

## The City of New Braunfels 2014 Work Plans

The 2014 City of New Braunfels Work Plan represents a collaboration of ideas, concerns, and methodologies discussed during the current planning year with Implementing Committee members, scientists and stakeholders. There are a number of 2013 projects that are presented here that might/might not be completed until 2014, thus requiring that these projects be extended to the 2014 Work Plan. As the 2013 projects move forward over the course of the year, the 2014 Work Plans will be adjusted to meet Edwards Aquifer Habitat Conservation Plan (HCP) goals and objectives.

### **5.2.2.1 Old Channel Restoration**

The City of New Braunfels will continue to assess remaining non-native vegetation, monitor restored native habitat for all 2013 projects that are completed. Additionally, the City of New Braunfels will continue to do limited channel modifications to enhance fountain darter habitat, further implement bank stabilization and erosion control measures in areas from Elizabeth Street downstream approximately 2,400 feet through the Horseshoe of the Old Channel.

### **Old Channel Non-native Vegetation Removal and Maintenance**

In addition to reestablishment of native vegetation after the sediment island removal, channel restoration includes portions of the Old Channel between Elizabeth Street downstream approximately 2,400 feet through the Horseshoe of the Old Channel.

Long-term Objective: Control non-native vegetation and establish favorable native vegetative species to the maximum extent possible.

Assumptions: Restoration of native aquatic vegetation will be accomplished in the Old Channel between the Elizabeth Street Bridge and through the Horseshoe bend in the river for a distance of approximately 2,400 feet and will involve the removal of non-native vegetation, planting of native vegetation and repeated gardening and supplemental plantings. This effort will continue until the proportional native and non-native targets outlined in Table 4-6 of the HCP are met or funds are expended. [Table 4-6 is included in Section 4.1.1.1 of the HCP which discusses the Long-term biological goals for the fountain darter in the Comal system.](#)

**TABLE 4-6  
GOALS—FOUNTAIN DARTER HABITAT (AQUATIC VEGETATION) (m<sup>2</sup>)**

Study Reach	<i>Bryophytes</i>	<i>Hygrophila</i>	<i>Ludwigia</i>	<i>Cabomba</i>	<i>Fil. Algae</i>	<i>Sagittaria</i>	<i>Vallisneria</i>
Upper Spring Run Reach	1,850	650	<b>150</b>			600	
Landa Lake	4,000	<b>250</b>	<b>900</b>	<b>500</b>		1,250	13,500
Old Channel	150	<b>200</b>	<b>1,500</b>		300		
New Channel	150	1,350		350			
<b>TOTAL</b>	<b>6,150</b>	<b>2,450</b>	<b>2,550</b>	<b>850</b>	<b>300</b>	<b>1,850</b>	<b>13,500</b>

\****Bold/italics*** indicate a restoration activity that deviates from the Maximum observed.

Target 2014 /Performance Measure: Reestablishment of native aquatic vegetation and reduction of non-native aquatic vegetation in accordance with the areas defined in Table 4-6

Methods: The target locations for *Hygrophilla* removal will be based on a review of historical vegetation mapping data to identify areas in which high value native vegetation has historically occurred and taking into consideration possible adverse affects from other mitigation actions. Two-dimensional hydraulic models have been used in the 2013 work plan, and will continue to be used in the 2014 Work Plan to evaluate the potential for success of the native vegetation restoration. This evaluation will consider the depth, velocity, and substrate conditions present in the proposed areas along with what non-native vegetation is thriving in these areas. In areas bare of vegetation, the reason vegetation is absent (*e.g.*, recent flood scour, or unsuitable depth, velocity or substrate conditions) will be evaluated prior to final selection of target areas.

Selected locations will first be sampled to remove fountain darters. Sampling will employ appropriate methods such as fanning and/or seining depending on local conditions. Non-native vegetation will then be removed and placed on a tarp adjacent to the stream where qualified personnel will examine the plants for fountain darters (eggs through adults). Fountain darter life stages will be returned to the stream. If native vegetation is not available from the San Marcos National Fish Hatchery and Technology Center (SMNFHTC), it will be harvested from Landa Lake and planted to cover approximately 20 percent of the denuded area. A variety of native vegetation (*e.g.*, *Ludwigia*, *Bryophytes*, and filamentous algae) will be used to meet targets outlined in Table 4-6 of the HCP.

Monitoring: Each area in which non-native vegetation has been removed will be monitored for the reestablishment of non-native vegetation and effectiveness of the native vegetation planting two weeks after treatment and then weekly thereafter. Once native aquatic vegetation is established in an area, monitoring will be conducted on an annual basis. Activities regarding Old Channel plantings will be carefully mapped to monitor success for future reference and historical documentation.

Specific attention will be paid to the amount of suspended solids in the Old Channel resulting from storm runoff or activities in the Springfed Pool. Best management practices are being investigated to reduce impacts from storm runoff and sediment removal from the Springfed Pool

may be needed as a future mitigation activity to enhance habitat in the Old Channel. The Springfed Pool is located off channel and adjacent to the Old Channel.

As noted in the HCP (Section 5.2.2.3), following natural disturbances such as floods, periods of limited recharge, and/or herbivory, as well as anthropogenic disturbances such as recreation or vandalism, the monitoring/maintenance schedule will be adjusted temporarily in order to provide stability for the native vegetation re-establishment. Monitoring will include estimated aerial coverage of native and non-native vegetation within the treated area. Any reestablished non-native vegetation will be removed during each monitoring visit and if deemed necessary, additional native vegetation will be planted. Removal of non-native vegetation will follow the same protocols as the original removal methodology. Removed vegetation will be transported to an off-site composting facility.

Allocated funds for 2014:\$ 175,000

Estimated Budget:\$ 175,000

\$175,000 Vegetation Restoration

### **5.2.2.2/5.2.2.3 Comal River Aquatic Vegetation Restoration and Maintenance**

The City of New Braunfels will undertake a program of native aquatic vegetation restoration within key, sustainable reaches of the Comal River by planting native vegetation in unoccupied areas and in areas where non-native aquatic vegetation is removed. Restoration and maintenance represent two different work plan elements within the HCP as noted below. The amounts and types of vegetation removed and restored in this program will follow the targets provided in Table 4-5 and 4-6 of the HCP.

#### **Native Aquatic Vegetation Restoration**

Long-term Objective: Control of non-native vegetation and establishment of target native vegetation preferred by fountain darters. The City of New Braunfels will continue to coordinate with the Texas Parks and Wildlife Department (TPWD) on projects located in the Comal River and Landa Lake.

Assumptions: Native vegetation restoration will continue in areas of Landa Lake and the Comal River. Restoration efforts include establishing additional *Cabomba* along the eastern shoreline of Landa Lake and along the New Braunfels' golf course property as well as *Ludwigia* in upper sections of Landa Lake. Restoration of native aquatic vegetation in the Old Channel is covered under the 2014 work plan 5.2.2.1.

Target 2014/Performance Measure: Identification of target non-native aquatic vegetation removal areas and implementation of native aquatic restoration of ~1000 square meters.

Methods: The target locations for non-native plant removal will be based on a review of historical vegetation mapping data to identify areas in which high value native vegetation has historically occurred. Two-dimensional hydraulic models will continue to be used as well as referencing newly established vegetated areas from the 2013 work plan, to evaluate the potential for success of the native vegetation restoration including areas of existing bare substrate. This evaluation will consider the depth, velocity, and substrate conditions present in the proposed areas along with what non-native vegetation, if any, are thriving in these areas. In areas that are bare of vegetation, the reason vegetation is absent (*e.g.*, recent flood scour, or unsuitable depth, velocity or substrate conditions) will be evaluated prior to final selection of target areas. Target restoration areas will be selected within the various identified locations noted above.

Selected locations will first be sampled to remove fountain darters. Sampling will employ appropriate methods such as fanning and/or seining depending on local conditions. Non-native vegetation will then be removed and placed on a tarp adjacent to the stream where qualified personnel will examine the plants for fountain darters (eggs through adults). Fountain darter life stages will be returned to the stream. If native vegetation is not available from the SMNFHTC or available from vendors, it will be harvested from Landa Lake and planted to cover approximately 20 percent of the denuded area. A variety of native vegetation (*e.g.*, *Ludwigia*, *Bryophytes*, and filamentous algae) will be used to meet targets outlined in Table 4-6 of the HCP.

Monitoring: Each area in which non-native vegetation has been removed will be monitored for the reestablishment of non-native vegetation and effectiveness of the native vegetation planting two weeks after treatment, then every two weeks for three months and then quarterly thereafter. Once native aquatic vegetation is established, monitoring will be conducted on an annual basis. However, if monitoring suggests continued gardening and/or supplemental planning is required, this will continue on a bi-weekly or monthly basis as needed. Activities regarding Comal River aquatics habitat will be carefully mapped to monitor success for future reference and historical documentation.

However, as noted in the HCP (Section 5.2.2.3), following natural disturbances such as floods, periods of limited recharge, and/or herbivory, as well as anthropogenic disturbances such as recreation or vandalism, the monitoring/maintenance schedule will be adjusted temporarily in order to provide stability for the native vegetation reestablishment. Monitoring will include estimated aerial coverage of native and non-native vegetation within the treated area. Any reestablished non-native vegetation will be removed during each monitoring visit and if deemed necessary, additional native vegetation will be planted. Removal of non-native vegetation will follow the same protocols as the original removal methodology. Removed vegetation will be transported to an off-site composting facility.

### **5.2.2.3 Native Aquatic Vegetation Maintenance**

The City of New Braunfels will conduct yearly maintenance for native aquatic vegetation restored in Landa Lake and the Old Channel, and for flow-split management. These particular projects are discussed in Sections 5.2.2.1 for Landa Lake and the Old Channel, and flow-split management is discussed in Section 5.2.1.

Long-term Objective: Maintenance of restored native aquatic vegetation and minimization of invasive non-native aquatic vegetation.

Assumptions: This activity in FY 2014 is covered under Work Plan Element 5.2.2.2.

Target 2014/Performance Measure: Establishment of native aquatic vegetation in target restoration locations within the Comal River system.

Methods: Monitoring will include estimated aerial coverage of native and non-native vegetation within the treated area. Any reestablished non-native vegetation will be removed during each monitoring visit and if deemed necessary, additional native vegetation will be planted. Removal of non-native vegetation will follow the same protocols as the original removal methodology. Removed vegetation will be transported to an off-site composting facility.

Monitoring: Monitoring of restored native aquatic vegetation will be conducted on annual basis. However, as noted in the HCP (Section 5.2.2.3), following natural disturbances such as floods, periods of limited recharge, and/or herbivory, as well as anthropogenic disturbances such as recreation or vandalism, the monitoring/maintenance schedule will be adjusted temporarily in order to provide the stability for the native vegetation reestablishment.

Allocated funds for 2014: \$ 220,000

Estimated Budget: \$ 220,000

\$182,000 Aquatic Vegetation Restoration  
\$ 5,000 Monitoring/Maintenance  
\$ 33,000 15% Contingency

### **5.2.5/5.2.9 Non-native Animal Species Control**

The City of New Braunfels will continue to conduct non-native animal species control on an annual basis and include annual maintenance and monitoring. The non-native animal species that will be addressed include the suckermouth catfish, tilapia, nutria, and ramshorn snail. Since this work plan has two components identified within the HCP, each component has been broken out to facilitate the development of the work plan and budgets.

#### **Control of Harmful Non-Native Animal Species**

Long-term Objective: Eliminate or maintain the density of non-native animal species at suppressed levels to minimize their impact to the Comal River ecosystem.

Assumptions: This will initially focus on the intensive effort to reduce non-native species and the assessment of removal techniques. Updated removal techniques will be utilized based on 2013 results / determinations in the field.

Target 2014/Performance Measure: Continue to evaluate the efficacy of removal techniques and cost benefit of these efforts, focusing primarily on the suckermouth catfish, tilapia; and expanding current Nutria control. Based on program monitoring of 2013 accomplishments and activities, the 2014 work plan will use that data to establish standard measures for overall habitat and species benefit.

Methods: Seasonal concentration of tilapia and other non-native fish into localized areas will be exploited for removal through seining techniques utilizing mesh sizes that are selective against impacting fountain darters and other Covered Species. Each seining effort will involve salvage of native species, which will be returned to the system. The City of New Braunfels will increase its nutria poisoning program, while considering possible additional physical removal methods and other methods such as relocation. A major focus of non-native removal will target suckermouth catfish given their overall destructive impacts on habitats within the system. Given the anticipated difficulties in control of suckermouth catfish, several different removal techniques will be attempted that include trapping with hoop nets and giggering with divers. These efforts initially focused on Landa Lake in 2013 to evaluate effectiveness and the cost benefit of the efforts and will continue into 2014 on Landa Lake. During these combined efforts, any ramshorn snails encountered in 2014 will continue to be removed. All non-native species removed will be disposed of offsite following City of New Braunfels policies.

Monitoring: It is expected that the planned EAA biomonitoring program will accomplish monitoring requirements-

### **Reduction of Non-Native Species Introduction and Live Bait Prohibition**

The City of New Braunfels will undertake measures to stop or substantially reduce the introduction of non-native species from aquarium dumps and establish the ~~range of~~ prohibition of live bait non-native species-

The City of New Braunfels will continue to prohibit these activities by a City ordinance of domestic and non-native aquatic organisms, targeting specifically the practice of releasing aquarium trade species into ~~the~~ Landa Lake and the Comal Riversystem.

The City of New Braunfels will continue to promote banning the use of certain non-native species as live bait for fishing. The City of New Braunfels will additionally consult with

relevant resources, ~~at a minimum~~ Texas Parks and Wildlife Department (TPWD) and the United States Fish and Wildlife Service (USFWS)) to determine which native species may be used as bait for fishing locally that do not present a threat to the Endangered Species through introduction of pathogens or other mechanisms. This information will be used to compile a preferred listing of native bait species to be used.

These preferences and prohibitions will be communicated to the public through signage at key entrance points to parks on Landa Lake and the Comal River. Educational materials for outreach purposes will be developed for distribution.

Long-term Objective: Reduce the introduction of non-native species to ~~the~~ Landa Lake and the Comal River ecosystem.

Assumptions: This effort is primarily a public outreach and education effort.

Target 2014/Performance Measure: Expand education and enforcement based on the existing State regulation prohibiting the introduction of exotics; priority signage locations would include entrance points to Landa Lake, the fishing pier, and popular fishing locations on the Comal River. TPWD has education programs that can be utilized.

2014 would involve the process for NB City Council to consider adoption of a City ordinance that would prohibit the introduction of domestic and non-native aquatic organisms, prohibiting ~~specific live~~ bait ~~non-native~~ species and aquarium trade dumps into Landa Lake and the Comal River. By potentially removing these non-native species from Landa Lake and the Comal River, it will improve the overall habitat for native and endangered species. Prohibition of certain live bait species identified as presenting a potential threat to the endangered species, in consultation with relevant resources (e.g.- TPWD and USFWS) as identified through the approved 2013 work plan, is also anticipated.

Methods: Expand on educational materials and outreach materials that are designed to focus on negative effects of introducing non native species into Landa Lake and the Comal River -and produced for distribution to the public. TPWD has education programs that will continue to be assessed and potentially utilized. Continual improvements of existing signage will be managed according to existing City criteria.

Continue to solicit updated information, relevant studies, and opinions from Science expertise regarding potential threats or lack thereof to the Endangered Species by use of native species as live bait; compile into a useable format to assist in identifying native species to be used as bait.

In 2014, the City will follow its normal process for creation and adoption of additional ordinances. This will involve public meetings, stakeholder input, drafting of the ordinance and possible adoption by the City.

Monitoring: It is anticipated that the biomonitoring program will detect the presence of newly introduced species. Signage will be inspected annually for repair or replacement as necessary as well as identification of other locations that may need signage.

Total Allocated funds for 2014: \$ 135,000

Total Estimated Budget: \$ 135,000

\$3,000 Signage

\$111,750 Species Control

\$20,250 - 15% Contingency

### **5.2.6/6.3.6 Monitoring and Reduction of Gill Parasites**

The City of New Braunfels will retain and oversee the work of a contractor to conduct gill parasite (Asian trematode – *Centrocestus formosanus*) monitoring and continuing evaluation of reduction measures. This may involve control of the non-native first host (snail – *Melanoides tuberculatus*). However, continual research on the most effective means of gill parasite control will be conducted as part of the AMP as discussed in Section 6.3.6 to determine the most effective method of gill parasite control that will actually be implemented.

Long-term Objective: Effective control of gill parasite concentrations to minimize their threat to the ~~fountain darters and other~~ Covered Species within the Comal system; including evaluation regarding the direct threat Gill parasites may have on fountain darters.-

Assumptions: The focus will be the evaluation of 2013 Work Plan methods for snail removal to determine the most effective, yet least destructive methodology to affect cercariae concentrations in the water column. This includes the assessment of the temporal effectiveness of control measures on sustained reductions of cercariae in the water column. The following conservation measures were also identified in the HCP:

- Based on the system-wide survey from 2013, a decision will be made following the process set out in the AMP Agreement as to whether an initial system-wide removal effort is necessary, and if so, how to facilitate the performance of that effort;
- Based on the system-wide survey from 2013, an updated gill parasite monitoring program will be implemented and further research will be done. Cercarial concentrations will continue to be monitored in multiple areas along the Comal River on at least a semi-annual basis, and more frequently when spring flow initially drops below 150 cfs or other springflow triggers that are developed. Corresponding fountain darter sampling to examine correlations between cercariae densities and fountain darter estimated infection rates in the wild will also be part of that monitoring effort.

Target 2014/Performance Measure: Continue system-wide snail distribution and density estimates, evaluation of alternative snail control measures and temporal effectiveness of cercarial density reductions, expansion of the existing gill parasite monitoring program.

### Methods:

*Baseline* – In 2013, system wide surveys were made to assess overall *Melanooides* distribution and densities. Relative abundance were marked on existing substrate/vegetation maps. Follow up surveys will focus on known areas of high density of *Melanooides*.

*Gill Parasite Monitoring* – Results from the 2013 baseline assessment will be used to establish a comprehensive gill parasite monitoring program. Cercarial concentrations will be monitored at the reach boundary locations (and potentially specific hotspot areas) twice per year, and monthly when total Comal discharge drops below 150 cfs. Gill parasite monitoring will be coordinated with the fisheries biological monitoring.

*Routine Monitoring*- Based on 2013 results, the 2014 monitoring plan will likely include reaches in the following sections (or up to 8 locations based on current conditions and observations):

- Upper Landa Lake,
- Middle Landa Lake,
- Lower Landa Lake,
- New Channel above the Power House,
- Old Channel above Schlitterbahn,
- Old Channel above the confluence,
- New Channel above the confluence with the Old Channel, and
- Comal River below the Confluence.

It is anticipated that methods used in 2013 will be used for 2014 monitoring. Wadeable areas will be sampled with a dip net while non-wadeable areas will be sampled via scuba. In both instances, three replicates of a one square meter area will be sampled and *Melanooides* counted. Three random replicates of each substrate/vegetation type will be sampled in each reach. These data will then be used to extrapolate snail locations and densities for the system. Three random replicates of each substrate/hydrodynamic type within each reach will then be sampled for validation of the extrapolation methodology. Identified high density *Melanooides* areas will also be systematically sampled with three one square meter replicates.

Water column cercarial concentration sampling will be conducted across the channel at the downstream boundary of each reach segment. Sampling locations along each cross section will be determined from an examination of the hydraulic model simulations to ensure an adequate stream-wide distribution accounts for the hydraulic flow net at that location (i.e., slack water versus stronger velocity fields). A total of 10 samples will be targeted at each cross section unless complex hydraulics suggests a higher spatial sampling. All water samples will be collected based on the existing NFHTC protocol. Sampling will proceed from downstream to upstream reaches. Samples will be collected between 9 and 11 am on sunny days to minimize temporal variance in the sampling. Each water sample will be filtered using an apparatus described in Cantu (2003). The cercariae will then be stained on the filters with a 10% Rose

Bengal solution. Filters will then be transported to the NFHTC laboratory where the number of cercariae on each filter will be counted with the aid of a dissecting microscope.

Evaluation of Removal Technologies:

*Snail Removal Methods* – Based on the 2013 results, additional field testing will be conducted in selected areas to evaluate the effectiveness and cost benefits to achieve desired outcomes of snail density reductions. Repopulation possibilities will be estimated based on removal efficiencies.

*Potential Removal Methods*- Based on 2013 results, the focus on potential removal will be in the indentified high density areas which appear to be in the upper channel, Landa Lake and the upper spring run reach.

Low Flow Monitoring and Response:

Low Flow Monitoring: Cercarial concentrations will be monitored in multiple areas along the Comal River on at least a semi-annual basis, and more frequently when spring flow initially drops below 150 cfs or other springflow triggers that are developed. Monitoring protocols will be established in 2013 as part of the developed gill parasite low flow monitoring program.

In the event that the cercarial monitoring detects elevated levels, snail removal will target high density areas using the method(s) indentified. Cercarial monitoring will then be repeated a few days after completion of snail removal and then monthly up to 6 months following removal efforts. In this instance, snail removal will be conducted in an upstream to downstream manner.

Allocated funds for 2014: \$ 175,000

Estimated Budget: \$ 175,000

\$ 45,000 Routine Monitoring  
\$ 95,000 Continue Evaluation of Removal Techniques  
\$ 35,000 Low Flow Monitoring and response

### **5.2.8 Native Riparian Habitat Restoration (Comal Springs Riffle Beetle)**

The City of New Braunfels will restore native riparian zones, where appropriate, to benefit the Comal Springs riffle beetle by increasing the amount of usable habitat and food sources (i.e., root structures and associated biofilms). The method of riparian zone establishment will include the removal of non-natives and replanting of native vegetation representative of a healthy, functioning riparian zone. Trees and plants with extensive root systems will be given preference to create the maximum beetle habitat. Fine sediment covering exposed roots and springs will also be removed. The riparian zone will be monitored (at least annually) for continued success and removal of reestablished non-natives. Riparian zones will be protected until the preferred

riparian zone is established. Riparian habitat zones will be created along Spring Run 3 and along the portion of the western shoreline that is owned by City of New Braunfels. In addition, riparian restoration also benefits the system through bank stabilization and nutrient and sediment processes. The City of New Braunfels will continue their program to incentivize private landowners on the Comal River and its tributaries to establish riparian zones along the western shoreline. This program will be accomplished through work plan element 5.7.1.

Long-term Objective: Continual removal of perimeter areas that have non-native vegetation and fine sediments from the target area of Landa Lake and hillside waters edge-adjacent to Spring Run 3. Establishment of beneficial native riparian species habitat for Comal Springs riffle beetles.

Assumptions: It is assumed that this effort will focus on the identification of target native riparian species habitat most beneficial for Comal Springs riffle beetles that also meet erosion control requirements. ~~and~~ The subsequent removal of non native vegetation and establishment of native vegetation in the upstream 100 meters of target areas of Landa Lake and Spring Run 3. This is followed by the selective removal of fine sediments adjacent to these areas within Landa Lake. It is assumed that the effort will be split between the bluff and Spring Run 3 given the different characteristics in these locations and therefore differences in approaches are anticipated. Restoration of the remaining area will be accomplished in segments during future years and incorporate revisions based on monitoring of the first year (2013) efforts. The continuous long term objective will be to continually evaluate the effectiveness of the proposed methods.

Target 2014/Performance Measure: Continue identification of target native vegetation, monitoring newly restored areas in 2013 for stability and effectiveness; as well as restoration of an additional 100 meters of non-native vegetation; including an area 100 meters of the western shoreline upstream of the original 2013 work area in Landa Lake and Spring Run 3. Fine sediments will be removed and restoration will be accomplished. Work with landowners other than the City- to gain access and cooperation.

Methods: Continual technical workshops will be undertaken with riparian ecologists and aquatic biologist to identify target native vegetation for use in the restoration as well as identifying potential habitat compared to occupied habitat. A technical assessment of the removal of non-native vegetation and bank stabilization will be used to produce a specific work plan to accomplish this effort. This will include establishment of sediment control structures to eliminate sediment input to Landa Lake and Spring Run 3 during restoration activities. Given the sensitive nature of beetle habitats, removal of fine sediments will be accomplished via hydrosuction that targets fine silt removal. 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 to recognize 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. The divers doing the hydrosuctioning will take the following measures to minimize

loss/harm of biota in the area. Divers will fin the area to be suctioned to encourage 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. One worker will be stationed by the air compressor and sediment bag to ensure diver safety, monitor operations, and answer public questions. It is assumed sediment removal will be accomplished through a maximum of three two-hour dive cycles each day with a one hour surface interval between dives. Disposal of removed sediment will be at a composting facility. Initial efforts will include testing the hydrosuction methods outside beetle habitat areas to refine suction nozzle size and mechanics of the removal process. Estimates of Riffle Beetle population will be based on field measurements. Program effectiveness will be determined by follow up measurements to estimate changes in population.

Monitoring: The effectiveness of establishing native riparian vegetation will be assessed near the end of 2014 with sufficient lead time to influence work plan development for 2015. Accumulation of fine sediments will be assessed in the restoration area at the same time based on visual inspection. In the event of heavy rainfall, the accumulation of fine sediments will be assessed in the following week.

Allocated funds for 2014:\$ 75,000

Estimated Budget: \$ 75,000

- \$ 2,500 Selection of Area
- \$ 20,000 Assessment and Design
- \$ 30,000 Riparian Restoration
- \$ 15,000 Fine Sediment Removal
- \$ 7,500 10% Contingency

### **5.7.1 Native Riparian Habitat Restoration**

The City of New Braunfels will continue the program to increase the area of the riparian zone along the Old Channel, the golf course, and in the vicinity of Clemens Dam. As long term plans continue to take shape for the reestablishment of the riparian zone, private and public landowners will be asked to participate in the plan. Reimbursement for the price of native plants will be provided to private and public landowners. Criteria to qualify for reimbursement will be established along with a list of preferred natives to replant developed in consultation with the New Braunfels forester.

Long-term Objective: Restore the native riparian vegetation and encourage private landowners to utilize native plants when landscaping.

Replacement of native vegetation in the previous location of the sediment island is needed as well bank stabilization. This work will be conducted in conjunction with native riparian restoration.

Assumptions: Sequencing will start with a continuation of the 2013 bank stabilization project and continuing riparian vegetation restoration along the north bluff of the Old Channel. Native vegetation restoration that will contribute to establishment of aerial vegetation targets for native species that are favorable for fountain darters.

EAHCP Science Committee – After initial design for riparian restoration is completed and prior to actual construction, the Science Committee will be consulted to ensure proposed concepts maximize the benefit to the species and for final approval of the design.

Target 2014/Performance Measure: Final implementation of bank stabilization and riparian restoration in the Old Channel adjacent to where the Sediment Island was removed. Based on methodology and equipment used for bank stabilization, it is probable that bank stabilization and riparian restoration may occur simultaneously.

Methods: Utilizing the 2013 engineering assessment of the northern bluff of the Old Channel, will be the best approach to identify further stabilization measures. This assessment will give preference to methodologies that are least disruptive to habitat and are supportive of archeological preservation. The assessment will also include preparation of the existing engineering designs; identify methods to minimize environmental impacts within the Old Channel; and supporting documentation necessary to obtain any additional permits. Riparian Restoration at a minimum will include the removal of non-native riparian vegetation species and planting of appropriate native species. Bank stabilization and riparian restoration will be initiated upon receipt of the required permits. The 2013 engineering design and potential start of construction (late 2013) will most likely be phased between 2013 and 2014 Work Plans.

Native vegetation will be planted over approximately 20 percent of the exposed area with a mixture of bryophytes, *Ludwigia* and filamentous algae harvested from Landa Lake.

Monitoring: Sediment buildup will be monitored on an annual basis or after flood events. In the event that sediment buildup is detected, then remedial sediment removal will be initiated followed by native vegetation restoration. The area will be monitored for the reestablishment of non-native vegetation and effectiveness of the native vegetation planting two weeks after treatment and then quarterly thereafter. However, as noted in the HCP (Section 5.2.2.3), following natural disturbances such as floods, periods of limited recharge, and/or herbivory, as well as anthropogenic disturbances such as recreation or vandalism, the monitoring/maintenance schedule will be modified temporarily in order to provide the stability for the native vegetation re-establishment. Monitoring will include estimated aerial coverage of native and non-native vegetation within the treated area. Any reestablished non-native vegetation will be removed during each monitoring visit and if deemed necessary, additional native vegetation will be planted. Removal of non-native vegetation will follow the same protocols as the original removal methodology. Removed vegetation will be transported to an off-site composting facility.

Allocated funds for 2014: \$ 100,000

Estimated Budget: \$100,000

\$36,000 Riparian Restoration (2<sup>nd</sup> Phase of construction)

\$44,000 Vegetation Planting (2<sup>nd</sup> Phase of construction)

\$5,000 Monitoring and Maintenance from 1<sup>st</sup> Phase of construction (2013)

\$15,000 15% Contingency (2<sup>nd</sup> Phase of construction)