



Appendix I | **2024 COSM & Texas State University Reports**



Appendix I1 | **Aquatic Vegetation Restoration and Floating Vegetation Mat Management**

2024 Edwards Aquifer Habitat Conservation Plan Annual Report – Appendix II

**Texas Wild-Rice Enhancement, Non-Native Aquatic Vegetation Removal and Floating Vegetation
Mat Mitigation in the Upper San Marcos River for Year 2024**

The Meadows Center for Water and the Environment

Ecological Research Group

Texas State University



Emily Lorkovic
Collin Garoutte
Christopher Riggins
Thomas Heard
Shelby Bork

Prepared for:
City of San Marcos / Edwards Aquifer Habitat Conservation Plan

January 5, 2024

The Habitat Field Crew as part of the Ecological Research Group at The Meadows Center for Water and the Environment at Texas State University serves as a pillar of environmental stewardship for the Upper San Marcos River, whether it's striving to restore and preserve the unique aquatic ecosystem of the Upper San Marcos River and its inhabitants, engaging in community outreach, mentoring students and volunteers through hands-on experience, or by simply leaving the river in a better state than it was when our crew arrives on site. The success of this endeavor is a direct result of our dedicated crew, both past and present, who constantly push conservation boundaries to revitalize the headwaters of this unique ecosystem. However, we are not alone in this endeavor. It is only possible through the coordinated efforts of fellow EAHCP contractors, Texas State University Departments, volunteer groups, and other organizations throughout the community, that all continue to play critical roles in this program's progression.

Texas Wild-Rice Enhancement (EAHCP 5.3.1)

EAHCP Obligations:

The City of San Marcos (CoSM), in partnership with the Meadows Center for Water and the Environment (Texas State University), will identify areas of optimal habitat for *Zizania texana* (Texas wild-rice, TWR)) 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.

2024 Compliance Actions:

TWR coverage was increased through maintenance of existing stands with a focus on reaches that have not already exceeded EAHCP coverage goals for TWR. Existing stands throughout the river were maintained by focused gardening and removal of non-native SAV regrowth within and immediately adjacent to stands which suppressed the expansion of non-native SAV while promoting the expansion of TWR. New TWR stands were established through the clearing of non-native SAV from areas of suitable habitat, allowing for TWR to naturally seed these areas and, through regular gardening, preventing non-natives from outcompeting TWR seedlings.

Prior to focused removal of non-native SAV, the 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 bags or skiffs, when possible, 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.

Seventy-seven individuals of TWR were planted in the Lower I-35 reach in 2024. Planting was limited due to low-flows and the continued implementation of EAHCP Condition M, which was triggered on June 20th, 2024, limiting SAV restoration activities and minimizing disturbance. Efforts were made to enhance TWR using stand-up paddle boards ("Paddle Sweep") to access and remove non-native SAV by hand around existing stands. This new method has proven to be highly effective along shallow bank margins while minimizing disturbance caused by foot traffic. The use of paddle sweeps also provides an elevated vantage point to scout for non-native regrowth and enables crew members to cover large sections of river within a single field shift. In addition to paddle sweeps, routine walk-in maintenance sweeps were also performed by targeting any reemerging *Hydrilla verticillata* (Hydrilla) and *Hygrophila polysperma* (Hygrophila) in previously cleared areas, as well as around TWR stands.

Low flow conditions throughout 2024 have allowed for the expansion of non-native floating vegetation in areas that had been previously occupied by TWR. *Nasturtium officinale* (Nasturtium) and *Ceratopteris thalictroides* (Ceratopteris) expanded significantly from Sewell Park to City Park and has been documented spreading into downstream reaches which has caused significant die-off of TWR and other native SAV in several areas. Significant effort was put forth in 2024 to manage these non-native species and limit its negative impacts to TWR. The removal of these two species is especially difficult and time-consuming. To supplement EAHCP funding and to support effective removal and maintenance of floating non-native SAV, outside funding from the Environmental Service Committee at Texas State University was obtained for 2025 and potentially for future years. Persistent low-flow conditions also resulted in the dewatering of several mature stands of TWR resulting in desiccation and die-off. The new available habitat made space on banks for Ceratopteris to thrive. Its spore production capabilities also allow this species to expand and outcompete drought-tolerant native SAV.

Texas Wild-Rice Seedling Propagation

Texas wild-rice that was grown from seedlings is maintained in the outdoor, aquifer fed, raceways at the Freeman Aquatic Building (FAB) on the campus of Texas State University (Fig 1). Texas wild-rice expansion is continually observed in the river via both seed and tiller reproduction, with seedling growth occurring in freshly denuded areas. Care is taken to allow this expansion to take place naturally when non-native SAV is removed in those areas.



Figure 1. Texas wild-rice seed propagation trough and seedling growth in Texas State University raceways.

Proposed Activities for 2025

The top-down strategy will continue with maintenance removal of Hydrilla and Hygrophila regrowth from Spring Lake to Ramon Lucio Park (Lower I-35 Reach). The river sections from Cheatham Street to Ramon Lucio Park, including the Rio Vista millrace and the lower section of Purgatory Creek will be in recovery. Bulk removal of Hygrophila in the lower section of the Lower I-35 Reach will continue once flows consistently rise above 120cfs and Condition M is lifted. Most of the planting of native species will take place in the Recovery Zone but will occur outside the areas of heavy recreation traffic. To this point

we have achieved the eradication of all large dense areas of Hydrilla, therefore future restoration efforts will be directed to the maintenance of resilient populations of all native SAV species, including Texas wild-rice, and preventing reemergence of non-native species. Effort will go towards fostering the natural expansion of native species into areas cleared of Hydrilla and Hygrophila and increasing the density of TWR in areas it is already present. Supplemental outside funding will continue to be necessary to suppress *Nasturtium* and *Ceratopteris* in the upper sections of the river, especially in densely seeding stands of TWR, along river margins, and in areas that become exposed during low-flow conditions. Additional outside funding will also allow for the removal of Hydrilla and Hygrophila from Capes Dam to the Blanco River confluence. This funding has also supported limited planting of native SAVs within this reach under Condition M protocols.

Control of Non-Native Plant Species (EAHCP 5.3.8)

EAHCP Obligations:

The COSM will partner with Texas State University to develop and implement a non-native plant removal program reaching from Spring Lake downstream to the city limits. Appropriate permits will be obtained for the removal of non-native plants.

2024 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 treated previously. This minimizes the spread of non-native plants from upstream sources and significantly improves overall efficiency. Each reach is designated as a Work Zone, Recovery Zone, or Maintenance Zone. A Work Zone will receive focused effort and large-scale non-native SAV removal. The next stage is designated as a Recovery Zone which is an area that has already received removal treatment in the past but still requires regular small-scale removal to prevent non-native SAV from reestablishing. This supports natural expansion of native SAV and concurrent planting in areas that do not have enough coverage to support natural expansion. The final designation is a Maintenance Zone, which has had nearly all non-native SAV removed, and the focus has shifted to supporting native populations.

The primary focus in 2024 was to remove bulk non-native plants and plant native plants while flows remained above 120cfs. After flows dropped below 120cfs and Condition M was implemented on June 20, 2024, our focus concentrated on the maintenance of all previously restored reaches. Persistent low flows throughout this period stressed native SAV species allowing for rapid expansion of non-native and invasive floating vegetation in sensitive areas as the river contracted, exposing marginal areas that were dominated by TWR or other native SAV. The reduction of SAV populations coupled with the reproductive potential of invasive floating species created wide-spread negative effects throughout several reaches in the river, especially in the seeding area of TWR from Sewell Park to City Park.

Nasturtium, *Ceratopteris*, *Eichhornia crassipes* (*Eichhornia*) and *Pistia stratiotes* (*Pistia*) and vegetation mats consisting of dislodged *Ceratophyllum demersum* (*Ceratophyllum*) from Spring Lake interfere with photosynthetic processes by blocking sunlight to underlying SAV; however, the invasive floating vegetation species actively outcompete TWR whereas vegetation mats accumulate primarily on emerged stands. While negative effects from these species are caused by different mechanisms, they all eventually lead to native SAV die-off. Therefore, it is critical to remove or clear floating vegetation and vegetation mats covering native SAV to maintain the health of the SAV communities. Currently, all species mentioned above persist in Spring Lake which continues to serve as source populations that spread downstream, thus requiring routine removal to prevent the spread and establishment of non-native SAV in

the lower river segment. Outside funding was acquired to supplement the effective management of these species, both in Spring Lake and the upper reaches of the river throughout 2024 and will continue through 2025.

In addition to *Nasturtium* and *Ceratopteris*, *Limnophila sessiliflora* (*Limnophila*) is another non-native species that is beginning to expand in reaches that had historically been excluded from work plans such as the Bicentennial reach. *Limnophila* often inhabits the same slow current habitats as *Cabomba*, and is often difficult to distinguish from *Cabomba* until the species becomes fully established in an area. It can grow fully submerged and also slightly emergent along bank margins. As more effort is targeted at removing non-native SAV species, such as *Hydrilla* and *Hygrophila*, this species is often the next most competitive species to expand into the newly denuded areas.

Denuded areas (not due to recreation) with suitable habitat are typically replanted with native SAV species grown at the Texas State University raceways at the Freeman Aquatic Building. Given continued low flow conditions requiring Condition M protocols, special approval of a novel planting method was granted by USFWS that minimized disturbance by transplanting cuttings of native SAV from directly gathered from the river and from our stocks in the Texas State University raceways. Stock of plants were maintained at the raceways and the number of individuals for each native SAV being maintained at this location were recorded to track inventory and assess stock in relation to work plans at the end of each month (Table 1). Native SAV species were selected for planting based on habitat preference and corresponding suitability of denuded area, with a focus on improving SAV diversity. Efforts in the river were aimed at allowing for natural expansion of native stands, but if a native species was not present in an appropriate area, then raceway stocks were used to introduce those species to that area. The 2024 work and recovery zones did receive several rounds of “normal condition” planting before Condition M was implemented.

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 2 and Table 3). All data reported is from Jan 1st, 2024 – Oct 31st, 2024.

Table 1. Number of individual plants per species maintained each month in the raceways at the Freeman Aquatic Building through October 31st, 2024.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct
Zizania	195	195	195	195	195	195	1280	1280	0	0
Ludwigia	2152	912	0	600	600	0	0	1200	1200	1200
Potamogeton	0	0	0	0	0	0	0	816	816	816
Sagittaria	0	0	0	0	0	0	0	0	0	0
Cabomba	160	160	0	0	0	0	0	0	0	0
Hydrocotyle	0	0	0	0	0	0	0	0	0	0
Heteranthera	0	0	0	0	0	0	0	0	200	200

Table 2. Number of individuals of each native species planted in the San Marcos River in 2024. *denotes reaches that were designated as Work Zones in 2024.

River Reach	Species	Individuals Planted
Cypress Island	Ludwigia	472
Upper I-35*	Ludwigia	288
Lower I-35*	Cabomba	80
	Heteranthera	100
	Ludwigia	500
	Potamogeton	100
	Zizania	77
Below Sewell	Ludwigia	75
	Sagittaria	30
Rio Vista	Ludwigia	2176
Total River Subtotals	Cabomba	80
	Heteranthera	100
	Ludwigia	3511
	Potamogeton	100
	Sagittaria	30
	Zizania	77
	Total River	3898

Table 3. Estimated area (m²) of non-native vegetation and floating non-native vegetation removed by reach in 2024. *Denotes reaches that were designated as Work Zones in 2024.

River Reach	Species	Area Removed (m2)
Spring Lake	Ceratopteris	160.41
	Eichhornia	13.29
	Hydrilla	21.20
	Hygrophila	151.29
	Pistia	104.82
Spring Lake Dam	Ceratopteris	23.66
	Hydrilla	0.92
	Hygrophila	54.13
	Nasturtium	8.67
Sewell Park	Ceratopteris	39.78
	Hydrilla	0.20
	Hygrophila	36.70
	Myriophyllum	0.99

	Nasturtium	0.08
Below Sewell	Ceratopteris	1356.36
	Hygrophila	357.36
	Limnophila	0.96
	Nasturtium	668.97
	Pistia	17.12
City Park	Ceratopteris	143.38
	Hydrilla	2.51
	Hygrophila	27.06
	Nasturtium	30.05
Lower City Park	Ceratopteris	113.12
	Hydrilla	2.65
	Hygrophila	57.97
	Nasturtium	62.42
	Pistia	0.51
Hopkins to Snake Island	Ceratopteris	94.68
	Hydrilla	5.60
	Hygrophila	112.45
	Limnophila	51.99
	Nasturtium	37.26
Bicentennial Park	Ceratopteris	36.06
	Hydrilla	0.73
	Hygrophila	64.70
	Limnophila	20.64
	Nasturtium	18.01
	Pistia	1.10
Cypress Island	Ceratopteris	3.21
	Hygrophila	8.83
	Hydrilla	1.52
	Limnophila	0.91
	Nasturtium	0.87
	Pistia	0.64
Rio Vista	Ceratopteris	3.06
	Hydrilla	0.40
	Hygrophila	41.29
	Limnophila	0.55
	Nasturtium	0.26
	Pistia	6.79

Upper I-35*	Hydrilla	2.43
	Hygrophila	85.10
	Nasturtium	0.77
Lower I-35*	Ceratopteris	0.29
	Hydrilla	0.73
	Hygrophila	1210.46
	Limnophila	15.18
	Myriophyllum	0.01
	Nasturtium	4.16
Total River Subtotals	Ceratopteris	1974.01
	Eichhornia	13.29
	Hydrilla	38.89
	Hygrophila	2207.35
	Limnophila	90.23
	Myriophyllum	1.01
	Nasturtium	831.52
	Pistia	130.98
	Submerged Aquatic Veg	2337.47
	Floating Aquatic Veg	2949.80
	Total	5287.27

2024 LTBG and Restoration Reaches (Submersed Aquatic Vegetation Non-Native Removal and Native Planting Sites)

The species planted in the river in 2024 were: *Zizania texana* (Texas wild-rice), *Ludwigia repens* (Ludwigia), *Cabomba caroliniana* (Cabomba), *Sagittaria platyphylla* (Sagittaria), *Potamogeton illinoensis* (Potamogeton), and *Heteranthera zosterifolia* (Heteranthera). Low disturbance planting of native SAV was approved by USFWS as an acceptable method that limits disturbance while under Condition M. Therefore, planting methods switched from growing out mature potted plants in raceways to instead collecting cuttings from raceway plants and from plants within the river and transferring them to the substrate in the target areas. The non-designated reaches have historically not been treated and are now part of the removal plan and have required much effort to remove and restrict regrowth of large areas of non-native SAV. All non-designated reaches upstream of the I-35 reach have been successfully treated and are now in maintenance condition. Removal effort maps have been updated to represent three different levels of removal methods. This includes Normal, Maintenance, and Paddle. Normal removal includes the initial denuding of non-native vegetation and any subsequent removal of significant regrowth. Maintenance consists of small-scale removal of minor regrowth that causes little to no disturbance. Paddle occurs from stand-up paddleboards, focusing on shallow marginal areas and floating non-native species, causing less disturbance to surrounding habitat.

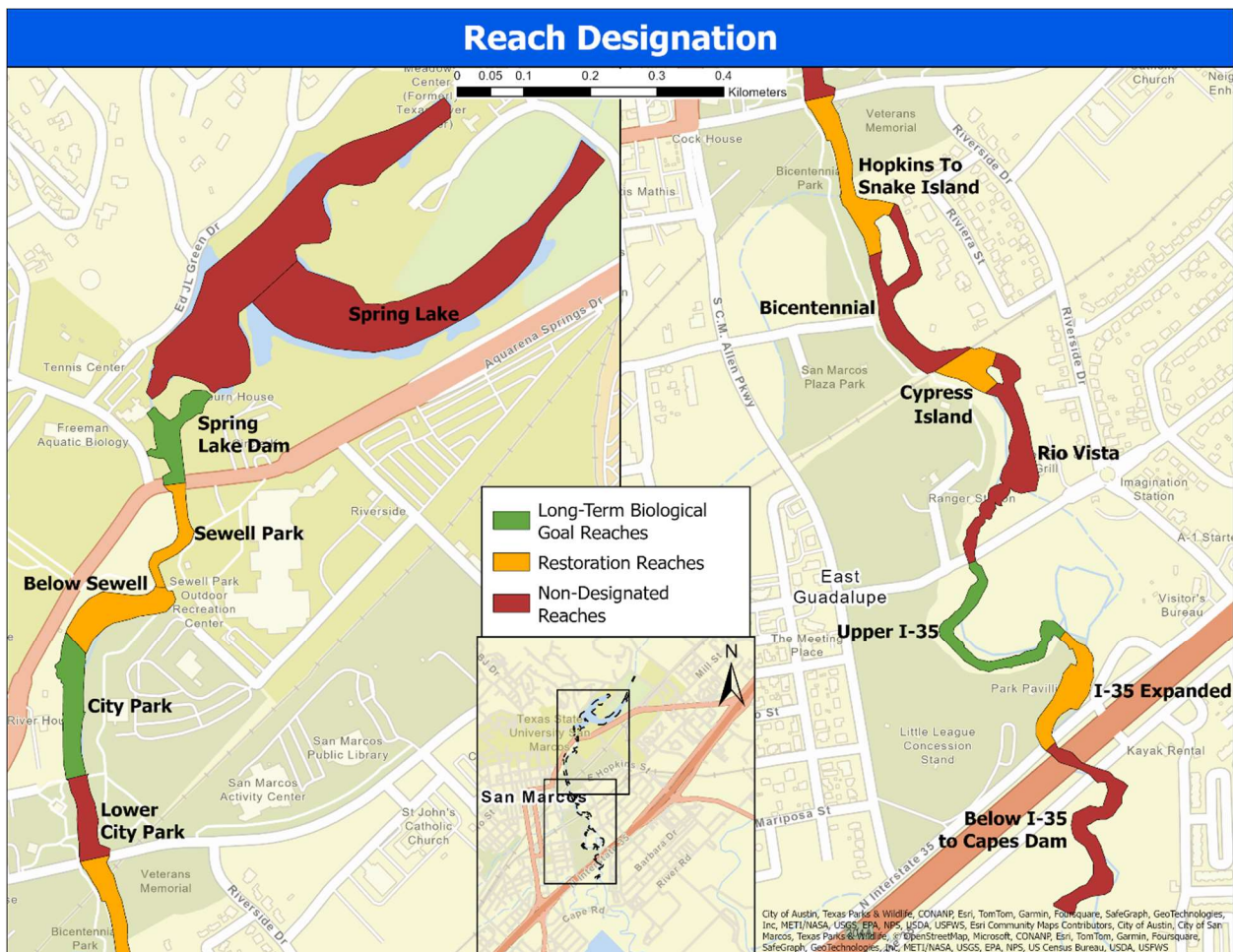


Figure 2. Long Term Biological Goal, Restoration, and Non-Designated reaches. The 2024 work year included focused removal in the I35 reaches, maintenance in all reaches for 2025.

Spring Lake Reach

In 2024, Spring Lake continued its designation as a maintenance zone, requiring ongoing maintenance (i.e. limited, selective removal of non-native SAV) a practice that has been proven successful. Ceratopteris and Hygrophila were targeted for removal; however, several small sources of Pistia, Hydrilla, Eichhornia, and Hyacinth were also identified and removed. The non-native vegetation removal took place above the Eastern and Western spillways, but the entire lake was monitored. Maintenance effort resulted in the removal of **160.41 m²** of Ceratopteris, **151.29 m²** of Hygrophila, **104.82 m²** of Pistia, **27.20 m²** of Hydrilla, and **13.29 m²** of Eichhornia (Fig 3). Hygrophila is has been subdued to a maintenance level within the lake. Native SAV species, such as Ludwigia and Cabomba, are established, but struggling to compete with expansion of Eurasian milfoil throughout the area that received large scale Hygrophila removal. The large native SAV patches above both spillways continue to send propagules downstream through fragmentation with visible increases in the Spring Lake Dam reach. Hygrophila maintenance in Spring Lake requires occasional sweeps using a combination of SCUBA divers, snorkelers, and kayakers, focusing on areas with any recent regrowth. Effort is limited to the minimum amount necessary to prevent Hygrophila from becoming reestablished and proliferating. Monitoring for Hydrilla will need to increase as it has now been noted in several locations throughout Spring Lake. Though still limited to small areas, Hydrilla has the potential to expand significantly in a short amount of time. TWR above each spillway did not respond well to the prolonged drought and reduced spring flow, leading to lower densities.

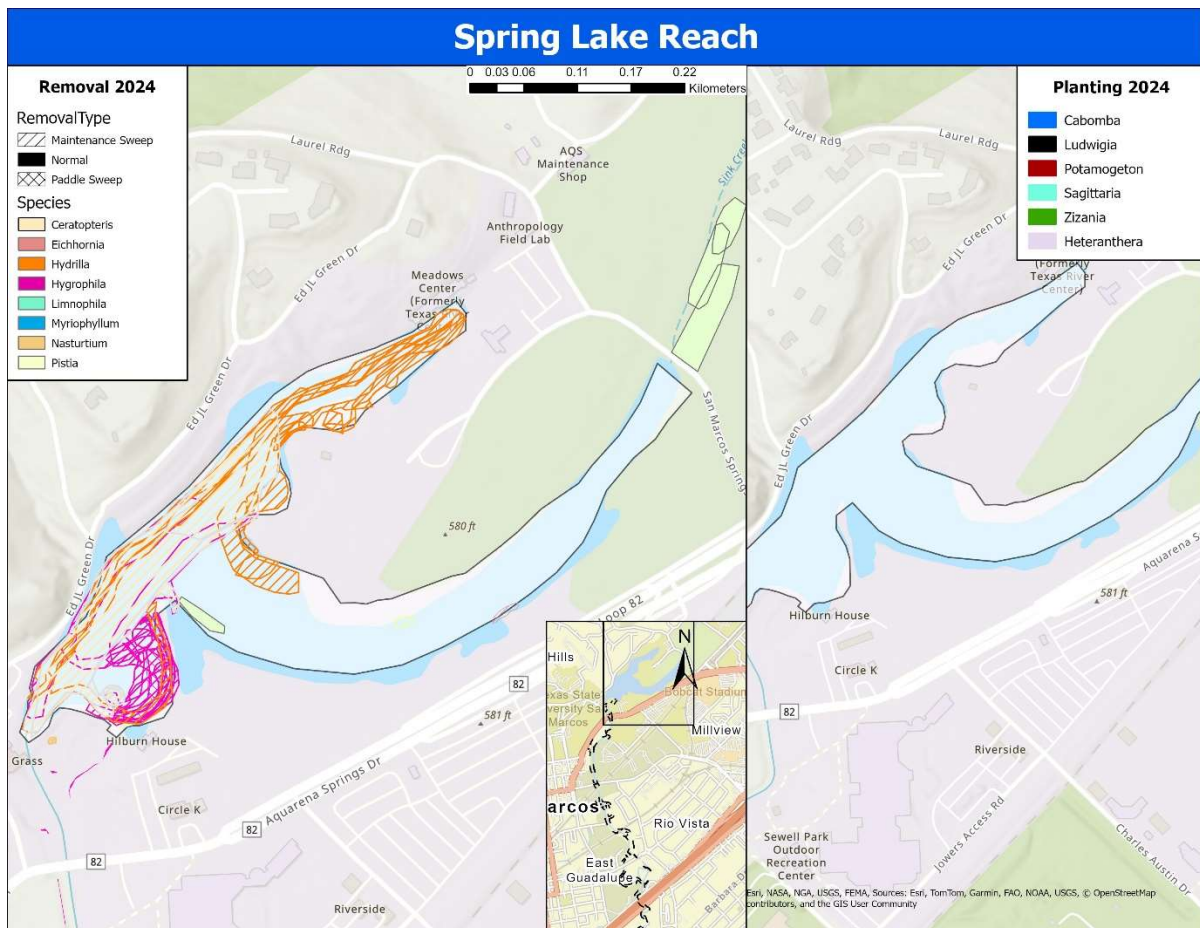


Figure 3. The location of non-native vegetation removal in Spring Lake restoration reach in 2024. No planting occurred in 2024 for this reach.

Spring Lake Dam LTBG Reach

Spring Lake Dam LTBG reach continued its designation as a maintenance zone for 2024 which required occasional maintenance to prevent non-native SAV regrowth. Maintenance effort resulted in the removal of **54.13 m²** of Hygrophila, **23.66 m²** of Ceratopteris, **8.67 m²** of Nasturtium, and **0.92 m²** of Hydrilla (Fig 4). No planting of native SAV occurred in this reach. Heavy recreation, coupled with low-flow conditions, resulting in impacts to TWR and along other native SAV and allowed non-native SAV species to reestablish, as sources of non-native SAV persist in Spring Lake. Patches of Ludwigia, Cabomba and Sagittaria were observed throughout the reach but at reduced coverage. This reach will remain a maintenance zone in 2025.

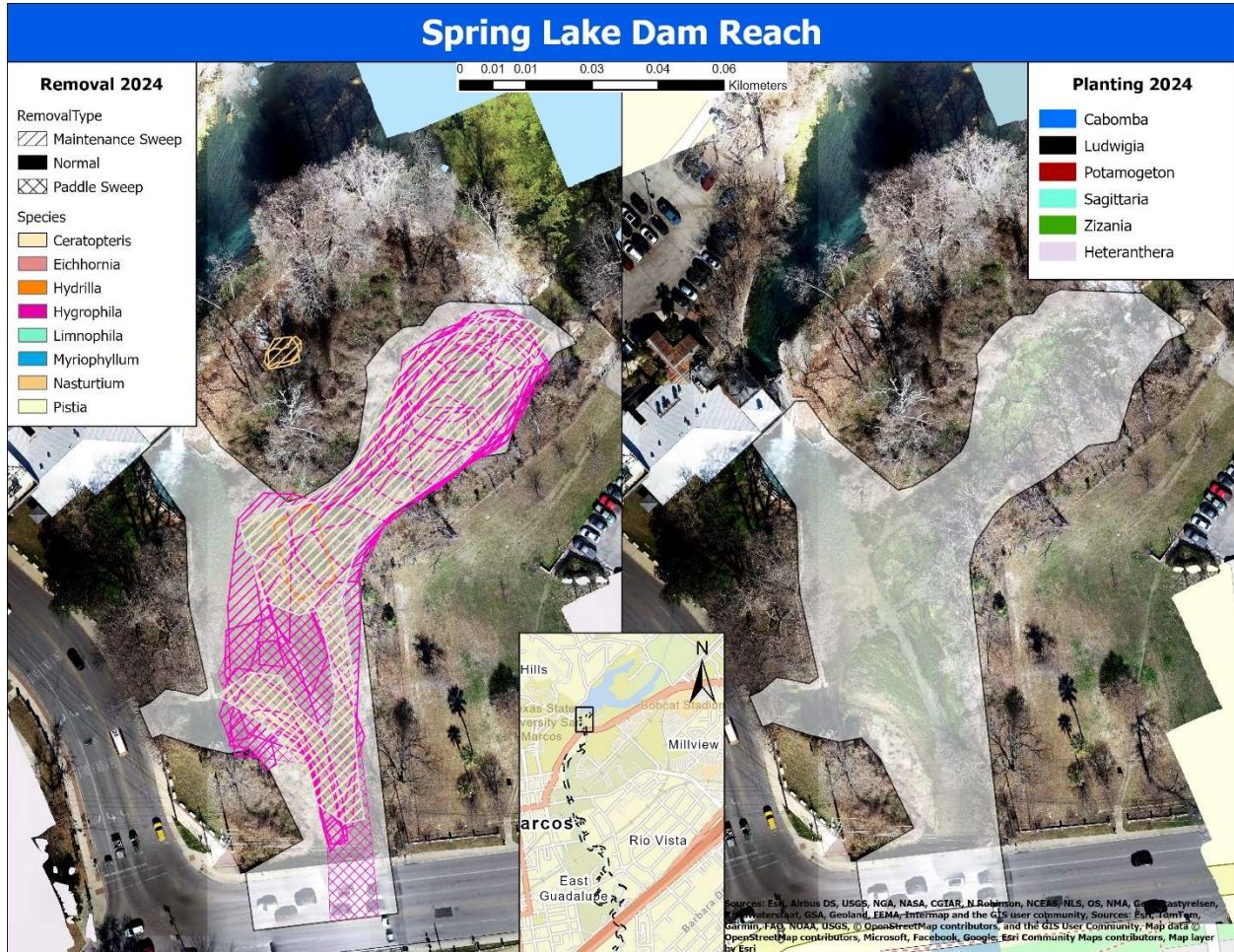


Figure 4. The location of non-native vegetation removal in Spring Lake Dam Long Term Biological Goal reach in 2024. No planting occurred in 2024 for this reach.

Sewell Park Restoration Reach

The Sewell Park Restoration reach continued its designation as Maintenance Zone in 2024 which required occasional maintenance to remove non-native SAV within existing patches of native SAV. Maintenance effort resulted in the removal of **39.78 m²** of Ceratopteris, **36.7 m²** of Hygrophila, **0.99 m²** of Myriophyllum, **0.2 m²** of Hydrilla, and **0.08 m²** of Nasturtium (Fig 5). Persistent low-flow conditions experienced throughout 2024 caused native SAV within shallow areas to be overtaken by other semi-aquatic and terrestrial species. Non-native floating vegetation also expanded in areas where river levels declined and created extremely shallow or dewatered areas because of low-flow conditions. This is anticipated to continue to be problematic so long as source populations persist upstream. This reach will be designated as a maintenance zone in 2025 and will continue to receive routine maintenance and limited native, non-TWR SAV planting.



Figure 5. The location of non-native vegetation removal in Sewell Park Restoration reach in 2024. No planting occurred in 2024 for this reach.

Below Sewell Restoration Reach

The Below Sewell Restoration reach continued its designation as a maintenance zone for 2024; however, substantial effort was required to combat the rapid expansion of floating invasive species. As waters receded due to drought and spring flow declined, nearly half the wetted channel was exposed which transformed this area into a riparian environment. TWR was negatively impacted or killed from the stream channel changes. Maintenance effort resulted in the removal of **1356.36 m²** of *Ceratopteris*, **668.97 m²** of *Nasturtium*, **357.36 m²** of *Hygrophila*, **17.12 m²** of *Pistia*, and **0.96 m²** of *Limnophila* (Fig 6). Additionally, **75 individuals** of *Ludwigia* and **30 individuals** of *Sagittaria* were planted. *Nasturtium* and *Ceratopteris* readily expanded in this reach in areas had become dewatered, were denuded of TWR and/or exhibited extremely shallow conditions. Combination of removal and flow conditions facilitated the spread of *Bacopa monnieri*, which currently is the most abundant complex vegetation in the reach. Effective management of these two species required supplemental outside funding. Most of this removal effort took place outside the bounds of the wetted river channel so as not to violate Condition M protocols. This reach will remain a maintenance zone in 2025.

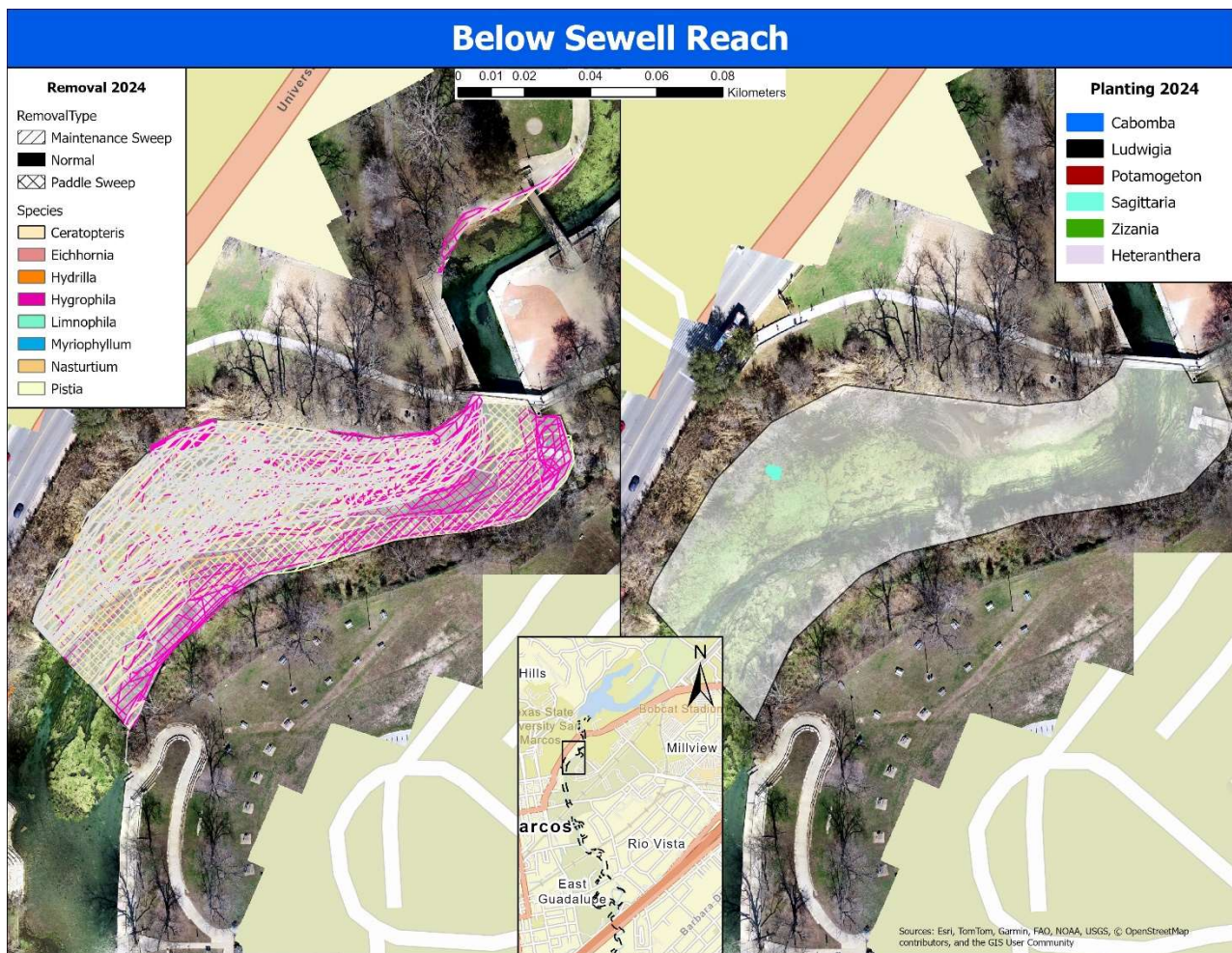


Figure 6. The location of non-native vegetation removal and native SAV planting in Below Sewell Restoration reach in 2024.

City Park LTBG Reach

The City Park LTBG reach continued its designation as a maintenance zone for 2024, which required minor maintenance to prevent non-native SAV regrowth. Maintenance effort resulted in the removal of **143.64 m²** of Ceratopteris, **30.05 m²** of Nasturtium, **27.06 m²** of Hygrophila, and **2.51 m²** Hydrilla (Fig 7). TWR, along with other native SAV along Dog Beach (i.e. river-right), were significantly affected by a combination of recreation and low-flow conditions. Supplemental plantings of native, non-TWR SAV will likely be required in 2025 and future years to reach target SAV goals. This reach will remain a maintenance zone in 2025.

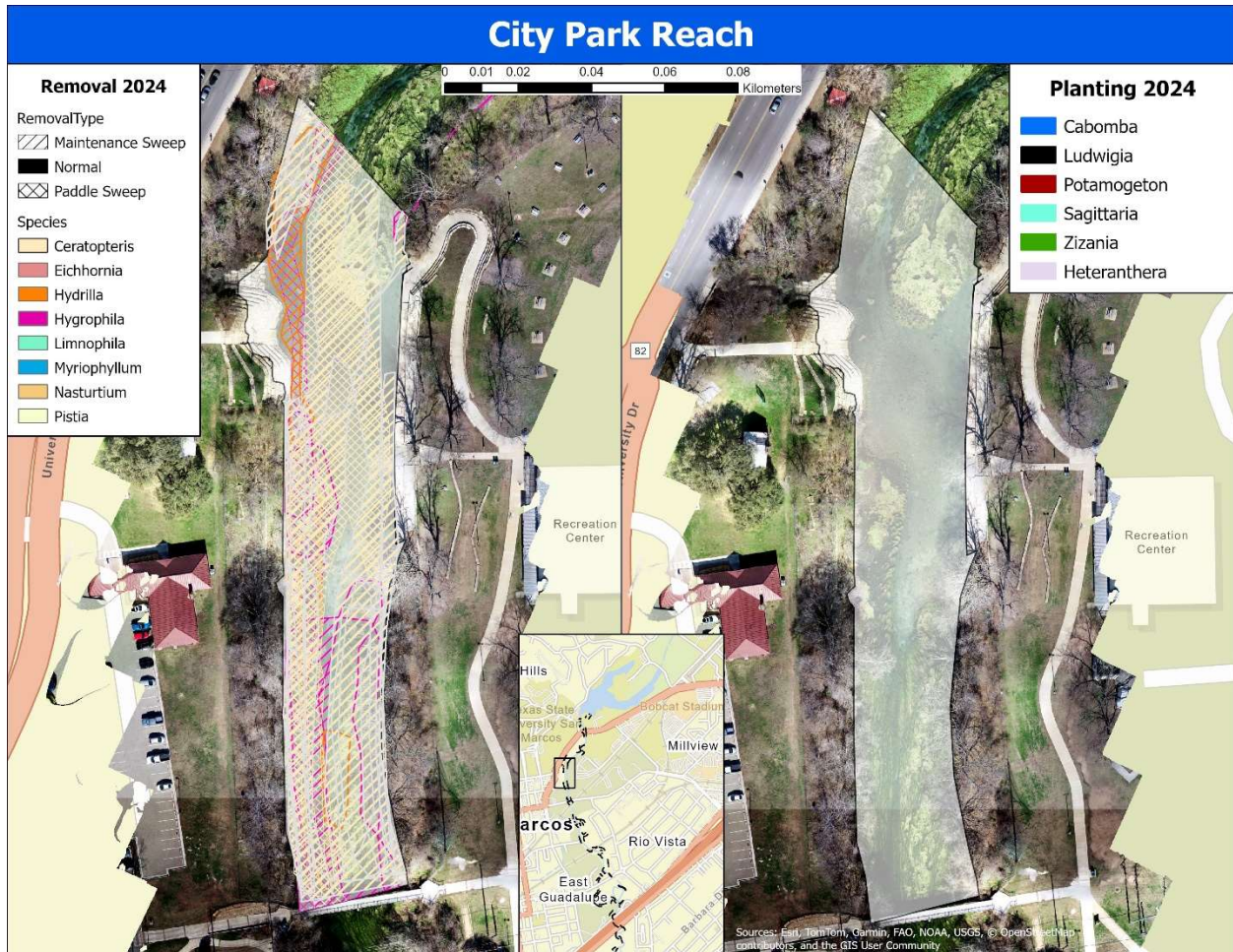


Figure 7. The location of non-native vegetation removal within City Park Long Term Biological Goal Reach in 2024. No planting occurred in 2024 for this reach.

Lower City Park Reach

The Lower City Park reach is a non-designated reach that was a maintenance zone for 2024 which required occasional maintenance to remove non-native SAV within existing patches of native SAV. Maintenance effort resulted in the removal of **113.12 m²** of Ceratopteris, **62.42 m²** of Nasturtium, **57.97 m²** of Hygrophila, **2.65 m²** Hydrilla, and **0.51 m²** of Pistia (Fig 8). This reach will remain a maintenance zone in 2025.



Figure 8. The location of non-native vegetation removal within the Lower City Park reach in 2024. No planting occurred in 2024 for this reach.

Hopkins to Snake Island Restoration Reach

The Hopkins to Snake Island Restoration reach continued its designation as a Maintenance Zone in 2024. This reach received a relatively high level of effort resulting in the removal of **112.45 m²** of Hygrophila, **94.68 m²** of Ceratopteris, **51.99 m²** of Limnophila, **37.26 m²** of Nasturtium, and **5.6 m²** of Hydrilla (Fig 9). This area continues to exhibit a diverse community of SAV including high densities of SAV species that have been documented to support higher densities of fountain darters. This reach will remain a Maintenance Zone in 2025.

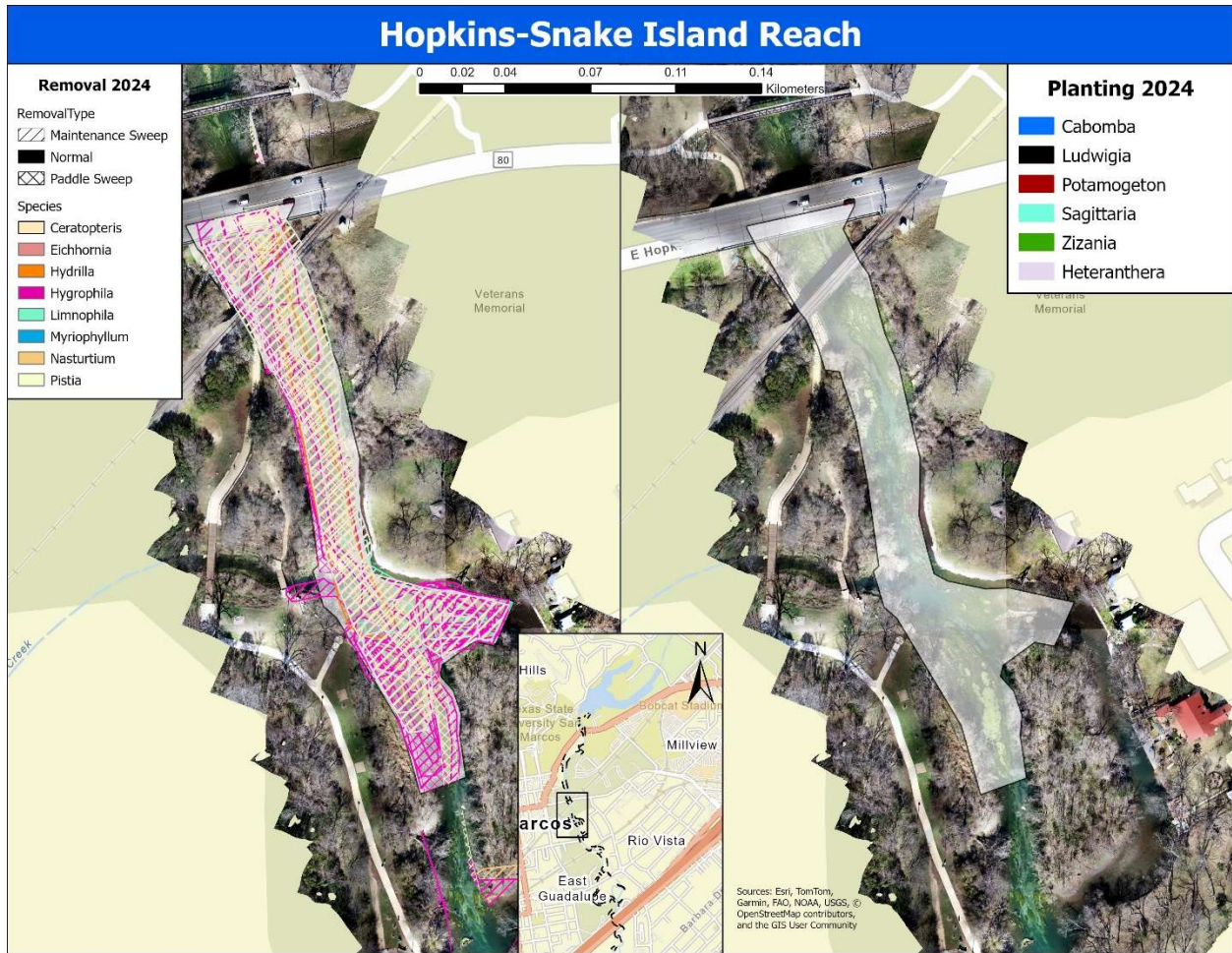


Figure 9. The location of non-native vegetation removal within the Hopkins to Snake Island reach in 2024. No planting occurred in 2024 for this reach.

Bicentennial Reach

The Bicentennial reach remained a maintenance zone in 2024. Extensive maintenance was conducted in this reach throughout 2024, while under Condition M. This area was dominated by Hydrilla prior to bulk removal treatment that occurred in Spring of 2022, therefore very few native aquatic species were present after Hydrilla regrowth had subsided. Two native SAV species, Cabomba and Sagittaria, were already present and displayed rapid natural expansion throughout this reach with little-to-no assistance beyond control of non-native SAV regrowth. Past Ludwigia plantings have expanded considerably. Frequent maintenance removal effort resulted in the removal of **64.7 m²** of Hygrophylla, **36.06 m²** of Ceratopteris, **20.64 m²** of Linnophila, **18.01 m²** of Nasturtium, **1.1 m²** of Pistia, and **0.73 m²** of Hydrilla (Fig 10). This reach will remain a Maintenance Zone in 2025.

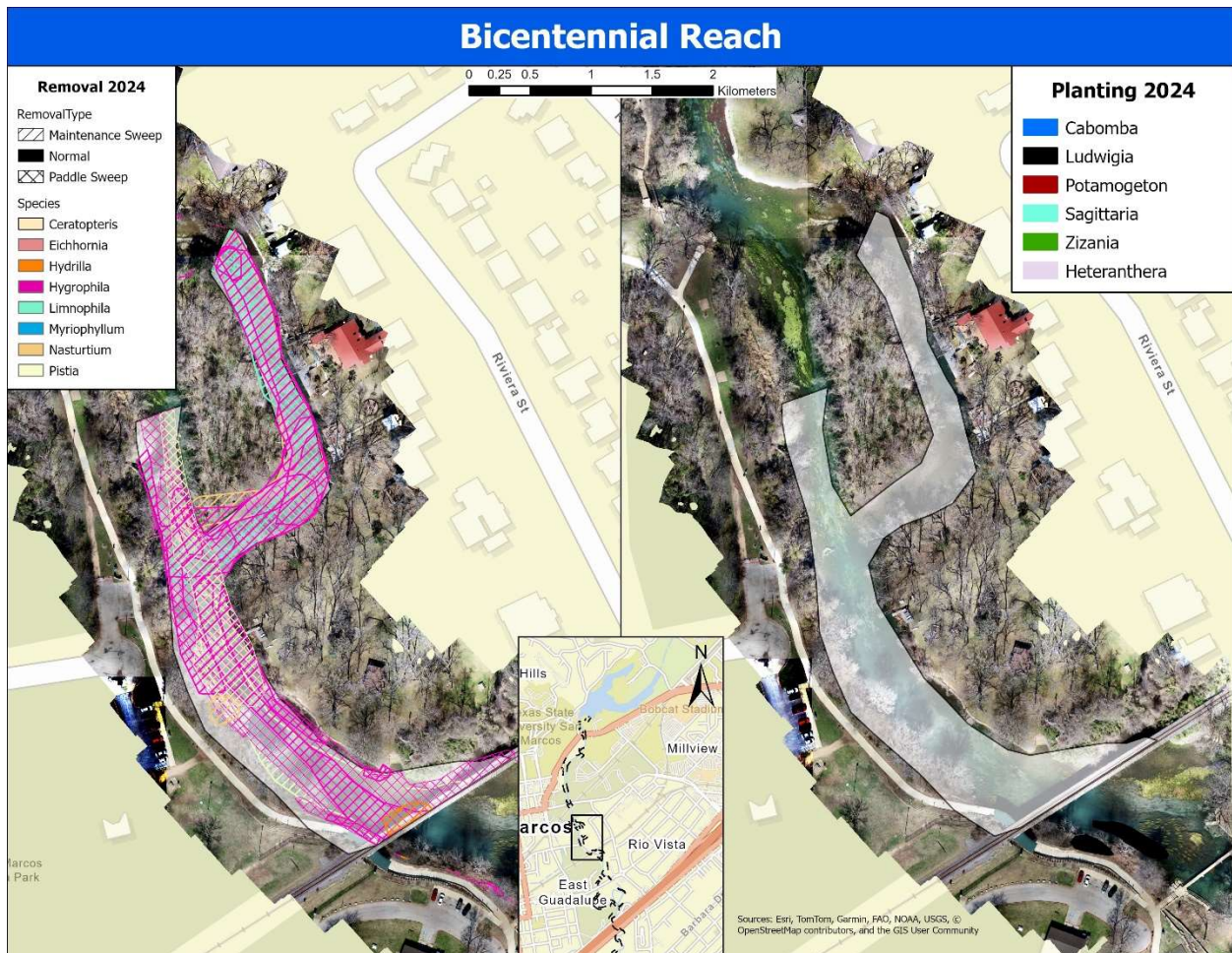


Figure 10. The location of non-native vegetation removal within the Bicentennial reach in 2024. No planting occurred in 2024 for this reach.

Cypress Island Restoration Reach

Cypress Island is a restoration reach and was designated as a recovery zone in 2024. Periodic maintenance was conducted to mitigate any regrowth of non-native SAVs and to promote the expansion of TWR, Cabomba and Ludwigia. Cabomba has expanded naturally into areas previously occupied by Hydrilla while Ludwigia plantings have also successfully expanded. A total of **8.83 m²** of Hygrophila, **3.21 m²** of Ceratopteris, **1.52 m²** of Hydrilla, **0.91 m²** of Limnophila, **0.87 m²** of Nasturtium, and **0.64 m²** of Pistia were removed in 2024 (Fig 11). Additionally, **472 individuals** of Ludwigia were planted. Continued maintenance and if necessary, planting will continue in 2025. This reach will become a Maintenance Zone in 2025.

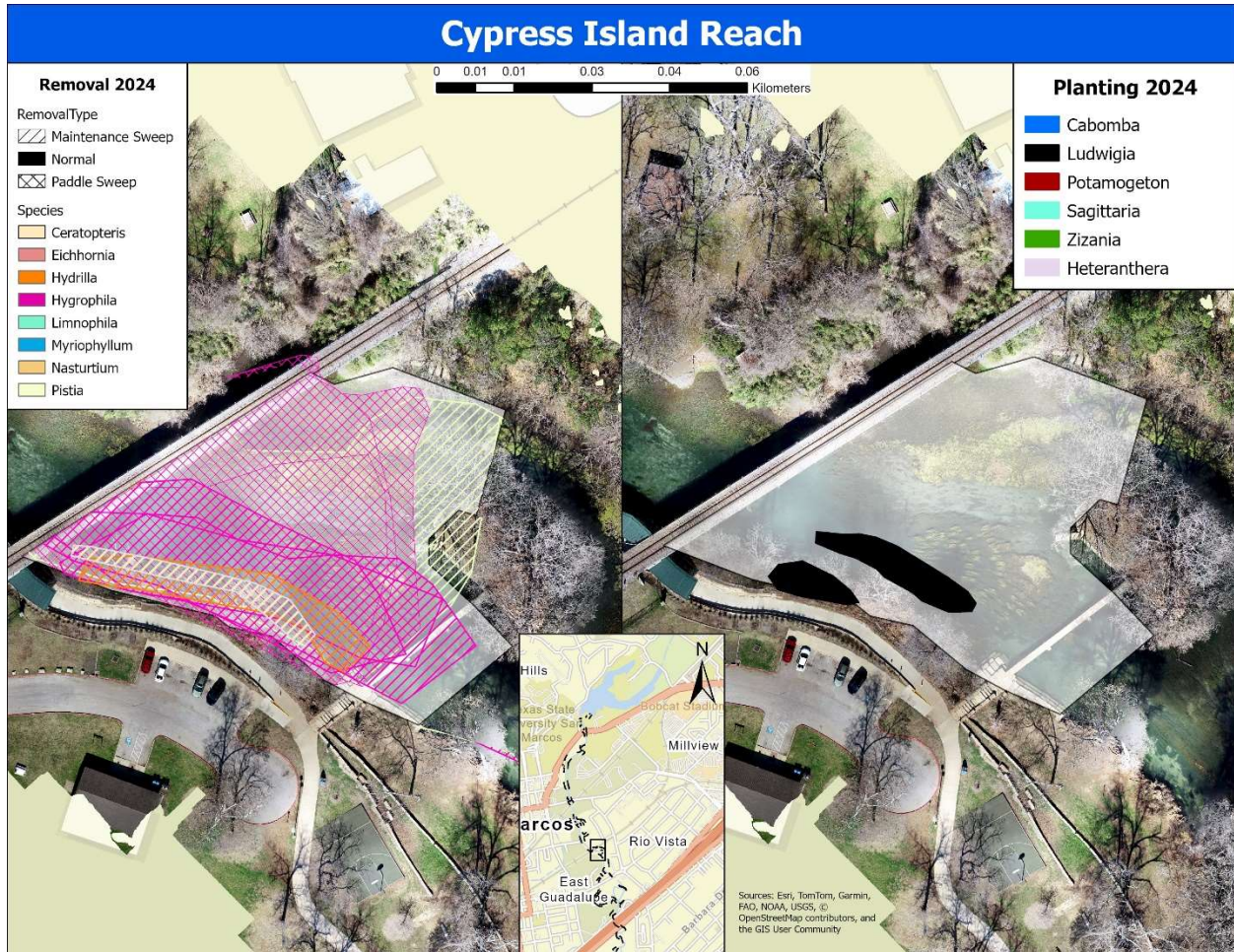


Figure 11. The location of non-native vegetation removal and native SAV planting within the Cypress Island reach in 2024.

Rio Vista Reach

Rio Vista is a non-designated reach and was designated as a recovery zone in 2024. Periodic maintenance was conducted to mitigate any regrowth of non-native SAVs and to promote the expansion of TWR, Cabomba and Ludwigia. Cabomba has expanded naturally into areas previously occupied by Hydrilla while Ludwigia plantings have also successfully expanded. Efforts in the reach resulted in the removal of **41.29 m²** of Hygrophila, **6.79 m²** of Pistia, **3.06 m²** of Ceratopteris, **0.55 m²** of Linnophila, **0.4 m²** of Hydrilla, and **0.26 m²** of Nasturtium (Fig 12) Additionally, **2176 individuals** of Ludwigia were planted, and this reach will become a maintenance zone in 2025.

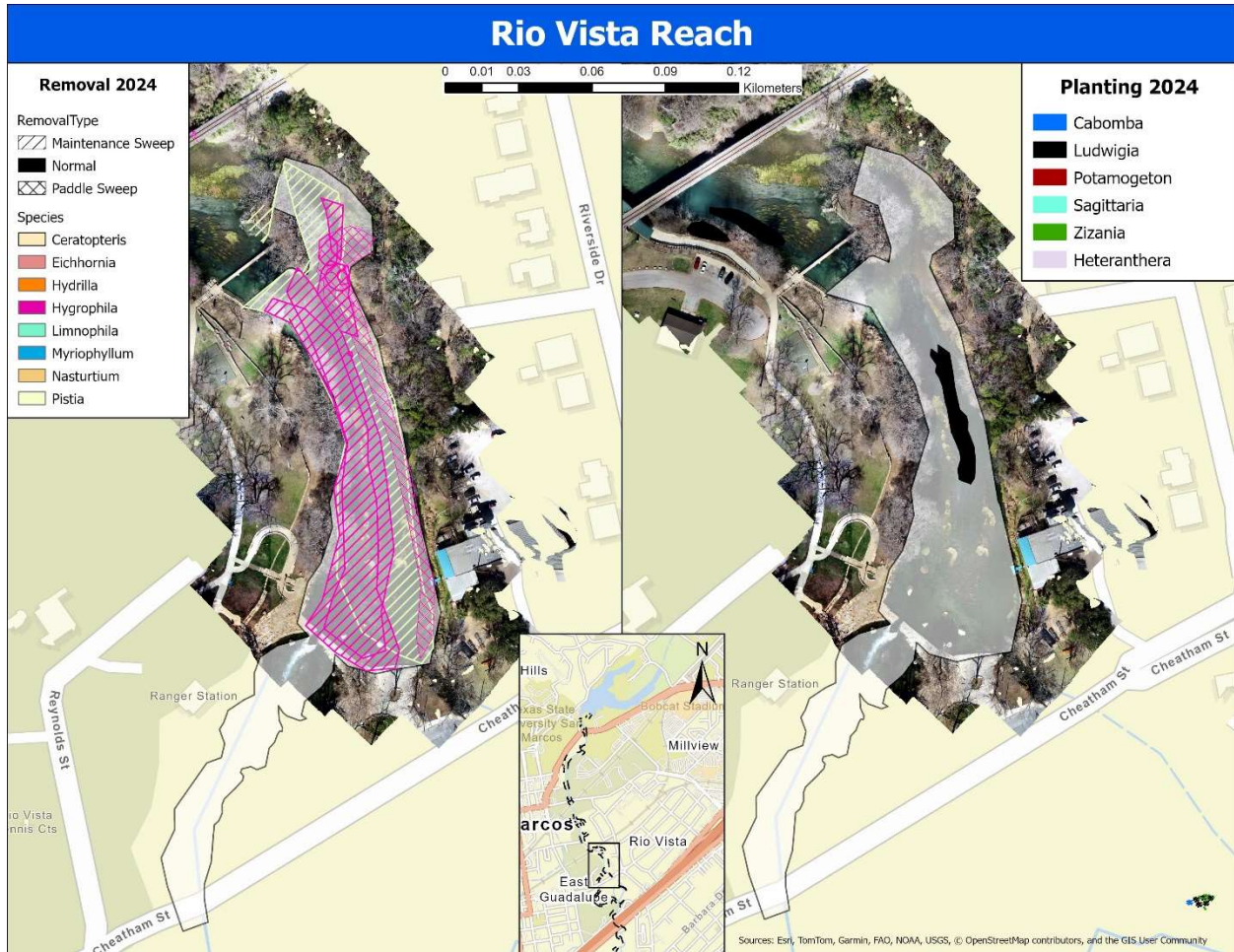


Figure 12. The location of non-native vegetation removal and native SAV planting within Rio Vista reach in 2024.

I-35 Upper LTBG Reach

This reach was designated a work zone in 2024 which received some removal work to minimize regrowth and expansion of non-natives. A total of **85.1 m²** of Hygrophila, **2.43 m²** of Hydrilla, and **0.77 m²** of Nasturtium were removed by maintenance sweeps (Fig 13). Additionally, **288 individuals** of Ludwigia were planted. This reach was treated heavily for removal efforts early in the implementation of the EAHCP; thus, an effort was made to maintain progress. Native SAV was planted in previous years and continues to occupy suitable habitat in this reach, suggesting successful restoration of the native SAV community.



Figure 13. The location of non-native vegetation removal and native SAV planting within the Upper I-35 reach in 2024.

I-35 Lower Reach

The I-35 Lower reach was designated a work zone in 2024. Like Upper I-35, this reach received some removal in 2024 to minimize regrowth and expansion of non-natives and to conserve previous effort. A total of **1210.46 m²** of Hygrophila, **15.18 m²** of Limnophila, **4.16 m²** of Nasturtium, **0.73 m²** of Hydrilla, **0.29 m²** of Ceratopteris, and **0.01 m²** of Myriophyllum were removed by maintenance sweeps (Fig 14). Planting also occurred in this reach including a total of **80** individuals of Cabomba, **100** individuals of Heteranthera, **500** individuals of Ludwigia, **100** individuals of Potamogeton, and **77** individuals of Zizania were planted (Fig 14).

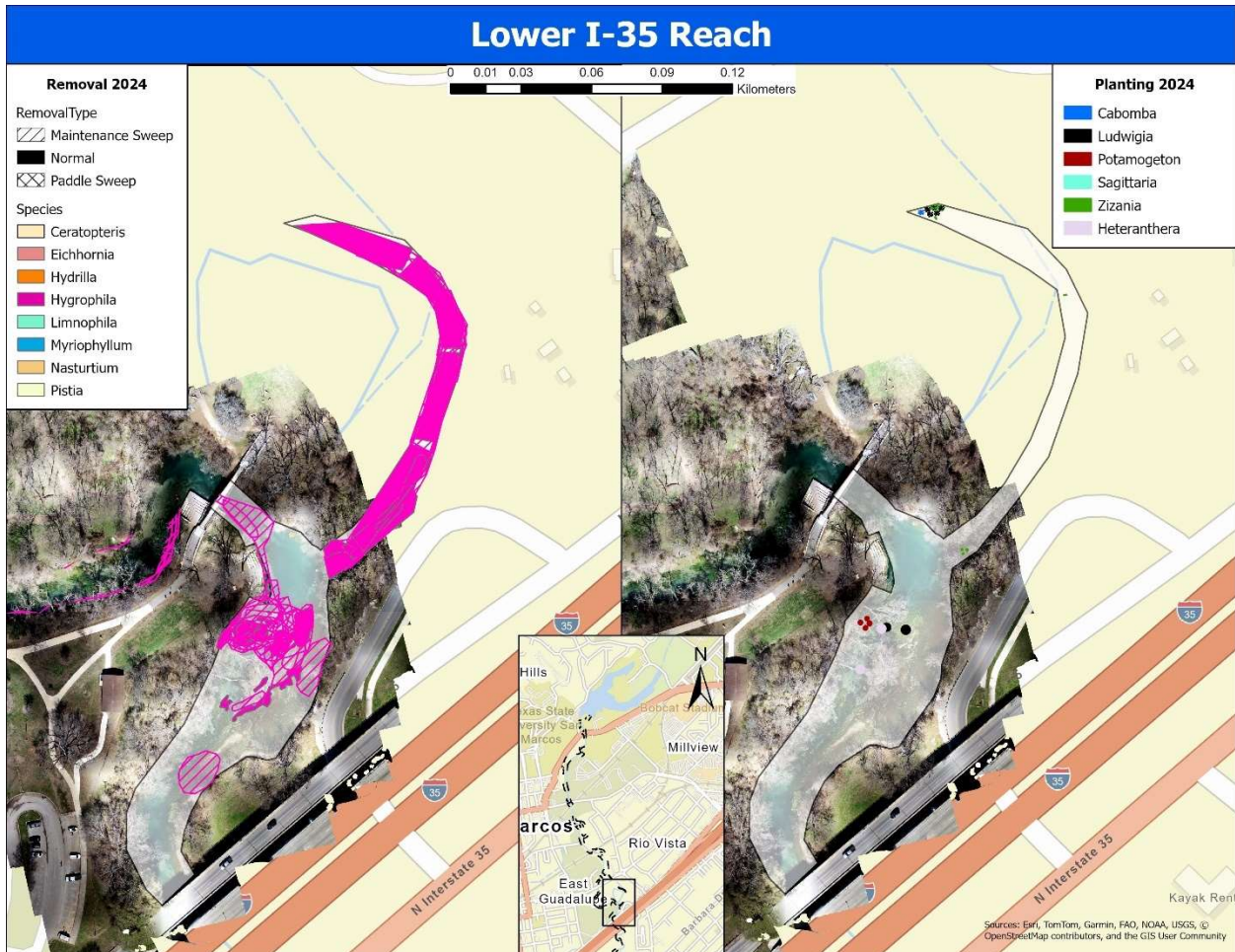


Figure 14. The location of non-native vegetation removal and native SAV planting within the Lower I-35 reach in 2024.

Vegetation Mat Removal (EAHCP 5.3.3)

EAHCP Obligations:

The COSM will partner with Texas State University 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.

2024 Compliance Actions:

Approximately **20,952.64 m²** of floating vegetation mats were removed from in and around TWR stands spanning from Spring Lake Dam to Snake Island throughout 2024 (Fig 15). The areas of focus were the State Scientific Area protection zones, due to presence of dense populations with emergent seeding heads of TWR. During the summer recreation season, vegetation mats primarily consisted of fully dislodged *Ceratophyllum* and fragments of Texas wild-rice, while for the rest of the year they were predominantly dislodged *Ceratophyllum*.

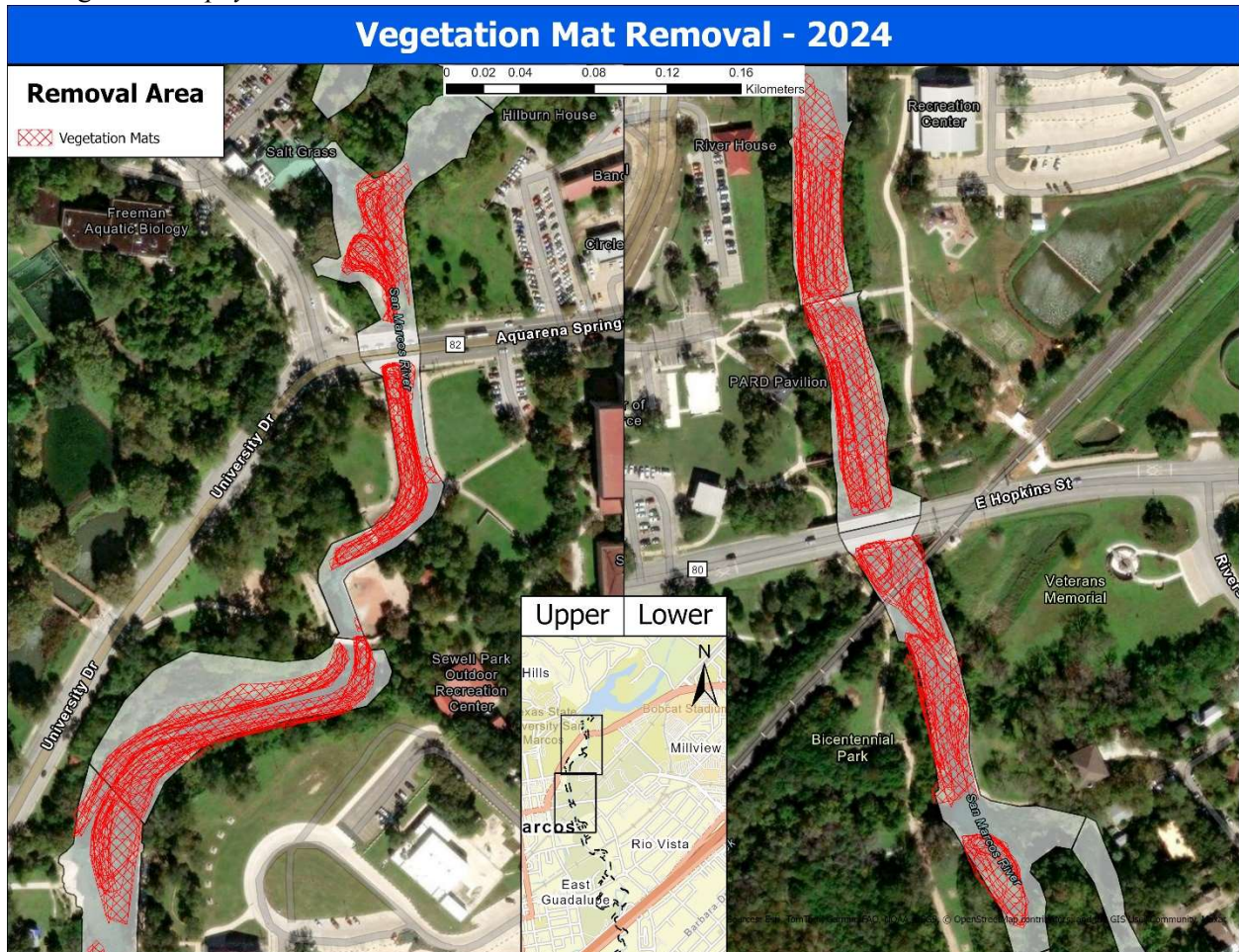


Figure 15. Vegetation mat removal in 2024.

2024 Summary

In 2025, the continued implementation of top-down removal strategies successfully maintained progress in restored reaches. Texas wild-rice (*Zizania texana*) and other native species continued to expand in areas where *Hydrilla* and *Hygrophila* had been removed, requiring additional planting only in large, heavily denuded areas. Upper reaches were carefully managed to mitigate the re-emergence of non-native species and facilitate the ongoing expansion of native vegetation. Targeted efforts were increased in vulnerable reaches, such as Below Sewell, to address their low resilience to low-flow conditions. These enhanced efforts sustained maintenance activities and supported downstream progress, ensuring the restoration effort remained aligned with the objectives of the Edwards Aquifer Habitat Conservation Plan (EAHCP).

In 2024, the San Marcos River faced significant stressors during a third consecutive year of record-breaking drought. Prolonged low flows resulted in channel shrinkage and riparian expansion, altering habitat conditions throughout the river. These conditions caused notable shifts in species composition, particularly in widened reaches below Sewell. Multiple die-offs of Texas wild-rice were observed in shallow, nearshore zones, where *Ceratopteris spp.* (water sprite) rapidly colonized, necessitating intensive removal and maintenance. By the end of 2024, native species such as *Bacopa* and *Sagittaria* began passively recolonizing slackwater areas, signaling potential for recovery. However, upstream sources of non-native propagules and regrowth from remnant tubers continued to pose challenges.

The combination of low flows and increased human activity during the summer further stressed TWR stands, particularly near public access points and along the main longitudinal channel from Spring Lake Dam to Stokes Park. Low flows also contributed to the accumulation of floating vegetation mats, which became entangled in stands of submerged aquatic vegetation (SAV) and emergent TWR. Efforts to control these mats were concentrated in protection zones such as TWR enclosures within the San Marcos River State Scientific Area and dense TWR stands in Spring Lake Dam, Sewell Park, Below Sewell, and Bicentennial Park.

The temporary suspension of Condition M protocols at the start of 2024 allowed for large-scale removal of *Hygrophila* in the I-35 reach and *Hydrilla* below Cape's Dam. This opportunity enabled full clearance of the Upper 35 reach, portions of the I-35 reach, and the river channel from Cape's Dam to the Stokes Park outflow. Additionally, focused planting of *Ludwigia* and *Cabomba* was undertaken in the Cypress Island and Rio Vista reaches.

When low-flow Condition M resumed in the summer, restoration activities continued under conditional approval from the U.S. Fish and Wildlife Service (USFWS). Adjustments were made to minimize substrate disturbance and protect water quality and native biota. These included:

1. Reducing staff footprints during habitat access.
2. Conducting snorkel surveys to identify fountain darters and mussels.
3. Using "plugging" techniques for native plant cuttings and potted specimens.
4. Removing non-natives while immediately planting natives.

Regulatory meetings with USFWS now occurs at each 10 cfs drop below 90 cfs, allowing for real-time assessments of river conditions and adaptations to best practices.

Dominant vegetation types shifted to native species following bulk removal and community restoration efforts. Despite drought conditions and reduced habitat availability, downstream expansion of TWR, *Ludwigia*, and *Cabomba* was observed across the project area. Planting efforts and passive colonization

improved SAV coverage, particularly in deeper, less accessible areas between Snake Island and the Rio Vista pools. These locations offered critical refuges for fauna, including fountain darters, during the recreation season. In reaches most impacted by drought, habitat dynamics shifted to favor riparian, emergent, or floating vegetation types. Native SAV species such as *Bacopa*, *Ludwigia*, and *Sagittaria* became dominant in these areas.

Restoration efforts were supported by Texas State University students through a federal work-study program, alongside volunteers and supplemental funding. Approximately \$91,200 in supplemental funds were utilized to maintain the level of effort achieved in previous years while addressing new challenges, such as the removal of floating non-native vegetation and SAV from littoral and riparian zones. The two supporting projects (WAIVS and HAAP, see Summary of Supplemental Projects) have been essential in enabling large-scale aquatic invasive species removal, repatriation of native vegetation, and continued habitat restoration, ensuring ongoing progress and alignment with EAHCP goals. University students also played a crucial role in maintaining native SAV stocks at the Freeman Aquatic Building (FAB) for planting in recovery zones and other areas, as in-channel nurseries were not feasible in the San Marcos River system. This work was vital for sustaining restoration progress. This collaborative effort has ensured that restoration zones transition into maintenance zones, thereby supporting the long-term goals of the EAHCP.



Figure 16. Hopkins Street to Snake Island restoration reach removal and planting progress in early 2023. Before treatment (left, 2020) and progress of native SAV expansion 2 years after treatment and initial planting (right, Jan 2023). This reach provides an example of restoration efforts that focus on obtaining a diverse composition of SAV species and coverage that have continued to expand downstream throughout 2024.

Proposed Activities for 2025

For 2025, the aquatic vegetation treatment work plan continues the strategy of top-down removal for non-native SAV. Effort will focus on maintaining the upper reaches with a focus on removing any regrowth, and frequent maintenance and planting within the 2024 work zone. Since the 2024 work zone has already been treated for removal in previous years, most of the focus will rely on the continued maintenance and suppression of non-native SAV regrowth and subsequent planting of native SAV that may not be present, or that have reduced coverage. All forecasted work is expected to proceed under the assumption that condition M remains in place, as flows are currently well below 120cfs. Best management practices will be adapted to focus removal efforts to primarily maintenance of previously worked areas and secondarily to create buffers around existing TWR stands. Texas State University will continue to support removal efforts in 2025, focusing on floating invasive species, as well as invasive and non-native SAV removal from within Spring Lake downstream, covering the entire upper two river miles. Additionally, a

supplemental project funded by Texas Parks and Wildlife (TPWD), targets enhancing native SAV and removing hydrilla from Cape's Dam to below Stoke's park. Overall, the EAHCP vegetation restoration efforts will continue to be enhanced with funding from the Texas State University, TPWD and federal work study totaling \$89,630. This dynamic management process continues to require adaptability due to newly established non-native species, increased climate change induced stressors for native SAV species, and increasing recreational impacts due to a growing regional population and record high summer temperatures.

Summary of Supplemental projects

HAAP

The Upper San Marcos River is a 4.5-mile stretch that begins at Spring Lake on the campus of Texas State University in San Marcos and flows down to the confluence with the Blanco River. This stretch of clear, spring-fed water is a popular destination for paddlers and anglers who target Largemouth Bass, sunfish, and Rio Grande Cichlids. The Upper San Marcos is the only location where Texas wild-rice (*Zizania texana*) is found. This federally endangered species provides habitat for recreational fish species as well as the federally endangered Fountain darter (*Etheostoma fonticola*). Texas wild-rice faces numerous threats, including competition with non-native aquatic invasive species such as Hydrilla and Hygrophila. This project will enhance fish habitat in the Upper San Marcos River by removing aquatic invasive species and Attachment A Proposal and Budget replacing them with native aquatic vegetation such as Texas wild-rice. This project will be a continuation of previous federally funded efforts to restore Texas wild-rice in locations upstream of the proposed project area and would occur in conjunction with a US Army Corps of Engineers grant to the City of San Marcos to remove invasive vegetation along the riparian margin of the Upper San Marcos in the same area.

Project Objectives:

The work will follow previously established methods for aquatic invasive species removal and native submerged aquatic vegetation propagation and planting techniques developed through the EAHCP implementation. The area will first be mapped with a drone to identify areas of non-native SAV. The removal of non-native SAV will be from upstream to downstream to minimize the spreading of non-native plants from upstream sources. The first effort will include a focused effort on large-scale non-native removal. Following the large-scale removal, these sites will be revisited throughout the project duration to provide recurrent smaller-scale removal to prevent non-native SAV from re-establishing. This maintenance level removal will occur throughout the project, helping to reduce competition and allow native species to become established and expand. Prior to clearing, non-native vegetation will be fanned to displace fountain darters or any other aquatic fauna. Removal is then performed by hand with removed vegetation being captured in nets or skiffs to minimize non-native propagation downstream by fragmentation. Denuded areas that have had thorough non-native removal for at least three months will be replanted with native SAV species grown at the Texas State University raceways at the Freeman Aquatic Building. Efforts in the river are aimed at allowing for natural expansion of native stands, but if a native species is not present in an appropriate area, then raceway stocks are used to introduce those species to that area. As upstream populations continue to increase, natural expansion also increases. This reduces the required planting effort as removal efforts progress downstream. Planting typically occurs in the fall season. Planting efforts will attempt to create areas of diverse cover and to add other native species to areas of Texas wild-rice planted under the SARP grant. See Attachment 1 for a list of native SAV for this project. The project area covers approximately 3.1 river miles of the Upper San Marcos River, overlapping 1.3 river miles that received SARP work in 2021 and expanding another 1.8 river miles downstream.

Table 4. Number of individuals of each native species planted in the San Marcos River within the HAAP work zone in 2024.

HAAP Work Zone	Cabomba	40
	Heteranthera	730
	Ludwigia	3343
	Potamogeton	200
	Zizania	1082

Table 5. Area of removal of each non-native species in the San Marcos River within the HAAP work zone in 2024.

HAAP Work Zone	Species	Area Removed (m2)
	Hydrilla	558.65
	Hygrophila	14.42
	Total	573.07

Proposed Activities for 2025

HAAP effort will continue into 2025 following the same protocols as 2024, with a focus of ongoing maintenance in the upper sections of the work zone that received initial removal in 2024 before continuing downstream. No new areas of vegetation will be denuded until Condition M restrictions are lifted. Areas of non-native removal that continue to show no recurrence of regrowth will receive planting according to provisions made under Condition M, similar to HCP planting efforts.

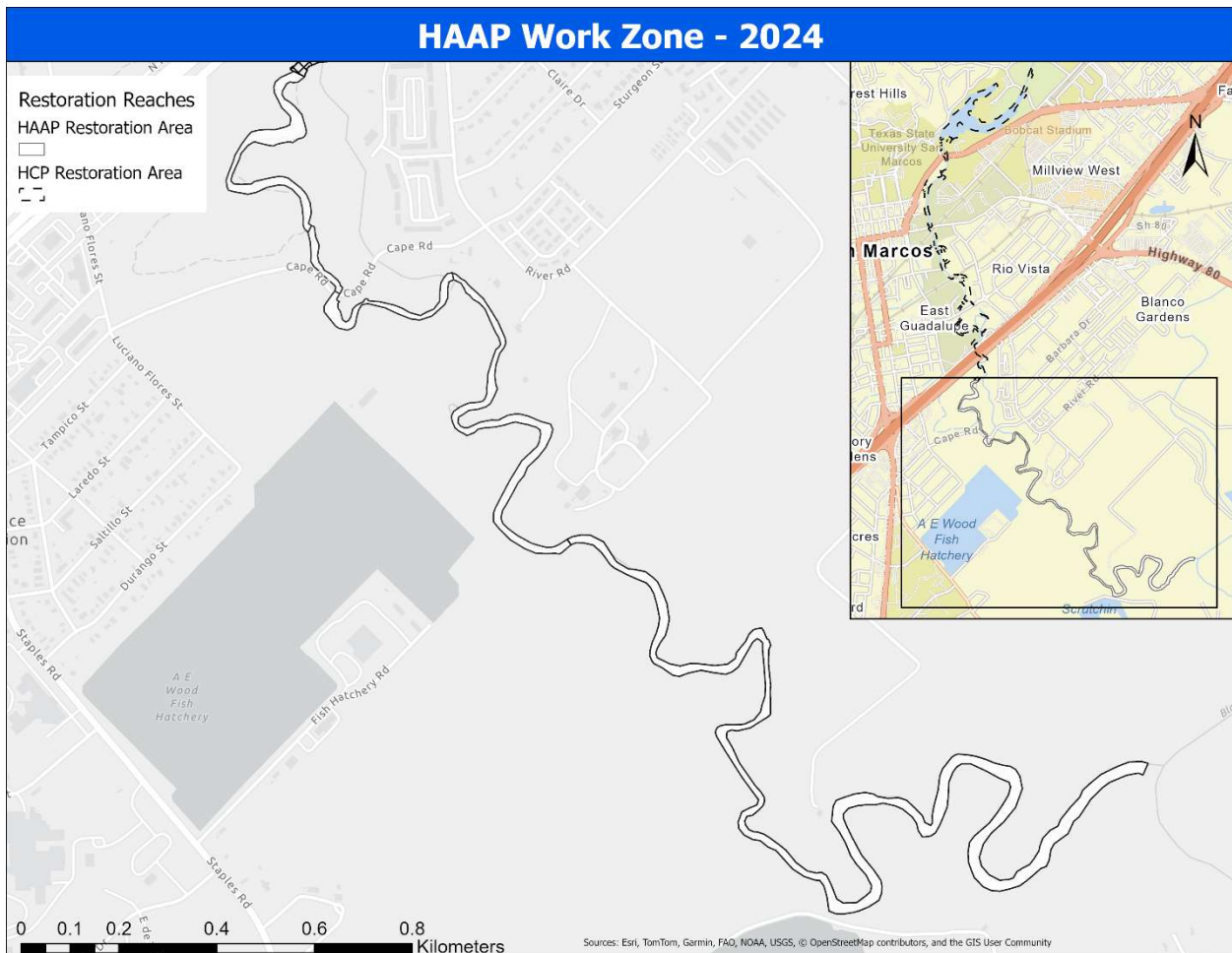


Figure 17. Designated HAAP Work Zone in 2024.

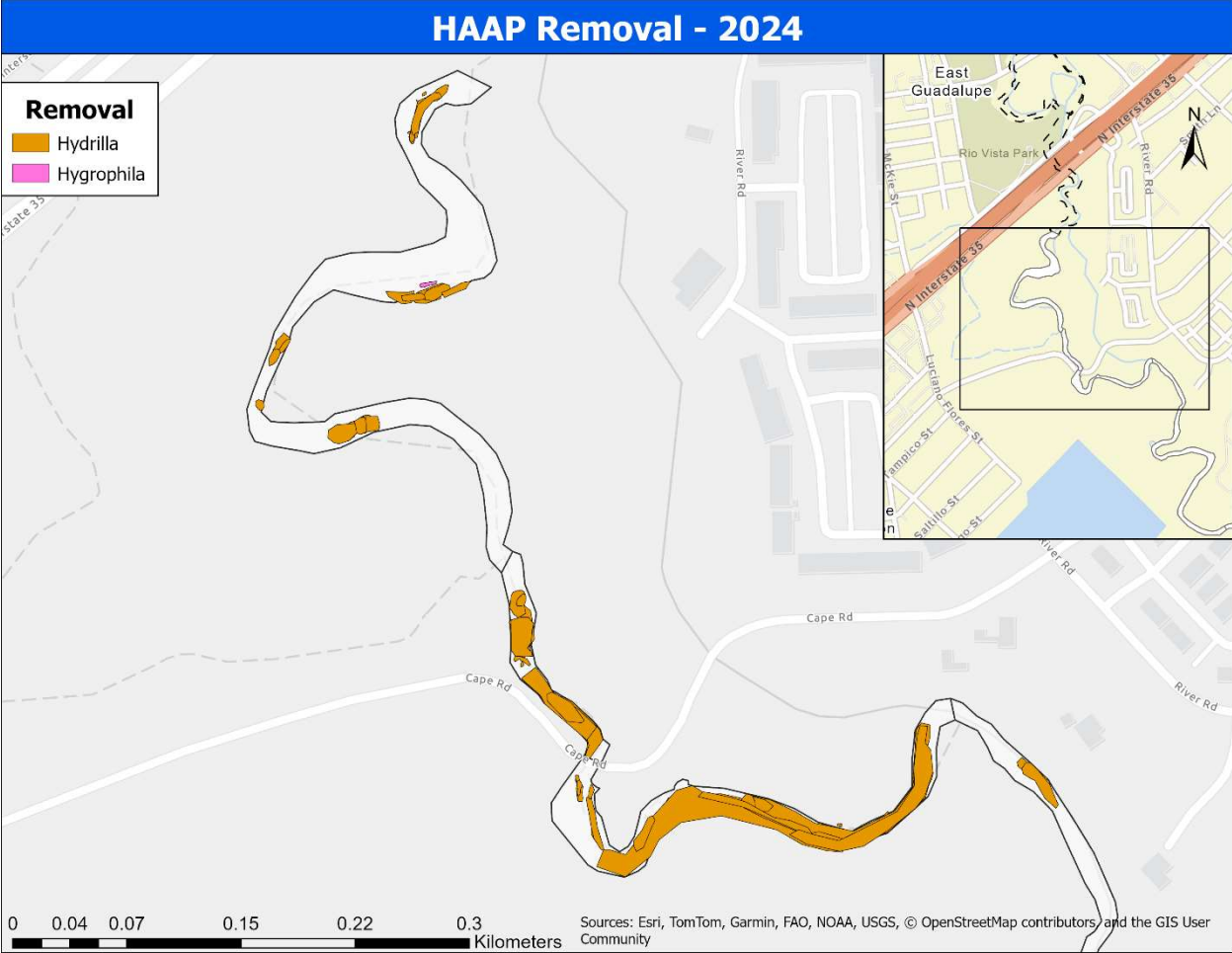


Figure 18. The location of non-native vegetation removal within the HAAP work zone in 2024.

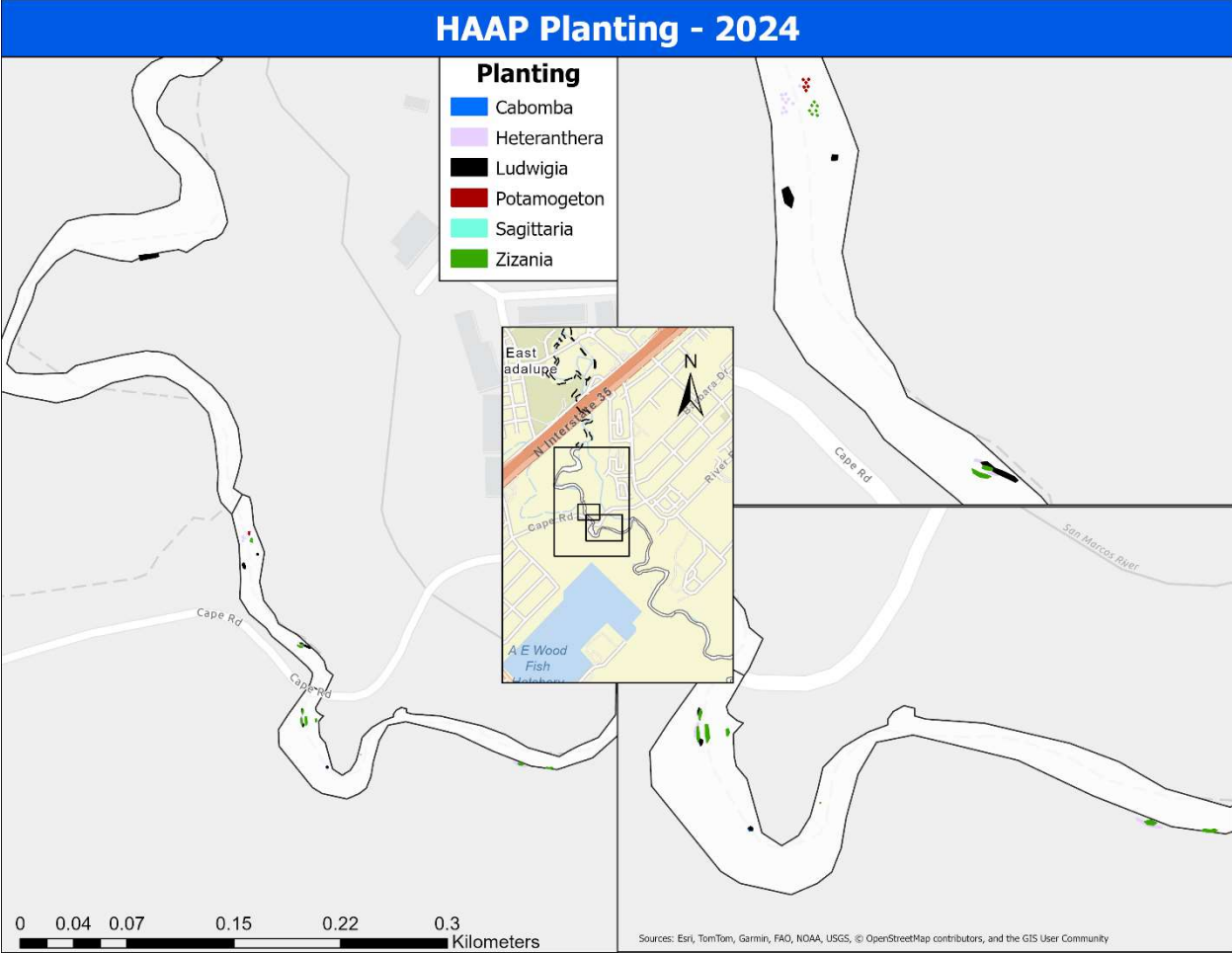


Figure 19. The location of native SAV planting within the HAAP Work Zone in 2024



Appendix I2 | **Management of Recreation in Key Areas**

2024 EAHCP Annual Report – Appendix I2:

EAHCP Management of Public Recreation (EAHCP Section 5.3.2/ 5.4.2)

2024 Overview and Summary of Activities

City of San Marcos/ Texas State University

Management activities associated with river recreation in the San Marcos River system per EAHCP Sections 5.3.2 & 5.4.2 are conducted help minimize and avoid impacts to threatened and endangered species and their habitats. River recreation management-related activities conducted in 2024 are summarized below.

Conservation Crew

In 2024, the City of San Marcos (CoSM), through Texas State University (TXST), hired part-time Conservation Crew staff to patrol and monitor the upper San Marcos River, assist with EAHCP-related habitat protection activities, educate river visitors of the EAHCP, and promote stewardship of the San Marcos River.

In 2024, nine part-time staff worked during the peak recreation season (May-Aug) and between 2-4 staff during the off-season. On average each staff person worked approximately 15 hours per week with a total of approximately 3,526 hours worked in 2024. In early May 2024, an orientation/ training was provided to the Conservation Crew to familiarize them with the EAHCP, park rules and daily duties. The Conservation Crew utilized a Daily Checklist to guide their daily activities as they patrol the primary recreation areas of the river between Upper Sewell Park and IH-35. COSM staff managed the Conservation Crew and coordinated scheduling.

The conservation crew engaged with river visitors and provided them with information on the EAHCP, threatened and endangered species in the San Marcos River, park rules and good river stewardship practices. The focus of the education is litter prevention and protection of Texas Wild-Rice (TWR) and aquatic vegetation in the river and why visitors should strive to avoid or minimize disturbance of aquatic vegetation. The Conservation Crew tracks the number of conservations held with river visitors and in 2024 a total of 4,167 conversations were held.

The Conservation Crew routinely collected litter from within the river and in adjacent parks as they patrol the river. In addition, the Conservation Crew maintains and recovers litter placed in several “trash collection boats” located in the river. In 2024, the Conservation Crew collected a total of 3,051 ft³ of litter from the river and 2,064 ft³ of litter from City Parks.

The Conservation Crew also assisted with propagating native plants, painting of native riparian plants and with the set-up, monitoring, and maintenance of TWR exclusion barriers.

Educational Signage

CoSM and TXST kept in place and maintained existing signage within riverfront parks that is related to the EAHCP, park rules and general river stewardship. In addition, CoSM installed new

signage at multiple locations within City riverfront parks to educate visitors of park rules and regulations (**Figure 1a**). The signage helps to inform river and park visitors of the EAHCP, threatened/ endangered species, general park regulations and environmental protection initiatives. **Figure 1b** shows examples of existing signage located within CoSM and TXST riverfront parks. **Figure 1c** shows examples of new signage installed in 2023 within CoSM riverfront parks and remained in place through 2024.

COSM, TXST, and EAA continued the development of updated EAHCP-related signage for TXST riverfront parks (i.e. Sewell and Upper Sewell Parks). It is anticipated that the updated signage will be completed and installed in early 2025.



Figure 1a. Examples of new signage installed within riverfront parks along the upper San Marcos River in 2024. These signs were installed along the edge of the “No Go Zones” denoted in purple on the above map where disposable containers are not permitted by City ordinance.



Figure 1b. Examples of existing signage installed within riverfront parks along the upper San Marcos River. The top two signs are located in CoSM’s Rio Vista Park and the bottom two signs are located in TXSTs Sewell and Upper Sewell Parks. The TXST signs will be replaced with new signage in early 2025.



Figure 1c. Example of signage that remained in place in CoSM riverfront parks along the upper San Marcos River throughout 2024.

Installation of Texas Wild-Rice Exclosures and Protection Zones with the Defined State San Marcos River Scientific Area

San Marcos River flow remained below 120 cfs for the duration of 2024. As such, TWR exclosures, buoys and signage established to protect TWR stands and sensitive habitat during low-flow periods remained in place throughout the entire year. **Figure 2** shows the location of the TWR protection zones and **Figure 3** shows examples of the installed protection zones. The Conservation Crew routinely monitored and maintained the exclosures throughout 2024. The exclosures will remain in place until river flow increases above 120cfs.



Figure 2. Map showing the location of TWR protection zones in the San Marcos River.



Figure 3. Photos showing the buoys, signage and exclosures that were installed to denote the TWR protection zones in the San Marcos River. The photo on the upper left is in the river immediately downstream of the Hopkins St bridge, photo on the right is immediately downstream of Sewell Park, photo on bottom left is at Bicentennial Park at the Purgatory Creek confluence and photo on bottom right is the signage in place at the Eastern Spillway area just below Spring Lake dam.

Designated River Access Points and River Access Restrictions

COSM and TXST continued the strategy of focusing river access to designated stabilized river access points along the river while restricting access to other segments of river with fencing and/or dense riparian vegetation. This strategy has proven to be highly effective in preventing trampling and disturbance of both riparian and aquatic vegetation in areas where fencing is in place and river access restricted.



Appendix I3 | **Litter Removal**

2024 EAHCP Annual Report – Appendix I3:

City of San Marcos & Texas State University EAHCP Litter Management Summary

(EAHCP Sections 5.3.3 & 5.4.3)

Litter was collected from within the San Marcos River from Spring Lake to Stokes Park throughout 2024. Although litter collection activities occurred year-round, efforts were amplified during the river recreation season (May-Sept). The entire river segment from Spring Lake Dam to Stokes Park was cleaned once per month during the non-recreation season and once per week during the recreation season. Funding for litter collection efforts was provided through both the EAHCP program and the City of San Marcos. The volume of litter collected from within the San Marcos River in 2024 is summarized below in **Table 1** and **Figure 1**. Total litter removed from the San Marcos River in 2024 was 577.5 ft³.

In addition, litter was removed from the lower portions of several tributaries of the San Marcos River that include Purgatory Creek and the Riverside Drive drainage channel. The volume of litter collected from within San Marcos River tributaries in 2024 is summarized below in **Table 2** and **Figure 2**. Total litter removed from the San Marcos River tributaries in 2024 was 48.2 ft³.

In addition to the in-channel litter cleanup summarized above, the CoSM and TXST routinely collected and managed litter within riverfront parks and within contributing watershed areas with the use of staff, contractors and volunteers.

Table 1. Volume of litter collected and removed from the San Marcos River per reach in 2024.

2024 Litter Removed (ft ³)			
	Spring Lake Dam to IH35	IH35 to Stokes Park	Total
January	-	-	0.00
February	-	-	0.00
March	8.04	8.04	16.08
April	8.04	13.40	21.44
May	10.72	13.40	24.12
June	101.84	42.88	144.72
July	114.57	54.27	168.84
August	72.36	36.18	108.54
September	32.16	17.42	49.58
October	8.04	9.38	17.42
November	6.70	6.70	13.40
December	6.70	6.70	13.40
Total	369.17	208.37	577.54

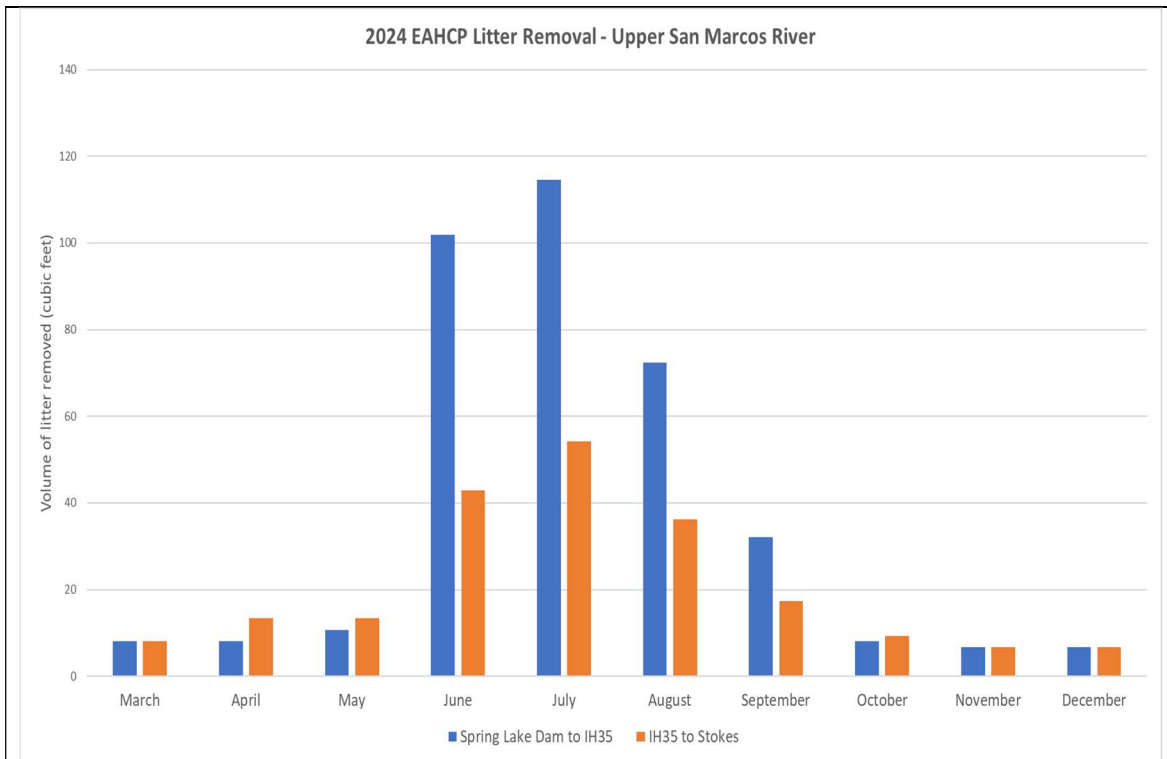


Figure 1. Volume of litter collected, per month, from the San Marcos River in 2024.

Table 2. Volume of litter collected and removed from San Marcos River tributaries in 2024.

2024 Litter Removed (ft ³)			
	Purgatory Creek	Riverside Dr Creek	Total
March	0.00	5.36	5.36
September	5.36	0.00	5.36
November	5.36	10.72	16.08
December	10.72	10.72	21.44
Total	21.44	26.80	48.24

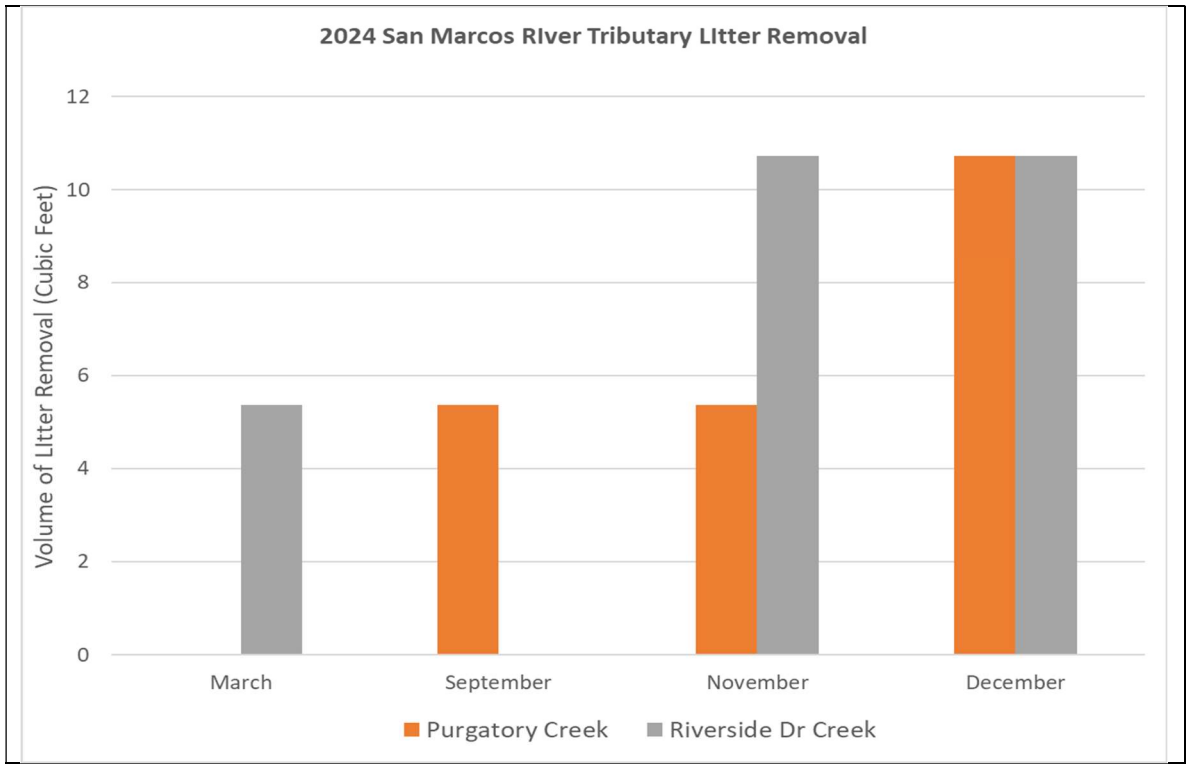


Figure 2. Volume of litter collected, per session, from San Marcos River tributaries in 2024.

In addition to litter removal efforts, the City of San Marcos passed an ordinance in early 2024 prohibiting single-use disposable containers within portions of riverfront parks immediately adjacent to the San Marcos River in an effort to help reduce litter accumulations in the river. Signage installation and educational outreach regarding the ordinance occurred in 2024 to inform river users of the ordinance.



Appendix I4 | **Non-Native Littoral Plant Removal**

**2024 EAHCP Annual Report – Appendix I4:
Non-Native Littoral Vegetation Management
(EAHCP Section 5.3.8)**

In 2024, non-native riparian/ littoral vegetation management efforts consisted of routine monitoring for the presence of non-native vegetation and treatment of non-native, invasive vegetation along the San Marcos River from above Bert Brown Road (upstream of Spring Lake) to just downstream of IH-35.

Targeted non-native species included Brazilian Vervain, Caribbean Lantana (and hybrids), Cat's Claw Vine, Chinaberry, Chinese Elm, Chinese Privet, Chinese Tallow, Eleagnus sp., Elephant Ears, English Ivy, Japanese Honeysuckle, Johnson Grass, Ligustrum, Limnophila, Nandina, Parrot's Feather, Periwinkle, Purple Trailing Lantana, Umbrella Sedge, Vasey Grass, Water Hyacinth, Wisteria and Arundo Cane.

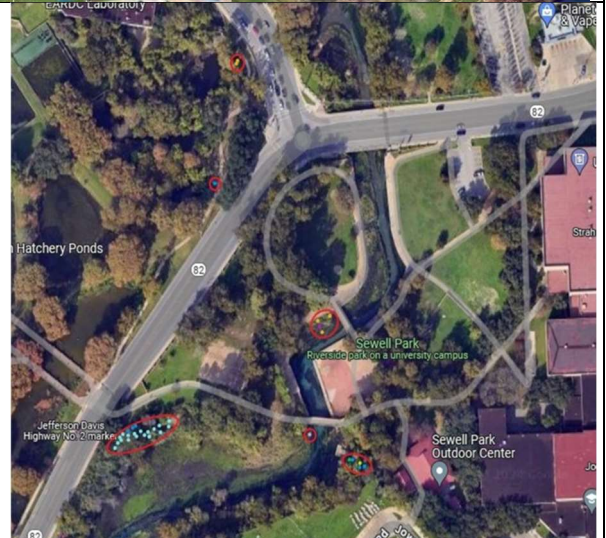
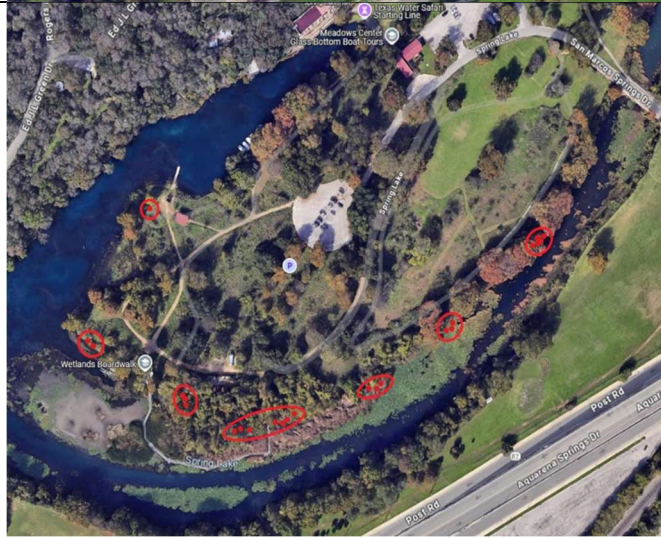
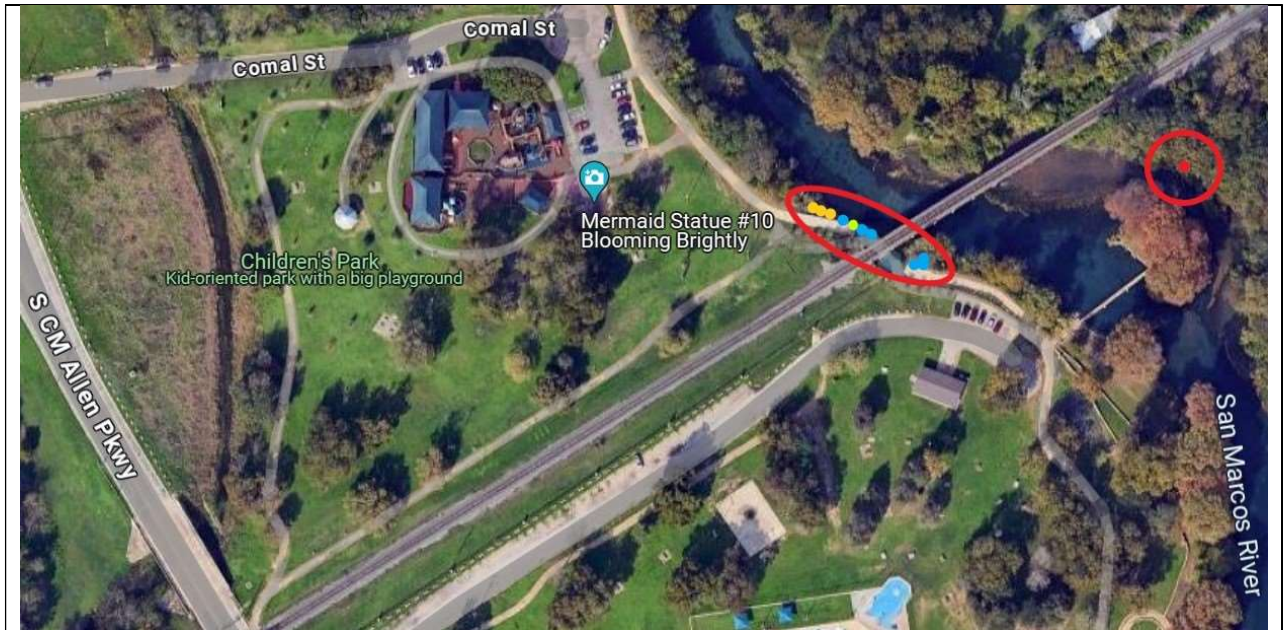
Non-native vegetation management in 2024 included the continued cutting, removal and herbicide-treatment of a dense stand of non-native Arundo Cane (*Arundo donax*) located along the bank of the San Marcos River in the area of Lower Sewell Park (**Figure 1**). Herbicide treatment of Arundo Cane involved only localized application of individually cut Cane stalks with a small, handheld pump sprayer. Broadcast treatment was not conducted to reduce the potential of introduction of residual herbicide into the adjacent river.

Approximately 1/3 of the Arundo stand was cut and treated in 2024 in addition to the 1/3 of the stand that was treated in 2023. Several follow-up maintenance herbicide treatments were performed through this area where re-emergent cane shoots were observed. The remaining portion of the stand will be managed in 2025.



Figure 1. Location in TXSTs Sewell Park where intensive, initial non-native, invasive vegetation management occurred in 2024. The focus in the area was removal of non-native Arundo Cane

Routine maintenance included monthly monitoring of the littoral zone along the San Marcos River from Sink Creek to just downstream of IH-35 and herbicide-treatment of any observed re-emergent non-native vegetation. Locations where intensive maintenance was required included the slough arm of Spring Lake (i.e. lower Sink Creek), Spring Lake Dam “Island” area, Crook Park, Ramon Lucio Park and the IH-35 area (**Figure 2**).



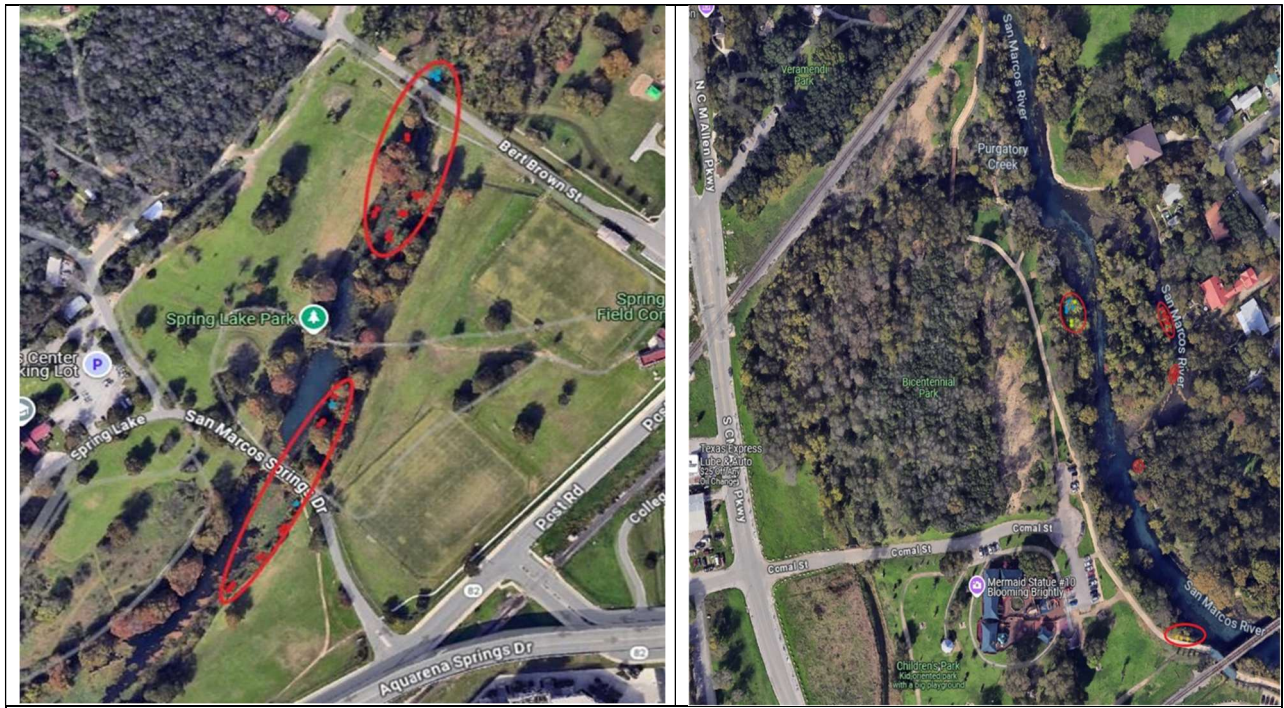


Figure 2. Aerial photos showing locations where non-native, invasive vegetation maintenance occurred in 2024.

Photo Log:



Photo 1. Targeted herbicide-spot treatment of elephant ears in Stokes Park



Photo 2. Cutting, spot herbicide-treatment, hauling and loading of Arundo Cane along the San Marcos River in Lower Sewell Park. The bottom photo shows an area in lower Sewell Park previously infested with dense Arundo Cane.

Herbicide Applications

Chemicals (herbicides) were applied with a 1- or 2-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 other blade to expose more of the cambium layer and then treated with herbicide. Arundo cane treatment involved the cutting of individual canes and application of a small amount of herbicide on the remaining cut/ exposed cane.

The herbicide mixtures applied to non-native vegetation in 2024 included:

Tree and Shrub Mix: **Vastlan** at 5 oz per gallon, mixed with **Aquastar** at 5 oz per gallon. **Aqua King Plus** Surfactant at 1 oz per gallon, and **Turf Mark Blue**, blue dye, at 1 oz per gallon. This mix can be used anywhere as both herbicides can be applied in wetland or upland areas.

Sensitive Mixes: These are basically weaker versions of the Tree and Shrub Mix. **Vastlan** at 1-2.5 oz per gallon, **Aquastar** at 2.5 oz per gallon, **Aqua King Plus** Surfactant at 1 oz per gallon, and **Turf Mark Blue**, blue dye at 1 oz per gallon. This can be applied in wetland or upland areas.

Aquatic Mix: **Clearcast** at 6 oz per gallon, mixed with **Aqua King Plus** Surfactant at 1 oz per gallon, and **Turf Mark Blue**, blue dye, at 1 oz per gallon.



Appendix 15 | **Control of Non-Native Animal Species**

2024 EAHCP Annual Report – Appendix I5:
EAHCP Control of Non-Native Animal Species
(EAHCP Sections 5.3.9 & 5.4.13)

2024 Overview and Summary of Activities -
City of San Marcos/ Texas State University

Summary

In 2024, Texas State University and the City of San Marcos continued to work with a contractor to manage non-native fish and aquatic species in the upper portion of the San Marcos River system to help minimize direct and indirect impacts to threatened and endangered species as well as to the overall aquatic ecosystem. As in previous years, the non-native species targeted for removal included tilapia, suckermouth armored catfish, sailfin catfish and non-native snails.

Removal of these non-native species was conducted primarily by polespearing and spearfishing. Spearfishing was conducted regularly throughout the year in various locations throughout the upper portion of the river system, from Spring Lake Dam to Stokes Park. Gill netting and bowfishing, in addition to spearfishing, was conducted in Spring Lake to primarily target tilapia.

Routine non-native species removal efforts were supported by polespear tournaments in which the public was invited to participate by competing with other participants to remove as many tilapia, suckermouth armored catfish and non-native snails as possible from the San Marcos River over a two-week period. Two polespear tournaments were held in 2024, one in mid-February and one in late Oct-early November.

The City of San Marcos continued to offer the Pet Fish Drop-Off and Adoption program throughout 2024 to offer an outlet for residents and TXST students to properly get rid of unwanted aquarium fish to decrease the potential for the improper release of aquarium fish into the San Marcos River.

Results

A total of 1,741 suckermouth armored catfish, 1 sailfin catfish and 241 tilapia were removed from the San Marcos River system in 2024. This equated to the removal of 1,012 lbs. of biomass from the river system.

All removals were from the upper portion of the river system between Spring Lake and Stokes Park. Most of the tilapia removed were from Spring Lake and catfishes from the river. The February polespear tournament yielded removal of 443 suckermouth armored catfish and 29 tilapia (**Figure 1**). The October/November polespear tournament yielded the removal of 579 suckermouth armored catfish and 56 tilapia (**Figure 2**). All other removals were a result of routine spearfishing efforts. The total number of hours spent on non-native removal efforts in 2024 was approximately 605 hours.

Detailed non-native removal data for 2024 is included in **Attachment 1**.

The Pet Fish Drop Off and Adoption program resulted in the drop-off of 237 unwanted aquarium fish in 2024. Two hundred and five fish were adopted in 2024.



Figure 1. Results of the Spring 2024 Non-Native Polespear Tournament, February 9-24, 2024.



Figure 2. Results of the Winter 2024 Non-Native Polespear Tournament, Oct 25 - Nov 13, 2024.



ATLASENVIRONMENTALTX.COM

Edwards Aquifer Habitat Conservation Plan San Marcos River Non-Native Fish Removal Program 2024 Work Chart

Totals:		605		1741	516.8	1	2.81	241	492.2	1011.8
Dates	Location	Hours	Type of Work	Plecocs Caught	Total Pleco Weight	Sailfins Caught	Total Sailfin Weight	Tilapia Caught	Tilapia Total Weight	Notes
1/5/2024	Spring Lake	8	Spearfishing					17	43.39	
1/11/2024	Spring Lake	8	Spearfishing					7	16.58	
1/15/2024	Spring Lake	8	Spearfishing					4	4.07	
1/1-31/24	Office	40	Tournament Programming							
		64		0	0	0	0	28	64.04	64.04
Dates	Location	Hours	Type of Work	Plecocs Caught	Total Pleco Weight	Sailfins Caught	Total Sailfin Weight	Tilapia Caught	Tilapia Total Weight	Notes
2/9/2024	Cape's Dam to Stokes Park	0.2	Tournament	34	12.6					
2/9/2024	Cape's Dam to Stokes Park	0.2	Tournament	1	0.05					
2/9/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	1	0.88					
2/9/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	46	29.97					
2/10/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	2	1.186			1	0.5	
2/10/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	2	1.19					
2/10/2024	Cape's Dam to Stokes Park	0.2	Tournament	11	2.42					
2/10/2024	Cape's Dam to Stokes Park	0.2	Tournament	12	1.21					
2/10/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	5	2.2					
2/10/2022	Rio Vista Dam to Cape's Dam	0.2	Tournament	54	24.42					
2/11/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	1	0.44	1	2.81			
2/11/2024	Cape's Dam to Stokes Park	0.2	Tournament	3	0.64					
2/11/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	5	5.32					
2/12/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	99	8.41					
2/12/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	5	2.1					
2/12/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament					5	6.7	
2/12/2024	Cape's Dam to Stokes Park	0.2	Tournament	11	3.45					
2/12/2024	Cape's Dam to Stokes Park	0.2	Tournament	6	1.38					
2/12/2024	Cape's Dam to Stokes Park	0.2	Tournament	2	0.44					
2/12/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	4	1.82					
2/13/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	2	0.75					
2/13/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	1	0.56					
2/13/2024	Cape's Dam to Stokes Park	0.2	Tournament	1	0.5					
2/14/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament					5	10.98	
2/14/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	6	2.58					
2/14/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	7	2.52			3	2.2	
2/15/2024	Cape's Dam to Stokes Park	0.2	Tournament	3	1.12					
2/15/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	4	2.21					
2/15/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	12	5.38					
2/15/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	38	15.22			3	2.38	
2/16/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament					10	23.43	
2/17/2024	Cape's Dam to Stokes Park	0.2	Tournament	2	0.43					
2/18/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	1	0.31					
2/18/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	3	3.31			1	1.88	
2/18/2024	Cape's Dam to Stokes Park	0.2	Tournament	11	2.6					
2/18/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament					1	0.25	
2/19/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	1	0.13					
2/20/2024	Cape's Dam to Stokes Park	0.2	Tournament	2	0.82					
2/20/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	5	4.01					
2/22/2024	Cape's Dam to Stokes Park	0.2	Tournament	2	1.07					
2/22/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	28	1.16					
2/22/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	7	0.9					
2/23/2024	Cape's Dam to Stokes Park	0.2	Tournament	1	0.31					
2/23/2024	Cape's Dam to Stokes Park	0.2	Tournament	1	0.5					
2/1-29/24	Office	97	Tournament Programming							
2/5/2024	Spring Lake	5	Spearfishing					10	30.11	
2/7/2024	Rio Vista Falls	4.2	Spearfishing	14	11.8					
2/13/2024	Spring Lake	5	Spearfishing					7	16.99	
2/19/2024	Spring Lake	4	Spearfishing					2	5.86	
		124		456	158.316	1	2.81	48	101.28	262.406
Dates	Location	Hours	Type of Work	Plecocs Caught	Total Pleco Weight	Sailfins Caught	Total Sailfin Weight	Tilapia Caught	Tilapia Total Weight	Notes
3/1-31/24	Office	5	Tournament Programming							
3/5/2024	Spring Lake Dam to IH35	5	Spearfishing	8	4.76					
3/11/2024	Spring Lake	4	Spearfishing							
3/28/2024	Spring Lake	2	Bowfishing/Scouting					0		
3/29/2024	Spring Lake Dam to Rio Vista Dam	14	Spearfishing	83	40.14					
		30		91	44.9	0	0	0	0	44.9
Dates	Location	Hours	Type of Work	Plecocs Caught	Total Pleco Weight	Sailfins Caught	Total Sailfin Weight	Tilapia Caught	Tilapia Total Weight	Notes
4/15/2024	Spring Lake	16	Gill Netting					43	132.09	
4/16/2024	Spring Lake Dam to IH35	2	Spearfishing	5	1.96					
4/23/2024	IH35 to Stokes	1	Spearfishing	2	0.42					
4/25/2024	Spring Lake	16	Gill Netting					31	88.92	
		35		7	2.38	0	0	74	221.01	223.39
Dates	Location	Hours	Type of Work	Plecocs Caught	Total Pleco Weight	Sailfins Caught	Total Sailfin Weight	Tilapia Caught	Tilapia Total Weight	Notes
5/8/2024	Spring Lake	15	Gill Netting					17	47.22	
5/21/2024	Spring Lake Dam to IH35	4	Spearfishing	11	4.49			1	0.44	
5/28/2024	IH35 to Stokes	4	Spearfishing	20	7.43					
		23		31	11.92	0	0	18	47.66	59.58
Dates	Location	Hours	Type of Work	Plecocs Caught	Total Pleco Weight	Sailfins Caught	Total Sailfin Weight	Tilapia Caught	Tilapia Total Weight	Notes
6/3/2024	Spring Lake Dam to IH35	4	Spearfishing	15	6.08					
6/4/2024	IH35 to Stokes	5	Spearfishing	34	9.67					
6/6/2024	Spring Lake Dam to IH35	6	Spearfishing	59	23.87			1	0.31	
6/11/2024	IH35 to Stokes	4	Spearfishing	11	2.93					
6/18/2024	IH35 to Stokes	4	Spearfishing	23	5.48					
6/20/2024	Spring Lake Dam to IH35	3	Spearfishing	4	1.29					
6/24/2024	Spring Lake Dam to IH35	3	Spearfishing	3	0.96					
6/25/2024	IH35 to Stokes	4	Spearfishing	18	6.13					

6/28/2024	Spring Lake Dam to IH35	4	Spearfishing	15	3.81						
		37		182	60.22			1	0.31	60.53	
Dates	Location	Hours	Type of Work	Plecocs Caught	Total Pleco Weight	Sailfins Caught	Total Sailfin Weight	Tilapia Caught	Tilapia Total Weight	Notes	
7/1/2024	Spring Lake Dam to IH35	2	Spearfishing	9	1.94						
7/2/2024	IH35 to Stokes	4	Spearfishing	19	5.19						
7/8/2024	Spring Lake Dam to IH35	2	Spearfishing	4	1.67						
7/9/2024	IH35 to Stokes	3	Spearfishing	9	3.42						
7/11/2024	Spring Lake Dam to IH35	3	Spearfishing	12	4.84						
7/15/2024	Spring Lake Dam to IH35	4	Spearfishing	29	9.99						
7/16/2024	IH35 to Stokes	6	Spearfishing	40	9.26						
7/18/2024	Spring Lake Dam to IH35	4	Spearfishing	6	2.21			3	2.96		
7/22/2024	Spring Lake Dam to IH35	2	Spearfishing	1	0.35			1	1.67		
7/23/2024	IH35 to Stokes	2	Spearfishing	8	2.56						
7/25/2024	Spring Lake Dam to IH35	4	Spearfishing	3	1.77			5	3.65		
7/29/2024	Spring Lake Dam to IH35	2	Spearfishing	4	0.62						
7/30/2024	IH35 to Stokes	4	Spearfishing	11	4.05						
		42		155	47.87	0	0	9	8.28	56.15	
Dates	Location	Hours	Type of Work	Plecocs Caught	Total Pleco Weight	Sailfins Caught	Total Sailfin Weight	Tilapia Caught	Tilapia Total Weight	Notes	
8/1/2024	Spring Lake Dam to IH35	4	Spearfishing					5	5.27		
8/5/2024	IH35 to Stokes	5	Spearfishing	14	3.03						
8/6/2024	Spring Lake Dam to IH35	10	Spearfishing	78	22.09						
8/8/2024	Spring Lake Dam to IH35	3	Spearfishing					2	3.55		
8/12/2024	Spring Lake Dam to IH35	1	Spearfishing	1	0.25						
8/13/2024	IH35 to Stokes	3	Spearfishing	5	1.18						
8/15/2024	Spring Lake Dam to IH35	2	Spearfishing	2	0.21						
8/19/2024	Spring Lake Dam to IH35	2	Spearfishing	3	0.24						
8/20/2024	IH35 to Stokes	5	Spearfishing	14	2.07						
8/28/2024	Spring Lake Dam to IH35	3	Spearfishing	2	0.54						
8/29/2024	IH35 to Stokes	2	Spearfishing	6	1.66						
		40		125	31.27	0	0	7	8.82	40.09	
Dates	Location	Hours	Type of Work	Plecocs Caught	Total Pleco Weight	Sailfins Caught	Total Sailfin Weight	Tilapia Caught	Tilapia Total Weight	Notes	
9/2/2024	Spring Lake Dam to IH35	1	Spearfishing	1	0.61						
9/3/2024	Spring Lake Dam to IH36	1	Spearfishing	1	0.08						
9/9/2024	Spring Lake Dam to IH37	5	Spearfishing	9	6.31						
9/10/2024	Spring Lake Dam to IH38	6	Spearfishing	15	4.76						
9/12/2024	IH35 to Stokes	2	Spearfishing	2	0.15						
9/1-30/24	Office	45	Tournament Programming								
		60		28	11.91	0	0	0	0	11.91	
Dates	Location	Hours	Type of Work	Plecocs Caught	Total Pleco Weight	Sailfins Caught	Total Sailfin Weight	Tilapia Caught	Tilapia Total Weight	Notes	
10/21/2024	Spring Lake Dam to Rio Vista Dam	4	Spearfishing	10	3.49						
10/22/2024	Rio Vista Dam to Cape's Dam	6	Spearfishing	77	19.94						
10/25/2024	Cape's Dam to Stokes Park	0.3	Tournament	38	2.16						
10/25/2024	Cape's Dam to Stokes Park	0.2	Tournament	7	0.21						
10/25/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	3	2.6			5	3.26		
10/25/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	2	2.31			3	2.62		
10/26/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	1	0.88						
10/26/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	9	0.54						
10/26/2024	Cape's Dam to Stokes Park	0.3	Tournament	70	3.96						
10/26/2024	Cape's Dam to Stokes Park	0.3	Tournament	29	0.85						
10/27/2024	Cape's Dam to Stokes Park	0.2	Tournament	2	0.19			1	0.31		
10/27/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	6	1.69						
10/27/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	5	0.99						
10/27/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	42	15.77						
10/28/2024	Spring Lake Dam to Rio Vista Dam	0.3	Tournament	58	14.62			7	1.37		
10/28/2024	Cape's Dam to Stokes Park	0.2	Tournament	1	0.18						
10/29/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	1	0.64						
10/29/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	1	0.55						
10/29/2024	Cape's Dam to Stokes Park	0.2	Tournament	2	0.56						
10/29/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament					1	2.56		
10/29/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament					5	2.87		
10/30/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament					10	9.06		
10/30/2024	Cape's Dam to Stokes Park	0.2	Tournament	37	0.71						
10/30/2024	Cape's Dam to Stokes Park	0.2	Tournament	58	3.67						
10/30/2024	Spring Lake Dam to Rio Vista Dam	0.2	Tournament	7	1.8			4	0.99		
10/1-31/24	Tournament Programming	65	Tournament								
		80		466	78.31	0	0	36	23.04	101.35	
Dates	Location	Hours	Type of Work	Plecocs Caught	Total Pleco Weight	Sailfins Caught	Total Sailfin Weight	Tilapia Caught	Tilapia Total Weight	Notes	
11/1/2024	Cape's Dam to Stokes Park	0.3	Tournament	53	7.49						
11/1/2024	Cape's Dam to Stokes Park	0.2	Tournament	7	0.77						
11/1/2024	Cape's Dam to Stokes Park	0.2	Tournament	12	2.19						
11/1/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	2	0.12						
11/1/2024	Spring Lake Dam to IH35	0.2	Tournament	2	2.26			3	4.16		
11/2/2024	Spring Lake Dam to IH35	0.2	Tournament	1	0.007						
11/2/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	7	3.91						
11/3/2024	Spring Lake Dam to IH35	0.2	Tournament	6	2.81			2	0.63		
11/4/2024	Cape's Dam to Stokes Park	0.2	Tournament	1	0.27						
11/4/2024	Spring Lake Dam to IH35	0.2	Tournament	1	0.25						
11/4/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	3	0.51						
11/4/2024	Cape's Dam to Stokes Park	0.2	Tournament	1	0.18						
11/4/2024	Cape's Dam to Stokes Park	0.2	Tournament	3	1						
11/4/2024	Spring Lake Dam to IH35	0.2	Tournament	10	3.82			4	2.89		
11/5/2024	Spring Lake Dam to IH35	0.2	Tournament					2	1.06		
11/6/2024	Rio Vista Dam to Cape's Dam	0.2	Tournament	1	0.31						
11/7/2024	Spring Lake Dam to IH35	0.2	Tournament					7	6.49		
11/7/2024	Rio Vista Dam to Cape's Dam	0.3	Tournament	44	23.19						
11/10/2024	Spring Lake Dam to IH35	0.2	Tournament	1	0.94			1	1.69		
11/11/2024	Spring Lake Dam to IH35	0.2	Tournament					1	0.88		
11/12/2024	Rio Vista Dam to Cape's Dam	0.3	Tournament	45	19.64						
11/1-30/24	Tournament Programming	65.5	Tournament								
		70		200	69.667	0	0	20	17.8	87.467	



Appendix 16 | **Native Riparian Habitat Restoration**

2024 EAHCP Annual Report – Appendix I6:

EAHCP Native Riparian Restoration (EAHCP Sections 5.7.1)

2024 Overview and Summary of Activities

City of San Marcos/ Texas State University

Summary

In 2024, riparian restoration efforts were focused on the continued removal and management of non-native, invasive vegetation within the riparian zone of the upper San Marcos River. Target non-native species included, but were not limited to, Privet (*Ligustrum* sp), Chinese Tallow (*Triadica sebifera*), Chinaberry (*Melia azedarach*) and Paper Mulberry (*Broussonetia papyrifera*).

Work efforts in 2024 included the initial removal of dense, non-native vegetation in focused areas as well as treatment of re-emergent non-native vegetation within the riparian zone along the river corridor from Spring Lake to IH-35. The primary focus area in 2024 for initial non-native vegetation removal was the continued work within a City of San Marcos-owned property located along the river across from the Cypress Island of Rio Vista Park (**Figure 1**). Work at this location included continued cutting of large non-native trees (primarily ligustrum and Chinese Tallow) and application of herbicide to help prevent re-growth (**Figure 2**). Slash material from cut non-native trees was used to form sediment control berms in the area where vegetation was removed (**Figure 2**). Maintenance of the riparian zone to remove re-emergent non-native vegetation occurred throughout 2024, generally from Spring Lake Dam to Stokes Park.

Native vegetation was planted within the riparian area along the San Marcos River in 2024, primarily through volunteers planting workdays. Plantings occurred primarily along the San Marcos River within the Riverside Dr property work area and within Crook and Ramon Lucio Parks (**Figure 3**).

Substantial riparian restoration efforts also occurred in 2024 through the US Army Corps of Engineers (USACE) San Marcos River Section 206 Aquatic Ecosystem Restoration Project. Through this project, non-native species including Elephant Ears, Ligustrum, Chinaberry and Chinese Tallow were removed from COSM and State of Texas properties located along the San Marcos River, primarily downstream of IH-35. The project also included planting of native vegetation in areas where non-native vegetation was removed. Work areas included Bicentennial Park, Ramon Lucio Park, Crook Park, Thompson's Island, Stokes Park, TPWD A.E. Wood State Fish Hatchery, and the COSM Wastewater Treatment Plant (**Figure 4**). The focus of the work conducted in 2024 was on treatment of non-native vegetation (primarily Elephant Ears) and native plantings along the San Marcos River downstream of Capes Dam.

Figures

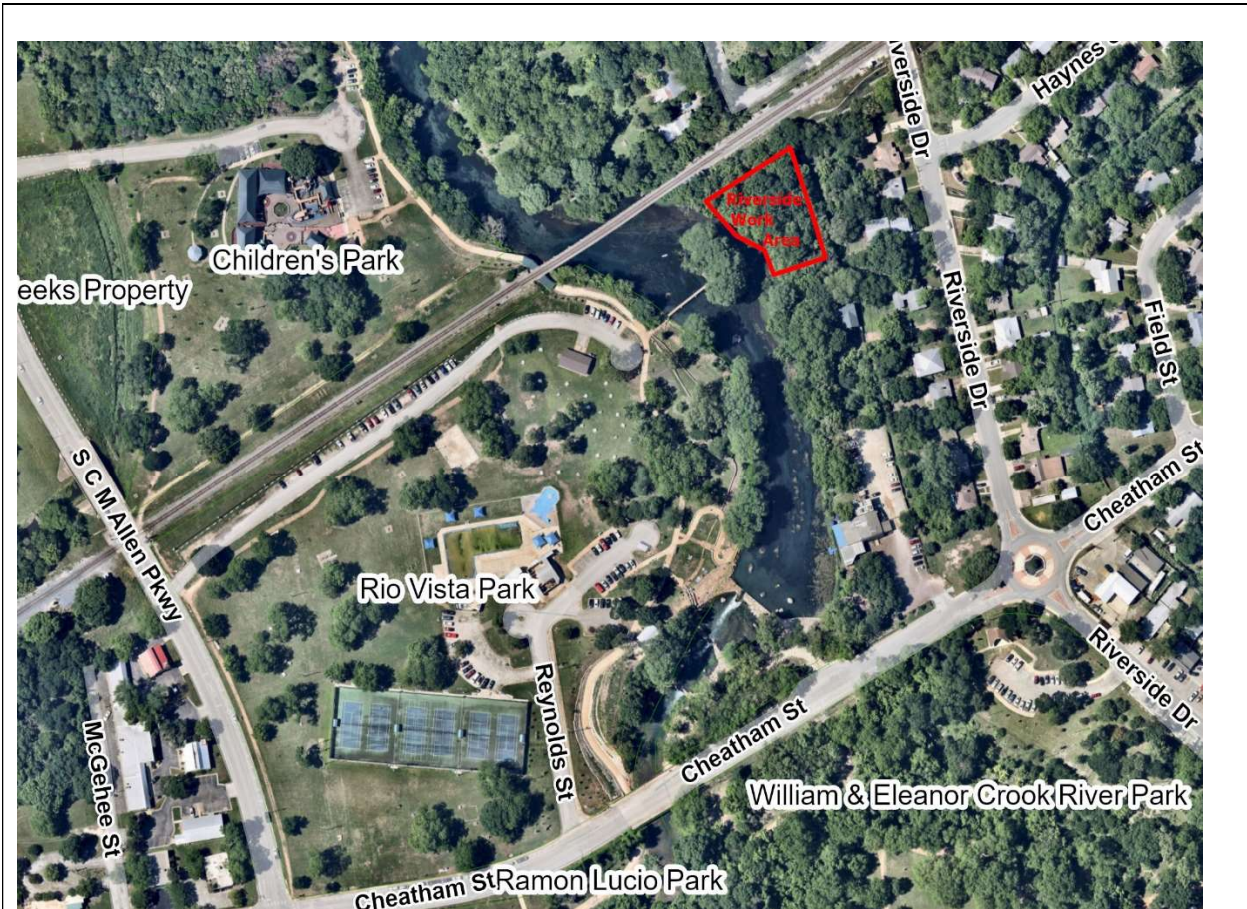


Figure 1. Location of intensive, non-native vegetation removal work area where work occurred in 2024 along the San Marcos River across the river from the “Cypress Island” of Rio Vista Park.





Figure 2. Photos of riparian restoration activity along the San Marcos River at the “Riverside” property across from the Cypress Island of Rio Vista Park. Photos depict cut and treated ligustrum trees, formation of sediment control berms and native planting.



Figure 3. Native plantings and installed fencing to serve as a riparian protection zone, Crook Park/ Wildlife Annex.

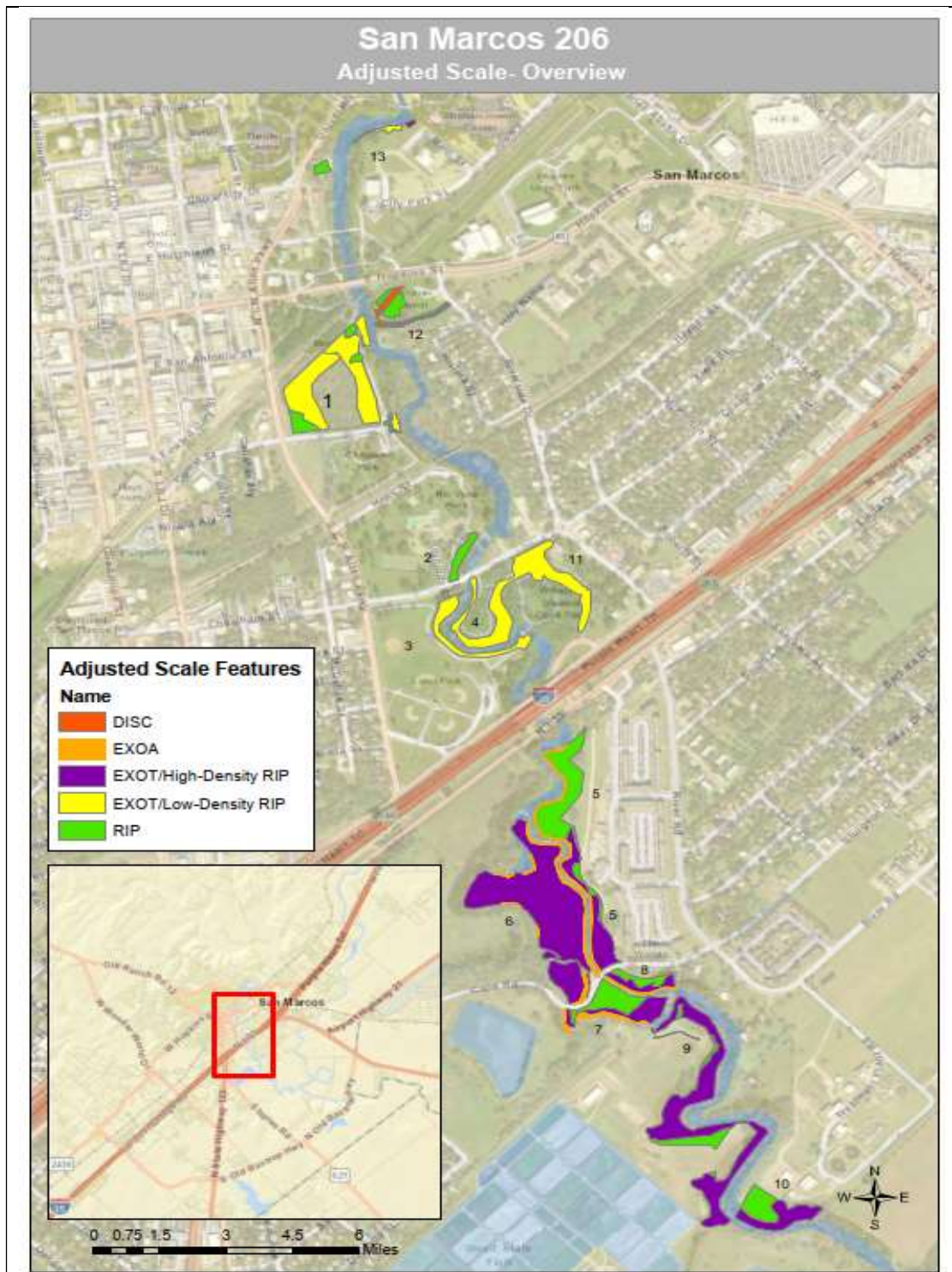


Figure 4. USACE San Marcos River Aquatic Ecosystem Restoration Project Work Areas. (EXOA represents areas where Elephant Ear treatment have or will occur, EXOT/ High-Density RIP represents areas where significant non-native removal and plantings has or will occur. EXOT/ Low-Density RIP represents areas where light, non-native removal and plantings has or will occur. RIP represents areas where only native plantings has or will occur).



Appendix 17 | **Household Hazardous Waste**

2024 EAHCP Annual Report – Appendix I7:

City of San Marcos Household Hazardous Waste Management (EAHCP Section 5.7.5)

Summary of 2024 Activities

The City of San Marcos Household Hazardous Waste (HHW) collection program was made available, free of charge, for all Hays County residents throughout 2024. Through this program, residents were allowed to drop off household chemicals and paint that are considered hazardous to the environment. The HHW program also includes the implementation of a reuse program for items that are in good condition and able to be reused by interested visitors. Labor needed to operate the facility was contracted through Green Guy Recycling. Throughout 2024, the HHW collection center was open to the public every Friday from 12:00pm to 3:30pm and Saturday from 8am to 12pm. The HHW collection center is located at 630 E. Hopkins, San Marcos, TX 78666.

Most 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 protecting water quality and minimizing the potential for pollutant releases.

HHW Drop-Off Center Participation

The primary function of the HHW program is the drop-off center. Residents are able to drive into the unloading area, where they are met by an HHW worker. The participants remain in their vehicle as HHW center workers unload 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 2024 was 261 per month (totaling 3,140 participants in 2024) and the total amount of HHW dropped-off at the center was 221,561 lbs.

The HHW facility is open to all residents of Hays County. Most 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 protecting 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 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.

This program received many compliments from visitors. 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. Total reuse participation was at approximately 4,000 users.

The amount of household hazardous waste diverted from the waste stream and distributed by the Reuse Program totaled 9,914 pounds.

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 collected and disposed of approximately 221,561 pounds of HHW in 2024. Without this program, there would likely have been an increased probability of the improper disposal of HHW in the municipal waste stream or illegally dumped. Drop-off disposal weights for 2024 averaged 18,463 per month.



Appendix 18 | **Spring Lake Activities**

Approved Spring Lake Access Activities 2024

Name	Department /Agency	Duration	Description	Impact +/-	
Alvear, Dominique	USFWS	3/1/2024	1/31/2022	Dip netting to collect Fountain Darters for refugia	Moderate
Cochran, Jerry	Texas Water Safari	6/8/2024	6/8/2024	1st annual canoe race from San Marcos to Seadrift	Moderate
Daw, Adam	U.S. Fish and Wildlife Service	6/10/2024	6/28/2024	Drift netting to collect Texas Blind Salamanders and San Marcos Salamander for Refugia Program	Moderate
Douglas, Audrey	Texas A&M University	3/21/2024	5/1/2024	Collecting water samples from mouth of spring	Minimal
Jensen, Jennifer	TXST Geography dept.	11/10/2023	11/2/2023	Bathymetric Lidar Survey of Spring Lake	Minimal
Dussler, Rob	TXST Meadows Center	6/2/2024	6/2/2024	Spring Lake Staff Appreciation Picnic	Minimal
Forstner, Michael	TXST - Biology Dept.	6/1/2022	5/11/2030	Hoop net and basking trap sampling of turtles	Moderate
Gay, Danielle	TXST - Biology Dept.	4/8/2024	4/10/2023	Turtle trapping with small hoop nets for BIO4435. data recorded and turtles released on site.	Moderate
Garoutte, Collin	ERG Meadows/SMRF	1/1/2024	12/31/2024	Floating invasive vegetation removal	Minimal
Gutierrez, Felipe	TXST - Ingram School of Engineering	5/29/202	6/26/2024	Wattler sample collection for classroom instruvtion	Minimal
Hart, Haskell	Independent Research	12/32/2023	8/1/2023	Water sampling to test eDNA sequencing	Minimal
Kraft, Michelle	Dive Shop San Marcos	9/1/2024	9/1/2024	Underwater wedding in Deep Hole	Minimal
Larossi, Christina	SonTek	6/5/2024	6/4/2024	Workshop instructing on use of Dopper instrumentation to measure velocity and flow of water	Minimal
Lemke, David	TXST - Biology Dept.	8/31/2022	8/31/2023	Examination and cotelection of plant specimens for class use	Minimal
Mccorkle, Amanda	TXST - Theater & Dance	9/18/2024	9/20/2024	Preformative art conducted in canoe launched at Sycamore Point	Moderate
Luevano, Gizelle	EAA	1/1/2024	12/31/2024	Annual/routine Monitoring of main spring office at Deep Hole	Minimal
Nevarro, Aspen	San Marcos River Foundation	5/21/2022	7/6/2030	Floating invasive vegetation removal	Moderate
Nobels, David	The University of Texas at Austin	3/1/2024	5/31/2024	Collection of algae samples for taxonomy purposes	minimal
Null, Mark	In-Situ	2/27/2024	2/26/2024	Seminar / demonstration of water monitoring instrumentation	Minimal
Oborny, Ed	BioWest	7/1/2012	Still Active	EAHCP biological monitoring, COMPREHENSIVE AND CRITICAL PERIOD MONITORING PROGRAM;	minimal
O'Conner, Michael	University of Arkansas	6/3/2024	6/7/2024	sweep nets to capture adult damselflies of the species Enallagma signatum and Ischnura posita	minimal
Prentice, Stephen	Texas State University	7/24/2023	9/30/2023	Cognitive behavior research of SCUBA divers	Minimal
Gibson, Randy	USFWS SM Aquatic Resource Center	10/31/2023	7/31/2024	Dip netting in sediment for new species of annelid worms	Moderate
Shannon, Steve	TXST - Geography Dept.	9/23/2023	10/27/2023	US Compost Council Certification Class	Minimal
Shartau, Ryan	University of Texas at Tyler	11/26/2023	12/2/2023	Dip net collection of Mollies to conduct experimnts at UT Tyler	Moderate
Smith, Heather	TXST - Anthropology Dept.	2/6/2024	3/1/2024	ANTH 3361 - Field Method : Mock excavations to practice archaeological excavation techniques	Minimal
Smith-Kollaus, Kristy	EAA	9/16/2023	9/16/2024	iment sampling as part of the annual water quality component of the Edwards Aquifer Habitat Conservation Plan; Snorkel	minimal
Spencer, ryan	TXST - Biology Dept.	5/31/2024	8/29/2022	Interviews conducted of MCWE staff, focus groups, tour observations for PhD dissertation	Minimal
Wells, Mona	MCWE	1/10/2023	1/1/2030	Installation of ecological observatory	Moderate
Whited, Brooke	Independent Research	10/20/2023	10/31/2023	Collecting water samples to test dissolved oxygen levels for highschool class project	Minimal
Woody, Richard	Skies of Southwest Photography	4/21/2024	4/21/2024	Access to hillside to take photos	Minimal
Yurri, Matt	TXST - Marketing & Communication	8/18/2023	8/18/2023	Filming for TXST holiday video	Minimal

EAHCP 2024 Annual Report

Appendix 8 - Spring Lake Dive Access Data

2024	TXST Student OW Dives	OW Checkout Dives	Volunteer Dives	Research Dives	External Dives	New Volunteers	Veteran Groups	Monthly Totals
January	0	390	162	4	0	16	0	572
February	12	570	211	11	0	16	2	822
March	7	713	213	4	0	12	0	949
April	90	465	169	11	0	22	10	767
May	0	483	148	5	0	42	0	678
June	0	530	189	3	0	25	0	747
July	8	464	195	10	0	22	0	699
August	0	478	200	10	0	14	10	712
September	4	418	213	0	0	11	0	646
October	30	312	174	0	0	27	0	543
November	90	387	213	0	0	16	12	718
December	0	213	87	0	0	10	0	310
YTD	241	5423	2174	58	0	233	34	8163