Geodatabase of the South Texas Uranium District

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Abstract

Uranium and its associated trace elements and radionuclides are ubiquitous in the South Texas Tertiary environment. Surface mining of this resource from the 1960's through the early 1980's at over 60 locations has left an extensive anthropological footprint (Fig. 1) in the lower Nueces and San Antonio river basins. Reclamation of mining initiated after 1975 has been under the regulatory authority of the Railroad Commission of Texas (RCT). However, mines that were active before the Texas Surface Mining Act of 1975 was enacted, and never reclaimed, are now considered abandoned. The Abandoned Mine Land Section of the RCT is currently reclaiming these preregulation uranium mines with funding from the federal government. The RCT monitors the overall effectiveness of this process through postreclamation radiation and vegetative cover surveys, water quality testing, slope stability and erosion control monitoring. Presently a number of graduate and postgraduate students are completing research on the watershed and reservoir distribution of trace elements and radionuclides downstream of the South Texas Uranium District. The question remains as to whether the elevated levels of uranium, its associated trace elements and radiation levels in the South Texas environment are due to mining activity or natural geological abundance. An answer to such an environmental geology question can be resolved through the spatial analysis using a Geographic Information System (GIS). The compilation of past and present environmental monitoring and geospatial data into a publicly available GIS database will facilitate the resolution of this issue. The present state of refinement in GIS and the ease of public access to large data sets through the Internet provide a unique opportunity to compile historical data and the results of current investigations (Parker and Herbert, 2000) (Brandenberger et al., 2000) into a dynamic and easily distributable database for future research.

The most comprehensive text to date is "The South Texas Uranium District Abandoned Mine Land Inventory" (Waggoner et al., 1994) published by the RCT in which 18 abandoned uranium mine sites are characterized based upon gamma radiation, soil, spoil, vegetation and water quality. These results and a digital Autocad file were used to develop a classification system of all the mines into a GIS point file. Historic mine locations in the Autocad file were generally accurate when they displayed the base-map imagery described below. Some location adjustments were necessary to accommodate the increased accuracy of the base map. Mines are classified into three classes. The "Regulated" classification indicates that the mine was permitted, operated and reclaimed by the operator after enactment of the Texas Surface Mining Act of 1975. The 18 mines opened before 1975 are classified as "Reclaimed" or "Unreclaimed" and are presented in Figure 1.

Data used for the base maps are 1-meter-resolution DOQQs published by the U.S. Geological Survey (USGS) and were supplied by the Texas Natural Resources Information Service (TNRIS). DOQQs are digital images of aerial photographs corrected for distortion caused by camera angle and terrain slope. DOQQs combine the image characteristics of color infrared photography with the geometric qualities of a map and are distributed for areas matching one-quarter of a USGS topographic quadrangle. DOQQs are cast in the Universal Transverse Mercator grid coordinate system, North American Datum of 1983 (NAD83). The images used for the production of the DOQQs were obtained from the National Aerial Photography Program during 1995-98. The horizontal accuracy of these DOQQ files is 33 feet at a scale of 1:12,000 or approximately twice that of a standard USGS topoquad. This base map provides an accurate geospatial environment for all future research of the mining district (e.g., Figs. 2 and 3) and Beaman et al. (2001).

Various public domain GIS data sets are included in the geodatabase and can be downloaded at http://snapper.cbi.tamucc.edu/umine. All GIS data have been reprojected into the UTM Zone 14 NAD 83 coordinate system to match the DOQQ base-map imagery. Data are provided as individual ESRI shape files for ArcView 3.x users and in a Microsoft Access personal geodatabase and relatively linked ArcGIS Project for ArcGIS 8.x users. Some of the included data are listed in Table 1.

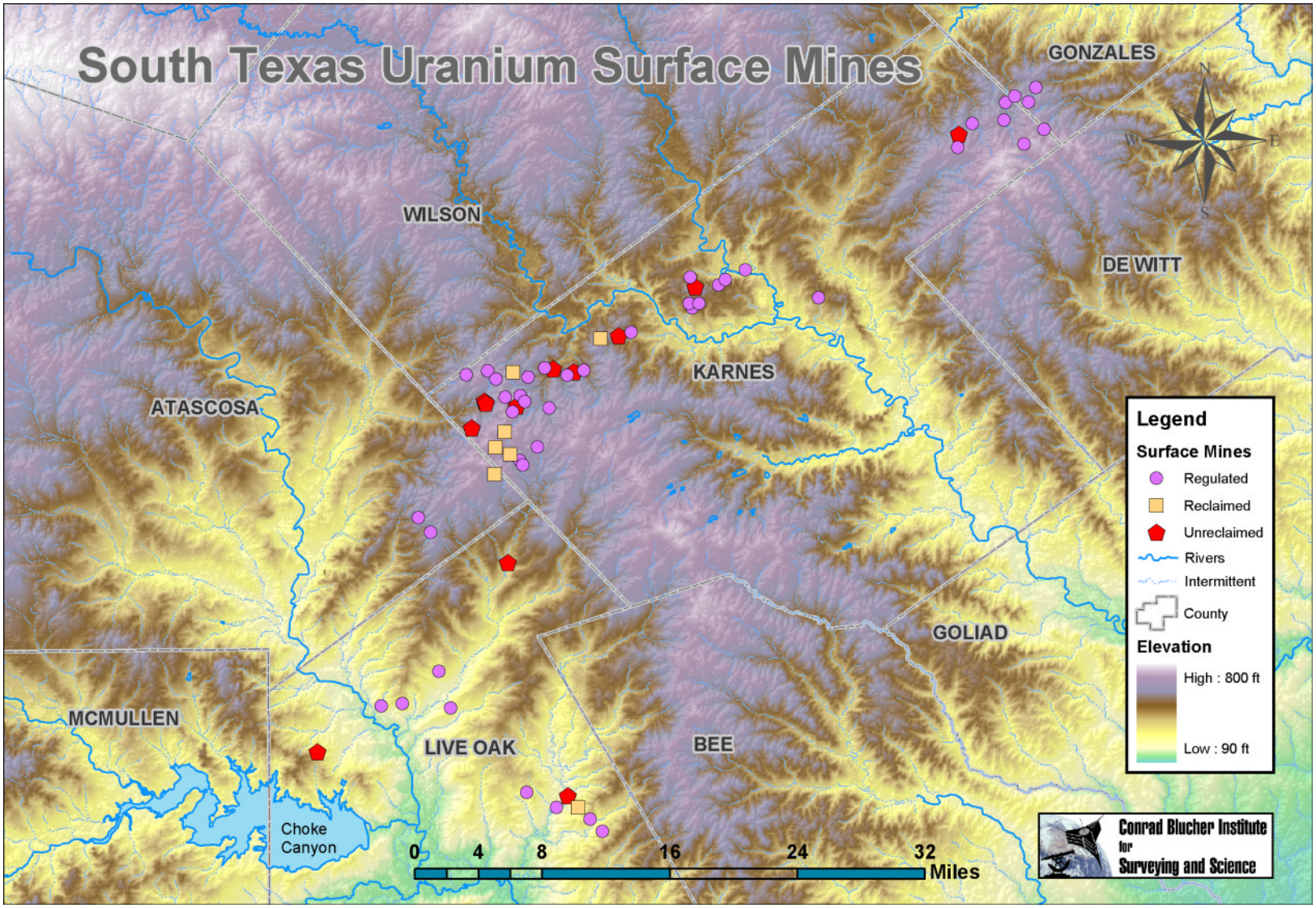

Figure 1. Map of uranium surface mine reclamation status. Regulated mines were reclaimed by the operator upon closure. Abandoned preregulation mines are classified as *reclaimed* or *unreclaimed*.

Figure 2. Labus-Hoffman Mine (reclaimed) and Stoeltje Mine (unreclaimed).

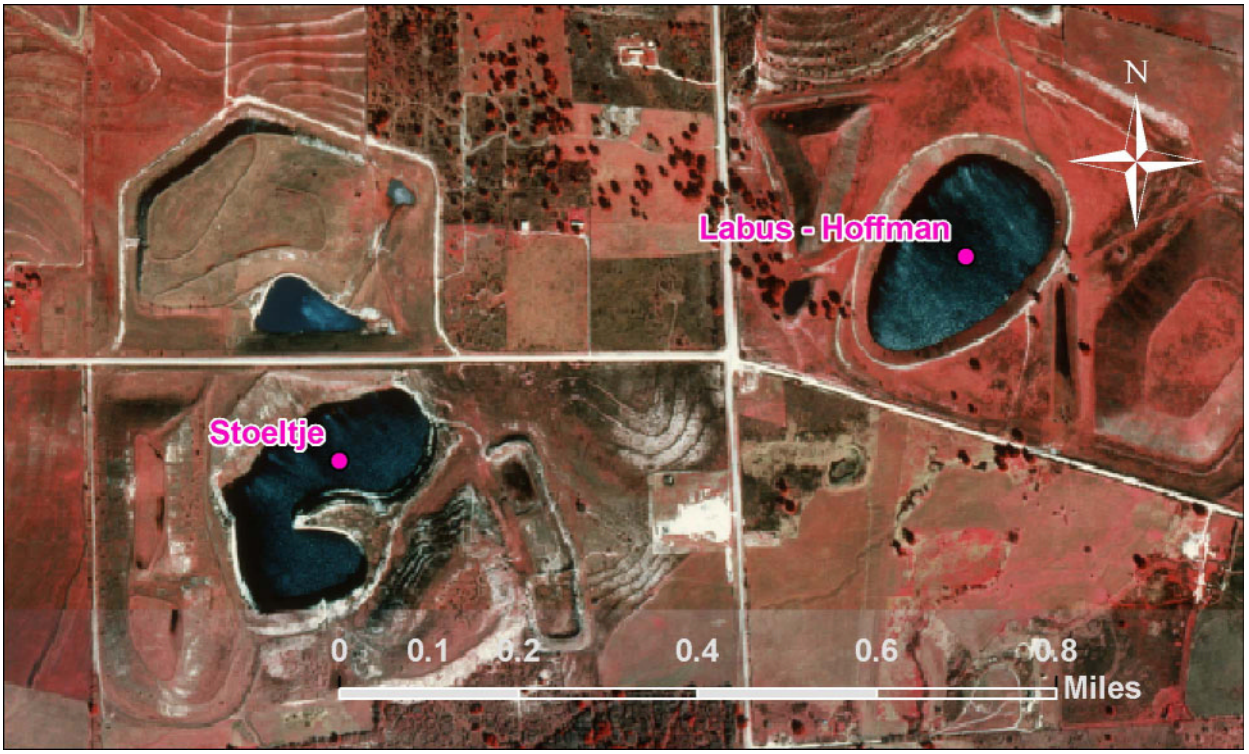

Figure 3. Mines reclaimed into the Uranium Mill Tailings and Reclamation Act (UMTRA) site.

Table 1. Partial list of geospatial data downloadable at http://snapper.cbi.tamucc.edu/umine.

Data Type	Source	Hyperlink
Elevation	USGS NED	http://edcnts12.cr.usgs.gov/ned/default.htm
Surface Hydrology	TXDOT	http://www.tnris.state.tx.us/
Roads	U.S. Census Bureau	http://www.census.gov/geo/www/
DOQQ Imagery	TNRIS	http://www.tnris.state.tx.us/
Uranium Surface Mines	RCT	http://www.rrc.state.tx.us/divisions/sm/sm.html

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Questions concerning the use and origin of the data can be directed by email to the primary author at mbeaman@cbi.tamucc.edu. Funding for this work was provided by the GCAGS 2001 Student Grant Program for the proposal entitled “South Texas Uranium District: Construction of a Publicly Available Geographic Information Systems Database.” The authors acknowledge Ronald Parker for inspiration and encouragement. This work would not have been possible without the support and cooperation of Mr. Jon Brandt and the Surface Mining and Reclamation Division of the Railroad Commission of Texas.

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