

Indiana Coal Mine Information Project

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In 1981 the Indiana Geological Survey (IGS), in cooperation with the Indiana Division of Reclamation (DOR), accelerated its mapping of active and abandoned coal mines in the state. This project was undertaken to organize and document all available mine information and make it easily accessible to users.

The IGS, as well as industry, private citizens, and other government agencies, is interested in the location of coal mines because the mines affect: (1) exploration for and development of coal, petroleum, and other mineral resources; (2) construction of highways, bridges, and public works; (3) construction and maintenance of homes and buildings; and (4) coal-resource calculations. The Indiana Bureau of Mines and Mining (IBMM) is concerned with how mines affect the health and safety of coal miners; the DOR is concerned with the effect of mines on reclamation and on safety and environmental hazards.

History

Coal has been mined in Indiana for more than 150 years. Thomas Wilson, an early State Mine Inspector, reported that the first coal was mined in 1825. It was stripped from an outcrop on Little Pigeon Creek east of Newburgh in Warrick County by Mr. Alpha Frisbee (5). Other sources report mining as early as 1765 (3). The American Cannel Coal Co., which mined coal near the present town of Cannelton in 1837, was the first company to be granted a charter by the Indiana State Legislature (1,8). Before 1915 Indiana coal was produced almost entirely by underground mines. After 1915 surface mining grew steadily in importance (Figure 1) and by 1939 displaced underground mining as the principal method of production (2).

Collection of mine information by Indiana state agencies began with the *Geological Reconnaissance of the State of Indiana* by David Dale Owen (1837). Collection of mine information on an annual basis began with the report of the State Coal Mine Inspector in 1879. The 1898 report of the Department of Geology and Natural Resources (1) was the most complete compilation of Indiana coal mining to that date, and it is the primary source of early mine information. Publication of mine information by the IGS began in the early 1950s with the release of the *Preliminary Coal Map* series. Coal companies are now required by law to file copies of their underground workings with the IBMM. By 1976 IBMM files contained more than 1,600 maps documenting about 500 active and abandoned mines.

Underground mines

In 1976 the IGS began the project of mapping underground coal mines by compiling existing in-house mine maps, which included maps collected during the course of various projects and photographs of mine maps from various county recorders' offices. To create more comprehensive and accessible documentation of underground coal mining, the IGS, in cooperation with the IBMM and the U.S. Bureau of Mines (USBM), transported all the maps on file at IBMM to the USBM facilities in Pittsburgh, Pennsylvania, for microfilming.

The microfilm file documents not only abandonment maps but also maps filed annually by coal companies as required by Indiana law. It was necessary to pick the abandonment map or the map showing the most recent workings for use in this pro-

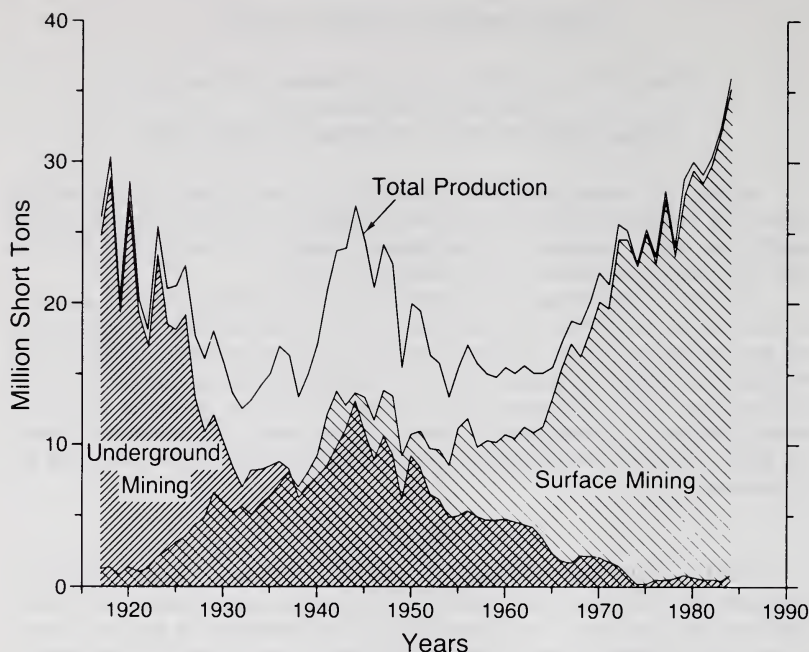


FIGURE 1. Graph showing total coal production and production by underground and surface mining in Indiana, 1917-84. Data from 3, 4, and 6.

ject. An 8½- by 11-inch photograph of each mine map was printed from the microfilm, then each mine map was converted to a scale of 1:24,000 (the scale of U.S. Geological Survey 7½-minute quadrangle maps) before plotting. The procedure for map scaling and transfer, which was similar to that discussed by Urhin (7), involved the use of a digitizer and a computer, both of which were available at the IGS. The published *Coal Map* series (1 inch to 1 mile scale) (Figure 2) was then compiled from these 1:24,000 maps.

Problems related to working with old mine maps on the microfilm format include: (1) lack of a common scale (7), (2) poor quality of some maps due to age or damage, (3) lack of surface information necessary to locate a mine, (4) duplication of mines in the file, that is, a single mine with two or more names, and (5) incomplete information about the mine itself, such as mine name, company name, location, and seam of coal mined. Although many maps were found to lack sufficient data for plotting because of one or more of the reasons listed above, almost all mines could be properly identified and plotted by using information from other mine maps and available literature.

Surface mines

The IGS has maintained a set of 1:24,000 quadrangle maps showing the locations of surface mines for a number of years. These maps have been updated several times.

In preparing for the mapping of surface mines. The IGS purchased sets of aerial photographs from the U.S. Department of Agriculture for the counties that had surface mining. These photos were taken between 1972 and 1981. Available county soil surveys from the Soil Conservation Service were also obtained.

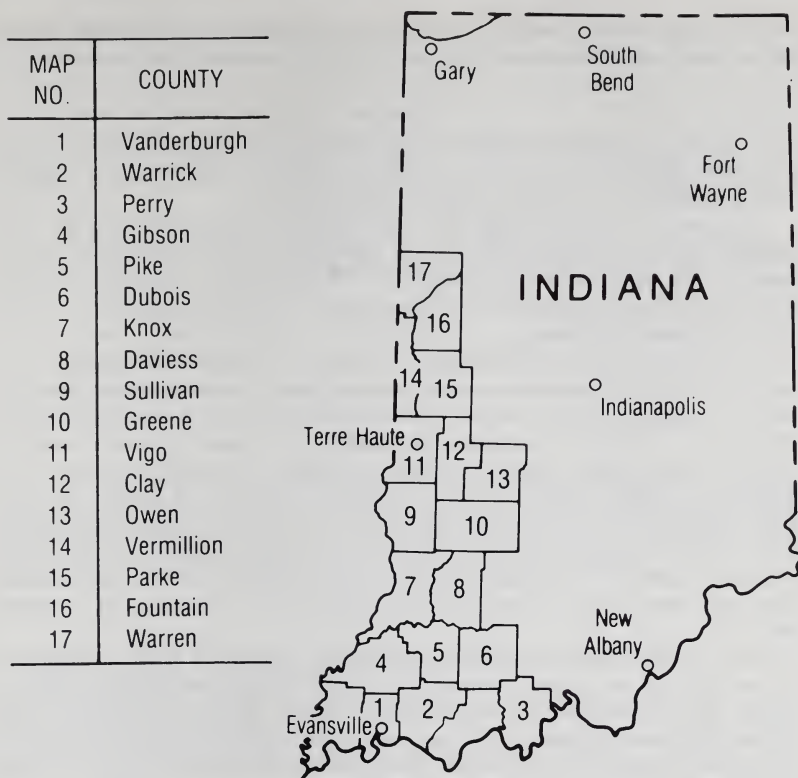


FIGURE 2. Index map of Indiana showing location of counties covered in the Coal Map series for underground mines.

Older aerial photos dating from 1937 were invaluable in plotting many of small mines that were totally overgrown on more recent photos. The annual affected-area maps, which show the extent of land affected by mining, were on file at the DOR. These maps were photographed, and 8½- by 11-inch prints of them were made.

Mylar overlays were made for each quadrangle, and the information from the different sources was then scaled and plotted on the overlays. Information from the soil maps was used to check on the other plots and also to locate on the photos small mines that would have been missed otherwise. The outlines completed from the various sources were compared with aerial photos, and the best mine outlines were transferred to U.S. Geological Survey 7½-minute quadrangle maps.

It was necessary to use the photos in combination with the affected-area maps to plot mine outlines for areas mined after 1976. The recent mines were difficult to distinguish on the photos because of the high quality of reclamation in the Indiana coalfield. Areas mined subsequent to the most recent aerial photographs were mapped entirely from affected-area maps.

Both sets of 7½-minute quadrangle maps, surface and underground, were then photographed, and three I to I film-positive prints were made of each map from both sets. Both the IGS in Bloomington and the DOR in Jasonville maintain a set of these prints on open file. The various seams and mined areas were differentiated by using

different colors of film overlays on two of these prints. The third set was left uncolored and is on file at the IGS for use in making reproductions on request.

Database

The IGS began accumulating coal-mine information in the late 1940s. As the size of the files increased and requests for detailed information became more frequent, it became apparent a computer database was desirable.

Currently the mine database uses the Scientific Information Retrieval (SIR) Database Management System (DBMS). SIR has the capability to handle blank variable fields as well as multiples of the same variable. These capabilities are necessary because of the variable nature of the mine-file information. The mine database has now been in use for about three years.

The following types of information, if known, are included in the database for each mine: number of the source map(s), name(s), dates of mine operation under this name, pit name(s), company name(s), county(ies) location(s), U.S. Geological Survey 7½-minute quadrangle(s) location(s), township(s) and section(s) location(s), dates of operation, type of mine, method of mining, method(s) of transportation, major consumer(s), coal seam(s) mined, thickness of seam(s), depth of coal seam(s), elevation of coal seam(s), lithology of roof, lithology of floor, IGS coal sample(s) taken in the mine, production by year (in tons), source(s) of production figures, and production by seam (in tons). This database currently contains over 66,000 lines of information about more than 7,000 mines and pits. Each surface-mine pit is treated as an individual mine.

SIR and the database of mine information make possible a variety of inquiries. For example, we can retrieve information about all underground mines in Sullivan County that produced more than 50,000 tons per year, mined the Springfield Coal Member (Petersburg Formation), and operated between 1900 and 1950, or we can retrieve information about all mines in Indiana that mined the Survant Coal Member (Linton Formation) where it was more than 3.5 feet thick.

The quality of existing mine information varies greatly, but documentation of large underground mines is fairly complete since the establishment of the IBMM and the agencies that preceded it. Information on surface mines is much less complete. Much of the data in existing IGS files on early (pre-1950) surface mines was obtained from the Indiana Coal Association. Identification of surface-mine pits is complicated by the general practice of considering the tippie location to be the mine location. This practice causes a great deal of confusion for an area where several large mines had a number of pits. Therefore, each surface pit has been treated as a mine. Little information is available on most small mines, both surface and underground, that operated before the early 1950s.

Conclusions

A wide range of users have requested information made available by this project. The DOR uses the information extensively in its Abandoned Mine Lands Program. Operations involving the use or extractions of subsurface resources, such as coal, oil and gas, industrial minerals, and ground water, require the use of coal-mine information. Mine maps also aid planners and developers in areas where building or road and bridge work is intended. Mine information assists government and industry in making resource-reserve calculations.

The contributions of this project to current users have proved substantial; future use and value are foreseeable in projects presently in the planning stage. These maps will be of importance if the underground production of Indiana coal once again in-

creases. Mining laws in Indiana require drilling 20 feet laterally in advance of the mine workings when approaching within 200 feet of the boundaries of abandoned works. The U.S. Office of Surface Mining has initiated a program to encourage states to form a mine subsidence insurance program. Products of the coal mine information project should be very valuable in assessing subsidence risks both in establishing the program and in assisting individual property owners in deciding if the insurance is necessary for them. As more individuals become aware of the availability of coal-mining data, the use and benefits of these data will increase.

The importance of compiling reliable and accessible information was stressed more than 100 years ago by the first Indiana State Coal Mine Inspector, Herbert H. Richards:

"I cannot exaggerate the importance of having correct plans. When our present mines are abandoned and filled with water, these maps will have to guide us in future mining operations, and if they are misleading we should be much better without them, for they may cause much destruction of life." (5)

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