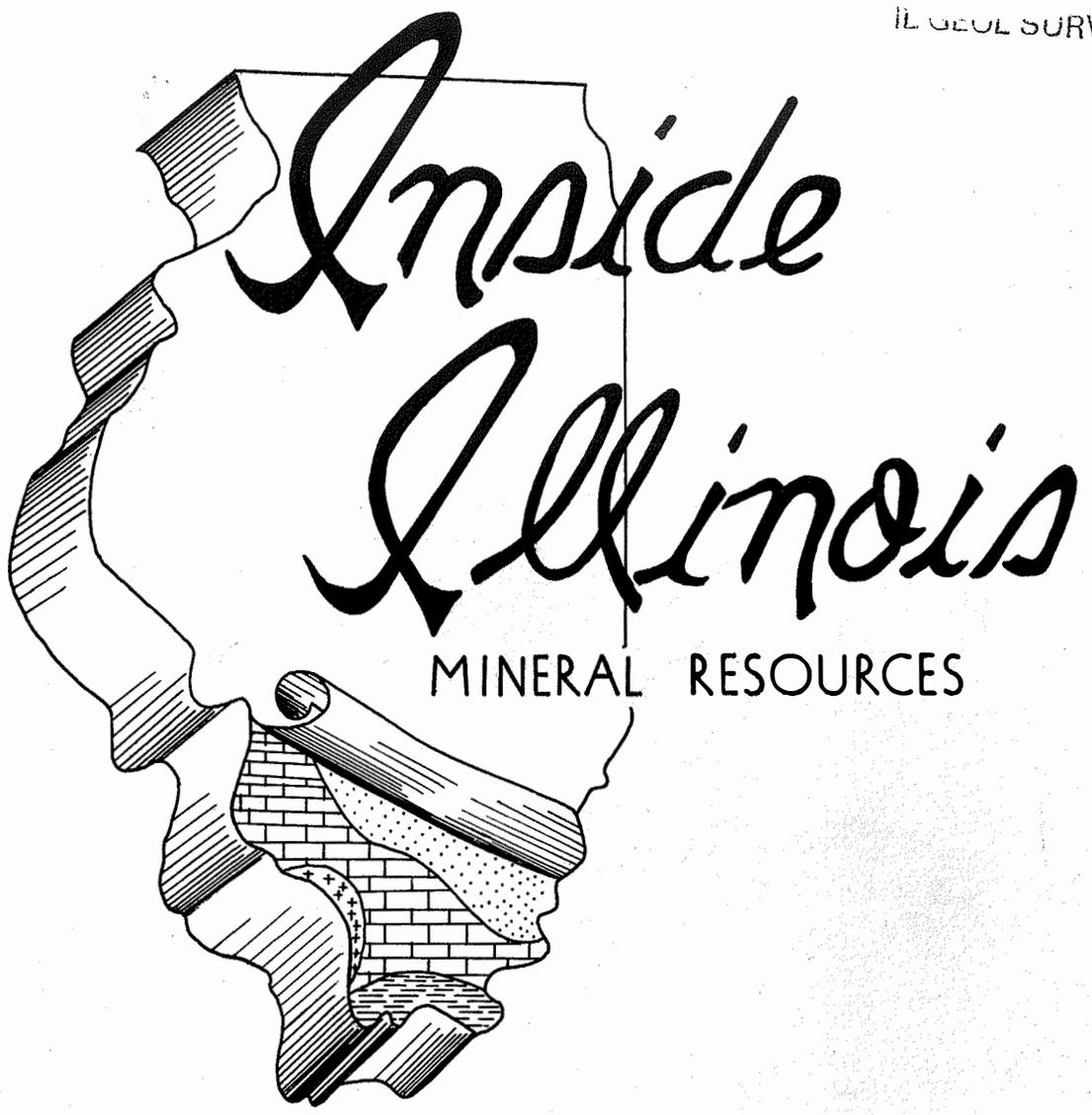


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Inside Illinois

MINERAL RESOURCES

ILLINOIS STATE GEOLOGICAL SURVEY

URBANA

John C. Frye, Chief

1962

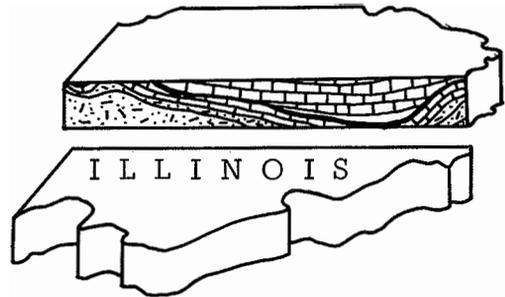
Inside Illinois

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ILLINOIS SURVEY

MINERAL RESOURCES

WHAT IS THE EARTH'S CRUST
UNDER ILLINOIS MADE OF?

It is made of rock, covered by
a mantle of loose material and
soils.



WHAT KIND OF ROCK?

Beneath the unconsolidated man-
tle lie one-half to two miles
of sandstones, shales, and limestones. The rocks lie in layers
like the crumpled pages of an old book.

WHY ARE THESE ROCKS IN LAYERS?

They originated as sediments, such as sand, clay, or lime, in
seas or large bodies of fresh water where they were deposited
layer upon layer.

WHAT LIES UNDER THE SEDIMENTARY ROCKS?

Below the layered rocks is a very much older and more complex
mass of crystalline rock. Much of this mass once was molten,
but later it solidified to form rocks like granite.

HOW WAS THE COVERING MANTLE OF LOOSE MATERIAL FORMED?

Most of the unconsolidated material that forms the mantle above
the bedrock was brought in by the huge glaciers that covered most
of Illinois during the geologically recent (less than 1,000,000

years ago) Pleistocene Epoch. Such material is called glacial drift and consists of pebbly clay, sand, gravel, and boulders that had been picked up by the overriding ice as it moved southward. When the ice melted, the drift materials were left strewn over the bedrock.

The wind also played its part by moving the loose material and depositing it again as loess (wind-blown silt) or as dune sand. These activities are still going on.

HOW WAS THE TOPSOIL FORMED?

Topsoil was and is still being formed by the action of rain, sun, and frost, wind, bacteria, insects, small animals, and plant growth and decay in rock materials such as glacial drift.

WELL DRILLERS FIND SOILS DEEP BELOW THE SURFACE - WERE THEY FORMED IN THE SAME WAY AS THE TOPSOILS?

Yes. They were formed during warm periods between glacial invasions and subsequently were buried by the glacial drift of the next invasion.

HAVE DINOSAURS EVER BEEN FOUND HERE?

They probably roamed over the state, but no bones have been found in the thin Mesozoic deposits at the extreme southern tip of the state where they might have been buried and preserved. The remainder of the state contains no Mesozoic sediments.



HAVE REMAINS OF OTHER LARGE EXTINCT ANIMALS BEEN FOUND IN ILLINOIS?

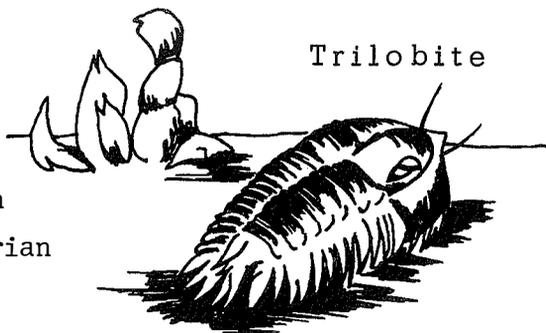
The remains of Ice Age mammoths and mastodons are sometimes found.

Very much older are the giant salamander-like amphibians whose remains are found in the coal-bearing rocks. They are among the oldest four-footed animals. Their exact age is not known, but they are believed to be about 300 million years old.

WHAT ARE THE OLDEST
FOSSILS FOUND IN
ILLINOIS?

The remains of sea animals called trilobites have been found in sandstone of Cambrian age at Oregon, Illinois.

These early settlers are estimated to have lived here 500,000,000 years ago.



M I N E R A L W E A L T H

IS ILLINOIS RICH IN MINERALS?

It possesses two of the world's three most important minerals -- coal and oil. The third, iron ore, is brought to Illinois down the Great Lakes from the rich iron ore region in Minnesota and Michigan, comes from other regions by way of the Mississippi River, and is imported from foreign sources via the St. Lawrence Seaway. Large quantities of iron ore used in the East St. Louis area come from deposits in Missouri.

WHAT IS THE DOLLAR VALUE OF ILLINOIS
MINERAL PRODUCTION?

Illinois produced approximately \$616,000,000 worth of mineral products in 1960. The addition to the state's economy is several times this figure because transportation, power generation, construction and building, and many manufacturing industries

benefit directly from the high production of mineral materials in Illinois.

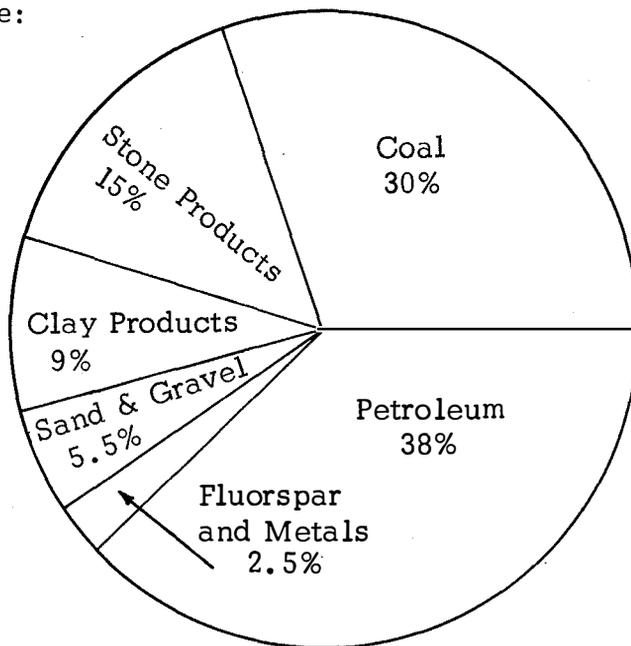
HOW DOES ILLINOIS RANK AS
A MINERAL PRODUCING STATE?

Illinois is first in the Upper Mississippi Valley and eighth in the nation in mineral production.

WHAT KINDS OF MINERAL PRODUCTS ARE
PRODUCED IN ILLINOIS?

Illinois produces a great variety of mineral products. In order of their value they are:

- Oil and natural gas
- Coal
- Clay products
- Limestone and dolomite
- Cement
- Gravel
- Common sand
- Special sands
- Zinc
- Fluorspar
- Lead



Included in the broad groups above are such mineral products as lime, liquefied petroleum gases, whitewares and pottery, structural and refractory clay products, lightweight aggregate, silica sand, and tripoli.

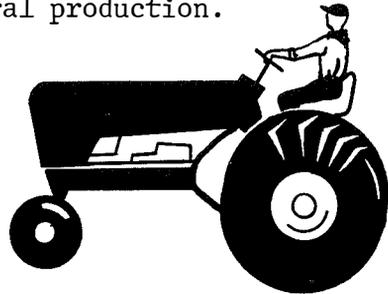
Soil also is a complex mineral substance, and, in the scientific sense, so is water.

HOW MANY PEOPLE WORK IN THE MINERAL
INDUSTRIES IN ILLINOIS?

Approximately 34,000 people work in mines, quarries, oil fields, and direct processing operations such as oil refineries and cement and clay products plants. Many more are involved in transporting the materials and working in the plant offices or are dependent members of workers' families. A large portion of the state population thus derives its living from mineral production.

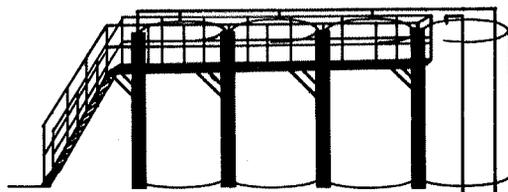
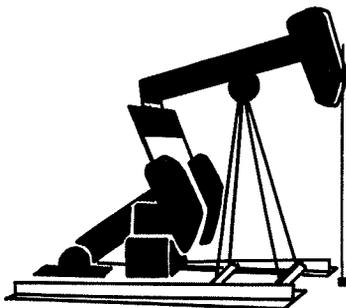
DOES THE ILLINOIS FARMER BENEFIT
FROM THE PRODUCTION OF MINERALS?

The farmer's position has been changed greatly through the use of mineral products. Petroleum-driven machines not only have increased production but have released the farmer from much manual labor. Each year, more than 3,100,000 tons of agstone (crushed limestone and dolomite) are applied to the soil to improve the calcium and magnesium content. Other stone products -- sand and gravel, crushed stone, cement, and lime -- are used in paving farm-to-market roads and in the construction of farm buildings and facilities.



IN HOW MANY ILLINOIS COUNTIES
ARE MINERALS PRODUCED?

Recent records show that mines, quarries, pits, or oil or gas wells are located in 96 of the 102 counties of the state.



C O A L

HOW IMPORTANT IS COAL TO MANKIND?

The greatest industrial districts and the wealthiest and strongest nations are those in which coal is abundantly available.

HOW DOES ILLINOIS RANK AS A PRODUCER
OF COAL?

Illinois ranks fourth in the United States. It is exceeded in production only by West Virginia, Kentucky, and Pennsylvania. Illinois mines are among the largest and most efficient in the nation.

HOW IS ILLINOIS COAL USED?

Its greatest single use is as fuel for electric power generation. Other markets include manufacturing, and home and commercial heating. Most of our coal moves by rail, a smaller amount by river barge and lake freighter.

HOW MUCH COAL IS MINED IN ILLINOIS EACH YEAR?

In the last 10 years, an average of about 46 million tons of coal per year has been mined. In 1960, more than 45 million tons, valued at approximately \$183 million at the mine, was produced.

WHEN WILL ILLINOIS COAL SUPPLIES BE EXHAUSTED?

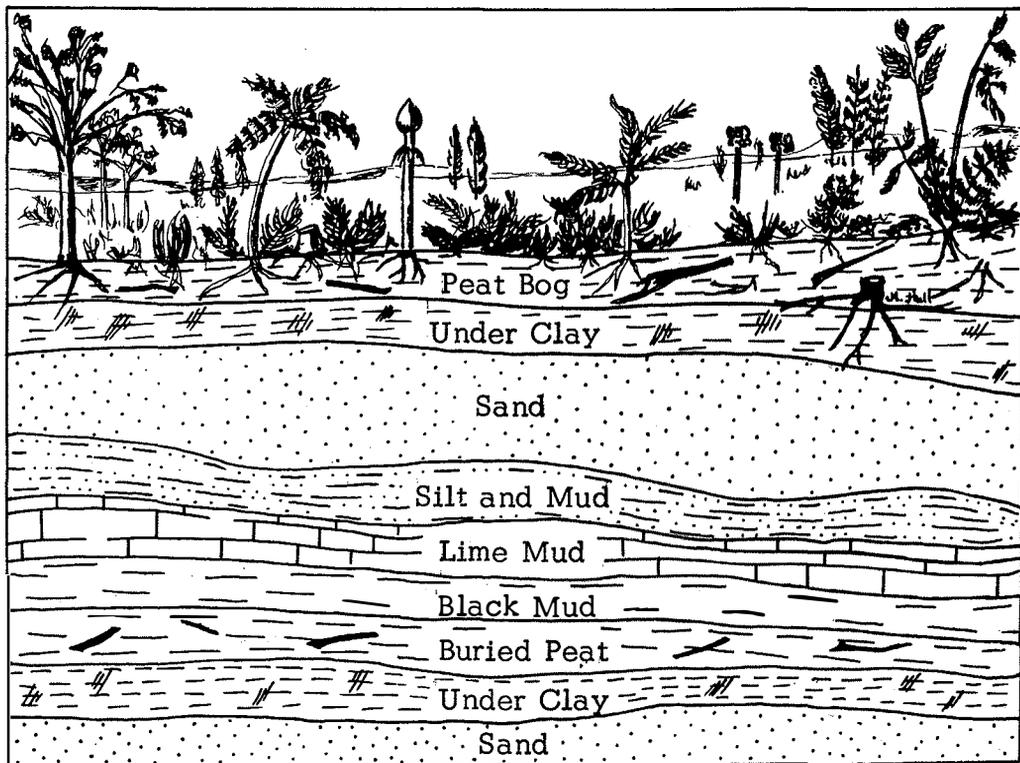
It would take well over 1,000 years at the present rate of mining to exhaust Illinois coal reserves. It is estimated that about 137 billion tons of coal remains in the ground in seams of minable thickness.

HOW MANY COAL BEDS ARE THERE IN ILLINOIS?

There are 35 to 40 Illinois coal beds, but most are relatively thin and only 9 are being mined at present.

HOW DID ILLINOIS COAL BEDS FORM?

Coal originated from plants that lived a very long time ago when a great sea lay west of Illinois and most of the state was a low coastal plain. The plain was covered with great swamps in which grew many varieties of trees and other plants. The trunks, branches, stems, leaves, seeds, spores, and roots of these plants accumulated to form thick masses of peat. The peat beds, after a time, were covered by shallow seas and buried by sand and mud. Periodically a new swamp formed, a new peat bed accumulated, and more layers of mud and sand were deposited. This happened many times until the layers of peat, mud, and sand were several thousand feet thick. As the mass slowly hardened, the sand and mud became sandstone, shale, and limestone, and the peat became coal.

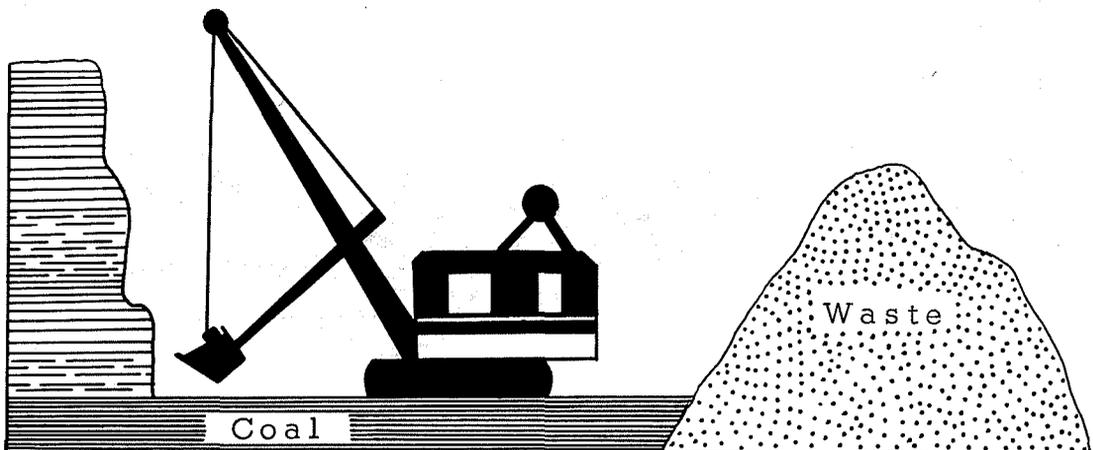


HOW IS IT KNOWN THAT COAL ORIGINATED
FROM PLANT REMAINS?

Sometimes plant impressions or fossilized wood can be seen in the coal. Often the roots are seen in the clay just below the coal bed, and the stumps of the trees of the coal forest are preserved in the deposits associated with the coal. When a piece of coal is specially prepared and studied under the microscope, it is seen to be largely composed of carbonized plant remains.

HOW EFFICIENT ARE ILLINOIS COAL MINES?

Illinois mines are highly advanced in the use of new machines and methods of mining. Underground mines in the state lead the nation in the number of tons mined per man each day, and this amount is increasing. Increased productivity has made it possible to hold the price of coal relatively low so that it can compete successfully with other fuels for many uses.



WHAT IS A "STRIP MINE?"

A strip mine is an open pit operated at the surface by removing, or "stripping," the overburden of soil and rock that covers the coal seam.

WHAT DO WE GET FROM COAL BESIDES HEAT AND POWER?

Although the principal use of coal is for heat and power, including the manufacture of electricity, so many new uses are being discovered that no complete list can be made. Most important are:

Chemicals used in making medicines and drugs,
like aspirin and the sulfa drugs

Wood preservatives like creosote

Tar-like paving and roofing materials

Special fuels and solvents

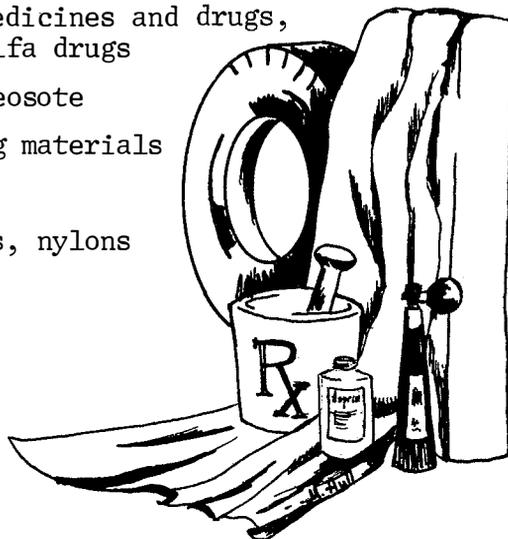
Artificial rubber, plastics, nylons

Perfumes, flavors, dyes

Explosives

Oil, gas, ammonia

Fertilizer



WHAT IS COKE?

Coke is a substance formed by heating finely ground coal of special quality in the absence of air and drawing off the gases (volatile matter) and water without burning the solid portion. The remaining solid residue is a porous cellular material of great strength.

The structure and nature of coke make it a valuable fuel for blast furnace use. It burns rapidly at a high temperature, supports the heavy charge of ore, and supplies the carbon needed for changing iron ore into steel.

IS COKE BECOMING AN IMPORTANT COAL PRODUCT IN ILLINOIS?

Experiments on producing coke from Illinois coal were begun by the Illinois State Geological Survey in 1943. Success of the

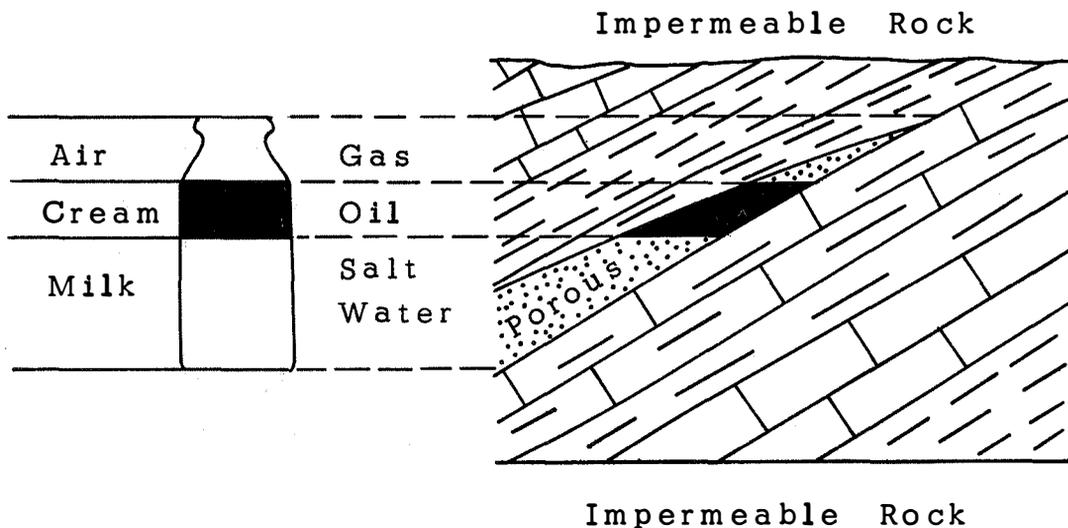
program is strikingly illustrated by the increasing use of Illinois coal for this purpose. More than 1,000,000 tons of Illinois coal are mined annually for the manufacture of metallurgical coke.

O I L

HOW WAS OIL FORMED?

There are several theories about the origin of oil. The one most generally accepted today is that oil is derived from organic material. Ages ago, when Illinois was covered by seas, large numbers of animals and microscopic plants lived, died, and were buried in the fine sediments deposited at the bottom of the seas. As these sediments slowly hardened into bedrock, they remained saturated with salt water.

In some manner the plant and animal matter was changed into oil, either in the shale that was formed from the mud or later in the "oil reservoir" rock into which it had moved. Because oil and gas are lighter than salt water, they slowly rose to the top of the porous rock layers just as cream comes to the top in milk.



HOW DO GEOLOGISTS KNOW IF OIL IS PRESENT

UNDER AN AREA OF LAND?

Only drilling can reveal whether oil is present in commercial quantities, but careful geological study can indicate the most favorable places to drill. This can be done only by studying the position and nature of the bedrock layers; the surface hills and valleys may have nothing to do with the location of oil.

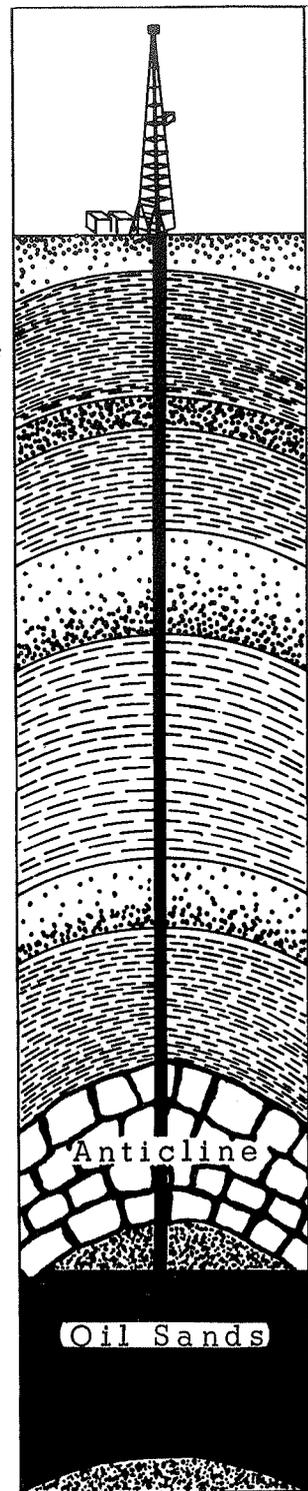
Because oil and gas move upward above salt water, the geologist tries to find the high spots in a porous rock layer or porous spots in dense rock layers. To get this information, he studies rock layers at the surface and, by using well samples, beneath the surface. In some cases he tests the depths of the earth with special geophysical instruments.

ARE THERE LAKES OF OIL UNDERGROUND?

No. Oil occurs in small pores between the grains of the coarser types of ordinary sandstone or limestone and in fractures, crevices, and partings. These same openings permit oil to move under subterranean pressures into oil wells.

HOW DOES ILLINOIS RANK IN OIL PRODUCTION?

It ranks eighth among the states, exceeded only by Texas, Louisiana, California, Oklahoma, Wyoming, Kansas, and New Mexico, and produces about 3 percent of the nation's oil.

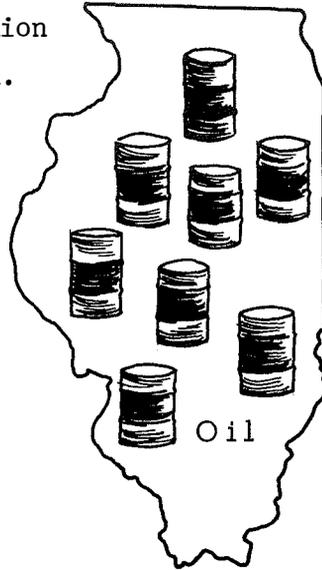


HOW MUCH OIL DOES ILLINOIS PRODUCE?

In 1961, Illinois produced about 77.5 million barrels of oil valued at over \$230 million.

HOW MANY OIL FIELDS ARE THERE?

There are approximately 350 producing fields in the state, consisting of about 32,000 wells. In 1961, the deepest producing well was 5,340 feet. The deepest well in the state was drilled to 8,616 feet.



WHAT IS THE LARGEST PRODUCING WELL ON RECORD IN ILLINOIS?

A well near Centralia produced about 12,000 barrels of oil in the first 24 hours. A typical Illinois oil well produces about 65 barrels of oil the first day.

HOW IS OIL PRODUCED?

There are two basic types of oil production -- primary and secondary. In primary oil production the oil flows naturally from the well or is pumped out. Gas or water in the porous rocks may help bring the oil to the surface. About one-third of the oil in the rocks may be pumped out this way before the well goes "dry."

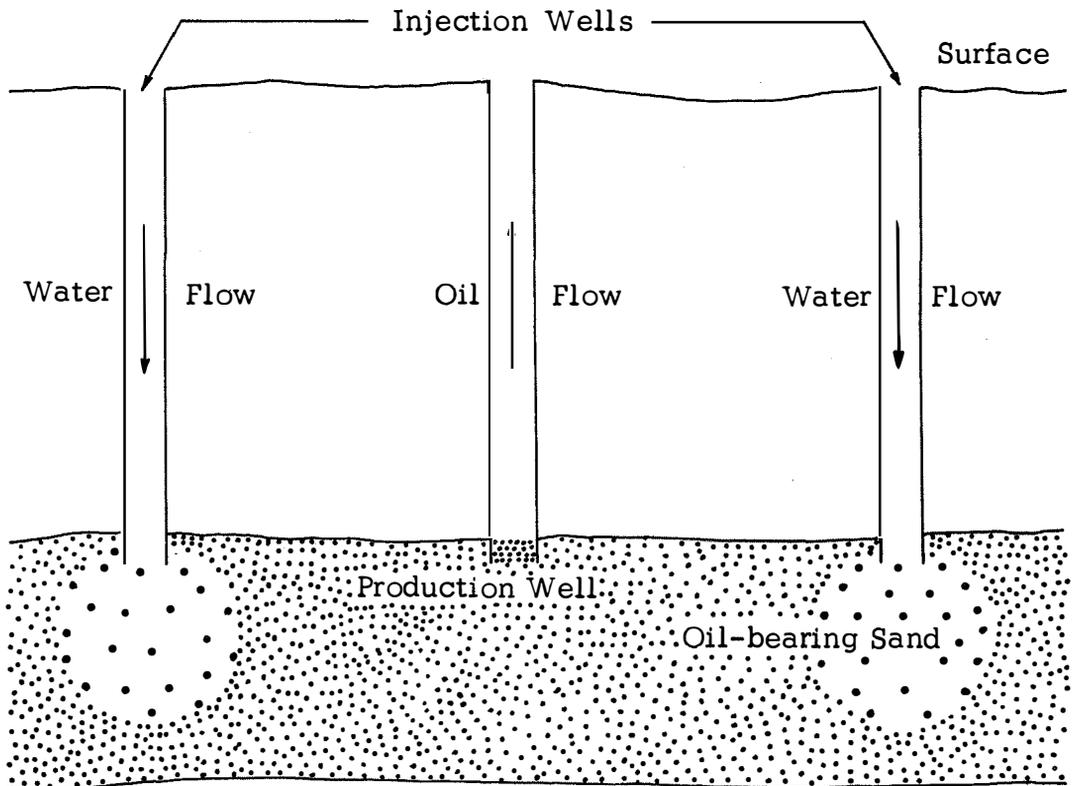
By using secondary recovery methods, another one-third of the oil may be recovered. The most common form of secondary recovery used in Illinois is waterflooding. In this process, water pumped into input wells forces oil out of the producing wells -- additional oil that could not be recovered through primary pressure alone. At the present time, waterflooding accounts for more than 60 percent of the state's total oil production.

IS OIL PRODUCTION INCREASING OR DECREASING
IN ILLINOIS?

Yearly oil production increased during the early 1950's and has remained nearly constant since 1955. Waterflooding, new discoveries, and new methods of well completion such as the fracturing of the oil-bearing rock are keeping production high.

However, new oil fields must be found and ways of recovering a greater percentage of the oil in known fields must be developed if the Illinois oil industry is to remain productive. Future oil fields may produce from deeper strata than the present ones.

Cross section of Waterflooding Process



F L U O R S P A R

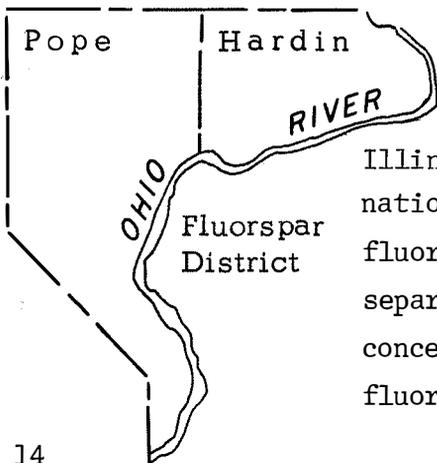
WHAT IS FLUORSPAR?

Fluorspar (the mineral name is fluorite) is a hard, glassy mineral composed of two chemical elements, calcium and fluorine. It is commonly gray or yellowish white, but is sometimes white, blue, green, or black. Some varieties glow in invisible ultraviolet light; this property is named "fluorescence," after the mineral.

HOW IS FLUORSPAR USED?

More than 50 percent of the fluorspar produced in Illinois is used for the manufacture of hydrofluoric acid. Largest consumer of the acid is the aluminum industry. Hydrofluoric acid also enters into the preparation of many fluorine chemicals, including those which play a part in the manufacture of refrigerants, plastics, insecticides, aerosols, and high energy fuels for rockets and missiles.

A large amount of fluorspar is used as a flux in the iron and steel industry and in the ceramic industry for making glass and enamels.



HOW MUCH FLUORSPAR IS MINED IN ILLINOIS?

Illinois produces over 50 percent of the nation's "finished" fluorspar -- that is, fluorspar of high purity that has been separated from crude ore by cleaning and concentrating processes. Most of the fluorspar mined in the United States comes

from a small area in Illinois and Kentucky. Illinois produces the larger share, 134,529 tons in 1960 valued at \$6,935,500.

WHERE IS FLUORSPAR FOUND?

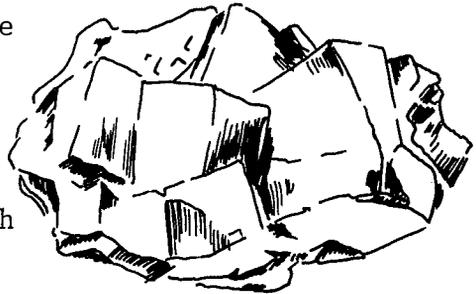
Fluorspar is mined from nearly horizontal, bedded deposits and from nearly vertical veins as much as 800 feet deep in Pope and Hardin Counties in southern Illinois.

L E A D, Z I N C, A N D S I L V E R

WHERE ARE LEAD AND ZINC ORES MINED IN ILLINOIS?

Lead and zinc are mined in the extreme northwest corner (Jo Daviess County) and in the southeast corner (Pope and Hardin Counties) of the state. In southeastern Illinois, they occur with the fluorspar deposits.

Galena



WHAT ARE LEAD AND ZINC ORES?

The principal ore of lead is galena -- soft, very heavy lead sulfide. The mineral is gray and has a metallic luster. It breaks in cubes along step-like cleavages.

The chief ore of zinc is sphalerite (zinc sulfide) called black jack or blende by miners. It is lighter than galena, has a resinous luster, and may be brown, yellow, or black.

HOW ARE LEAD AND ZINC EXTRACTED FROM ORE?

After lead and zinc ores have been mined, the ore is crushed and a large percentage of the waste rock discarded. The resulting ore concentrate is finely ground in huge mills and mixed with

water and chemicals. The mixture is agitated and the valuable lead and zinc minerals are floated off.

HOW LONG HAVE LEAD AND ZINC BEEN MINED IN ILLINOIS?

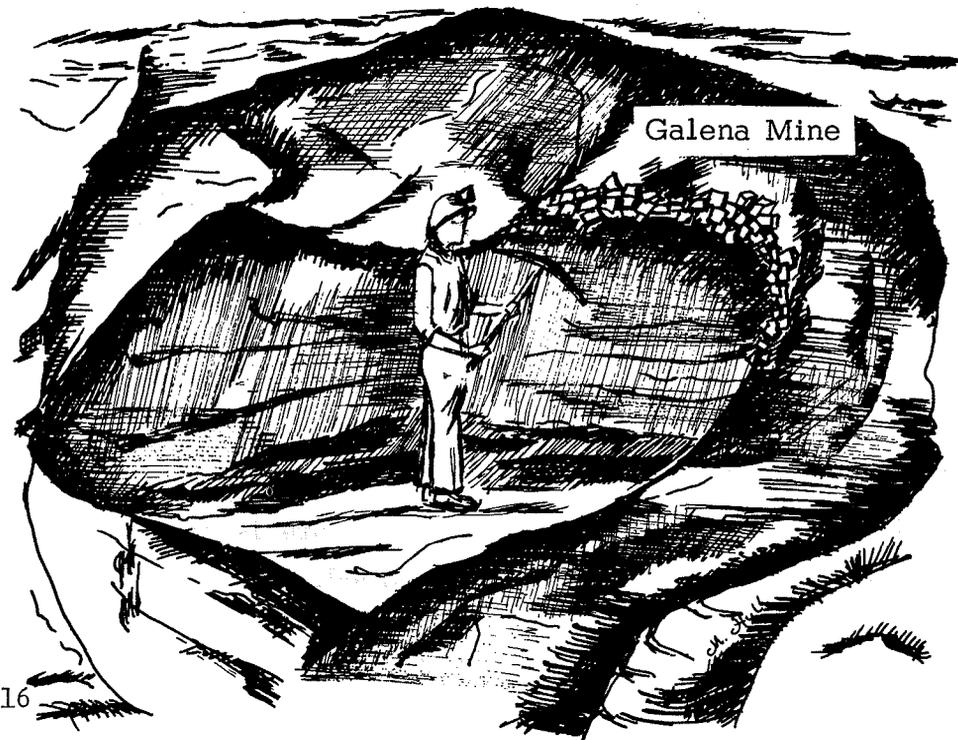
The lead deposits of northwestern Illinois were known to French explorers over 250 years ago and have played an important part in Illinois history. In southern Illinois, lead mining began in 1842. Until the 1890's, the zinc ore was thought to be of no value.

IS THERE ANY SILVER IN ILLINOIS?

Silver occurs in minute amounts with some of the lead ore in southern Illinois.

HOW MUCH LEAD AND ZINC DOES ILLINOIS PRODUCE?

In 1960, 29,500 tons of zinc valued at about \$7,624,000, and 3,000 tons of lead worth \$702,000 were produced.



S T O N E A N D S T O N E P R O D U C T S

WHAT KINDS OF STONE ARE PRODUCED
IN THE STATE?

Limestone and dolomite are the most abundant rocks quarried but small amounts of sandstone also are produced. In northeastern Illinois, colorful boulders from glacial deposits are plentiful enough in some places to be used for building homes and rock gardens.

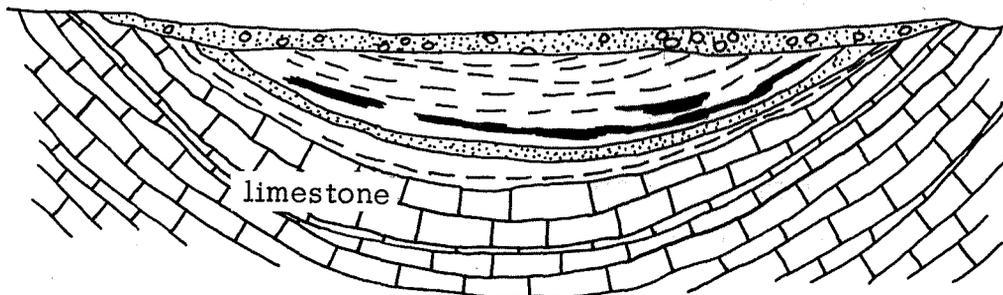
WHAT ARE LIMESTONE AND DOLOMITE?

Limestone consists mainly of a mineral called calcite, which is composed of calcium, carbon, and oxygen. A variety of limestone containing magnesium as well as calcium, carbon, and oxygen is called dolomite.

WHERE ARE MOST ILLINOIS LIMESTONE AND DOLOMITE
QUARRIES FOUND?

The bedrock strata in Illinois originally were formed as flat layers but have since been down-warped into a spoon-shaped depression called the Illinois Basin. Thick limestone and dolomite formations crop out along the margins of the basin, the western

Illinois Basin



border of which nearly corresponds to the western boundary of Illinois. Large outcrop areas are exposed in the northern part of the state, and smaller outcrop areas occur along the major river valleys.

The thick limestones and dolomites slope inward toward the deeper central portion of the basin where they are covered by sandstones, shales, and thin limestones of the younger rocks of the Pennsylvanian Period. Consequently, there are fewer limestone quarries in central Illinois than in other areas of the state.

HOW MUCH LIMESTONE AND DOLOMITE IS PRODUCED?

Illinois produced about 37 million tons of limestone and dolomite in 1960, valued at nearly \$51 million.

ARE THERE MANY USES FOR LIMESTONE AND DOLOMITE?

Yes. There are over 50 uses. Millions of tons are crushed annually for use in making concrete roads and buildings in the state, for road surfacing, and for agricultural limestone. Large quantities go into making lime and cement. Lesser amounts of stone are used for making alkalis and glass, for railroad ballast and building stone, for dusting coal mines to prevent explosions, and as an ingredient in mineral feeds for stock.

WHERE IS CEMENT MADE IN ILLINOIS?

There are three plants near LaSalle and one near Dixon in Lee County that manufacture cement. A new cement plant is being built at Joppa in extreme southern Illinois.

About \$31 million worth of cement was produced in Illinois in 1960.

WHY IS AGRICULTURAL LIMESTONE (AGSTONE) USED ON SOILS?

Limestone and dolomite counteract or neutralize soil acidity, improve soil structure, and add minerals useful for plant growth.

HOW DID PETRIFIED SEA SHELLS GET INTO ILLINOIS LIMESTONE LAYERS?



Most Illinois limestone was formed ages ago on the floors of ancient seas that from time to time covered most of Illinois, and the shells belonged to creatures that lived in these seas. There are whole reefs, made up of corals and the remains of other sea animals, exposed in the bedrock in northern Illinois.



S A N D A N D G R A V E L

WHAT WAS ILLINOIS LIKE DURING THE ICE AGE?

Ice-sheets, like the one that now covers Greenland, spread out from centers in Canada and extended over the northern United States.

The ice sheets moved down from the north not once but several times, and between the glacial stages the weather was as warm as at present.

HOW LONG AGO WAS THE ICE AGE?

The last ice sheet disappeared from northeastern Illinois about 12,000 years ago. Geologists regard this as a very short time indeed, compared with the age of most rocks and geologic events.



WHAT EFFECT DID THE GLACIERS
HAVE ON ILLINOIS?

By smoothing out the hills and valleys and covering up most rough and rocky land, the glaciers laid the foundation for the rich agricultural prairie. Most of the gravel and sand, including the valuable natural bonded molding sand, are glacial deposits.

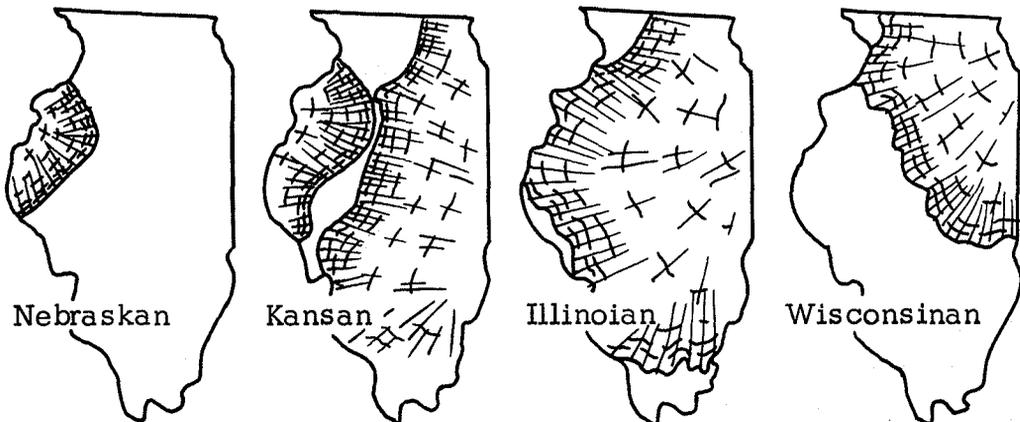
WHERE DID THE GRANITE BOULDERS
COME FROM?

Many of them came from Canada imbedded in the glacial ice. The region near Lake Superior furnished both granite boulders and pieces of copper that occasionally are found in Illinois.

HOW WERE SAND AND GRAVEL DEPOSITED?

As the glaciers grew and moved forward, they not only picked up clay, sand, and loose rock but also plucked material from the bedrock. The melting of the glacier released these materials and the glacial meltwaters sorted out the sand and gravel, depositing them as outwash plains in front of the ice, as a filling in valleys draining away from the ice, and in hills and ridges near the ice front.

Stages of Glaciation



WERE ALL THE SAND AND GRAVEL DEPOSITS IN ILLINOIS
LEFT BY THE GLACIERS?

There are sand deposits and chert (flint) gravels in western Illinois and extreme southern Illinois that are older than the glacial deposits. Sands of recent origin are dredged from the larger rivers. Commercial silica sand comes from sandstone bedrock.

HOW MUCH SAND AND GRAVEL DOES ILLINOIS PRODUCE?

In 1960, 26,500,000 tons was produced, valued at \$24 million.

WHAT IS MOLDING SAND?

Molding sand is used to form molds into which molten metal is poured to make castings. The sand yields a smooth-surfaced mold that will not collapse or fuse when metal is poured into it.

WHAT TYPES OF ILLINOIS SAND ARE SUITABLE
FOR METAL MOLDING?

Illinois has two principal kinds of molding sand -- silica sand produced in northern Illinois that can stand the very high temperatures involved in the casting of steel and other metals, and natural bonded molding sand that is used principally for iron molding practically as it comes from the ground.

S I L I C A S A N D A N D S I L I C A

WHAT IS SILICA SAND MADE OF?

Natural sands are small fragments of minerals and rocks. Silica sand consists almost entirely of the mineral quartz.

HOW IS SILICA SAND USED?

Illinois silica sand is of high purity and hence is widely used for glass making. The usual types of glass are made by melting

a mixture of chemical raw materials containing more than two-thirds silica sand.

Silica sand also is an excellent molding sand because it can endure the great heat of steel casting. One of the newest uses of the sand is in the hydraulic fracturing of oil wells. Some silica sand is ground into flour to be used in scouring compounds, enamel, pottery, porcelain, and tile, or as a filler in paint.

Quartz



WHERE DOES SILICA SAND COME FROM?

The Ottawa, Wedron, Troy Grove, and Oregon areas of northern Illinois are the principal sources of the state's silica sand.

IS ILLINOIS AN IMPORTANT PRODUCER OF SILICA SAND?

It is a major producer and in 1960 produced 2,500,000 tons of silica sand valued at \$9,000,000.

WHAT IS TRIPOLI?

Tripoli is a technical name for the white "amorphous" or "soft" silica of extreme southern Illinois. It is ground to a flour-like consistency for use as white rouge, as a filler in paints, and as a fine abrasive in grinding, scouring, and buffing compounds and powders.

WHERE IS TRIPOLI MINED?

It is mined in Alexander and Union Counties at the southern tip of Illinois.

C L A Y F O R I N D U S T R Y , H O M E , A N D F A R M

WHAT KINDS OF CLAY DOES

ILLINOIS HAVE?

Fireclay, shale, surface clay, fuller's earth, and kaolin are found in Illinois.



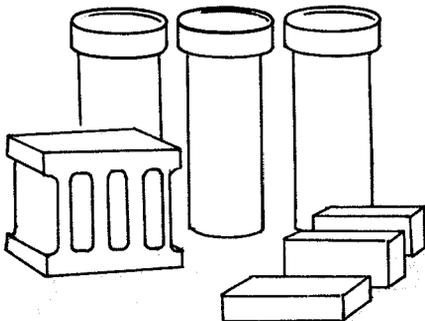
HOW LARGE ARE ILLINOIS CLAY DEPOSITS?

Supplies of surface clay and shale are inexhaustible; fireclay and fuller's earth are abundant; but the quantity of kaolin is small.

WERE ALL THE CLAYS FORMED AS A RESULT OF THE GLACIERS?

Only surface clay was formed as a result of glaciation. The shale and fireclay exist as layers in the bedrock, the fireclay lying just below some of the coal beds. The kaolin and fuller's earth of southern Illinois were formed before the Ice Age when the Gulf of Mexico extended as far north as the southern tip of the state.

WHAT ARE THE MAJOR USES FOR ILLINOIS CLAYS?



Structural clay products -- brick, drain tile, and hollow block -- are made from shale, fireclay, and surface clay.

Fireclay is used to bond together molding sand, to plaster the walls of industrial furnaces, and to make refractory brick that can withstand the great heat in these

furnaces and in the huge brick-lined ladles that handle molten metal. Illinois fireclay may have supplied the stoneware crocks in your kitchen and the sewer pipes under the house.

Shale is mixed with limestone to make cement. Illinois kaolin is used for crucibles, china, and porcelain. Fuller's earth is employed in bleaching and filtering oil, as a grease absorbent, as a sweeping compound, and as animal litter.

HOW LARGE IS THE ILLINOIS CLAY INDUSTRY?

About \$56,621,000 worth of clay products was produced in 1960.

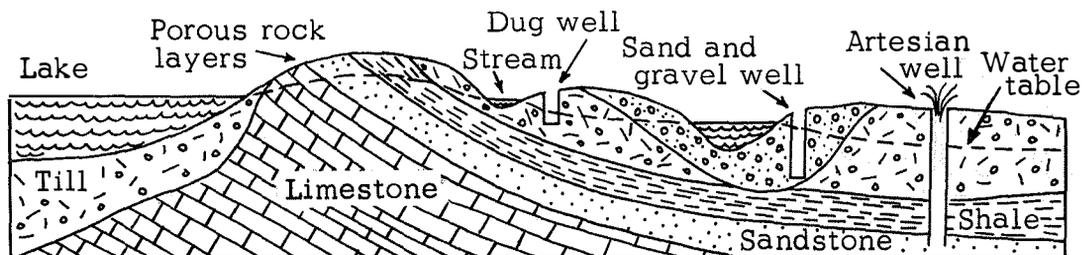
G R O U N D W A T E R

WHAT IS GROUND WATER?

Water that occurs below the land surface is called subsurface water. Below a certain level (the water table) all openings in the unconsolidated glacial material and in the bedrock are filled with water called ground water. The source of ground water is precipitation. Water falling in or flowing over the surface seeps between loose particles of soil and percolates downward.

HOW DEEP IS ILLINOIS' DEEPEST WATER WELL?

The deepest water well in Illinois, at Oglesby, is 2,800 feet deep. Most of the deep wells are in the northern third of the state.



WHAT IS AN ARTESIAN WELL?

Rain water may enter a porous rock layer that is exposed at the surface. If the rock layer slopes downward under the ground and is overlain by an impervious layer, the water may flow down to great depths and for many miles. Water seeks its own level. Therefore, when this deeply buried porous layer is tapped by a well, the water moves far up the hole above the porous bed or it may flow out of the top of the well. Such wells, including many Illinois deep wells, are called artesian.

WHAT KINDS OF FORMATIONS YIELD GROUND WATER?

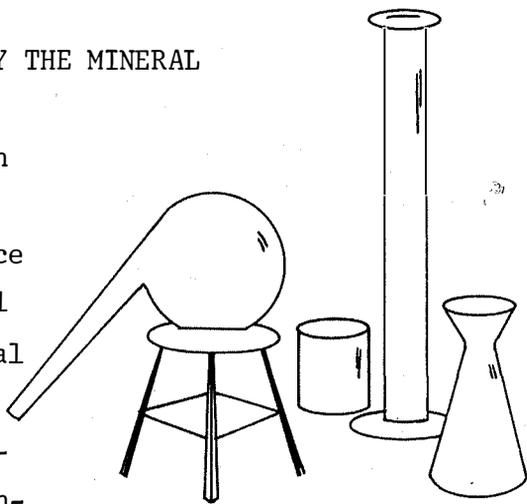
Wells that penetrate the bedrock may draw their water from layers of sandstone and from limestone having zones full of fissures or crevices. Wells drilled into unconsolidated glacial material draw their water from sand or gravel beds.

M I N E R A L S A N D S C I E N C E I N I L L I N O I S

HOW DOES THE GEOLOGICAL SURVEY STUDY THE MINERAL RESOURCES OF ILLINOIS?

The State Geological Survey Division of the Department of Registration and Education explores the occurrence and distribution of rock and mineral deposits, makes physical and chemical studies of useful rocks, minerals,

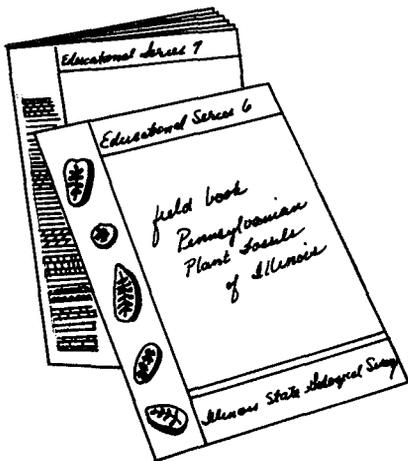
and mineral products, develops techniques and methods for preparing mineral substances for use, seeks new information concerning the naturally occurring minerals, and conducts experiments to



improve and find new uses for the minerals of Illinois. The results of its field surveys and laboratory findings are published as Survey reports and are available to all citizens upon request.

HOW CAN THE PUBLIC RECEIVE THE BENEFITS OF THIS SCIENTIFIC WORK?

The vast store of information in the open files of the Geological Survey is available to the public. Its scientific and technical staff answers requests for information received by letter, telegram, telephone, or personal interview.



WHAT IS THE COST OF ITS SERVICES?
No charge is made for these services. Many publications are distributed free within the state for 60 days from date of issue, after which a small fee is charged for certain ones.

HOW CAN A LIST OF PUBLICATIONS ISSUED BY THE STATE GEOLOGICAL SURVEY BE OBTAINED?

Write to the Illinois State Geological Survey, Natural Resources Building, Urbana, Illinois. The list is free.

HOW DOES THE GEOLOGICAL SURVEY COOPERATE WITH THE PUBLIC SCHOOL SYSTEM?

The Geological Survey publishes popular and educational booklets designed for the use of teachers and students; it distributes a labeled collection of rocks and minerals for class use in Illinois schools; it conducts several geological field trips each year in various sections of the state for science teachers,

students, and others of the general public; and it gives illustrated lectures on the geology and mineral resources of the state.

HOW IMPORTANT IS GEOLOGY?

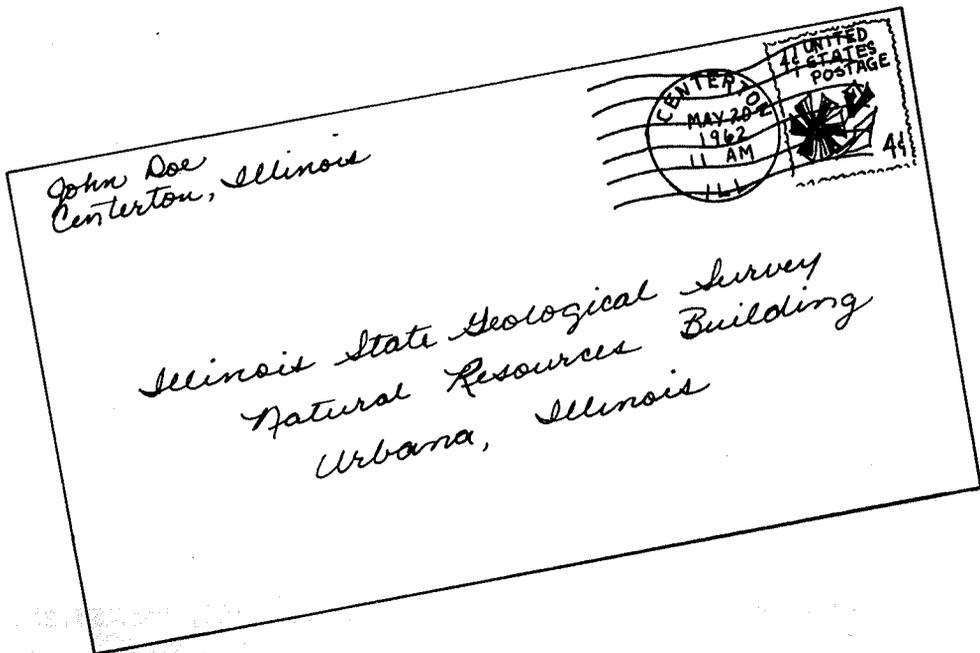
Our national life and welfare is dependent more and more upon the further discovery and the proper and best use of the natural resources of the earth. Geology and allied sciences are being called upon increasingly to aid in a more intelligent and efficient discovery and use of mineral resources.

IS GEOLOGY DIFFICULT TO UNDERSTAND?

The main ideas are easy to understand and greatly increase anyone's enjoyment and appreciation of the world on which we live.

HOW DOES ILLINOIS RANK IN GEOLOGICAL RESEARCH AND SERVICE TO THE CITIZENS OF THE STATE?

Illinois is widely recognized by educators, scientists, and industrialists as outstanding in promotion of research and aid to industrial development.



Illinois State Geological Survey, 1962