MINE SUBSIDENCE IN ILLINOIS: FACTS FOR HOMEOWNERS

Robert A. Bauer
Billy A. Trent
Paul B. DuMontelle

ENVIRONMENTAL GEOLOGY 144 1993

Department of Energy and Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY

MINE SUBSIDENCE IN ILLINOIS: FACTS FOR HOMEOWNERS

Robert A. Bauer
Billy A. Trent
Paul B. DuMontelle

ENVIRONMENTAL GEOLOGY 144 1993

ILLINOIS STATE GEOLOGICAL SURVEY
Morris W. Leighton, Chief
Natural Resources Building
615 East Peabody Drive
Champaign, IL 61820-6964

Prepared for
ILLINOIS MINE SUBSIDENCE INSURANCE FUND

CONTENTS

FIGURES

TABLES

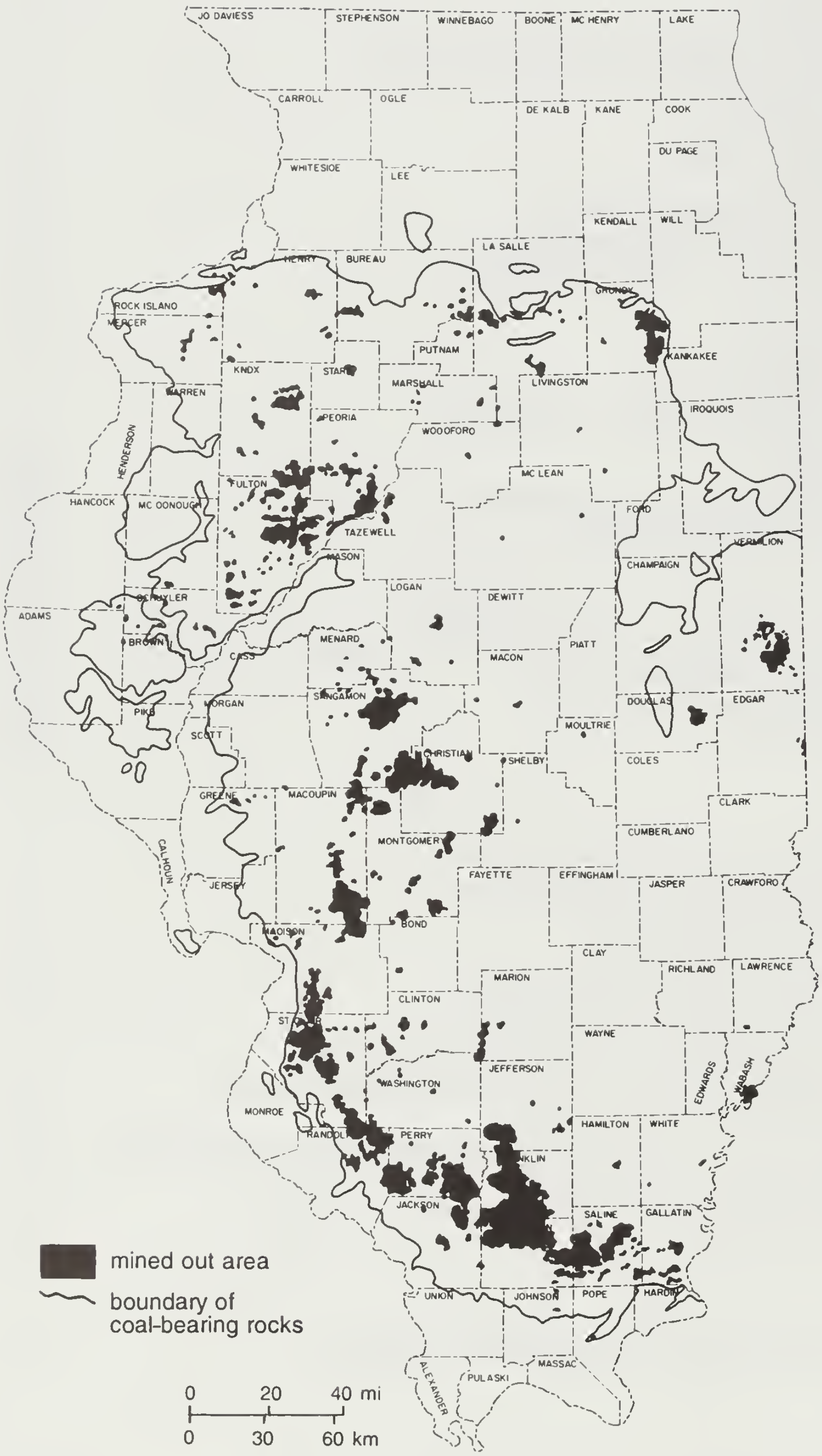


Figure 1 Areas where coal has been mined in Illinois.

About 750,000 acres of Illinois land has been undermined for coal and other minerals. About 178,000 acres of residential and other built-up land in Illinois lies close to underground mines and may be susceptible to subsidence. An estimated 320,000 housing units in the state have been built over or adjacent to underground mines.

Subsidence of the surface above abandoned coal mines is not common, although it does occur. Homeowners should be aware of any nearby mines and the causes and consequences of subsidence. Then they can decide whether to insure their homes against possible damage.

MINE SUBSIDENCE IN ILLINOIS: FACTS FOR HOMEOWNERS

Signs of Subsidence

Cracks suddenly appear in the foundation or walls and ceilings, then grow. The ground around the house also starts to crack. Popping and snapping can be heard as the house shifts. Doors and windows stick, jam, or break. Parts of the house tilt, and doors swing open or closed. The chimney, porch, or steps separate from the rest of the house. Water mains break, resulting in dirty tap water, loss of water pressure, and soaked ground. Gas and sewer lines leak.

If subsidence is developing, several of these problems are likely to emerge within a few days or weeks. If one or two incidents occur at random, they may be traced to some other cause.

Table 1 Underground mines that have produced industrial minerals and metals, compiled by county and commodity.

County	Mineral (no. of mines)	County total
Adams	limestone (4)	4
Alexander	gannister (2), tripoli (4)[a], clay[a]	6
Calhoun	clay (5)	5
Carroll	lead (2)	2
Du Page	dolomite (1)	1
Greene	limestone (1)	1
Hardin	fluorspar (130)[b], lead (1)[b], zinc[b]	131
Henderson	limestone (1)	1
Jackson	clay (1)	1
Jo Daviess	lead (93)[c], zinc (9)[c]	102
Johnson	limestone (1)	1
La Salle	clay (6), limestone (2)	8
Livingston	clay (1)	1
McDonough	clay (3)	3
Madison	clay (2), limestone (2)	4
Marshall	clay (1)	1
Monroe	limestone (2)	2
Pike	limestone (3)	3
Pope	fluorspar (51)[d], lead (7)[d], zinc[d], barite[d]	58
Randolph	limestone (3)	3
Rock Island	clay (1)	1
Saline	fluorspar (2)[e], lead[e]	2
Scott	clay (1)	1
Union	clay (12), tripoli (2)	14

Source: Treworgy and Hindman 1991

[a] 2 of the 4 tripoli mines also mined clay.

[b] 29 fluorspar mines also produced lead, 10 produced zinc, and 4 produced lead and zinc.

[c] 54 lead mines also produced zinc.

[d] 25 fluorspar mines also produced lead, 3 produced zinc, 2 produced lead and zinc, and 1 produced barite.

[e] 1 fluorspar mine also produced lead.

Underlying Cause

Subsidence, or the sinking of land surface, commonly results from underground mining.

Underground mines were developed in Illinois soon after the first settlers arrived. They mined coal, lead, zinc, fluorite, claystone, and limestone. During the early years, land over mining areas was sparsely populated. If the ground settled, little damage resulted. As towns and cities expanded over mined-out areas, subsidence became a serious problem.

In Illinois, property damage has been severe enough that a state law, the Mine Subsidence Insurance Act, was passed in 1979 to provide subsidence insurance for homeowners in mining areas. Amendments to the Act have added to the coverage for insured structures. (More information about the insurance program and the Illinois Mine Subsidence Insurance Fund is available from their headquarters in Chicago. See p. 15.)

Mine subsidence insurance in Illinois covers damage caused by mining any mineral resource. Homeowners should be aware that subsidence is possible if any mineral has been mined in their area. One of the state's largest mine subsidence events took place over a lead-zinc mine in Galena (Touseull and Rich 1980). But most mine subsidence in Illinois is related to coal extraction because these mines underlie large areas of the state.

The total acreage of abandoned underground coal mines (fig. 1) far overshadows acreage undermined for all other commodities (table 1). About 178,000 acres of residential and other built-up areas can be found close to underground mines, and an estimated 320,000 housing units have been built on land over or adjacent to underground mines (Treworgy and Hindman 1991).

Figure 2 shows how extensive underground coal mining has been in each county. Counties with more than 1% of their land undermined have a mine subsidence insurance premium automatically included in their homeowners insurance policies, as required by the Mine Subsidence Insurance Act of 1979.

Help for Homeowners

The Illinois State Geological Survey (ISGS) has prepared this publication to explain the causes and nature of subsidence and to discuss ways of minimizing the damage caused by subsidence. With this information, homeowners will be able to decide whether they live in subsidence-prone areas, understand some common effects of mine subsidence, and recognize problems that can be mistaken for mine subsidence.

Figure 2 Counties of Illinois undermined for coal. Counties with undermined areas of 1% or more are automatically included in the mine subsidence insurance program.

GEOLOGIC SETTING

Knowing what geologic (earth) materials lie above and below a coal mine leads to understanding how and why subsidence takes place. When materials fail, either above or below mine workings, the surface may subside.

The term "overburden" refers to all earth materials overlying the coal that is mined—the sand, clay, pebbles, and other deposits of glacial origin as well as bedrock.

Glacial materials range from less than 10 feet to more than 200 feet thick over the areas mined in Illinois. A layer of windblown silt, called loess, blankets most of the surface of the state, including coal mining areas. Loess ranges from less than 2 feet to about 25 feet thick (fig. 3), except for a part of southwestern Illinois where it may be as much as 100 feet thick. Beneath these surficial deposits is bedrock consisting of flat-lying or gently dipping sequences of shale, coal, claystone, limestone, and sandstone (fig. 4). The layer below most Illinois coals is a soft clay, called underclay.

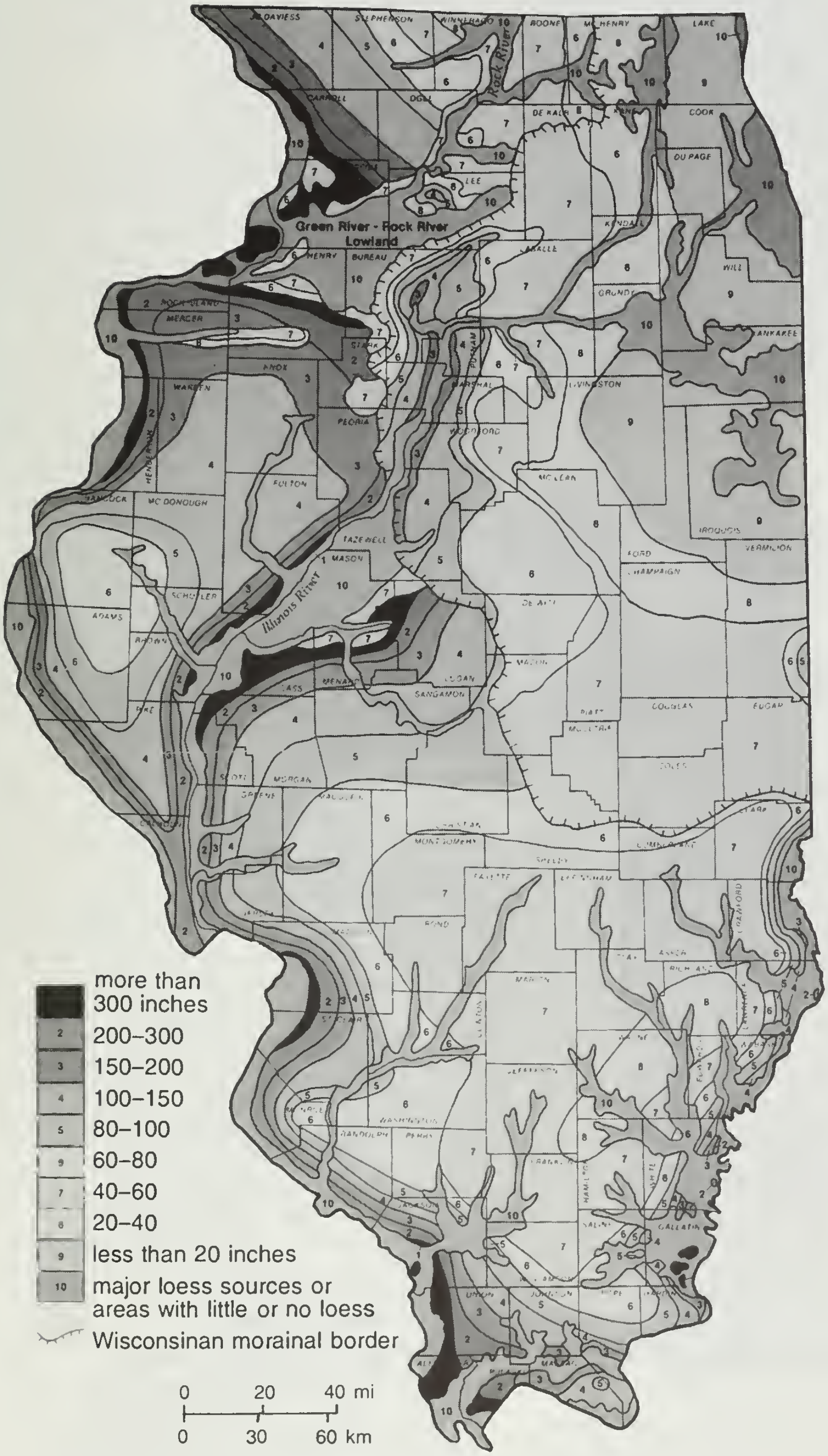


Figure 3 Total loess thickness in Illinois (Fehrenbacher et al. 1986).

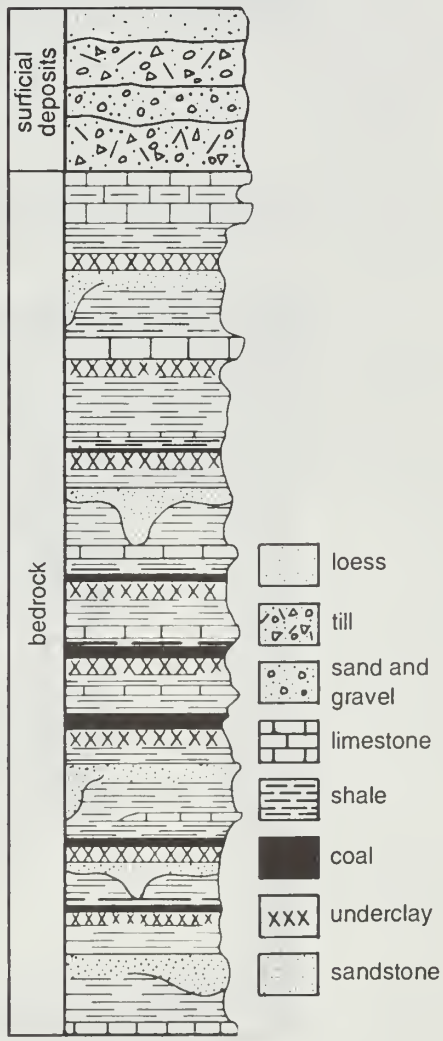


Figure 4 Generalized geologic column representing layers of surficial deposits underlain by layers of bedrock that might be present in a typical undermined area.

UNDERGROUND COAL MINING METHODS

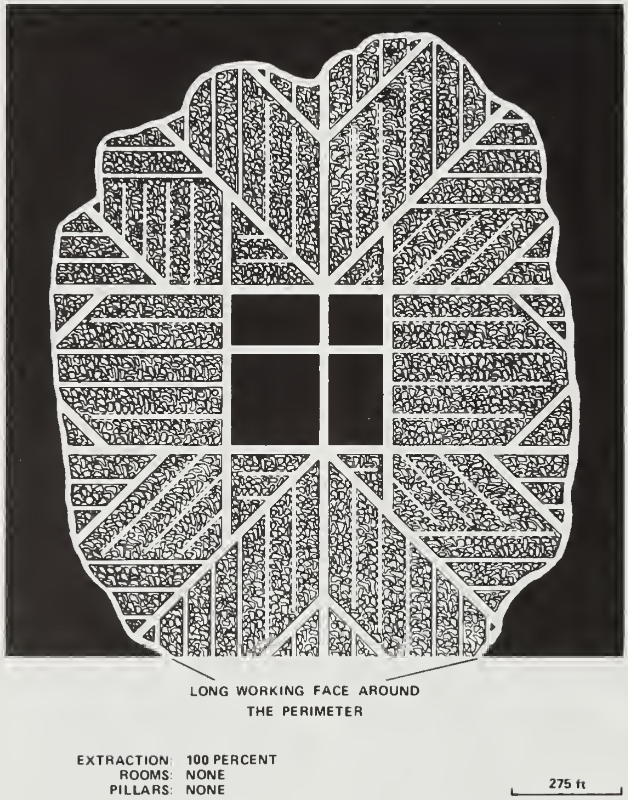


Figure 5a Early longwall mine. Coal was removed from center (shaft) outwards along continuous perimeter. Voids were backfilled with rock support (after Andros 1914a).

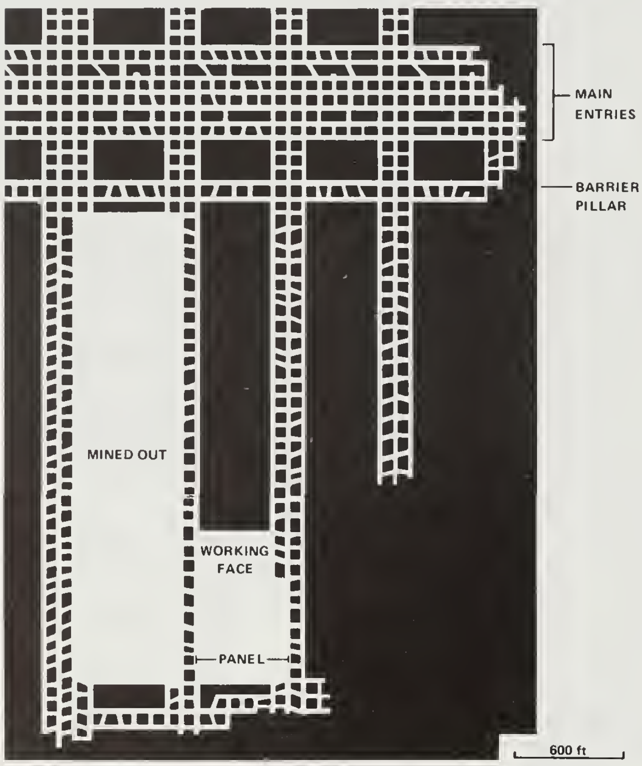


Figure 5b Modern method. General development plan for high extraction retreat and longwall mining. See figs. 5c and 5d for detailed view (after Hunt 1980).

Strip or surface mining accounts for about 40% of current coal production in the state. Although strip-mined land may settle, it is not called subsidence.

Much of Illinois coal lies too deep for surface mining and requires an underground mining operation. Two fundamental methods of underground mining are used in Illinois: high extraction (including longwall) and room and pillar (low extraction).

High Extraction—Planned Subsidence

High-extraction methods (fig. 5) mine almost all the coal in a localized area. They always result in the surface subsiding above a mine within several days or weeks after the coal has been removed. The sinking or subsiding of geologic materials lying over the mined-out area will continue for years, although it will diminish rapidly after a few months. Once subsidence has decreased to levels that no longer cause damage to structures, the land can usually be developed. In early longwall mines (fig. 5a), workers maintained the haulageways (entrances) by leaving areas of stacked rock, wooden props, and rock-filled wooden cribs to replace the support lost by the removal of coal. The mine roof, then the overlying bedrock and earth, settled onto the stacks of rock. When this occurred, a few feet of subsidence resulted at ground surface.

Modern high-extraction systems are designed to achieve a high rate of production (figs. 5b-d). Using the high-extraction retreat method, miners remove as much coal as possible in a small area until the roof starts to collapse; then they retreat to the next area. Using the modern longwall method, workers mine 100% of the coal along a straight working face beneath artificial roof supports. The mine roof collapses immediately behind the working face, causing 4 to 6 feet of subsidence. This amounts to 60% to 70% of the mined height of the coal seam plus any roof or floor materials that have been removed.

Room and Pillar—Unplanned Subsidence

Using the room-and-pillar system, miners create openings (rooms) as they work. Enough coal is left in pillars to support the ground surface. In

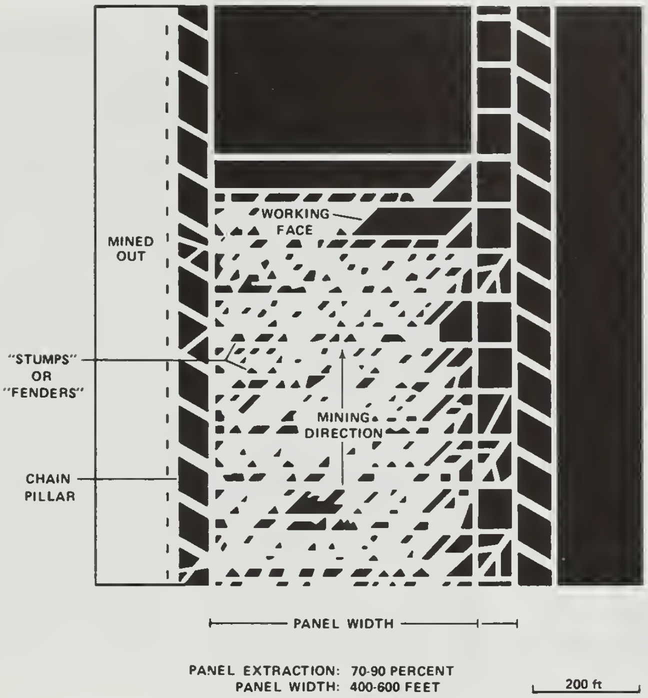


Figure 5c Modern method (high extraction retreat). Small stumps of pillars are left for safety. Chain pillars may be mined to increase panel width (after Hunt 1980).

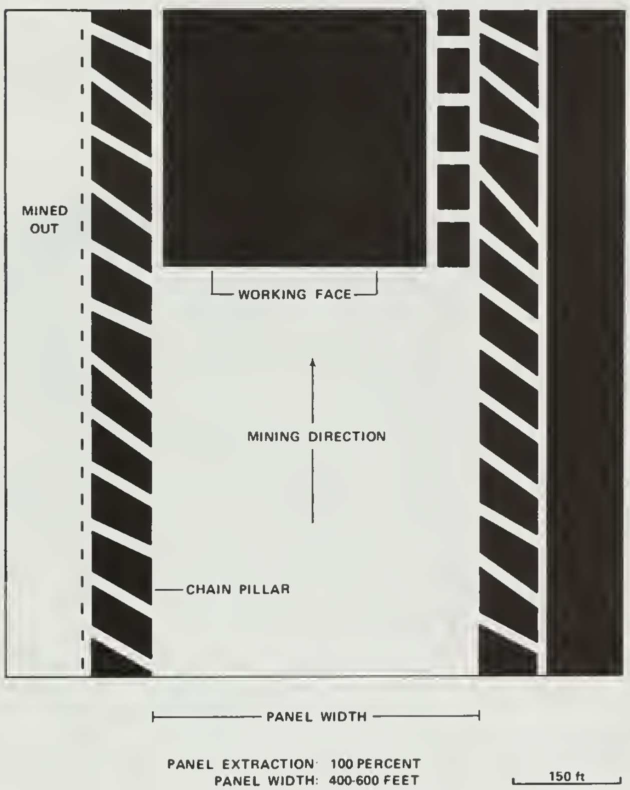
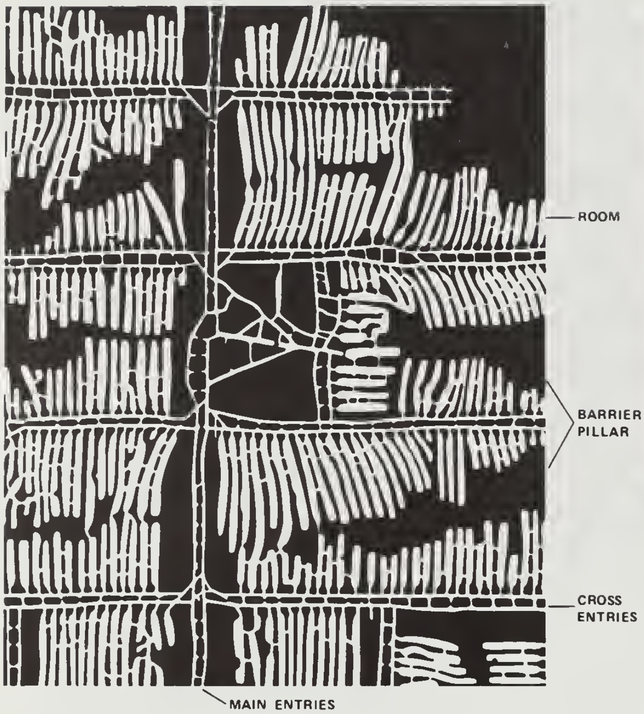


Figure 5d Modern method (longwall). All coal is removed along a straight mining face, thus forming a sharply defined panel with no remaining coal support (after Hunt 1980).

Illinois, this system results in extraction of 40% to 75% of the coal.

The room-and-pillar method frequently used before the early 1900s was characterized by rooms that varied considerably in length, width, and sometimes direction (fig. 6a). To separate production areas (panels) from main entries (providing more support to the main entryways) and to improve ventilation, mine operators devised the modified room-and-pillar or panel system (fig. 6b). This system provided a more regular configuration of production areas. The rooms and pillars were set back from the main entries, and production areas (panels) had well defined boundaries as a result of the broad barrier pillars or unmined areas left between panels. Two room-and-pillar methods in current usage are the blind room and the checkerboard (figs. 6c-d). Using the first method, miners bypass every sixth or seventh room of a production area. The unmined area (blind room) functions as a large pillar to support the roof. This method is still used today. The checkerboard system has evenly spaced square pillars in a checkerboard pattern of panels 1,750 feet wide by 2,250 to 2,750 feet long. Modern room-and-pillar mines have many main and secondary entries to provide for required ventilation.

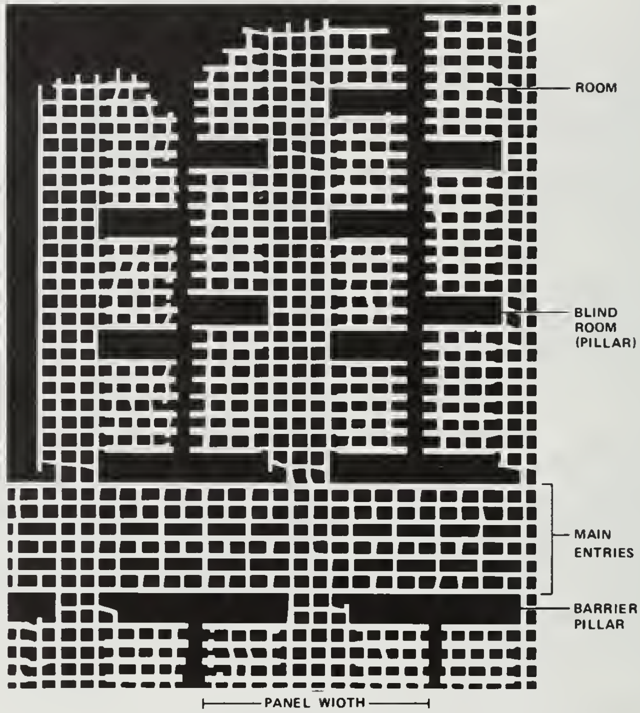
No one can predict when or if the land above a room-and-pillar mine will sink. If any coal has been removed from an area, subsidence of the overlying geologic materials is always a possibility.



PANEL EXTRACTION: UP TO 80 PERCENT (IF PILLARS ARE PULLED)
ROOM WIDTH: 15 to 40 FEET
ROOM LENGTH: 100 to 400 FEET
ROOM PILLAR WIDTH: 5 to 40 FEET
BARRIER PILLAR WIDTH: 0 to 150 FEET

500 ft

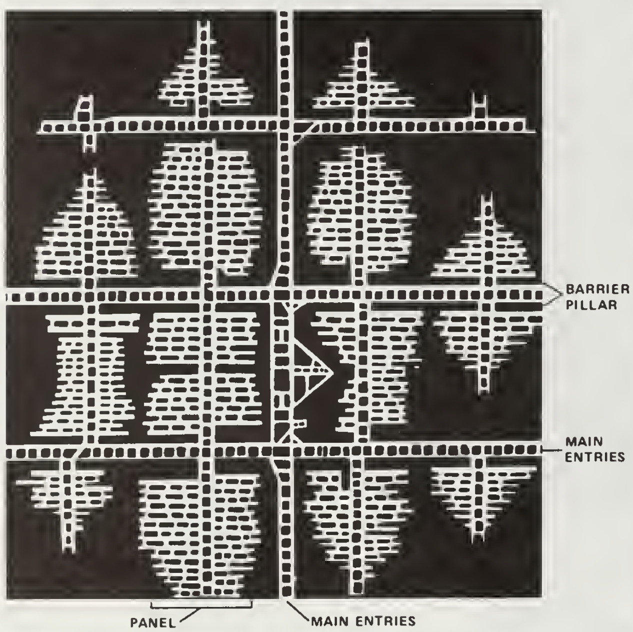
Figure 6a Early room and pillar mining method (basic). Irregular layout was typical of some early mines (after Andros 1914b).



PANEL EXTRACTION: 50-65 PERCENT
ROOM WIDTH: 15-25 FEET
ROOM LENGTH: 200-300 FEET
ROOM PILLAR WIDTH: 25-60 FEET
BLIND ROOM (PILLAR) WIDTH: 80-120 FEET
BARRIER PILLAR WIDTH: 100-150 FEET

350 ft

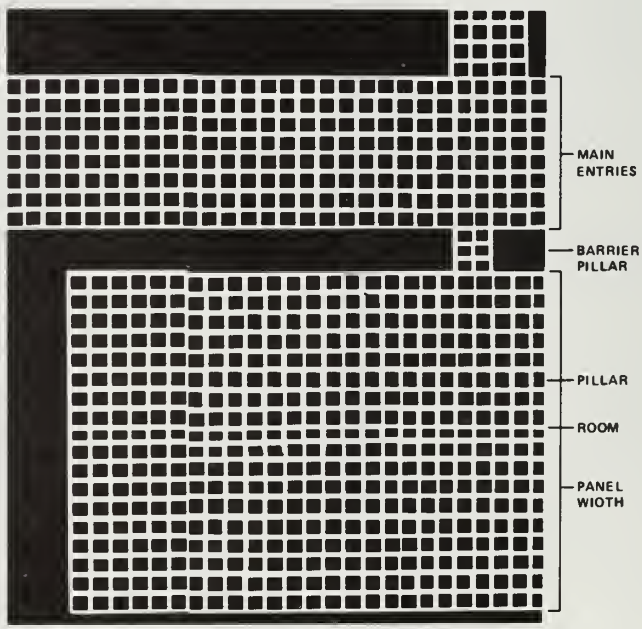
Figure 6c Modern method (blind room). Every sixth or seventh room within a panel is left unmined (blind) for additional support of the overburden (after Hunt 1980).



PANEL EXTRACTION: UP TO 80 PERCENT (IF PILLARS ARE PULLED)
ROOM WIDTH: 15-30 FEET
ROOM LENGTH: 200-300 FEET
ROOM PILLAR WIDTH: 10-30 FEET
BARRIER PILLAR WIDTH: 50-150 FEET

500 ft

Figure 6b Early method (modified). More regular layout of rooms and pillars; panels were separated from main entries (after Andros 1914a).



PANEL EXTRACTION: 40-60 PERCENT
ROOM WIDTH: 15-25 FEET
ROOM LENGTH: 1000 (OR MORE) FEET
ROOM PILLAR WIDTH: 40-60 FEET
BARRIER PILLAR WIDTH: 100-150 FEET

300 ft

Figure 6d Modern method (checkerboard). Large, evenly spaced square pillars in a checkerboard configiration (after Hunt 1980).

MINE MAPS

Copies of original mine maps may contain detailed features, such as shaft locations, surface facilities, and location and size of coal pillars left in the mine. Original mine maps are used to accurately determine the type of mining performed in each area and to relate the location of mine features to surface structures.

Illinois law requires mining companies to file maps and mining information with the State Mine Inspector, Department of Mines and Minerals in Springfield and with the Office of the County Clerk in the county where the mine is located. These are the official repositories for mine maps.

Because parts of some mine maps are only approximate representations, correlating small areas of subsidence with specific rooms or parts of production areas may be difficult. A further complication is that many old mines are partly collapsed or unstable, and thus inaccessible. Some are flooded, and some contain methane gas, carbon dioxide, carbon monoxide, and little or no oxygen. In places, the air may be explosive.

Abandoned mines are extremely dangerous. Approval and supervision must be obtained from the State Mine Inspector, if it is necessary to enter them.

TYPES OF SUBSIDENCE

Researchers have learned much about the nature and causes of subsidence by studying the effects at the ground surface, drilling holes down to mines, lowering small television cameras down the holes to view mine conditions, and personally inspecting mines that are still accessible. In Illinois, subsidence of the land surface may take either of two typical forms: pit or sag (trough).

Pit Subsidence

Pits are usually 6 to 8 feet deep and range from 2 to 40 feet in diameter (fig. 7), although most are less than 16 feet across. Newly formed pits have steep sides with straight or bell-shaped walls.

Pit subsidence usually occurs over mines less than 200 to 300 feet deep. The mine roof collapses and the void works up through the overlying bedrock and surficial layers of glacial deposits and loess to the surface, where a hole forms over 1 or 2 days. If the bedrock is only a few feet thick and the surficial deposits are loose, these materials may subside and wash into adjacent mine voids so that they produce a surface hole deeper than the height of the collapsed mine void.

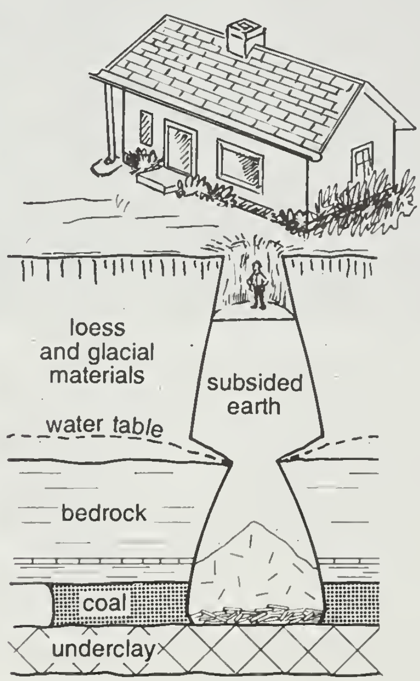


Figure 7 Photograph and cross section of a typical pit subsidence event (after Wildanger et al. 1980).

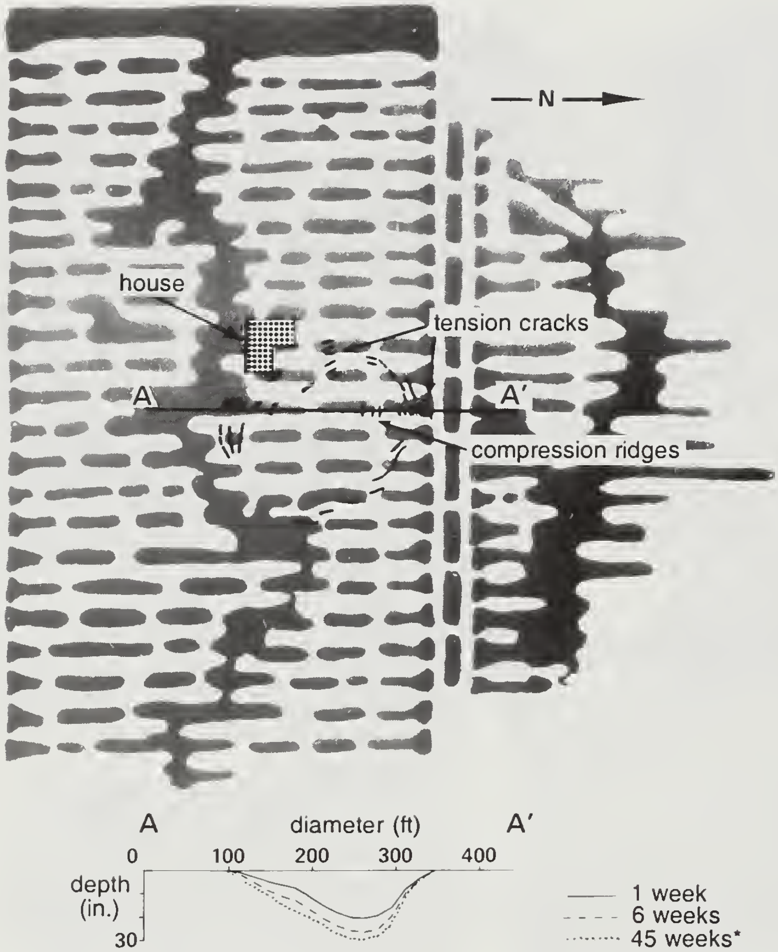


Figure 8 Sag subsidence shown on map of the underlying mine. Profile A–A′ shows the sag developing. Compression ridges formed near the deepest part of the sag, and tension cracks formed around the perimeter. (*Data from Dave Kiesling, Department of Civil Engineering, University of Illinois, pers. comm. 1981.) See also figure 9.

Sag or Trough Subsidence

Sag subsidence forms a gentle depression over a broad area. Some sags may be as large as a whole mine panel —several hundred feet long and a few hundred feet wide (fig. 8). Several acres of land may be affected. The maximum vertical settlement is usually 2 to 4 feet, as shown along the profile below the mine plan in figure 8.

A major sag may develop suddenly (in a few hours or days) or gradually (over years). The profile in figure 8 shows settlement that took place over 45 weeks.

Sags may originate over places in mines where the coal pillars have disintegrated and collapsed, or where the pillars have settled into the relatively soft underclay that forms the floor of most mines. Sags can develop over mines of any depth.

Tension cracks form as the ground is pulled apart by downward bending of the land near the outside edges of the sag. Generally, the cracks parallel the boundaries of the depression. Near the center of the sag, compression ridges form as the ground is squeezed by upward bending of the land. Ridges are observed less frequently than tension fractures because the area of compression is much smaller.

EFFECTS OF SUBSIDENCE: PROBLEMS AND SOLUTIONS

Pit Subsidence

When pits develop, the ground only moves in one direction—it drops vertically.

Pits are most likely to form at the surface after heavy rainfalls or snow melts. Water does not usually accumulate in the pits but drains down into the mine. A common treatment is to fill the pit with sand or clay, cap the fill with a clayey soil, and compact the clay tightly so that its permeability is very low. Many pits have been permanently filled in this way.

Structures can be damaged if pit subsidence develops under the corner of a building, the support posts of a foundation, or other critical spot. Otherwise, the probability of a structure being damaged by pit subsidence is low because most pits are relatively small,that is, only a few feet across. If pit subsidence develops under foundation walls, it may not immediately affect the house because the foundation temporarily bridges the pit (fig. 7). Eventually, the "bridge" may become damaged.

Homeowners living where pit subsidence is common should periodically inspect crawl spaces and other hidden areas of their homes. A pit should be carefully filled so that proper support is again established beneath the foundation.

Subsidence pits that are not filled pose a special danger for both people and animals. They are often deep and steep-sided. Anyone who falls in may find it very difficult to get out.

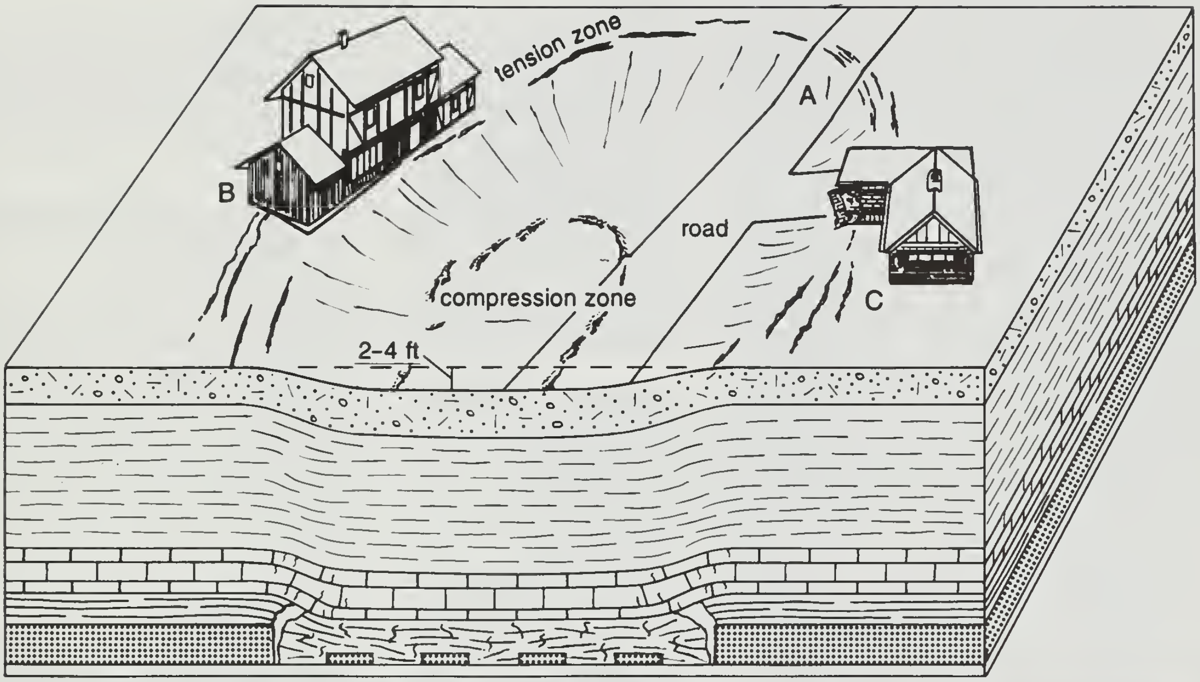


Figure 9 Block diagram and photos of a typical sag subsidence event. A. Road in compression zone. Asphalt has buckled. B. Wood frame house in tension zone. Foundation has pulled apart and dropped away from the superstructure in one corner. C. Brick house in tension zone. Walls, ceilings, and floors have cracked.

Sag Subsidence

The ground moves in two directions during sag subsidence (fig. 9). It drops vertically and moves horizontally toward the center of the sag. At the surface, the sag may be much broader than the collapsed part of the mine. For example, a failure in a mine 160 feet deep could cause minor surface subsidence more than 75 feet beyond the edge of the undermined area. The deeper the mine, the larger the area affected.

Sag subsidence has an orderly pattern showing tensile features surrounding possible compression features. Mapping of all the tensile features shows orderly movements toward the center of the sag.

Type and extent of damage to surface structures relate to their orientation and position within a sag. In the tension zone, any large cracks that develop in the ground may damage buildings and roads as well as driveways, sidewalks, pipes, sewers, and utilities. Houses B and C in figure 9 show cracking and separation caused by tension throughout their structures. Until subsidence has ceased and repairs can be made, house B will need to be entirely supported. Damage in house C will be restricted mostly to the unsupported side, so that only this side will need support.

In the comparatively smaller compression zone, roads (A) may buckle and foundation walls be pressed inward. The foundations of any houses in the center of the sag would be under horizontal compression. Although the area affected by compression is substantially smaller than the tension zone, buildings damaged by compression may need their foundations rebuilt. They may also need to be releveled.

Figure 10 Bearing walls of a house on a slab. The entire superstructure has been jacked up to a level position, exposing the interior.

Repair of Houses Damaged by Subsidence

A house may be built on a slab, footings with a crawl space, or a basement. Each type of construction requires a different type of treatment for subsidence damage. The repair of most structures requires detaching the house from the slab or foundation to relieve stress to the frame and to allow for releveling. The releveling technique is unique for each house because construction and access differ for each structure.

When buildings have not been releveled, problems have been known to recur months after the initial subsidence event: windows may crack, doors and windows stick, and plumbing leaks.

Houses on slabs Some houses are supported by broad, flat concrete pads called slabs. These houses are usually attached to the slabs. If subsidence takes place and a slab settles, its house will be pulled downward.

Restoring such a house to a level position may require detaching the house from the slab and jacking up the frame. Bolts that hold the frame to the slab can be difficult to find and remove because they are located in the walls. The load-bearing walls must be supported and jacked up because the typically constructed slab cannot be jacked up without causing severe damage.

When the house is raised and the walls separated from the floor, the interior is exposed to the outdoors (fig. 10)— a situation that presents some problems to the owner until a new, level floor is put in. Grading and pouring a new floor cannot be done until subsidence and settling of the ground ends, which may be a year or more. The elevation of the ground around the house can be measured periodically to determine when movement has ceased.

Houses with crawl spaces Other houses are supported by perimeter footings with foundation walls (and interior piers when necessary) so that a crawl space is created between the floor and the ground surface. Bolts attaching the foundation to the wood frame are generally accessible. Once the house is detached from its frame and support beams are placed under it, it can be jacked to a level position. Blocks from the walls of the crawl space are easily removed so that the beams can be inserted (fig. 11).

The family can usually continue to occupy the house because the floor is jacked up with the frame.

Houses with basements In other houses, support is provided by basement walls and, where necessary, interior piers with posts. Subsidence may cause cracks in the basement walls and floors of such houses. If the exterior waterproofing is cracked, water may occasionally enter through the foundation wall.

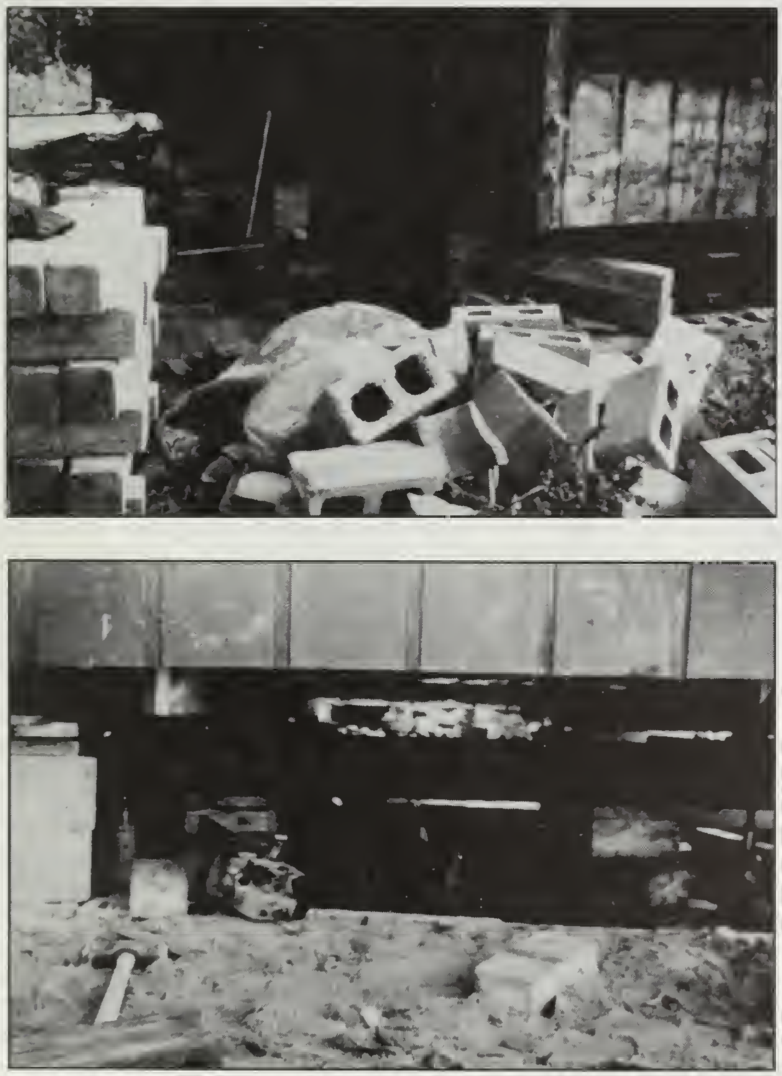


Figure 11 (above) Concrete blocks of a crawl space have been removed to make room to jack the house to a level position. (below) A closer view of the crawl space shows the I-beams supporting the releveled house.

Basements with poured concrete walls may present special problems. For example, basement windows may not be large enough or in the best locations to allow support beams to be brought in and put into position. Breaking through basement walls can be time consuming, difficult, and costly. Where basement walls are constructed of concrete blocks, supporting and releveling a house follows the same procedure as that discussed for a house with a crawl space.

In any case, basements allow room for access so that solutions can be devised for each house.

Brick houses Houses built of brick or other masonry will show cosmetic cracks after only small movements occur. Large movements may render the entire structure unstable. A brick structure, unlike a wood frame, generally cannot cantilever or extend over a subsided foundation without supplemental support. Expensive remedial measures may be necessary to develop suitable support for these heavy structures.

Effects on Utilities and Drainage

Subsidence responsible for damaging foundations may also be responsible for broken water mains, water lines, gas lines, sewer lines, telephone lines, and electrical wires. If utility poles tilt or sink, power and other lines may sag or pull from the poles. In turn, this may expose electrical wires and create another hazard.

Gas leaks are the greatest hazard because an explosion can occur, but leaks from broken water mains are often the first noticeable evidence of major subsidence. Leaking water or sewer pipes cause additional problems by saturating the ground around a foundation or washing soil from under the house, especially in areas with moisture-sensitive soils.

Water can also pond in a sag (fig. 12). If any part of a house is in a sag, an attempt should be made to keep the area under it dry. Also, the ground surrounding the foundation must be kept well drained because excess moisture can cause additional foundation-bearing problems.

Figure 12 Ponding created by sag subsidence.

CONDITIONS THAT MAY BE MISTAKEN FOR MINE SUBSIDENCE

Other circumstances produce similar damage that may be mistakenly attributed to mine subsidence (Bauer 1983 and Bauer and Van Roosendaal 1992). Problems may be caused by the following conditions.

Soils

Shrinking and swelling Moisture-sensitive soils expand when wet and shrink when dry. Many decades of cyclic wetting and drying build up pressure against foundation walls, as soil and other debris fall into the space between the foundation wall and the dry, shrunken soil. As the walls press inward, the floor of the house may drop and tilt (fig. 13).

Loss of load-bearing support can cause foundations to tilt or sink (fig. 13). To avoid problems, homeowners should take measures to keep water away from foundation walls. Downspouts should discharge water several feet from the house. The earth should be built up and graded to slope away from the foundation so that water will then drain away from the house.

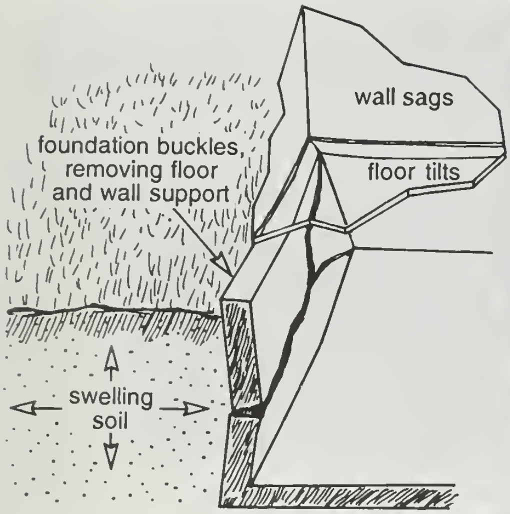
Trees or large shrubs growing near foundations tend to alter soil moisture conditions to a considerable depth. The water content of the soil can be lowered significantly. During a drought, plant roots may absorb so much of the available water that the soil shrinks from lack of moisture. When soil shrinks below the footings, it allows them to sink or tilt outward.

Freezing and thawing As some poorly drained soils freeze and thaw, they expand and contract in a manner similar to moisture-sensitive soils (fig. 13). Proper drainage through the use of granular materials (sand, for example) can reduce the potential for frost heave. These materials should be used beneath unheated outbuildings, driveways, retaining walls, and other structures that are most likely to be affected.

Piping Piping, or subsurface erosion from water washing away fine-grained soil, can occur along broken or separated sewer lines, water lines, and downspouts (fig. 13).

When a sewer line is carrying a high flow, water will surge out of a broken pipe and saturate the soil. When the flow is low, water in the saturated soil flows back into the sewer pipe and carries soil with it. This process may excavate a cavity around the sewer line, and the cavity may become large enough to reach the surface, where a hole appears. More often, the piping process slowly lowers the ground surface and causes a depression.

Piping into a sewer line develops over many years. The ground may sink or collapse, forming depressions that have been mistaken for mine subsidence. Loess is highly susceptible to piping. (Figure 3 shows the thickness and distribution of loess in Illinois.)



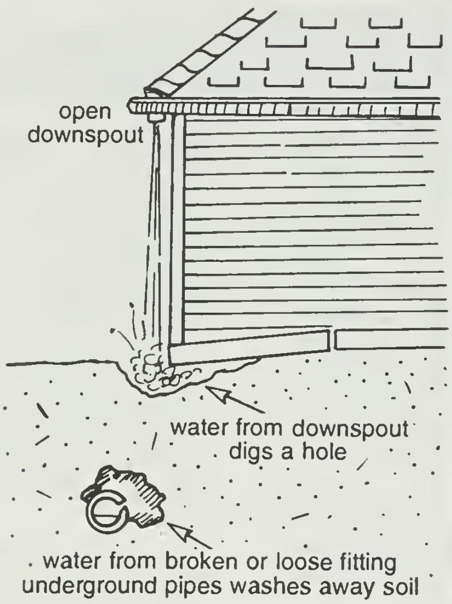


Figure 13 Examples of damage that may be mistaken for mine subsidence. (above) Shrink-and-swell and/or freeze-and-thaw cycles damage a foundation. (below) Water washes supporting soil from beneath a floor slab.

Inadequate Support for Main Beam of House

Intermediate supports for the main beam of a house may sink if they do not rest on poured concrete footings, if footings are not below the annual frostline, or if footings are too small. An inadequate contact area between a beam and a support may also concentrate enough weight onto the beam to crush it, thus lowering the floor. Also, if a thick stack of shims has been used between the beam and the support columns, they usually become compressed, thus lowering the beam (fig. 14). The ends of the main beam should rest on the foundation walls to reduce the likelihood of the beam moving a different amount than the foundation and causing cracks to develop in the walls above.

Also, poor construction or insufficient floor joists can result in sagging floors, a condition sometimes mistaken for subsidence.

Figure 14 Main beam is not attached to the foundation. Because of differential settling, cracks develop in the house above the beam.

INFORMATION FOR HOMEOWNERS CONSIDERING MINE SUBSIDENCE INSURANCE

The purchase of mine subsidence insurance may be advisable to protect property lying above or near an undermined area or an area soon to be mined.

Homeowners in counties where 1% or more of the land has been undermined (fig. 2) — a significant exposure to mine subsidence — will automatically have subsidence insurance added to their policies when issued. Anyone refusing coverage will be asked to sign a waiver.

Insurance agents can describe the mine subsidence insurance program and outline the coverage available.

Table 2 County maps and directories of Illinois coal mines.

Adams	Greene	Madison	Sangamon
Bond	Grundy	Marion	Schuyler
Brown	Hamilton	Marshall	Scott
Bureau	Hancock	Menard	Shelby
Calhoun	Hardin	Mercer	Stark
Cass	Henry	Monroe	Tazewell
Champaign	Jackson	Montgomery	Vermilion (2 maps)
Christian	Jasper	Morgan	Danville Coal
Clay	Jefferson	Moultrie	Herrin Coal
Clinton	Jersey	Peoria	Wabash
Coles	Johnson	Perry	Warren
Crawford	Kankakee	Pike	Washington
Cumberland	Knox	Pope	White
Douglas	La Salle	Putnam	Will
Edgar	Lawrence	Randolph	Williamson (3 maps)
Edwards	Livingston	Richland	Herrin Coal
Franklin	Logan	Rock Island	Springfield Coal
Fulton	McDonough	St. Clair	misc. coals
Gallatin (3 maps)	McLean	Saline (3 maps)	Woodford
Herrin Coal	Macon	Herrin Coal	
Springfield Coal	Macoupin	Springfield Coal	
misc. coals		misc. coals	

For more information, contact the Illinois Mine Subsidence Insurance Fund headquarters in Chicago (see addresses, p. 15).

The county clerk's office is a good place to learn about local mining activities. They are likely to have a map showing general outlines of the underground mines. Assistance is also available from the Illinois Department of Mines and Minerals in Springfield, which is the repository for the original, detailed coal mine maps of the state.

For general information on coal mines in Illinois, contact the Illinois State Geological Survey in Champaign. The ISGS provides copies of the original mine maps, as well as county maps (table 2) showing active and abandoned mines and their known extent on a 1:100,000-scale base with township, range, and section lines. The county maps are updated at regular intervals. A county directory of coal mines accompanies each map and lists company names, mine names and numbers, type of mine, years operated, coal seam mined, and mine location.

A report on the state's subsurface operations on minerals other than coal (Cook, unpublished notes, 1979) is on file in the ISGS Industrial Minerals and Metals Section. General information on the locations of all underground mines appears in Treworgy and Hindman (1991).

WHAT IF SUBSIDENCE DAMAGE OCCURS?

Help is available. Any homeowner suspecting property damage due to mine subsidence should immediately call his or her insurance agent, who will have the property examined.

A state agency that may also be contacted is the Abandoned Mined Lands Reclamation Council in Springfield (see addresses below). After gathering information from the homeowner over the phone, they may decide to send a team to investigate. If subsidence is still taking place, and if conditions are life threatening, they may suggest or arrange for immediate work to prevent further damage. The U.S. Office of Surface Mining makes funds available for such situations. Although the funds cannot be used to repair the damage already done to a house, they can be used to stop the damage in progress and thus save a house.

If the insurance agent or the Abandoned Mined Lands Reclamation Council find that a home is not subsiding because of a mine, they may be able to suggest what is causing the problem and whom to contact.

CONTACTS FOR ADDITIONAL INFORMATION

Illinois Mine Subsidence Insurance Fund
Two Prudential Plaza
180 North Stetson Avenue, Suite 1410
Chicago, IL 60601-6710
800/433-6743

Illinois State Geological Survey
615 East Peabody Drive
Champaign, IL 61820-6964
217/333-4747

Abandoned Mined Lands Reclamation Council
928 South Spring Street
Springfield, IL 62704
217/782-0588

Illinois Department of Mines and Minerals
300 West Jefferson Street, Suite 300
Springfield, IL 62791-0137
217/782-6791

ACKNOWLEDGMENTS

This publication is an updated revision of *Mine Subsidence in Illinois: Facts for the Homeowner Considering Insurance*, which was released in 1981 as ISGS Environmental Geology Notes 99.

We appreciate the helpful comments provided by ISGS reviewers, Susan C. Bradford, Heinz H. Damberger, and Myrna M. Killey.

The Illinois Mine Subsidence Insurance Fund sponsored the reprinting of the original booklet and the printing of the present publication. The distribution of this mine subsidence information for homeowners is largely due to the strong support of the Fund's general manager, Edmund W. Murphy.

REFERENCES

Andros, S. O., 1914a, Coal Mining Practice in District I (Longwall): Illinois State Geological Survey, Champaign, Mining Investigation Bulletin 5, 42 p.

Andros, S. O., 1914b, Coal Mining Practice in District VI (Mines in Bed 6 in Franklin, Jackson, Perry, and Williamson Counties): Illinois State Geological Survey, Champaign, Mining Investigation Bulletin 8, 49 p.

Bauer, R. A., 1983, Damage that may be mistaken for coal-mine subsidence, *from* Proceedings of the Illinois Mining Institute Annual Meeting, October 7-8, 1982, Springfield, Illinois: Illinois State Geological Survey, Champaign, Reprint 1983E, 7 p.

Bauer, R. A., and D. J. Van Roosendaal, 1992, Monitoring problems: are we really measuring coal mine subsidence?, *in* S. S. Peng, ed., Proceedings of the Third Workshop on Surface Subsidence Due to Underground Mining, June 1992, Morgantown, WV, p. 332-338.

Cook, W. J., 1979, Non-coal subsurface mines in Illinois: unpublished notes on open file in the Industrial Minerals and Metals Section, Illinois State Geological Survey, Champaign, Illinois.

Fehrenbacher, J. B., I. J. Jansen, and K. R. Olson, 1986, Loess Thickness and Its Effect on Soils in Illinois: University of Illinois at Urbana-Champaign, College of Agriculture, Agricultural Experiment Station in cooperation with the Soil Conservation Service, U. S. Department of Agriculture, Bulletin 782, 14 p.

Hunt, S. R., 1980, Surface subsidence due to coal mining in Illinois: Ph.D dissertation, University of Illinois at Urbana-Champaign, 129 p.

Illinois State Geological Survey, 1990, Illinois coal mine maps and directories, *in* Publications of the Illinois State Geological Survey, p. 121.

Touseull, J., and C. Rich, Jr., 1980, Documentation and Analysis of a Massive Rock Failure at the Bautsch Mine, Galena, Illinois: U.S. Bureau of Mines, Report of Investigations 8453, 49 p.

Treworgy, C. G., and C. A. Hindman, 1991, The Proximity of Underground Mines to Residential and Other Built-up Areas in Illinois: Illinois State Geological Survey, Champaign, Environmental Geology 138, 18 p.

Wildanger, E. G., J. W. Mahar, and A. Nieto, 1980, Sinkhole Type Subsidence over Abandoned Coal Mines in St. David, Illinois: Abandoned Mined Lands Reclamation Council, Springfield, Illinois, 88 p.

Editor: Ellen M. Wolf
Designer: Sandra K. Stecyk

Printed by the Illinois Mine Subsidence Insurance Fund
by authority of the State of Illinois/1993

Cover photos (above) House affected by a sag subsidence event from the collapse of an abandoned coal mine. House is being maintained in a level position as ground moves downward. (below) Pit type subsidence event occurring next to the foundation of a home in southwestern Illinois. This event is the result of the collapse of a shallow abandoned coal mine.