

Work Plan Development Process

The Work Plans were developed through a collaborative process with input from resource agencies, knowledgeable scientists, and interested parties. Dr. Thomas Hardy and Melani Howard began to develop early drafts of the work plans in late fall of 2011. This included a site visit and discussions with staff at the USFWS National Fish Hatchery and Technology Center regarding planned Texas wild rice and native aquatic plant production capabilities. Dr. Hardy and Ms. Howard also arranged for a meeting on January 20th 2011 with personnel from EAA and Texas State University to discuss planned water quality monitoring activities identified in the HCP and included the following:

- Dr. Thomas Hardy – Texas State University
- Melani Howard – City of San Marcos
- Dr. Weston Nowlin – Texas State University
- Dr. Benjamin Schwartz – Texas State University
- Geary Schindel – Edwards Aquifer Authority
- Jon Cradit – Edwards Aquifer Authority

This meeting was intended to provide input on technical approaches, spatial locations, timing, frequency, constituents, and related technical issues to guide work plan development and monitoring anticipated monitoring as required in the HCP.

A technical coordination meeting was then held on January 4th. 2012 involving the following participants:

- Thomas Hardy – Texas State University
- Melani Howard – City of San Marcos
- Robert Doyle – Baylor University
- Ed Oborny - BioWest
- Jackie Poole – Texas Parks and Wildlife Department
- Dianne Wassenich – San Marcos River Foundation
- Ken Ostrand - National Fish Hatchery & Technology Center
- Kevin Connally – U.S. Fish and Wildlife Service
- Allison Land – Texas A&M Graduate Student

The purpose of the coordination meeting was to outline the direction Dr. Hardy and Ms. Howard had taken on the development of the draft work plans, solicit input on specific methods and level of effort required for work elements and feasibility of alternative approaches. Based on this meeting, the preliminary draft work plans were revised to reflect input received.

The approach taken and status of the preliminary draft work plans were shared with the HCP Implementing Committee on January 30th 2012. Preliminary draft work plan development continued and a second technical meeting was held on February 13th 2012 involving the following participants:

- Thomas Hardy – Texas State University

- Melani Howard – City of San Marcos
- Nathan Pence – City of New Braunfels
- Tom Brandt – USFWS National Fish Hatchery and Technology Center
- Steve Bereyso – San Antonio Water Systems
- Ken Ostrand - USFWS National Fish Hatchery and Technology Center
- Ed Oborny - BioWest
- David Mahula – San Antonio Water Systems

This meeting reviewed the existing work plan elements and technical discussions on assumptions and budgets, level of effort, discussion on technical approaches and integration of work plan elements between Texas State University, City of San Marcos, City of New Braunfels, and the Edwards Aquifer Authority.

Dr. Hardy also arranged for a site reconnaissance in Spring Lake with Ms. Jackie Poole of the TPWD to assess site specific characteristics for potential Texas wild rice restoration efforts in Spring Lake to guide work plan development on February 12 2012.

Additional technical coordination has continued through one-on-one contact with various agency personnel and scientist during further work plan development.

The Draft Work Plans provided below have been shared with resource agencies, knowledgeable scientists, and interested parties in anticipation of the scheduled technical meeting on March 20th 2012. The intent of that meeting is a critical review of work plan assumptions, methods, and level of efforts. Based on these inputs, the Draft Work Plans will be revised and submitted to the Implementing Committee by April 1st 2012 for review and discussion at their April 15th 2012 meeting.

5.3.1/5.4.1 Texas Wild-Rice Enhancement and Restoration

Texas State University will partner with the City of San Marcos to undertake a program of Texas wild-rice (TWR) enhancement and restoration in Spring Lake and the San Marcos River.

Long-term Objective: To restore at least 8000 m² of TWR (in addition to the existing 4000 m²) and successfully implement the State Scientific Area (SSA) protection program for existing and restored areas of TWR during flows of 120 cfs and below (see HCP Section 5.6).

Assumptions: Existing areal coverage of TWR is approximately 4000 m². The average long term biological goal for TWR (HCP Table 4-10) is 12,000 m². To achieve this goal would require an 8000 m² increase over the first phase of the HCP period with an annual goal of approximately 1100 m² of TWR restoration each year.

Enhancement and restoration of TWR focuses on selective gardening of non-native vegetation in mixed stands of TWR and removal of non-native vegetation in areas adjacent to existing TWR stands. The work plan will also include selective TWR planting in areas where non-native vegetation and sediment is removed as discussed in HCP measures 5.3.6/5.4.4 (Sediment removal) and 5.3.8/5.4.3/5.4.12 (Control of non-native plant species).

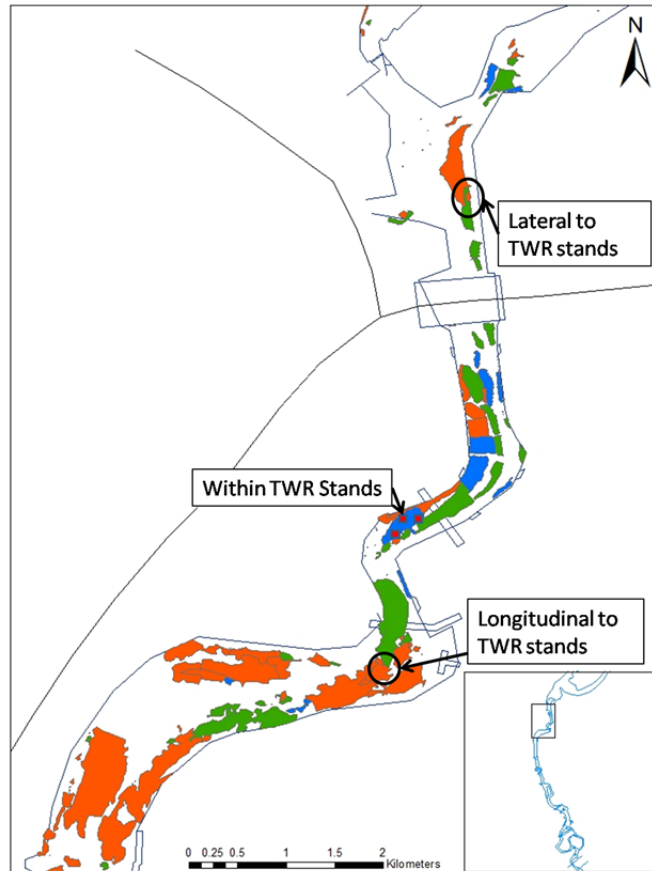
Hardy et al. (2011a) estimated that the removal of *Hydrilla verticillata* and *Hygrophila polysperma* within TWR stands and in a 2-meter buffer around those stands could potentially provide over 1,000 m² of additional optimum TWR habitat area over the entire simulated flow range (45 to 80 cfs) within the San Marcos River downstream of Spring Lake. Proactive planting and conservative non-native vegetation removal has a high potential for the expansion of existing TWR stands that would remain hydraulically suitable at these modeled flow levels (Hardy et al. 2011a). In addition, TWR areal coverage within Spring Lake is targeted for 1500 m².

Target 2013/Performance Measure: Successful expansion of TWR stands through selective gardening within and around existing stands and plantings where non-native vegetation and silt is removed. These strategies will target a goal of at least 1100 m².

Methods: Model results from Hardy et al. (2011a) will be used to identify restoration/enhancement areas for TWR that have a high probability of success (*i.e.*, optimal habitat). TWR stands were identified as mono (*i.e.*, 100% TWR) or mixed (*i.e.*, TWR stands mixed with *Hydrilla* or *Hygrophila*). *Hydrilla* and *Hygrophila* were selected due to their high relative abundance in the San Marcos River. In mixed stand areas, the non-natives will be removed and the original TWR stand monitored for expansion. Similarly, for TWR stands occupying optimal areas with adjacent non-native vegetation, the non-native plants will be removed and the TWR monitored for expansion. Finally, in optimal areas for TWR that are unoccupied by TWR, any non-native vegetation that is present will be removed and TWR planted and monitored to assess the success of transplants.

The specific areas chosen for field trials will first consider only optimal habitat areas that remain suitable over the full range of discharges between the long-term average and lower flows as show in model

results from Hardy et al (2011a). In 2013, TWR stands will be selected upstream of IH-35 (See Figure below). TWR stands will be selected based on predicted TWR optimal conditions and hydraulic habitat homogeneity within and around the stand, a practical working environment (i.e. manageable current velocity), and suitability over the critical flow ranges.



When gardening or removal of adjacent non-native vegetation is undertaken, the non-native vegetation will be fanned to displace fountain darters prior to uprooting the vegetation. The non-native aquatic plants will be shaken, fountain darters (or other native species) salvaged and returned to the river, and the non-native vegetation bagged for disposal at the city's composting facility.

Monitoring: Replanted areas will be monitored monthly to evaluate success rate. The treatment areas will be weeded as needed.

Allocated funds for 2013: \$ 250,000

Estimated Budget: \$226,550

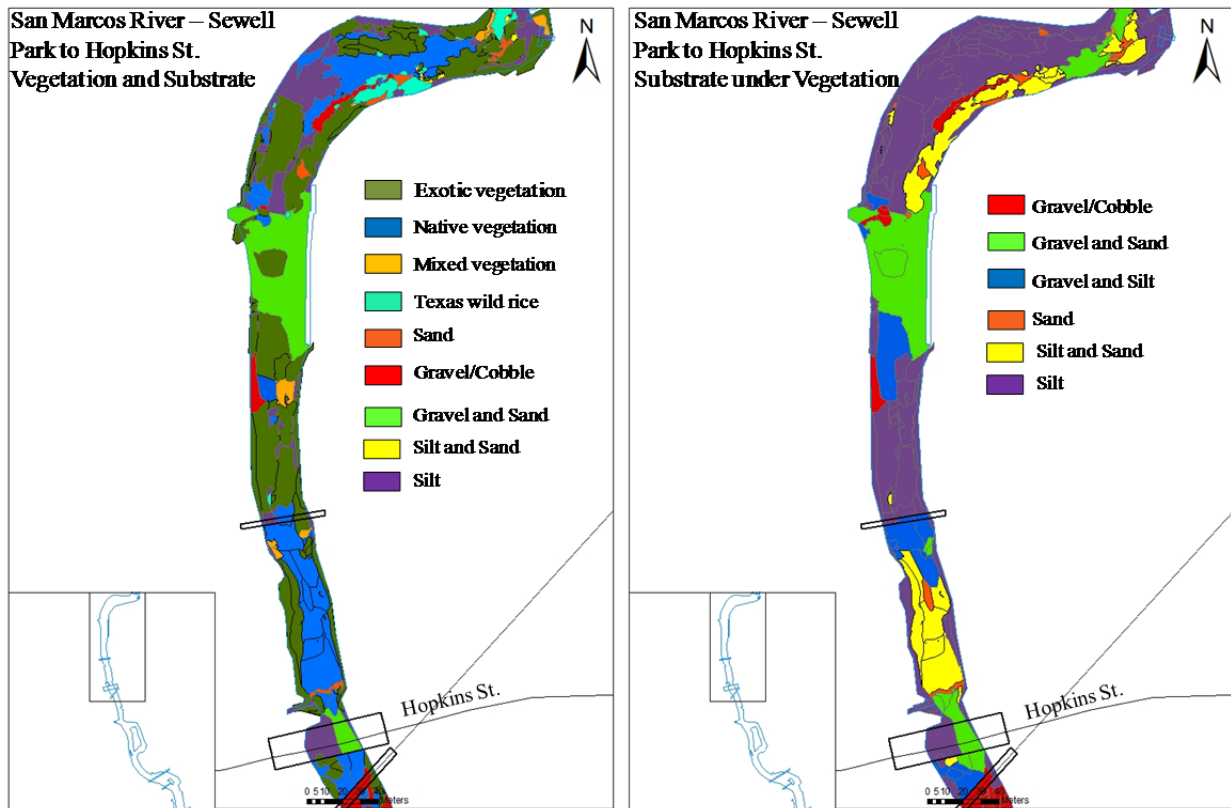
5.3.6/5.4.4 Sediment Removal

The City of San Marcos will remove sediment from the river bottom at various locations from City Park to IH-35. Texas State University will remove sediment from key areas of Texas wild-rice habitat in Spring Lake and from Spring Lake Dam to City Park.

Long-term Objective: Initial removal of targeted fine sediments and then maintenance removal of accumulations of sediment detrimental to TWR and native vegetation restoration efforts as necessary.

Assumptions: FY 2013 sediment removal efforts and budget target a practical restoration effort that is integrated with other Work Plan efforts and minimizes potential negative impacts on the aquatic ecosystem and Covered Species habitats.

Hardy et al. (2011b) estimated 21,500 m² (12,750 m³) of fine sediment in the San Marcos River between City Park and Rio Vista Falls. As illustrated in figure below, there is a high correlation between the distribution of fine sediment and non-native vegetation. Therefore, areas with fine sediment accumulation and associated non-native vegetation will be targeted for removal. In addition, approximately 150 m² of fine sediment and Texas wild rice restoration is targeted for removal in Spring Lake based on a site reconnaissance by TPWD and RSI.



Target 2013/Performance Measure: Successful removal of approximately 3000 m² (and associate volumes) of fine silt and non-native vegetation.

Methods: Removal of non-native vegetation prior to sediment removal is covered under Work Plan elements 5.3.8, 5.4.3, and 5.4.12. As specified in the HCP, hydrosuction will be used to remove accumulations of sediment. Divers will be trained on equipment operations, diving safety protocols, and recognition of all stages of listed species from larval to adult. Sediment will be vacuumed using a hose that has a screen to prevent suctioning biota greater than 0.25 inches in diameter. Divers will fin the area to be suctioned to encourage fountain darters and other biota to move out of the area. The nozzle of the vacuum will be kept down in the soil and not allowed to swing through the water column during the operation. In addition, placement of stakes around the area to be suctioned will keep divers away from stands of Texas wild-rice. One worker will be stationed by the air compressor and sediment bag to ensure diver safety, monitor operations, and answer public questions. A second individual will be stationed upstream to warn river users of ongoing operations. Based on discussions with the RSI Diving Control Officer, it is assumed that sediment removal will be accomplished through a maximum of three 2-hour dive cycles each day with a one hour surface interval between dives. Sediment removal is targeted between October and April outside the peak recreation period. Disposal of removed sediment will be at the Texas State University Composting Center. Sediment samples from each spatially disjunct location will be sent to TCEQ for testing prior to non-native vegetation and sediment removal.

Monitoring: After targeted depth of fine sediment removal has been achieved, the bed elevation will be measured from existing benchmarks and the sediment composition delineated (i.e., sand, gravel, etc). Bed elevation and substrate composition will then be monitored at each location before and after the recreation season.

Allocated funds for 2013: \$ 500,000

Estimated Budget: \$151,800

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

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

Long-term Objective: To keep the density of non-native aquatic plants as low as possible through continuous removal from the river and to increase the native riparian zone along the San Marcos River to 15 m or greater on public and private lands.

Assumptions: Riparian replanting is addressed in HCP Measure 5.7.1. Riparian, littoral and aquatic non-native removal will occur under this measure – 5.3.8. Non-native aquatic plants will be removed in association with fine sediment removal and TWR enhancement Work Plans 5.3.6/5.4.4 and 5.3.1/5.4.1.

Target 2013/Performance Measure: Remove 25% of non-native riparian and approximately 1250 m² of non-native aquatic vegetation with replanting of native aquatic and littoral vegetation.

Methods: *Riparian Zone* – City of San Marcos and Texas State University will partner to contract for the removal of non-native trees and shrubs. Tree/shrub cutting and removal will comply with City and University regulations and policies.

Littoral - On the banks, elephant ear (*Colocasia esculentes*) will be the focus of removal efforts. Mechanical removal will be used wherever possible. Glyphosate will be wicked onto newly-cut stems to remove more “entrenched” elephant ear plants.

Non-native Aquatic Plants - Divers that will be conducting sediment control will first remove non-native aquatic plant species from the area to be worked that day. Removal will initially focus on hydrilla and hygrophylla as these species are the most actively invasive. Prior to plant removal, the area will be fanned or sampled with appropriate gear to remove fountain darters and other native species. The non-native aquatic plants will be removed, shaken and bagged for disposal the composting facility. Denuded areas will either be targeted for TWR or selected native species planting. TWR and native species will be obtained from the USFWS SMNFHTC, the San Marcos River, or approved vendors. Initial efforts for restoration of TWR or native vegetation will target planting of approximately 20 percent of the surface area restored.

Monitoring: *Riparian* – Areas of removal will be revisited on a monthly basis to control returning non-native species.

Aquatic vegetation - Replanted areas will be monitored monthly to evaluate success rate. The planted areas will be weeded (i.e., non-native species removed) and replanted as needed to meet target areal coverage. An annual river inventory will be conducted to identify the presence and location of new non-native vegetation establishment.

Allocated funds for 2013: \$ 375,000

Estimated Budget: \$278,300

5.3.3/5.4.3 Management of Floating Vegetation Mats and Litter

The City of San Marcos and Texas State University will perform activities to manage floating vegetation and litter removal to enhance habitats for Covered Species. Management activities will include removal of vegetation mats that form on top of the water surface as well as on top of Texas wild-rice plants, particularly during low flows, and removal of litter for the littoral zone and stream bottom. Texas State University will manage aquatic vegetation in Spring Lake through use of its harvester boat and through hand cutting of vegetation by divers authorized to dive in Spring Lake.

Long-term Objective: Minimize impacts of floating vegetation and litter on TWR stands and overall aquatic community within the San Marcos River.

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

Target 2013/Performance Measure: Continued implementation of the established protocols.

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

San Marcos River – Floating vegetation will be pushed downstream and inorganic litter will be picked up weekly from the substrate, surface and littoral zone of the San Marcos River from Sewell Park to IH-35 during the recreational season (May 1st to September 30th) and monthly during offseason. Monitoring of downstream Texas wild-rice stands to keep the stands clear of drifting vegetation will also be undertaken. Divers will not pick up litter within Texas wild-rice stands. Personnel will be trained by the TPWD to recognize Texas wild-rice and to protect the plant stand while removing the accumulated

floating plant material. On Texas wild-rice stands, personnel will lift (not push) the floating material from the top of the Texas wild-rice stands and allow it to float downstream.

Monitoring: Floating vegetation and litter are targeted for weekly removal during the recreation season and then monthly during the remainder of the year. In the event of low flows (e.g., San Marcos discharges below 120 cfs), monitoring for vegetation mats will be conducted bi-monthly outside the recreation season.

Allocated funds for 2013: \$ 80,000

Estimated Budget: \$92,000

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

The City of San Marcos, in partnership with Texas State University, will implement non-native and predator species control in the San Marcos River on a periodic basis with expanded efforts of control, if needed, at low flows. The species include suckermouth catfish, sailfin catfish, tilapia, and *Melanoides* and *Marisa* snails. Educational materials will be provided to local pet shops and commercial outlets who sell aquarium species. Alternatives, such as a university release pond, will be offered at the end of each semester.

Long-term Objective: Reduction of non-native and predator species in the San Marcos River to levels that minimize their direct and indirect impacts on Covered Species and the aquatic ecosystem.

Assumptions: The primary effort in 2013 will be the testing and evaluation of different control measures for target species within Spring Lake and the San Marcos River.

Target 2013/Performance Measure: Testing and refinement of control measures and evaluation of effectiveness of control measures for non-natives animal species targeted in the HCP.

Methods: In Spring Lake, tilapia removal will be targeted by the use of gill nets during the winter to early spring period. Gill net mesh size and deployment will be undertaken in a manner that avoids impacts to resident turtles and other native species. Block seining will also be employed in shallow areas where gill nets are not feasible. Catfish control will be approached using divers and gigs within Spring Lake and the San Marcos River. Hoop nets and/or other live trap methods will also be assessed. Other technologies, such as a heat box, fish-specific disease, and daughter-less technology require further research for their applicability to these species, but if successful, could reduce populations rapidly. The level of effort for all testing of control measures will be confined to the existing budget allocation for FY2013.

Although not targeted for systematic removal during 2013, effective removal of *Melanoides* can be accomplished by determining the locations of highest snail density and using dip nets to remove the snails weekly. *Marisa cornuarietus* is found sporadically in the upper reach of the San Marcos River. This snail vertically migrates at night and is easily spotted with a flashlight. The species will be controlled by diving several hours after sunset to hand-pick the snails from the submergent vegetation.

Monitoring: It is assumed that the integrated biological monitoring program will assess the status of non-native animal species.

Allocated funds for 2013: \$ 35,000

Estimated Budget: \$35,075

5.4.6 Sessom Creek Sand Bar Removal

Texas State University and the City of San Marcos will conduct a study of sediment removal options to determine the best procedure to remove the sand and gravel bar that minimizes impacts to listed species. Texas State University will submit the study for review through the AMP and implement the actions coming out of that process.

Long-term Objective: Provide the best hydrodynamic configuration of the channel upstream of the University Bridge that minimizes the sediment deposition in Sewell Park thus providing optimum TWR conditions downstream of Sessom Creek.

Assumptions: This effort will provide the supporting technical analysis of alternatives ranging from no action to complete bar removal and the specific recommendation for action.

Target 2013/Performance Measure: Complete analysis and provide technical report of alternatives and final recommendations.

Methods: Data on the 3-dimensional channel topography and sediment characteristics within the river were collected as part of the ARRA funded San Marcos Observing System (SMOS) and complimented with grant monies from the City of San Marcos to acquire subsurface sediment characteristics using ground penetrating radar. In addition, SMOS supported the development of calibrated 2-dimensional hydraulic models for the entire San Marcos River. The existing model will be expanded to include the sediment rating curve that SMOS generated for Sessom Creek to rerun the hydrodynamic model for this section of river to evaluate sediment transport characteristics, bar formation at Sessom Creek and below the University Bridge under the existing channel configuration over a range of flow rates. Alternative configuration of the existing sediment plug (i.e., contouring, shaving or complete removal) will also be evaluated in the model to determine the best hydrodynamic configuration of the channel upstream of the University Bridge that minimizes the sediment deposition in the vicinity of the existing Cut Grass Island to favor TWR conditions in terms of both the hydraulics and sediment deposition characteristics.

Monitoring: Not Applicable

Allocated funds for 2013: \$ 25,000

Estimated Budget: \$ 25,000

5.3.7 Designation of Permanent Access Points/Bank Stabilization

The City of San Marcos and Texas State University will stabilize banks and establish permanent river access points in eroded areas, to include locations such as Clear Springs Apartments, City Park, Hopkins Street Underpass, Bicentennial Park, Rio Vista Park, Cheatham Street underpass, and Ramon Lucio Park and potentially other areas (as determined during the Adaptive Management Process). Areas around and between access points will be planted with vegetation that discourages streamside access (*e.g.*, prickly pear and acacia). River trail location will be revised to maximize width of riparian vegetation and ease of use for the public.

Long-term Objective: To reduce bank loss and sediment input through the stabilization of banks and minimization of access at non-designated sites through provision of safe access for the public.

Assumptions: Design, dimensions and materials may differ between access points.

Target 2013/Performance Measure: Design and construction of access points as determined through the design and public input process. Target establishment of riparian vegetation is addressed in Measure 5.7.1.

Methods: *Bank Stabilization/permanent access points* – At each of the identified areas for bank stabilization listed above, site-specific stabilization plans will be developed through a stakeholder process prior to finalization of design and initiation of work. Exact location will depend upon location of Texas wild-rice stands and areas targeted for flow dependent protection under the State Scientific Area (SSA) efforts. For example, natural rock will be used to create a stone terrace for access and bank stabilization with the bank on either side restored with riparian vegetation. Native riparian vegetation will be planted in areas adjacent to the access/stabilization areas in order to discourage river users from entering the river in places other than the access point. The existing riparian vegetation will be increased in width as much as practical given site specific characteristics. Prior to each construction period, the area will be swept clean of darters and enclosures will be put into place to keep darters out of the construction area. No work outside this area will occur.

Fishing Access Points – Preliminary recommendations for location of fishing access points will be developed by the City of San Marcos based on the location of Texas wild-rice stands and areas targeted for flow dependent protection under the SSA efforts.

The public will be involved through stakeholder input which will be solicited through two workshops. Based on input, the location and number of access points will be finalized.

Monitoring: Surveys will be performed to determine public satisfaction and use of access points. The riparian zone will be monitored for development of undesirable access routes.

Allocated funds for 2013: \$ 500,000

Estimated Budget: \$469,200

5.7.1 Native Riparian Habitat Restoration

The City of San Marcos and Texas State University will undertake a program to increase the area of the riparian zone on public lands from the Spring Lake Dam to IH-35 using native vegetation. As plans take shape for the reestablishment of the riparian zone, private landowners will be asked to participate in the plan. Reimbursement for the price of native plants will be provided to private landowners. Criteria to qualify for reimbursement will be established along with a list of preferred natives to replant.

Long-term Objective: Establish a robust native riparian community that benefits Covered Species and the habitat quality adjacent to and within the San Marcos River.

Assumptions: Removal of non-native riparian vegetation (Measure 5.3.8) will occur prior to or simultaneous with Measure 5.7.1.

Target 2013/Performance Measure: Design of a robust riparian community from Spring Lake dam to IH-35 on both public and private lands. Establish an ongoing stakeholder group for design and implementation.

Methods: Develop the community structure for the riparian zone using existing USFWS transects, literature research and stakeholder input. Use stakeholder groups to involve private landowners in the establishment of a healthy riparian zone. Begin hands-on workshops to remove small portions of non-natives and plantings of native shrubs and trees. Areas will be planted at a ratio of three hard mast trees to one soft mast tree, with 20 percent of the vegetation consisting of fruit-bearing shrubs. Vegetation such as big bluestem, switchgrass, Indian grass, live oak, Texas red oak, bur oak, pecan, bald cypress, American beautyberry, and buttonbush will be used. Fencing may be required for the first two years to allow for the establishment of the species.

Monitoring: Monitoring will occur monthly in newly planted areas to ensure success and revise methods as needed.

Allocated funds for 2013: \$ 100,000

Estimated Budget: \$100,050

5.3.2/5.4.2 Management of Recreation in Key Areas

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

Long-term Objective: To establish a trained force of Park Rangers that will enforce all HCP measures in and along the San Marcos River while educating the public about the Covered Species and importance of their protection.

Assumptions: This measure was not specifically funded for FY 2013. However, with establishment of the SSA and other HCP measures, enforcement will be required in 2013.

Target 2013/Performance Measure: Train existing and contracted park rangers for enforcement of species-oriented protection measures during the recreational season. This season can vary depending on onset of warmer temperatures.

Methods: Employ TPWD game warden to train existing and contracted park rangers for enforcement of species-oriented protection measures. Park Rangers will monitor river user activities from mid-March to mid-September Thursday through Sunday and holidays. Park Rangers will educate river users to enhance protection of Covered Species.

Monitoring: The public will be surveyed annually during the recreation season to assess the level of understanding of Covered Species, ongoing HCP Measures, effectiveness of the public outreach and education program, and the impacts of recreational activities on species and habitat.

Allocated funds for 2013: \$ 0

Estimated Budget: \$43,700

5.7.6 Impervious Cover/Water Quality Protection

The City of San Marcos and Texas State University will establish a program to protect water quality and reduce the impacts incentives for the program based upon the LID/BMP practices. Urban land development tends to increase the intensity of storm water flows and the amount of nonpoint source (NPS) pollution reaching local water resources. Buildings, roads, and other impervious surfaces shed rain more rapidly than areas covered by vegetation, and most typical urban land uses require rapid drainage of storm water. The very rapid, direct connection of developed land across paved surfaces and through drainage conveyances to waterways tends to carry more pollutants more quickly from the land surface to water resources. A number of water quality problems and impairments in Texas are attributed in full or in part to such urban storm water runoff carried through storm sewers and channelized streams.

Long-term Objective: Implement a program that minimizes the impacts associated with impervious cover associated with urbanization and changes in land use/cover in the Upper San Marcos watershed; manage stormwater as close to its source as possible, treat stormwater as a resource rather than a waste product; emphasize conservation and the use of on-site features to protect water quality; and increase infiltration to groundwater and aquifer recharge for the protection of riverine integrity.

Assumptions: Construction of the proposed sediment retention ponds under Measure 5.7.4 are funded under this Measure.

Target 2013/Performance Measure: Develop a master plan to be implemented by Texas State University and City of San Marcos that incorporates all jurisdictional watershed areas for the purpose of meeting the goals stated in the long-term objective.

Methods: City of San Marcos and Texas State University will contract for the development of an Upper San Marcos River watershed master plan. The contractor will assemble stakeholder groups to gather public input, research successful LID and BMP practices, and develop a plan that includes recommendations for land use, ordinance modifications, and detailed LID/BMP practices as needed.

Monitoring: N/A

Allocated funds for 2013: \$ 500,000

Estimated Budget: \$305,900

5.7.5 Management of Household Hazardous Waste

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

Long-term Objective: Provide a place for citizens of San Marcos and Hays County to safely dispose of HHW on a weekly basis.

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

Target 2013/Performance Measure: Continue outreach to 1400 participants; contract with two additional part-time personnel to conduct public outreach events and then convert or dispose of the HHW between events. Increase outreach by covering the cost of surrounding communities that cannot afford to partner in a HHWC program.

Methods: Open drop-off opportunities two days a week (Tuesday and Friday) from 12:00 noon to 3:30 p.m. to the public. Conduct HHWC events to correspond with the National Pharmaceutical Take Back Day Events as announced by the EPA.

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.

Allocated funds for 2013: \$30,000

Estimated Budget: \$29,120

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

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

Long-term Objective: Reduce the potential of spill of hazardous materials in the San Marcos River and its tributaries.

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

Target 2013/Performance Measure: Coordination with TXDOT for the implementation of hazardous materials restrictions and establishment of signage.

Methods: Identify all transport routes that cross the San Marcos River and its primary tributaries. Identify any that have hazardous material traps. This information will be used to initiate public meetings, drafting of City ordinances, and coordination with TXDOT.

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

Allocated funds for 2013: \$ 0

Estimated Budget: \$ 0

5.7.3 Septic System Registration and Permitting Program

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

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

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

Target 2013/Performance Measure: To have an accurate record of new and existing septic systems installed and modified in city jurisdiction. Also, by ordinance, to have all owners of septic systems connect to municipal sewer lines as they become available.

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

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

Allocated funds for 2013: None

Estimated Budget: N/A

5.7.4 Minimizing Impacts of Contaminated Runoff

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

Long-term Objective: Reduce the input of sediment and roadway pollutants into the San Marcos River.

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

Target 2013/Performance Measure: Design the Best Management Practices (BMPs) to be constructed at Veramendii Park and along Hopkins Street that will reduce total suspended solids (TSS) by 85%.

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

Monitoring: N/A

Allocated funds for 2013: \$0

Estimated Budget: See Measure 5.7.6

5.4.5 Diversion of Surface Water

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

Long-term Objective: Meet diversion restrictions specified under the HCP.

Assumptions: None

Target 2013/Performance Measure: Restriction of surface pumping as specified under the HCP.

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

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

Allocated funds for 2013: \$ 0

Estimated Budget: \$ 0

5.4.7 Diving Classes in Spring Lake

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

Long-term Objective: Maintain the integrity of the ecology and cultural resources within Spring Lake.

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

Target 2013/Performance Measure: Implement the diving protocols as outlined in the Spring Lake Management Plan.

Methods: The Diving Safety Officer will monitor all diving activities in Spring Lake, assuring all guidelines contained in the Diving Safety Manual for Spring Lake 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.

Allocated funds for 2013: \$ 0

Estimated Budget: \$ 0

5.4.8 Research Programs in Spring Lake

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

Long-term Objective: Maintain the integrity of the ecology and cultural resources within Spring Lake.

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

Target 2013/Performance Measure: Implement the protocols for research as specified in the Spring Lake Management Plan.

Methods: 1. 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:

- Name and contact information of the responsible party conducting the research,
- Purpose and expected outcomes of the activities, including a description of how the project contributes to science,
- 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,
- Methodology, including literature review,
- 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)
- Expected impact, and
- Timeline of Project

A copy of the final report and any publications on a research project will be provided to the Lake Manager

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.

Allocated funds for 2013: \$ 0

Estimated Budget: \$ 0

5.4.10 Boating in Spring Lake and Sewell Park

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

Long-term Objective: Maintain the integrity of the ecology and cultural resources within Spring Lake and San Marcos River.

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

Target 2013/Performance Measure: Implement the protocols for boating as specified in the Spring Lake Management Plan.

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

- All boats must be properly washed/disinfected before being placed in lake and once they are removed (see Equipment in Lake in the Spring Lake Management Plan).
- 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.
- All boating events must be designed to keep participants away from glass bottom boat operations.

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

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

Allocated funds for 2013: \$ 0

Estimated Budget: \$ 0

5.4.9 Management of Golf Course and Grounds

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

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

Assumptions: None

Target 2013/Performance Measure: Finalization of the Gold Course Management Plan and Integrated Pest Management Plan.

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

Monitoring: Each year the Golf Course Manager will report to the Lake Manager detailed information on maintenance activities and materials used during the year.

Allocated funds for 2013: \$ 0

Estimated Budget: \$ 0

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

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

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

Education

The following recommended education venues are examples of ways to educate the public on Covered Species and HCP measures:

- a. Signage. Post signage at various areas along the river from Spring Lake dam to Ramon Lucio Park. Signage will be simple, natural, and when possible the existing sign locations will be used (trying to avoid too many signs). Signs will have the same template and coloration so they are recognized up and down the river. Signs will cover the rules of the river and educate the public on the importance of the resource. All signs will be bilingual. Signs should include QR codes.
- b. Video Loop at City Park offering information about the river and safety rules while people are waiting for shuttle or tubes.
- c. Posted maps showing trail, access points, fishing access and other amenities. Include a map at Stokes Park to help inform about the San Marcos River/Blanco confluence.
- d. Existing recreation information at hotels/restaurants, bed and breakfast facilities, Chamber of Commerce, Visitor's Center, City of San Marcos internet site, etc. could be modified to include information on restrictions so river users are prepared prior to entering the river.
- e. Hold a training session for the park rangers so they can help disseminate the information and educate the public about the San Marcos River.
- 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.
- g. Hold a lecture series at Texas State University for incoming freshmen.
- h. Stencils on rented tubes with river trivia and important rules.
- i. River Festivals for mass dissemination of information.
- j. City, university and local group websites.
- k. Overall Interpretation Plan to pull all the informational ideas together for conformity, continuity, and implementation.

Total cost for initial implementation - \$20,000

Annual maintenance = \$5,000

Permits

City of New Braunfels and/or Hays County Watershed Protection Permit

City of New Braunfels Floodplain Development Permit

City of New Braunfels Site Preparation Permit

Texas State University ICUC

TPWD Scientific Permit

TPWD Sand and Gravel General Permit

TPWD Aquatic Vegetation Removal Permit (PWD-1029)

TPWD Exotic Species Research Permit (PWD-1021)

TPWD Permit to Introduce Fish, Shellfish or Aquatic Plants into Public Waters (PWD-1019)

Texas Historical Commission Section 106 of the National Historic Preservation Act of 1966 consultation

TCEQ Permit

Texas GLO

FWS Endangered Species Permit

NEPA

USACE 404 Permit