

Clinch River Environmental Studies Organization

Background

The Clinch River Environmental Studies Organization (CRESO) is an education/research program with a mission of:

- providing middle, high school, and undergraduate students opportunities for unique field research and extended learning experiences in areas of research design and protocols, data management and analysis, biology, and resources conservation and management and
- promoting community outreach and education through student-driven programs and presentations.

Established in 1989, CRESO is supported by the US Department of Energy (DOE), Anderson County Schools, Oak Ridge Schools, the University of Tennessee Forest Resources Research & Education Center, and the Environmental Sciences Division of the Oak Ridge National Laboratory. Research focuses on inventory and long-term monitoring of the population status and activity patterns of selected species in Anderson County, TN. Examples include bird banding of breeding migrants, dynamics of canopy gaps, radiotelemetry of snakes and turtles, monitoring of terrestrial and aquatic amphibians, and using trained “turtle dogs” for determining population densities and age structure of the eastern box turtle, the TN state reptile.

Students share their project findings and conservation ideas at science fairs and professional meetings, in scientific journals, on the CRESO website, and through outreach workshops including K-12 classrooms and community groups such as Oak Ridge Institute for Continued Learning. Several CRESO students have continued their research after entering college and subsequently published their findings as a senior thesis or in peer-reviewed journals. New research and outreach initiatives include developing and piloting a standards-based box turtle curriculum, assisting local elementary schools in wetland creation/restoration and study methods, and providing guidance about wetland curriculum design. The program is coordinated by teachers of biology, math, and science from area schools, and instruction is further augmented and enriched by volunteer scientists, conservationists, and natural resource professionals who give their time and share their experience with CRESO students.

Introduction

A main goal of CRESO is to actively engage middle and high school students in meaningful long-term ecological field studies that focus on the flora and fauna of East Tennessee, specifically the Valley and Ridge ecoregion. Over 500 students have directly participated in CRESO research efforts since the program was initially funded in 1989 by a grant from DOE. The majority (95%) of students that work for CRESO enter the field of science after graduation, and several students have returned to Anderson County to teach science in the local school systems.

Student researchers conduct detailed inventory and long-term monitoring projects that provide information on the physical parameters, macro and microhabitat preferences, and population trends of targeted species. A high priority is placed on using and developing protocols that

consider the well-being of study organisms and insure quality control of large data sets. A variety of biomonitoring techniques are used to identify potential abiotic and biotic factors that influence population structure and temporal changes in community assemblages. Applied technologies (e.g., GIS, radiotelemetry, pit tags) are used to study intraspecific and interspecific interactions of individual organisms and how they use their three-dimensional landscape. Documenting the interactions and landscape use patterns is critical for understanding community dynamics (e.g., who competes with whom, how critical resources are partitioned, disturbance responses).

CRESO outreach education programs have been presented to thousands of individuals within the local area and across the United States and Canada. The CRESO research model has continued to improve, and student participants have consistently maintained a distinguished level of research standards and ethics.

Another important CRESO objective is to provide appropriate outlets for presenting research results. Students regularly speak at professional conferences and have reported new findings in several peer-reviewed publications, supporting the CRESO goal of quality research. Because student researchers have traditionally demonstrated a solid work ethic, opportunities to interact with professional ecologists and data managers are increasingly available to them. This early exposure to a range of experts is a key factor in helping students mature in their scientific thinking.

Ongoing Research

The projects listed below are examples of ongoing research that has recently been presented at state and regional conferences:

- Response of the Eastern Box Turtle (*Terrapene carolina carolina*) to Silviculture Treatments in the Valley and Ridge Province of East Tennessee
- Growth Rates in the Wild for the Black Kingsnake (*Lampropeltis getula nigra*)

Box Turtle Research - Abstract: Part 1

The potential impacts of different forest management options on the eastern box turtle (*Terrapene carolina carolina*) are uncertain. Rough terrain, thick vegetation, downed tree tops, and other features at our study site made traditional search techniques problematical for determining box turtle densities. From 2006 to 2008 trained Boykin Spaniels were employed at the University of Tennessee Forestry Resources Research Center in Oak Ridge, Tennessee, to find box turtles in two oak-hickory hardwood forest stands subject to different silviculture



The box turtle research team includes students and Boykin Spaniels.

objectives. We captured 456 individual box turtles a total of 707 times (36 % recapture rate) during pre/post sampling of an 11 ha regeneration clearcut and about 64 ha of surrounding habitat. There was no difference in the percentage of individuals originally found pre-clearcut and recaptured post-clearcut (31%) when compared to individuals captured and recaptured in the surrounding forest. Although there were no pre-harvest capture data for a 13 ha forest stand within the study site subject to partial harvesting techniques (e.g., thinning, shelterwood cuts) in 2004–05, a high density of turtles was found there in 2007–08. The data also suggest a clustered distribution pattern for box turtles.

Box Turtle Research - Abstract: Part II

As part of a larger study, we used radiotelemetry to determine the response of the eastern box turtle (*Terrapene carolina carolina*) to a regeneration clearcut harvest. Two adult males, two adult females, and four juveniles were tracked pre/post harvest. One additional adult male was tracked post-harvest. The four adults were tracked from 12 July 2006 to present while the four juveniles were tracked from 15 September 2006 to present. Clearcutting occurred from mid-August until mid-October 2007. Home range size and turtle location showed no obvious changes. Six of the eight pre/post tracked individuals had home ranges that directly intercepted the harvest site. Four individuals continued to include parts of the harvest site during or after the clearcut.



Students conduct radiotelemetry studies in order to determine the response of box turtles to a clearcut harvest.



Turtle behaviors observed through radiotelemetry illustrate patterns that have been described in the larger population and provide more specific insight into population distribution, recapture location data, and seasonal patterns.

Radiotelemetry allows researchers to gather data on a variety of natural history and life history strategies. A male turtle (left) was found eating a mushroom – an important resource for box turtles.

Kingsnake Research - Abstract:

During an 11 year coverboard study (June 1997–2008) at the University of Tennessee Forestry Resources Research Center in Oak Ridge, Tennessee, we encountered 2,031 snakes including recaptures. We captured 73 individual black kingsnakes (*Lampropeltis getula nigra*) a total of 140 times for a recapture rate of 48%. Individual kingsnakes with a minimum of two months between captures had a mean growth rate of 2 cm/mo. Kingsnakes ≤ 60 cm had a mean snout to vent length increase of 2.9 cm/mo while those > 60 cm averaged 1.4 cm/mo. Kingsnake growth rates were greater than those reported by Jenkins et al. (2001)¹ in a study conducted 6 km from our field site. In their study capture rates were substantially higher, and snakes grew appreciably larger. Differences in soils and small mammal densities suggest reasons for population and kingsnake size discrepancies between the two studies. We observed one regurgitation event that combined with the disgorged prey items reported by Jenkins still only provides scant information on prey mass to snake mass ratios. We hypothesize an ontogenetic shift in feeding, but gaining quantitative insights into foraging theory will require a collective effort on the part of herpetologists.



Two middle school students captured a pair of cornsnakes from under the coverboard in the background. The coverboard monitoring technique helps provide information on snake assemblage, sex ratios, growth, associated organisms, and activity patterns.



A CRESO research student presents kingsnake findings at a meeting of the Tennessee Herpetological Society.

More Information

For more information contact CRESO at: creso@acs.ac.

Note: The CRESO website is presently being transferred to a new web host. (January 05, 2009)

¹ Jenkins, L.N., T.J. Thomasson, and J.G. Byrd. 2001. A field study of the black kingsnake *Lampropeltis getula nigra*. Herpetological Natural History. 8(1):57–67.