

Abandoned Coal Mines in Iowa

Map Preservation and Archiving

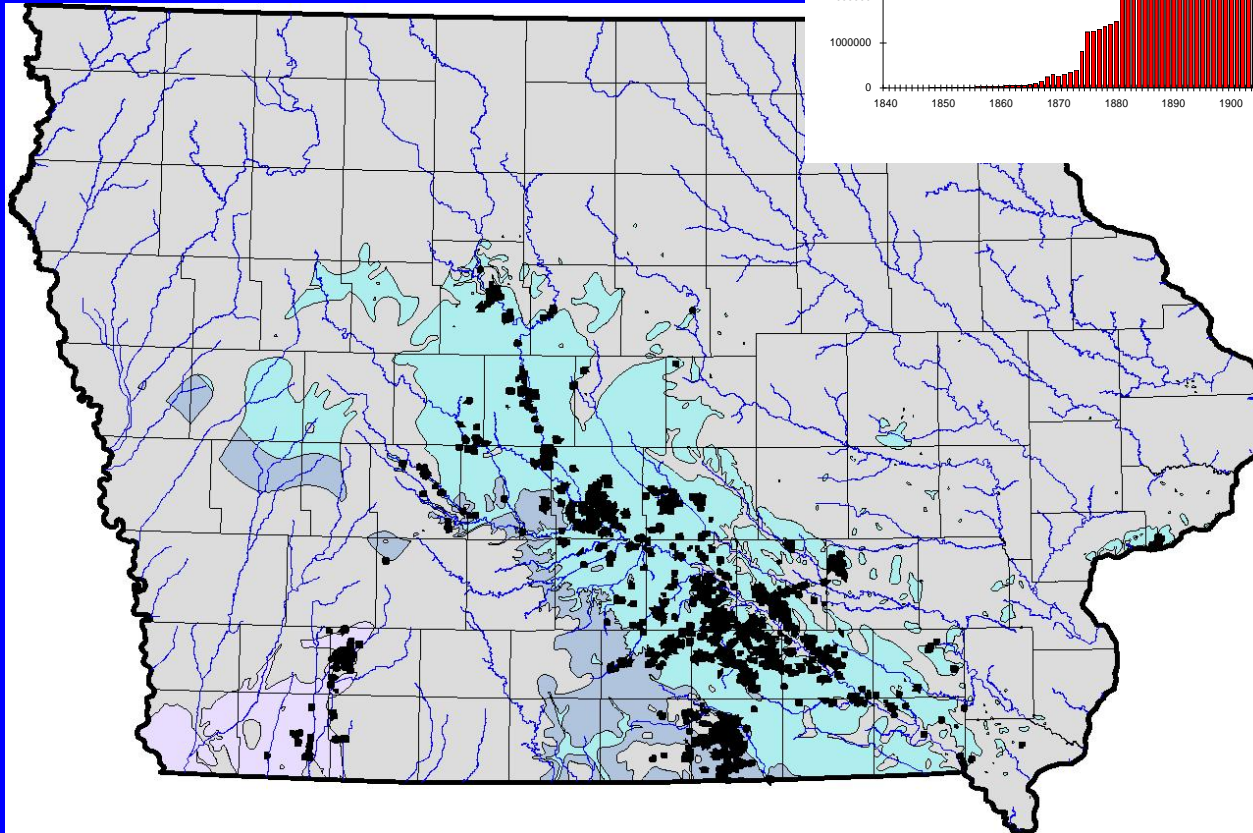
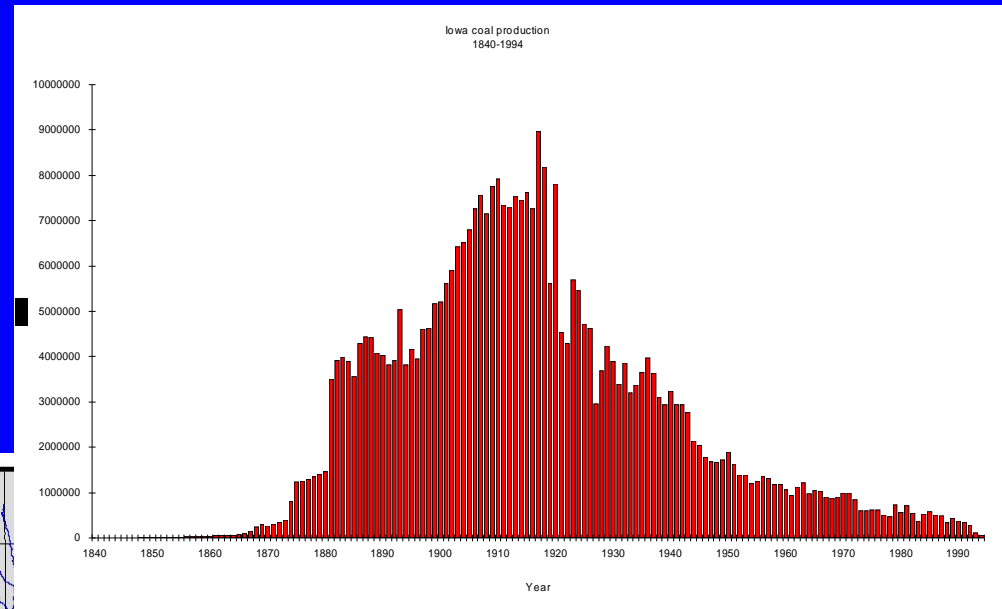


lithograph from State Historical Society of Iowa

Mary R. Howes
Research Geologist
Iowa Geological Survey

Coal production by year

Greatest production was from late 1890's to late 1920's –the majority of maps are also from this period - 80 to 110 years old.



Location of coal mines

Mine extents are exaggerated so that distribution can be seen at this scale.

Significant events in coal mining information management

- 1840's - Earliest known coal mining near Ft. Des Moines and along the Des Moines River in southeast Iowa. Little information remains.
- 1865 - Council Bluffs named as the eastern terminus of the Union Pacific Railroad. Four railroad companies begin laying track across Iowa.
- 1880's - Iowa coal industry undergoes rapid expansion in response to demand for coal for the railroads.
- 1884 - Office of State Mine Inspectors was created. Surveyed maps of all underground coal mines that employed more than four people were to be filed on a biennial schedule.
- 1917 - Peak year of coal production in Iowa.
- 1973 - State Mine Inspectors' files, maps, and surveyed maps were transferred to the Iowa Geological Survey.
- 1978, 79 etc. - IGS assisted with investigating episodes of suspected coal mine subsidence in Des Moines and other areas.
- 1979 - Coal mines for the Des Moines area were plotted on 7.5' topographic maps.
- 1984 - Coal mine map restoration and database project begins.
- 1988 - Coal mine geographic information system database is developed.
- 1989 - IGS published *Abandoned Underground Coal Mines of Des Moines, Iowa, and Vicinity*.
- 1994 - Last operating coal mine in Iowa closed.
- Recent - scanning and georeferencing photographs as needed, updates to databases.



Township index map and index listing

The township maps were prepared by the State Mine Inspector in the 1960's to provide a quick reference to mine locations and index to the storage location of the mine map if there was a map in the collection. Other information about the mine is noted where available.

CROCKER TOWNSHIP --- RANGE 24 --- TOWNSHIP 20 --- POLK COUNTY

No. on Map	Name of Mine	File Number	Description and Location
1	Taylor Coal Company No. 2	1928	Case 1 No. 56 Shaft 236 ft. Coal 4 ft. Geo. Survey 1008 page 132 & 133 part of sec. 26 & 35 all of sec. 36
2	Wright Coal Company	1924	Case 1 No. 43 E. part of Sec. 25 & part of Sec. 24
3	Anderson Coal Company	No map	Shaft 285 ft. Geo. Survey 1008 page 132. SW of SW of Sec. 25

Mine map storage before restoration



Blueprint map in poor condition



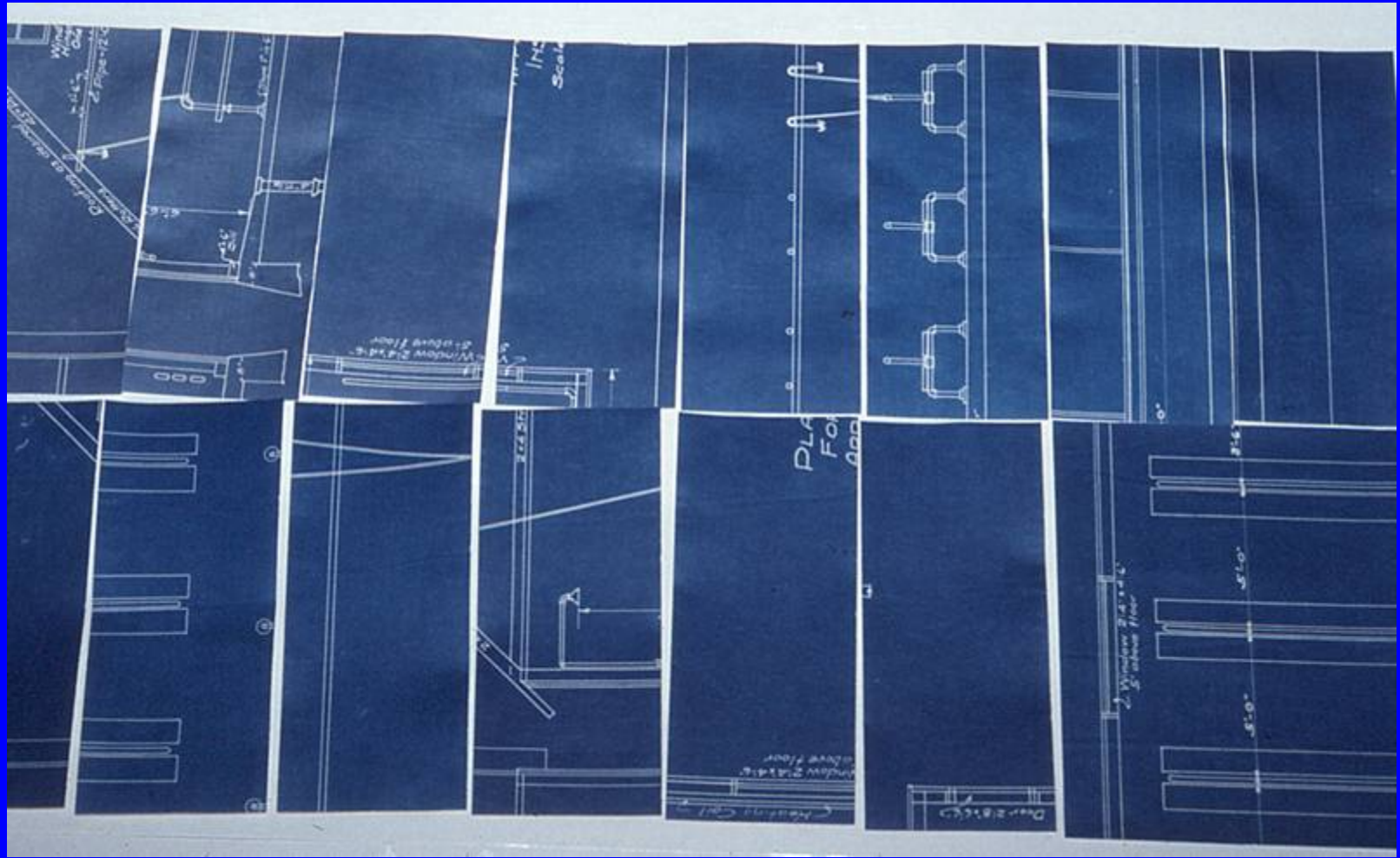
Goals of Mine Map Restoration Project

- Map restoration and preservation
 - IGS recognized the need to preserve the maps and the information on them.
 - Investigated methods of map restoration and preservation
 - Museum-quality archiving was beyond financial reach
 - Iowa State Historical Department proposed a document conservation method that was within the available budget
 - Customized storage was designed and built.
- Improved access to information contained on mine maps
 - Photographed the maps with a document copy camera that produced an 8-1/2 x 11 in. archival negative. Two prints were made from each negative. The photo collection provides for all routine access to the map collection.
 - Developed a catalog database and searching applications to locate maps by location, name, etc.

Highlights of Mine Map Collection

- About 1,550 maps are in the collection. Approx. 50 additional maps are represented by photographs from maps that were loaned to IGS.
- 1,480 are surveyed mine maps that can be located
- 765 mine sites are represented by one or more maps
- Many maps represent revisions of earlier maps
- Surveyed mine maps are on a variety of materials. Blue prints make up the majority. There are also blue lines, ink on linen, canvas, and paper.
- Condition of the maps ranged from very good to very poor.
- “Readability” ranges from good to poor and may not be related to condition.
- Smallest map is 9” x 11”, the largest 57” x 108”.

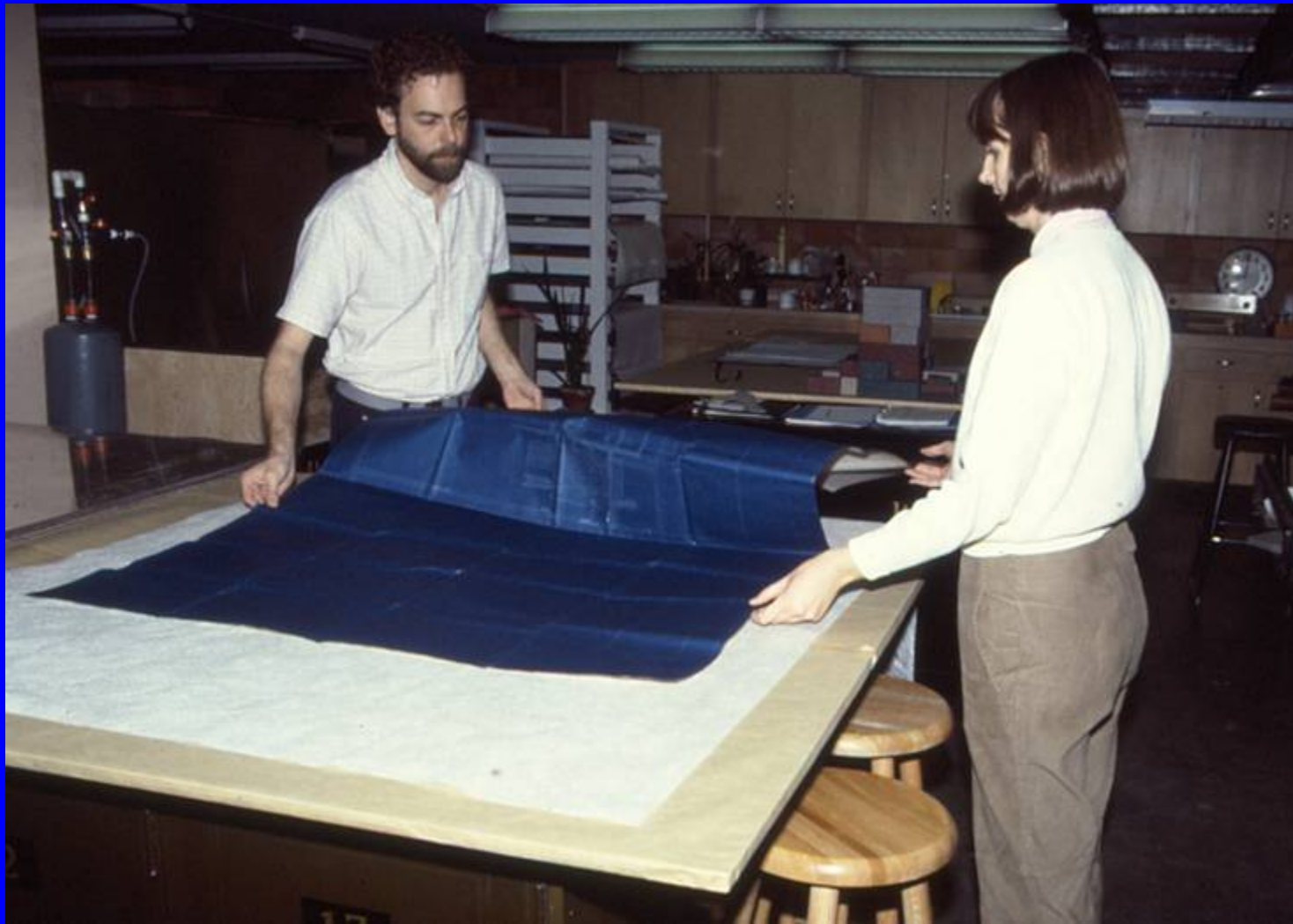
Results of process testing



“Dry-cleaning” map surface



Preparing map for washing – positioning on backing sheet



Washing map – note backing sheet to support the map



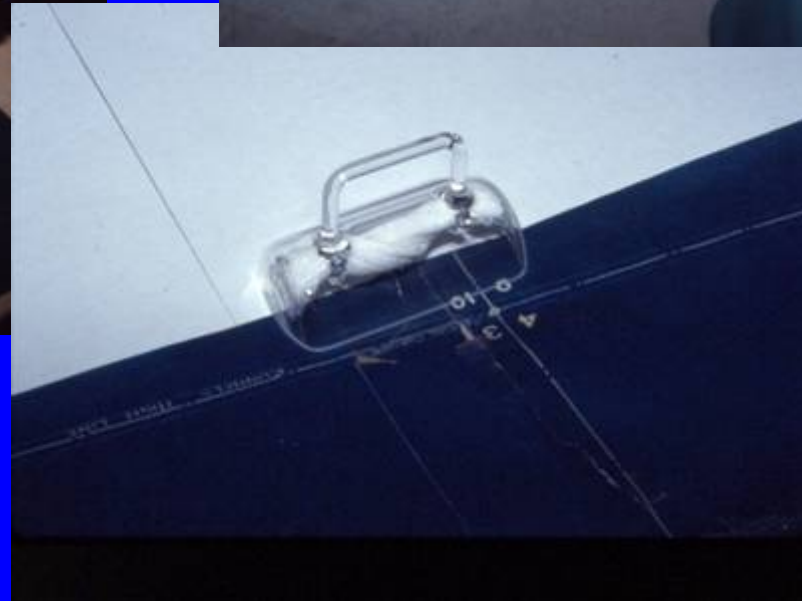
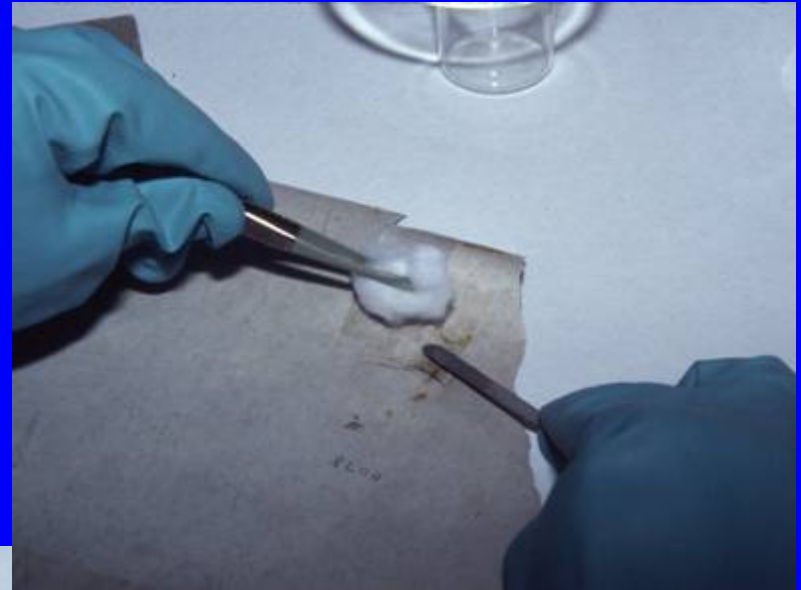
Positioning map in drying rack



Preparing map for washing – removing creases



Removing tape from maps using heat and solvents



Patching maps that are torn or have been cut into sections

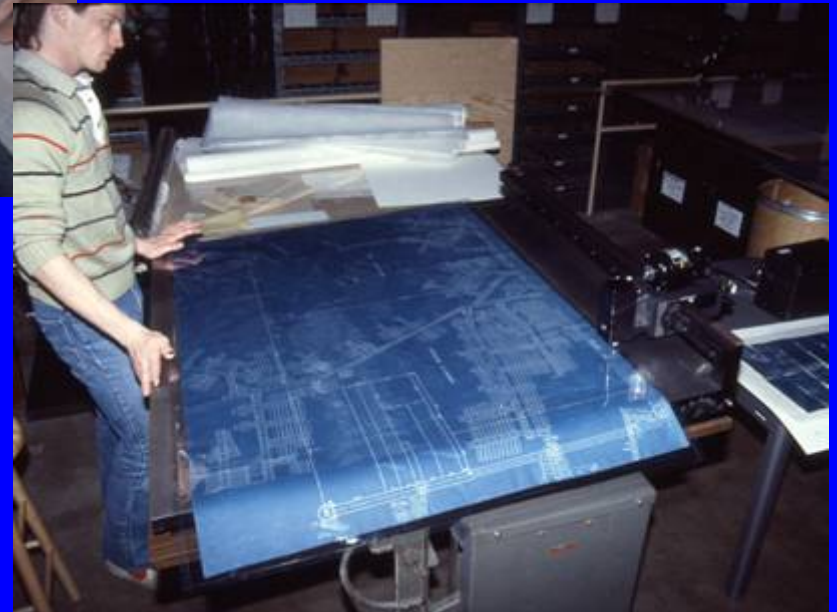


Enclosing in polyester film



Smoothing to remove air bubbles

Welding the envelope closed with ultrasonic welder



Site ID	77029		
Site name	American Coal Mining Co.		
Sequence No.	1		
No. of Site Records	3		
Quadrangle	des moines sw		
Central location	sw sw ne se 29 t079n r24w		
Area location #1	se 29 t079n r24w		
Area location #2	sw sw nw 28 t079n r24w		
Area location #3	nw sw 28 t079n r24w		
Area location #4	sw sw 29 t079n r24w		
Map name	american coal mining company		
Map ID	0893		
Last revision date	03/31/1919		
Map storage location	b2l		
Map size	40 in. x	46 in.	
Map scale	1 in. =	100 ft.	
Microfilm map	Yes		
Owner/superintendent	isaac evans		
Opening date	1912		
Ending date	1919		
Mining method	room and pillar		
Mine entrance type	shaft		
Surface elevation	0 ft.		
Shaft depth	0 ft.		
Coal seam	Blackoak		
Coal seam elevation	0 ft.		
Data type	Surveyed map		
Add'l notes	The "3rd Vein" was mined at this site. It is assigned to the currently accepted name Blackoak Coal. The name of the Blount & Evans Coal Co. appears on the back of one of the maps for this mine suggesting that the mines may		

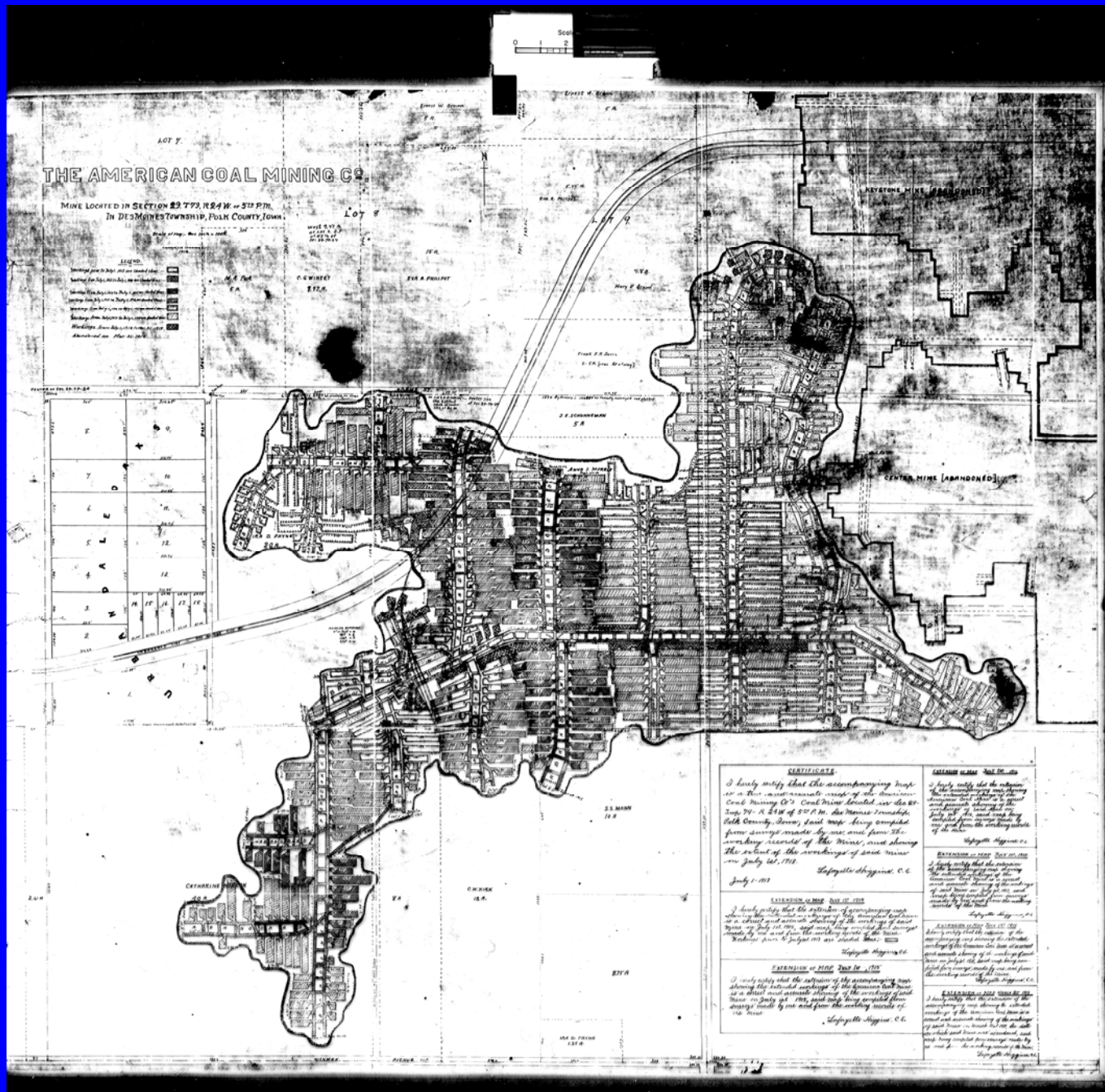
Coal mine database

- Database was developed to serve as a catalog for the maps. A simple application allowed searches by name, location, or id.
- Typical data elements for mines with surveyed mine maps are shown at left
- Data available from a linked Access application (Arcview 3.2)

Map photography

Following the restoration process, the maps were photographed using a document copy camera that produced an 8-1/2 x 11 inch archival quality negative. Prints from these negatives were used to develop the GIS database. The negatives continue to be used to make copies of the maps for a variety of purposes.

Scanned image of a negative from a blueprint map



Map storage following restoration



Large custom-made storage cabinet holds maps up to 57" x 108"

Mine maps are sorted by size and stored in cardboard boxes in cabinets



Coal mine geographic information system databases, part 1

Mine sites were classified into seven categories based on the geographic information available

- Surface
- Underground
 - Surveyed mine map with good location references-known location and extent
 - Surveyed mine map with poor location references-known extent, approx. location
 - State Mine Inspectors' township-known location and approx. extent
 - State Mine Inspectors' files, IGS publications, etc.-unknown extent, location approx. to 1/4 section or smaller
 - State Mine Inspectors' files, IGS publications, etc.-unknown extent, location approx. to one section
 - State Mine Inspectors' files, IGS publications, etc. - unknown extent, unknown location

Coal mine geographic information system databases, part 2

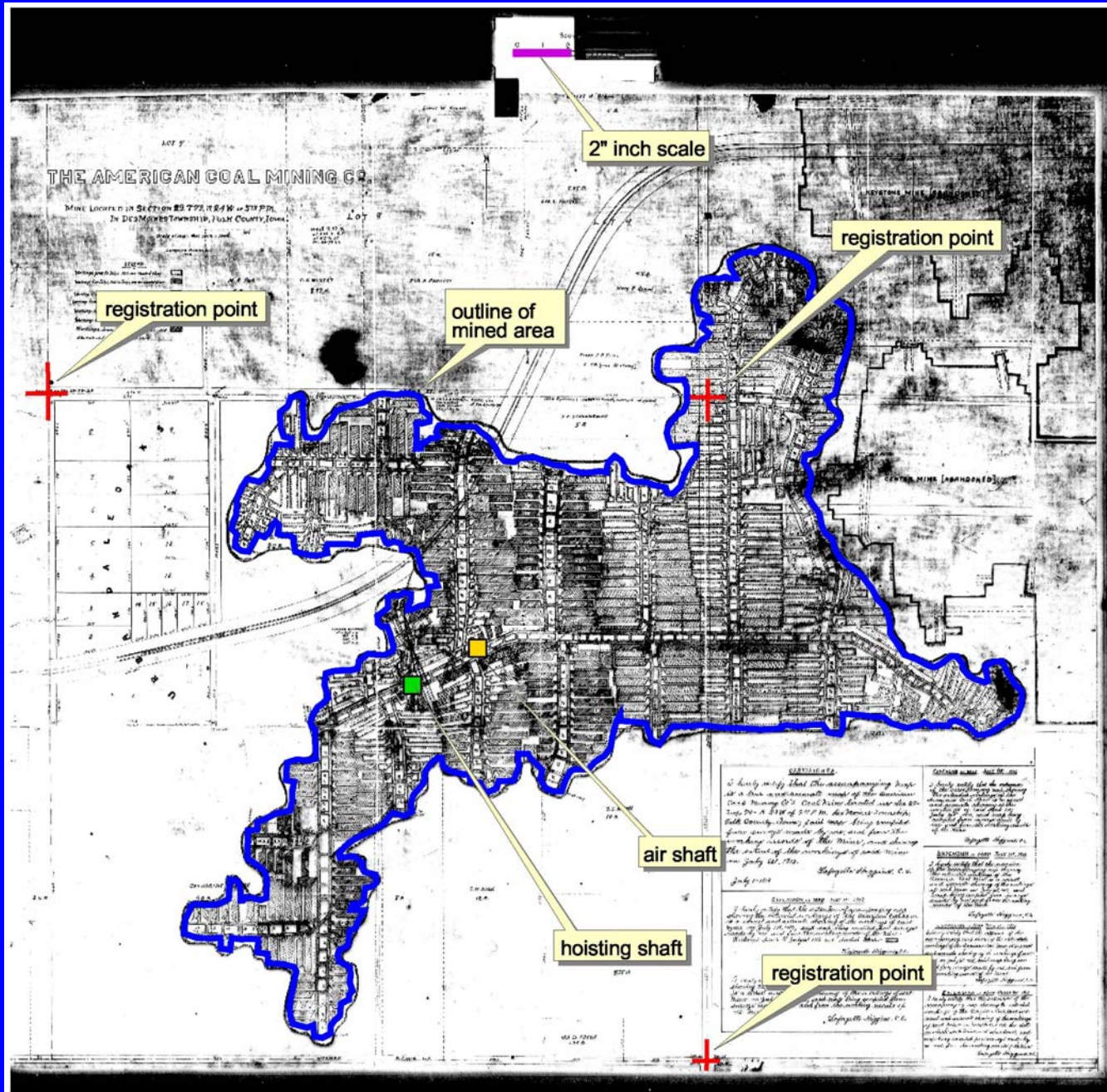
- This process was streamlined by the earlier development of the Coalmine database which had already identified the mine sites and all associated maps and other data, as well as the most recent map for the site.
- Mine outlines, shaft locations, and registration marks were digitized with Autocad from the photographs taken as part of the mine map restoration project. Generally the map with the latest revision was selected unless the condition of the map was such that it could not be digitized.
- Coordinate conversion was performed with Autocad using 7.5' topographic maps by selecting points on the quadrangle that corresponded to the registration marks digitized with the mine data.
- Data was exported from Autocad files and imported into pcArcInfo as a polygon coverage (mine outlines) and a point coverage (shaft locations)
- Identifiers linking the outline to the Coal mine database were added to the attribute tables
- Attributes were added from the Coal mine database

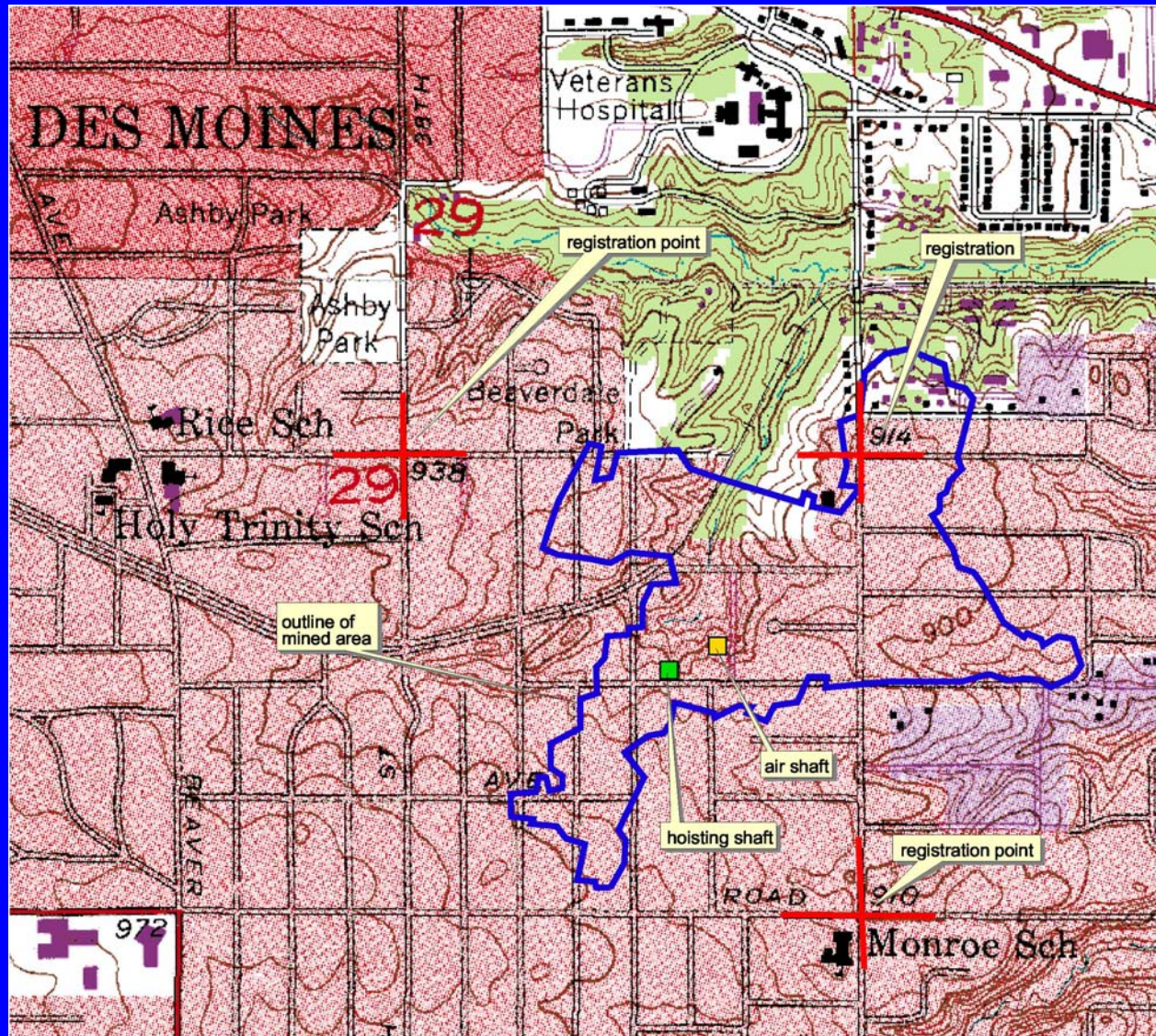
GIS development, 1988

Photo prints of mine maps were used as the source for digitizing in AutoCad

Features of mine maps that were digitized:

- outline of mined-out area
- two or more registration points and the scale
- or-
- one registration point, a directional feature, and the scale
- mine entrances

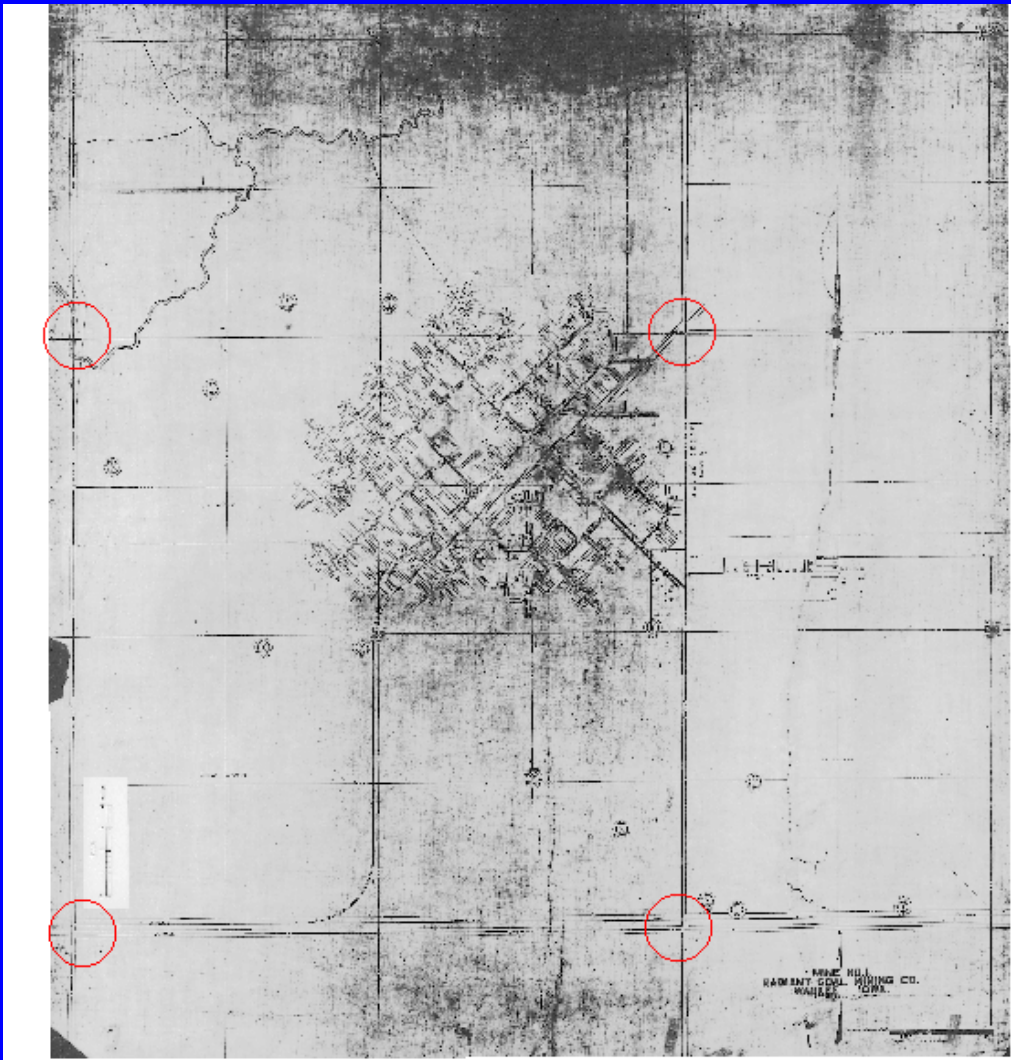




GIS development, 1988, cont.

Registration step - digitized registration points are located and “transformed” to the equivalent points on a georeferenced 7.5’ topographic quadrangle. The digitized mine outline and entrance locations are transformed with the reference points.

Georeferencing mine map images, 2005, step 1



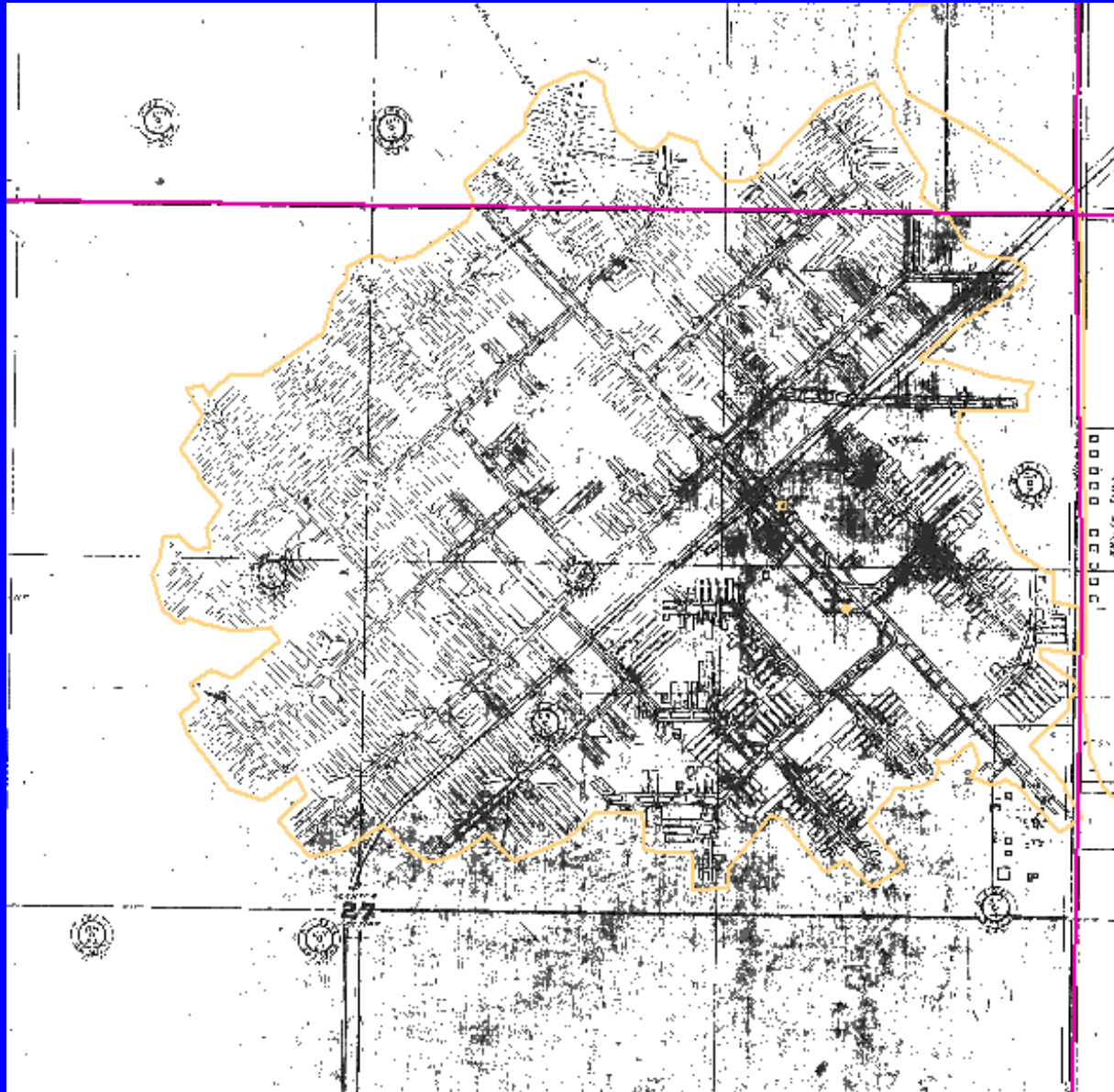
- Negative is scanned at 600 dpi, saved as .tif image
- Minor cropping and cleanup
- Identify reference points. In this example, four section corners have been located and circled in red.
- Load layers for georeferencing and the mine map image into Arcmap 9 with the Georeferencing extension. Zoom to the approximate location of the map. Select the map image as the layer to georeference and fit it to the data view

Georeferencing mine map images, 2005, step 2



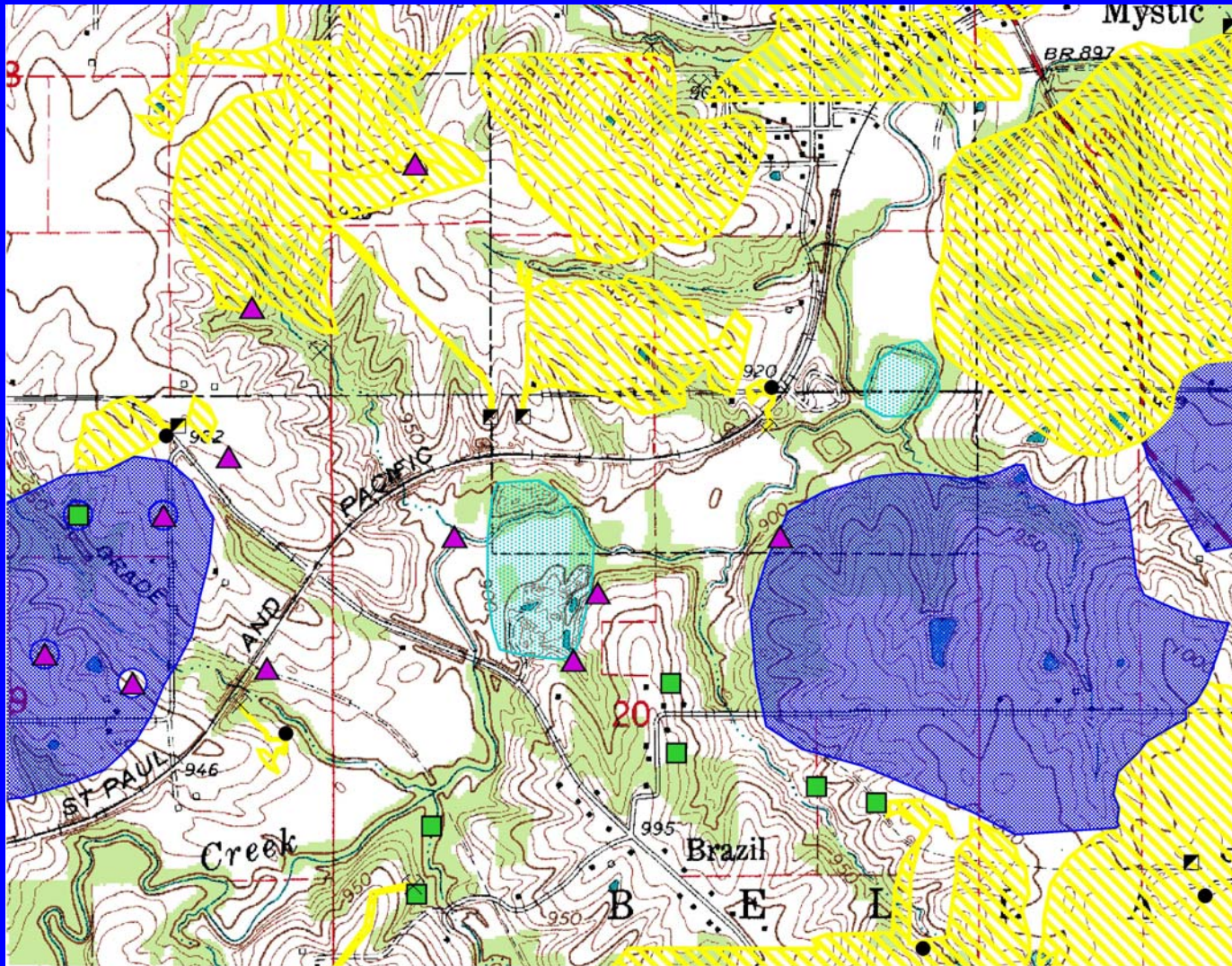
- Reference points on the map image are linked to matching reference points on the data view. The northeast section corners are linked (blue line) in this screen capture. Two widely spaced points are adequate for “scale-and-rotate” georeferencing.
- Arcmap will write/update the world file for the image.
- It may be helpful to classify the legend for the image to remove the mid-gray tones—this doesn’t alter the image, only the way it appears on the screen.

Digitizing/Updating GIS database features, 2005



- Outline showing the mine extent is digitized/updated into the coal mine GIS database (gold line).
- Mine opening are digitized/updated into the mine entrance GIS database (gold markers).
- Attributes are updated, including information about georeferencing and location of scanned, georeferenced image.

Area of extensive underground mining

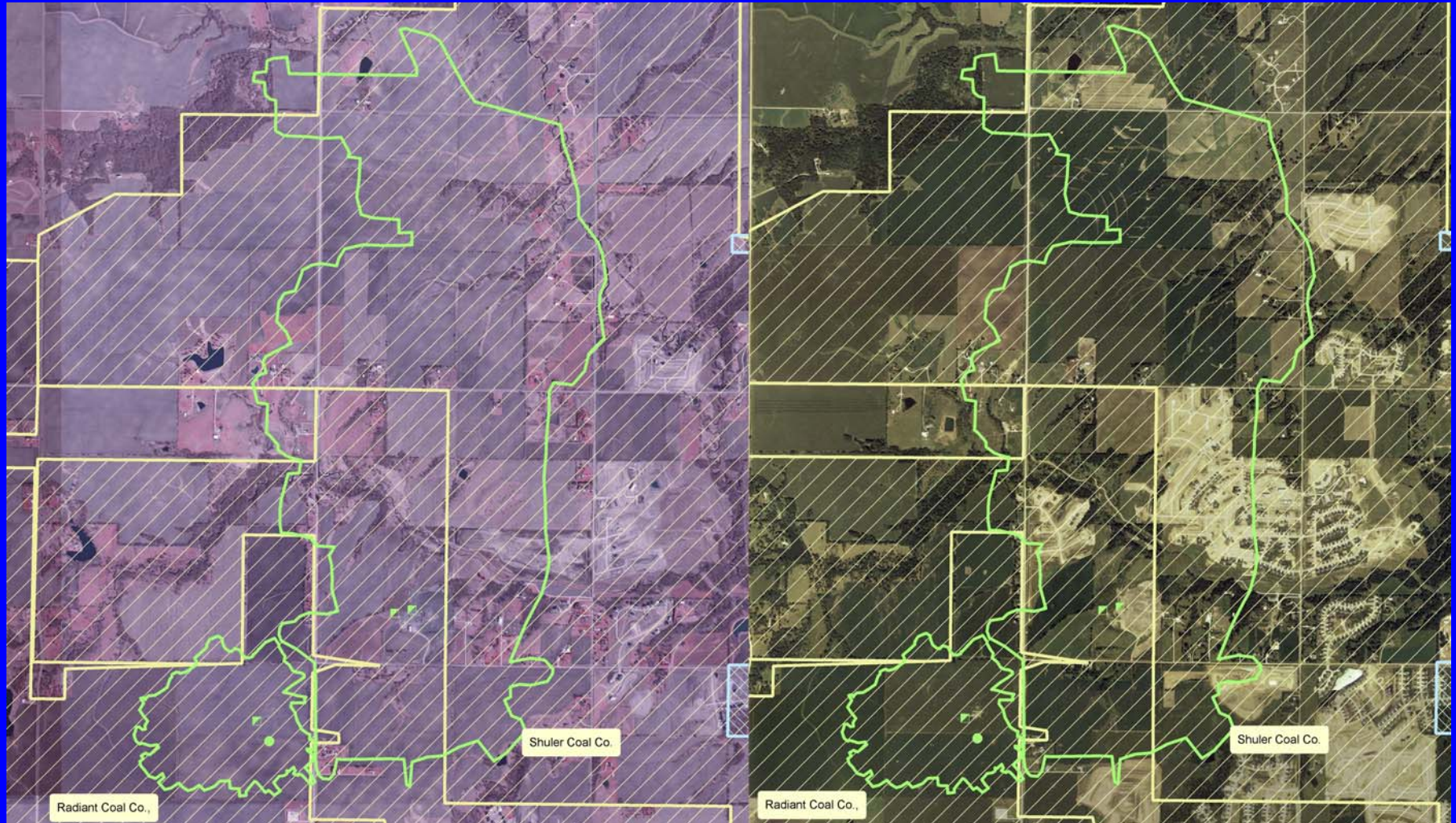


Five categories of abandoned mine data are shown. The “point location” mines are stored as one-acre round polygons to maintain compatibility with other coal mine data. The one acres areas are not included in acreage totals. On this view, the “point mines” have been converted to marker symbols for display purposes.

Summary of coal mine GIS database

- About 5,800 mines can be documented in Iowa
- 3,062 mines can be located within at least one square mile
- 765 mines have a surveyed map that can be located
- 1,480 mines are located as points only
- 2,766 mines have only a post office as a location (not located in GIS database)
- About 345 surface mines exist

Comparison of 2002 and 2004 land use and historic coal mining



2002 aerial photo (false color IR)

2004 aerial photo (true color)