

5.2.2.2/5.2.2.3 Comal River Restoration and Maintenance

Long-term Objective:

To decrease density of invasive, non-native aquatic vegetation and establish favorable native aquatic vegetation within Landa Lake and select portions of the Comal River to increase useable fountain darter habitat.

Target for 2017:

In late 2015, the EAA began an analysis of the submerged aquatic vegetation for the Comal River system including the Old Channel. The goal of this analysis is to establish a timeline, including annual goals, to achieve the vegetation restoration Biological Goals set forth in the EAHCP, and to use lessons learned from field experience in the first years of implementation, to modify existing methodologies. This analysis is expected to be completed in the summer of 2016. All methodologies pertaining to Old Channel aquatic vegetation restoration activities are pending until decisions are made in regards to the submerged aquatic vegetation analysis.

Monitoring:

Each area in which non-native vegetation has been removed will be routinely monitored for the re-establishment of non-native vegetation and effectiveness of the native vegetation plantings. 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. Vegetation mapping will be conducted to assess progress of aquatic vegetation restoration efforts.

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. Where possible, landowners immediately adjacent to Landa Lake and the Upper Spring Run area will be informed of aquatic restoration efforts in order to promote awareness and minimize negative impacts associated with recreation and/or maintenance. Any re-established non-native vegetation will be removed during each monitoring visit and if deemed necessary, additional native vegetation will be planted.

Budget:

Table 7.1:

\$100,000

Estimated 2017 budget:

\$100,000

5.2.4 Decaying Vegetation Removal and Dissolved Oxygen Management

Long-term Objective:

Maintain acceptable levels of DO within Landa Lake and minimize the impacts associated with decaying vegetation (or other factors).

Assumptions: It is assumed that the Edwards Aquifer Authority will calibrate and maintain an index site(s) for monitoring and observing real-time dissolved oxygen levels at strategic locations within Landa Lake. DO data collected by the EAA will be shared with the City of New Braunfels to help inform management decisions. The continued dislodging of floating vegetation mats from Landa Lake is dependent on continued funding of Task 5.2.10: Litter Collection and Floating Vegetation Management.

Target for 2017:

Develop a comprehensive DO management plan for Landa Lake. The management plan will include an evaluation of existing DO data and research and will identify feasible mitigation strategies that can be implemented in Landa Lake during periods of depressed DO. The City of New Braunfels will continue to operate existing aerators when DO concentrations, as measured in Landa Lake, fall below 4 mg/l. The efficiency and suitability of the existing aerators to increase DO concentrations during periods of low springflow will also continue to be evaluated in 2017.

Methods:

The City of New Braunfels will solicit professional assistance for, and engage in, the development of a comprehensive DO management plan for Landa Lake. The plan will include the analysis of all existing DO data and research to help predict DO concentrations during low-flow periods based on the minimum total Comal discharge management objectives set forth in Table 4-2 of the HCP. The plan will also include an evaluation of the linkage between observed fountain darters and DO measurements collected as part of the EAHCP Biological Monitoring Program and EAA Variable Flow Study. Feasible and cost-effective DO mitigation strategies will also be researched, evaluated, and included in the management plan. The management plan will be intended to guide the City of New Braunfels in achieving compliance with Task 5.2.4 of the HCP. If predicted or observed dissolved oxygen diel patterns are trending toward less than 4 mg/l the solar-powered aeration units will be deployed by City of New Braunfels staff.

Aquatic vegetation conditions and floating vegetation mats will be visual observed for signs of stress or decay on a weekly basis. If vegetation decay is evident and floating vegetation mat coverage reaches critical levels, then removal of decaying vegetation will be considered or other comparable management strategies will be developed based on specific conditions.

Monitoring:

Real-time dissolved oxygen and temperature will be monitored to evaluate projected trends indicative of problematic temperature or oxygen levels. Vegetation and floating vegetation mats in Landa Lake will be monitored on a weekly basis during the May

through September period to assess overall conditions and apparent stress levels (i.e., leaf coloration and condition).

Budget:

Table 7.1:

\$15,000

Estimated 2017 budget:

\$15,000

DRAFT

5.2.5/5.2.9 Non-Native Animal Species Control

The City of New Braunfels will continue to implement a program to reduce non-native animal species in the Comal River system. The non-native animal species that will be targeted include the suckermouth armored 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.

Long-term Objective:

Reduce populations of non-native animal species to minimize their direct and indirect impacts to the Covered Species and the Comal River ecosystem.

Assumptions: The HCP Biological Monitoring program will continue to track populations of targeted invasive, non-native species. Data collected as part of this program will be utilized to guide and refine invasive species removal efforts.

Target for 2017:

Continue existing program to remove non-native invasive species, including tilapia, nutria, and suckermouth armored catfish from the Comal River system utilizing removal methods proven successful in previous years. Continue to record counts and biomass of removed species.

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 continue its nutria trapping program. 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. All removed non-native species will be disposed of offsite following City of New Braunfels policies.

Monitoring:

The HCP Biological Monitoring program will assess the status of non-native species populations and the impact of non-native removal to the Covered Species.

Reduction of Non-Native Species Introduction and Live Bait Prohibition

Long-term Objective:

Minimize the introduction of non-native species to the Comal River system.

Assumptions: The City of New Braunfels will explore the potential for implementing an education and outreach program aimed at educating and informing residents and visitors on the negative impacts of aquarium dumping and live bait usage. It is assumed education

methods will provide more benefit than the implementation of ordinances and prohibitions regarding aquarium dumping and live bait usage.

Target for 2017:

Develop and implement a program to educate residents and visitors on the negative impacts of aquarium dumping and usage of specific live bait species. Education and outreach will be achieved by distributing educational information and installing signage at key locations at Landa Lake and the Comal River. TPWD education materials and programs will be consulted and utilized.

Methods:

Distribute education and outreach materials designed to inform the public of the impacts of invasive species on the Comal River ecosystem. TPWD programs regarding the introduction of non-native, invasive species will be assessed and potentially utilized.

Monitoring:

It is anticipated that the HCP Biological Monitoring 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.

Budget:

Table 7.1:

\$75,000

*\$20,000 transferred from the Non-Native Animal Species Control task to fund Bank Stabilization and Riparian Restoration project in 2016.

Estimated 2017 budget:

\$55,000

5.2.6/6.3.6 Monitoring and Reduction of Gill Parasites

The City of New Braunfels will continue to implement a monitoring program associated with the gill parasite (*Centrocestus formosanus*) and its intermediate host snail *Melanoides tuberculatus*.

Long-term Objective:

To conduct monitoring and acquire data regarding gill parasite cercariae water column concentrations, fountain darter infection rates, host snail density and distribution, and gill parasite hosts to determine potential threats to fountain darters and other Covered Species within the Comal system. Develop management measures, as needed, to minimize negative impacts to fountain darter populations caused by gill parasites.

Target for 2017:

Continue existing monitoring program including snail distribution and density monitoring, cercariae water column concentration monitoring and snail infection prevalence.

Methods:

It is anticipated that methods used in previous years (2014-2016) to conduct annual *Melanoides* distribution and density surveys will be utilized in 2017. 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 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 contractor's 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.

Budget:

Table 7.1

\$75,000

*\$45,000 transferred from the Gill Parasite Control task to fund Bank Stabilization and Riparian Restoration project in 2016.

Estimated 2017 budget:

\$ 30,000

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

The City of New Braunfels will continue to promote the prohibition of the transport of hazardous materials on routes crossing the Comal River and its tributaries. This effort may include development of local ordinances, installation of additional signage, and TXDOT approval.

Long-term Objective:

To minimize the potential for accidental spills or releases of hazardous materials into the Comal River system that may cause negative impacts to the Covered Species.

Target for 2017:

Maintain signage installed in 2016 and monitor for the presence of trucks carrying hazardous cargo on routes crossing the Comal River and its tributaries.

Methods:

In 2016, the City of New Braunfels reviewed existing City ordinances and concluded that Ordinance No. 93-7 effectively restricts the transport of hazardous cargo within Loop 337 and IH-35 and therefore, over roadways crossing the Comal River. The installation of additional hazardous route prohibition signage at key roadways near the headwaters of Landa Lake and the Comal River is expected to have been completed by the end of 2016.

Monitoring:

The City of New Braunfels Police Department will monitor for trucks carrying hazardous cargo on prohibited routes.

Budget:

Table 7.1:

\$0

Estimated 2017 budget:

\$0

5.2.8 Native Riparian Habitat Restoration (Comal Springs Riffle Beetle)

The City of New Braunfels will continue to implement a program to restore and maintain native riparian zones along Spring Run 3 and the western shoreline of Landa Lake to benefit the Comal Springs Riffle Beetle. Upon establishment of riparian zones on City of New Braunfels property, the City may develop a program to provide funding and incentives to riparian landowners who wish to establish native riparian vegetation on privately-owned lots located along the Western shoreline of Landa Lake.

Long-term Objective:

Establish a healthy, functioning riparian area along Spring Run 3 and the western shoreline of Landa Lake to benefit the Comal Springs Riffle Beetle. Establish native riparian vegetation to increase the stability of the bank, decrease erosion/ sedimentation, and increase the amount of usable habitat and food sources.

Assumptions: It is assumed this effort will continue to focus on the identification of target native riparian species most beneficial for the Comal Springs Riffle Beetle that also meet erosion control requirements. The target area for subsequent removal and establishment of native vegetation is the upstream 100 meters of Landa Lake and Spring Run 3 and proceeding north into private property lots (along the waters edge). It is assumed 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 work undertaken in previous years.

Target for 2017:

Continue to maintain previously restored areas along Spring Run 3 and the Western shoreline of Landa Lake. Continue removal of non-native vegetation and planting of native riparian vegetation. Continue to monitor recently restored areas for stability and established vegetative growth.

Methods:

Continue the removal of non-native, invasive plant species within the riparian zone. Plant deer-resistant, native plant species in Spring and Fall in areas where vegetation is sparse or not present. Plantings will be focused immediately along the waters' edge and in areas immediately up gradient of the shoreline. Utilize native plant species which have been observed in the immediate area and have proven successful in previous planting efforts. Install erosion/ sediment control devices, as needed in areas lacking sufficient vegetation and stability, to control hillside erosion and resulting sedimentation to riffle beetle habitat areas. Install fencing around young plants, as needed, to control foraging and damage by wildlife. Irrigation lines were installed in previous years and will be utilized and maintained, as necessary, to increase the survivability of plantings.

Monitoring:

Monitoring will occur on a regular basis to assess the survivability of plantings and the presence of non-native vegetation. Planting plots have been mapped and are utilized to

track the success of plantings in specific locations. Methods will be revised, as needed, based on results of monitoring. In the event of heavy rainfall, the erosion and sedimentation will be assessed in the following week. Sediment control devices will be monitored to assess effectiveness and stability. Sediment captured behind the control devices will continue to be measured and total volume quantified. The HCP Biological Monitoring program will track riffle beetle populations within Spring Run 3 and along the western shoreline of Landa Lake. Data collected as part of the biological monitoring program will be utilized to determine locations for focusing riparian zone restoration activities.

Budget:

Table 7.1:

\$25,000

Estimated 2017 budget:

\$25,000

DRAFT

5.2.10 Litter and Floating Vegetation Control

The City of New Braunfels will continue ongoing activities to manage floating vegetation and litter removal to enhance Covered Species and to prevent accumulations above and within aquatic vegetation restoration areas. Management activities will include dislodging of vegetation mats, to allow continued movement downstream, that form on top of the water surface and removal of litter for the littoral zone and stream bottom. The City of New Braunfels will manage aquatic vegetation in Landa Lake by dislodging floating vegetation entrained on the flow control structures, fishing piers, Landa Park Drive Bridge and other locations within Landa Lake where vegetation mats and litter accumulate.

Long-term Objective:

Minimize impacts of floating vegetation and litter on the overall aquatic community within the Comal River system.

Background:

Currently the City of New Braunfels contracts with a private contractor for the removal of litter and dislodging of floating vegetation from Landa Lake, the Comal River and the Guadalupe River. 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 unfunded in 2017.

All litter removal and vegetation dislodging in Landa Lake is associated with protection of Covered 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 for 2017:

Continue efforts to remove litter and dislodge floating vegetation mats from applicable portions of the Comal River system to prevent negative impacts to flow control structures, aquatic restoration areas, and Covered Species habitat. In the event of low-flow conditions or receipt of depressed dissolved oxygen levels in Landa Lake, the removal of, and/or increased efforts to dislodge, floating vegetation mats may be initiated to prevent oxygen consumption by decaying vegetative material.

Methods:

Landa Lake: (Jan 1st to December 31st). Routine vegetation maintenance and litter removal will occur from Jan 1st to December 31st. Vegetation maintenance and litter

removal will occur on a scheduled basis between March and September and on an as-needed basis during the remainder of the year. Floating vegetation mats will be dislodged from flow control structures, the Three Islands area, fishing pier and other locations where vegetation mats accumulate.

Comal River: (April 1st to October 30th). Vegetation maintenance and litter pickup from May 1st to September 30th is on a scheduled basis. Floating vegetation will be dislodged and inorganic litter will be picked up from the substrate, surface and littoral zone of the Old Channel. Underwater litter in the New Channel from the NBU Hydroelectric dam downstream to below the last tubers exit will be removed utilizing SCUBA.

Monitoring:

City of New Braunfels staff will monitor litter and floating vegetation mats in applicable areas. City staff will monitor contractor efforts and coordinate additional efforts when deemed necessary.

Budget:

Table 7.1:

\$0

Estimated 2017 budget:

\$30,000

*\$30,000 transferred from 2017 Impervious Cover/Water Quality Protection to fund Litter and Floating Vegetation Management. Budget consists of contract which includes dislodging floating veg-mats (\$20,000), underwater litter collection (\$5,000), and litter removal with in the Old Channel (\$5,000).

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 for 2017:

Continue to implement and update the existing IPMP.

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 describes 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:

The EAHCP Water Quality Monitoring Program includes base flow and storm sampling at designated locations along the Comal River both up- and downstream of the Landa Park Golf Course. Samples are analyzed for various herbicides and pesticides. Detections of pesticides and herbicides utilized for golf course maintenance operations may warrant the need for revisions to the existing IPMP.

Budget:

Table 7.1:

\$0

Estimated 2017 budget:

\$0

5.7.1 Native Riparian Habitat Restoration

Long-term Objective:

Increase the area and density of native riparian vegetation, reduce non-native riparian vegetation, and prevent streambank erosion in areas immediately adjacent to the Comal River to compliment aquatic vegetation restoration efforts and improve water quality.

Target for 2017:

Monitor and maintain previously restored riparian areas along the Old Channel of the Comal River between Landa Lake and the Golf Course Road bridge crossing (i.e. maintenance of riparian restoration that occurred as part of the Bank Stabilization and Riparian Restoration project in 2016). Remove non-native riparian vegetation along the Old Channel of the Comal River between Golf Course Road and the Old Channel Index Reach. Removal of non-native vegetation and select native vegetation will first be targeted to locations that will increase solar penetration and compliment aquatic vegetation restoration efforts. Install erosion control structures along channel utilizing removed non-native vegetation.

Methods:

Riparian restoration occurring in 2016 as part of the Bank Stabilization and Riparian Restoration project will be monitored and maintained to ensure success of native plantings and prevention of non-native vegetation re-emergence.

Non-native riparian vegetation (primarily *Ligustrum sp.*) will be removed utilizing herbicide applications and hand-removal methods. Removed vegetation will be utilized to form sediment capture zones in riparian areas with high erosion potential. In areas where riparian vegetation consists of only non-native species, a portion of the non-natives will be left in place until native species are planted in order to minimize the potential for erosion. Planting of native riparian vegetation is expected to occur in 2018.

Monitoring:

Monitor changes of solar exposure to the Old Channel as a result of non-native riparian plant removal. Previously restored riparian areas will be monitored for the re-emergence of non-native vegetation and success of native plantings. Sediment capture structures will be monitored for effectiveness.

Budget:

Table 7.1:

\$100,000

*\$50,000 transferred from 2017 Native Riparian Habitat Restoration to fund Bank Stabilization and Riparian Restoration project in 2016.

Estimated 2017 budget:

\$50,000

5.7.5 Management of Household Hazardous Wastes

The City of New Braunfels will continue the hazardous household waste (HHW) program through the City of New Braunfels' Solid Waste division.

Long-term Objective:

Reduction in the improper disposal of hazardous wastes and incorporation of prescription drug and Freon drop off.

Target for 2017:

Continue hazardous household waste program which will include three HHW collection events. The City of New Braunfels will tentatively hold one additional HHW collection event in 2017 pending available budget.

Methods:

Conduct HHW collection events which incorporate an education and outreach component.

Monitoring:

The volume of hazardous waste material collected during the HHW collection events will be noted and compared to previous efforts.

Budget:

Table 7.1:

\$30,000

*\$30,000 transferred from 2017 Management of HHW to fund Bank Stabilization and Riparian Restoration project in 2016.

Estimated 2017 budget:

\$30,000

*\$30,000 transferred from 2017 Impervious Cover/Water Quality Protection to fund Litter and Floating to HHW.

5.7.6 Impervious Cover/Water Quality Protection

Long-term Objective:

Reduction and control of non-point source pollutant discharges to Landa Lake and the Comal River system. To increase the implementation of Low Impact Development (LID) projects and provide incentives to reduce impervious cover.

Assumptions: It is assumed HCP funding will be available in future years to implement a LID Rebate Program and/ or other water quality protection strategies.

Target for 2017:

The City will continue to examine the LID Rebate Program, as it has been developed to date, and will consider the inclusion of specific measures, methods, and funding in the 2018 EAHCP Work Plan for implementation of a water quality protection program.

Methods:

In 2016, the City of New Braunfels adopted a LID Manual. In 2017, the City will at a minimum continue to provide information about the LID Manual to individual property owners and educate them about the incentives expected to be included in the LID Rebate Program. Other water quality protection strategies will also be evaluated in order to develop a water quality protection program that will provide maximum benefit to water quality and the covered species.

Budget:

Table 7.1:

\$100,000

*\$15,000 transferred from 2017 Impervious Cover/Water Quality Protection to fund Bank Stabilization and Riparian Restoration project in 2016.

Estimated 2017 budget:

\$10,000

*\$30,000 transferred from 2017 Impervious Cover/Water Quality Protection to fund Litter and Floating Vegetation Management, \$30,000 transferred to HHW, \$10,000 transferred to fund an increase in Old Channel Restoration, and \$2,500 transferred to fund an increase in Flow Split Management.