Underground mining for coal in Ohio (state) was reported in 1889 (Crowell, 1995). The majority of underground mining takes place in coal and the mining areas of northeastern Ohio (Fig. 1). Other common coalbeds are located underground within thin coal beds in the Appalachian, Carboniferous, and eastern parts of the state. Scientists have estimated that over 18,000 mines have been in operation over the last 379 years (Dempsey, 1999). With so many large numbers of mines over such a long period of time, there is an increasing probability that mines will collapse and subside as they age and degenerate and as development occurs across the Ohio landscape.

Mine subsidence in Ohio has been recognized as a problem for over 50 years (Norell, 1970). The LiDAR and digital-aerial photo imagery clearly show pit subsidence locations, some of which are next to I-77 and I-70 near Byesville. The damage to the collapse of I-70 near Cambridge cost approximately $3.8 million to repair (Norell, 1970). The large number of data points generated using the LiDAR technique produces a high-resolution model of the elevation of the ground surface is computed for the thousands of laser pulses that are fired every second (Harding, 2000). The large number of data points generated using the LiDAR technique produces a high-resolution model of the surface topography. The State of Ohio has a program to provide high-resolution digital imagery and LiDAR datasets for state government entities and the general public (OGRIP, 2006). The LiDAR data produced with an average laser pulse spacing of 7 feet, with an accuracy of 1 foot (OGRIP, 2006). The large number of data points generated using the LiDAR technique produces a high-resolution model of the surface topography. The State of Ohio has a program to provide high-resolution digital imagery and LiDAR datasets for state government entities and the general public (OGRIP, 2006). The LiDAR data produced with an average laser pulse spacing of 7 feet, with an accuracy of 1 foot (OGRIP, 2006).

These LiDAR datasets and the LiDAR hillshade are presented in Figs. 2a–2c. The orange discoloration is acid mine drainage. The orange discoloration is acid mine drainage. A car located in the garage fell 110 feet down a 230 feet shaft. Since this incident, acid mine drainage has been a problem. As abandoned-underground mines are recognized, the mine acidity increases. As of 2005, the Ohio Department of Transportation had spent approximately $25 million to repair highway damage caused by subsidence. As abandoned-underground mines are recognized, the mine acidity increases. As of 2005, the Ohio Department of Transportation had spent approximately $25 million to repair highway damage caused by subsidence.

One method being investigated to detect un mapped, abandoned surface mines and abandoned-underground mines is Light Detection and Ranging (LiDAR). Airborne LiDAR also known as laser surveying, uses a laser to measure the precise distance between the aircraft and the ground surface. LiDAR— which has been determined releasing the aircraft at a distance and the aircraft altitude is measured. Using differential kinematic GPS and inertial navigation systems (INS), the location and elevation of the ground surface is computed for the thousands of laser pulses that are fired every second (Harding, 2000). The large number of data points generated using the LiDAR technique produces a high-resolution model of the surface topography. The State of Ohio has a program to provide high-resolution digital imagery and LiDAR datasets for state government entities and the general public (OGRIP, 2006).

The Ohio Geographically Referenced Information Program (OGRIP), 2006, Ohio Statewide Imagery Program (OSIP), imaged the state with high-resolution imagery in 2006 and 2007. The coal imagery clearly shows some unusual patterns (red arrows) within the mowed field. The other unusual patterns in the center of the image may be caused by mining or other subsidence problems. The orange discoloration is acid mine drainage. The orange discoloration is acid mine drainage.

As part of our continuing work to map abandoned underground mines, a pilot project undertaken to examine the potential of using the LiDAR high-resolution imagery and LiDAR datasets to find indications of abandoned mines. For this study areas around the state were selected in areas where mining had occurred or where subsidence problems have been identified. These other cities include an area north of Gurling, Guernsey County (Figs. 2a–2c); an area near Wrighton, Medina and Summit counties (Figs. 4a–4b). The area near SouthEden has been known as a location of pit subsidence features for over 50 years (Yarwood, 1995). This LiDAR imagery clearly shows some unusual patterns (red arrows) within the mowed field. The other unusual patterns in the center of the image may be caused by mining or other subsidence problems. The orange discoloration is acid mine drainage. The orange discoloration is acid mine drainage.