

Federal Program: Endangered Species Act

**Mine Stability and Implications for Federally Listed Bat Species (Indiana Bat)
Conservation**

ANNUAL REPORT

Project Number E-35-R-1

Presented to:

Joe Kath

Division of Wildlife Resources

Illinois Department of Natural Resources

Submitted by:

George Feldhamer, Principal Investigator
Jeff Corcoran, Graduate Research Assistant
Tim Carter, Principal Investigator

1 July 2007

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Background Information and Justification--A complex of over 50 abandoned microcrystalline silica mines owned by Unimin Minerals in southern Illinois has become an increasingly important resource for the endangered Indiana bat (*Myotis sodalis*). At least 14 of these mines are large enough to accommodate substantial numbers of hibernating bats. An estimated 52,400 bats (est. in 2005) of 5 different species hibernate within these mines. Indiana bats were first discovered using one of these abandoned mines in 1996. In 2005, an estimated 37,500 Indiana bats used 6 of the abandoned mines within the complex. Additionally, male Indiana bats use these mines as roost sites during the summer, with an estimated 11,000 individuals in “bachelor colonies” among 6 mines.

There has been a dramatic increase in the number of bats using these mines in recent years, as evidenced by yearly surveys of hibernacula. Such increases indicate that these mines are a desirable location for these bats to hibernate. Paradoxically, however, we are unsure if these mines are a safe place for hibernating bats. Like all abandoned mines, there is considerable settling and periodic cave-in or sloughing of material off ceilings and walls throughout these silica mines. While there is no evidence of large numbers of bats being killed by these events, the risk still exists. Unlike coal mines, these silica mines do not harbor toxic or flammable gases. Therefore, only periodic cave-ins represent a potential danger to hibernating bats.

Objectives--This project was initiated in August of 2006 to quantify the extent of instability in abandoned silica mines and the potential danger posed to hibernating bats. Instability--measured as the percentage of material sloughing (spalling) from ceilings and walls per unit of time--will be determined as a function of the following variables: time of year, mean internal and external temperature, range of internal and external temperature variability, moisture content of silica, and presence of clay seams or other material impurities.

Accomplished to Date--Twelve abandoned mines with a total 120 rooms were selected for their spalling treatments; high, medium, and low. Three sheets of black plastic were set in each room, one in the approximate center and two sheets against side-walls. The material that falls on each sheet is then measured each month for 30 rooms and on a rotating quarterly basis for the remaining 90 rooms with a total of 60 (30 monthly and 30 quarterly) rooms being checked each month. The material is measured using a 20 liter bucket. If a major fall occurs, more than approximately 160 L, the amount of material is estimated using the formula for volume.

Other variables determined are temperature and the amount of moisture in the material on the walls. Temperature data are being collected using iButton temperature data loggers. Moisture analysis is being conducted by removing a loose piece of material from the wall of each room and sealed in a Ziploc bag and then sealed in a larger plastic bag. It is then crushed at the UNIMIN plant in Elco, IL. The material is then analyzed using a moisture analyzer at the same plant. Data collection began in September 2006 and is continuing.

The temperature data loggers did not arrive until late November. They were put out into each room in December and January. They can only gather data for about 365 days so they will be collected after one year and the data downloaded to be analyzed. No temperature data have been downloaded yet.

Spalling data have been collected for the past 9 months. Moisture content of samples has been determined through March 2007. No statistical analyses of the data have been initiated. From direct observations of spalling as determined from contents on the plastic sheets, the rooms that have experienced the greater temperature and moisture variations have produced steady or heavy amounts of spalling. One room in particular in Magazine mine had about 2.5 cm of ice that formed during January and February. It produced a consistent amount of spalling for a few months after the ice thawed. The largest spalling event occurred in Mine Mode 2C with an estimated volume of 150,362 L.

To Be Accomplished—Monitoring of spalling events will be continued throughout the summer. Temperature data loggers will be downloaded during December 2007. Data analysis will be conducted during spring of 2008 with a final report submitted summer 2008.