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A Home for Herps Is Also a Place for People

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Abstract

In the Piedmont region of North Carolina, USA, a rich herptofauna lives largely unnoticed by the general populace. Many youth are unaware of the rich diversity of life that our local woodlands and wetlands harbor as well as the specific habitat needs of these various reptiles and amphibians (herptofauna, or "herps"). For the past four years we have conducted a herpetology program for high school students to introduce them to these elusive organisms, their specific habitats and connections to the global environment. Our students have constructed rich science content and science process understandings but, most importantly, we claim that students have developed a sense of place.

Keywords: reptiles, amphibians, fieldwork, ecological education, North Carolina, high school students, place-based education

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Mr. Rogers made famous the song with the refrain, "It's a beautiful day in the neighborhood." That is truly how we feel after four years of following Boykin Spaniel dogs through the woods and fields to find Box Turtles, wading in wetlands at night to catch and identify calling frogs, walking in puddles and small vernal pools to hold and study local salamander species, checking traps in our lake to see how many of our aquatic turtles are new and how many are recaptures, and examining, oh so closely, the snakes that cross our paths. All of these activities and more have occurred on a 365-acre tract of eastern deciduous forest at a North Carolina environmental education center, Chestnut Ridge Camp and Retreat Center (CCR), in our neighborhood—all with a group of 30 or so teenagers in tow.

For the past four years we have spent one summer week and six additional follow-up days during the academic year with our Burroughs-Wellcome funded program called Slip Slidin' Away (SSA), collecting data on local populations of various reptiles and amphibians. We started this project for several reasons. We ourselves have a deep appreciation for these organisms and we realized that most people do not know the flora and fauna in their own neighborhoods. Youth are not spending much time outdoors and teenagers are rarely outside to just explore (Louv 2008). Typically, teenagers have fewer opportunities to engage in summer outdoor programs than younger children, so we designed SSA as a program for high school students.

As science educators, we know that many students make early decisions about careers—and that often these do not include science-related occupations (Hannover and Kessels 2004). Many high school students are resistant to pursue careers in science because they are disenchanted with school science and find their science courses unappealing and lacking relevance and meaning (Murphy, Lunn and Jones 2006) as well as uninspiring and noncreative (Porter and Parvin 2008). Roth and Barton (2004) suggest that particularly the poor, people of color, and women disengage from science because of the nature of science practices and forms of knowing that are stressed during science teaching. Students may even "hate" science because of the emphasis on memorization and testing (Berger 2009).

Because of this portrayal of science in schools, we wanted our students to become engaged in real scientific research projects. Specifically, we wanted to create a model of true inquiry-based science associated with fieldwork related to studies of reptiles and amphibians (herptofauna, or "herps"). While students were learning about the science, we also wanted them to learn about the animals and habitats associated with the mixed hardwood forest. We wanted them to build a sense of place that included not only awareness and appreciation but also a commitment to the local community. We wanted our students to care deeply and to want to make a difference.

> *There is mounting evidence that structured, nonschool science programs can feed or stimulate the science-specific interests of adults and children, may positively influence academic achievement of students, and may expand participants' sense of future science career options* (Bell et al. 2009, 3).

Because of this type of engagement with science and habitat, we wondered, will our students develop a sense of place about CCR as a home for herps?

Program Description

The high-school students who have attended our SSA herpetology program range in age from 13-year-olds (rising ninth graders) to 17-year-olds (rising seniors); they were selected to participate based on an application, which included a personal letter of interest and a recommendation from a teacher. Our students had a range of academic abilities, although many had high school performance and high interest in science.

We have involved the high school students in five active research projects. Each project has been guided by a descriptive inquiry question to give students a clear purpose for data collection. All data sheets used for these projects can be found at http://www.uncg.edu/cui/ssa/. These projects and their concomitant research questions include:

Aquatic Turtle Population Mark and Recapture Study

What types of turtles are found in Fellowship Lake and what is the population estimate for each species? Students set between five and eleven baited aquatic turtle hoop traps in a 13-acre lake. As part of this mark/recapture project, students transported equipment to the lake and donned chest- or hip-waders to set or pull traps from various positions around the lake (Figure 1). During the first summer session, five traps were used around the perimeter of the lake. During the second summer session, eight traps were set around the perimeter of the lake and three traps were set in the center of the lake. A returning student suggested this trap arrangement to see if different numbers or types of turtles would be caught in a different part of the lake. During the third and fourth summers, 11 traps were set in the lake and in a discharge stream. Returning students suggested variations in types of bait (chicken or sardines) as an additional investigation.

Figure 1. Retrieving a turtle trap

Once traps were pulled from the lake, students removed the turtles, processed them, and re-baited and reset the traps in the lake. Processing the turtles entailed identifying, marking, and measuring them. Students identified each turtle using a field guide and knowledge that had been previously shared with them by a wildlife biologist. They consulted a field data collection notebook to determine the appropriate marking for the particular species of turtle that was captured. They marked each turtle by filing a series of notches in the edge of the turtle shell (Figure 2). Students, working in pairs, weighed each turtle and collected other morphological data such as sex, scute count (scutes are the scales on the turtle shell), and injuries. All turtles were photographed (both carapace—top shell and plastron—bottom shell) and released back into the lake. Atmospheric conditions and water temperature data were also recorded. Students also recorded the presence or absence of leeches.

Figure 2. Marking the turtle with notches on the shell edge

Box Turtle Population Study and Radio Telemetry Tracking

What is the population estimate of Box Turtles on the CCR property? What is the range of six individual Box Turtles? On one or two days during each summer session, Boykin Spaniel dogs, trained to catch Box Turtles, accompanied students into the field. The dogs were much more efficient at finding and retrieving Box Turtles than the high school students (Figure 3). Multiple turtles were caught on each of these days with the number of turtles captured ranging between four and twenty-four. When multiple turtles were captured in a day, flagging tape was hung to mark the capture location and a GPS unit was used to determine the geographic location. Turtles were processed (notches filed and morphometric data collected; Figure 4) and in six cases they were fitted with radio transmitters before being released at the point of capture (Figure 5). Students used radio telemetry equipment to find these turtles at a later time and recorded the new locations.

These Box Turtles were tracked multiple times during the year (Figure 6).[1]

Figure 3. Boykin Spaniel with discovered Box Turtle

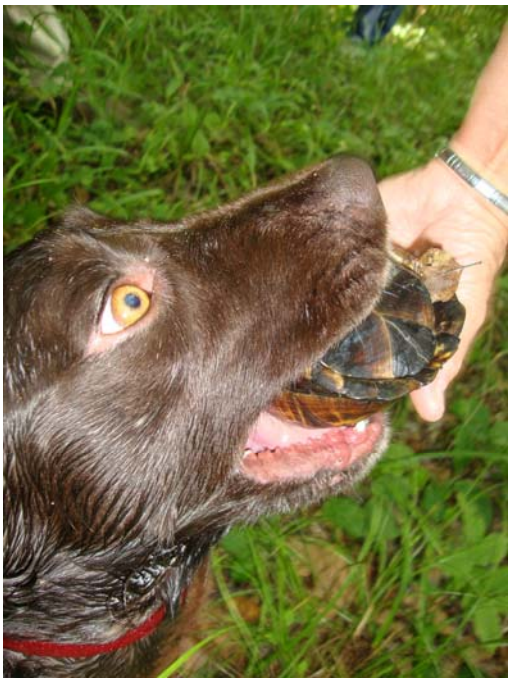

Figure 4. SSA student measuring the length of a Box Turtle's plastron

[1] See http://www.uncg.edu/~absomers/BoxTurtleBook.pdf for a free e-book called *The Box Turtle Connection: A Passageway into the Natural World* for additional information.

Figure 5. Box Turtle fitted with a radio transmitter

Figure 6. SSA student tracking a Box Turtle

Calling Amphibian Survey

What species of calling amphibians are found on the CCR property? Students learned to identify species-specific frog-calling patterns (Figure 7). They recorded

data based on a modified protocol outlined in the *North Carolina Calling Amphibian Survey Project* (http://www.ncparc.org/casp/casp-volpage.htm). Ten stops were designated along a single walking route near frog habitat on the camp property. Beginning 30 minutes after sunset, students walked their route, spending two minutes at each stop. During the stop time, students listened for frogs. At the end of the listening period, students discussed which frogs they heard and then determined an index of abundance: 1-individuals can be counted and there is space between their calls; 2-some overlapping, but some individuals can be identified; and 3-full chorus, calls constant, continuous, and overlapping. Students recorded this data on data sheets along with several environmental parameters like temperature and moon phase.

Figure 7. Spring Peeper, a calling amphibian

Woodland Amphibian and Reptile Population Survey

What species of amphibians and reptiles are found on the CCR property? Students checked three types of forest transects for the presence of amphibians and reptiles: 1) a coverboard array that consisted of pieces of plywood, pieces of tin and vertically positioned sections of PVC pipe (Figure 8); 2) a drift fence with pitfall traps and terrestrial traps (Figures 9 and 10); and 3) minnow traps placed in depressions filled with rainwater (Figure 11). Reptiles and amphibians were identified, measured, and weighed (Figure 12). Students recorded the site location for each organism with a GPS and indicated weather parameters such as air temperature, cloud cover, wind code and recent rainfall amounts.[2]

[2] More information on this type of survey study has been described by Tomasek, Matthews and Hall (2005).

Figure 8. Coverboard transect with wood, tin and PVC pipe

Figure 9. Drift fence transect

Figure 10. Terrestrial trap along a drift fence

Figure 11. Minnow trap floating in a depression filled with rainwater

Figure 12. SSA student holding a marbled salamander found in a drift fence pitfall trap

Vernal Pool Survey and Certification Designation

Do the wetlands at CCR include vernal pools (temporary pools, often called ephemeral pools), which are critical breeding sites for specific salamanders and many types of frogs? For this study, students visited two aquatic pool sites and used an established protocol from the Massachusetts Audubon Society (1993) to determine whether or not the aquatic pool was a vernal pool by identifying obligate and facultative species of amphibians,[3] as well as aquatic insects and aquatic plants that were in the wetland (Figure 13). All amphibians were collected, identified, measured, weighed, categorized by age class and released into the wetland at the time of collection. Students also carried out the following activities: (a) locating the

[3] Amphibians such as spotted salamanders that only breed in vernal pools are called obligate species; amphibians such as green frogs that choose to breed in vernal pools because they are available habitat are called facultative species.

wetland on an aerial orthographic map; (b) preparing a diagram with particular attention to the accurate marking of the water inlets and outlets (if present); and (c) taking water temperature and atmospheric data in different areas. Additionally, students captured Eastern Newts in minnow traps and aquatic dip nets and conducted a morphological analysis of the newts (Figure 14), recording sex and general age classification data as well as length and weight.

Figure 13. SSA student identifying organisms at the vernal pool

Figure 14. Examining Eastern Newts at the vernal pool

The purpose of Slip Slidin' Away was to expose students to ecological fieldwork by engaging them in a variety of field science projects related to local reptile and

amphibian species. The goals of SSA were to nurture students' enthusiasm for field science and science-related careers as well as to increase their knowledge of herpetology and competence in collecting, processing, analyzing and communicating scientific data. Students were engaged in the whole process of science: generating research questions, reading research and talking with others working in the field, struggling with equipment and data collection, interpreting collected data, and finally presenting their research projects focusing on methodologies and findings to others. Students were additionally exposed to careers in the biological/ecological science disciplines and had an opportunity to meet and work with a number of scientists. We wanted students to know what scientists do and how scientists think.

Most sessions of SSA were held at the rural environmental education center, CCR, but some follow-up days were held at a nearby state park, a nearby vernal pool, a state natural science museum, a state university, and a private university field station. Students not only collected data, they also entered data into spreadsheets as well as a statewide online database. Students spent time analyzing the data and engaging in scientific argumentation, using evidence to support their developing explanations. Some students wrote papers and prepared public presentations for both formal and informal meetings. Students presented their findings at a Student Academy of Science meeting and a regional meeting of the Southeast Partners for Amphibian and Reptile Conservation. They also worked with the public at our state museum's reptile and amphibian day event.

Lessons Learned about a Sense of Place

While much of our work focuses on field ecology, we know that developing "A Feeling for the Organism" (Keller 1993) is critical and in this paper we report on place-based outcomes for the teenagers with whom we have worked. The outcomes we report are based on interviews with 21 students. Interview questions included the following: 1) How is CCR a special place for you? 2) What have you learned about the reptiles and amphibians that live at CCR? 3) What have you really learned through SSA (things that you didn't know before)? 4) What do you know about worldwide declining amphibian species? 5) Do you think that declining amphibian species might be a problem at CCR? Why or why not? 6) Do you think that your involvement in SSA might have any effect on your ability to be an advocate for herps and their environments? Why? How?

Today's student more commonly studies tropical rainforests in South America and deserts in Africa than the habitats in their own backyards. One of our goals was to help students develop not only a sense of what lives in their own neighborhoods but a connection to their local environment, a sense of place. Our data indicate several important aspects of sense of place: 1) emotional attachments, 2) building relationships in authentic contexts, and 3) a desire to share discoveries and new concepts with others.

Our findings indicate that learning about local species was a highlight of the program, especially when students realized that the same species of animals lived on their land/in their yards, and in pools or streams on their properties or nearby

public lands (including school yards). They developed emotional attachments to many of the animals. Some students talked about their initial fears and how the SSA experience helped them not only overcome those fears but helped them develop a love for reptiles and amphibians. Students also developed emotional attachments to the forest itself. They described the setting as "home away from home" and said they "loved being in the wild" and "getting in touch with nature." This new knowledge of animals and place provided a type of place-based knowledge that fueled students' developing scientific inquiries.

Students were excited to learn and they felt that the SSA experience was powerful because it was "real, not staged." The animals and the environment were "real"—in other words, they were found in nature as opposed to an artificial environment. In addition, the science was "real" or authentic in that there were no prescribed answers. Unlike cookbook laboratory exercises in school, the instructors did not know the outcome of each investigation *a priori*. For many, reptile and amphibian studies were brand-new experiences. They described their new experiences as "unexpected and exciting." Students had the opportunity to try out new scientific techniques and develop their skills in data collection and analysis.

Not only did students enjoy developing new relationships with reptiles and amphibians, they also enjoyed building new relationships with each other and with the staff (Figure 15). Community building was an important part of our program. Part of our learning community included experts and other herp enthusiasts. Interactions with these individuals were important in helping the students to identify with a culture of people who appreciated and respected reptiles and amphibians. Students used social networking to stay in cyber contact with each other and reconnected personally and frequently at public events.

Figure 15. SSA student discussing data collection with staff

When describing how they could be advocates for reptiles and amphibians and the environment, students talked about helping herps as well as helping others to learn more about these elusive species. Many students described how they would no longer kill reptiles and indicated that they would help to protect them from harm. They also described how they would be involved in efforts to protect animal habitat from degradation or destruction. This sense of commitment also extended to education. Sixty-seven percent of the students interviewed described how they would help others to learn about reptiles and amphibians and how important these species are to the health of our environment. Many students were thinking about how they could take active roles in the protection of their local environment.

At the same time, students had unrealistic views of our particular place, CCR. For example, when describing potential amphibian declines at CCR in particular, many students did not see themselves as caretakers of the environment. Instead, they felt that CCR was responsible for taking care of the environment, which included monitoring, maintaining and protecting habitat. Many said that this was done because the CCR staff was minimizing human impacts. Only 25 percent of the students who responded in this manner saw themselves in the caretaker role: "we are keeping a good eye on them [amphibians]." Additionally, students believed that the worldwide decline of amphibians was not likely to impact CCR because people cared about these species.

Implications for Science and Environmental Education

We have learned many lessons from our four years of involvement with this program:

1. Many high school students (if not most) have never spent any time searching for turtles, frogs, snakes, salamanders or lizards, but they like it.
2. Some high school students do not enjoy collecting data (but some really do and gain a new appreciation for data collection and data analysis); yet, they will (almost) all do it if interested in the content area being studied.
3. Students are pleased to have an opportunity to contribute to a project that has a long-term database started by other students on animals that they get to see, hold, touch and measure.
4. Long-term projects can provide rich contexts for authentic inquiry and enable students to develop a sense of place.
5. Students need to spend extended time in the field setting to master data collection methods and try out new research techniques.
6. Students benefit greatly from informal and formal discussions with experts in the field.
7. Students should have an opportunity to share their knowledge gained and questions generated in formal and informal settings.

We found that it is critical to immerse young people in the out-of-doors and give them time and multiple opportunities to develop "a feeling for the organism." SSA has been successful in meeting the goals of developing career awareness about natural resource fields, developing deep content knowledge about herpetology and promoting enthusiasm for science education and it has been an enriching

experience that according to one of our students, offers "unique opportunities to participate in fieldwork and observe creatures in actual habitats." Several of our students said that CCR is a relaxed, memorable place and to at least one young man, "it is very special to my heart." Our implicit message is, if we are careful with our land and continue to conserve these precious, undeveloped acres, homes for herps can also mean a place for people. At least people like us.

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Relevant Websites

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Frog Watch, USA: http://www.aza.org/frogwatch/

National Biological Information Infrastructure: http://www.nbii.gov/portal/server.pt/community/amphibians/201

North Carolina Calling Amphibian Survey Project: http://www.ncparc.org/casp/casp-volpage.htm

Partners for Amphibian and Reptile Conservation: http://www.parcplace.org

United States Geological Survey's Amphibian Research and Monitoring Initiative: http://armi.usgs.gov/

United States Geological Survey's North American Amphibian Monitoring Program: http://www.pwrc.usgs.gov/naamp/

University of North Carolina at Greensboro, data sheets for all Slip Slidin' Away projects and project highlights: http://www.uncg.edu/cui/ssa/

University of North Carolina at Greensboro, *The Box Turtle Connection: A Passageway into the Natural World*: www.uncg.edu/~absomers/BoxTurtleBook.pdf