

Geography of Species Richness and Endemism of the Obligate Cave Fauna of the Interior Low Plateaus and the Appalachian Mountains

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The charge from the Appalachian Landscape Conservation Cooperative

The project will assemble georeferenced data, identify key intermediate (classification) data, and develop supporting science products that depict and map karst habitats and biotic resources across the Appalachian LCC based on the most appropriate method of classification to facilitate landscape-level planning objectives and address conservation and management needs.

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The Team

Biologists

- David Culver, American University
- Matthew Niemiller, University of Illinois
- Kirk Zigler, University of the South

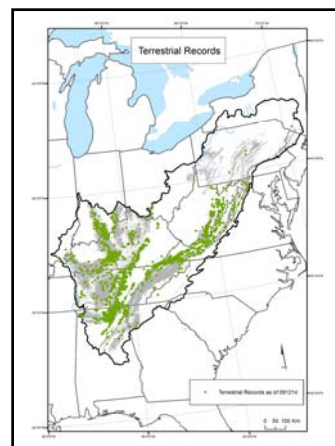
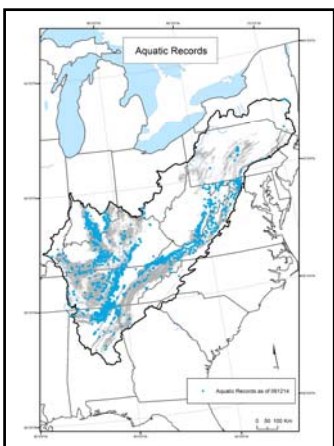
Geologists and Geographers

- Daniel Doctor, U.S. Geological Survey
- David Weary, U.S. Geological Survey
- John Young, U.S. Geological Survey

Statistician

- Mary Christman, MCC Statistical Consulting and University of Florida

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We Have A Lot of Data!

- 11,134 Records
 - 9833 species records
 - additional 1301 genus records
- 710 Species
- 40 additional subspecies
- 131 genera
- 67 families
- 34 orders
- 14 classes
- 5 phyla

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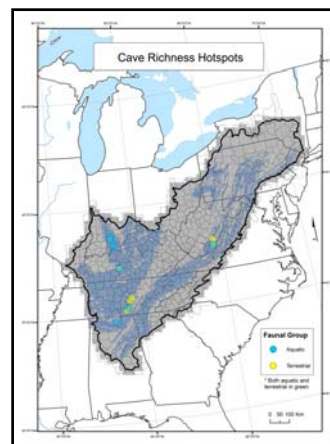
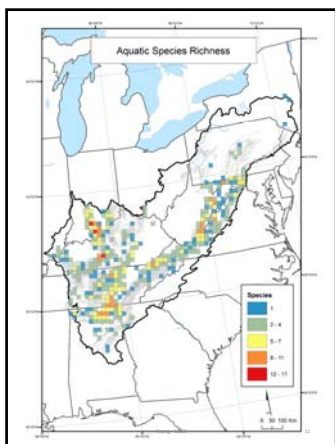
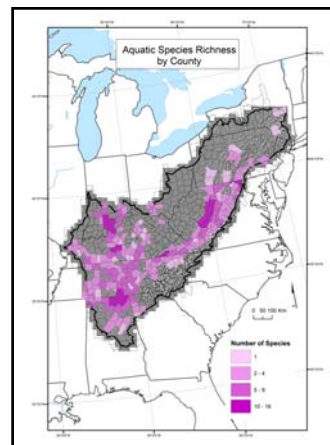
For stygobiont/troglobiont records, the winner is.....Tennessee

- TN (2,404; 21.6%)
- KY (2,163; 19.4%)
- IN (1,631; 14.6%)
- AL (1,341; 12.0%)
- VA (1,329; 11.9%)
- WV (1,182; 10.6%)
- IL (432; 3.9%)
- GA (284; 2.6%)
- MD (168; 1.5%)
- OH (70; 0.6%)
- NC (62; 0.6%)
- PA (52; 0.5%)
- NY (13; 0.1%)
- SC (3; 0.0%)

Analysis of Species Richness and Endemism at Three Scales

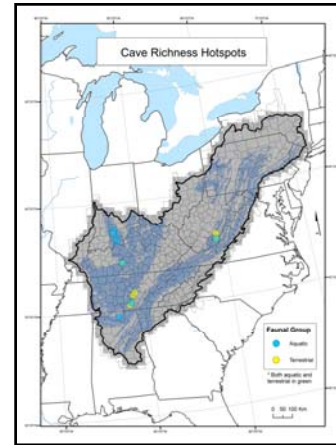
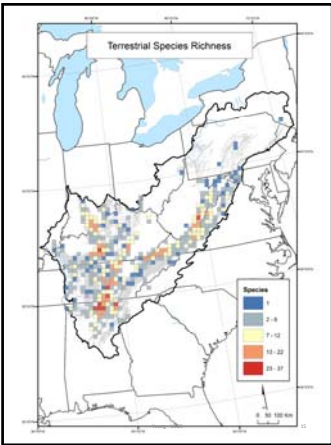
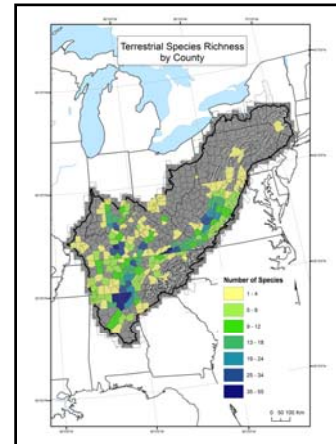
- Individual Cave
 - Advantages: Detailed, Fine-scale analysis and protection
 - Disadvantages: Wildly different sampling intensities; different sizes and areas; only α -diversity is included but β diversity is more important
- 20 X 20 km grid cells
 - Advantages: Equal sizes; minimize differences in sampling intensities;
 - Disadvantages: Artificial divisions
- Counties
 - Advantages: Familiar units; other data, especially relating to human activities, available at this scale
 - Disadvantages: Unequal areas

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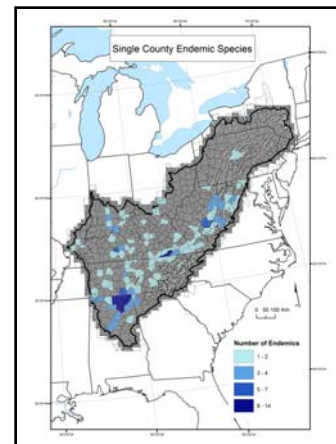
Patterns of Stygobiont Hotspots

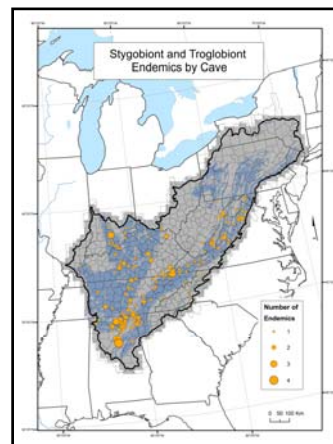
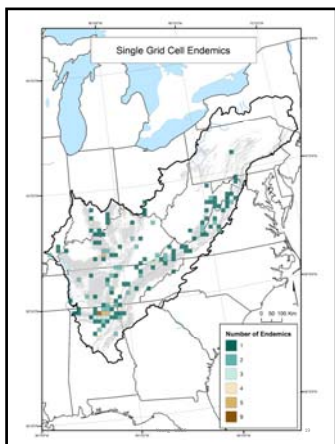
- At the county scale, there are a number of hotspots, including southern Indiana, Mammoth Cave region, northeast Alabama/southcentral Tennessee, southwest Virginia, and southern West Virginia
- At the 20 X 20 km scale, hotspots are southern Indiana and Mammoth Cave region
- Some of the differences in these above patterns are the result of the way counties and grids are categorized in the color ramps
- There is an apparent lack of data for Pennsylvania
- At the scale of single cave, most (6 of 10) of richest caves are in southern Indiana



Patterns of Troglobiont Species Richness

- At the scale of counties, there are hotspots in northeast Alabama/southcentral Tennessee, Mammoth Cave region, and southwest Virginia
- At the scale of 20 X 20 km grids, there are hotspots in northeast Alabama/southcentral Tennessee and the Mammoth Cave region.
- There is an apparent lack of data for Pennsylvania
- For single cave hotspots, Tennessee and West Virginia dominate, with 4 of 9 and 3 of 9, respectively.





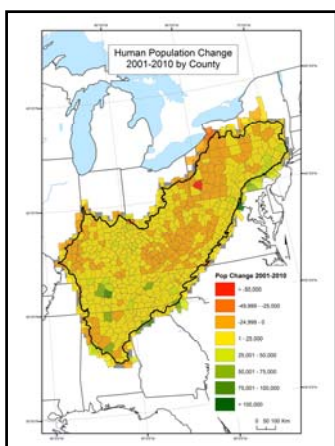
Patterns of Endemism

- There are many single county endemics, but there is a concentration in northeast Alabama and southcentral Tennessee
- At the scale of 20 X 20 km, single grid cell endemics are common, also with a concentration in northeast Alabama and southcentral Tennessee
- There are a total of 218 single cave endemics, with Alabama having 65, followed by Tennessee with 44. Only McClunney Cave in Jefferson County, Alabama as four endemic species

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An Overall Predictor of Threat?

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Conclusions

There are important differences in pattern at different scales, but several robust patterns emerge

- Northeast Alabama and southcentral Tennessee is the major hotspot for both troglobiont and endemism richness
- Southern Indiana is the major hotspot for stygobiont richness
- The Mammoth Cave region is an important hotspot of both troglobiont and stygobiont richness
- Broad scale threats to the cave fauna are likely to come from the urbanizing areas of the Appalachian LCC, especially Nashville and the Washington DC regions.

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