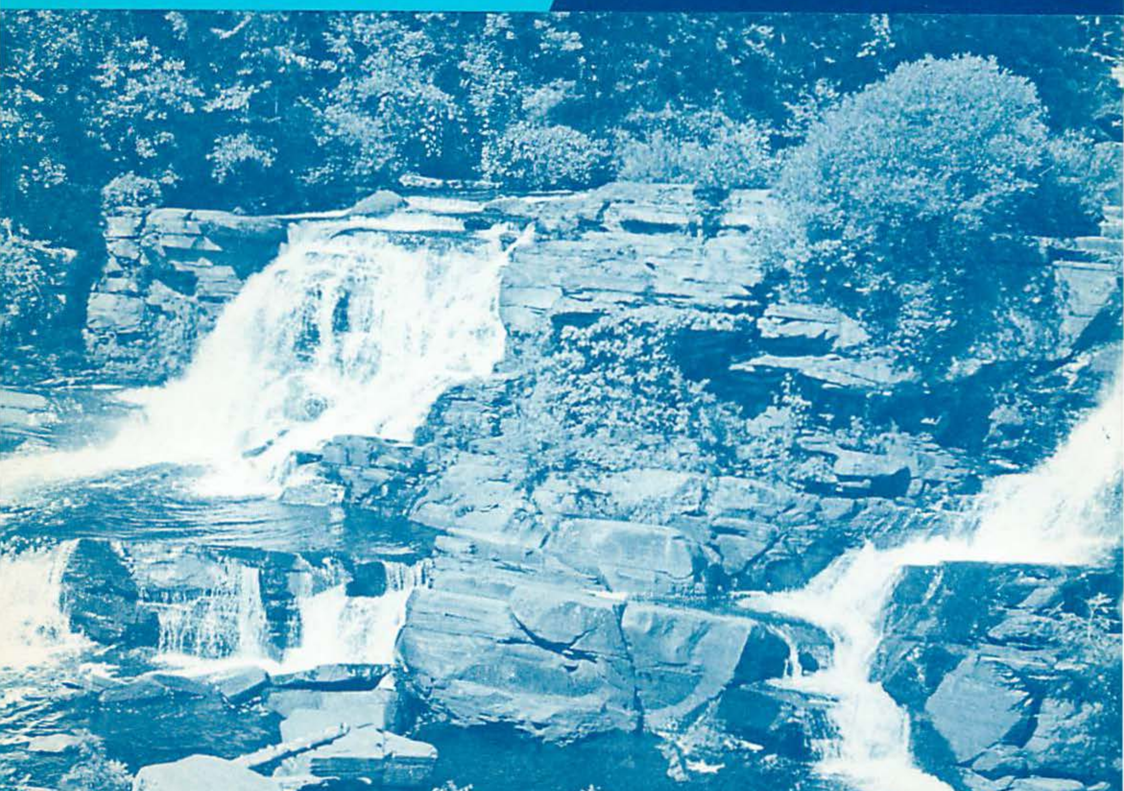
PENNSYLVANIA GEOLOGY



THE PENNSYLVANIA GEOLOGICAL SURVEY VOL. 14/5

COMMONWEALTH OF PENNSYLVANIA
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TOPOGRAPHIC AND GEOLOGICAL SURVEY
Arthur A. Socolow, State Geologist

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ON THE COVER: Resica Falls, at the intersection of Pa. Route 402 and Bushkill in Monroe County. The stream cascades 40 feet over a succession of green and red sandstones and shales of the Devonian age Catskill Formation. Photo courtesy of William Bolles, Pa. Dept. of Education.

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Editor, Arthur A. Socolow; Associate Editor, Donald M. Hoskins.

October 1983

FROM THE DESK OF THE STATE GEOLOGIST

AND THEN THERE WERE NONE

It is sad to note that for the first time in over 250 years there is not a single operating metallic mineral mine in Pennsylvania. Last month the New Jersey Zinc Company mine at Friedensville (just south of Bethlehem) closed down, ending a zinc mining history there that goes back to the 1840's.

A few years earlier, in 1977, the very impressive Grace Mine at Morgantown, Pennsylvania (within sight of the Turnpike) shut down its iron ore production, despite large remaining reserves of quality ore and a very modern mining and milling operation.

And in 1973 the world-reknowned Cornwall iron mine ceased operation, having established a record of continuous mining going back to 1742 and having served the nation's iron needs with distinction through war and peace for over two centuries.

The closing of the Friedensville zinc mine is an interesting lesson in economic geology, with emphasis on the economic aspect. As recently as 1981 this was the second largest zinc producing mine in the country, and its yield placed Pennsylvania as the sixth largest zinc producing state in the nation. Two major economic factors created the rapid demise of this historic mine with a loss of several hundred jobs: First and foremost was the enormous recent increase in the cost of electricity needed to run the battery of huge pumps which kept the mine dewatered. Secondly, was the adverse impact of the recent recession on the demand and price for zinc in this country. As in the case of the Grace iron mine mentioned above, the Friedensville closing is particularly unfortunate in light of the large remaining reserve of quality ore.

So it has come to pass that Pennsylvania, which in the 1800's and early 1900's had literally hundreds of metal producing mines, yielding a variety which included iron, manganese, chromium, lead, silver, nickel, copper, cobalt, graphite, magnesium, zinc, uranium, and vanadium ores, today has no metallic mining.

Such is the lesson of economic geology. The trend is not necessarily irreversible. New technology, new demands for resources, international crises affecting access to foreign resources, and possible discoveries of new high grade ore bodies within the state could bring metallic mining back again. This is a subject area to which economic geologists at the Pennsylvania Geological Survey will have to be attentive.

Arthur A. Socolow

Waterfalls in Pennsylvania

Alan R. Geyer and Donna M. Snyder
Pennsylvania Geological Survey

Pennsylvania's landscape is the result of a continuing conflict in nature. There is a constant struggle between the geologic forces that build the land and those that wear it down. Almost all scenic geologic features in Pennsylvania have been created from this never-ending battle.

The waterfall is an excellent illustration of this struggle of natural geologic processes. The waterfall sculptures (carves) the rocks into some of this Commonwealth's most breathtaking scenery.

Waterfalls often are grouped into three classes or types based on their origin: 1) waterfalls whose origin is due to the different resistance of the rocks to the action of running water; 2) waterfalls whose origin is due to geologic factors other than the resistance of the rocks, an example of this type would be the waterfalls created by a valley glacier that has scooped out a river valley leaving small tributary streams "hanging" and a waterfall is born; and 3) waterfalls created by the formation of calcium carbonate (dripstone) around the edge of a pool in a limestone cave. Pennsylvania's waterfalls "fall" into all three types and range in free fall from a few inches to a sheer drop of over 100 feet and in volume of water from a trickle to that of Bushkill Falls, often referred to as the "Niagara Falls" of Pennsylvania.

The following list of Pennsylvania's waterfalls has been compiled by the authors from many information sources. We know it is *not* complete and we welcome your comments, photographs, and additions.

NAME	NEAREST TOWN	COUNTY	PHYSIOGRAPHIC PROVINCE
Beaver Falls	Beaver Falls	Beaver	Appalachian Plateaus Pittsburgh Plateaus Section
Homewood Falls	Homewood	Beaver	Appalachian Plateaus Pittsburgh Plateaus Section
Scudders Falls	Pennington	Bucks	Piedmont Triassic Lowland Section
Cameleon Falls	Jim Thorpe	Carbon	Valley and Ridge Appalachian Mountain Section
Onoko Falls	Jim Thorpe	Carbon	Valley and Ridge Appalachian Mountain Section

NAME	NEAREST TOWN	COUNTY	PHYSIOGRAPHIC PROVINCE
Falls of French Creek	Saint Peters	Chester	Piedmont Triassic Lowland Section
Howard Falls	Edinboro	Erie	Appalachian Plateaus Glaciated Section
Creek Falls	Dawson	Fayette	Appalachian Plateaus Allegheny Mountain Section
Cucumber Falls	Ohiopyle	Fayette	Appalachian Plateaus Allegheny Mountain Section
Ohiopyle Falls	Ohiopyle	Fayette	Appalachian Plateaus Allegheny Mountain Section
Nay Aug Park Falls	Scranton	Lackawanna	Valley and Ridge Appalachian Mountain Section
Conewago Falls	Falmouth	Lancaster	Piedmont Triassic Lowland Section
Grant City Falls (Muddy Creek Falls)	Rose Point	Lawrence	Appalachian Plateaus Glaciated Section
Neshannock Falls	Mayville	Lawrence	Appalachain Plateaus Glaciated Section
Quakertown Falls	Hillsville	Lawrence	Appalachian Plateaus Glaciated Section
Spillway Falls	Portersville	Lawrence	Appalachian Plateaus Glaciated Section
F.L. Rickets Falls	Red Rock	Luzerne	Appalachian Plateaus Allegheny High Plateaus Section
Ganoga Falls	Red Rock	Luzerne	Appalachian Plateaus Allegheny High Plateaus Section
Harrison Wright Falls	Red Rock	Luzerne	Appalachian Plateaus Allegheny High Plateaus Section
Kitchen Creek (Adams Falls)	Red Rock	Luzerne	Appalachian Plateaus Allegheny High Plateaus Section
Oneida Falls	Red Rock	Luzerne	Appalachian Plateaus Allegheny High Plateaus Section
Whirlpool Canyon Falls	Wilkes Barre	Luzerne	Valley and Ridge Appalachian Mountain Section
Springfield Falls	Springfield Fall	Mercer	Appalachian Plateaus Glaciated Section
Buck Hill Falls	Buck Hill Falls	Monroe	Appalachian Plateaus Glaciated Low Plateaus Section
Buttermilk Falls	North Water Gap	Monroe	Valley and Ridge Appalachian Mountain Section
Clarke Falls	Analomink	Monroe	Appalachian Plateaus Pocono Plateau Section
Lee Falls	Analomink	Monroe	Appalachian Plateaus Pocono Plateau Section
Marshall Falls	North Water Gap	Monroe	Valley and Ridge Appalachian Mountain Section
Paradise Falls	Mount Pocono	Monroe	Valley and Ridge Appalachian Mountain Section
Resica Falls	Bushkill	Monroe	Valley and Ridge Appalachian Mountain Section
Spruce Cabin Falls	Canadensis	Monroe	Appalachian Plateaus Glaciated Low Plateaus Section
Stoddartsville Falls	Stoddartsville	Monroe	Appalachian Plateaus Pocono Plateau Section
Twin Falls	Marshall Creek	Monroe	Valley and Ridge Appalachian Mountain Section
Bridal Veil Falls	Shoemakers	Pike	Valley and Ridge Appalachian Mountain Section

NAME	NEAREST TOWN	COUNTY	PHYSIOGRAPHIC PROVINCE
Bridal Veil Falls	Bushkill	Pike	Valley and Ridge Appalachian Mountain Section
Brides Maid's Falls	Bushkill	Pike	Valley and Ridge Appalachian Mountain Section
Brides Maid's Falls II	Bushkill	Pike	Valley and Ridge Appalachian Mountain Section
Bushkill Falls	Bushkill	Pike	Valley and Ridge Appalachian Mountain Section
Deer Leap Falls	Dingmans Ferry	Pike	Appalachian Plateaus Glaciated Low Plateaus Section
Dingmans Falls	Dingmans Ferry	Pike	Valley and Ridge Appalachian Mountain Section
Factory Falls	Dingmans Ferry	Pike	Appalachian Plateaus Glaciated Low Plateaus Section
Fulmer Falls	Dingmans Ferry	Pike	Appalachian Plateaus Glaciated Low Plateaus Section
High Falls	Canadensis	Pike	Appalachian Plateaus Glaciated Low Plateaus Section
High Falls	Bushkill	Pike	Valley and Ridge Appalachian Mountain Section
Indian Ladder Falls	Canadensis	Pike	Appalachian Plateaus Pocono Plateau Section
Leavitt Falls	Canadensis	Pike	Appalachian Plateaus Glaciated Low Plateaus Section
Pinchot Falls (Sawkill Falls)	Milford	Pike	Valley and Ridge Appalachian Mountain Section
Raymondskill Falls	Milford	Pike	Valley and Ridge Appalachian Mountain Section
Ridgeway Falls	Rowland	Pike	Appalachian Plateaus Glaciated Low Plateaus Section
Shohola Falls	Shohola Falls	Pike	Appalachian Plateaus Glaciated Low Plateaus Section
Silver Thread Falls	Dingmans Ferry	Pike	Valley and Ridge Appalachian Mountain Section
Snow Hill Falls	Skytop	Pike	Appalachian Plateaus Glaciated Low Plateaus Section
Winona Falls	Shoemakers	Pike	Valley and Ridge Appalachian Mountain Section
Elklick Falls (Laurel Falls)	Markleton	Somerset	Appalachian Plateaus Appalachian Mountin Section
Klink Falls (Laurel Falls)	Markleton	Somerset	Appalachian Plateaus Allegheny Mountain Section
Laurel Falls	Markleton	Somerset	Appalachian Plateaus Allegheny Mountain Section
Angle Falls	Hillsgrove	Sullivan	Appalachian Plateaus Allegheny High Plateaus Section
Buttermilk Falls	Shunk	Sullivan	Appalachian Plateaus Allegheny High Plateaus Section
Cold Run Road Falls	Eagles Mere	Sullivan	Appalachian Plateaus Allegheny High Plateaus Section
Dry Run Falls	Hillsgrove	Sullivan	Appalachian Plateaus Allegheny High Plateaus Section
Dutchman Falls	Laporte	Sullivan	Appalachian Plateaus Allegheny High Plateaus Section
Lewis Falls	Jamison City	Sullivan	Appalachian Plateaus Allegheny High Plateaus Section

NAME	NEAREST TOWN	COUNTY	PHYSIOGRAPHIC PROVINCE
Lincoln Falls	Lincoln Falls	Sullivan	Appalachian Plateaus Allegheny High Plateaus Section
Twin Falls	Jamison City	Sullivan	Appalachian Plateaus Allegheny High Plateaus Section
Wenonan Falls	Sonestown	Sullivan	Appalachian Plateaus Allegheny High Plateaus Section
Falls of Devil's	Susquehanna	Susquehanna	Appalachian Plateaus Glaciated Low Plateaus Section
Bucks Falls	Starrucca	Wayne	Appalachian Plateaus Glaciated Low Plateaus Section
Twin Falls	Hawley	Wayne	Appalachian Plateaus Glaciated Low Plateau Section
Wangum Falls	Hawley	Wayne	Appalachian Plateaus Glaciated Low Plateau Section
Adams Falls	Ligonier	Westmoreland	Appalachian Plateaus Allegheny Mountain Secion
Buttermilk Falls	Buttermilk Falls	Westmoreland	Appalachian Plateaus Allegheny Mountain Section
Buttermilk Falls	Falls	Wyoming	Appalachian Plateaus Glaciated Low Plateaus Section
Wildcat Run Falls	York	York	Piedmont Piedmont Uplands Section.

Selected References

Geyer, A. R., and Bolles, W. H. (1979), *Outstanding scenic geological features of Pennsylvania;* Pennsylvania Geological Survey, 4th ser., Environmental Geology Report 7, 508 p.

Stone, R. W. (1942), *Many Waterfalls in Pennsylvania;* Internal Affairs Monthly Bulletin, vol. 10, no. 12, November, p. 21-30.

Surplus Topographic Maps

The Survey has accumulated a quantity of outdated 7½′ quadrangle topographic maps. We are offering them, in limited numbers, to teachers and troop leaders.

If you are interested in receiving a limited number of these maps contact Arthur A. Socolow, State Geologist, Dept. of Environmental Resources, Bureau of Topographic and Geologic Survey, P.O. Box 2357, Harrisburg, PA 17120. Maps will be supplied as long as they last on a first-come first-serve basis. Orders for specific quadrangles cannot be accepted.

WATER WELL COMPUTER FILE - A STATUS REPORT

Donna M. Snyder
Pennsylvania Water Well Drillers Licensing Program

History

The Bureau of Topographic Geologic Survey is responsible for the administration of the Pennsylvania Water Well Drillers Licensing Act 610 of 1956. Under the provisions of this Act a water well driller is required to complete and file with the Bureau a water well completion report for each water well drilled in Pennsylvania. In 1969, with an initial grant from the Department of Housing and Urban Development, the Bureau began coding data from the drillers water well records and a computer file was started.

Current Status

These computerized water well data have been updated recently with approximately 15,000 new records. Printouts for all 67 counties, except Philadelphia County, have been received by the Bureau and are on open file and available to the public. Each county printout consists of four reports. The first printout, called "Report Type A," shows the township, well number, owner, well location by latitude and longitude and well use. The second printout is called "Report Type B" and lists the total depth of the well, casing length, screening, drilling method, water level, yield and drawdown. "Report Type C" identifies the topographic setting, the major and minor aquifers, depth to bedrock, type of bedrock and type of surficial material. The fourth, "Report Type P," contains the depth and yield of water-bearing zones. The township and well number are used as a cross reference between Reports A, B, C and P.

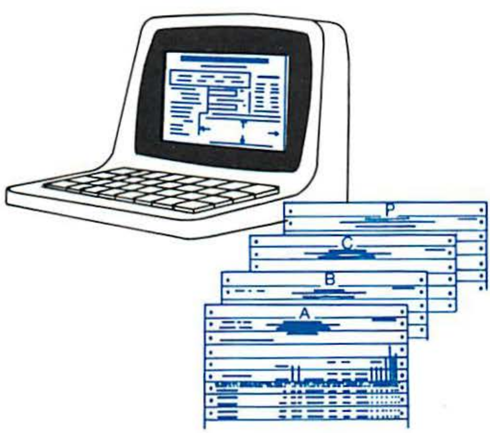
The information contained on the computer printouts has not been field checked and has been classified as "unverified" data. In addition, the computer printouts, for various reasons, do not represent all water wells in a specific area. The well records used are selected records based on the drillers location description and our assigned accuracy code; i.e. can be located within 1000 feet to ½ mile (codes 2 or 3 respectively). The code is determined by the quality of the drillers location map submitted on the water well completion report form.

Information may be requested on a county basis or township basis, depending on your need and the cost involved. If 10 or fewer sheets are desired, there is no charge. If the information needed requires more than 10 sheets, the cost is 25 cents per sheet, including the first 10. Also, the Department of Environment Resources' Policy requires that the Bureau charge $7.50 per hour for staff time spent searching and assembling data in addition to the 25 cents per page charge. The printouts are available from the **Pennsylvania Geological Survey — WWI, P.O. Box 2357, Harrisburg, Pennsylvania 17120; telephone 717-787-5828.**

Future

The Department of Environment Resources' Bureau of Information Systems is currently redesigning the Water Well Inventory File to enable us to run the data on a microcomputer. Once the microcomputer and file are operational, we will enter water well information directly from the water well drillers records into the data file. Our goal, in the not too distant future, is to enter the information into the computer on a daily basis as the records are received from the drillers.

The water well computer file along with the Bureau's published groundwater reports may provide planners, engineers, geologists, well drillers, developers, and state and local governments with an excellent tool for monitoring and managing Pennsylvania's groundwater resources.

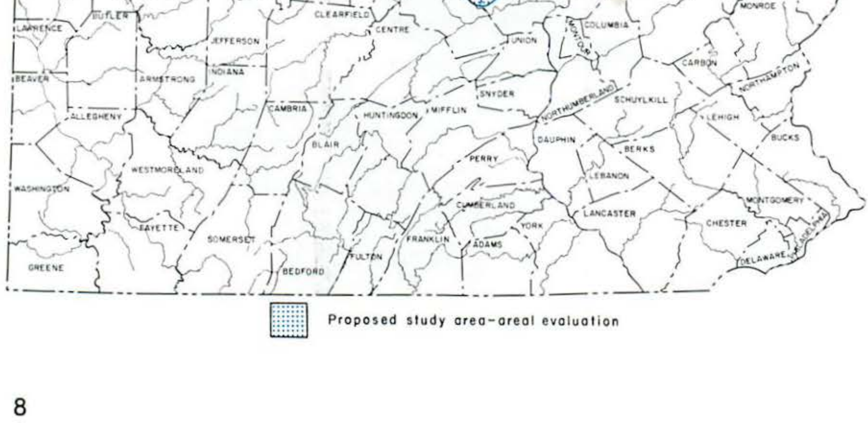


The River Valleys of North-Central PA — The Commonwealth's Best Aquifers

A team of geologists and hydrogeologists from the Pennsylvania Geological Survey and the U.S. Geological Survey has begun a study of the mineral and groundwater resources of the glacial valleys in north-central Pennsylvania. These valleys are believed to contain valuable deposits of sand and gravel and may comprise the most important aquifers of the area.

The geologists will study the composition, texture, and quantity of the sand and gravel resource. The hydrogeologists will attempt to locate and define areas where large quantities of groundwater may be developed. They will determine the natural groundwater quality of these aquifers and evaluate any man-induced contamination. By using groundwater flow models, they will attempt to show the flow system within these aquifers. All of this information will aid in the development of water supplies and in evaluating the potential use of these aquifers for the augmentation of streamflow during low-flow periods.

Two final reports are planned. They will contain detailed maps of the glacial and river sand and gravel deposits, well locations, groundwater-table, and chemical quality of the groundwater. Profiles showing the depth of these valleys and the groundwater flow patterns will be included. In addition, a comprehensive text will accompany each report.



The Arthur L. Long Lime Kiln, An Active Record of Yesteryear

Samuel W. Berkheiser, Jr., Pennsylvania Geological Survey
and
Donald T. Hoff, Pennsylvania Historical and Museum Commission

LOCATION AND SETTING — The restored and working Arthur L. Long batch kiln is located between the villages of Mandata and Urban in Northumberland County. It is in what is locally known as Stone Valley, bounded by Hooflander Mountain on the north and Fisher Ridge on the south. The kiln is about 2.5 miles due east of the active Meckley Limestone Products quarry in Jordon Township at latitude 40°40′31″N and longitude 77°47′12″W in the Pillow 7.5-minute quadrangle.

Geologically, the kiln and approximately ½-mile-long contiguous quarry are located on the faulted south limb of a doubly-plunging anticline of which the Silurian-Devonian Keyser Formation is the principle bedrock and quarry stone (Hoskins, 1970).

DESCRIPTION OF KILN — Batch kilns were used in Stone Valley from the time of the first permanent settlers to about 1936, when they were gradually replaced with the more productive draw kilns. Rotary and vertical-shaft kilns are today the chief producers and the steel industry is the primary consumer of lime. Arthur L. Long ardently operates the present batch kiln as a hobby with the small amount of resultant lump lime being used on farms within his family circle. (Fig. 1).

Batch kilns are generally characterized as having a work chamber at the base from which the initial fire is started in the firebox and the finished lump lime (burnt lime or quicklime) is withdrawn. The charge chamber is situated vertically above and the overall shape of the chamber is best described in "Longie's" own words as "egg-shaped with the pointy end down and a nickle dip of ice cream on top" (Fig. 2). Most batch-type kilns are built on a hillside for ease of charging at the top and drawing lump lime out the base. "Longie's" present kiln produces about 18 tons of lump lime with a single charge of about 6 tons of creek coal and 30 tons of limestone. This kiln may have been built around 1850 and the remains of a smaller and much older kiln are located on the upper charging level. Very close to the restored kiln, "Longie" built a 36-ton batch kiln in 1935, of which only some chestnut timbers are

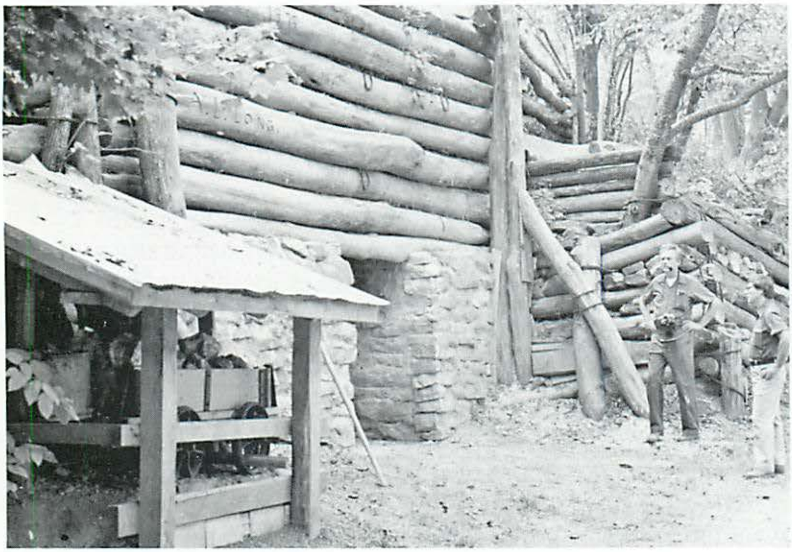


Fig. 1 Fred J. Meckley (right), who brought to our attention the Arthur L. Long batch kiln, and Donald T. Hoff discussing the hardships of burning lime. Notice the 1-ton (25-bushel) two-horse quarry wagon under the shed at left.

still visible. The ruins of 43 other batch kilns may be observed near the quarry.

QUARRY PROCEDURES — Today, we do not give much thought to producing 30 tons of variously sized crushed limestone. Many of the Commonwealth's limestone quarries average well over 100,000 tons per year. However, until about 1935, most stone was dug by hand. In 1926, when "Longie" started in the lime business at age 15, the only way to drill blast holes was by hand. A good man could drill 5 ft in a 10-hour day and was recompensed 2 cents per inch. Most holes were usually drilled at an angle to a depth of about 3 ft. Black powder was used for blasting until about 1930. At $2.25 for a 25-lb keg, black powder was considerably less expensive than dynamite. Drill holes were usually loaded and shot twice to save the labor of drilling additional holes. The first charge was meant only to crack the quarry face. Powder would be worked into these cracks for the second shot to ensure better breakage. Rubblization was completed with a 16-lb sledge held firmly between two hands. Sized limestone was loaded by hand and with a stonefork (Fig. 3) into wooden one-ton (25-bushel) two-mule wagons which would carry the stone to the kiln.

Arthur Long has developed his own geologic column for the approximately 40-ft-thick mining interval of the surrounding lime quarries. His experience and sharp eyes have subdivided most of the Byers Island Member of Keyser Formation into the following economic units from top to bottom:

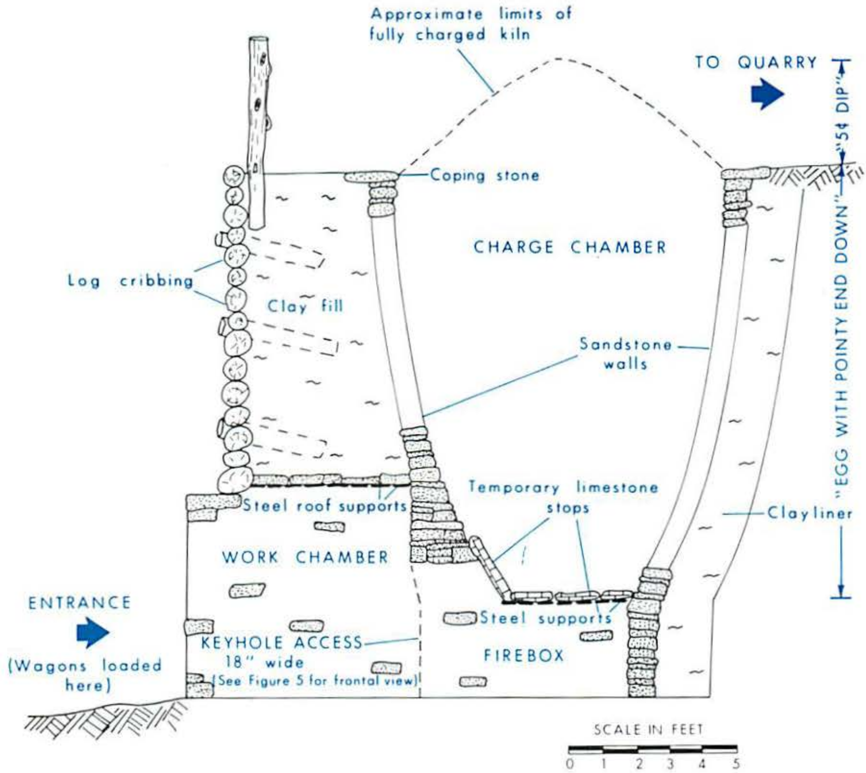


Fig. 2 Cross-section of the Arthur L. Long lime kiln. The firebox, shown here in longitudinal section, is used intially to ignite the charge above the steel supports and temporary limestone stops. The keyhole access provides draft to the firebox and charge chamber, and is used to extract the lump lime after the completed burn. Kiln is shown uncharged.

Thickness in Feet	Unit Name (from Pa. Deutsche)	Quality of Lime (as per Arthur Long)
variable	Turtle Stone (Shildrough)	"Gute Lime"
1.0	Clay Seam	"No Earthly Gute"
3.0	Pencil Stone	"No Earthly Gute"
15.0	Rough Stone	"Not as Gute Lime"
4.5	Flat Stone	"Gute Lime"
4.5	Curly Stone	"Gute Lime"
1.5	Cast Iron (Goose block)	"Gute Lime"
4.0	Solid Stone	"Best Lime"
?	Shale	"No Earthly Gute"

Fig. 3 Arthur L. Long using stonefork to load sized limestone. Notice 16-lb. sledge in foreground.

Fig. 4 View of an early charge "ring" of 4- to 6-inch limestone. Notice 1- to 4-inch-size limestone near chamber walls. 3 bushels of creek coal will follow.

Fig. 5 Samuel W. Berkheiser, Jr. tending the initial 3-5-hr. burn in the firebox. Notice long pole to the left with forked hooks used to extract the lump lime through the keyhole, which is clearly visible at rear of work chamber.

Hoskins (1970) reports that chemical analyses from this interval further west in Meckley's quarry range from 80.8 to 84.1 $CaCO_3$. The "Turtle Stone", "Rough Stone" and "Curly Stone" of "Longie" resemble nodular bedding that Head (1969) interpreted to represent sedimentary boudinage. The "Pencil Stone" is an argillaceous slate-like unit that breaks along bedding into long flat fragments. The "Cast Iron" and "Solid Stone" are covered by slump in most of the now-abandoned quarries, but "Longie's" description suggests a very finely crystalline limestone.

CHARGING THE KILN — The kiln charge is generally constructed of successively thicker "rings" (layers) of creek coal and limestone from bottom to top (Fig. 4). The creek coal comes from dredging to the north. The limestone was originally quarried by hand from the adjacent Keyser Formation. As a general rule of thumb, about 1.25 tons of creek coal is needed to produce 4 tons of lump lime (too much coal produces slag, whereas too little coal produces lump lime with stone cores). For an average-size kiln (450 bushels), it usually takes two men about 2 days to quarry the stone and charge the kiln.

FIRING THE KILN — The kiln is ignited by starting a *wood fire in the firebox, which is kept active 3 to 5 hours. The firebox is tended through a small opening in the work chamber called a keyhole (Fig. 5). The burn length is usually between 10 days and 3 weeks, depending on atmospheric conditions and the draft established through the keyhole and kiln charge. Slaked lime (hydrated lime) from previous burns is added to the "nickel dip" as the fire breaks through the cone. When the kiln is cool enough to permit, a temporary roof is constructed over the "nickel dip" to keep rain out and prevent the quick lime from hydrating and expanding in the kiln (Fig. 6).

*Deleted adjective used by A. L. Long indicating his opinion of the low value of the wood used.

Fig. 6 Constructing temporary roof over "nickel dip" at the end of the burn. Notice the lime on the cone which was used to snuff out burn-throughs.

Fig. 7 Arthur L. Long hefting a "Gute Bushel" of lump lime. Notice the position of the handles on the bucket for ease of dumping. Also, the keyhole is just visible behind "Longie".

A burning kiln requires daily attention. Care must be taken to avoid suffocation from the carbon dioxide gas that is released. Chemically, the heat changes the limestone from calcium carbonate to calcium oxide (quicklime) liberating carbon dioxide gas. If water is added, the quicklime changes to calcium hydroxide (hydrated lime), which is known as slaked lime. This was the main agricultural liming material and outhouse sanitation agent until about 1945. Whitewash, which was a valuable preservative and sanitation material applied to the interior of dairy barns, is made by adding excess water.

MARKETING LUMP LIME — Until about the late 1940's, agriculture was the main end use of the burnt lime. In fact, many farmers in the valley had their own lime kilns. Even those few individuals who produced lime as a major occupation usually had another job. The demand for lime as a soil neutralizer was replaced with pulverized limestone and most batch kilns in the Commonwealth became dormant by 1950.

Horse and wagon or horse and sleigh were the main modes of transportation in the heyday of lime burning. The market area for a kiln was generally about a 30-mile radius. Wagons would be pulled up to the work chamber and loaded with wooden bushel buckets as soon as the lime was cool enough to handle (Fig. 7). The lump lime (quicklime) was extracted through the keyhole. A long pole with two hooks on the end helped to bring the lump lime through the keyhole and into the work chamber. If one had survived the ordeal of quarrying the stone and charging the kiln by hand, and hadn't succumbed to the CO_2 from the burning limestone, the operator could look forward to having the lump lime dust irritate the skin. If there was moisture present on the skin, the lime dust would hydrate and cause a burning sensation. Hydrating lump lime can "hard boil a raw egg". The quicklime and coal ash all were sold as part of the deal. Obvious slag would usually be discarded. Pulverized lump lime was not popular until the late 1940's when mechanized spreading became feasible.

The capacity of a wagon or sleigh (25, 50, or 60 bushels) determined the size of the horse or mule team (2, 4, and 5 respectively). For the far reaches of the market area, "Longie" can remember starting for the destination with the loaded sleigh at 1:00 am, spreading the lump lime during the day, staying overnight with the farmer, and returning home the next day. The lump lime was applied directly to the fields, usually at the rate of 2 tons per acre or one bushel every ten steps. The quicklime would air slake (hydrate) in the field and could be spread from the slaked piles with a shovel at a later date. Using the above formulas, one average size kiln (450 bushels) would cover about 9 acres.

CONCLUSION — Pennsylvania is now one of the nation's leading lime producers. The end use of lime has changed over the years. However, we occasionally need to look back to realize how far we have come. "Longie" plans to burn lime every fall and will welcome visitors, especially strong ones, to what he fondly refers to as the "Long's Ponderosa". We are indebted to Arthur L. Long for sharing this glimpse back into our mineral heritage to a time when the best pair of work boots in the Sears and Roebuck Catalog cost $2.25.

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Hoskins, D.M. (1976), *Geology and mineral resources of the Millersburg 15-minute quadrangle, Dauphin, Juniata, Northumberland, Perry, and Snyder Counties, Pennsylvania,* Pa. Geol. Survey, 4th ser., Atlas 146, p. 7 and 34.

Humor (?) In Geology

The following is excerpted from the Journal of Geologic Education, 1980, vol. 28, as authored by Diane Baclawski of the Geology Library, Michigan State University.

What do you get when you scare a tree to death?
Petrified Wood

What rock is cleaner than dirt?
Soapstone

On a hot day, what does a geologist use to cool off?
An alluvial fan

Who is the geologist's favorite actor?
Rock Hudson

How does a geologist buy his milk?
In quartz

Which popular music group is the favorite of geology students?
Rolling Stones

Where do coastal and marine geologists go to relax after a hard day's work in the field?
To an offshore bar!

Why does a geologist play baseball in his spare time?
So he can run on a diamond

SURVEY ANNOUNCEMENTS

STATE BOOKSTORE MOVES

The State Bookstore has moved its Harrisburg retail, over-the-counter outlet to the Capitol complex in Harrisburg and is now located in Room G-56 (ground floor) of the South Office Building. This location, behind the Capitol Building and the Old Museum Building, is very accessible to anyone visiting Harrisburg. The bookstore stocks all of our geological publications and is open 8:30 a.m. to 4:00 p.m. The address for mail order publications remains the same: P. O. Box 1365 Harrisburg, PA 17105

NEW OIL AND GAS PIPELINES MAPS

An updated and revised pair of maps has been issued by the Pennsylvania Geological Survey, one showing the principal crude oil and product pipelines in the state, and the other showing the principal natural gas pipelines of Pennsylvania.

Published in 2 colors on a scale of 1:500,000 (1 inch equals 8 miles) these maps will be of interest not only to the oil and gas industry, but also to land use and energy planners, industrial developers, municipal officials, and anyone concerned with the accessibility of these critical energy resources.

The two maps are published in a packet as Map 62, "Natural Gas Pipelines and Crude Oil Pipelines of Pennsylvania" and are available from the State Book Store, P. O. Box 1365, Harrisburg, PA 17125. The mail order price is $6.25 (plus 38¢ tax for Pa. residents); check should be payable to "Commonwealth of Pennsylvania".

SURPLUS GRAND ATLASES AVAILABLE

Approximately 50 surplus volumes of the Grand Atlas series of the Second Geological Survey of Pennsylvania (1874-1889) are available free of charge on a first-come, first-serve basis here at the Bureau of Topographic and Geologic Survey. Turned over to us by the Historical and Museum Commission, the Grand Atlases contain many beautiful maps and sections of the bituminous and anthracite coal regions, and oil and gas regions of southeastern Pennsylvania. None of the plates are folded, and many are suitable for framing. The volumes will not be mailed and may only be obtained in person. Inquiries must be directed to Arthur Socolow, State Geologist, P.O. Box 2357, Harrisburg, PA, 17120. The telephone number is 717-787-2169.

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7th Fl., Highland Bldg.
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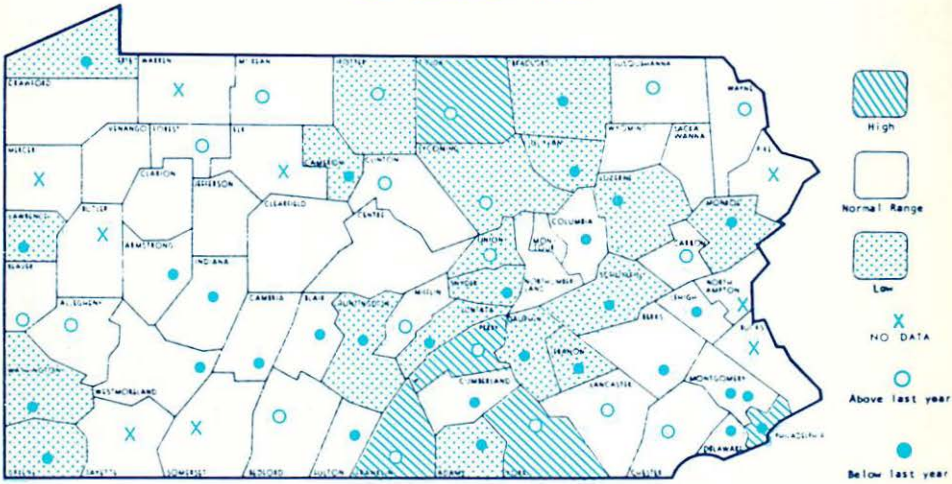
GROUND-WATER LEVELS FOR SEPTEMBER 1983



Bureau of Topographic and Geologic Survey
Dept. of Environmental Resources
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