependent on the continued maintenance (gardening) of reemergent non-native species thereafter.

Removal of non-native aquatic vegetation around existing TWR stands occurs by hand. The removed non-native vegetation is allowed to rift downstream into a seine, bag or catch net set up downstream of the removal location, given a proximal river access is available, and if not, loaded directly into a skiff. The removed vegetation is moved to the shore and plants are shaken to remove trapped fauna which are documented and returned to the river. The remaining plant matter is then disposed at the City of San Marcos (COSM) or Texas State University Spring

Lake composting facilities as appropriate. Denuded areas are monitored, and any regrowth of non-native aquatic vegetation is removed.

Although it is not anticipated that TWR planting will be needed in 2024, if needed, the contractor will grow TWR from both tillers and seeds provided by U.S. Fish and Wildlife Department staff at the San Marcos Aquatic Research Center (SMARC). SMARC staff collects mature seeds from the panicle by gently pulling upwards until seeds are released. Mature seeds are plump, filled out, and either green or brown in color. Seeds are then placed in a plastic bag during collection and counted and potted by MCWE within 3-6 months following collection. TWR seeds are placed on top of soil in 8-inch pots and covered with pea gravel to secure the seeds from floating in the water. Seeds are spread out evenly within each pot, and gently pushed into the saturated soil and gravel mixture. Once TWR seeds have germinated they will be separated out and planted in a similar manner as TWR tillers. Tillers of TWR are collected by removing them from floating vegetation mats or from fragments attached to mature plants in the river. TWR tillers are transported to the raceways located at the Freeman Aquatic Biology (FAB) and potted in soil that consists of a bulk mixture containing topsoil and mushroom compost. TWR tillers are planted in 8-inch pots with the soil being highly saturated with water so that the tillers can be inserted without causing damage to the roots. Density of fragments per pot is generally 3-5 individuals. The pots are placed into the FAB raceways with pumps generating current velocity over the newly planted fragments. Water in the raceways is sourced from a nearby Edwards Aquifer artesian well. Plants remain in the raceways until roots are firmly established in the pots.

The process of planting begins by transporting potted TWR individuals from the FAB to the predetermined planting site in the river. A diver and a handler carry the plants to the designated section, and while the diver digs a hole in the substrate using a trowel, the handler gives the diver a pot of TWR. The contents are removed from the pot and inserted into the hole before returning the empty pot back to the handler for collection. The diver works downstream to upstream in a linear pattern of planting. Individuals are placed about 0.5 meters apart. This process is adjusted as needed to meet the varying conditions of each planting site.

Production of plants at the FAB is incorporated into this Work Plan budget (TWR Enhancement & Removal of non-natives). These methodologies may be adjusted as more is learned about collection and planting procedures.

Monitoring:

Newly planted areas are monitored to evaluate survivability and plant establishment. TWR planting and removal of non-native aquatic vegetation is mapped and quantified via GIS techniques. System-wide TWR coverage is monitored annually through the EAA Biological Monitoring program, with the data collected being used to evaluate TWR coverage and identify areas of concern.

Budget:

Table 7.1:

\$100,000

Estimated 2024 budget:

\$10,000

5.3.6/5.4.4 Sediment Management

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

Long-term Objective:

The removal of sediment in support of native aquatic planting activities has proven to be both ineffective and expensive. From 2013 to 2015, three of the six required sites have received only 158 m³ of sediment removal costing approximately \$555,000. In 2017, an Adaptive Management Proposal to amend this conservation measure in the EAHCP was approved.

The Sediment Removal and Impervious Cover/Water Quality Protection are now combined into one conservation measure that addresses sediment control within the upper San Marcos River watershed to minimize sediment and other contaminated runoff. The primary focus is reducing erosion in and sediment transport from the Sessom Creek watershed which has historically contributed heavy sediment loads to the Upper San Marcos River.

The COSM will provide; (1) design of wastewater relocation and erosion/sediment control in Sessom Creek; (2) Sessom wastewater line rehab and relocation; and (3) construction of stormwater control (SWC) features and associated land management tasks that control erosion, minimize sedimentation, and reduce pollutants in the Sessom Creek watershed.

Target for 2024:

See discussion in Section 5.7.6 Impervious Cover/Water Quality Protection

Method:

See discussion in Section 5.7.6 Impervious Cover/Water Quality Protection

Budget:

Table 7.1:

\$25,000

Estimated budget for 2024:

\$0

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

Long-term Objective:

To decrease the density of or eliminate, if possible, non-native aquatic and littoral vegetation along the upper San Marcos River to enhance fountain darter habitat by increasing the distribution of native aquatic flora as provided in the long-term goals set forth in the EAHCP submerged aquatic vegetation (SAV) nonroutine adaptive management.

Target for 2024:

Non-Native Aquatic Plant Removal

Continue efforts to systematically remove non-native SAV from the upper San Marcos River. Figure 1 represents the Work Zone designated for removal of non-native SAV in 2024, assuming that 2023 non-native SAV removal goals are able to be accomplished with consideration of Condition M restrictions that have been in place since mid-2022. *Hygrophila* and *Hydrilla* will be removed following the top-down protocol starting below the section completed in 2023 and continuing downstream for the duration of the project.

The 2023 Work Zone where bulk removal of non-native SAV previously occurred will be reclassified as a Recovery Zone in 2024. Native SAV within Recovery Zones will be allowed to expand naturally or via supplemental plantings into areas previously occupied by non-native SAV or otherwise devoid of SAV. Recovery Zones will be monitored and maintained to remove any reemergent non-native SAV. Segments of the upper San Marcos River designated as “Maintenance Zones” will be regularly monitored for remnant and/ or reemergent *Hydrilla* or *Hygrophila* and removed as necessary.

To prevent regrowth of non-native SAV, the top priority for 2024 will be maintaining the 2023 Work Zone (now classified as a Recovery Zone) given the significant volume of and areal extent of *Hydrilla* and *Hygrophila* removed. This is also due to Condition M restricting the initial bulk removal of *Hydrilla* and *Hygrophila* in early 2023, causing the subsequent maintenance removal effort to continue into early 2024. Assuming that Condition M restrictions will be lifted in 2023, *Hydrilla* will have largely been removed from the segment of the San Marcos River between the railroad bridge above Rio Vista Park downstream to the to the Rio Vista Dam. In 2024, this area will be regularly monitored and maintained from upstream to downstream to identify and remove regrowth of non-native SAV. Secondary priority will be making downstream progress into the new 2024 Work Zones which will follow the method of non-native removal from upstream to downstream with the goal of thorough removal of both *Hydrilla* and *Hygrophila* extending from Rio Vista Dam down to I-35, including the mill channel starting adjacent to Ivar’s River Pub restaurant and Cheatham Street. Forward progress will occur incrementally to allow for sufficient effort to go towards maintaining previously worked areas.

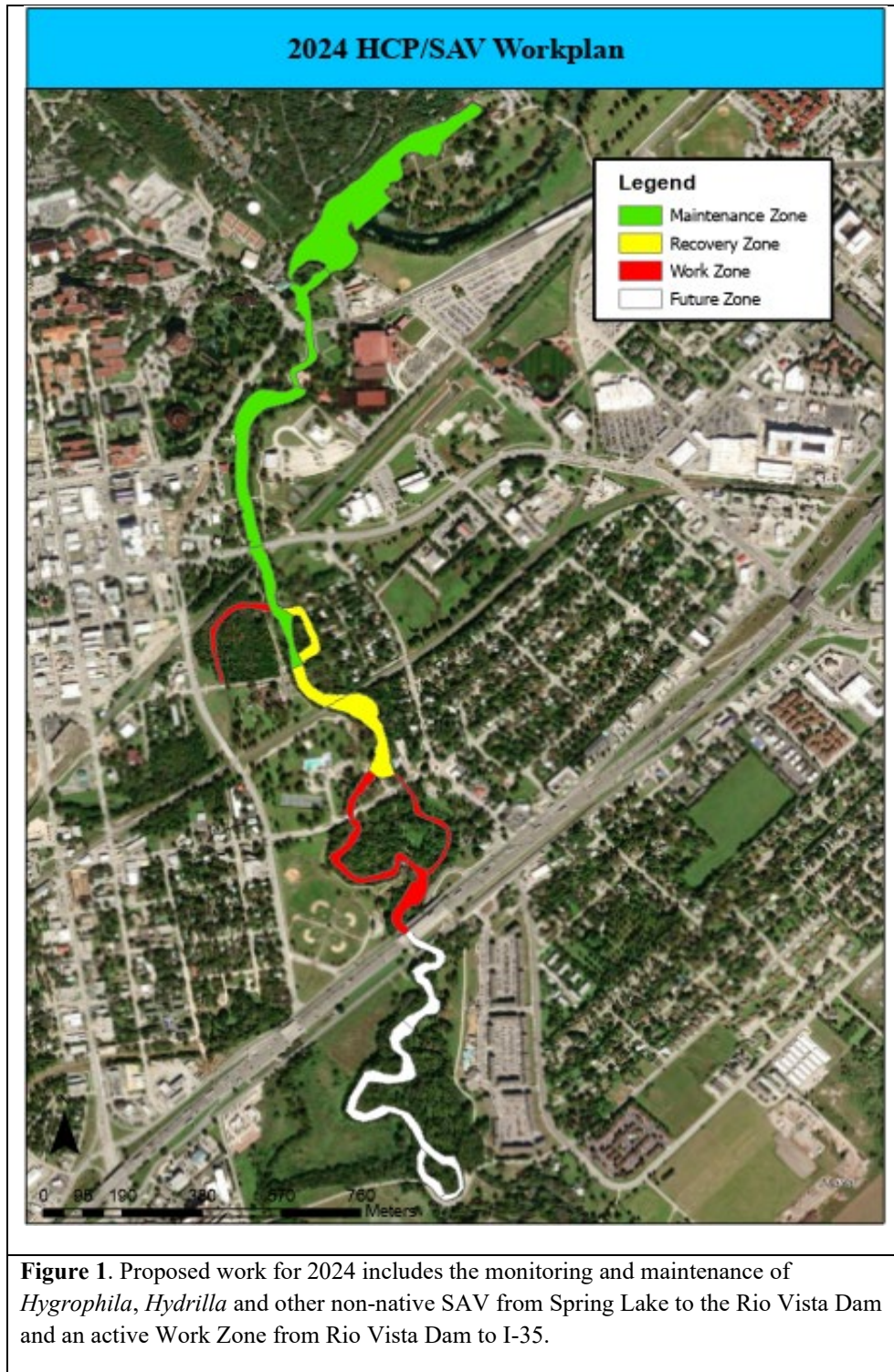


Figure 1. Proposed work for 2024 includes the monitoring and maintenance of *Hygrophila*, *Hydrilla* and other non-native SAV from Spring Lake to the Rio Vista Dam and an active Work Zone from Rio Vista Dam to I-35.

Non-Native Littoral Plant Removal

Perform monitoring and maintenance activities within the littoral zone of the upper San Marcos River system where non-native littoral plants have previously been treated and/ or removed. The area designated for continued monitoring and maintenance will include the littoral zone within

and the riparian zone immediately adjacent to Spring Lake and the San Marcos River between Spring Lake and Stokes Park. Monitoring and non-native vegetation maintenance will also occur in downstream portions of tributaries where non-native vegetation exists and contributes to the introduction and spread of those non-native species (i.e. lower Sink Creek, Purgatory Creek and Sessom Creek). This includes maintenance of areas where littoral vegetation (i.e. elephant areas) was treated/ removed as part of the United States Army Corps of Engineers (USACE) San Marcos Aquatic Ecosystem Restoration project.

Work completed under this task will focus on the treatment and/ or removal of non-native littoral zone vegetation (i.e. elephant ears) and non-native vegetation within the riparian zone immediately adjacent to the water's edge. Work under this task will not include treatment of non-native vegetation within the upper riparian zone which will be managed under EAHCP Task 5.7.1 Native Riparian Habitat Restoration.

Methodology:

Non-Native Aquatic Plant Removal

The focus will be to eliminate dense stands of non-native SAV and allow for native SAV to maintain and/or expand its coverage. Non-native aquatic plants will be removed and replaced with native aquatic plants in association with TWR enhancement as described in Conservation Measure 5.3.1/5.4.1. Divers remove non-native aquatic plants by hand. The removed vegetation is allowed to drift down and is captured by a seine, bag, catch net, or transferred directly into a skiff where access and conditions allow. Any removed vegetation is shaken to remove trapped fauna, which are returned to the river before being disposed of at the COSM or Spring Lake composting facilities. Denuded areas are then monitored for subsequent regrowth of non-native species, which are maintained as needed.

Hydrilla and *Hygrophila* will be systematically removed from upstream to downstream. Reaches that have been thoroughly cleared of large patches of these species for two or more years are considered Maintenance Zones while reaches in which large amounts of these species are being removed are designated as Work Zones. A Work Zone in which all *Hydrilla* and *Hygrophila* have been thoroughly removed during the previous year are considered a Recovery Zone. These Recovery Zones may still require additional effort to ensure the thorough removal of these species' root systems and tubers. *Hydrilla* tubers can remain viable for multiple years despite being buried over 12 inches beneath the sediment. Downstream reaches exhibiting significant coverage of *Hydrilla* and *Hygrophila* are considered future Work Zones. In 2024, the primary Work Zone will include the river segment between Rio Vista Dam and IH-35, including the old Mill Channel (Figure 1). The segment of the San Marcos River from Snake Island to Rio Vista Dam will transition to a Recovery Zone (Figure 1).

The practice of removing non-native SAV from upstream to downstream helps to reduce labor hours spent on gardening undesirable SAV regrowth that results from non-native plant fragments migrating downstream from upstream stands and reestablishing in denuded areas and actively competing with newly planted or established native SAV. This method also allows for increased natural expansion of native SAV in the absence of non-native SAV. Large homogenous stands of non-native SAV will be targeted. Non-natives SAV will be removed from mixed stands of native and non-native SAV, and the area will be monitored for regrowth. The plant species will be prioritized to provide the most diversity possible after removal of non-native species, if necessary, depending on available habitat and history of the plant species' success in the available habitat. If the prioritized species has not been successful in the habitat type to be planted, another species may be planted in its place. Planting will not occur in areas impacted by intense recreation.

During conditions of low flow, increased stress on native SAV species has allowed for the expansion of non-native SAV species, either already present in these areas, or newly introduced to them. This requires an increased effort to prevent non-native species from becoming reestablished, especially along bank margins and shallow areas that were previously considered restored. Removal efforts will adjust accordingly, prioritizing maintaining Maintenance Zones and Recovery Zones, over making forward progress in Work Zones, ensuring the long-term success of native SAV restoration. Non-native aquatic plant species that occurred at very low abundances in the past have been observed to be increasing recently. These species have benefited from persistent low flows and less competition from once abundant non-native plants that have been removed. Management of these species may slow progress depending on how successful these species become. The primary Work Zone for 2024 will start at the downstream-most limits of the 2023 work zone, bottom of Rio Vista falls, and extend down to I-35. The extent of 2024 Work Zone should not exceed the maximum removal allowable for *Hydrilla* and *Hygrophila* habitat disturbance limits, disturbance estimates will still be maintained at regular intervals.

Hydrilla and *Hygrophila* are removed by hand and, when possible, are collected from the river and transported to either the COSM or MCWE composting facilities. Areas of removal are then de-rooted, which includes meticulous removal of roots, small plants, and tubers. This process is repeated until no *Hydrilla* or *Hygrophila* are observed. After an area has been effectively de-rooted and no regrowth occurs, native plants are either planted or allowed to populate the cleared areas through natural expansion.

Native Aquatic Plant Introduction:

Planting efforts will focus on species diversity, species habitat preferences, and available fountain darter habitat at the time of planting. The planting of native SAV will occur once the designation of a Work Zone changes to Recovery Zone, as this minimizes the potential and occurrence of non-native SAV regrowth. This is expected to take 3-6 months from when the site

is finished as a Work Zone, depending on the density and area of non-natives originally present in the site. Efforts will focus primarily on preserving areas with existing native SAV to allow for the natural expansion of those populations throughout the river system. Portions of the riverbed with minimal native SAV coverage will be planted with native SAV best suited to that habitat type while ensuring a high level of biodiversity is maintained overall. The goal provides species presence within all reaches to allow for natural expansion to occur downstream of each population. Planting will not occur in areas impacted by intense recreation.

Production of native SAV will continue at the FAB at Texas State University as described in the TWR Enhancement section (5.3.1/5.4.1). Fragments and tillers of native aquatic plants removed from floating vegetation mats or from fragments attached to mature plants in the river are used for propagation at the FAB. Funding for the production of native SAV at the FAB is incorporated into this Work Plan budget.

Native SAV will be planted described in the TWR Enhancement section (5.3.1/5.4.1) using a team comprised of one or more divers plus one or more handlers depending on the river depth and location. A planting hole will be made in the substrate using a trowel and the handler will give the diver a pot of native SAV. The contents are removed from the pot and inserted into the hole before returning the empty pot back to the handler for collection. The diver works downstream to upstream in a linear pattern of planting. Individuals are placed approximately 0.25 meters apart and gardened as needed to remove invading plants. This process is adjusted as needed to meet the varying conditions of each planting site and species.

Environmental conditions at the time of planting determine which native species will be planted. *Cabomba* and *Sagittaria* have exhibited greater success in finer substrates (silt) within areas of slower moving water. Both species can be planted in a range of water depths. However, some reaches are challenging, such as Cypress Island, where only TWR has shown success in outcompeting *Hydrilla*. However, *Cabomba* is currently expanding into the Cypress Island Reach from upstream.

In the San Marcos River, *Ludwigia* has been planted in a wide variety of habitat types ranging from areas with shallow depths, high velocities over coarse substrates to areas with slack-water habitat over silt substrate to determine which habitat results in greatest rates of expansion and persistence. In 2021, *Ludwigia* planting in the Hopkins/Snake Island reach showed significant expansion in both shallow and deep areas, which has continued into 2023 and has shown similar success with subsequent plantings in other denuded areas. This species shows greater resilience in different flows and depths, if the substrate is appropriate, and is often used if other species fail to expand within a denuded area. *Hygrophila* has been observed to reduce the expansion of two native species: *Ludwigia* and *Potamogeton*. *Potamogeton* is an additional species that has struggled to become established in several reaches, and its coverage decreases downstream of Cypress Island. Like *Ludwigia*, *Potamogeton* has been planted in numerous areas with varying

substrate compositions in an attempt to determine the most suitable habitat type. It was observed to exhibit the best growth in the upper reaches with high flow and dense, coarse substrates (gravel/sand and clay).

In 2016, *Hydrocotyle* was accepted as an approved native species to plant in the San Marcos River. *Hydrocotyle*, like *Ludwigia*, can become a littoral species, persisting in areas of shallow water. Therefore, these species are utilized to replant river margins or areas of very shallow water depths or along riverbanks. This species also exhibited resilience to low flows in 2023 by adapting to emerged conditions in areas where the riverbed had become exposed, namely sections of Sewell Park, making *Hydrocotyle* an ideal candidate for planting in areas sensitive to dwindling flow regimes.

On September 14, 2022, the Science Committee approved two new native aquatic plant species, *Heteranthera dubia* and *Myriophyllum heterophyllum*, as acceptable species for submerged aquatic vegetation restoration in the San Marcos River. The contractor will identify planting areas in the IH-35 long-term biological goal reach (LTBG reach) for planting of *Heteranthera* and *Myriophyllum*. The plots will be chosen to offer differing habitat types (depths, substrate, and edge/corridor).

Heteranthera and *Myriophyllum* individuals will be removed and counted from non-LTBG reaches. The removal sites will be tracked via GIS polygons. These individuals will be re-planted at the IH-35 LTBG reach. Planting sites will be tracked via GIS polygons and the number of individuals planted will be adjusted as needed.

Non-Native Littoral Plant Removal

The littoral zone within and the riparian zone immediately adjacent to Sink Creek, Spring Lake, the San Marcos River (between Spring Lake and Stokes Park) will be monitored on a monthly basis to assess for re-emergent non-native vegetation. Reemergent elephant ears will be spot-treated with Clearcast aquatic herbicide (Imazamox-based) at a rate of approximately 6oz/ gallon of water with applications made using a hand-held pump sprayer. Reemergent ligustrum and chinaberry trees in the riparian zone immediately adjacent to the waterway will be spot-treated with Aqua Star herbicide (glyphosate-based) using a hand-held pump sprayer and mechanically removed. Reemergent Chinese tallow trees will be spot-treated with Vastlan herbicide (triclopyr-based) and mechanically removed.

Monitoring:

Aquatic Vegetation: Newly planted areas will be monitored monthly to evaluate success rates. All planted areas are weeded (non-native species removed) and replanted as needed. All planting and removal areas are monitored via quadcopter imagery and/or visual observation. Both planting and removal efforts are mapped and quantified via GIS techniques. Work Zones

are separated into reaches to assess changes among and within reaches of the San Marcos River and to identify presence of non-native vegetation and to assess the expansion of native vegetation. SAV coverage is also monitored annually within LTBG reaches through the EAA Biological Monitoring program. The data collected is used to evaluate native SAV coverage and identify areas of concern.

Littoral Vegetation: Areas along Sink Creek, Spring Lake and the San Marcos River where non-native vegetation has previously been treated will be monitored on a monthly basis. Any observed re-emergent non-native littoral plants will be re-treated and/ or removed.

Budget:

Table 7.1:
\$50,000

Estimated 2024 budget:
\$200,000 (\$170,000 for SAV restoration and \$30,000 for littoral zone non-native vegetation management)

5.3.3/5.4.3 Management of Floating Vegetation Mats and Litter

Long-term Objective:

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

Existing vegetation management activities in Spring Lake will continue to follow the Spring Lake Management Plan and the EAHCP, as described under Methodology.

Target for 2024:

Management of Aquatic Vegetation in Spring Lake and Floating Vegetation Mats:

Manage nuisance floating aquatic vegetation in Spring Lake through use of the harvester boat and with trained divers authorized to dive in Spring Lake. Extract or dislodge floating vegetation mats within the San Marcos River where accumulations are anticipated to negatively impact TWR and other stands of native SAV. Additionally, invasive aquatic floating vegetation will be managed by Texas State University with the assistance of EAHCP contractors and volunteers from various organizations.

Management of Litter:

Continue litter collection efforts to reduce litter accumulations in the upper San Marcos River. Litter management efforts will include the routine removal of litter from the littoral zone, riverbed, water column of the San Marcos River from Spring Lake Dam reach to Stokes Park. Litter collection will occur once weekly during the recreation season and monthly during the off-season. Litter removal will also occur quarterly within the lower portions of several of the major tributaries to the upper San Marcos River (i.e. Sessom Creek, Purgatory Creek, Riverside drainage channel and Willow Creek).

Methodology:

Management of Floating Vegetation in Spring Lake: Each week about five springs are gardened, with trained divers returning to garden the same springs every two to three weeks. During summer algal blooms, the springs are managed more frequently (up to four springs per day), primarily to remove algae. Texas State employees and supervised volunteers 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 machete. Over the next 1.5-meter radius around the spring opening, they shear vegetation to a height of 30 cm, and then to one meter over the following three-meter radius. Plant materials are not collected, but rather carried away by the current. Cumulatively, about six meters of vegetation around each spring opening is modified. Mosses are not 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 clears the top meter of the water column, cutting vegetation from sections one, two, and three once a week. The harvested vegetation is visually checked by the driver for fauna caught in the vegetation. If the driver observes fauna, he/she will stop work and return 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 (EAHCP § 5.4.7.1) and avoid contact with them. Vegetation mats

are removed from zones four and five on an as-needed basis. The total area treated equals about nine surface acres.

The Habitat Conservation Plan Manager for the COSM, in partnership with local non-profit organizations, schedule volunteers for the cleanup of nuisance floating species such as water hyacinth and water lettuce from Spring Lake. The floating plants are collected by hand and shaken prior to removal from the river to dislodge any aquatic animal species caught in the plant. The collected vegetation is transported to the COSM disposal facility.

Management of Floating Vegetation in the San Marcos River: Floating vegetation accumulations within and covering TWR and other native plant stands are pushed or lifted off the stands and allowed to float downstream. The effort required to mitigate damage and negative impacts to TWR and native SAV associated with accumulation of floating vegetation mats typically increases during low-flow conditions and in areas with significant TWR coverage, as the floating vegetation effectively becomes trapped within stands of TWR as waters recede.

Management of Litter in the San Marcos River: Collect and remove inorganic litter from the substrate, water column, surface and littoral zone of the San Marcos River from Upper Sewell Park to City Park and from IH-35 to Stokes Island once weekly during the recreational season (May 15th to September 30th) and once monthly during the offseason (October 1st – May 14th). The City of San Marcos maintains a separate contract and funding for litter cleanup between City Park and IH-35.

Collect and remove litter on a quarterly basis from portions of four San Marcos River tributaries in the area immediately upstream of the confluence and where access is available (i.e. Willow Creek, Purgatory Creek, Riverside Drive Drainage Channel, Sessom Creek).

Monitoring:

Floating Vegetation Mat Mgmt: Locations of floating vegetation mat accumulations and removal and approximate volume removed will be tracked and provided in monthly progress reports.

Management of Litter: Report on a monthly basis the volume of litter collected for each litter removal session.

Budget:

Table 7.1:

\$80,000

Estimated 2024 budget:

\$57,520 (\$40,000 for floating vegetation management & \$17,520 for litter removal)

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

Long-term Objective:

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

Target for 2024:

Continue efforts to remove non-native species from the San Marcos River system. The species targeted for removal include suckermouth catfish, tilapia, and two snail species, *Melanooides* and *Marisa cornuarietis*. Track non-native species removal efforts.

Methodology:

Contractor will use methods that have proven to be successful in removal of non-native species from the San Marcos River system from Spring Lake to Stokes Park. Current methods for non-native fish removal include spearfishing within the river and bowfishing & gill netting in Spring Lake. Contractor will track the number and weight of individual fish species removal.

Host annual volunteer polespear tournaments (2), permitted through the municipality, to increase total removal, while saving costs and providing an educational awareness component to participants. Ensure that all tournament participants adhere to means and methods that avoid impacts to resident turtles and other native species. Tournament participants are given a packet of information and are required to sign liability waivers.

Effective removal of *Melanooides* and *Marisa cornuarietis* is accomplished by determining the locations of highest snail density and using dip nets to remove the snails during the polespear tournaments. These species are best controlled by diving several hours after sunset to hand-pick the snails from the substrate and SAV.

Polespearing tournaments were initially cleared by the COSM and for every upcoming tournament, the COSM departments are notified.

COSM has an ordinance prohibiting the dumping of aquaria into the San Marcos River (Sec. 58.037) and accepts unwanted aquatic fauna at the Discovery Center.

Monitoring:

In order to monitor the reduction of overall non-native species abundance in the San Marcos River ecosystem, the contractor will track the number of individuals removed and compile the weights of the individual animals removed. This information may assist in determining overall effectiveness of this conservation measures impact of species population dynamics.

Budget:

Table 7.1:

\$35,000

Estimated 2024 budget:

\$16,200

5.3.7 Designation of Permanent Access Points/Bank Stabilization

Long-term Objective:

Provide access points along the river for recreational access. Maintain integrity of structures that serve to control bank erosion, protect TWR and other SAV and listed species habitat in the Upper San Marcos River.

Target for 2024:

The COSM completed the construction of bank stabilization/access points at seven locations along the San Marcos River in 2014 within maintenance repairs occurring in 2017. The City also made repairs to the Rio Vista Fall and Dog Beach access locations in 2022. Additional repairs to the access points will be performed on an as-needed basis and will be funded by the City.

Monitoring:

The access points will be visually monitored by City staff on a regular basis. Divers will measure any undermining of each of the access points twice annually. The surface of each site will also be inspected for damage.

Budget:

Table 7.1:

\$20,000

Estimated 2024 budget:

\$0

5.7.1 Native Riparian Habitat Restoration

Long-term Objective:

Establish a robust native riparian buffer along the Upper San Marcos River from the headwaters to City Limits to benefit the Covered Species by minimizing bank erosion and infiltrating/ filtering stormwater runoff. The riparian buffer will also help to minimize public river access which can lead to bank erosion and direct impacts to TWR and aquatic vegetation. A zone of prohibitive vegetation along the uppermost edge of the riparian buffer will be established to encourage river users to access the river via hardened access points. Private riverside landowner participation in this program will be encouraged and the EAHCP will provide the labor and plants as practical. EAHCP-funded contractor(s) will perform invasive removal and maintenance.

Target for 2024:

Monitor and maintain previously restored riparian areas along the San Marcos River from Spring Lake to city limits, and within select tributaries of the San Marcos River, to reduce non-native regrowth, encourage establishment of native vegetation and reduce the seed source of non-native vegetation within the riparian zone of the San Marcos River. This includes maintenance of the riparian areas restored on City property as part of the United States Army Corps of Engineers (USACE) San Marcos Aquatic Ecosystem Restoration project.

Continue efforts to remove remaining non-native vegetation from Snake Island, within City property located on river-left across from the Cypress Island in Rio Vista Park (**Figure 2**). Plant native vegetation, as needed, in areas where non-native vegetation has been adequately controlled.

Work completed under this task will focus on the treatment and/ or removal of non-native riparian zone vegetation and will exclude treatment of non-native littoral plants (i.e. elephant ears) which will be managed under EAHCP Task 5.3.8/5.4.3/5.4.12 Control of Non-Native Plant Species.



Figure 2. 2024 riparian restoration focus areas include Snake Island located across from Bicentennial Park (left) and City property across from Cypress Island in Rio Vista Park (right).

Methodology:

Manually remove and/ or treat invasive, non-native vegetation and regrowth using a glyphosate/triclopyr herbicide mix to treat the stumps and/or roots. On upland trees, shrub stumps and root buttresses, Relegate (Triclopyr-based herbicide) is used. Relegate is mixed with glyphosate, Drexel Surf Ac 820 Surfactant and Turf Mark Blue, a blue dye. Roots are scraped and treated with herbicide mix then monitored. Treated and adjacent areas will be monitored for re-growth and seed sources.

Removal of non-native trees (i.e. ligustrum & Chinese tallow) and vegetation on Snake Island and the City property across from Cypress Island began in 2023 and will continue in 2024 in order to slowly and methodically remove non-native vegetation.

Planting of native vegetation on the Snake Island and City property across from the Cypress Island at Rio Vista Park will be performed by a contractor while maintenance plantings within previously restored riparian areas will be conducted primarily by volunteers during regular volunteer planting events. Candidate native plant species for planting will include but not be limited to Turks Cap, Inland Sea Oats, switchgrass, Eastern gamagrass, frogfruit, elderberry, beautyberry, buttonbush, American Sycamore, Bald Cypress and Pecan.

Monitoring:

Monitoring will occur throughout all previously restored riparian areas on a monthly basis to assess for re-growth of non-native riparian vegetation. This will include monitoring and maintenance of the riparian areas previously restored on City property as part of the United States Army Corps USACE’s San Marcos Aquatic Ecosystem Restoration project (**Figure 3**). Re-treatment of reemergent non-native vegetation will occur as needed.

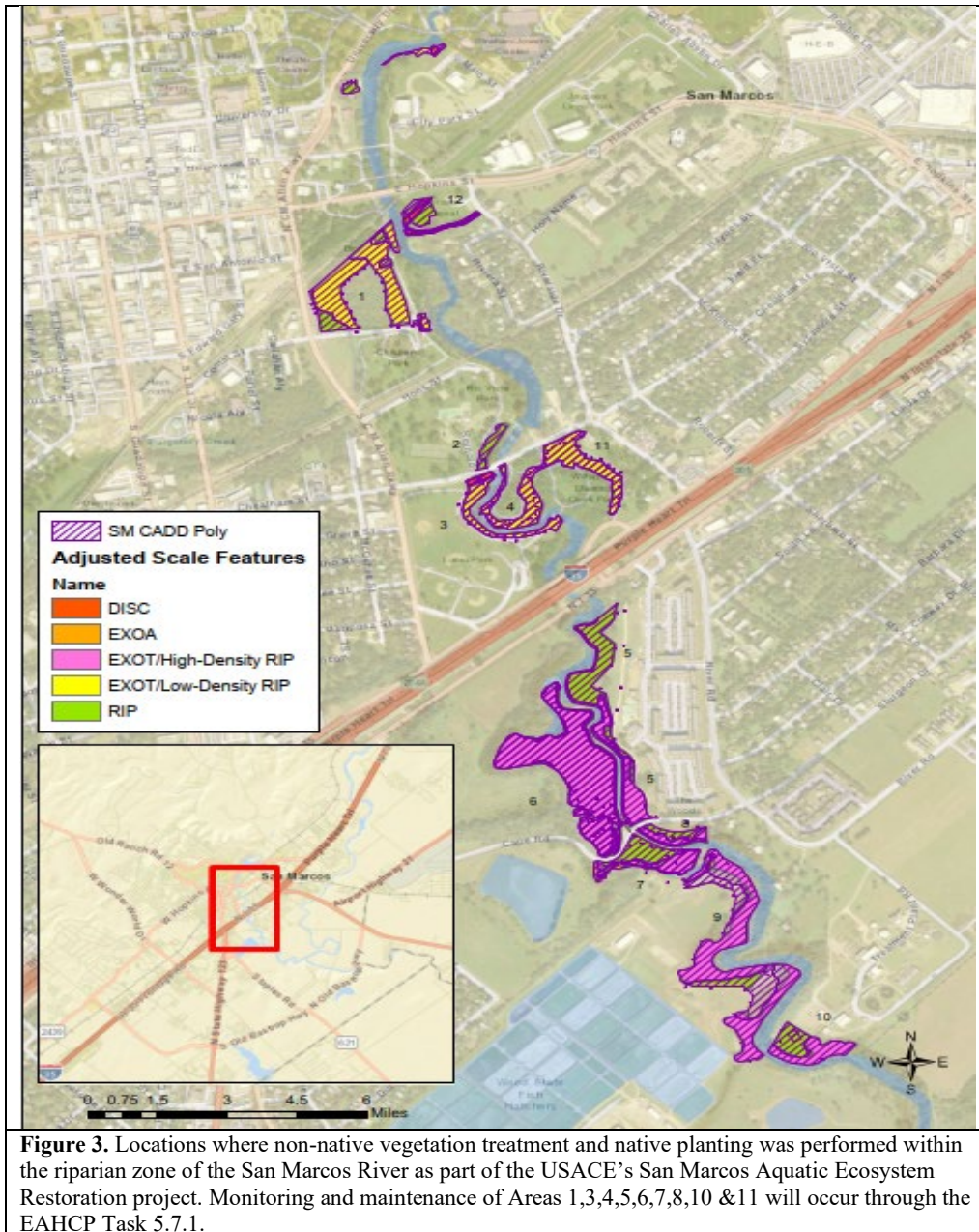


Figure 3. Locations where non-native vegetation treatment and native planting was performed within the riparian zone of the San Marcos River as part of the USACE’s San Marcos Aquatic Ecosystem Restoration project. Monitoring and maintenance of Areas 1,3,4,5,6,7,8,10 &11 will occur through the EAHCP Task 5.7.1.

Monitoring and maintenance will continue to be a mix of contract work funded by EAHCP and COSM, as well as through volunteer efforts. The City will continue to maintain riparian zone protection fences in place to prevent trampling and disturbance of the riparian buffer.

Budget:

Table 7.1:

\$20,000

Estimated 2024 budget:

\$20,000

5.3.2/5.4.2 Management of Recreation in Key Areas

Long-term Objective:

To minimize the impacts of incidental take resulting from recreation which includes, but is not limited to swimming, wading, tubing, boating, paddle boarding, scuba diving, snorkeling and fishing.

Target for 2024:

1. Hire Conservation Crew members that will perform public outreach, recreation impact minimization efforts, and assistance with the removal of litter, floating vegetation mats and non-native vegetation. The fully staffed Conservation Crew will work approximately 15 hours/week (Wed to Sun) from mid-May to September with a limited number of staff working prior to and after the peak recreation season.
2. Continue the implementation of the following recreational management goals at a minimum:
 - a. Signage. Signs have been posted in kiosks at most of the river access points and along the Upper San Marcos River. Signs cover the rules of the river, educate the public on the importance of the resource and EAHCP project efforts.
 - b. Exclusion barriers will be installed within designated SSA areas when flows decrease below 120 cfs and TWR stands are vulnerable (primarily during the recreation season).
 - b. Video loop at City Park offering information about the river and safety rules while people are waiting for shuttle or tubes. Video was finished and installed in 2016/2017 for Lion's Club and will be updated and distributed electronically for increased exposure.
 - c. Posted maps showing trail, access points, and other amenities. River maps are located at the Discovery Center which serves as the trailhead to the San Marcos River and help inform visitors and recreationists about the San Marcos River/Blanco River confluence.
 - d. EAHCP brochures have been placed at the Tourist Information Bureau for visitors.
 - e. Park Rangers. Training materials covering the river flora and fauna are available for the park ranger training so they can help disseminate listed species 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. The San Marcos Discovery Center is a facility dedicated to public education and outreach regarding the San Marcos River. A local nonprofit, the Mermaid Society, is also promoting river awareness within the San Marcos community.
 - g. Coordinate with the Texas State University Outdoor Recreation center to help educate river users about endangered species and EAHCP restoration on the San Marcos River.

- h. Continue to provide outreach at booths including Concert Series (Earth & Water), Passport SMTX, Business Expo, Mermaid Society events, San Marcos Sustainability Fair, and Don't Mess with Texas Litter Cleanup.
- i. Continue to educate the public during volunteer planting days and public events.
- j. Continue to educate the public engaged in water-based recreation on sustainable river behaviors that protect listed species and their habitats through interns and Conservation Crew program.
- k. Introduce the Certificate of Inclusion (COI) program to qualified third parties conducting recreational activities in and along the San Marcos River.
- l. Monitor watercraft and educate recreationists about the invasive zebra mussels.

Document education/ outreach efforts, litter collection, EAHCP program assistance and other river recreation management activities conducted by the Conservation Crew.

Monitoring:

Litter removed from the river and river parks by the Conservation Crew is tracked. Also, the Conservation Crew will monitor boats and river structures for the presence of zebra mussels from Spring Lake Dam to IH-35.

Budget:

Table 7.1:
\$56,000

Estimated 2024 budget:
\$65,000

5.7.6 Impervious Cover/Water Quality Protection

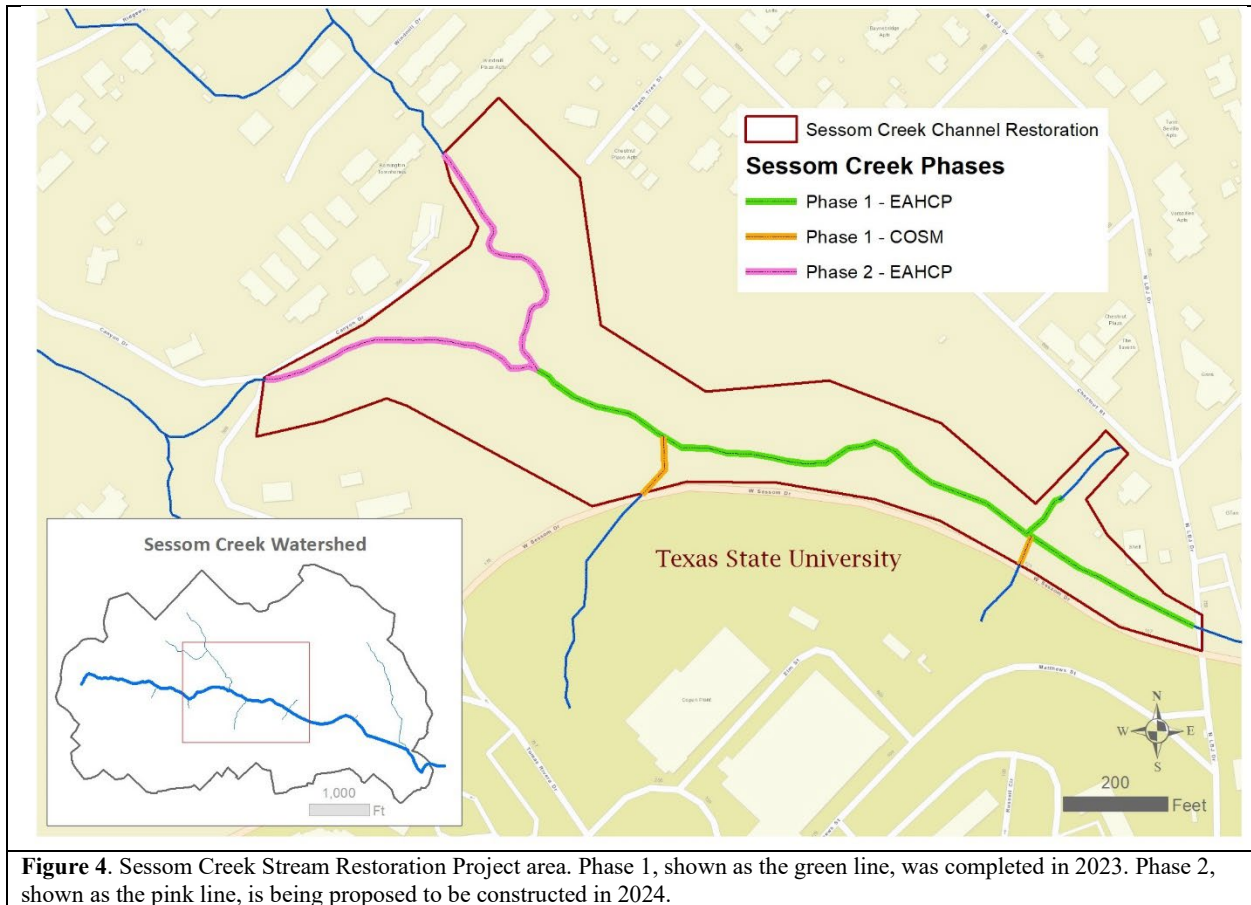
Long-term Objective:

Establish a program to protect water quality and reduce the impacts from contaminated runoff based on recommendations listed in the *San Marcos Watershed Protection Plan*.

Target for 2024:

Construct Phase 2 of the Sessom Creek Stream Restoration project according to design plans that were completed in 2023 and funded through the EAHCP program. The project includes the construction of natural channel design elements and native plant restoration throughout approximately 565 linear feet of Sessom Creek from its confluence with the Windmill tributary upstream to the Loquat/Canyon Road intersection and 550 linear feet of Windmill Tributary (Figure 4).

In addition, the COSM has identified wastewater improvements within upper Sessom Creek. These improvements will be funded by COSM and will work in collaboration with the stream restoration and stormwater management practices to the maximum extent practical. The wastewater improvement project is separate but would occur in conjunction with the Sessom Creek Stream Restoration project work.



Monitoring:

The EAA Sessom Creek real-time monitoring station will measure turbidity, dissolved oxygen, and temperature. Any changes in water quality due to Sessom Creek restoration will be monitored by this monitoring station, the construction site will be monitored by the construction inspector.

Budget:

Table 7.1

\$200,000

Estimated 2024 budget:

\$675,000*

*Funding will cover construction and construction administration services associated with Phase 2 of the Sessom Creek Stream Restoration project.

5.7.5 Management of Household Hazardous Waste

Long-term Objective:

Implement a household hazardous waste (HHW) collection program that provides a place for citizens of San Marcos and Hays County to properly and safely dispose of HHW to minimize the potential for dumping or introduction of HHW into the river or recharge zone and impacts to Covered Species.

Target 2024:

Continue to operate the COSM HHW Drop-Off and Reuse Center to provide a location for the safe and proper disposal of HHW items. Conduct public outreach to educate residents on proper HHW disposal and awareness of the COSM HHW Drop-Off and Reuse Center.

Methodology: The HHW Drop-Off and Reuse Center is located at 634 E Hopkins in San Marcos, TX. The hours of operation of the center are every Friday from 12-3:30pm and every Saturday from 8am-12pm. The HHW Drop-Off Center accepts cleaning products, fluorescent lights, paint, paint thinners, solvents, degreasers, glues/ adhesives, pesticides, herbicides, lawn chemicals, pool chemicals, automotive filters, car and household batteries, thermometers, cell phones, used cooking oil, propane cylinders and medical sharps. The HHW Reuse Center allows an opportunity for residents to pick-up HHW items such as cleaning supplies, fertilizers, and paint that are dropped off at the HHW Collection Center.

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 with 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 2024 budget:

\$30,000

5.3.4 Prohibition of Hazardous Materials Transport Across the San Marcos River and its Tributaries

Long-term Objective:

Reduce the potential of spill of hazardous materials in the San Marcos River and its tributaries through the designation of a hazardous materials route in COSM.

Target for 2024:

The proposed hazardous materials transport route map has been completed. Next steps include coordination between surrounding political subdivisions, Texas Department of Transportation, and the COSM to formally designate the hazardous materials transport route.

Budget:

Table 7.1:

\$0

Available budget for 2024:

\$0

5.7.3 Septic System Registration and Permitting Program

Long Term Objective:

To ensure 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.

Target for 2024:

Maintain an accurate record of new and existing septic systems installed and/ or modified within COSM’s jurisdiction. City ordinance requires all owners of septic systems connect to municipal sewer lines as they become available.

Methodology - It is required by law that all septic systems are permitted by the local Designated Representative (DR), which is currently the City of San Marcos’ Environmental Health Department. Plans are submitted with the application and reviewed by the DR for TCEQ compliance. Once these requirements are met, the permit to construct is issued. The design, site evaluation, installation and inspections can only be performed by individuals 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

Available budget for 2024:

\$0

5.4.5 Diversion of Surface Water

Long-term Objective:

Texas State University will curtail its permitted surface water diversions as a function of total San Marcos springflow to protect the aquatic resources as specified under the EAHCP flow management strategy.

Target for 2024:

Restriction of surface pumping as specified under the EAHCP. 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 EAHCP Section 2.5.5). The total diversion rate from Spring Lake is limited to 4.78 cfs; the total diversion rate from the San Marcos River at Sewell Park is limited to 2.22- cfs (See EAHCP Section 2.5.5.1 and 2.5.5.2 respectively).

Methodology - When flow at the USGS gauge (08170500) San Marcos River in Sewell Park 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, TWR, 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 52 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 daily when any of the pumping restrictions are in force.

Budget:

Table 7.1:

\$0

Available budget for 2024:

\$0

5.4.7 Diving Classes in Spring Lake

Long-term Objective:

Maintain the integrity of the ecology within Spring Lake through controlling access to Spring Lake in accordance with federal, state and local laws.

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

Target for 2024:

Implement the diving protocols as outlined in the Spring Lake Management Plan, EAHCP, and the ITP with the following modifications: no more than 16 volunteer divers will be allowed in the lake per day, with no more than eight at one time.

Methodology - The Diving Safety Officer will monitor all diving activities in Spring Lake, assuring all guidelines contained in the Diving Safety Manual for Spring Lake, Spring Lake Management Plan, EAHCP, and 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

Available budget for 2024:

\$0

5.4.8 Research Programs in Spring Lake

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 within Spring Lake through controlling access to Spring Lake in accordance with federal, state and local laws. All research activities in Spring Lake are governed by the Spring Lake Management Plan, EAHCP, and ITP.

Target for 2024:

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

Methodology - 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

Available budget for 2024:

\$0

5.4.10 Boating in Spring Lake and Sewell Park

Long-term Objective:

Maintain the integrity of the ecology within Spring Lake and San Marcos River through controlling access to Spring Lake in accordance to federal, state and local laws. All boating activities in Spring Lake are governed by the Spring Lake Management Plan, EAHCP, and ITP.

Target for 2024:

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

Follow the below protocol for all boats (canoe, kayak, and paddleboards) 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 per the protocol defined 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 non-glass bottom boat activity must not interfere with routine 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. 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

Available budget for 2024:

\$0

5.4.9 Management of Golf Course and Grounds

Long-term Objective:

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

Target for 2024:

Continued implementation of the Grounds Management Plan and Integrated Pest Management Plan. Texas State University completed conversion of the Golf Course to Intramural Recreation Fields. COSM will work with the Texas State Facilities to better understand how the change will affect the Grounds Management Plan and the Integrated Pesticide Management Plan.

Methodology - The grounds will be maintained to meet the recreational function in an environmentally sensitive manner. It is the responsibility of the Grounds Manager to maintain the grounds in accordance with the Integrative Pest Management Plan (IPM). This plan describes the activities and materials to be used to control pests (i.e. insects, weeds, and other living organisms requiring control) in a way that minimally impacts the environment. The IPM is updated as needed by the Grounds Manager, in consultation with the Lake Manager and the Environmental Review Committee. The Grounds Manager will consult with the Lake Manager on any unique situations that may arise outside of routine maintenance that could impact Spring Lake.

Monitoring:

Each year the Grounds Manager will report to the Lake Manager detailed information on maintenance activities and materials used during the year. Documentation of herbicide application is monitored by the Texas Department of Agriculture through unannounced spot checks.

Budget:

Table 7.1:

\$0

Available budget for 2024:

\$0