Ohio Geology Newsletter

FALL 1983

Division of Geological Survey

OHIO'S SALT INDUSTRY

Salt of the earth. Worth their salt. Salary. Perhaps no other mineral commodity is more familiar to the general public than salt, otherwise known as the mineral halite. In fact, for what other mineral could the average man on the street give a passable physical description and in many cases identify the chemical constituents—sodium chloride? Obviously such a familiarity has developed because salt is one of the few mineral commodities that is used by nearly everyone on a daily basis with little or no alteration. However, many if not most Ohioans are unaware of the extensive salt industry and its long history in the state and of the many uses for this commodity in addition to enhancing the flavor of a hamburger or melting snow and ice on the freeway.

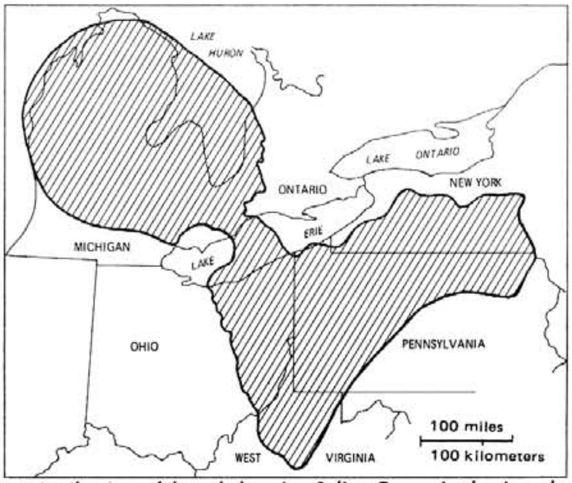
For example, rock salt is used in the production of ice cream, tanned hides, glass and ceramics, and food products. Salt derived from artificial brines is used to produce chlorine for the chemical industries, which in turn use this by-product for solvents, antifreeze, plastics and resins, pesticides, antiknock compounds in gasoline, and for pulp and paper processing. Caustic soda and soda ash, additional by-products of brine production, are used in paper, phenol, soaps, detergents, and bleaches. Brined salt is also used for water treatment (softening).

This list of products serves to point out the importance of this common and abundant mineral to an industrial society. And Ohio has long held a position of national prominence in the production of this commodity owing to the vast reserves of salt that underlie the eastern part of the state. In 1982, Ohio ranked fourth in salt production behind Louisiana, Texas, and New York and produced about 9 percent of the national total.

GEOLOGY OF OHIO SALT

Ohio's rock-salt deposits are confined to a sequence of rocks of Late Silurian age (about 410 million years ago) known as the Salina Group. These rocks have an aggregate thickness of more than 1,000 feet in eastern Ohio and are composed principally of evaporitic rocks such as anhydrite, dolomite, and halite interbedded with shale.

The Salina Group is subdivided into seven units, lettered A to G, from oldest to youngest. The F unit, the principal salt-bearing unit in Ohio, is further subdivided into units F_1 through F_4. These subdivisions are not formal stratigraphic ones, but they are useful and reliable in subsurface correlation based upon data from oil and gas wells.



Distribution of the salt-bearing Salina Group in the Appalachian and Michigan basins.

The Salina Group underlies most of the state except along the axis of the Cincinnati arch in southwestern Ohio. Outcrops of Salina rocks are limited to the margins of the arch; however, no salt beds crop out because the western limit of the salt beds is in the subsurface of eastern Ohio. The Salina rocks dip southeastward into the Appalachian basin at a rate ranging from about 30 feet per mile on the west to nearly 80 feet per mile in the easternmost part of the state. As a consequence of this dip, the depth to the salt-bearing beds of the Salina Group increases from about 1,350 feet in Lorain County to more than 6,500 feet in Belmont County.

Salt beds are present in the B, D, E, and F units of the Salina Group, but only the D and F units have economic potential in Ohio at this time. The D unit, which may have up to 40 feet of salt, was brined at Painesville and is still brined at Akron. The F unit is by far the most important and widespread salt in Ohio. The F_1 salt is the most extensive and has a thickness of 50 to 80 feet. This unit is mined at Fairport Harbor in Lake County by the Morton Salt Company. The F_2 salt

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

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

Chief's corner by Horace R. Collins

We have previously noted in this column the fact that Ohio's coal industry has been in a serious decline for slightly over a decade. The acid rain issue presents new pressures which threaten to even further depress coal production while greatly increasing the cost of coal and in turn the electrical energy produced by coal.

Scientists are far from being united on the acid rain issue. The causes and environmental consequences of acid rain are major areas of scientific uncertainty. The role of sulfur dioxide from the Midwest (Ohio and surrounding states) in acidic deposition in the northeastern states is questionable. Ohio and other large coal-using states have been steadily lowering their sulfur dioxide emissions over the past 10 years. Federal emission standards have been met and, in fact, in many cases exceeded. If sulfur dioxide emissions in the Midwest are decreasing, one may ask why is acid rain increasing in the Northeast? If emissions from Ohio and other midwestern states are bad, why aren't similar emissions from other states also bad? It is interesting to note that at least one major bill before the U.S. Congress would allow electric utility companies in the northeastern states to actually increase their SO_2 emissions while requiring the midwestern states to make major reductions. This notion flies in the face of increasingly strong evidence of the importance of locally produced sulfur dioxide and nitrogen oxides as sources of acid deposition. If acid rain is truly a serious environmental threat to the nation, it is clearly a threat to all, not just a selected few.

How serious is acid rain to the environment? There is no clear answer. Unfortunately, media hype has greatly overplayed many aspects of acid rain. We have all seen political cartoons showing airliners flying through acid rain and emerging with huge holes in the aircraft or a person putting their hand in a lake labeled as acid and having the flesh eaten from the hand, showing only the skeletal remains. Are these portrayals accurate? Patently no! Researchers generally consider acid rain to be rain having a pH of 5.0 to 5.6. Without putting too fine a point on it, apples, beer, oranges, jam, and spinach, to name only a few foods, have a pH more acid than acid rain. There does not seem to be any great hue and cry, however, to reduce the jam consumption of Americans.

Consumers have paid a very heavy price for sulfur dioxide reduction to date. One way in which costs have increased is through the importation of high-priced, lower sulfur coal from other states. Out-of-state low-sulfur coal not only costs more but results in less mining in Ohio with a corresponding loss of local jobs. Technologies such as coal washing, scrubbers, and fluidized-bed combustion can all help but are very costly and in some cases only partially effective. Although these technologies would undoubtedly be used, the most likely way sulfur dioxide emissions would be lowered beyond current levels would be by importing more coal, thus further reducing production of our native coals. Another round of sulfur dioxide reduction must, because of increased costs, result in another round of price increases to consumers. Not only will electric bills go up, so will the cost of many everyday products used in the home because of increased costs to the manufacturer.

There is national legislation currently pending which would, through mandated reductions in sulfur dioxide emissions in the Midwest, gravely affect the already shaky Ohio coal industry. It would seem that before such drastic measures are taken, all Americans, not just Ohioans, should be assured that, in fact, acid rain is a serious environmental threat, that the sources are known, and that the proposed cure will work. Ohio and the nation cannot afford another round of cost increases similar to those of the past decade without assurance that we know what we are doing.

OHIO GEOLOGY

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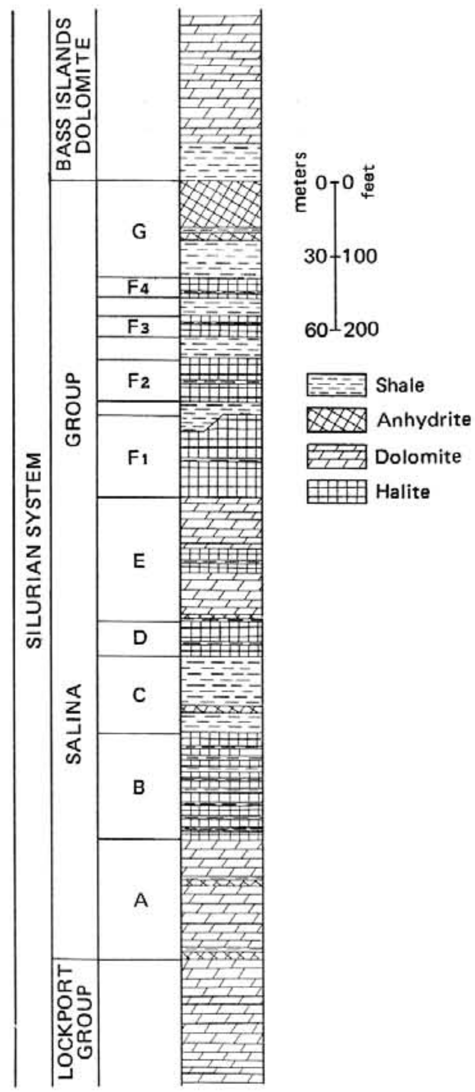
New items, notices of meetings, etc, should be addressed to the attention of the editor. Change of address and new subscriptions should be addressed to the attention of the secretary.

continued from page 1

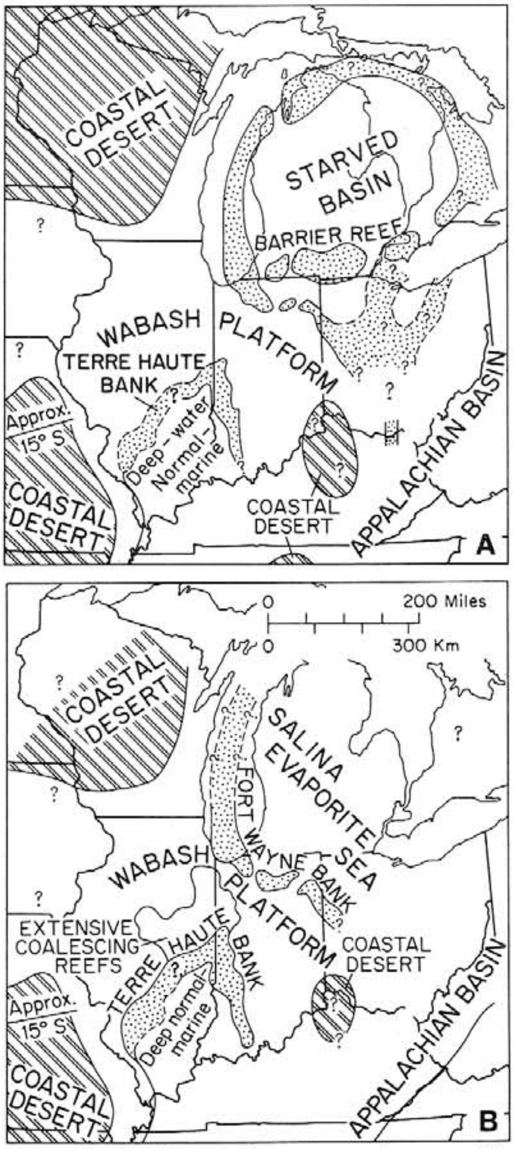


Composite section of the Salina Group and associated rocks in Ohio.

is locally more than 70 feet thick in Cuyahoga County and is mined by the International Salt Company in Cleveland. The F_4 salt is up to 127 feet thick along the Ohio River and is brined just across the river in Marshall County, West Virginia.

The environment of deposition of the Salina evaporites has been a topic of considerable debate among geologists for many decades. The lack of analogous modern environments, in which great thicknesses of evaporites are accumulating, has made the interpretation of the Salina rocks a particularly difficult proposition.

Two major depositional models have been proposed and each has its merits based upon the available evidence. The most widely accepted explanation is the barred-basin model, which proposes that a body of sea water was restricted from unimpeded communication with the open sea by a submerged barrier or shelf. In an arid climate, as has been postulated for Ohio and adjacent

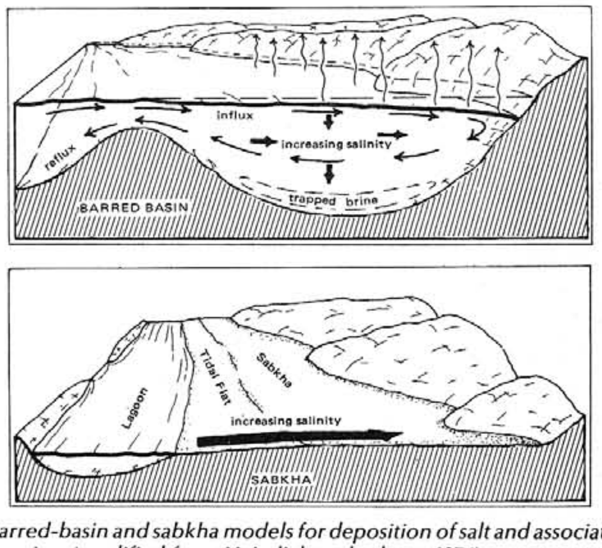


Paleogeography of Ohio and adjacent areas during Middle (A) and Late (B) Silurian time (modified from Shaver and others, 1978, Indiana Geological Survey Special Report 15).

areas during the Late Silurian, evaporation of the sea water would have led to hypersalinity of the waters in the restricted basin. These dense, hypersaline waters would then sink to the bottom of the basin as layers of brine, from which evaporite minerals such as anhydrite and halite would precipitate as the solubility product of a particular mineral was exceeded.

This model also postulates that the depth of water over the barrier was sufficient to allow an influx of normal marine waters to replenish those lost by evaporation and to allow for reflux of brine over the barrier so that a balance in the concentration of the brine was achieved. Such a balance between influx and reflux is necessary to accumulate relatively great thicknesses of particular evaporite minerals.

A point of some debate in the application of the barred-basin model to the Appalachian basin and other areas is the nature of the barrier that restricted the basins. It has been suggested that extensive reefs and shallow banks surrounded these basins and provided an effective restrictive mechanism. The presence of such reefs has long been known, but some workers have concluded that these reefs, which flourished during the Middle Silurian, were not of sufficient extent to provide an effective barrier. Very recent work, however, suggests that the reefs and the shallow platforms upon which they were located still must be considered as a viable mechanism for restriction of the basin.



Barred-basin and sabkha models for deposition of salt and associated evaporites (modified from Heimlich and others, 1974).

Another explanation which has received support in recent years is the sabkha model. This hypothesis suggests that the evaporite minerals were deposited on an extensive tidal flat that was periodically inundated by hypersaline waters from a restricted lagoon (sabkha is an Arabic word meaning shallow lagoon). The presence of shallow-water depositional features such as desiccation cracks, halite crusts, erosion surfaces, and flat-pebble conglomerates in some Salina rocks, particularly in the New York part of the basin, are cited as evidence for this environment of deposition.

Natural brines are found at many horizons in the geological column of Ohio. They were once the only source of salt in Ohio, but now are generally a nemesis because of problems associated with their disposal when they are produced from oil and gas wells. Natural brines represent sea water that was trapped in the tiny pores between sediment grains at the time of deposition of the marine sediments. This "fossil sea water" has been chemically altered to a great degree from its original composition and in some cases these brines contain a relatively high concentration of chemical elements such as bromine. The most important brines in the history of the salt industry in Ohio were from Pennsylvanian rocks in the eastern part of the state.

HISTORY

Salt was a commodity of critical importance and intense interest to European settlers in Ohio in the late 1700's. Salt was not only a dietary necessity but also a necessity in the preservation of certain perishable food-stuffs. Salt transported across the Appalachian Mountains by packhorse commanded from $4 to $8 per bushel between 1788 and 1800.

Sketch of salt making at Scioto saline in Jackson County in the late 1700's.

Owing to these conditions, the search for and extraction of salt were of principal concern to settlers and government authorities. Seeps of natural brines were known in the Ohio country, including the Scioto saline, near Jackson in Jackson County, which was depicted on Lewis Evans' map in 1755. This salt lick, in the Sharon sandstone of Pennsylvanian age, had long been utilized by Indians as a source of weak brine that could be evaporated to produce salt. The U.S. Congress, with the Act of May 18, 1796, set aside this salt lick and others as public land in order to avoid a monopoly by the private sector. One of the first acts of the legislature of the newly formed State of Ohio in 1803 was to establish regulations governing the utilization of salt licks.

In 1809 the state's first brine well was drilled in Gallia County to a depth of 100 feet. Numerous others, many of them successful, were drilled in various parts of eastern Ohio. Indeed, so successful were these brine wells that by 1826 the Scioto saline and other publicly held salt licks were sold at auction. The weak brines produced at such natural seeps could not compete with subsurface brines that were of sufficient concentration to yield a pound of salt per gallon of brine. In 1833, brine wells in the Muskingum Valley produced between 300,000 and 400,000 bushels of salt.

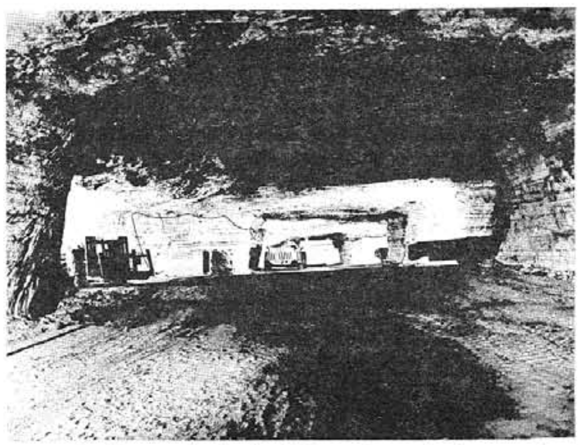
In 1886, the salt industry in Ohio took on a new dimension that heralded the demise of the numerous natural-brine wells and the emergence of the modern salt industry. This revolution was begun by the discovery of bedded halite or rock salt during the drilling of an oil well in Newburg Township, Cuyahoga County. By 1889 the Newburg Salt Company was producing artificial brine, and soon after many other companies were formed in order to extract the highly concentrated artificial brines from the Salina salt beds in northeastern Ohio.

This essentially unlimited supply of salt produced an intense competition and repeated attempt at monopoly of the salt industry. The result was a decline in the price per barrel (280 lbs) from $2.50 soon after the Civil War to a low of 40 cents, which included 25 cents for the barrel, in July 1897. A number of brining operations were able to exist solely because of the production of by-products such as bromine and calcium chloride. Indeed, many of these operations produced salt at a loss.

PRODUCTION

Underground Mines

The Fairport Harbor mine of the Morton Salt Company is located on the Lake Erie shore on the west side of the Grand River in Lake County. Mining is by the room-and-pillar method in a 17-foot interval within the upper part of the Salina F_1 salt bed at a depth of about 1,900 feet beneath the surface. The mine is beneath Headlands Beach State Park and Lake Erie. The mine is served by two vertical shafts: a 12-foot-diameter shaft for access and ventilation and a 16-foot-diameter production shaft for removal of salt. Almost the entire production from this mine is used for snow and ice control.



Room-and-pillar method of mining salt at the International Salt Company mine in Cleveland. Note large machinery for scale.

The International Salt Company mine is on Whiskey Island in Cleveland, Cuyahoga County, and, like the Morton mine, is beneath Lake Erie. The F_2 salt is mined by the room-and-pillar method from a 14- to 17-foot interval at a depth of slightly over 1,700 feet. Two shafts, each 16 feet in diameter, provide access, ventilation, and removal of salt. Most of the salt produced in this mine is used for snow and ice control.

Brine Fields

Currently, brine is produced at four operations in Ohio. Three of these, PPG Industries and Diamond Crystal Salt Company in Summit County and Morton Salt Company in Wayne County, produce artificial brine from the Salina salt beds. R. H. Penick Company in Licking County produces natural brine from the Silurian "Newburg" ("second water of the Big Lime" in drillers' terminology).

Natural brine from the 12 wells at the Penick operation is used entirely for control of snow and ice in winter and for dust control on secondary roads in summer. PPG Industries' brine production is used solely by the company to produce, by electrolysis, chlorine and caustic soda. Morton and Diamond Crystal evaporate brine to produce salt that is used for a variety of products including table salt, preservative and food-processing salt, water-conditioning salt, pressed salt blocks for livestock, and in various chemical processes.

The simplest artificial-brine wells consist of well bores into which tubing is inserted. Fresh water is pumped down the well bore to the salt bed, where solution takes place, creating a brine that is pumped to the surface through the tubing. Brine wells of this early design were inefficient and short lived because solution of the salt bed took place at the top of the bed. The result was a cone-shaped cavity known as a "morning glory." Commonly, roof collapse destroyed tubing and casing in these wells.

Other techniques, such as the reverse-circulation method and the Trump method, are more efficient, but most modern artificial-brine wells consist of two separate boreholes drilled from 500 to 1,000 feet apart. Fresh water is injected into one well under very high pressure, which will, if successful, initiate a fracture between the two wells. Eventually a tunnel is dissolved through the salt bed, establishing an interconnection between the two wells. One well is then used for injecting fresh water and the other one is used for extraction of brine.

DISTRIBUTION AND RESERVES

The Salina salt beds underlie all or part of 24 eastern Ohio counties, covering an area of more than 9,800 square miles. This salt is estimated to have a tonnage in excess of 2.5 trillion tons; even if only one-fourth of this tonnage were recoverable, it could supply the nation's requirements for 32,000 years at present rates of consumption.

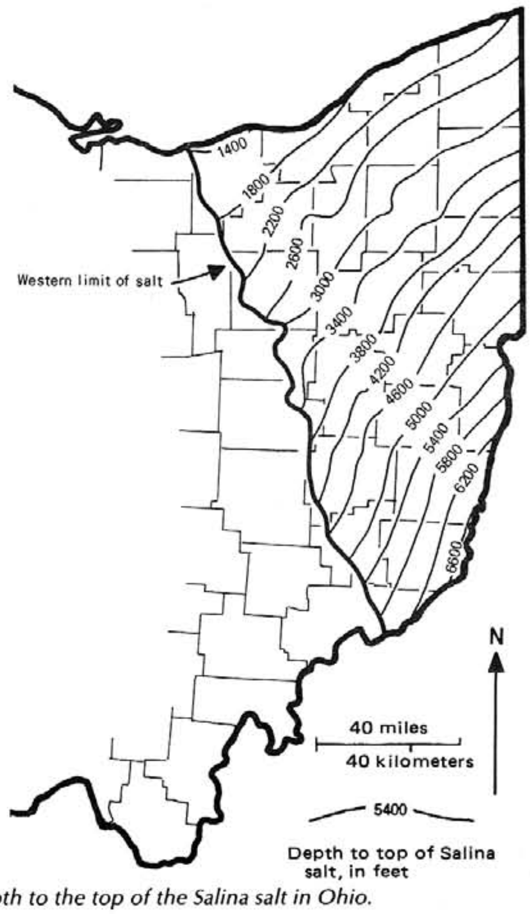
Virtually all of the Salina salt beds in Ohio are sufficiently near the surface to be reached by artificial-brine wells. Conceivably, all of these beds could be reached by deep-mine operations also, but it would be economically unattractive at this time to consider deep mining salt at depths greater than about 2,500 feet. Even with this arbitrary maximum depth, more than 1,400 square miles of northern Ohio are underlain by salt with at least one bed greater than 25 feet in thickness.

CURRENT OUTLOOK

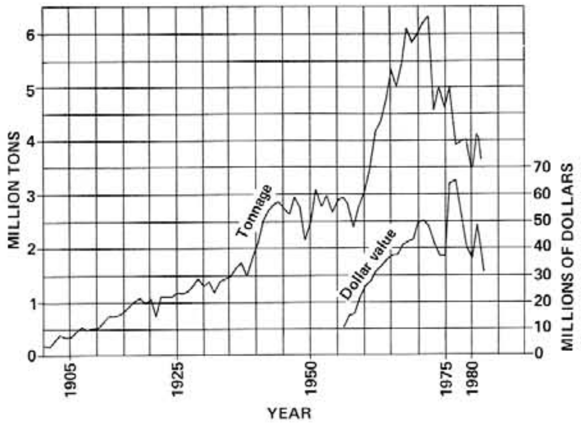
In 1982, nearly 3.7 million tons of salt were produced from two underground mines and four brining operations. This production was valued at $31.3 million with an average price per ton of $8.53. During 1982, 406 individuals were directly employed in the extraction and production of salt in the state.

Beginning with the establishment of Ohio's two underground salt mines, the Morton Salt Company mine in 1959 and the International Salt Company mine in 1962, production began a dramatic upward surge, reaching an all-time high of 6.4 million tons in 1972 (see accompanying chart). Since that time, production and value have declined to early-1960's levels. Perhaps the most significant factor in this production decline was the closing of the Diamond Shamrock Corporation's brine fields in Lake County in 1977, which decreased brine production by half. These fields, which had been in operation since 1912, were the largest in Ohio. Production was used by the company in the manufacture of chlorine and soda ash. Since the closing of these fields, brine production has remained steady at slightly under 1 million tons annually.

The principal market for rock salt from the two underground mines has been for snow and ice control (road salt).The completion of the interstate highway system in the late 1960's provided a significant and



Depth to the top of the Salina salt in Ohio.



Production of salt in Ohio, 1900-1982.

comparatively steady market for rock salt. The vagaries of the winter weather—a cold, snowy winter is a boon to rock-salt production—cause year-to-year fluctuations in production, but there has also been a change in patterns of salt application by municipalities and other civil authorities. The current trend is to salt only main thoroughfares instead of all or most secondary roads. Perhaps this is a reaction to the economic downturn of the last several years by budget-conscious officials.

The economic recession of the past several years also has had an effect on the various uses of salt, particularly in the chemical industry, and there has been increased competition from two Canadian underground mines in Ontario. Because of lesser value of the Canadian dollar in comparison to the American dollar, Canadian salt can be purchased by American municipalities at a better price. Canadian shipping costs are also apparently cheaper. Shipping costs, always a significant factor in transport of a low-unit-cost commodity, account for a surprising pattern in usage of salt in Ohio. Shipping by water is so significantly cheaper than truck transport that it is cheaper for companies with underground mines on the Lake Erie shore to transport road salt by barge from their Louisiana salt-dome mines to Ohio River cities such as Cincinnati than to transport the salt by truck from northern Ohio.

Despite these problems, the outlook for the Ohio salt industry is not an unfavorable one. Reserves are enormous and the two underground mines could conceivably operate indefinitely. Assuming that a noncorrosive and cost-competitive substitute for road salt is not developed, the rock-salt market should remain at about current levels. Economic recovery may increase the demand for salt and brine in the coming years.

—Michael C. Hansen

FURTHER READING

Bownocker, J. A., 1906, Salt deposits and the salt industry in Ohio: Ohio Geological Survey Bulletin 8, 42 p.

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QUARTERLY MINERAL PRODUCTION,
APRIL-MAY-JUNE 1983

Commodity	Tonnage sold this quarter[1] (tons)	Number of mines reporting sales[1]	Value of tonnage sold[1] (dollars)
Coal	7,914,060	227	254,531,499
Limestone[2]	6,825,651	92[3]	24,695,413
Sand and gravel[2]	6,381,382	205	17,617,597
Salt[2]	468,435	5	3,645,110
Sandstone/conglomerate[2]	400,440	20	4,943,902
Clay[2]	195,739	13	1,148,712
Shale[2]	206,626	18[3]	346,973
Gypsum[2]	54,473	1	454,305
Peat[2]	7,333	4	44,265

[1]These figures are preliminary and subject to change.
[2]*Tonnage sold* and *Value of tonnage sold* include material used for captive purposes. *Number of mines reporting sales* includes mines producing material for captive use only.
[3]Includes some mines which are producing multiple commodities.

OHIO GEOLOGY SLIDE CONTEST AWARDS PRESENTED AT STATE FAIR

Ohio Geology Slide Contest winners at awards ceremony at the Ohio State Fair. L. to r.: Horace Collins, State Geologist and Division Chief; Steve Dow (3rd); Larry Foster (4th); Tina Takach (5th); Jeffrey Story (Honorable Mention); George Bell (1st); Paul Neely, Jr. (Honorable Mention); Allen Kraps (Honorable Mention); Sandy Evans (Honorable Mention); Mike Hansen, contest coordinator. Robert Panlener (2nd) and Trudy Beal (Honorable Mention) were unable to attend the ceremony.

Winners of the 1983 Ohio Geology Slide Contest were presented with award plaques and certificates in ceremonies held during Conservation Day festivities at the Ohio State Fair on Saturday, August 13. The ceremony, which was attended by a large audience, was held in the Ohio Department of Natural Resources amphitheater at Teater Park on the Fairgrounds. Horace R. Collins, Division Chief and State Geologist, presented the awards. The attractive award plaques, consisting of the winner's photo laminated on hardwood and featuring an inscribed brass plate, were furnished through the generosity of the Ohio Mining and Reclamation Association, Neal S. Tostenson, President.

The 1983 contest had an added bonus. The winning slide, of the Sharon sandstone at Nelson-Kennedy Ledges, by George A. Bell, is featured on the cover of the 1984 Ohio Department of Natural Resources calendar.

NEW PHOTOTYPESETTING EQUIPMENT

Jean Lesher with AM Varityper Comp/Edit system.

This issue of *Ohio Geology* is the first Survey publication to be prepared using our new AM Varityper Comp/Edit 5618 phototypesetting unit. Not only will this equipment permit us to prepare Survey manuscripts for publication more quickly and efficiently, but we will also be able to interface with our new computer system for mineral production statistics.

Jean Lesher, the Survey's phototypist, has undergone extensive training in the use of this new equipment and, after a few predictable start-up glitches, has gained confidence in the new system. The Survey will continue to produce high-quality publications but, with the new system, they will be prepared more quickly and less expensively.

SURVEY STAFF CHANGES

COMINGS

Glenn E. Larsen, Geologist, Regional Geology Section.
Renia Peterson, Public Inquiries Assistant, Public Service Section.
Edward M. (Mac) Swinford, Geologist, Regional Geology Section.

AND GOINGS

John L. Sullivan, Assistant Driller, Regional Geology Section.

EDITOR'S NOTE

Perhaps prophetically, the *Chief's Corner* by Division Chief Horace R. Collins in the Summer 1983 issue of *Ohio Geology* called attention to the fact that some production aspects of this newsletter are beyond our control. The Summer 1983 issue was a case in point. We apologize to our readers for the poor quality of printing of this issue, particularly for the poor quality of the photographs. Apparently, problems with the presses at the state Division of Printing are to blame. We were faced with the choice of reprinting that issue, with no guarantee of improvement and with a certain delay of an additional month or more, or sending the issue "as is" in order to convey our information in a somewhat timely fashion. We chose the latter.

Historical vignettes

View of 90-gallon-capacity salt kettles of the Big Bloom Salt Works at Durant, Morgan County. This plant, of a design dating to pioneer days, utilized brine from the "Salt Sand" and produced 30 barrels of salt per day.
Photo by J. A. Bownocker, 1903.

SURVEY STAFF NOTES

Angie Bailey

Don Guy

Angie Bailey is a Public Inquiries Assistant in the Subsurface Geology Section and has been with the Survey since 1978. Angie deals daily with the large volume of data pertaining to oil and gas wells in the state and insures that such information is properly recorded and filed for easy access by the public. She also answers numerous telephone inquiries and takes customers' orders for well cards and oil and gas maps. Angie particularly enjoys the variety she encounters in her job and the opportunity to meet the public.

Angie lives in Westerville with her two daughters. She enjoys camping, swimming, bowling, and craft projects.

Don Guy is a Geologist with the Lake Erie Section in Sandusky. Among his responsibilities are collecting and evaluating data on erosion along the Ohio shore of Lake Erie and evaluating the impact of proposed shore-protection structures. Don has coauthored several reports and articles on shore erosion and also has been involved in studies of Lake Erie bottom sediments.

Don joined the Survey in 1973 and has bachelor's and master's degrees in geology, from Earlham College and Bowling Green State University, respectively. He lives with his wife, Eilene (a newspaper editor), and son, Alan, in Sandusky, where they sail and bicycle in their free time.

1984 ODNR CALENDAR NOW AVAILABLE

A 13-month calendar (December 1983 through December 1984) featuring outstanding photographs of Ohio's scenic beauty is now available from the Ohio Department of Natural Resources. The 1984 ODNR calendar also lists important natural resources events such as hunting, trapping, and fishing seasons; lunar phases; significant meetings; and historic natural resources and other special events and festivals of interest to individuals involved in programs and activities pertaining to Ohio's natural resources.

The color photographs that highlight each month represent a variety of locations and seasons in the state. These range from spectacular ice falls in Hocking Hills State Park to the tranquillity of a sunset to sheaves of wheat in an Amish field. A number of the photos are of geologic features, including the cover photograph of the winning entry in the 1983 Ohio Geology Slide Contest by George A. Bell of Zanesville.

The 1984 ODNR calendar, which makes a memorable gift, is available from the Publications Center, Ohio Department of Natural Resources, Fountain Square, Building B, Columbus, Ohio 43224. Cost is $5.78, which includes tax and handling.

OHIO AGGREGATES ASSOCIATION MEMBERS TOUR SURVEY

Members of the Ohio Aggregates Association (OAA), accompanied by OAA President Herbert Conrad, of Bluffton Stone Company, and OAA Vice President Raymond Martin, of R. W. Sidley, Inc., recently toured Survey facilities in Columbus. This visit was part of the activities of the annual meeting of the Association.

OAA members had the opportunity to view the numerous geological records and maps housed at the Survey, hear a brief lecture on the history and programs of the Division, and to visit each section. Principal activities of the Survey were reviewed, particularly those pertaining to aggregates, and various pieces of laboratory and testing equipment were shown in operation. Association members attending the tour expressed considerable interest in Survey activities in the area of aggregates, and many were pleasantly surprised at the tremendous volume of information available to the industry. We encourage our constituency to get to know us better and to become familiar with our files of information on the geology of Ohio.

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