



ENVIRONMENTAL CONSULTANTS

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1 February 2010

Williamson County Conservation Foundation  
350 Discovery Boulevard  
Cedar Park, Texas 78613

**Re: Proposal for Georgetown Salamander (*Eurycea naufragia*) Research for the  
Williamson County Regional Habitat Conservation Plan**

SWCA Environmental Consultants appreciates the opportunity to provide the Williamson County Conservation Foundation with this proposal to conduct Georgetown salamander research as called for in the Williamson County Regional Habitat Conservation Plan.

The proposed work tasks are described in greater detail in the attached scope of services. If you have any questions about the included scope of services, feel free to contact me at our office at (512) 476-0891.

Respectfully,

A handwritten signature in purple ink that reads "Craig Crawford". The signature is written in a cursive, flowing style.

Craig Crawford  
Project Manager

## INTRODUCTION

The Georgetown salamander (*Eurycea naufragia*) is an amphibian in the Plethodontidae family that is endemic to springs flowing from the northern segment of the Edwards Aquifer near Georgetown, Texas. This species is considered by the United States Fish and Wildlife Service (USFWS) as a candidate for Federal listing (66 FR 54807). Georgetown salamanders are thought to be threatened by habitat loss as many of the springs where this species formerly lived have been degraded by development. In fact, the species name “*naufragia*” means “remnants” in Latin and refers to the few remaining remnants of habitat for this salamander. While the USFWS considers listing of the Georgetown salamander to be warranted, publication of a proposal to list the species has been precluded by other, higher priority listing actions (USFWS 2004). In their 2008 Candidate Notice of Review (73 FR 75176), the USFWS lowered the listing priority number (LPN) for this species from a 2 to an 8. It is their opinion that current and planned conservation actions taken by Williamson County reduce the magnitude of the threat to the Georgetown salamander to a moderate level. Their rationale includes:

*Williamson County and the Williamson County Conservation Fund are currently actively working to protect habitat and acquire land within the contributing watershed for the Georgetown salamander. Also, they are planning to conduct monitoring and data-collecting activities in an effort that is expected to lead to the development of a conservation strategy for this species. Although this species still meets our definition of a candidate, these conservation actions reduce the magnitude of the threat to the Georgetown salamander to a moderate level by reducing the amount of development occurring in the portion of the watershed that affects the species. Thus, we have changed the LPN for this species.*

The overarching objective of SWCA’s proposal is to characterize salamander habitat utilization of the open space at Twin Springs and one other reference population, to describe and monitor this habitat for water quality and quantity on a seasonal and annual basis, to determine short- and long-term Georgetown salamander population trends, and to make recommendations designed to ensure minimal conflict between development and the ecological health of the salamander and its habitat.

## BACKGROUND AND SCOPE OF SERVICES

**Background.** The Georgetown salamander is a small (less than 3 inches long) salamander that inhabits springs and spring runs within the San Gabriel watershed. The species is known to occur only in Williamson County, Texas, where it has been found at springs in association with the South, Middle, and North Forks of the San Gabriel River, The Cowan and Berry Creek drainages, and in one cave (Bat Well) near the Sun City Development. Habitat for the Georgetown salamander and *Eurycea* salamanders in general, is described as shallow pools of well-oxygenated, sediment-free water that occur in caves and at springs and spring runs. The Service identifies the primary threats to the Georgetown salamander as degradation of water quality and quantity due to urbanization.

The Georgetown salamander is entirely aquatic and, based on similarities with other *Eurycea* species, it is expected that water quality degradation from various contaminants, decreased dissolved oxygen, increased sediments, and increased nutrients can cause disease and deformities, which could then result in salamander population declines. Urbanization and increases in impervious cover can increase contaminant loads in springs and groundwater, as well as alter local hydrologic regimes by increasing storm runoff and decreasing baseflows in drainages. Increased storm runoff may result in a decrease in aquifer recharge, increased variability in water availability and flow, and decreased water quality. Decreases in baseflow result in a decrease in water availability at spring locations, with decreased spring flow especially problematic during periods of drought.

A total of 13 Georgetown salamander locations are currently known in Williamson County and given the rapid rate of urban development and current lack of understanding of existing habitat conditions, perceived threats and long-term ecological needs of this species, federal listing within the next few years is a distinct possibility. To the extent possible it is in the best interests of Williamson County to develop proactive habitat management and monitoring plans that strive to remove threats and conserve populations to the maximum extent practicable.

The following scope of services proposes to utilize the best available scientific information to evaluate, protect and monitor Georgetown salamanders and their habitat on the Twin Springs Preserve property.



*Scope of Services.* SWCA proposes to accomplish project objectives through implementation of six work tasks: spring and drainage assessment, habitat monitoring, literature review, mark-recapture studies, monthly surface counts, and characterization of known and potential Georgetown salamander habitat. SWCA will coordinate efforts with Dr. Benjamin A. Pierce, a local Southwestern University professor and expert on amphibians and salamanders, and Dr. Andy Price, a salamander expert.

## **WORK TASKS**

### **Task I. Spring and Drainage Assessment for Occupied Salamander Habitat**

SWCA biologists will visit Twin Springs to initiate the following:

1. prepare a preliminary map of occupied and potential salamander habitat;
2. determine hydrologic origins of spring discharge;
3. establish quantitative techniques for monitoring dominant flora and invertebrate fauna; and
4. document site assessment findings.

**Cost for Task I:      \$5,560.00**

### **Task II. Salamander Habitat Monitoring and Water Quality/Quantity Assessment**

SWCA will establish a water quality/quantity monitoring station for monthly site visits to Twin Springs, where physical, chemical and meteorological parameters will be considered for inclusion in a long-term monitoring program and include:

1. *Physical environment:* air and water temperatures, precipitation rates (frequency and duration), groundwater flow quantity (flow meter) and quality.
2. *Hydrologic / meteorological data:* yearly and monthly spring discharge; monthly spring stage; spring run temperatures (intervals), and water velocity.
3. *Water Quality:* pH, dissolved oxygen concentration, water temperature, and total dissolved solids.

**Cost for Task II:      \$15,028.00**

Tasks III, IV, and V will be performed by Dr. Ben Pierce of Southwestern University as a sub-contractor to SWCA.

### **Task III: Literature Review**

The literature review and synthesis will provide a compilation and analysis of existing research literature relevant to the conservation and management of Georgetown salamanders. There are only two papers currently published or in press on the Georgetown salamander, but research on related species of *Eurycea* and other stream-dwelling salamanders will provide important information about the ecology of *Eurycea naufragia*, including environmental factors that may be positively and negatively associated with population persistence.

The main objectives of the literature review include:

1. Conduct detailed review and synthesis of existing data on natural history, geology, ecology, and genetics of *Eurycea* salamanders.
2. Identify critical issues, parameters, and needs for preparation of conservation strategy for the Georgetown salamander.
3. Gather information that can be used in development of educational materials on the Georgetown salamander.

### **Task IV: Mark-Recapture Studies**

Dr. Ben Pierce and students have conducted monthly surface counts of salamanders at Twin Springs over the past year and surface counts of salamanders at Swinbank Spring over a two-year period. While surface counts can provide information about relative density of salamanders and long-term trends in relative numbers of salamanders, mark-recapture studies are required to estimate absolute population size.

Mark-recapture studies will follow the same protocol used successfully by biologists at the City of Austin to monitor the closely related species Jollyville Plateau salamander (*Eurycea tonkawae*). Animals will be captured and anesthetized in the field. Small spots of colored plastic (visual implant elastomers) will be injected under the skin. Using several different colors and positions of the marks, we will provide a unique mark for each animal. In addition, each animal will be photographed for later analysis of size and backup identification. All marking and photography will be done in the field; animals will be anesthetized for only a few minutes and then quickly returned to the spring.



Studies conducted by the City of Austin indicate that animals are not harmed by the marking procedure.

The mark-recapture protocol requires that we collect and mark animals for three days in a row. Mark-recapture studies will be conducted on the Twin Springs population and one reference population. This study is labor-intensive and will require Dr. Pierce, three student assistants, and a summer research intern, as well as several volunteers. The mark-recapture studies will be carried out in the summer of 2010.

The main objectives of the mark-recapture studies include:

1. Conduct mark-recapture studies of Georgetown salamander populations at Twin Springs and one additional site.
2. Determine estimates of absolute population size of salamanders.
3. Provide information on survivorship and movement of salamanders within spring run.
4. Gather abundance and ecological data that can be used in development of conservation management strategies.

#### **Task V: Monthly Surface Count Surveys**

Monthly surface counts will be continued at Twins Springs and a reference population over the 12-month period of the grant. These counts will provide information on trends in relative population size. With the availability of marked animals (see mark-recapture studies above), the surface counts will also provide information on survivorship and movement of animals within the spring run.

For each surface count, a transect will be established along the spring run, beginning at the spring outflow and extending 25-30 meters downstream. We will overturn all potential cover objects that are submerged in the spring run and look for salamanders. Salamanders will be captured with a dip net and photographed for identification of marks and later measurement of size. Salamanders will then be returned to the spring. At the conclusion of each surface count, temperature (°C), oxygen concentration (mg/l), specific conductivity, and discharge will be measured.

Monthly surface counts will be conducted by Dr. Ben Pierce and three students.

On a volunteer basis, Dr. Ben Pierce and his students conducted salamander surface counts at Twin Springs Preserve at monthly intervals between September 2008 and

December 2009. One survey was completed in the spring of 2007, before the property was acquired by Williamson County. The number of salamanders observed at Twin Springs during surface counts ranged from a low of 3 to a high of 30, with an average of  $18 \pm 2.13$  (standard error of the mean). The mean percent of cover objects occupied by salamanders was  $1.07\% \pm 0.11$ . Mark-recapture studies conducted on the closely related species Jollyville Plateau salamander found that surface counts such as those previously conducted detected on the average about 20% of the total population size. If the same relationship between animals detected in surface counts and total population size holds for the Georgetown salamander, then the total population at Twin Springs is likely around 100 animals.

The main objectives of the surface counts include:

1. Conduct monthly surface counts of *E. naufragia* at Twin Springs Preserve and reference populations.
2. Monitor status of salamanders at each site.
3. Gather abundance and ecological data that can be used in development of conservation management strategies.
4. Estimate survivorship and movement with data from marked animals.

**Cost for Tasks III, IV, and V:      \$24,965.00**

Task VI will be performed by Dr. Andy Price as a sub-contractor to SWCA.

**Task VI:      Characterize habitat and water quality of known and potential sites of Georgetown Salamanders**

Work under this task will be performed by Dr. Andy Price in order to characterize both habitat quality and water quality at up to 10 additional spring sites. This effort will be an attempt to identify new locations with habitat occupied by the Georgetown salamander, as well as evaluating sites thought to potentially contain suitable habitat for the Georgetown salamander.

**Cost for Task VI:      \$4,000.00**

**Total Cost for Year 1: \$49,553.00**