

# **Mammoth Cave International Center for Science and Learning Report to Congress – FY2010**

## **RLC Name and year established:**

Mammoth Cave International Center for Science and Learning, established 2004

## **Parks Served (indicate host park):**

- \* Mammoth Cave National Park (KY) – host park
- Cumberland Piedmont Network
- Abraham Lincoln Birthplace National Historic Site (KY)
- Carlsbad Caverns National Park (NM)
- Wind Cave National Park (SD)
- Great Basin National Park (NV)
- Jewel Cave National Park (SD)
- Geological Resources Division

## **Funding Source(s):**

Originally co-funded through a cooperative agreement with Western Kentucky University using two one-year (2004 and 2006) Congressional line item appropriations. On-going funding is via cooperative agreement using combination of NPS project funds and WKU funds.

## **Introduction:**

The Mammoth Cave International Center for Science and Learning (MCICSL), located at Mammoth Cave National Park, coordinates research at the park, provides logistical support for researchers studying the park, participates in developing research needs and projects addressing management issues, summarizes and interprets park research for the public and staff, and develops outreach programs for college and adult education. MCICSL's research coordination role includes administering the park research permitting system (40-50 research projects annually). MCICSL's outreach programs (science symposiums, workshops, classes, and field trips) provided over 10,756 person-hours of direct education contact in FY2010. In addition to Mammoth Cave National Park, the MCICSL works with other cave parks to develop service-wide solutions to karst and cave related management issues.

MCICSL is administered through a cooperative agreement with Western Kentucky University and was temporarily funded with two non-recurring congressional line item appropriations requested by the cooperator, Western Kentucky University. The staff of MCICSL consists of a Research Director (Dr. Rickard S. Toomey, III) and a part-time Education Program Specialist (Shannon Trimboli). Both Dr. Toomey and Ms. Trimboli are appointed through the Ogden College of Science and Engineering at WKU. In addition, both NPS and WKU provide office space, computer support, technical assistance, and administrative support. Dr. Toomey and Ms. Trimboli have an office at WKU; both also have offices at MACA, Dr. Toomey with

Science and Resource Management and Ms. Trimboli with Interpretation and Environmental Education.

MCICSL administers the Maple Springs Research Center in Mammoth Cave National Park. The Maple Springs Research Center consists of facilities for large groups and for individuals and small groups. The large group facility consists of a bunkhouse which can house up to 17 persons and includes a small workroom, a classroom building with kitchen facilities that doubles as a dining facility, and men's and women's restrooms and showers. The small group facility can accommodate up to 10 persons and consists of a 4-bedroom house with living room, kitchen, and two bathrooms. The center has parking space for approximately twenty vehicles. In FY2010 this facility was utilized for at least 2,200 bed-nights. Since this facility is provided at low (\$4.50/bed-night) or in many cases no cost, the value of this facility to researchers using the park is over \$188,000 dollars in saved lodging costs.

### **Highlights of FY10 Accomplishments:**

#### *1) Facilitating use of parks for scientific research:*

In FY2010, MCICSL began working with a group of local 7<sup>th</sup> grade advanced science students to study a unique flow pattern of one of Mammoth Cave's underground rivers. This unique flow pattern, although naturally occurring, has the potential to impact the cave's geological, biological, and archeological resources. It is also likely to be influenced by climate change. The 7<sup>th</sup> graders' research will provide valuable baseline data for understanding the frequency and duration of the flow pattern. This baseline data will serve as the foundation for more advanced research by university students and other scientists interested in studying the hydrology of Mammoth Cave. In the future, park staff will be able to use this increased understanding of the underground river's hydrological flow pattern for making science-informed management decisions.

In addition, MCICSL coordinates all of the scientific research and research permitting at Mammoth Cave National Park. This includes working with outside scientists to develop research proposals, overseeing the proposal review process, recruiting reviewers from both inside and outside of MACA, developing compliance documentation for proposals, and assisting the researchers with on the ground logistics. MCICSL also continues to act as a primary scientific consultant on large park-wide projects such as studies looking at managing contaminants from parking lot runoff and minimizing their impact on the cave system, and a multi-park project studying ways to minimize lamp flora growth in commercialized caves.

#### *2) Providing research information or value-added products to park staff and managers:*

The MCICSL Research Director worked with MACA, CUPN, FWS, and Kentucky Department of Fish and Wildlife Resources to develop White-nose Syndrome (WNS) response plans and interpretive materials for use at MACA. WNS is a zoonotic that is spreading through cave bats in the eastern US. MCICSL Research Director has helped develop decision matrix and certification forms to reduce potential for spread of the disease by researchers and education groups. He has also led in working with researchers to be sure that decontamination protocols needed to protect park bats are followed. The interpretive materials he has assisted in developing have park staff to intercept visitors who might be able to transmit WNS to park caves and reduce the potential for transfer. MCICSL personnel worked with the park to hire and oversee two

summer interns to assist in monitoring bat populations and developing baseline information before WNS starts affecting bats in the area.

*3) Communicating the relevance of park research and results to the public and making research results widely available:*

MCICSL staff participate in numerous educational programs throughout the year which communicate the relevance of park research to a variety of audiences. Often, these programs take the form of customized, in-depth educational field experiences for high school students, college students, and life-long learners. MCICSL staff also gave several conference presentations on park research during FY2010. In addition, the Education Program Specialist recently re-organized the MCICSL website to make it easier to locate scientific publications on research being conducted at MACA. As time allows, the Education Program Specialist writes public-oriented research summaries which she posts on the MCICSL website.

MCICSL continues to serve as core members of the committee that is developing the exhibits for the new MACA visitor center. MCICSL continues to provide both technical assistance on scientific topics and information on approaches to convey that science to the public. As the exhibit fabrication phase has begun, MCICSL has assisted in developing and reviewing exhibit text and graphics. They have also facilitated filming and other exhibit development activities on park.

*4) Promoting resource stewardship through partnerships:*

MCICSL continues to serve as a primary contact between MACA and its sister park, the South China Karst World Heritage Site. This agreement was signed in August 2009. MCICSL staff also helped facilitate the development of a sister park arrangement between MACA, WKU, the Karst Research Institute of the Slovenian Academy of Sciences and Arts, Postojna Cave, and Škocjan Caves National Park which was signed in February 2010. The signing of the Slovenian sister park agreement coincided with a workshop for a local high school environmental sciences class. The workshop provided the students with the opportunity to interact with a Slovenian karst researcher and learn about some of the issues shared by cave parks world-wide.

MCICSL continues to partner with WKU's Hoffman Institute to provide intensive, weeklong, field-based workshops and classes during the summer. The participants for these workshops and classes are resource managers, educators, and the general public. Through the classes, the participants gain a greater knowledge and understanding of the resources and are better able to care for the resources they encounter in their personal and professional lives. MCICSL also continues to work with the National Cave and Karst Research Institute.

Other partnerships MCICSL has that promote resource stewardship include a partnership with the National Association of Geoscience Teachers (NAGT). NAGT funds the Geoscience-Teachers-in-the-Park (GTIP) program. FY2010 was the fifth year of this partnership. Through the GTIP program, local teachers gain hands-on experience working with researchers at Mammoth Cave National Park. The teachers then take their experiences back to the classroom in the fall. This program not only increases the teachers' knowledge and experiences, but also promotes awareness and resource stewardship in both the teachers and their students.

*5) Other Significant Accomplishments:*

In May 2010, MCICSL worked with researchers and educators from the Ohio State University (OSU) and Wright State University (WSU) to host a workshop for students with mobility impairments. The workshop provided a geology-focused learning experience, including

cave trips, for 6 mobility-impaired students. The results of the workshop are being used by the OSU and WSU researchers to develop a toolkit for teaching geology to people with mobility impairments using such things as virtual reality and virtual field trips. This research was partially funded by an NSF ODEG grant.

### **Climate Change Research and Education:**

The Mammoth Cave International Center for Science and Learning has been involved in research, education, and planning projects related to climate change at Mammoth Cave. MCICSL has led in developing a cooperative internal and external research team (led by Dr. Warren Campbell - WKU, Dr. Rick Toomey - MCICSL, Rick Olson - NPS-MACA, Bob Carson - NPS-MACA, and Johnathan Jernigan - NPS-CUPN) to model the way cave airflow responds to external climate. This information will provide an important tool for understanding how changing climate will affect climate-sensitive cave resources. This team has begun data gathering and modeling for a simple system and developed a proposal for study of a very complex system impacting important endangered species and archaeological resources. This project includes not only research components, but also attempts to develop potential methods to mitigate damage to important cave resources caused by alterations (or potential future alterations) of cave climate. This project has been funded for FY2011 through the SCC.

MCICSL has been working with MACA and CUPN scientists on climate monitoring and to assist in using park climate data for developing educational projects. This includes assisting on developing new exhibits for the visitor center which will include current monitoring and research data. MCICSL also incorporates climate change into its interpretive programming for students of all ages.

### **Brief Impacts to Accomplishments:**

The lack of permanent funding for MCICSL staff continues to have the greatest potential negative impacts for MCICSL. Funding for both MCICSL's Research Director position and the Education Program Specialist position are scheduled to run out in mid-FY2010. The Research Director and the Education Program Specialist have been devoting a significant portion of their time towards writing and applying for grants that will provide additional funding for MCICSL's activities. MACA and WKU are also actively searching for more permanent or long-term funding sources. Unless additional funding is received within the next 6 months, the Mammoth Cave International Center for Science and Learning will cease to exist during FY2011.

**Photographs:**

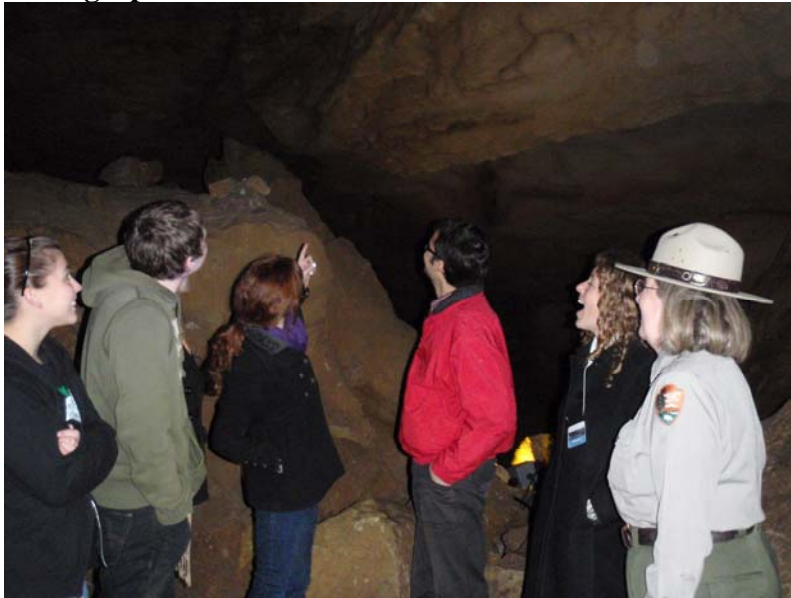


Figure 1: Local high school environmental science students interact with a Slovenian karst researcher during a workshop at Mammoth Cave National Park. The workshop was designed to introduce the students to cave and karst resource management issues that affect show caves world-wide. The workshop coincided with the signing of a sister park arrangement between MACA, WKU, the Karst Research Institute of the Slovenian Academy of Sciences and Arts, Postojna Cave, and Škocjan Caves National Park.



Figure 2: In late FY2010, MCICSL facilitated filming for MACA's new Visitor Center exhibits. MCICSL is a core member of the exhibits development committee and provides technical assistance on scientific topics and information on approaches to convey that science to the public.

**Collaboration with other RLCs:**

In FY2010, MCICSL staff continued to collaborate with the Southern California Research Learning Center and Biscayne National Park in the Sea to Shining Sea Program. This program provides live, interactive, virtual experiences for remote audiences. This collaboration led to a presentation at the National Association for Interpretation’s (NAI) national workshop. In addition, MCICSL staff continues to participate in network wide Research Learning Center strategic planning. Both the Research Director and Education Specialist also serve on RLC small working groups. MCICSL is actively participating in the RLC Spreadsheets Across the Curriculum project in collaboration with the University of South Florida and University of Arkansas.

**Collaboration with other NPS Programs:**

MCICSL Research Director participates on service-wide, state-wide, and park-wide teams to develop response to White-nose Syndrome (WNS) in bats. WNS is a zoonotic that is spreading through cave bats in the eastern US. MCICSL Research Director has helped develop decision matrix and certification forms to reduce potential for spread of the disease by researchers and education groups. He has also led in working with researchers to be sure that decontamination protocols needed to protect park bats are followed.

CUPN and MCICSL staff continue to work together to disseminate information about research and monitoring activities within MACA. MCICSL also assists CUPN staff on I&M monitoring projects and with finding additional volunteers to assist with the projects.

**GPRA Goals that MCICSL is Helping MACA Achieve:**

Goal Category I	
Ia9	Paleontological Resources <b>RLC Lead</b>
Ib0	Research Learning Center <b>RLC Lead</b>
Ia0	Cave <b>RLC primary assist</b>
Ia1	Disturbed Lands/Exotic Plant Species
Ia2	Threatened and Endangered Species
Ia2X	Native Species of Special Concern
Ia4	Water Quality
Ia5	Historic Structures
Ia8	Archeological Sites
Ib1	Natural Resource Inventories
Ib3	Vital Signs
Ib4	Geological Resources
Ib5	Aquatic Resources
Goal Category II	
Ia	Visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities.
Ib	Park visitors and the general public understand and appreciate the preservation of parks and their resources for this and future generations. <b>RLC Primary assist</b>
Goal Category IV	
IVb1A	Park Partnerships <b>RLC primary assist</b>
IVb2	Visitors Attending Facilitated Programs: attendance at facilitated programs will increase by 10%. <b>RLC primary assist</b>

**Plans for FY11 and Beyond:**

- Secure long-term funding for MCICSL through base funding or long-term project funding.
- Establish two permanent NPS positions (Research and Education) within MCICSL to improve coordination with park.
- Continue cooperative relationship with WKU.
- Facilitate research at Mammoth Cave.
- Streamline research permit approval process.
- Develop additional partnerships to address research needs.
- Develop statewide and national karst research initiative in cooperation with WKU, Northern Kentucky University, the Kentucky Geological Survey, and the Cave Research Foundation, New Mexico Tech, University of South Florida, National Cave and Karst Research Institute.
- Provide in-depth professional development opportunities about karst and karst research for informal and formal educators.
- Produce additional research summaries for internal and public use.
- Maintain and improve MCICSL website.
- Conduct workshops and classes about natural / cultural resources.
- Increase citizen science opportunities.
- Increase internship opportunities for college students.
- Continue working towards Strategic Planning goals.
- Increase science communications through field experiences for high school and college groups.

**RLC Housing Information:**

Approximate researcher-educator/nights housed: 2,200

Approximate savings to researchers: \$188,000

**Other savings/facilitation for researchers:**

MCICSL coordinates scientific research and research permitting at Mammoth Cave National Park. This includes working with outside scientists to develop research proposals, overseeing the proposal review process, recruiting reviewers from both inside and outside of MACA, developing compliance documentation for proposals, and assisting the researchers with on the ground logistics. MCICSL staff is also actively involved in writing grant proposals to continue funding the research learning center until permanent base funds can be secured. Many of these grant proposals include collaborations with outside scientists to conduct research at MACA.

**Partnership Information:**

We had approximately 10 university research partnerships.

We had approximately 8 education partnerships

We had approximately 3 funding partnerships

We had approximately 7 other types of significant partnerships

**Quotes from Partners:**

"I learned you don't have to have a lab filled with test tubes and beakers to be a scientist. Anyone with a curious mind and an urge to discover can be a scientist." -- 8th grade student at TK Stone Middle School during a presentation at the Kentucky Association for Environmental Education's 2010 conference where he and several of his classmates reported on a hydrological research they participated in the previous year at Mammoth Cave National Park

**RLC Research Tables:**

- 1 = little or superficial involvement (e.g., aid with permitting, communicate with researchers about project logistics).
- 2 = moderate involvement (e.g., provide short-term housing (few days), participate in scientific meetings/workshops on research topic, facilitate communication of research results to managers or public, some logistical aid).
- 3 = significant involvement (e.g., provide longer-term housing, web/computer access, actively solicit projects, co-write research proposals, focused effort to communicate research results to managers or the public). Any research that helped park needs for management information.

<i>RLC involvement level</i>	<i>Approximate # permits or other non-permitted research projects</i>
1	21
2	30
3	16
<b><i>TOTAL Projects/Permits</i></b>	<b><i>67</i></b>

***Does your RLC process and manage research permits for your host park?***

Yes

**Literature citations:**

# Peer-reviewed journal (or similar) publications: 4

# Reports concerning park resources or fulfilling important park information needs: 5

# Other reports (including science education or other topics): 9

**Student Table:**

<b>Degree</b>	<b>Number</b>
Bachelors	2
Masters	4
Ph.D.	2
Internships (High School or other)	6
VIP	77

**Communication Table:**

<b>Type of Product or Event</b>	<b>Audience P=public T=Teachers or students M= Mgmt or Staff S=scientists or professionals</b>	<b>Title of Product/Event</b>	<b>Number of Scientists Involved or Contributing</b>	<b>Number of Recipients, Benefactors, or Participants</b>
White Nose Syndrome Education and Interpretation for researchers and partners	MS	Education and interpretation related to MACA's policies aimed at minimizing the risk of spreading WNS to the park's caves	2	600
Karst Field Studies workshops	PTMS	Various workshop titles (2 workshops in FY10)	4	24
Internal research summaries	M	Various titles (2 summaries in FY10)	2	unrecorded number of visitors who benefited from guides' knowledge
Hosting International Exchanges at Park	MST	Chinese Embassy delegates and scholars Slovenian researchers and delegates	5	40
Conference presentations	PTMS	Various titles (4 presentations in FY10)	4	Unrecorded numbers of attendees
Field experiences for college, advanced high school, and other groups	PT	Various titles and topics	3	494
Training sessions	S	Safety presentations for Park staff; Training sessions for new and re-hire guides on research going on at the park	1	45