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Feb 15th, 10:45 AM

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Recommended Citation

Patricia Kambesis, Joel Despain, and Chris Groves, "The Making of a Connection: Exploration/Survey in Whigpistle Cave System" (February 15, 2013). *Mammoth Cave Research Symposia*. Paper 8.
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The Making of a Connection – The Potential of a Mammoth Cave System-Whigpistle Cave Connection

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Abstract

The current length of the Flint Ridge-Mammoth Cave System (to be called Mammoth Cave System for the rest of this paper) has been attained by a series of connections instigated by cave explorers/mappers of the Cave Research Foundation (CRF) and Central Kentucky Karst Coalition (CKKC). Between 1961 and 2011, connections have expanded the surveyed extent of the cave system to its current “official” length of 390 miles (650 km). Connections do not happen serendipitously; rather, systematic exploration is the key to successful connections. CRF and other groups working in the Mammoth Cave area have adopted a method of systematic exploration that involves mapping cave passages, correlating the surveyed cave passages and their elevations with topographic maps, aerial photographs, and elevation controls such as geographic surface benchmarks (Kambesis 2007). But most important is translating that data into cave maps projected onto topographic overlays. Cave maps and overlays reveal not only the extent of the cave system, but also invoke an understanding of the geological and hydrological conditions that control cave passage development and distribution (Kambesis 2007). Georeferenced cave maps along with geological and hydrological insight are what provide the perspective on cave connection potential and drives exploration objectives and priorities. Incorporating these data into a GIS system is proving to be a valuable exploration tool and one that is currently being used to work toward the next big connection to the Mammoth Cave System – that of Whigpistle Cave System. This paper focuses on the potentials toward making that next big connection and the work necessary to accomplish it.

Introduction

A section of the regional map of the Mammoth Cave area (Figure 1) shows the results of nearly 65 years of systematic cave exploration in the region. More than 585 miles (978 km) of cave passages have been explored and mapped not only within the Mammoth Cave System (with a length of 390 miles (650+km)), but in other caves located outside of Mammoth Cave National Park including Fisher Ridge Cave System at 119 miles (198 km), Whigpistle Cave System at 35 miles (58 km), Hidden River Complex at 21 miles (35 km), Crumps Spring Cave at 11 miles (18 km), James Cave at 10 miles (17 km) and Vinegar Ridge at 9 miles (15 km) (Gulden 2012). There are many smaller cave systems whose combined lengths with those of the larger caves approaches 650

miles (1000+ km) . Quinlan et al., (1983) suggested a potential of 1000 miles (1,600 km) of cave passages within the Mammoth Cave region. This potential has motivated cave explorers to pursue extending the known limits of the world’s longest cave system.

The mode for continuing to expand the world’s longest cave has been to seek connections with other nearby cave systems. Despite the great length attained by the Mammoth Cave System, connection potential is still viable with other large systems in the area. Though proximity of the passages of different cave systems hints at possible areas to connect, it is not the only, nor the most important criteria. Geological and hydrological conditions are

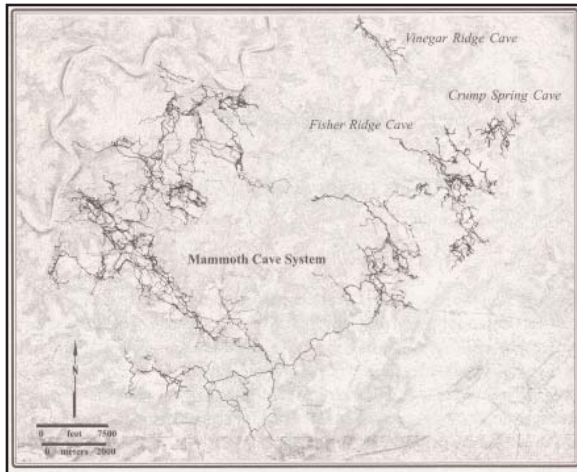


Figure 1: A section of the regional map of the Mammoth Cave area. From Borden and Brucker 2000

critical factors for determining viable areas in which to expend survey manpower and resources. For example, the Fisher Ridge Cave System is the next most extensive cave system in the Mammoth Cave region and comes within 300 feet (100 meters) of Mammoth Cave System. However, the areas of closest proximity between the two systems are located high in the ridges which are the least favorable spots for connection. Cave passages in high-ridge locations tend to be truncated by valley erosion which removes significant sections of previously connected passages. The best place to pursue connection is in the active, base-level streams that are still actively forming the caves. This is where connections have been made in the past and will likely continue to be made in the future. Of all of the known major caves in the Mammoth Cave area, Whigpistle Cave System holds the most promise for a future connection to the Mammoth Cave System.

The Potential for Connection

The GIS map shows that the Whigpistle Cave System is located a little more than a mile southeast of the Proctor section of Mammoth Cave System (Figure 2). Woolsey Valley, one of many erosional valleys on

the Mammoth Cave plateau, occupies the gap between both systems. This means that all upper level trunk passages in both systems have been truncated by valley erosion which is evident from exploration and survey of those passages in both cave systems. The cave sections where connection is most likely are between the base level streams of both cave systems i.e. Red River in Whigpistle and at the downstream Logsdon River sump in the Mammoth Cave System. The gap between those two areas is almost two miles straight-line distance and under Woolsey Valley. Despite that distance the following evidence points to these areas as having the highest potential for connection.

Connection precedence

A review of the history of exploration and survey of the Mammoth Cave System connections (Kambesis 2007) reveals that most connections occur in the active base levels of two systems and that these areas cross under the deep erosional valleys that have truncated higher elevation passages. The Flint Ridge–Mammoth Cave connection occurred under those conditions and all other connections occurred in association with the active stream levels.

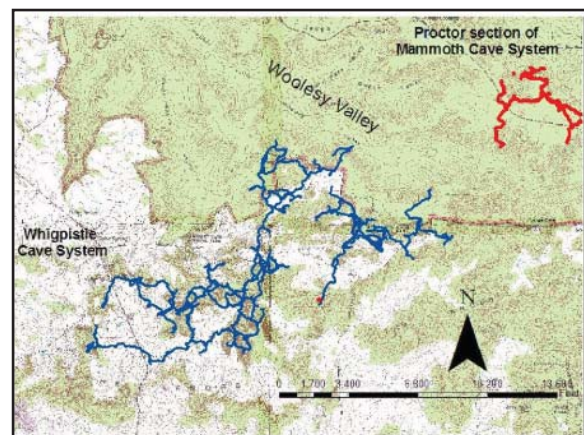


Figure 2: Topographic overlay showing location of Whigpistle Cave System and the Proctor section of the Mammoth Cave system.

Reassessment of the southwest sections of Proctor Cave

A considerable amount of time has been spent carefully remapping the Proctor section of the Mammoth Cave System in search for lower level routes that might bypass the downstream Logsdon River sump. Though plan view maps of the Proctor section give the impression of most favorable geography, the cave passages in that part of Proctor Cave are not deep enough to go under Woolsey Valley as evidence by cave and topographic elevation data.

Hydrology

The most compelling evidence for potential connection comes from the extensive amount of dye tracing that has been done in and around the Turnhole Basin which holds the Whigpistle Cave System and a good part (but not all) of the Mammoth Cave System drainage. A traced conducted by Quinlan (Courbon 1989) and reconfirmed by Jasper (1999) documented the hydrogeologic connection between the Hawkins-Logsdon River in the Mammoth Cave System and Red River in the Whigpistle System. Figure 3 illustrates the hydrological flow route as interpreted from both dye traces. Despite the amount of dye tracing that has been done in the area there are still hydrologic “mysteries” within this part of the groundwater basin. Groundwater flow from Mill Hole (located downstream of Whigpistle Cave System), has more stream discharge than the upstream rivers of Mammoth Cave. This groundwater flow, referred to as the Mill Hole River by Jasper (1999) has not yet been encountered by cave exploration efforts (though it is known to exist from dye tracing). Large cave passages formed by such a river should exist in the downstream portions of the Turnhole Spring Basin (Jasper 1999). The only significant cave passages ever found to date in the central portions of Turnhole are the 35 miles of the Whigpistle Cave System.

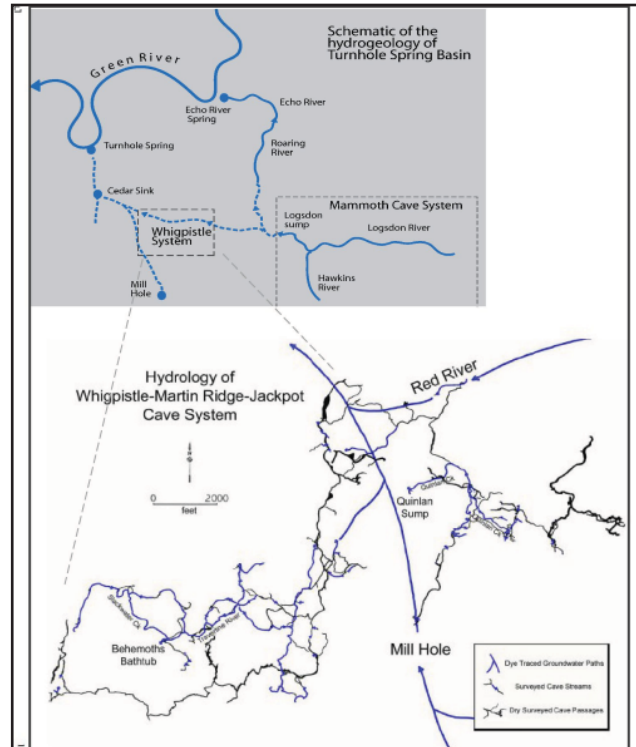


Figure 3: Schematic of the hydrology of Whigpistle Cave System with inset showing schematic of hydrology of Turnhole Spring Basin.

Connection Logistics

Because all of the underground rivers in the Mammoth Cave System that trend toward the Whigpistle Cave System become sumped (cave passages become water-filled), standard cave exploration techniques will not achieve the desired connection. However, technical cave diving can provide the means to make the survey connections necessary to link the two systems. In 2008, the author began working with a team of experienced cave divers toward achieving this goal. Discussions to consider logistics for working the downstream sumps of the Mammoth Cave System are in progress with the Resource Management office at Mammoth Cave National Park and several reconnaissance trips have already taken place in order to assess the conditions for cave diving in the sumps.

The Red River section of the Whigpistle Cave System is also in the process of being reassessed for potential efforts from that direction. The last trip to Red River occurred in the Fall of 1983 before the big storm that made that section of cave inaccessible from the Whigpistle entrance. The survey team documented a complex maze of stream passages some which sumped and others which were left as open leads. No one has been back to that area since. Plans are in progress to send survey teams to Red River from the Martin Ridge entrance of the Whigpistle System to continue working those leads.

Epilogue

Though the superlative length of the Mammoth Cave System and mileage potential for the Mammoth Cave area seem unbeatable on the world class scale, there is one other karst area that has the potential to surpass the Mammoth Cave area in terms of sheer passage density and possibly even cave system length. That area is located on the Yucatan Peninsula at the Caribbean coastline of the state of Quintana Roo, Mexico and is known as the Mayan Riviera. Like the Mammoth Cave area, tourism is the economic base, and caves play a significant roll as tourist attraction. The biggest difference in terms of caves between the two areas is that the Quintana Roo caves are predominantly underwater. Exploration of the cave systems of the Mayan Riviera began in the early eighties and to date over 1000 km of underwater cave passages have already been document. An additional 100 km of caves are located in the vadose zone i.e. no SCUBA or rebreather technology is required. In August of 2012, a dry connection between two underwater caves systems, Sistema Sac Actun and Sistema Dos Ojos, resulted in a cave system of 180 miles (303 km) in length and secured the number two position on the World's Longest Caves list (Heyer and Sprouse 2012). There are currently 223 known cave

systems under the Mayan Riviera – the potential for more connections is imminent (QRSS 2012). This extra bit of competition on the world cave length scale is a “gentle” push for pursuing more connections to the Mammoth Cave System.

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