



## **Field Cave Ecology**

July 16-21, 2018

GEOG 475, GEOL 475, and GEOS 510

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**Course Instructor:** Dr. Jerry Lewis

**Instructor Email:** lewisbioconsult@aol.com

**WKU Program Leader:** Dr. Leslie A. North

**Program Leader Email:** leslie.north@wku.edu

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### **Course Description and Objectives:**

The Mammoth Cave area is one of the hotspots of biodiversity among cave animals in North America, but what are these animals, and where are they found? These are questions concerning cave ecology, which is the study of subterranean habitats and their inhabitants, that are best understood by personal observation of the animals and their interactions with cave environments. Participants in Field Cave Ecology will learn to find and identify a variety of cave animals, as well as see their behavior and interactions with other species. To explore some tenets of population ecology, students will find species that occur in such small numbers that they interact little with one another, and others that occur in assemblages so dense they obscure the substrate. Watching living animals can teach about competition for food and space and even their strategies for the ultimate competition: predation.

Nowhere is the influence of geology more influential on the presence of cave fauna than in the central Kentucky karst area. We will observe zoogeographic patterns of the cave fauna as a function of the regional and local geology. For example, we will see cave beetles that are ubiquitous in caves of central Kentucky, while other widespread groups of cavernicoles are curiously absent. The local geology that determined the presence of the multi-level Mammoth Cave System provides a stage on which the animals partition this complex environment and inhabit it in myriad patterns. Students will see diverse cave and karst habitats including sinkholes, sinking streams and springs.

The course will consist of a combination of classroom discussions that summarize the biological principles and objectives of each day, followed by field trips to surface and underground sites in and around Mammoth Cave National Park. At least one field trip will be taken outside of the park to look at a classic example of pollution ecology in the Hidden River Cave groundwater basin. Participants will receive much of the class material in the field and

hands-on experiences like population censusing will be emphasized. The course is available as a workshop or for academic credit. There are no prerequisites for the class. This course will be held at the Cave Research Foundation's Hamilton Valley Field Station adjacent to Mammoth Cave National Park. Each student taking the course for academic credit will be required to complete a field journal and an individual field project. For the latter, a biologically rich cave is available for student use on the grounds at Hamilton Valley.

**Required Text:**

- Manual of course material, reports, and articles covered in class to be provided by WKU at the start of the course.

**Equipment and Supply List:**

Note, to avoid potential transmission of white-nose syndrome to bats in the cave, the Park Service requires that clothes and equipment used be thoroughly cleaned before being used in Mammoth Cave National Park. A disinfectant will be available to treat helmets and equipment, but for cave clothes it is easier to change to fresh items kept in a separate sealed plastic bag. White-nose syndrome has been identified in Mammoth Cave National Park, but it is still necessary to follow these precautions. WNS, caused by a fungus, is fatal to hibernating bats but does not affect humans. For details, visit [www.caves.org](http://www.caves.org) and click on WNS.

Participants are expected to provide their own field and caving equipment: helmet, 3 sources of light (to include a headlamp), sturdy boots (lace up, aggressive tread), kneepads, gloves, and cave pack. It is strongly suggested that participants be in good physical condition. Water, food, and first aid supplies are strongly suggested for cave trips. Participants should be prepared for lunch in the field every day, and some trips will require eating lunch in the cave. Finally, if nature should call while underground, participants should be prepared with a means of removing any and all waste from the cave as well.

1. **Helmet** (for caving trips) with non-elastic chin strap, quick-release buckle, and three- or four-point suspension. The helmet should stay on during a fall but be easily released if it should become wedged. The helmet will also be the mounting point for your primary light source, so any accommodation for attaching a headlamp is a plus.
2. **Light that can be helmet mounted.** REI or other outdoor outfitters carry suitable lights for caving. Bring extra batteries. No carbide lights.
3. **Flashlight** with extra batteries and extra bulb (ex. Mini-Maglite) plus another light for a total of at least 3 sources of light.
4. **Sturdy boots with non-skid soles** (comfortable, hiking, water resistant is good).
5. **Rugged clothing** that can withstand outdoor activity. These include comfortable pants or jeans that you can afford to get dirty and wet. To keep you warm in the 56° F, 100% humidity, underground environment you'll need to dress in layers. On some days we will be hiking in the summer heat and then making relatively short (1-2 hours) cave trips to see fauna and habitats, thus plan on being able to add or subtract clothing layers as needed. A long-sleeve shirt is strongly recommended. You will be underground most days, so be prepared with some clean changes of clothes. There will not be enough time to do laundry each day.

6. **Gloves** (garden type is ok, to protect hands and for gripping)
7. **Knee pads** (These are very helpful in protecting your knees). Basketball or other athletic-type knee pads are good.
8. **Small to moderate size day-pack** to hold batteries, jacket, clothing, supplies. A large backpack will be too bulky for narrow cave passages.
9. **Water Bottle** (fill before going on trips, to keep hydrated)
10. **Snack foods suitable for long underground hiking trips**– such as granola-type bars, small cans of fruit, dried fruit, trail mixes, beef or other jerky – similar to what you would take on a long day hike on the surface.
11. **Rain Gear** (layers of clothing for severe weather, umbrella, rain jacket, etc.)
12. Food if you are staying at Hamilton Valley Facility, which has a fully equipped kitchen, showers and restrooms.
13. Bedding (If staying at Hamilton Valley -sleeping bag or sheet or blanket, pillow). Hamilton Valley has 10 rooms with 4 bunks each.
14. Toiletries and Towels (If staying at HV-towels, toothbrush, toothpaste, shampoo, etc).

**Expectations and Attendance:** Due to the amount of course content that will take place in the field, participation in all class activities is a must. Participants that are enrolled in the course for academic credit must participate in all course activities to receive credit – no exceptions! Breakfast at Hamilton Valley each morning is not mandatory. It is strongly recommended, however, that all participants eat breakfast (with us or on their own) each morning so we can avoid cavers “burning out” in the cave. Students are expected to participate in all classes and field trips, except under special conditions (e.g., health).

In the rare circumstance that students are unable to fulfill the field requirements they will be invited to drop the course. All participants will receive a Certificate of Participation on the last day of the class for their full participation in the class. **This does not constitute the final grade for those taking the course for academic credit.**

**Participants are also required to follow all safe caving practices!**

**Grading:** Courses can be taken as non-credit workshops, Undergraduate and Graduate credit, or for Continuing Education Units. For those taking the course for academic credit, additional work outside of class activities will be required. Participants taking the course for academic credit will be required to complete and submit a fieldbook to the instructor at the end of the course for review. A standard 10-point grading scale (100-90 = A; 89-80 = B, etc.) will be used in the course. **The deadline for submitting all course material to the instructor is August 1.** Project grading is based on the insight and quality of work demonstrated, with some accommodation for those with limited background.

The assignment weight breakdown will be: Attendance (33%), Participation (33%), Project and fieldbook (34%). Due to the short time period of the course students are expected to participate in every field stop, rain or shine. Students should make accommodations to be as comfortable as possible in any type of weather.

Regular and prompt attendance is absolutely necessary in this class! You should keep in mind the following. Activities missed because of an unexcused absence cannot be made up and it will not be accepted. If a student is unable to participate in any field activities, he/she must notify the instructor as much in advance as possible. The instructors will determine if the student can successfully complete the course.

All students are required to sign a waiver for liability purposes related to any and all work involving multiple trips to the field for study and projects. The Karst Field Studies Program provides this form on the KFS website under the Forms tab. A blanket waiver form covering all trips even if they are short in distance or duration will be provided.

**Other Requirements/Information:** Each student will be required to take notes and observations in a field notebook. Students are required to have basic field equipment, including sturdy boots, a field notebook, rain gear, gloves, kneepads, and water.

**General Class Conduct and Policies:** During class periods, cell phones should be turned off and smoking is not allowed. While in cave, safety and conservation are primary concerns. We will move slowly and carefully to minimize danger and impact on the cave. On the surface, especially in the National Park, it is essential to drive carefully and to obey the speed limit. Beware of snakes, ticks, chiggers, and poison ivy. \*\* Cell phones should be turned off during class! \*\* Please treat your colleagues and their desire to learn with appropriate respect.

**ADA Statement:** Students with disabilities who require accommodations (academic adjustments and/or auxiliary aids or services) for this course must contact the Director of the Karst Field Studies Program, Dr. Leslie North at [leslie.north@wku.edu](mailto:leslie.north@wku.edu) or (270) 745-5982 so proper accommodations can be considered and made as necessary.

**Schedule Change Policy:** The Department of Geography and Geology strictly adheres to University policies regarding schedule changes. It is the responsibility of the student to meet all admissions deadlines. Only in exceptional cases will a deadline be waived (you will be required to fill out an appeal form). The form requires a written description of the extenuating circumstances involved and the attachment of appropriate documentation. Poor academic performance, general malaise, or undocumented general stress factors are not considered as legitimate circumstances.

## Tentative Class Schedule/Agenda

*Subject to Change*

### **Sunday** – Welcome to the Program

7:00pm Greetings and introductions  
Introduction to subterranean ecology

### **Monday\*** –The Mammoth Cave community

8:00am Course overview  
Cave fauna of the central Kentucky karst  
Ecological classification of cavernicoles  
Species interactions  
Field Trip: Mammoth Dome Sink, White's Cave,  
Echo River Spring; Adwell Cave

\*Deadline for all participants to inform the instructor of their project title

### **Tuesday** –Cave and other subterranean habitats

8:00am Soil, seeps, milieu souterrain superficiel, epikarst and...caves  
Cave Trip: Mammoth Cave upper level habitats in Gratz Avenues  
(Shaler's Brook), mid-level habitats in Jessup Avenue (Flint Dome)  
and Black Snake Avenue  
Student project time in Adwell Cave

### **Wednesday** –Zoogeography and evolution of cavernicoles

8:00am Physiographic provinces and regional cave faunas  
Speciation of cavernicoles: morphological and molecular approaches  
Cave Trip: Mammoth Cave at base-level, Styx and Echo rivers  
Student project time in Adwell Cave

### **Thursday** –Groundwater pollution ecology

8:00am Pollution ecology of the Hidden River groundwater basin  
Field trip: Overview from the escarpment, Cave City influent site,  
Horse Cave Sewage Treatment Plant, Hidden River Cave  
Student project time in Adwell Cave

### **Friday** – Community composition and quantification

8:00am Censusing methods for cave communities  
Cave trip: Mammoth Cave: Cleveland Avenue, Snowball Dining  
Room, Cathedral Domes  
Student project reports

#### Student project examples (conducted in Adwell Cave)

Competition in aquatic cave crustaceans  
Photoreactivity in cave versus spring isopods  
Cave cricket foraging range