

The 2015 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. As the 2014 projects move forward over the course of the year, the 2015 Work Plans will be adjusted to meet Edwards Aquifer Habitat Conservation Plan (HCP) goals and objectives.

5.2.1 Flow split management

Flow-split management is intended to compliment the ecological restoration of native aquatic vegetation in the Old Channel, by reducing long-duration high flows, meeting flow split management targets specified in the HCP –Table 5.3, and by allowing for more seasonal variability in the flow regime that mimics a more natural flow pattern. Presently, the culverts governing flow from Landa Lake into the Old Channel are inoperable, but currently under repair. As a result, a constant level of springflow can proceed through the culverts and into the Old Channel. The main objective for this Work Plan is to provide managed flows in the Old Channel.

Flow Control Structures

Long-term Objective: Maintain appropriate flow control structures to manage discharges entering the Old Channel to optimize conditions for fountain darter habitat.

Assumptions: Prior to 2014, the City of New Braunfels observed the smaller culverts (there are two) that connect Landa Lake with the old river channel under tee box two of the golf course were in serious disrepair. The areas around the outside of the pipes eroded away and needed to be reestablished to prevent lowering of Landa Lake levels as a result of dam/culvert failure.

The City of New Braunfels will have restored the original crest elevation of Landa Dam and removed accumulated sedimentation from the Landa Lake emergency spillway by summer of 2014. This will restore functionality of the structure as originally constructed, while reducing the potential for stress and damage to the gates, culverts, and associated infrastructure during high water events. The Landa Lake emergency spillway connects the lake to the Old Channel of the Comal River approximately 100 feet downstream of the gates and culverts. Design and permitting are complete and a construction contract was authorized to start construction in March 2014.

Target 2015/Performance Measure: Continue to exercise gates and perform routine maintenance for the flow control structures.

Methods: To ensure continued gate function, the City of New Braunfels will examine the gates monthly for proper function.

Monitoring: See Flow Split Management below.

Flow Split Management

Long-term Objective: Manipulate flows entering the Old Channel as specified in the HCP per Table 5-3, to optimize conditions for fountain darter habitat as controlled by operational flow control structures and real time gauge data. Provide continued maintenance on new flow control structures for long term functionality.

Assumptions: Flow-split management is contingent on fully operational flow control structures and access to real time gauge data.

Target 2015 /Performance Measure: Maintain target flow splits as controlled by proper operation and maintenance of repaired gates. Control gates are currently scheduled for repair in the 2014 work plan. The City of New Braunfels staff will operate the gates and monitor effectiveness and keep flows within the ranges defined by the HCP desired flow-split regime. Gates will be kept free of debris and exercised under a preventive maintenance program.

Methods: The City of New Braunfels staff will monitor real time flow readings from the gauges in the Comal River system and adjust flow control structures to meet the required flow split targets. The City of New Braunfels staff will observe flow control structures for the Old Channel and New Channel of the Comal River monthly, and more often if appropriate, and adjust flows based on measurements from the real-time flow gauges to maintain beneficial hydrologic conditions for habitat in the Old Channel. When total Comal Springs flow drops to 150 cfs and below, flow split structures will be operated as defined in the HCP to protect habitat within the Old Channel year-round, while continuing to allow flow in the New Channel at all times (*see* Table 5-3). Additionally, when total Comal Springs flow drops below 100 cfs, the City of New Braunfels staff will monitor and adjust if necessary the flow control structures more frequently to ensure the flow split ratio defined in Table 5-3.

**TABLE 5-3
FLOW-SPLIT MANAGEMENT FOR OLD AND NEW CHANNELS**

Total Comal Springflow (cfs)	Old Channel (cfs)		New Channel (cfs)	
	Fall, Winter	Spring, Summer	Fall, Winter	Spring, Summer
350+	80	60	270+	290+
300	80	60	220	240
250	80	60	170	190
200	70	60	130	140
150		60		90
100		60		40
80		50		30
70		50		20
60		40		20
50		40		10
40		30		10
30		20		10

Monitoring: Monitoring of daily flow split volumes will be based on information provided by the real time flow gauges in the Comal River. Proper adjustments of the control structures will be accomplished as outlined in the HCP and after major runoff events. Repairs will be immediately undertaken when necessary, but will be dependent upon safe working conditions in the field and availability of any damaged parts to the system. Trash racks at the flow control structures will be monitored on a quarterly basis and cleaned as necessary to prevent operational problems. When required, trash racks will also be cleaned after major runoff events.

Allocated funds for 2015 : \$ 0.00

Estimated Budget: \$ 5,000

\$1,500 Routine cleaning of trash racks and Inspections

\$3,500 – Repair and Maintenance (as needed)

5.2.2.1 Old Channel Restoration

The City of New Braunfels will continue to assess remaining non-native vegetation and monitor restored native habitat for all 2014 projects that are completed. Additionally, the City of New Braunfels will continue to do limited channel modifications to enhance fountain darter habitat where applicable in the remaining areas of the Old Channel downstream to Hinman Island Drive above the confluence with the New Channel of the Comal River.

Old Channel Non-native Vegetation Removal and Maintenance

In addition to continued monitoring and maintenance (gardening) of restored native vegetation from the Sediment Island downstream to Elizabeth street, channel restoration in 2015 will include non-native vegetation removal and subsequent native vegetation

restoration, maintenance and gardening in select areas 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 aquatic vegetation and establish favorable native aquatic vegetative species to the maximum extent possible.

Assumptions: Restoration of native aquatic vegetation will be accomplished in select areas of the Old Channel through the Horseshoe bend (approximately 2,400 feet downstream of Elizabeth Street) and will involve the removal of non-native aquatic vegetation, planting of native aquatic vegetation and repeated gardening and supplemental plantings of previous areas upstream. This effort will continue until the proportional native and non-native targets outlined in Table 4-6 of the HCP according to funds appropriated in Table 7.1 of the HCP.

**TABLE 4-6
GOALS—FOUNTAIN DARTER HABITAT (AQUATIC VEGETATION) (m²)**

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

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

Target 2015 /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 model results have been used in the 2013/2014 and will continue to be used in the 2015 to evaluate the potential for success of the native aquatic 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 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. Native vegetation for

plantings will consist of vegetation grown within the Landa Lake MUPPT nursery or from direct transplants within the Comal system. 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 routinely monitored for the reestablishment of non-native vegetation and effectiveness of the native vegetation planting. Once native aquatic vegetation is established in an area, monitoring will be conducted on a less frequent basis.

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 2015:\$ 175,000

Estimated Budget:\$ 175,000

\$175,000 Native Aquatic Vegetation Restoration – Old Channel

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

The City of New Braunfels will continue their 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 aquatic vegetation preferred by fountain darters. The City of New Braunfels will continue to coordinate with the 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 continued removal of non-native aquatic vegetation throughout Landa Lake, while establishing additional *Cabomba* along the eastern shoreline of Landa Lake and along the New Braunfels' golf course property; establishing additional *Sagittaria* in shallower portions of Landa Lake; and establishing *Ludwigia* in upper sections of Landa Lake. In addition, in 2015, select locations in the New Channel of the Comal River will be evaluated for potential restoration activities. Restoration of native aquatic vegetation in the Old Channel is covered under the 2015 work plan 5.2.2.1.

- Target 2015/Performance Measure: Identification of target non-native aquatic vegetation removal areas and implementation of native aquatic restoration of ~1,250 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 model results will continue to be used 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 adjacent to the site where qualified personnel will examine the plants for fountain darters (eggs through adults). Fountain darter life stages will be returned to the Lake/River. Native vegetation for plantings will consist of vegetation grown within the Landa Lake MUPPT nursery or from direct transplants within the Comal system. A variety of native vegetation (*e.g.*, *Ludwigia*, *Sagittaria*, *Cabomba*, and bryophytes) 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 routinely monitored for the reestablishment of non-native vegetation and effectiveness of the native vegetation planting. Once native aquatic vegetation is established, monitoring will be conducted on a less frequent basis. However, if monitoring suggests continued gardening and/or supplemental planning is required, this will continue as needed.

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.

Allocated funds for 2015:\$ 125,000

Estimated Budget:\$ 175,000

\$175,000 Native Aquatic Vegetation Restoration – Landa Lake / Comal River involves redistributing **\$50,000** from the 2015 Gill Parasite budget to more efficiently use resources to enhance fountain darter habitat in the Comal system.

5.2.3 Management of Public Recreation

Public recreational use of the Comal 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 New Braunfels will continue to expand their existing recreation control measures as specified in Section 5.2.3.(1)of the HCP. The City of New Braunfels will enforce these measures (as covered in various sections of the HCP) to ensure their success.

Long-term Objective: To maintain and continue to expand the voluntary Certificate of Inclusion Program (COI) for all outfitters utilizing the Comal River; while utilizing opportunities to educate the public about the Endangered Species and importance of their protection.

Assumptions: This measure was not specifically funded for FY 2014. The COI is voluntary and is established per the 2013 Work Plan. The 2014 goal is to obtain participation by a majority of the outfitters utilizing the Comal River.

Target 2015/Performance Measure: Continue to inform Outfitters of the benefits to their businesses from participating in the COI program and initiation of the program. Continue

to recruit any Outfitters that are associated with the City of New Braunfels and the Comal River.

Methods: The City will utilize its existing public input process to continue with the COI application, criteria and program administration. The COI will include the minimum requirements as specified in Section 5.2.3 (2) a-h.

Monitoring: The City of New Braunfels staff will collaborate with all COI participants and report on the program annually.

Allocated funds for 2014: \$ 0

Estimated Budget: \$1000
\$1000 – Advertise COI program

5.2.4 Decaying Vegetation Removal and Dissolved Oxygen Management

To minimize and mitigate the impact of incidental take from low-flow events, based on real time monitoring of dissolved oxygen (DO) levels in Landa Lake indicating a water quality concern created by decaying vegetation, the City of New Braunfels will continue to manage the DO management program. The program will be focused on ensuring adequate DO levels for the ecosystem regardless of the initiating circumstances.

Long-term Objective: Maintain acceptable levels of DO within Landa Lake and the Old Channel and minimize the impacts associated with decaying vegetation (or other factors).

Assumptions: Section 5.2.4 of the HCP implied the initiation of these actions when total Comal River discharges fall below 80 cfs. However, it is assumed that whenever low DO is evident regardless of the Comal River flows, remedial actions identified below are to be undertaken. Two portable Aerators have been installed in Landa Lake and are utilized when low DO levels are identified.

Target 2015/Performance Measure: Continue to monitor real time water quality monitoring devices in Landa Lake and maintain equipment to assist in DO management.

Methods: In 2013, real time water quality monitoring systems have been installed in Landa Lake and measures dissolved oxygen, temperature, pH, conductivity and turbidity. Since a real time water quality monitoring station has been established in the main body of Landa Lake in the vicinity of the Old Channel flow control structure; real time telemetry data will be connected to a computer system at the City of New Braunfels for monitoring water quality conditions. This is accomplished using wireless technology. The Comal River website will display data being collected in real time within the Comal River.

In 2013, two solar powered aeration systems were installed in Landa Lake. The solar powered aerators are based on a target area of approximately 10 acres (i.e., ~ 70 percent of Landa Lake). Continual testing involves an initial measurement of the diel oxygen profiles for several days during the summer to establish a baseline and then running the units for several days and monitoring the effective changes in the oxygen profiles. Based on these tests, a determination of whether additional units or location changes may be necessary. The units will then be stored for deployment in the event conditions warrant it.

If predicted or observed dissolved oxygen diel patterns are trending toward less than 4 mg/l (or other trigger/criteria as established through the Adaptive Management Process) the solar powered aeration units will be deployed. Vegetation conditions will then be evaluated via visual observations for signs of stress or decay on a weekly basis. If vegetation decay is evident and the aeration system is not able to keep oxygen levels above target thresholds, then mechanical removal of decaying vegetation will be initiated or other comparable management strategies will be developed based on specific conditions. In the event of mechanical vegetation removal, vegetation will systematically be examined for covered species and the species salvaged and returned to the system. Removed vegetation will be disposed offsite at a compost facility.

Monthly Monitoring: Real time dissolved oxygen and temperature will be monitored to evaluate projected trends indicative of problematic temperature or oxygen levels. Vegetation in Landa Lake will be monitored on a monthly basis during the May through September period to assess overall conditions and apparent stress levels (i.e., leaf coloration and condition). In the event projected trends of problematic oxygen levels are observed, then vegetation conditions will be evaluated via visual observations for signs of stress or decay on a weekly basis.

Allocated funds for 2015:\$ 15,000

Estimated Budget: \$ 15,000
\$ 12,750 Monitoring/Maintenance
\$ 2,250 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 2013/2014 results / determinations in the field.

Target 2015/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. Identify Turtle nesting habitat as it relates to consumption of the invasive Giant Rams Horn snails in Landa Lake.

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 gigging 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 has undertaken measures to stop or substantially reduce the introduction of non-native species from aquarium dumps and establish the range of prohibition of live bait species.

The City of New Braunfels will continue to educate and promote awareness, targeting specifically the practice of releasing aquarium trade species into the Comal system.

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 continue to consult with relevant resources such as TPWD and USFWS to determine which native species may be used as bait for fishing locally, that do not present a threat to the Endangered Species. This

information will be used to provide a continual updated list 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 Comal River ecosystem.

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

Target 2015/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 will continue to be utilized.

2014 involved the process for NB City Council that will consider adoption of a City ordinance that would prohibit the introduction of domestic and non-native aquatic organisms, prohibiting specific bait species and aquarium trade dumps.

Methods: Expand on educational materials and outreach materials that are designed 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 followed 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: \$ 75,000

Total Estimated Budget: \$ 75,000

\$2,000 Signage and Educational Materials

\$65,500 Species Control

\$7,500 - 10% 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*) and *Melanoides* long-term monitoring .

Long-term Objective: Effective monitoring of gill parasite concentrations and host snail counts to minimize their threat to the fountain darters and other Covered Species within the Comal system.

Assumptions: The focus in 2015 will be on continued monitoring of water column cercaria along established transects and conducting an annual system-wide inventory of *Melanoides* distribution and density. Cercarial concentrations will continue to be monitored in established transects along the Comal River annually, and more frequently when spring flow drops below 100 cfs or other springflow triggers that are developed.

Target 2015/Performance Measure: Continue system-wide snail distribution and density estimates and continuation of the existing gill parasite monitoring program.

Methods:

It is anticipated that methods used in 2014 to conduct the annual *Melanoides* distribution and density survey will be used for 2015 monitoring. Two fisheries biologist using dip nets will traverse the entire Comal System recording the location of dip net sweeps and number of snails collected within each sweep. Water column cercarial concentration sampling will be conducted annually across the channel at the established 2014 transects. A total of 10 samples will be targeted at each cross section unless complex hydraulics suggests a higher spatial sampling. 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 contractors laboratory where the number of cercariae on each filter will be counted with the aid of a dissecting microscope. Cercarial concentrations will be monitored more frequently when spring flow declines below 100 cfs or other springflow triggers that are developed.

Allocated funds for 2015: \$ 75,000

Estimated Budget: \$ 25,000

It is recommended that \$50,000 be transferred from 2015 Gill Parasite activities to Landa Lake / Comal River native aquatic vegetation restoration activities to most efficiently use the HCP allocated funds.

5.2.7 Prohibition of Hazardous Materials Transport Across the Comal River and Its Tributaries

The City of New Braunfels will continue coordination with the Texas Department of Transportation (TXDOT) to promote prohibited transportation of hazardous materials on routes that cross the Comal River and its tributaries. This effort may include refinement of City of New Braunfels ordinances, additional signage, and TXDOT approval.

Long-term Objective: Continue to identify and eliminate hazardous materials transport across the Comal River and its tributaries.

Assumptions: This effort will involve continual stakeholder engagement, public meetings, and coordination with TXDOT to follow the TXDOT guidelines. This work plan element is contingent on TXDOT continuous participation and support.

Target 2015 Performance Measure: Expanding the existing process of identification of smaller roadways and alternate routes that cross the Comal River and its tributaries. These routes pose an eventual threat to the endangered species and the need for refinement to the existing Hazardous Material prohibition transport plan, will provide safer transport across the Comal River and its tributaries.

Methods: Continue to expand and identify alternate transport routes that cross the Comal River and its primary tributaries that require protection and therefore prohibition. This information will be used to initiate public meetings, drafting and approval of City ordinances, and continuing coordination with TXDOT.

Monitoring: Annual monitoring of all installed signage will be undertaken and repair or replacement as necessary.

Allocated funds for 2015 :\$ 0.00

Estimated Budget:\$ 3,000
\$ 3,000 - Signage and Education

5.2.8 Native Riparian Habitat Restoration (Comal Springs Riffle Beetle)

The City of New Braunfels will continue restoration of 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 adjacent to Spring Run 3. Establishment of beneficial native riparian species for Comal Springs riffle beetles.

Assumptions: It is assumed that this effort will continue to focus on the identification of target native riparian species most beneficial for Comal Springs riffle beetles that also meet erosion control requirements and the subsequent removal and establishment of native vegetation in the upstream 100 meters of target areas of Landa Lake and Spring Run 3 and proceeding north into private property lots (along the waters edge). 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 2015/Performance Measure: Continue identification of target native vegetation, monitoring newly restored areas in 2014 for stability and effectiveness; as well as potential restoration of additional areas of the western shoreline upstream of the original 2013/2014 work area in Landa Lake and Spring Run 3 onto private property lots. Collaboration with landowners other than the City to gain access and cooperation will be undertaken in late 2014/early 2015.

Methods: Continual technical workshops will be undertaken with riparian ecologists and aquatic biologist to identify target native vegetation for use in the restoration. 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, additional implementation of BMPs in Panther Canyon will be considered for future consideration.

Monitoring: The effectiveness of establishing native riparian vegetation will be assessed near the end of 2015 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:\$ 50,000

Estimated Budget: \$ 50,000

\$ 45,000 Riparian Restoration

\$ 5,000 10% Contingency

5.2.10 Litter and Floating Vegetation Control

The City of New Braunfels will perform activities to manage floating vegetation and litter removal to enhance habitats for Covered Species. Management activities will include dislodging of vegetation mats, to allow continued movement downstream, that form on top of the water surface, particularly during low flows, and removal of litter for the littoral zone and stream bottom. The City of New Braunfels will manage aquatic vegetation in Landa Lake by removing floating vegetation that is entrained on the flow control structures, fishing piers, Spring Island, Landa Park Drive Bridge and other areas where mats collect. Litter removal in Landa Lake and the Comal River will continue under the existing City of New Braunfels program.

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

Assumptions: Litter and floating vegetation mat removal will follow the existing protocol and schedules currently employed by the City of New Braunfels as described below.

Methods: Currently the City of New Braunfels contracts with a private contractor for removal of litter and dislodging of floating weedmats from Landa Lake, the Comal River and the Guadalupe River. Those contracts are renewed annually and in 2012 were set at a cost not to exceed \$160,000 and include numerous mechanisms to reduce cost and scope mid season. SCUBA collections on the Comal River were added in 2007 as a pilot program and in 2008 as part of the contracts. SCUBA was added to protect the underwater habitat in the Comal River. Also in 2008, litter collection in Landa Lake was added to specifically

protect species habitat. The City of New Braunfels cooperated with the USFWS to implement litter collections in Landa Lake. These additional expenditures have been voluntary on the part of the City of New Braunfels in past years, but now are mandatory based on requirements in the HCP Section 5.2.10. It is possible that without funding from the HCP, this mitigation action would be continued to be unfunded in 2015. Funds previously committed for litter collection by the City of New Braunfels will be allocated for flow control work in 2014.

All litter removal and weedmat dislodging in Landa Lake is associated with protection of resource (species habitat), as there is no tubing recreation in Landa Lake. Underwater collection (SCUBA) in the Comal River is associated with resource protection (species habitat), however above water collection on the Comal River is a direct result of tubing activities. Collections on the Guadalupe River have no relevance to the HCP or species protection. Therefore only costs associated with Landa Lake and underwater Comal River collections will be included in HCP activities and budgets.

Target 2015/Performance Measure: Continued implementation of the established protocols.

Methods:

Landa Lake - (May 1st to September 30th). Vegetation maintenance and liter pickup during the non-recreation season is on an as needed basis. Floating vegetation mats will be dislodged from flow control structures and other locations.

Comal River – (May 1st to September 30th). Vegetation maintenance and liter pickup during the non-recreation season is on an as needed basis. Floating vegetation will be pushed downstream and inorganic litter will be picked up from the substrate, surface and littoral zone of the Comal River in the Old Channel and from the New Channel downstream to below the last tuber takeout point during the recreational season.

Monitoring: City of New Braunfels staff will monitor the contractor for compliance and initiate additional action when deemed necessary.

Allocated funds for 2015: \$ 0

Estimated Budget:\$40,000

\$37,500 Underwater Litter Collection (22 weeks, Comal River and Landa Lake)
\$2,500 Weed Mat Clearing (34 weeks)

5.2.11 Golf Course Management and Planning

The City of New Braunfels will implement their existing Integrated Pest Management Plan (IPMP) for Landa Park Golf Course. This process will incorporate public input and the Golf Course Advisory Board. The golf course IPMP will incorporate environmentally sensitive techniques to minimize chemical application, continue to 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 Landa Lake and the Comal River.

Assumptions: The Landa Park Golf Course will continue to implement their existing IPMP and make adjustments to the plan as needed.

Target 2015/Performance Measure: Implement the existing IPMP using continual Public Input process.

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 new IPMP. The IPMP 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.

Monitoring: Each year the City of New Braunfels Watershed Manger in cooperation with the Golf Course Manager will report to the HCP detailed information on all pertinent activities during the year.

Allocated funds for 2015: \$ 0

Estimated Budget: \$1000

\$ 1000 - Educational Materials and Signage (along Riparian areas)

5.7.1 Native Riparian Habitat Restoration

The City of New Braunfels will initiate a riparian restoration program to enhance 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 City Forester.

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

Restoration of native riparian vegetation in the previous location of the sediment island is needed to support the bank stabilization effort currently underway.

Assumptions: Sequencing will start with the completion of the bank stabilization project and continue with riparian vegetation restoration along the north bluff of the Old Channel. Native riparian vegetation restoration should be conducted to maximize the interactions of shading/light with the extensive native aquatic vegetation efforts being conducted in this reach to create direct habitat for fountain darters.

EAHCP Science Committee – As part of the bank stabilization effort, after initial design for riparian restoration is completed and prior to actual construction, the HCP Science Committee and Native Aquatic Vegetation Restoration Contractor will be consulted to ensure proposed concepts maximize the benefit to the species and for final approval of the design.

Target 2015/Performance Measure: The first step is the final implementation of bank stabilization and riparian restoration in the Old Channel adjacent to where the Sediment Island was removed. The remaining riparian restoration to be conducted along the Old Channel in conjunction with the native aquatic vegetation restoration work to maximize benefit to the fountain darter.

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.

Monitoring: The effectiveness of establishing native vegetation will be assessed near the end of 2015 with sufficient lead time to influence work plan development for 2015.

Allocated funds for 2015: \$ 100,000

Estimated Budget: \$100,000

\$25,000 Riparian Restoration

\$55,000 Vegetation Planting

\$5,000 Monitoring and Maintenance from 1st Phase of construction (2014)

\$15,000 15% Contingency

5.7.5 Management of Household Hazardous Wastes

The City of New Braunfels will continue the hazardous household waste (HHW) program that includes accepting prescription drugs and Freon, through the TCEQ and/or the waste disposal division of the City of New Braunfels. The City of New Braunfels will establish a four-times-a-year program that could be recognized in the City's MS4 compliance and storm water permit as a contributing activity.

Long-term Objective: Reduction in the improper disposal of hazardous wastes and incorporation of prescription drug and Freon drop off.

Assumptions: This effort will employ the existing program in place by the City of New Braunfels but include an expansion of public outreach, frequency and add additional scheduled efforts.

Target 2015/Performance Measure: Implementation of increased public outreach and education and addition of additional drop off event or events.

Methods: Public outreach and education will be increased in association with the increased scheduled drop off effort.

Monitoring: The amount and number of pickups will be noted and compared against historical efforts.

Allocated funds for 2015: \$ 30,000

Estimated Budget: \$ 30,000

\$2,000 Outreach

\$25,000 Additional Collection Events

\$3,000 10% Contingency

5.7.6 Impervious Cover/Water Quality Protection/LID

The City of New Braunfels will expand criteria related to desired impervious cover, provide incentives to reduce existing impervious cover on public and private property in New Braunfels, and implement BMP's associated with stormwater runoff in the area of Landa Lake and the Springruns. The City of New Braunfels will implement program based

upon the low impact development (LID)/Water Quality Work Group Final Report recommendations for Implementation Strategies and best management practices (BMPs). This Work Plan element includes development of the program and an incentive program for implementation.

Long-term Objective: Reduction and control of non-point source runoff in the Comal River system.

Assumptions: The primary focus of the is implementation of criteria, identification of specific BMPs, program guidance, and implementation strategy based on the LID/WQ Work Group Report from 2013. The efforts will focus on the identification of implementing the incentive program and identification of target program elements such as public education and outreach, rainwater harvesting, reduction of impervious areas, and other BMPs that would qualify for incentives. This effort will involve a stakeholder process followed by public outreach and education that outlines the incentive program and mechanisms for its implementation. It should be noted that the existing HCP budgets assume no BMP dollars in Year One. Given the public driven process, actual BMP design and implementation will not begin until Year Two and Three.

Target 2015/Performance Measure: Implementation of the program and strategy in conjunction with current MS4 process underway in the City of New Braunfels to incorporate a funded LID and impervious rebate/incentive and education program. BMP's developed as part of this program will include practices that directly benefit the lake and springs systems and are well above and beyond the features of the City's standard MS4 program.

Methods: The LID/WQ Work Group Report will continue to serve in developing of the existing program and implementation strategy. A public process will be continuous to provide for stakeholder input, implementation of the program elements and implementation strategy. As a public entity, the City of New Braunfels will utilize its own program to receive rebates for implementing BMP's associated with stormwater runoff in the area of Landa Lake and the Spring runs.

Monitoring: It is assumed that the WQ monitoring program of the HCP covered under other work elements will provide data for assessing the effectiveness of this measure.

Allocated funds for 2015: \$ 100,000

Estimated Budget: \$ 100,000

- \$ 5,000 Program Development
- \$ 90,000 Implement Program
- \$ 5,000 5% Contingency

City of New Braunfels - HCP Budget

HCP Section	Mitigation Action	HCP Budget	Estimated FY2015
5.2.2.1	Old Channel Restoration	175,000	175,000
5.2.1	Flow split management	0	5,000
5.2.2/5.2.3	Aquatic vegetation restoration	125,000	175,000
5.2.5/5.2.9	Non-native animal species control	75,000	75,000
5.2.4	Decaying vegetation removal	15,000	15,000
5.2.8	Native Riparian / Riparian improvement - riffle beetle	50,000	50,000
5.2.6/6.3.6	Gill parasite control	75,000	25,000
5.7.1	Restoration of riparian zones	100,000	100,000
5.2.7	Prohibition of hazardous material routes	0	3,000
5.7.6	Incentive program for LID/BMP stormwater management	100,000	100,000
5.7.5	Household hazardous waste program	30,000	30,000
5.2.3	Management of public recreation use	0	1,000
5.2.10	Litter control and floating vegetation management	0	40,000
5.2.11	Golf Course Management Plan	0	1,000

Totals 745,000 795,000