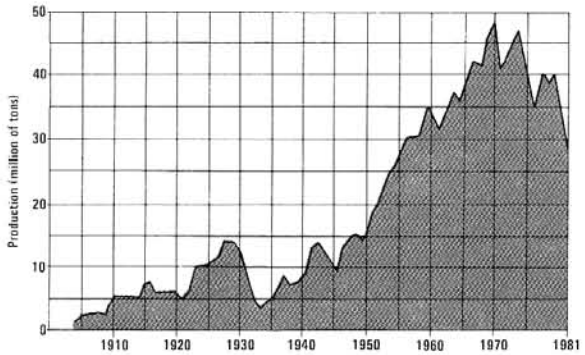
SPRING 1983

Ohio Geology Newsletter

Division of Geological Survey

OHIO'S SAND AND GRAVEL INDUSTRY

As a major mineral industry in Ohio, sand and gravel is a relative newcomer. Commodities such as coal, clay and shale, sandstone, and limestone were flourishing industries in the state by the mid-1800's, but it was not until after the turn of the century that sand and gravel began to be produced in large quantities. This dramatic increase in production, which became pronounced about 1950, can be directly correlated with the use of these commodities in concrete and for surfacing roads. Today, Ohio ranks fourth in the nation as a producer of sand and gravel and this commodity furnishes 45 percent of the state's aggregate.



Annual production of sand and gravel in Ohio.

The sand and gravel industry in Ohio is not, however, without problems. Because these commodities are so closely tied to the construction industry, the relative health of that industry and in turn the general economic climate are controlling factors in the fluctuations in sand and gravel production. Major road-building programs and housing booms are directly reflected by the amounts of sand and gravel produced in the state.

Ironically, housing booms and new construction threaten the very industry that is so dependent upon them. The most significant problem facing sand and gravel producers is the urban sprawl that gobbles up prime building sites at an alarming rate. Unfortunately, prime building sites are commonly also major deposits of sand and gravel. Consequently, significant areas of Ohio's sand and gravel resources are effectively unavailable for production because they are already sites for homes and businesses or are zoned for similar uses.

The answer to this dilemma of competition for space lies with first identifying and mapping economic sand and gravel deposits—through programs such as the Division of Geological Survey's mapping program—and then zoning these areas so that the sand and gravel can be mined before construction of homes and businesses takes place. This succession of land use is particularly compatible because sand and gravel pits can be reclaimed, with minimal environmental problems, to furnish attractive home sites, industrial parks, or recreational areas. Indeed, Ohio boasts several areas where this has been done and home sites have commanded premium prices.

Sand and gravel being extracted from an esker north of Circleville, Pickaway County.

Several counties in the state are considering zoning plans that incorporate accommodation of future development of mineral resources such as sand and gravel. Those planning agencies that have not incorporated such objectives in their plans would be wise to do so because the local citizenry will be the benefactors in not only eventually obtaining prime building sites but also in obtaining a vital commodity at the lowest possible price.

Characteristics and Classification

The terms "sand" and "gravel" refer only to the size of individual grains of rock and have no reference to the composition, physical characteristics other than size, origin, or usage of the material. Each of these size categories covers a broad range. Sand ranges in size from 0.0625 mm (very fine sand) to 2.0 mm (very coarse sand). Gravel ranges from particles greater than 2.0 mm in diameter (granules) to boulders, which can be several meters in diameter.

In addition, these materials in a geologic sense are unconsolidated—that is, the individual grains have not been cemented together. The rock equivalents of these sediments are sandstone and conglomerate. From a usage standpoint, sandstone or conglomerate may be crushed to yield unconsolidated sand- or

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ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

Richard F. Celeste, Governor • Lt. Gov. Myrl H. Shoemaker, Director

Chief's corner by Horace R. Collins

The feature article in this issue of *Ohio Geology* makes a number of important points concerning sand and gravel resources. Specifically, it is important to note that these resources are bulky, low-unit-cost commodities and that sand and gravel deposits for a number of reasons are commonly prime home and industrial construction sites. These two facts alone create several problems which society must deal with. Because of the bulky nature of sand and gravel, the transportation from pit to point of use is a major factor, often costing more than the commodity itself. It is obvious, therefore, that from a consumer-cost standpoint the closer to the point of use the better. However, from an esthetic standpoint, zoners and other land-use-policy organizations generally attempt to push sand and gravel pits into far, out-of-the-way places, thus greatly increasing costs.

Because sand and gravel deposits tend to be excellent building sites, competition exists between those who would use the sites for building purposes versus those who would extract the sand and gravel. Because of the low unit cost of sand and gravel and the high value of real estate, the builders frequently prevail in this tug of war. Again, the result is an increase in cost to the consumer in obtaining these resources at greater and greater distances with equally greater costs.

Part of the problem that creates this impasse is the lack of perception by those in land-use-policy agencies and by society-at-large regarding the geographic distribution of these vital resources. Sand and gravel deposits are not uniformly distributed throughout the state and mining operations are limited by occurrence.

Through its new mapping program the Division of Geological Survey hopes to help in this area by developing maps and reports detailing the precise distribution of sand and gravel in each of Ohio's counties. These maps probably will not by themselves eliminate the arguments over land use, but they certainly will be valuable tools to determine where sand and gravel occur and where mining could be carried on. With accurate information of this type it should be possible to reach land-use decisions which are favorable to all segments of society.

OHIO GEOLOGY

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gravel-sized particles. For purposes of production statistics the condition (unconsolidated or consolidated) of the deposit prior to extraction and treatment determines if the material is considered as sand or sandstone.

In terms of composition, sand and gravel deposits in Ohio have considerable variability. Because of their glacial origin, these materials are composed of a wide variety of rock fragments and mineral grains that were originally derived from the vast area scoured by Pleistocene ice sheets. Fragments of many varieties of igneous, metamorphic, and sedimentary rocks were scooped up by the glaciers on their southward journey from Canada and deposited by running water draining from the melting ice.

Because of the sorting effect of the flowing water, sand and gravel are commonly sorted into individual beds or layers according to size and to some degree by composition. Many sedimentary rock fragments, particulary shale fragments, are more quickly broken up by the tumbling action of active flowing-water transport.

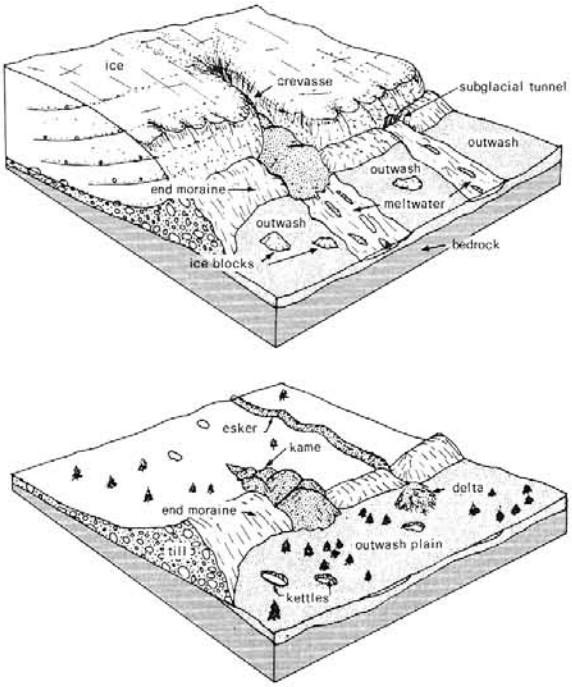
Geology and Distribution

The sand and gravel deposits of Ohio are the direct result of deposition by or in association with the vast ice sheets that dominated the north-central United States during the Pleistocene Ice Age, beginning about 1.5 to 2 million years ago. There were at least four major glacial advances and retreats; three of these glaciations—from oldest to youngest, Kansan, Illinoian, and Wisconsinan—are recorded by glacial sediments in Ohio. Sand and gravel are extracted from Illinoian and Wisconsinan deposits in the state.

The sediments deposited by or in association with the glaciers were derived from northern areas by the scraping, plucking, and scouring action of the ice as it moved southward. These sediments therefore record the variety of rock types traversed by a particular ice advance and consist of various igneous, metamorphic, and sedimentary rocks derived from distant Canadian sources as well as sedimentary rocks derived from nearby, local sources. Individual particles range in size from microscopic clay-sized fragments to large boulders.

Glacial sediments are commonly referred to as drift and can be subdivided into stratified and unstratified drift. Till is unstratified drift that was deposited beneath the ice, or more commonly as a layer of residual material as the ice melted. Till is an unsorted mixture of sediment ranging in size from clay to boulders and is seldom a source of sand or gravel except locally in northwest Ohio, where older sand and gravel deposits were incorporated into till during a readvance of the ice.

Stratified drift, the primary source of sand and gravel in Ohio, consists of material that has been subjected to the cleaning and sorting effects of running water. Stratified drift can be further subdivided into outwash and ice-contact

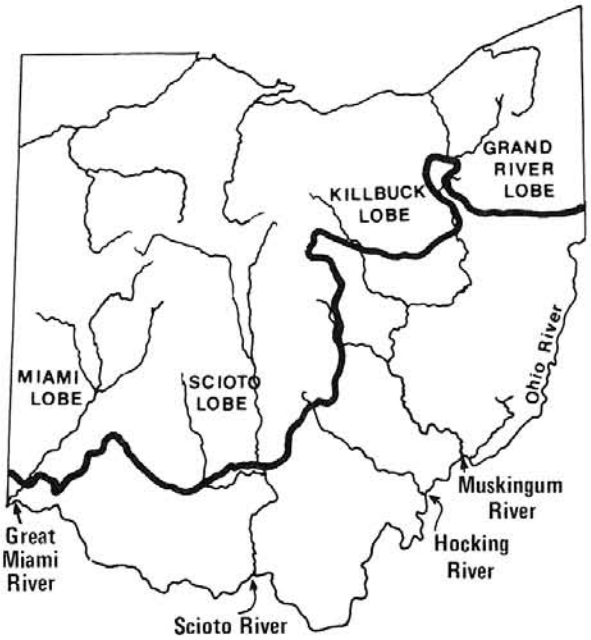


Origin of various glacial deposits. Kames, eskers, and outwash are important sources of sand and gravel.

stratified drift. Outwash deposits consist of materials carried away from the glacier by meltwater, either across an outwash plain where drainage systems were poorly defined, or along major meltwater streams such as the Great Miami, Little Miami, Scioto, Hocking, Muskingum, and Ohio Rivers. Stream-valley outwash deposits are confined by the valley walls of the stream and are commonly referred to as a "valley train." Postglacial downcutting by modern streams has removed much of the outwash from these valleys, leaving flat-topped deposits of sand and gravel, known as outwash terraces, along the valley walls. These outwash terraces commonly extend far beyond the glacial border and constitute a valuable aggregate resource in sand-and-gravel-poor areas of unglaciated southeastern and southern Ohio. Outwash deposits of both Illinoian and Wisconsinan age are exploited in Ohio.

The second category of stratified drift, ice-contact deposits, consists of water-sorted materials that were deposited on, within, or against the melting glacier. These deposits include such features as kames—conical hills deposited in holes, crevasses, or reentrants in the ice margin;

Kame deposited by the Illinoian glacier. Haynes, Hocking County.



Wisconsinan glacial lobes and major meltwater drainage systems.

eskers—snakelike ridges deposited in subglacial tunnels; and kame terraces—flat-topped terraces deposited by meltwater flowing between a valley wall and the lateral margin of a tongue of ice in the valley. Because of the variety of conditions necessary for ice-contact deposits to form, these features are localized in their distribution. Most of these deposits are concentrated along the southern extent reached by the Wisconsinan ice or between two lobes of ice. The Akron area, between the Killbuck and Grand River lobes, is a major area of kame deposits. Although kames and other ice-contact deposits are excellent sources of sand and gravel, they tend to be extremely variable in composition and degree of sorting because they have been subjected to less winnowing by flowing water than have outwash deposits.

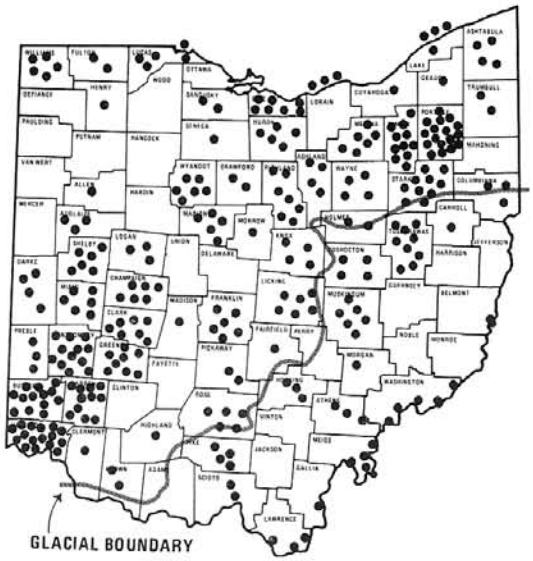
Sand and gravel deposits that formed in or in association with Lake Erie and its predecessors are of particular importance in northern Ohio. These deposits are either deltas that formed as northward-flowing streams emptied into waters ponded against the northward-retreating ice, or beach ridges that mark the shoreline of one of the several previous higher stages of Lake Erie. These beach ridges serve not only as a source of sand and gravel in northern Ohio but also as sites for roads, houses, and cemeteries.

Sand and gravel of glacial origin that has been reworked by modern Lake Erie is found beneath the lake waters. These deposits are exploited by commercial dredges (see accompanying article by D. L. Liebenthal).

Production and Mining

Sand and gravel are produced from 62 of Ohio's 88 counties, with the largest production coming from counties close to major metropolitan areas. This circumstance reflects not only the availability of sand and gravel from local deposits but also a critical competitive factor in production—the distance the commodity must be transported to its site of usage. Because sand and gravel are low-unit-cost items, fuel and labor costs for transport commonly determine whether or not a deposit can be economically exploited.

Because sand and gravel deposits in Ohio are close to or at the surface and because these deposits are composed of



Distribution of sand and gravel operations in Ohio.

unconsolidated materials, mining techniques are commonly simple. Various types of scooping machinery, such as end loaders, or small shovels are used to extract the deposit and load it into trucks or other transporting equipment such as conveyor belts. Draglines are commonly used to recover sand and gravel from water-filled pits located in stream valleys where the water table is close to the surface.

Depending upon the intended usage, some sand or gravel deposits can be used without any further processing; however, washing to remove clay- and silt-sized particles commonly is necessary along with sorting of the material into marketable sizes. The majority of sand and gravel is transported to its point of use by truck.

The average life of a sand and gravel pit in Ohio is about 25 years. These operations are subject to Ohio's surface-mine-reclamation law and therefore must be reclaimed. In contrast to some Ohio mineral industries, these reclamation requirements have probably improved the efficiency of the operation by forcing operators to plan ahead in the handling of overburden and in planning the progress of mining.

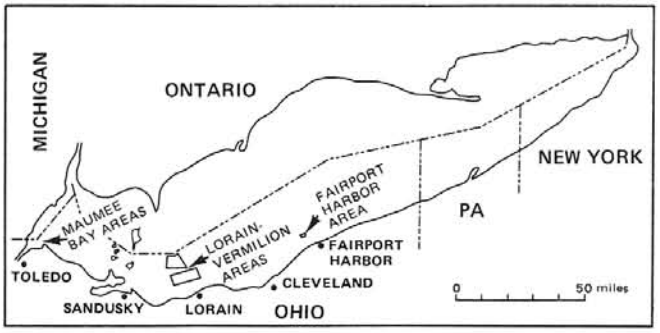
Sand and Gravel and the Survey

The Survey has long maintained a program designed to delineate the location, extent, characteristics, and geologic history of Ohio's sand and gravel resources. Several reports have been published and several others are completed and await publication. In addition, numerous other open-file maps of sand and gravel deposits in the state are maintained in the Survey files. These unpublished open-file maps are available for public inspection and cover major areas of outwash deposits such as along the Hocking, Scioto, Great Miami, and Little Miami Rivers. It is the intent of the Survey mapping program to prepare a map of sand and gravel deposits for each county of the state in which such deposits exist.

The Survey also has jurisdiction over the permit areas for sand and gravel dredging in Lake Erie. An ongoing research program of the Survey's Lake Erie Section is to define the extent and character of these sand and gravel deposits in the lake. The Survey stands ready to assist individuals, sand and gravel operators, government agencies, counties, and municipalities in the wise and continued use of Ohio's sand and gravel resources.

THE LAKE ERIE SAND AND GRAVEL INDUSTRY IN OHIO

Sand and gravel have been commercially dredged from the bed of Lake Erie since near the turn of the century. The bed of the lake beneath Ohio waters is under ownership of the State of Ohio and more than 2.1 million dollars in royalties have been paid to the state for removal of sand and gravel since 1949. Commercial dredging has removed more than 23.5 million tons of these commodities from the lake bed and from the bed of the Maumee River for use in the construction industry, principally in the counties bordering Lake Erie.

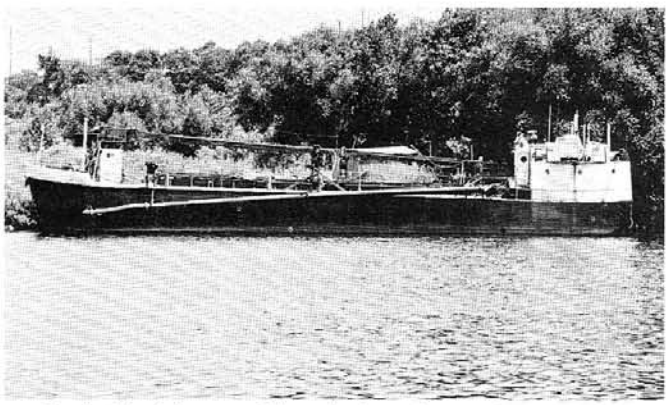


Dredging permit areas.

Ohio permit areas in Lake Erie presently established by law are in Maumee Bay, offshore from Lorain-Vermilion (2 areas), and offshore from Fairport Harbor. All dredging must take place within these authorized areas, which are all located several miles offshore to eliminate the possibility of damage to the shoreline and to prevent interference with the natural longshore littoral-transport system. In addition to the Ohio areas, commercial dredge vessels in Lake Erie use areas established by the State of Pennsylvania offshore from Erie, and by the Canadian government offshore from Point Pelee.

The permit areas contain different grades of sand. At times, to meet state specifications on size and composition, the vessel may need to mix two types of sand to meet these specifications, requiring the vessel to, for example, leave Cleveland and travel to Erie, Pennsylvania, pump half a load, travel to Fairport Harbor to finish the load, and then travel to the port where the load is to be delivered, possibly as far away as Toledo.

The dredging vessels all use the same method for sand and gravel extraction. In the spring, each vessel sets a dredge buoy inside the permit area. The buoy is generally a brightly painted 55-gallon steel drum fitted with a staff holding a steel



Typical dredging vessel. Note the long pipe, or drag, used for extracting sand from the lake bottom.

square, to make the buoy easier to pick up on radar during conditions of low visibility. The buoys are placed in the area where the desired materials are found and are used as reference points for successive trips. Dredging is done with a long steel and rubber pipe called a drag. The drag is 12 inches or more in diameter and has an open, square steel hood at one end. The hood opening is covered by a steel grid which keeps logs and other debris out of the drag. The drag is carried at deck level alongside the ship while the vessel travels to the dredge area. When the captain surmises that the ship is over an area of sand of the type called for in his orders, the drag is lowered. During the loading process the vessel circles slowly over the desired material. As the hood drags along the bottom, the grid on the hood breaks up the compacted sand, allowing it to be sucked up the pipe by huge centrifugal suction pumps. These powerful pumps can bring sand to the surface from depths of 90 feet.

After passing through the pump, the sand passes down a trough running the length of the cargo bin or hold. This trough has openings in the bottom spaced evenly along its length with removable screens corresponding in size to the size of sand desired. The material is sized to specifications as it drops through these openings into the bed of the vessel. Each opening can be shut off so that the crew can balance the load evenly along the hold to keep the ship's center of gravity low for sea-keeping ability.

Undesirable sand, silt, clay, and shell particles are carried along in suspension owing to their lower specific gravity and are washed overboard. The vessel's captain must have an intimate knowledge of sand quality within the permit area because commonly sand quality changes during loading, requiring the vessel to stop loading and move to another area. When the vessel comes over sand of desired quality, loading resumes. This procedure is called "prospecting."

Experienced lake men can differentiate high-quality sand at a glance from poorly graded, dirty, or high-shell-content sands. Colloquial terms used to describe marketable-size sand are "buckshot," which is fine gravel granules 2.38 mm in diameter; "coffee grounds," very coarse sand used as mason sand; and "snuff," a very fine sand used as molding sand, in asphalt, and even as a mixture with soil for golf-course greens.

Sand from Lake Erie is primarily used for mason, concrete, and fill sand and for beach replenishment. Other possible uses are as iron molding, filtering, and grouting sand, but these uses are not cost-effective because much reworking of the material is needed. The product is delivered to the ports of Toledo, Sandusky, Lorain, Cleveland, and Fairport Harbor.

All of the commercial sand dredges on Lake Erie are converted freight or bulk carriers. These vessels have been retrofitted with the pumps and equipment necessary for dredging. Older vessels were always selected because of their shorter length and efficiency of operation.

Only two companies, Erie Sand Steamship Company and Osborne Materials Company, presently dredge in the Ohio permit areas. Erie Sand Steamship Company owns four vessels, which are based in Erie, Pennsylvania. Of these four vessels, only two operate regularly in Ohio waters. The Motor Vessel *Lakewood,* the largest of the dredges, works around the clock, necessitating three full crews of nine men each. This vessel, built by the Chicago Shipbuilding Company in Chicago in 1903, is 390 feet in length, 78 feet in width or beam, and 20 feet in draft. In 1956, this vessel, which was originally named the *Charles M. Warner,* was fitted with a self-unloading conveyor and renamed the *Lakewood.* The only other vessel actively dredging Ohio waters is the *John R. Emery,* based in Sandusky. This ship was built in Buffalo, New York, in 1905. The *John R. Emery* (originally named the *Trenton*) is 140 feet long, 33 feet in beam, and 10 feet in draft, and carries a crew of three. It was, like the others, a bulk freighter before being converted.

Load of sand aboard the dredge F. M. Osborne.

The Osborne Materials Company is based in Grand River, Ohio. Their vessel, the *F. M. Osborne* (originally named the *Grand Island*) was built in Buffalo in 1910. In 1975, the present name was acquired when the vessel was completely rebuilt to standards of the American Bureau of Shipping.

The dredging industry has, for some time, been on a gradual decline, and the recent national economic problems have had a definite impact. The number of vessels operating has declined from nine in 1947 to the current number of three. This decline is due to various factors. Marketable sand volumes in Ohio waters have been reduced by past dredging, requiring vessel operators to spend more time in prospecting. In addition, undesirable material washed overboard during each loading settles over the remaining sand and reduces the quality of future loadings. Because of the need to mix loads to attain specifications, ships cannot sail the most cost-effective routes. Another problem is that the vessels are the oldest operating on the Great Lakes and retrofitting these ships to modern systems, including drydocking and maintenance systems, results in high overhead costs.

The Lake Erie Section of the Geological Survey has recently undertaken projects to find new sources of sand. The Survey, in cooperation with the U.S. Army, Corps of Engineers, conducted a limited survey to locate and map new offshore deposits of sand and gravel suitable for beach nourishment and restoration. The results of this study were published by the Corps in 1980 as Miscellaneous Report No. 80-10, *Sand resources of southern Lake Erie, Conneaut to Toledo, Ohio - seismic reflection and vibracore study,* by S. J. Williams, C. H. Carter, E. P. Meisburger, and J. A. Fuller. This study has enabled the Division to re-evaluate the volume of sand remaining in the permit areas and make refinements on earlier methods of estimating resources. Following the cooperative project, a vibratory coring device was developed for use on the Geological Survey research vessel, the *GS-1,* so that further studies could be conducted. Future projects will study in more detail the Ohio portion of the central basin of Lake Erie—the area from Vermilion to the Ohio-Pennsylvania state line—in a search for new sand and gravel resources.

—Dale L. Liebenthal
Lake Erie Section

Maggie Sneeringer

SURVEY NOW RESPONSIBLE FOR MINERAL INDUSTRIES REPORT

In June 1982, the Survey assumed responsibility for collecting and publishing mineral statistics for the State of Ohio. This responsibility, previously held by the Division of Mines (Department of Industrial Relations), was transferred to the Survey through passage of Ohio House Bill 385. This legislation also requires industrial-mineral producers to report their production figures on a quarterly basis rather than an annual basis as they had previously done. The reporting period for coal-mine operators remains quarterly.

The reporting format for both coal and industrial minerals was essentially unchanged for 1982 to avoid confusion during the agency changeover. However, the forms for 1983 are slightly different, with changes aimed at making report completion easier and to provide more accurate and reliable information for the published report. Instructions for filling out the new reporting forms are included with each form.

The Division of Geological Survey is looking forward to serving Ohio's mineral industries in this area, and urges the reporting operators to be as accurate and complete as possible when filling out the forms. If there are any questions pertaining to the identification of coal seams or other geological units being mined, geologists at the Survey will be glad to help out. The published report based on the data from these forms can provide you with valuable information about your industry, so help us help you!

—Margaret R. Sneeringer
Regional Geology Section

1982 OHIO MINERAL PRODUCTION

Commodity	Total 1982 production[1] (tons)	Number[1] of producing mines	Total 1982 value[1] (dollars)
Coal	36,907,447	295	1,110,404,217
Limestone	27,098,038	124[2]	93,248,266
Sand and gravel	26,522,465	245[2]	72,320,986
Salt	3,671,547	6	32,134,556
Sandstone/conglomerate	1,930,349	35	19,044,802
Shale	1,736,089	25	5,793,883
Clay	741,310	52[2]	2,853,801
Gypsum	144,682	1	1,204,466
Peat	16,643	6	113,620

[1] These figures are preliminary and are subject to change.
[2] Includes some mines which are producing multiple commodities.

COAL-WASHABILITY STUDY COMPLETED

The Survey recently submitted the final report on the potential washability of Ohio coals to the Ohio Air Quality Development Authority, the funding agency for this study. The objectives of this investigation were to assemble washability data pertaining to a wide range of Ohio coals and to develop a petrographic technique for rapid determination of the potential washability of a particular coal.

Eighty-eight samples representing most of the major coal seams in parts of eastern Ohio were run through a lab-scale coal-cleaning process in order to develop washability data. Analyses of the samples by Survey geologists David A. Stith and George Botoman included determinations of moisture, ash, total sulfur, pyritic sulfur, and Btu content.

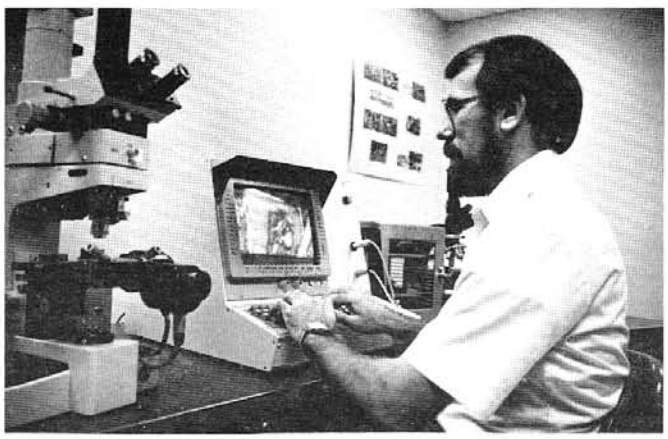
The petrographic portion of the study, conducted by Survey geologist Richard W. Carlton, attempted to develop a rapid microscopic technique for detecting the total pyrite content and particle-size distribution of this mineral within a small sample of coal. Carlton utilized a Leitz Orthoplan-Pol/MPV 2 microscope linked to a computerized Leitz T.A.S. automatic-image-analysis system, both of which were purchased under the Ohio Air Quality Development Authority grant.

Results of the study indicate that, of the sampled coals, one-fourth had less than 3 percent sulfur, but none could meet current federal air-quality standards without being washed. Five to 10 percent of the coals could be cleaned to yield less than 1 percent sulfur at 70 percent clean-coal recovery, and current washing technologies would yield an average sulfur reduction of 30 to 50 percent in the sampled coals.

The petrographic analyses indicate that, using similar automated equipment, the size distribution of pyrite in a small, crushed coal sample can be quickly determined and a prediction made concerning the washability of the coal. The current method used by industry requires a several-hundred-pound sample which must be subjected to a lengthy testing process.

Using data acquired from this study and data from future investigations, the Survey plans to eventually develop maps that depict the potential washability of individual coal seams. These maps would be of great value to coal operators in the planning of new mines because their efforts could be directed to areas that are indicated to have a good potential for removal of pyritic sulfur by washing.

A limited number of facsimile copies of this 68-page report, *Coal washability study—final report,* are available from the Survey for $2.31, which includes tax and mailing.



Dick Carlton operating computerized microscope system

EASTERN GAS SHALES PROJECT COMPLETED

The Survey recently completed an extensive report on the geology of the Devonian black shales of eastern Ohio. The study, begun in 1976, is part of the Eastern Gas Shales Project sponsored by the U.S. Department of Energy to evaluate the potential natural gas resources of the Devonian shales in the Appalachian Basin. The final report will be published by the U.S. Department of Energy, Morgantown Energy Technology Center in mid to late 1983. The Survey will be responsible for distribution of the final report.

The report includes six areas of research: (1) subsurface stratigraphic analysis, (2) structural interpretation, (3) mineralogic and petrographic characterization, (4) geochemical analysis, (5) fracture-trace and lineament analysis, and (6) gas-show monitoring program. The data generated by the study provide a basis for assessing the most promising stratigraphic horizons for occurrence of natural gas within the Devonian shale sequence and the most favorable geographic areas of the state for natural gas exploration. The information in the report should be useful in the planning and design of production-stimulation techniques.

Accompanying the 174-page text are a series of maps, plates, and cross sections; all maps are on 2-sheet (north and south) regional bases of eastern Ohio at a scale of 1:250,000. Stratigraphic plates include six regional geophysical-log cross sections, six isopach and percent radioactive shale maps, and four maps showing net thickness of radioactive shale facies. Regional structure was contoured on the tops of the Berea Sandstone and Onondaga Limestone and on the bases of the Cleveland and Huron Members of the Ohio Shale and the "upper" Olentangy Shale. In addition, structure maps at a scale of 1:62,500 are available on the Berea Sandstone for 37 counties and on the Onondaga Limestone for 44 counties. Generalized stratigraphic columns and mineral-variation diagrams of the Devonian shale sequence have been prepared for 11 Ohio wells and geochemical strip logs have been prepared for seven Ohio wells. Also available are maps showing results of gas-show monitoring through the Devonian sequence and a summary map showing favorable areas for Devonian shale exploration in Ohio. The fracture-analysis study includes a set of 37 maps prepared on 1:250,000-scale USGS topographic base maps.

A limited number of preliminary copies of the text of this report are available from the Survey for $1.75 plus tax and handling ($2.03 total). Diazo copies of all maps, plates, and cross sections are available from the Survey. Contact the Subsurface Geology Section at 614-265-6584 for prices and information pertaining to these maps.

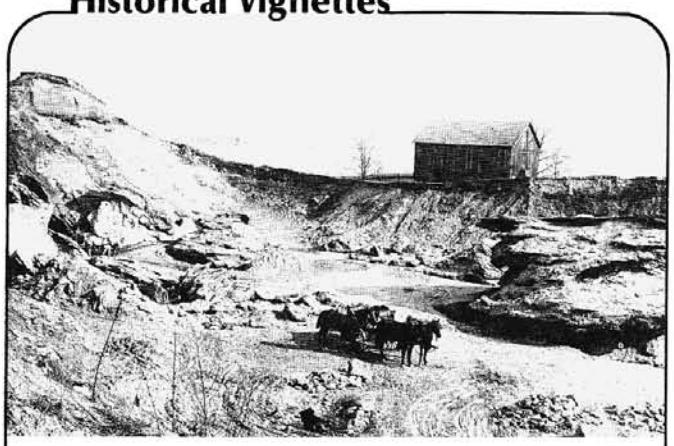
—John D. Gray
Head, Subsurface Geology Section

RESEARCH IN OHIO GEOLOGY AVAILABLE

The latest edition of *Research in Ohio geology* was printed last fall. This biennial compilation of research projects concerning Ohio geology was tabulated from responses to a questionnaire sent to university geology departments, government agencies, museums, and other investigators. *Research in Ohio geology 1981* covers projects completed or in progress in 1980 and 1981. Copies of the compilation are available free of charge from the Survey while supplies last.

—Merrianne Hackathorn
Technical Publications Section

Historical vignettes



Langdon's gravel pit, Hamilton County, circa *1915. Photo by Nevin M. Fenneman.*

SURVEY STAFF NOTES

Dale Liebenthal

Donna Swartz

Dale Liebenthal is the boat captain for the Survey's 48-foot Lake Erie research vessel, the *GS-1*. In addition, he handles many mechanical tasks connected with the operation of the boat and research equipment used by the Survey's Lake Erie Section.

Dale has been with the Survey since 1964 except for a three-year hiatus with private industry. He has military training in civil engineering and has been a member of the Ohio National Guard for 17 years. Dale, a Sandusky native, is married and has two children. During the evening hours of the summer months Dale is captain of the Cedar Point ferry. He also enjoys boating and fishing with his family on Lake Erie.

Donna Swartz is a key person in the Survey's Publications Center because she is the one who answers most of the numerous calls directed to the Survey's general phone number. Donna must relay these calls to the proper expert on the Survey staff. Such a task is complicated because of the wide variety of telephone inquiries received by the Survey. In addition to this responsibility, Donna takes phone orders for maps and publications, assists with over-the-counter sales and mailing, and is the secretary for *Ohio Geology*.

Donna has been with the Survey since 1973, except for a three-year interval in which she was a full-time mother. She enjoys the variety in her job and likes meeting the public. Donna has one child and enjoys crocheting, sewing, and other craft activities.

SURVEY FILM AVAILABLE FOR LOAN

The Survey's Emmy-award-winning film, *The Search, the Geological Survey of Ohio,* is available for loan to any group or organization upon request. There is no charge for the loan; however, return postage must be paid by the borrower.

This 28½-minute, full-color film traces the development of Ohio's mineral industries from pioneer days to the present and describes the Survey's role in encouraging these industries by development of sound geologic information. The geologic history of Ohio is briefly summarized in the film, and environmental problems such as landslides and the competition for space by mineral industries and suburban expansion are examined.

The Search was filmed at more than 50 locations in 20 Ohio counties and uses scores of historic photographs and paintings and original artwork to describe Ohio's geologic history and mineral resources. Coal, limestone, sandstone, salt, sand and gravel, gypsum, clay and shale, and oil and gas are important Ohio mineral industries that are traced from the geologic formation of the mineral deposits through the historical and modern development of these commodities.

The Search may be obtained by writing: ODNR, Division of Geological Survey, Building B, Fountain Square, Columbus, Ohio 43224 or by calling: 614-265-6605. If possible, please reserve *The Search* at least 3 weeks in advance. A street address is preferable to a Post Office box so that the film can be shipped by UPS.

GEOLOGIC POST CARDS

Post cards are a handy way to communicate short messages. Why not send a bit of Ohio geology along with a message to a colleague? The Survey has two varieties of geologic post cards available. One depicts flint, Ohio's official gemstone, and the other features a block diagram of the state that illustrates the geologic systems. These geology post cards are available from the Survey for 10 cents each. Be sure to specify either flint or the geologic map versions with your order.

SURVEY STAFF CHANGES

COMINGS

Katherine L. Jennings, Cartographer, Technical Publications Section.

Margaret R. Sneeringer, Geologist, Regional Geology Section.

Lawrence H. Wickstrom, Geologist, Subsurface Geology Section.

AND GOINGS

Brenda L. Wood, Office Machine Operator, Subsurface Geology Section.

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