

ATTACHMENT B***Watershed Based Plan*****Name of Project: Sequatchie Cave Natural Area Conservation Plan**

- ◆ **Special Note:** As opposed to most 319 projects which have as their aim the goal of restoring an impaired body of water, this project aims to protect a body of water with no known impairments currently. Rather than restoring an impaired stream to health, this project will preserve and enhance the high water quality of a stream that is already healthy. As such, this project cannot have the standard, 9-element watershed based plan. The nonpoint source section staff at EPA's Region 4 office provided guidance as to how to write a watershed based plan for a preservation project like this one.

Lead Organization:

Southeast Tennessee Resource Conservation and Development Council (SETNRCD) will provide overall leadership in this project. Partners including the Natural Resources Conservation Service (NRCS) and county groundwater specialists will provide technical assistance when necessary.

The Project Manager for this initiative will be Seth Shaffer, Executive Director with the SETNRCD, who has worked on several 319 grants throughout the region. He can be contacted at sshaffer405@gmail.com or 423-847-7990

Watershed Identification (name, location, 12-digit HUC, etc.):

Watershed name: Little Sequatchie River
HUC: 060200040204
Exceptional State Waters
Owen Spring Branch
Marion County
Waterbody ID: TN06020004015_0200

BMP List, Educational Activities and Budget

BMP Name	Quantity	Budget Estimate
Flow Monitoring	1	\$18,000
Design Work	1	\$30,000
Stabilization, grading and widening of wet-weather conveyance (WWC) from “boils” area downstream	1	\$4,000
Capture zone at Alabama Ave with treatment cell, and habitat enhancement	1	\$18,000
Forebay and detention area at Valley View Highway WWC w/ habitat enhancement	1	\$40,000
Capture zone at “triangle” with habitat enhancement	1	\$36,865.00

(Table 1: BMP list)

Educational Event	Quantity	Budget Estimate
End of Project Celebration	1	\$0
<p>Educational events</p> <p>TDEC will re-engage the public for educational events at Sequatchie Cave State Natural Area (SNA) once COVID-19 concerns have eased. Previous events have included a general introduction to the aquatic fauna at the site, and we now openly interpret the royal snail and Sequatchie caddisfly for visitors. Our hope is that by mid-2021 we will be able to return to interpretation of the cave and stream and expand to include improvements made to the site by two key recent property additions and use of local livestock to manage a kudzu infestation. We will engage local leaders and the general public as implementation of the 319 project progresses, as well as schedule a proper opening event at the conclusion of the work.</p>	Throughout grant period	\$0

<p>School cooperation Our liaison to local schools is our neighbor Dawn Quarles, who already has been instrumental in monitoring the property via her engagement as a GreenSteps <i>Trail Raiser</i>. The TDEC Division of Natural Areas (DNA) will welcome the opportunity to host “Meet Sequatchie Cave SNA” days with local school groups once COVID-19 guidance for such visits is developed. We welcome the opportunity to discuss school research projects at the site for appropriate age groups.</p>	Throughout grant period	\$0
<p>UT Studies At present a single UT-Chattanooga study continues at the SNA, focused on a rigorous examination of the amphibian community in the twilight zone of Sequatchie Cave. TDEC-DNA welcomes additional collegiate studies of the ecology of the SNA.</p>	Throughout grant period	\$0
<p>Signage Existing interpretive signage at the SNA includes a custom wooden kiosk devoted to the rare fauna and ecology of the site, a GreenSteps station with program details, and a placard from the Tennessee Concrete Association describing the benefits of the pervious concrete parking area installed in 2018. Future signage will be evaluated to interpret the design, implementation, and benefits of the bioretention area planned to front the entrance to the SNA under the tenets of this 319 project.</p>	Already present, evaluating future	\$0

(Table 2: Educational events)

Total Budget for Project:	\$155,000.00
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*Cost estimated from 2015 EQIP Payment Schedule and previous area estimates for septic repairs

Significance of This Water



(Photograph of Owen Spring Branch)

Sequatchie Cave State Natural Area is unique in that it is home to both the federally endangered royal snail (*Marstonia ogmorhapha*) and the endemic Sequatchie caddisfly (*Glyphopsyche sequatchie*). The pristine waters that emerge from the cave as the head of Owen Spring Branch create the ideal habitat for these species. Sequatchie Cave is the type locality for both of these invertebrates as well as an endemic cave beetle (*Pseudanophthalmus ventus*) and cave millipede (*Scoterpes ventus*), and provides habitat for other cave dwellers including the endangered gray bat (*Myotis grisescens*), Allegheny woodrat (*Neotoma magister*), and prickly cave crayfish (*Cambarus hamulatus*). In the 1950's the critically endangered pale lilliput mussel (*Toxolasma cylindrellus*) was vouchered from a downstream portion of Owen Spring Branch.

Unfortunately, at approximately 1000 feet downstream of the mouth of Sequatchie Cave, Owen Spring Branch receives a wet-weather conveyance (WWC) carrying a large amount of urban runoff from the unincorporated Sequatchie community as well as Sequatchie Mountain Road and abutting slopes. The intent of this project is to reduce the amount of pollutants in this runoff by implementing the BMPs found in Table 1. With these practices in place, the project will improve the overall water quality of Owen Spring Branch from the confluence of this WWC downstream, possibly expanding the populations and extending the range of many of these rare species. This is an ecosystem service that Sequatchie Cave State Natural Area can provide for the benefit of Owen Spring Branch and the Little Sequatchie River.

Without these practices in place, we could see an increase in sediment loads and contaminants from the confluence of the WWC downstream, potentially upsetting this delicate ecosystem. Ideally, with practices reducing the amount of pollution entering the stream (estimates found in Table 3), we anticipate increases in population levels of the key species and range expansions to

include lower portions of Owen Spring Branch. Any notable changes in these populations will be monitored and reported by TDEC and partner agencies.



(Photograph of Marstonia ogmorhaphes)

Watershed Description

The target watershed is located in the unincorporated Sequatchie community, sitting at the foot of Sequatchie Mountain in Marion County, Tennessee (See maps below for topography).

Estimated Reduction

The KCI Team developed a simplified nutrient loading and stormwater treatment model for the Sequatchie grant proposal target watersheds, using the Watershed Treatment Model (WTM) platform developed by the Center for Watershed Protection. For efficiency, the two watershed areas were lumped into a single WTM analysis of 48.6 acres. Based on visual estimates of land use proportions, the WTM was developed with $\frac{1}{4}$ of the area occupied by forested land, $\frac{1}{4}$ developed in low density residential land uses (<1 dwelling/acre), and the remaining $\frac{1}{2}$ in

medium density residential use (1-4 dwellings/acre). Appropriate rainfall statistics and soil properties were obtained from NOAA and NRCS data sources, respectively. The WTM analysis showed that the target watersheds generate a combined surface runoff load of 327 pounds of nitrogen and 75 pounds of phosphorus, annually, under existing conditions. The WTM was used to examine the benefit of retrofitting the watersheds with bioretention practices that would be designed to treat the calculated water quality volume for a 1 year/24 hour design storm (3.1 inches of rain), and that would effectively treat 40 of the 48.6 acres of the study area, assuming (conservatively) that, depending on the exact location of the structural control measure retrofits, some portions of the target watersheds may not effectively drain to them. WTM results predict that the two bioretention devices will remove 125 pounds of the runoff-delivered nitrogen (38%) and 31 pounds of the runoff-delivered phosphorus (41%), annually.

Sequatchie Retrofit Analysis	Total N (lbs/year)	Total P (lbs/year)
Nutrient Loads - Existing Conditions	327	75
Reduction from Bioretention Retrofits	125	31
Nutrient Loads - Future Conditions	202	44

(Table 3: Load reduction estimates)

Education and Outreach

The Sequatchie Cave State Natural Area is unique in that it already displays a great deal of educational information regarding the species mentioned. Additionally, the SNA is actively supported by one of our non-profit partners, GreenSteps Chattanooga, whose volunteers maintain the SNA litter and recycling station. The Sequatchie community has embraced Sequatchie Cave for over a century and remains proud of the area. Community volunteers regularly perform litter collections and manage vegetation in the most visible section of the park, the mouth of the cave itself.

Educational events take place periodically at the natural area and TDEC will attempt to re-engage the community once regular school programming starts hopefully by mid-2021. TDEC hopes to host a number of “Meet the Sequatchie CAVE SNA” days with local school groups once guidance for such visits is developed.

Coincidentally, the end of the grant period marks the 120th anniversary of a major grocer’s picnic which took place on those same grounds. Over a thousand people travelled by rail from Chattanooga for this large community gathering. When we can again gather safely in numbers, we hope to sponsor a smaller community gathering celebrating the improvements to the SNA with a cleanup, interpretation, and meal.

Timeline, Tasks, and Assessment of Progress

During winter 2020-2021 the selected project consultants (KCI) will monitor the flow of the ~42 acre WWC to Owen Spring Branch to understand its flow regime and potential influence on the stream. This system arguably poses the greatest threat to the ecology of Owen Spring Branch. The planned study augments an initial evaluation undertaken in winter 2019-2020.

Using this information, we will coordinate with the Sequatchie community, Marion County government, and KCI staff to begin design work for this aspect of the project. Design and consultation will occur throughout 2020 and into the following winter, and implementation undertaken in 2021.

Implementation and design will focus on four specific areas:

- Area 1 includes the “boils”, the terminus of a karst conduit from Sequatchie Cave that only flows in response to heavy storm events and during periods of a locally high water table; this feature is found inside the Park Street loop abutting a popular picnicking spot. The existing manmade WWC that drains this feature will be widened and stabilized to minimize additional erosion and transport of sediment into Owen Spring Branch.
- Area 2 includes the WWC at the intersection of Alabama Avenue and Park Street that drains an approximately 6.56-acre basin. This feature will be evaluated for expansion as a treatment cell or a small bioretention area and include a longer flow path and installation of native plants suitable for the SNA.
- Area 3 includes the most forward WWC along Valley View Highway at the entrance to the SNA. This approximately 42-acre basin drains approximately 1/3 of the Sequatchie community, including some commercial properties. The underutilized abutting fescue field will be refitted with a forebay and converted to a bioretention area with a longer flow path to manage significant storm events. Design may include installation of media to improve infiltration and promote establishment of native vegetation. Peak stormwater flows will be lowered and trash, sediment, and contaminants will be captured before discharge into Owen Spring Branch.
- Area 4 includes a grassy, mowed 0.4-acre triangular parcel bounded by Sequatchie Mountain Road, Owen Street, and Alabama Avenue in Sequatchie, and represents the convergence of the two primary WWCs that drain the 42-acre basin noted above. With permission of the community owners (“Sequatchie Trustees”), this privately held parcel will be reimagined as a bioretention pretreatment basin to support function of Area 3. All of these project installations will be completed within the three-year time period.

Monitoring and Documenting Success

Success of the Sequatchie Cave SNA project will flow from installation of the selected BMPs according to the above plan, which will markedly reduce the amount of sediment and trash entering Owen Spring Branch. The overarching goal of this unique project is not removal of a 303(d) listing from Owen Spring Branch, but rather the continued improvement of conditions in

the one-mile downstream segment between Valley View Highway and the Little Sequatchie River.

TDEC and partners will periodically survey the area to determine how key rare species populations are responding in this segment. Positive changes could indicate project success and demonstrate the importance of such programs. These surveys will be an addition to TDEC's normal water quality monitoring.

In an effort to gauge the project impact over time, SETNRCD will regularly engage Sequatchie resident Dawn Quarles, local GreenSteps outreach coordinator, as well as volunteer caretaker Philipp Collins, a lifetime Sequatchie resident. With their assistance we will document visible metrics of success, including the amount of trash and recyclables captured by the installed BMPs and kept out of Owen Spring Branch.

Sequatchie residents have a long memory and great appreciation for the cave and natural area, with many fondly recalling days of summer picnics and ice cold watermelons. With full implementation of this 319 project, the SNA will become more welcoming to visitors new and old, striking a balance between preservation of our natural resources and the recreation needs of the local community. We look forward to helping visitors further appreciate Sequatchie Cave State Natural Area for its unique beauty, biological importance, and historical significance.



(Photograph of Glyphosyche sequatchie)