



Cave and Karst Resource Management

June 22-26, 2019

GEOG 475, GEOL 475, and GEOS 510

Course Instructors: Dr. Pat Kambesis and Mr. Joel Despain

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WKU Program Leader: Dr. Leslie A. North

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Course Description and Objectives:

Objective: For students to know and understand the resource management, conservation and protection issues surrounding cave and karst resources. For students to come away with tools and ideas for solving cave management problems. For students to learn the legal basis for cave management in the US. For students to come away from the class inspired and enthused to complete cave projects and work to protect cave and karst resources.

Whether a resource of concern for park staff, an issue for non-profit managers or an important topic for family owners caves are increasingly being actively managed. It might be a concern over pollutants, endangered species, recreational use, liability, rare mineral features or even just a change in ownership that leads to increased management. The management actions may be gating, species monitoring, a use plan, closure periods or any other number of activities. This course teaches the management of cave and karst natural resources for private citizens, concerned cavers, park, preserve and forest managers and students interested in these topics.

This class includes detailed information on the many varied resources in caves and their management and conservation for

- biological,
- paleontological
- mineralogic
- hydrologic
- cultural
- archaeologic
- geologic
- and other

resources. Tools and ideas and practical solutions for managing these resources are discussed and reviewed with many examples from across the US and world.

A thorough review of both US federal and US state cave protection laws, regulations and policies is undertaken to provide an understanding of the range of the laws and their effects on cave management issues.

Cave management plans and their development and use are covered. These are wide ranging documents that vary from simple and small to complex and voluminous. Cave and karst data collection and management, cave inventory and monitoring and the use GIS will be covered. This includes discussions on field work, data sets and software, and analysis.

Additional special topics include tour cave management and operations, cave tour lighting, cave search and rescue, working with volunteers and caving groups – the pluses and minuses, cave gating and its costs and impacts, cave and karst research and other topics. The class also includes a detailed review of cave management in consideration of White Nose Syndrome disease in bats. The range of responses to White Nose by cave managers has been big. We will review these ideas and actions in light of the latest information on the disease.

The class will include several field trips into the Mammoth Cave system to view and discuss cave management issues and ideas in of the most impacted and resource rich cave environments in the world. Mammoth Cave is a living laboratory for cave management.

The class will be both in-class discussion and field discussions and examples. Students should be prepared to spend 2-4 hours a day underground though no special skills are required. Please see the personal equipment list for the class listed below. The course is available as a workshop, or for academic credit (either undergraduate or graduate). For those taking the course for academic credit, a cave or karst management project agreed to by the instructors before the end of instruction on June 21 will be required with final project submission required by August 31 following June class.

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 in one part of Mammoth Cave be thoroughly cleaned before being used in another part. 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 and click on WNS.

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. **Two (2) lights that can be helmet mounted.** REI or other outdoor outfitters carry suitable lights for caving. Bring extra batteries.
3. **Flashlight** with extra batteries and extra bulb (ex. Mini-Maglite)
4. **Sturdy boots with non-skid soles** (comfortable, hiking, water resistant is good).
5. **Caving coveralls are ideal, but a suitable alternative is rugged clothing** that can withstand outdoor activity. These include comfortable pants or jeans that you can afford to get dirty. To keep you warm in the 56° F, almost 100% humidity, underground environment you'll need to dress in layers. It is strongly advised that you have a thermal layer top (polypro or equivalent) and a bottom. If you are not using coveralls, then 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).

Attendance: Students are expected to participate in all classes and field trips, except under special conditions (e.g., health). Field trips involve easy to moderately challenging caving. In the rare circumstance that students are unable to fulfill the field requirements they will be invited to drop the course. In general the rigor of the trips are adjusted to the abilities of the class. **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.**

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, a report on an independent project is required. Students will need to remain in contact with the instructor for guidance. Deadline for written reports is August 1 of year of course. Project grading is based on the insight and quality of work demonstrated, with some accommodation for those with limited background.

Grade Scale (based mainly on project, but weighted according to participation in class):

A = equivalent to the finest work that is expected of a student at this level

B = good work, but with a few flaws in procedure and interpretation

C = average work

D = poor work, sloppy presentation

F = no redeeming features, or failure to turn in project by deadline

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 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

Saturday, June 22, 2019

Introduction to the course and the week ahead

1:00pm

Sign in and class orientation including the schedule for the week, course expectations and grading, field trips, guest lecturers, safety, personal equipment for the week, administrative issues such as paperwork, logistics such as housing, etc.

Section 1. The Basis of Cave Resource Management

2:00pm-3:00pm

A. Cave Resources – An Introduction

What are we trying to protect? Why? And what are the threats?

- Biological resources
- Archaeological and cultural resources
- Karst hydrology
- Cave and karst geology
- Cave paleontological resources
- Mineralogical features including speleothems
- Karst resources and surface features
- Cave recreation

3:00pm-3:15pm

Break

3:15pm-4:15pm

B. Cave management in the US – the big picture.

Who owns and manages our caves? What are their goals? How is this changing?

4:15pm-5:00pm

C. Cave Laws and Regulations

What laws do we need to follow and consider? How do they vary?

Federal Laws

- Federal Cave Resources Protection Act
- Endangered Species Act
- Archaeological Resources Protection Act and Native American Graves and Repatriation Act

State Laws

- Many varied and different state laws

5:00pm-6:30pm

Dinner Break

6:30pm-8:00pm

Special Evening Topics 1: The realities of managing a not-for-profit caving organization – David Foster, Executive Director of the American Cave Conservation Association.

4 1/4 hours of instruction

Sunday, June 23, 2019

Section 2. Cave Resources in Detail

8:00am-9:00am

A. Cave biology – How does it work and what lives in caves? How does it vary? What to consider in your management. Inventory and monitoring considerations. Field techniques and options. Planning and management options and tools. Where to seek assistance and more information. The Endangered Species Act and caves life. Other applicable laws to consider. White Nose Disease in bats.

9:00am-10:00am

B. Cave archaeological and cultural resources – What is in caves? How does it vary? What to consider in your management; a short review of the history of cave discoveries, inventory and monitoring considerations. Where to seek assistance and more information. Applicable laws. Planning and management tools and options.

10:00am-10:15am

Break

10:15pm-11:00am

C. Cave geologic *resources* – What is in caves and how does it vary? Even dirt is important when it 700,000 years old. What caves can tell us and their geologic resources.

11:00am-Noon

D. Karst hydrology – How does it work? How does it vary? What to consider in your management; inventory and monitoring considerations.

Noon to 1:00 pm

Lunch Break

1:00pm to 4:00 pm

Field Trip to Historic Mammoth field trip – Management of cultural and archaeological resources; cave gates and air flow; cave tour infrastructure, cave tour management, cave restoration, cave history, cave natural resource interpretation on tours and other topics of discussion.

4:00pm-5:00pm

E. Cave paleontology – What are cave paleontological resources and how important are they? New laws on paleontological resources. What to consider in your management; inventory and monitoring considerations.

5:00pm-6:30pm

Dinner Break – Meet with students taking the class for credit to plan for their class projects.

6:30pm-8:00pm

Evening Special Topics 2: Cave Management in the Era of White Nose Syndrome Disease – Rick Toomey, Director of the Mammoth Cave Center for International Learning.

9 ¼ hours of instruction (13 ½)

Monday June 24, 2019

2. Cave Resources in Detail continued

8:00am-9:00am

F. Cave mineralogy – Speleothems and all their many forms types and mineralogy. How do we protect these? What really is rare? How do we value these? What to consider in your management; inventory and monitoring considerations.

9:00am-10:00am

G. Cave recreation – What do people do in caves and why? Show caves – a changing American recreational activity. How does it vary? Wild Tours. Protecting caves that get daily and large-scale use is a big and complex challenge. Ideas for protecting cave resources in the context of recreation. What to consider in your management. Monitoring impacts and changes.

10:00am-10:15am

Break

10:15am-2:00pm

Field Trip and bring your lunch to Crumps Cave at Smith's Grove, Kentucky managed by Western Kentucky University – cave archaeology; management by a state agency; cave land tenure issues; community relations

Section 3: Techniques and Methods for Cave and Karst Resource Management

2:00pm-3:00pm

A. Managing projects and caver volunteers – finding help for your projects; working with cavers; formal agreements with the NSS for agencies; volunteer safety; volunteers are not free – managing the budget; equipment; timing; expectations; food.

3:00pm-5:00pm

B. Cave GIS and data management and use

- Karst GIS
- in-cave GIS
- Other data types

5:00pm-6:30pm

Dinner Break

6:30pm-8:00pm

Special Topics 3: Cave Maps and Cave Surveys – how does it work and what is it good for – Pat Kambesis

9 ¼ hours on instruction (22 ¾)

Tuesday June 25, 2019

Section 3: Techniques and Methods for Cave and Karst Resource Management continued

8:00am-8:30am

C. Cave gates—A complex issue with impacts, costs and challenges

8:30am-9:00am

D. Managing the new cave discovery

9:00am-10:00am

E. Cave research and researchers--Determining your needs; managing researchers; managing cave specimens; getting information back from researchers

10:00am-10:15am

Break

10:15am-11:00am

F. Cave inventory—How is it done and why; protocols for biology and mineralogy, field work and data management.

11:00am-Noon

G. Cave Monitoring – How is it done and why; protocols for biology and mineralogy, field work and data management.

Noon-1:00pm

Lunch

1:00pm-4:00pm

Field Trip to Collins Crystal Cave – cave history, cave restoration, cave vandalism, NPS cave management, etc.

4:00pm-5:00pm

H. Cave Management Plans – what, when and why

5:00pm-6:30pm

Dinner

6:30pm-8:00pm

Special Topics 4: Karst dye tracing—What can dye tracing tell you and why is it important; how it works -
- Leanne Bledsoe

10 ¼ hours of instruction (32 ¾)

Wednesday June 26, 2019

8:00am-8:30am

I. Cave Diving – how do we manage this? The balance of access vs. safety and impacts

8:30am-9:00am

J. Cave Digging

9:00am-10:00am

K. Cave restoration – how, what and why

10:00am-10:15am

Break

Section 4: Show Cave and Recreational Caving Management

10:15am-11:00am

A. Cave tours and cave education – how to educate and be entertaining; tour themes; tour jokes; tour sensitivities

11:00am-Noon

B. Infrastructure considerations

Noon-1:00pm

Lunch

1:00pm-2:00pm

C. Mitigating impacts

Lighting – cleaning and preventing lampenflora

2:00pm-3:00pm

D. Recreational Caving—Permits, trip leaders, group size, etc.

3:00pm-3:15pm

Break

3:15pm-4:00pm

E. Managing a multi-faceted tourist attraction – considering restrooms, cranky tourists, roads, trails, gift shops, etc.

4:00pm-5:00pm

Class close out

5:00pm-6:30pm

Dinner

6:30pm-8:00pm

Special Topics 3 – Cave Search and Rescue (Guest Speaker) -- working with law enforcement to facilitate search and rescue; protecting cave resources during a SAR; rescue pre-plans

9 hours of instruction (41 ¾ total hours for the class)

Thursday, June 27, 2019

Morning

Student departure

DRAFT