RICHLAND CREEK WATERSHED ALLIANCE

RCWA

# Amphibian Study Report

## Richland Creek Ecosystem
## Nashville, Tennessee

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## Introduction

The Richland Creek Watershed Alliance (RCWA) and Tennessee Wildlife Resources Agency (TWRA) formed a study partnership in 2012 to monitor the Richland Creek ecosystem for amphibians. The scope of the study was prioritized for the species of Greatest Conservation Need (GCN)—Streamside Salamander, *Ambystoma barbouri* (Photo below right, courtesy of Bob English).

The study project was funded through grant dollars received from the Tennessee Wildlife Resources Agency and Lucius Burch, Jr. Wildlife Habitat Fund of The Community Foundation of Middle Tennessee.


The amphibian study was implemented in four phases:

- Research and preparation
- Reconnaissance (Jul-Nov 2012)
- Priority surveys with TWRA (Jan-Mar 2013)
- RCWA study activities with volunteers (Mar-Jul 2013)

Historical references and conservation information were reviewed for *Amybstoma barbouri* habitat, plus other species that were most likely to be found in the Tennessee Outer Central Basin sub-ecoregion. TWRA biologist, Andrea (Pandy) English was the herpetology expert for the partnership. RCWA participated in all phases of the study, collected information about habitats and water quality during surveys, and prepared this study report.

Research and preparation phase involved reviewing conservation and historical information, amphibian monitoring methods and protocols, and reviewing watershed and ecoregion maps. The reconnaissance phase focused on inventorying the Richland Creek watershed for suitable habitat of the rare *Ambystoma barbouri*—Streamside Salamander, based on historic occurrence records for the ecosystem. The reconnaissance phase found three priority sites to survey for the Streamside Salamander and a fourth site to monitor for frogs only. Before monitoring began, each priority site was measured 100-meters long for surveying. The visual encounter survey (VES) method was applied. Monitoring commenced during the *Ambystoma barbouri's* breeding period (January – March). All of the amphibians encountered during each survey were counted and included in the study results.

In March, the director expanded the scope to involve volunteers. First, volunteers who were participating in a RCWA stream clean up were asked to report any salamanders or frogs they observed to RCWA. Five participants discovered two habitats, each with a different species

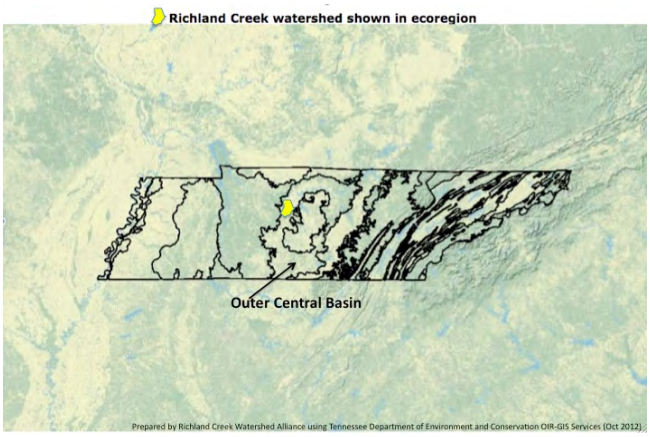
during the Neighborly Branch clean up project on March 2, 2013. Both habitats and species discovered were photographed and confirmed by the director.

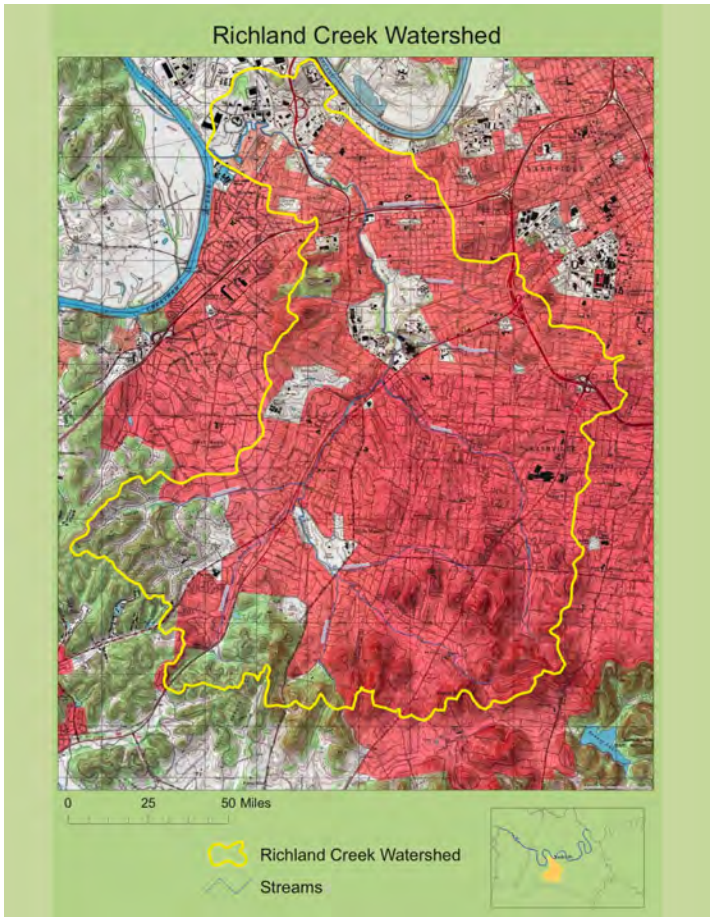
The director also began training a Belmont University environmental science student, Alex Jeffers *(photo above left)* in March, to assist with monitoring four additional locations and to install recorders for frog calls. Dr. Rabb's biology students at Nashville State Community College *(photo above right)* volunteered to assist with study project—listened to 120 hours of recordings collected for frog calls that minimized review-time for species identification by TWRA. RCWA collected water quality data and noted the habitats needing restoration or conservation during these surveys also.

This study work contributed to the Tennessee Amphibian Monitoring Program and to RCWA program objectives. Volunteer-participants gained a better understanding about amphibians' role in the ecosystem and their vulnerability from anthropogenic impacts; RCWA gained study skills for conservation to use later, while documenting some amphibian habitats of the Richland Creek ecosystem.

## Study Area

The Richland Creek watershed is an urbanized watershed located in West Nashville, Davidson County. Approximate watershed borders are the hills of West Meade to the west, Warner Park to the south, Interstate 440 to the east and the Cumberland River (RM 175.6 mouth) to the north (*map right, courtesy of TWRA*). Richland Creek drains about a 28 square-mile area that can be found on quad maps Scottsboro (308 NW), Nashville-West (308 NE), Bellevue (308 SW) and Oak-Hill (308 SE).




The Richland Creek ecosystem is part of the Tennessee Outer Central Basin sub-ecoregion (Nashville Basin). Richland Creek is a headwater of the Cumberland River and federally listed as impaired.

## Study Preparation

Historical and conservation information was reviewed to define habitat requirements suitable for the *Amybstoma barbouri* and for other species most likely to be found in the Tennessee Outer Central Basin ecoregion. TWRA biologist, Pandy English was the project's herpetology expert, and brought leadership and technical experience to the partnership. Below is the list of publications and resources that were referenced for the study.

1. Atlas of Amphibians in Tennessee - http://apbrwww5.apsu.edu/amatlas/
2. Thomas E. Ashton, An Annotated Check List of Orde Caudata (Amphbia) of Davidson County, Tennessee: Journal of the Tennessee Academy of Science: 106-111.1966.
3. Dodd, Jr., C. Kenneth, Monitoring Amphibians in Great Smokey Mountains National Park, 2003 (U.S. Geological Survey circular; 1258), Tallahassee, Florida.
4. LEAPS - http://www.leaps.ms/About%20LEAPS.htm
5. M.L. Niemiller and R. G. Reynold— Amphibians of Tennessee, 2011 University of Tennessee, Knoxville, TN.
6. NatureServ website - http://www.natureserve.org/infonatura/
7. Tennessee Amphibian Monitoring Program (TAMP) - http://www.tn.gov/twra/tamp/tamp.shtml
8. RCWA map - http://richlandcreekwatershedalliance.org/wp-content/uploads/2014/04/Richland_Creek_map1.pdf

## Survey Locations & Methods

Monitoring protocols for each survey were followed and each conducted to minimize habitat disturbance. The survey data collected and the information gathered about habitats studied were recorded in a waterproof field book. Coordinates of each sampling location are not being published to protect habitats from needless disturbance and the privacy of property owners. RCWA included sample site coordinates in report prepared for the Tennessee Wildlife Resources Agency.

### Survey Locations & Methods

| Stream | Site ID | Survey Method |
|---|---|---|
| Richland Creek branch – headwater *(p)* | CWds | VES & recorder |
| Richland Creek – headwater *(p)* | RChcc | VES & recorder |
| Richland Creek branch – headwater *(p)* | SCch | VES & recorder |
| Neighborly Branch | RCnb | passive |
| Richland Creek branch | RCoa | passive |
| Richland Creek branch | RCnscc | passive |
| Sugartree Creek branch | SCwl | passive |
| Sugartree Creek branch | SCcw | recorder |
| Richland Creek | RCtwf | recorder |
| Neighborly Branch - terrestrial | RCnbt | discovery |
| Neighborly Branch - spring | RCnbs | discovery |
| *p* – Site prioritized for *Ambystoma barbouri* | Prepared 2013 by the Richland Creek Watershed Alliance | |

A 100-meter transect was measured at the prioritized sites before monitoring commenced, and each site was surveyed three-times during the *Amybysoma barbouri* breeding period. The four additional stream habitats that were surveyed by the director and intern used a passive-encounter-approach-method with no pre-determined length of stream to be monitored. These four methods (VES, passive, recorder, & discovery) were applied at the eleven habitats monitored.

All amphibians encountered during monitoring phases (July 2012-April 2013) were included in the Summary of Results, except for the terrestrial Zigzag Salamanders

discovered at RCnbt. Only species dependent on aquatic habitats were included as contributing to study objectives, but RCWA did note that its terrestrial habitat was worthy of enhancement and preservation. Each habitat surveyed and species counted was photographed, except for the Green Frog, which we were unable to capture.

The water quality parameters measured include dissolved oxygen, pH, and temperature. Dissolved oxygen and water temperature were recorded using YSI Pro Optical meter and probe, and a glass thermometer measured ambient temperature. A hand-held meter calculated pH, which we calibrated using standard buffer solutions before each use. These measurements are listed in the Field Data Table (page 5).

## Summary of Results

The *Ambystoma barbouri* was not found during the study period, and no frogs were heard on recorders installed mid-April, but frogs were encountered and counted during surveys. Nine of the eleven habitats that we monitored counted individuals. The five amphibian species documented living in the Richland Creek ecosystem were the Two-lined, Cave and Northern Dusky Salamanders; and the Southern Leopard and Green Frogs. The 161 individuals counted were found in various phases of the amphibian life cycle (adult, sub-adult, larvae and eggs). The Zigazg Salamanders discovered in the riparian area were excluded from Summary of Results because they are a terrestrial species. Each species counted was photographed at least once, except for the Green Frog. Individuals that were counted, but that we were unable to capture (27) to confirm species are noted in the last row of the table below—Unidentified Individuals.

**Summary of Results**

| Species | Reconnaissance (Jul-Nov 2012 | VES Surveys (Jan-Mar 2013) | Passive Surveys (Mar 3-Mar 28 ,2013) | Recorders (Apr 19-20 2013) | **TOTAL COUNT** |
|---|---|---|---|---|---|
| Streamside Salamander *(Ambysoma barbouri)* | | | | | 0 |
| Southern Two-Lined (*Eurycea cirrigera)* | 4 A | 6 A | 13 A, 1 SA, 56 EM | | 23 A, 1 SA, 56 EM |
| Cave Salamander *(Eurycea lucifuga)* | | 1 A | 4 A | | 5 A |
| Long-Tailed Salamander *(Eurycea l. longicauda)* | | | | | 0 |
| Northern Dusky Salamander (*Desmognathus fuscus* | 4 A | 29 A, 3 L | 8 A | | 41 A, 3 L |
| Bullfrog *(Rana catesbeiana)* | | | | | 0 |
| Southern Leopard Frog (*Ranu u. utricularia)* | 1 A | 1 A, 1 L | | | 2 A, 1 L |
| Green Frog *(Rana Clamitan)* | | 2 L | | | 2 L |
| Northern Cricket Frog *(Acris crepitan)* | | | | | 0 |
| Unidentified Individuals | 6 frogs | 2 SA, 2 L salamanders | 4 A, 8 SA, 5 L | | 6 frogs & 4 A, 10 SA, 7 L salamanders |
| VES –visual encounter survey A- adult SA – sub adult L – larvae EM – egg mass | | | | | **161** |

## Field Data Table

Six of the seventeen dissolved oxygen (DO) measurements (35%) were highlighted for concern, or of question, because the DO level was found either below the regulatory requirement of 5.0 mg/L; or above the maximum saturation point for the water temperature recorded during the survey (maximum DO level for 9 $^0$C water temperature is 11.55 mg/L). Ambient (air) temperature was collected for most surveys, except during the reconnaissance phase.

### Field Data Table

| Date | Site ID | Time (CST) | T$^0$C Water/Air | pH | DO (mg/L) |
|---|---|---|---|---|---|
| 2012 Reconnaissance | | | | | |
| Aug 15 | SC | 1200 | | | |
| | SC- spring | 1430 | 17.4/ | | **2.42** |
| Sept 19 | RCh | 0830 | | | |
| | CWds - spring | 1030 | | | |
| | CWds | 1410 | | | |
| Oct 10 | CWus | 0926 | 14.8/ | 8.1 | 7.68 |
| | RC - spring | 1321 | 17.8/ | | 4.25 |
| Oct 26 | RCh | 0940 | 17.8/ | | 4.76 |
| | RChd | 1430 | 20.5/ | | 9.25 |
| 2013 VES surveys | | | | | |
| Jan 11 | CWds | 1215 - 1312 | | | |
| | RChcc | 1406 - 1447 | | | |
| Feb 1 | SCch | 1337 - 1413 | 11.0/1.0 | 7.7 | 9.18 |
| Feb 8 | RChcc | 1122 – 1244 | 11.0/8.0 | 7.8 | 9.62 |
| | CWds | 1320 - 1402 | 9.8/8.0 | 8.2 | 9.58 |
| Feb 22 | SCch | 1149 - 1258 | 12.9/15 | 7.7 | 9.49 |
| Mar 15 | RChcc | 1143 - 1224 | 12.8/20 | 7.8 | 10.59 |
| | CWds | 1317 - 1439 | 13.7/22 | 8.2 | 10.65 |
| Mar 22 | SCch | 1143 - 1239 | 11.1/10.5 | 8.1 | 9.64 |
| 2013 Passive surveys | | | | | |
| Mar 4 | RCnb | 1343 - 1400 | 1.7/ 14 | 8.8 | 13.57 |
| | RCoa | 1409 - 1500 | 10.3/ | 9.0 | 19.57 |
| | RCnscc | 1510-1606 | 10.7/14 | 8.8 | 13.57 |
| Mar 8 | RCoa | 1314 - 1453 | 11.9/19 | 8.1 | 9.12 |
| Mar 20 | SCwl | 1108 - 1245 | 11.6/10 | 8.0 | 11.31 |
| Mar 28 | RCnscc | 1150 - 1312 | | | |
| | | CST–central standard time | T-temperature $^0$C-degree Celsius | | mg/L – milligrams per Liter |

## Final Thoughts…

RCWA gained skills for future work documenting amphibians of Richland Creek ecosystem. Student-volunteers received a hands-on experience pertinent to their course of study (environmental science and biology), and the community gained a better understanding about the value of amphibians in an ecosystem and their vulnerabilities to anthropogenic activities. Study results contributed to the Tennessee Amphibian Monitoring Program objectives and furthered our programmatic goals. RCWA hopes to secure additional funds to continue this amphibian conservation work for preservation of the Richland Creek ecosystem.

It was observed that the historically noted habitat for the rare *Amybstoma barbori* had been eliminated by development. Amphibians depend on healthy stream and riparian habitats. As its common name implies, the Streamside Salamander lives nearby and breeds in the stream. Every habitat that we visited for this study project was observed degraded or altered by human activity. Amphibians have been around for 350 million years, and biologists and scientists worldwide are concerned about the impact of declining populations. Environmental quality, pollution and habitat loss are noted as causes for decline. Further impact anticipated from Climate Change and the collection of amphibians for the pet trade is also of concern.

Amphibians are in the middle of the food web and play a pivotal role in an ecosystem as secondary consumers in various food chains. Throughout their life cycle, amphibians have a relevant role for invertebrates and vertebrates. Because amphibians are consumers and prey, their decline or extinction has a very significant impact on sustainability of an ecosystem and its wildlife. Recent research indicates that tadpoles may play a very important role in maintaining the ecosystems of freshwater streams, which links streams to the surrounding riparian environment. The loss of tadpoles in a stream eliminates feeding activities and their interactions with other animals of the ecosystem. An important function of tadpoles is maintaining the release of nutrients through the feeding of leaf litter, a main source of energy in forest streams. Adult-amphibians play an important role as natural pest controllers. Because of their high-sensitivity to the quality of their surroundings (air, water; and aquatic and riparian habitats), amphibians are considered important ecological indicators of environmental quality. The decline of amphibians is a wake up call about the quality of our environment. Some conditions causing a decline in populations are air and/or water pollution, habitat fragmentation and loss, pesticides, and various other anthropogenic activities stressing the ecosystem. Each of these causes for population decline can be observed as a condition found in the Richland Creek ecosystem.

RCWA gathers information about the wildlife dependent on Richland Creek ecosystem for conservation purposes. Amphibians play a key role for wildlife and the sustainability of freshwater ecosystems. Conservation is an imperative objective of the RCWA mission—restore, protect and preserve the Richland Creek ecosystem.

The RCWA has developed the Richland Creek Conservation Fund as a resource to fund future studies such as this one, and for restorative purposes as outlined in our 2013 Strategic Plan Executive Summary, which can be found on the Resources/ Publications section of our website [www.richlandcreekwatershedalliance.org].

## Photographs

**Cover Photos** (RCWA): **Southern Leopard Frog,** tadpole (top); **Northern Dusky Salamander** adult (bottom).

**Two-Lined Salamander** (TWRA)

**Two-Lined Salamander eggs** (RCWA)

**Zigzag Salamander,** terrestrial species (RCWA)

**Northern Dusky Salamander larvae** (RCWA)

**Cave Salamander** (dpb Photography, volunteer)

## Acknowledgements

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Dr. Darlene Panvini and Alex Jeffers

**Nashville State Community College**
Dr. Jessica Rabb and 2013 summer biology-student participants

**Neighborly Branch Volunteers**
March 8, 2013 stream clean up

## And Supporters


The Richland Creek Watershed Alliance is a community-supported, watershed-based stream conservation group (public charity) focused on the environmental sustainability of the Richland Creek watershed, and dedicated to long-term restoration and preservation of its ecosystem.

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