Chester Historical Society's
NEWS & VIEWS
November 2021

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Dear CHS Members and Friends, I hope 2021 has been a safe, sane, and sanguine year for you, friends, and family. This newsletter has some surprising parallels to the HBO epic fantasy series *The Game of Thrones* which featured fire, ice, the iron throne, and dragons. In this newsletter the "fire" commemorates the 100th Anniversary of the Chester Volunteer Fire Company. "Ice" is a description of Chester's last ice age by Professor John Puffer. Instead of "the iron throne" and "dragons" we have pig iron and a blast furnace in the article *The History of the Chester Furnace Historic Site*. It is a teaser providing background for the upcoming CHS YouTube video on the Chester Furnace Historic Site. Enjoy the journey. ☼

Commemorating the 100th Anniversary of the Chester Volunteer Fire Company

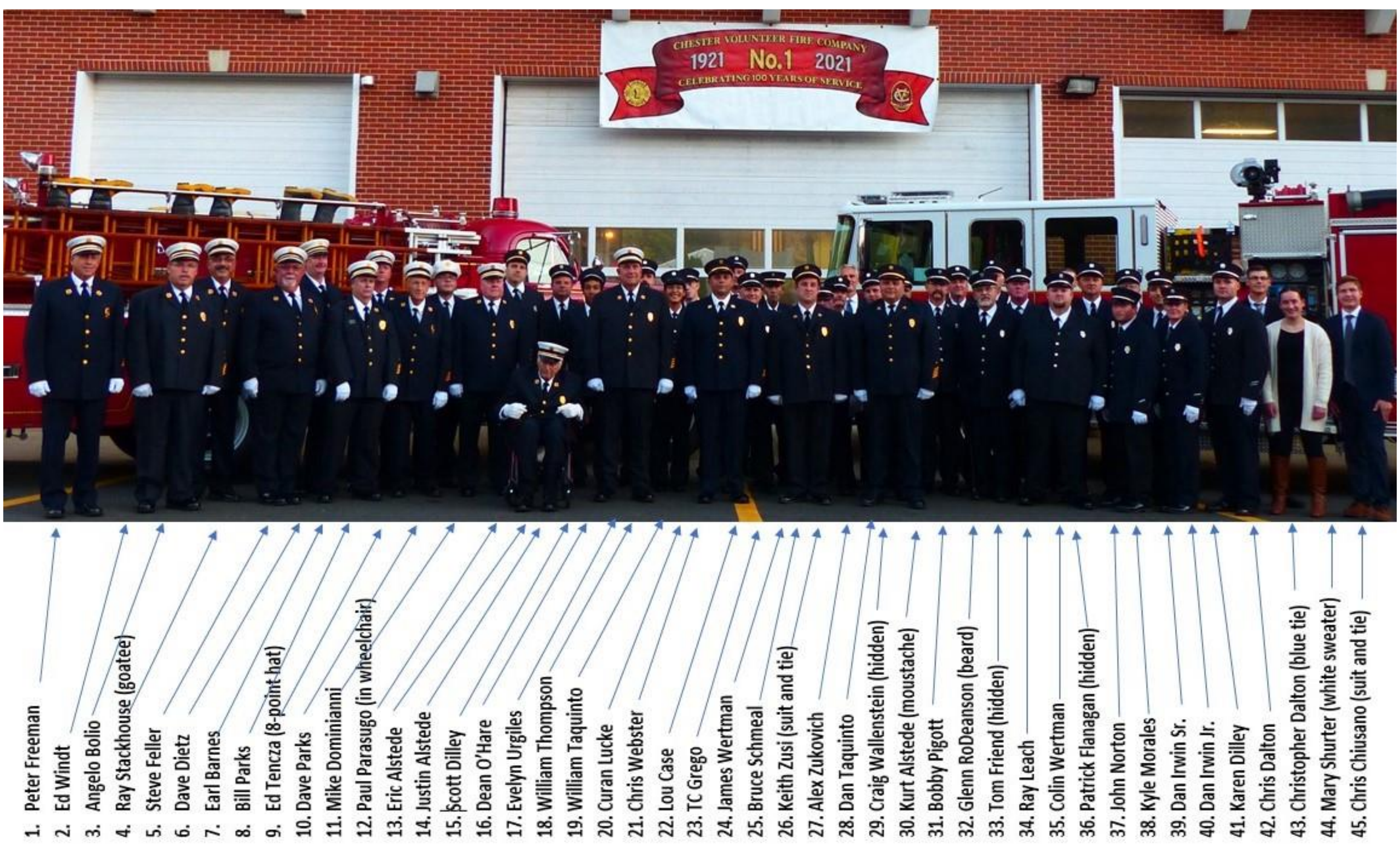
By Edward Ng – Chester Historical Society

The Chester Volunteer Fire Company (CVFC) was organized on October 21, 1921. The first Chief, President, Secretary, and Treasurer were Austin Nichols, W. Ashford, Lloyd Treadway, and G. Bodine, respectively. In 1922, the first firetruck was assembled at Chamberlain's Garage (30 Main St.) by mounting a chemical tank on the chassis of a Pierce Arrow auto (below left). Ironically, the newest apparatus is a 2020 Pierce Enforcer (below right) but is a far cry from the Pierce Arrow[1]. The first firetruck is shown on a trailer at the 1949 Fourth of July parade in Chester. It was a favorite in many parades.

[1] Thanks to Joan Case for providing the Pierce Arrow image. The Pierce Enforcer image was purchased from njfirepictures.com.

William Tredway gave CHS a photo of the members of the original company (right). He noted that members came from Chester, Flanders, and Long Valley. Lloyd Treadway provided the names for the Company. Sitting on the bumper are John Fragamane and Ray Croot; kneeling are Paul Sutton, George Dosa, and Charles Skillinger; left of the truck are Alvin Martensi, unknown, and Bill Furrier; on top of the truck from left to right are Walt Barkman, unknown, Bill Strait, and Duke Hartwell. Alvin Van Fleet and Austin Nichols are sitting behind the steering wheel; standing are Everett Vanover and Charles Sharp; standing to the right of the truck are Ted Cavanough, Tom Barker, Bill Cramer, G. Bodine, Lloyd Treadway, Buldger Blaine, and Bill Sturganger.

One hundred years after its founding, the Chester Volunteer Fire Co. No. 1 met to celebrate its centenary on October 21, 2021. The CVFC posed in front of the firehouse for this image. Thanks to President Colin Wertman for identifying each member. What else has changed?



In 1922 the land for the firehouse was purchased. The first Firemen's Carnival was held there that year. The original firehouse was a wooden 20' x 30' building and built in 1923 (below left). Over the next 100 years, the firehouse expanded outward and upward to house the increasing number of apparatuses as shown in the image from 2018. Note that the original fire alarm which was made from a locomotive wheel and mounted on a stand, is essentially unchanged. The fire alarm wheel is adjacent in the images below. Someone wanting to sound the fire alarm would just hit the wheel with a sledgehammer.

Returning to the 100th Commemoration ceremony. The Company marched east from the firehouse on Main St. then turned left to 47 Hillside Rd. where they held their 120th meeting. They marched past the sentimental favorite, the red 1959 Dodge Power Wagon, "The Turtle". Current homeowners, Anita and Greydon Rhodes, welcomed them to their house, just as Lloyd Tredway welcomed the Company to the same house for the first meeting. Ed Windt, John Norton, and Colin Wertman (L-R) ran the CVFC's business meeting.

After the meeting, everyone headed back to the firehouse for a reception meal. The most senior members, Dave Parks, Paul Parasugo, and Bill Parks (L-R) sat for a special picture.

In the image below left, Morris County Commissioner John Krickus presented Chief Scott Dilley with a Morris County Resolution honoring their 100th Anniversary. The 2022 Administrative Officers assembled for a group photo: from L-R Treasurer Ed Windt, Assistant Secretary Karen Dilley, Secretary John Norton, President Curran Lucke, and 2021 President Colin Wertman. Not shown are V.P. Steven Feller and Assistant Treasurer Louis Case.

The image to the right shows the 2022 CVFC Line Officers who assembled before the 100th Anniversary ceremony for this photo. Left to right: First Assistant Chief Daniel Taquinto, Deputy Chief Thomas Grego, Chief Daniel Taquinto, outgoing Chief Scott Dilley. Not shown is Second Assistant Chief Christopher Dalton.

We wish them and the CVFC good fortune in the years to come. We will have more on the CVFC's 100th on the CHS website soon. ☼

The Pleistocene (Ice Age) of Chester, New Jersey

By John H Puffer, Professor Emeritus, Rutgers Univ.

Ice Ages. There have been 5 major ice ages in the earth's history. The first was 2.4 billion years ago, the second 850-650 million, then 460-420 million, then 360-260 million, then finally the current ice age that began 2.6 million years ago and is still ongoing. The effect that the first four ice ages had on what is now the Chester area is unknown. All evidence has either eroded away, or Chester was not impacted. It is also difficult to know exactly where Chester was during previous ice ages because continental plates have been in constant motion throughout Earth's history. Typically ice ages occur whenever major continents drift toward one of the earth's poles then fluctuations in the earth's orbit and the CO_2 content of the atmosphere cause fluctuations in ice development. During the Pleistocene the earth's temperature and the gas largely responsible for the warming greenhouse effect (CO_2) have been very closely correlated (Figure 1).

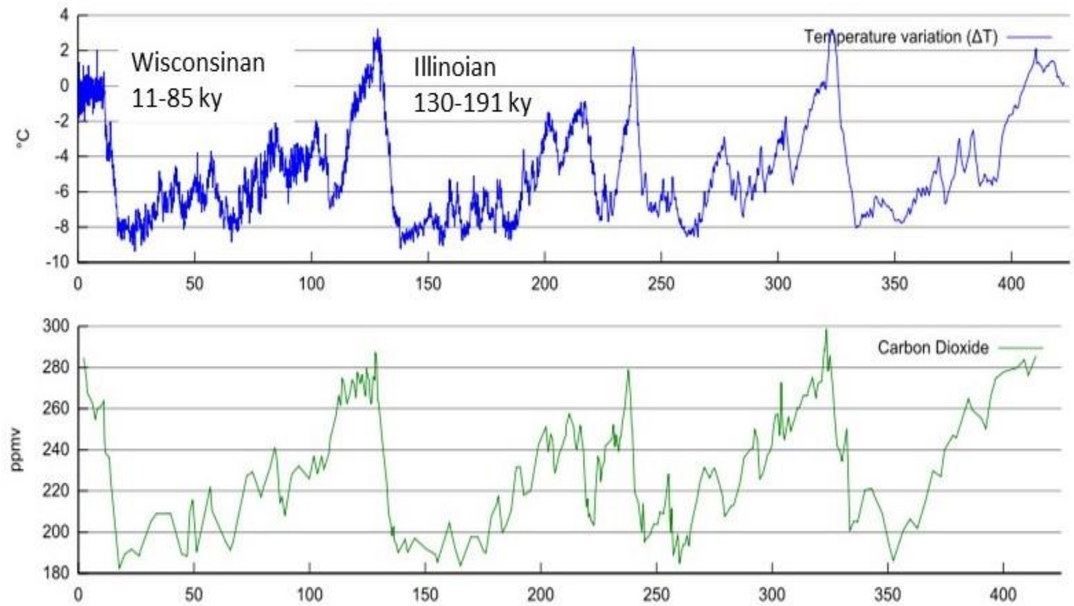


Figure 1. Temperature and carbon dioxide data collected from the Vostak Ice Cores (Petit and others, 1999) going back to 420,000 years before present. Note the very close correlation between temperatures and carbon dioxide content.

Pleistocene. The current ice age began 2.588 million years ago when ice sheets started to build up in the Arctic and advance south as glacial stages. Then partial ice melt periodically caused retreat north as interglacial stages. Only the last two stages of glacial advance have been accurately mapped. The most recent advance was the Wisconsinan Stage that lasted from 85,000 years ago until 11,000 years ago. The previous advance was the Illinoian Stage that lasted from 191,000 until 130,000 years ago. Geologists have decided to simply group the Pre-Illinoian stages together and refer to them as simply Pre-Illinoian.

The Wisconsinan and Illinoian stages are easily located on the graphs of temperature and CO_2 content in the earth's atmosphere (Figure 1) where the temperature and CO_2 dropped to the low points of Pleistocene fluctuations. The graph shows that we currently may be in an interglacial interval based on data collected from the Vostok, East Antarctica Ice Cores published by Petit and others (1999). A variety of data collected from the 3623 m thick ice cores, including oxygen isotopes, provides good indirect evidence of atmospheric temperatures and CO_2 content back to 420,000 years before present. More precise global records of climate based on direct measurements of the atmosphere began in the 1880s. In August 2018 it was reported that the earth reached the warmest temperatures in the last 120,000 years ago (Kaufman, 2018) during the peak of the interglacial warming of the

Pleistocene between the Wisconsinan and Illinoian stages (Figure 1). In May 2013 direct atmospheric readings of CO_2 surpassed 400 ppm (parts per million) for the first time since at least 4.5 million years ago on the basis of paleoclimate evidence (Clark, 2013). Since May 2013, global CO_2 levels have steadily increased to an average of 412.5 ppm in 2020 (Lindsey, 2021). We are, therefore, not currently experiencing a typical interglacial climate but are in a historically extreme CO_2 event that almost all climatologists believe is largely caused by fossil fuel combustion.

Glacial Erosion and Deposition near Chester. Arctic accumulations of snow during the glacial stages compressed into ice sheets that reached thicknesses of 2 miles, approximately the same thickness of today's oceans. These accumulations of ice slowly flowed south picking up soil, sand, and loose rock as they moved. The sand and rock content of the ice ground down the underlying rock and created smooth, rounded surfaces and inverted spoon shaped hills when hard rock was encountered or shallow valleys wherever soft rock was encountered. Many of these valleys filled with water to become glacial lakes. As warmer, subarctic temperatures were encountered at mid-latitudes, such as Chester New Jersey, the ice sheets melted creating a pile of rock and sand. As more ice flowed south the piles grew into wide hill shaped accumulations called terminal moraines. The terminal moraine of New Jersey occurs as a discontinuous hill about 2 miles wide and hundreds of miles long composed of a mixture of clay, silt, sand, pebbles, cobbles, and boulders. The low hill at the intersection of Rt 80 and Rt 15 near Dover is a good example of a terminal moraine.

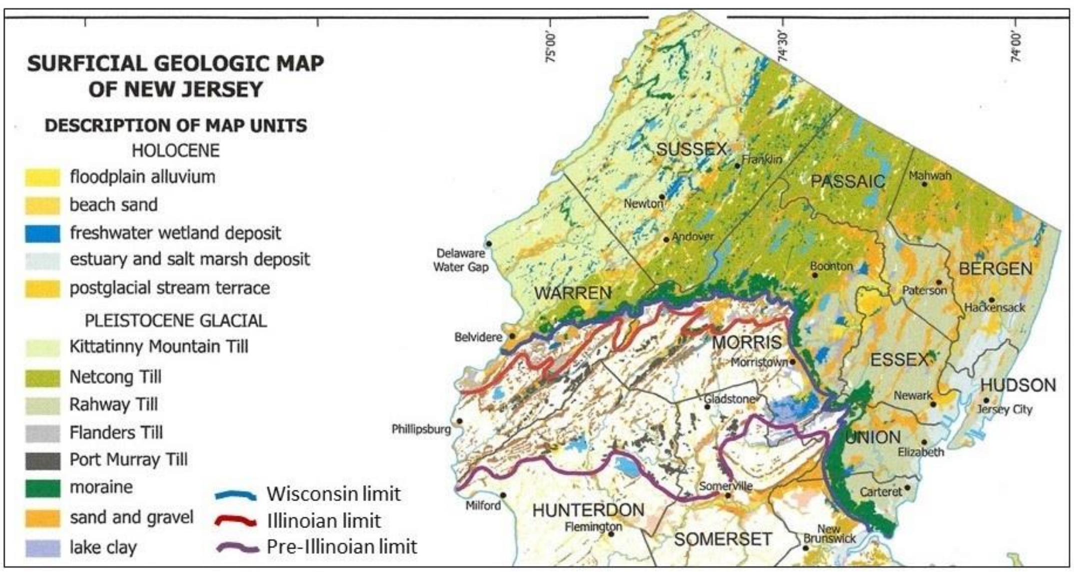


Figure 2. The northern half of the Surficial Geologic Map of New Jersey (2016) by the New Jersey Geological and Water Survey.

Most of what we know about the Pleistocene of New Jersey is due to the work of the New Jersey Geological Survey (NJGS) or what is now the New Jersey Geological and Water Survey. Possibly the earliest placement of the terminal moraine through New Jersey was mapped on "the State of New Jersey Surface Geology" by Cook and Smock (1878). They place the terminal moraine along an east-west line along the northern shore of "Budds Lake" later renamed as Budd Lake. This same placement of the terminal moraine appears on the NJGS "Geologic Map of New Jersey" by Cook (1889). A minor change in placement appears on the NJGS "Map Showing the Direction of Ice Movement in Northern New Jersey" by Kummel et al (1902) which shows the Pleistocene ice sheet moving directly south and terminating along and irregular east-west line located north of Budd Lake about halfway between Budd Lake and Lake Hopatcong. During the last one hundred years considerable work has been done by the NJGS and others to gradually improve on these early maps. Recent work has determined that three lines can now be plotted on the map; one representing the southern limit of the Wisconsinan ice sheet, another representing the southern limit of the Illinoian ice sheet, and a third representing the southern limit of any known pre-Illinoian glaciation. These efforts have

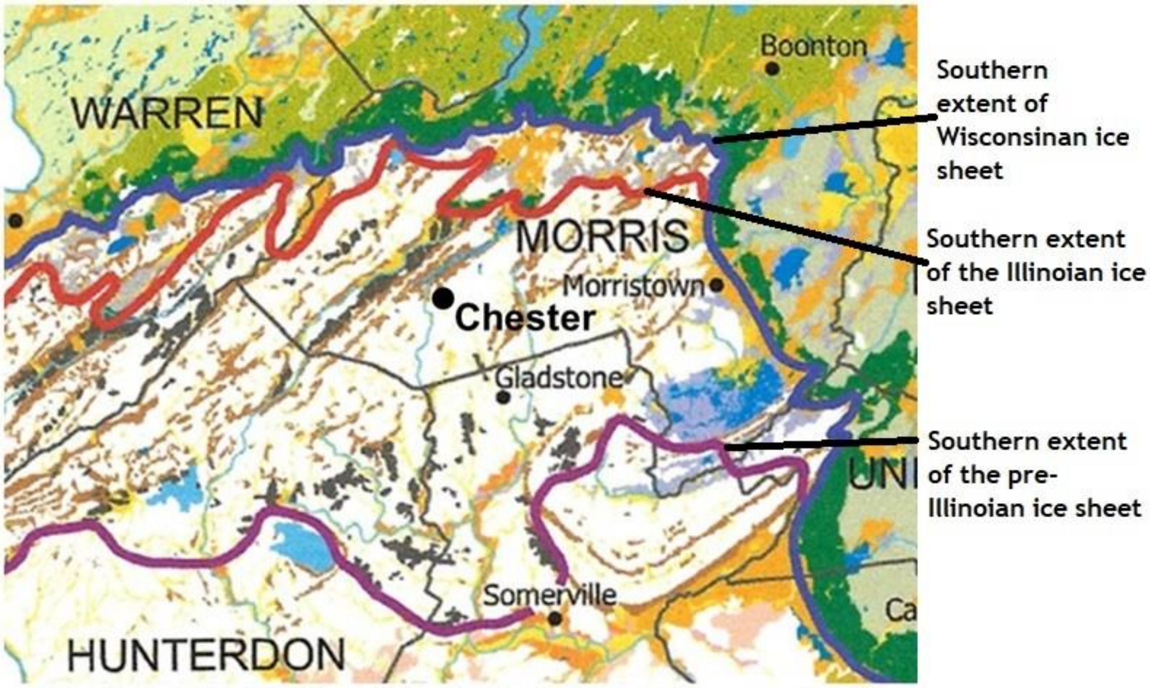


Figure 3. Central detail of Figure 2 showing Chester located in the area south of the Wisconsinan ice sheet (blue line) but north of the southern edge of pre-Illinoian glaciation (purple line).

culminated in the most recent (2016) map by the New Jersey Geological and Water Survey titled "Surficial Geologic Map of New Jersey" (Figures 2 and 3). The new map is a simplification (scale 1:1,000,000) of a recent USGS map (scale 1:100,000) by Stone and others (2002). It shows that Chester is located about halfway between the southern boundaries of Wisconsinan and the southern boundary of pre-Illinoian glaciation.

The Port Murray Till. Most evidence of glaciation within 10 miles north and 15 miles south of Chester has either been eroded away or was never developed to the extent of the areas north of Budd Lake. However, all of Chester was glaciated by pre-Illinoian ice sheets. Figures 2 and 3 show that pre-Illinoian "Port Murray Till" was deposited and is still exposed along Bartley Road and the upper bank of the South Branch of the Raritan River near the north-west edge of Chester. The Port Murray Till was probably deposited during the early Pleistocene between 2.5 million years ago and 800,000 years ago as till (an unlithified mixture of clay, silt, sand, gravel, and boulders that was carried by a glacier until it melted). The Port Murray Till is reddish-yellow and rich in clay and is only preserved on flat uplands.

Pleistocene Colluvium. Figures 2 and 3 also indicate a brown map pattern on both sides of Black River through Chester. The brown pattern represents nonglacial Pleistocene colluvium. Colluvium is a loose deposit of rock debris accumulated through the action of rainwash, gravity (avalanche debris), soil creep, or frost action at the base of a gentle slope or cliff.

The Hills of Chester. The shape of all the hills of Chester, including Mount Paul and Seward Hill, have been modified by Pleistocene glaciation. The erosive power of glaciation has reduced their size and smoothed off most rough terrain leaving gentle slopes and ridges. Hills including Seward Hill on Patriots Path near Rt. 24 and Mt. Paul in Mt. Paul Memorial Park located east of E. Fox Chase Road have both been glaciated. Seward Hill underwent additional modification during landscaping by AT&T Bell Labs researchers. The gentle ramp on the north side was bulldozed and a bunker was cut into the western side.

Glacial Lake Succasunna, Black River, and the Cooper Mill. Harper (2013) researched and wrote about the development of Glacial Lake Succasunna. The 10-mile-long glacial lake drained and all that remains is the wide and flat marshy flood plain of the Black River Wildlife Management Area (right). Harper has found that before Illinoian glaciation the Black River drained northward, but then became blocked when the Illinoian "wall of ice" advanced into the Black River valley. The valley then ponded to become a glacial lake that drained south through Cooper Mill. The knolls along Ironia Road west of Ironia were built at the edge of the ice sheet. The Black River resumed northward flow but was blocked again by the Wisconsinan glacier. Silt deposited into the lake during Wisconsinan glaciation filled the valley to an elevation higher than the out-flow stream at Cooper Mill and prevented the Black River from returning to its northward course after the ice melted. The Black River, known as the Lamington River, downstream from Cooper Mill, still flows south into Hacklebarney State Park (Figure 4). ☼

References

Clark, P. (2013). "CO2 at highest level for millions of years". Financial Times. Retrieved 27 May 2013.

Cook, G.H. and Smock, J.C. (1878), The State of New Jersey Surface Geology, New Jersey Geological Survey, map collection.

Cook, G.H. (1889), Geologic Map of New Jersey, New Jersey Geological Survey, map collection.

Harper, D.P., (2013), Roadside Geology of New Jersey, Mountain Press Publishing, Missoula, Montana, 345 pp.

Newell, W.L., Powars, D., Owens, J.P., Stanford, S.D. and Stone, B.D., 2000. *Surficial geologic map of central and southern New Jersey*. US Geological Survey.

Petit, J.R., Jouzel, J., Raynaud, D., Barkov, N.I., Barnola, J.M., Basile, I., Bender, M., Chappellaz, J., Davis, M., Delaygue, G. and Delmotte, M., 1999. Climate and atmospheric history of the past 420,000 years from the Vostok ice core, Antarctica. *Nature*, *399*(6735), pp.429-436.

Salisbury, R.D., 1902, The Glacial Geology of New Jersey, NJ Geol. Survey, Final Report 5.

Stanford, S.D., 1993. Late Wisconsinan glacial geology of the New Jersey highlands. *Northeastern Geology*, *15*, pp.210-223.

Stanford, S.D., 2010, Surface Geology of the Hackettstown Quadrangle, Morris, Warren, and Hunterdon Counties, New Jersey, NJ Geol. Survey, Open-File Map OFM-79, scale 1:24,000.

Stanford, S.D. and Harper, D.P., 1991. Glacial lakes of the lower Passaic. *Hackensack, and Lower Hudson Valleys, New Jersey and New York: Northeastern Geology*, *13*(4), pp.271-286.

Stone, B.D., Stanford, S.D. and Witte, R.W., 2002. *Surficial geologic map of northern New Jersey* (No. 2540-C). US Geological Survey scale 1:100,000.

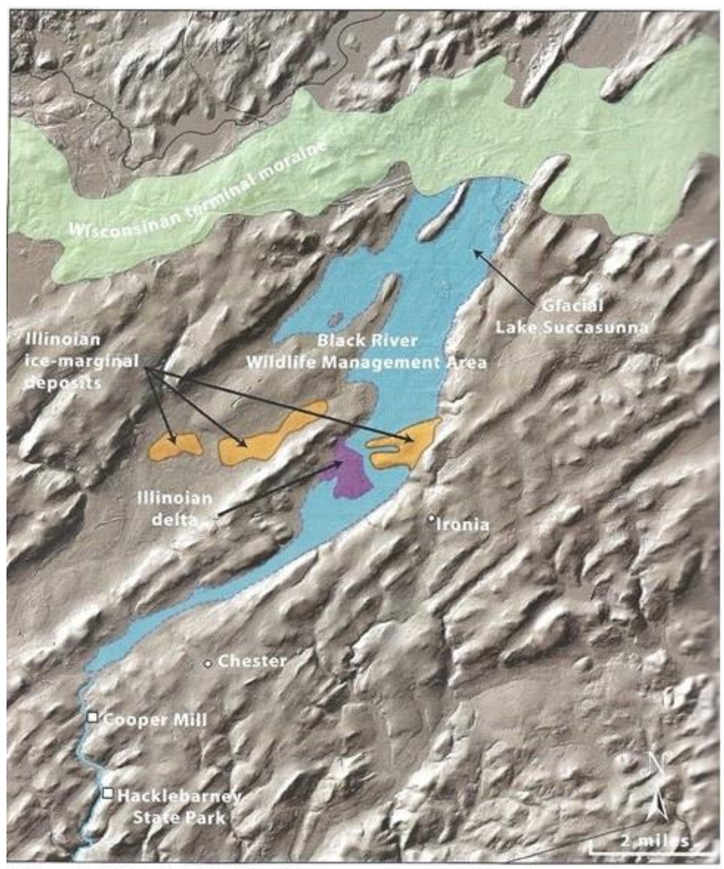
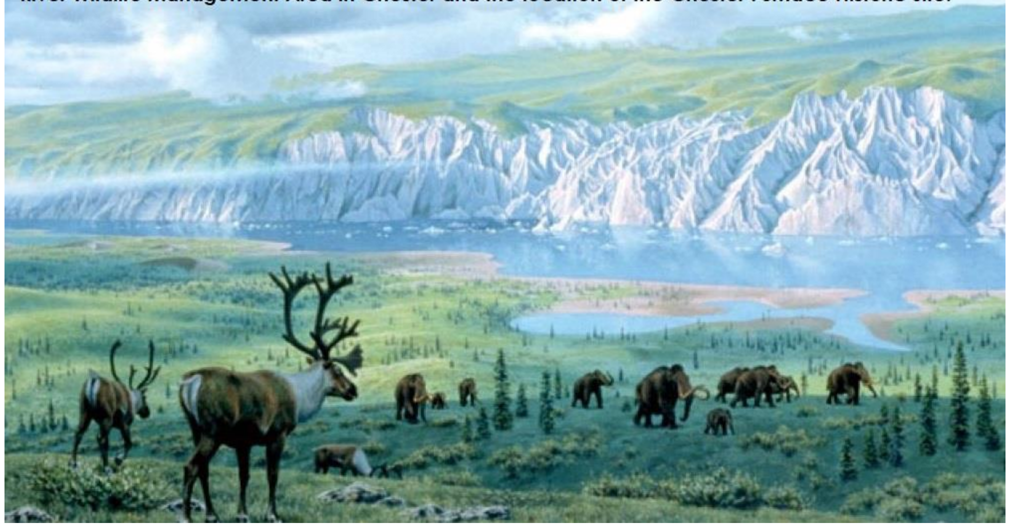


Fig. 4 Glacial Lake Succassuna developed when the Black River drainage was blocked by the Wisconsinan ice sheet (Harper 2013). The lake then filled up with silt and the Black River drained south at Cooper Mill.

The History of the Chester Furnace Historic Site

Edward Ng – Chester Historical Society

The Chester Furnace Historic Site brings to life one of the most unique periods in Chester's history. But like a good novel the story has many layers. On the surface it is a nice hike on Patriots' Path and along the Black River. But because most of the physical evidence is gone, the deeper story can be lost. Hopefully Prof. Puffer's article and this one will bring to life the site's fascinating history.


Glacial Lake Succasunna and Wisconsonian Ice Sheet at least 11,000 years ago. Now the Black River Wildlife Management Area in Chester and the location of the Chester Furnace Historic Site.

The Setting. The Furnace Historic Site is in the Black River Wildlife Management Area (BRWMA) which has quite a history. During the last ice age (11,000-85,000 years ago), the Wisconsinan ice sheet did not get as far south as Chester. This helped create glacial Lake Succasunna which would have encompassed the Furnace Site[2]. The ten-mile-long lake extended northeasterly from the current location of the Cooper Mill towards Randolph. Just as the BRWMA is relatively flat and marshy, so was the area around glacial Lake Succasunna. The caribou and wooly mammoths in the artist's depiction[3] are long gone, but the impact of another inhabitant remain – the indigenous people, the Lenape. Research reported in 2021 shows that humans were in the White Sands National Park, New Mexico, 21,000-23,000 years ago[4]. The abstract states: *These findings confirm the presence of humans in North America during the Last Glacial Maximum, adding evidence to the antiquity of human colonization of the Americas and providing a temporal range extension for the coexistence of early inhabitants and Pleistocene megafauna.* It is therefore reasonable to visualize the indigenous people, the Lenape, in this scene on the shores of Lake Succasunna.

The history of the Lenape since their arrival in New Jersey is meticulously recounted in Herbert C. Kraft's encyclopedic book, *The Lenape-Delaware Indian Heritage - 10,000 BC to AD 2000,* published in 2001. He provides copious supporting evidence that the Lenape were in New Jersey during the last ice age. Frances Greenidge, in her book *Chester, New Jersey – A Scrapbook of History – 1713-1971*, writes about the Lenape history in and around Chester. She reports that thousands of Lenape arrowheads and hundreds of spears, tomahawks, axes, drills, hoes, grinding stones, polishing stones, pendants, and pottery pieces were found on Chester farms and fields. Due to disease and disruption from European settlers, many Lenape left for other lands in New York and Pennsylvania. She also noted that their name for the river now in BRWMA was "Allamatunk" meaning "black rock bottom" or "black earth bottom" which the early settlers adopted and adapted calling their village, "Black River". It

[2] Puffer, John. "The Pleistocene (Ice Age) of Chester, New Jersey". *November 2021 Chester Historical Society News & Views.*

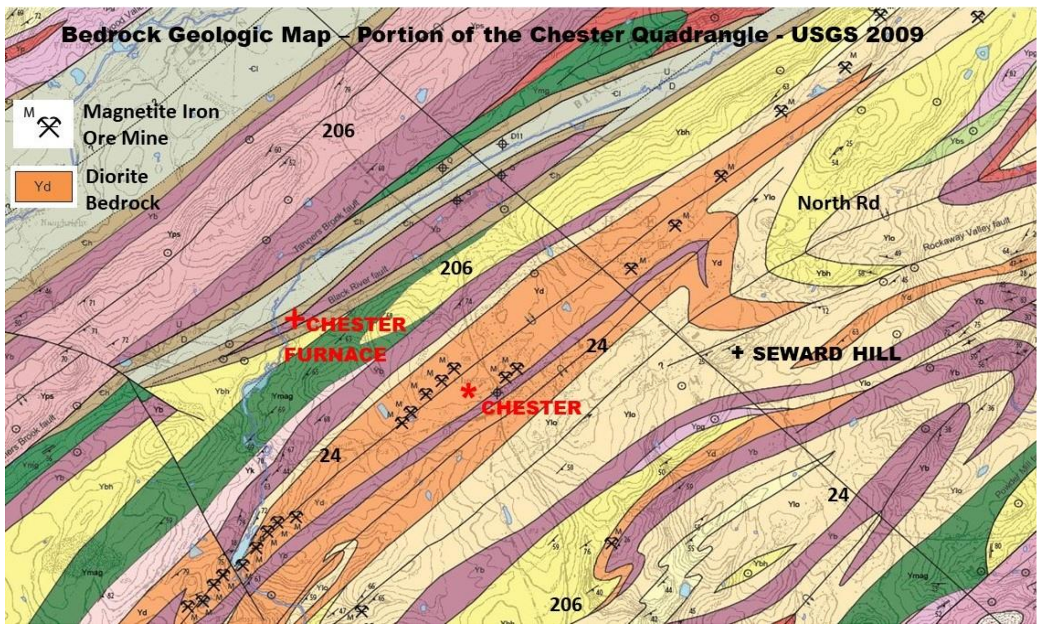
[3] Environmental Stewards, Rutgers University. 2012. "The Glacial Geology of New Jersey – Lecture Notes".

[4] Bennett, Matthew R. et al. 2021. "Evidence of humans in North America during the Last Glacial Maximum". *Science* **373**, 1528

was not until 1799 when the town name "Chester" was made official when Chester Township was created from a portion of the Township of Roxbury.

Greenidge also noted that Chester's "Great Roads" were based on Lenape trails. They bisected Chester, brought commerce and travelers to the village, and were used to export Chester's agricultural products. One of the Great Roads ran between Sussex NJ and New Brunswick NJ which was the furthest inland point on the Raritan River that large ships could travel to land their cargo, so that road was called the "Landing Road". A portion of the Landing Road runs on Main St. and north on Hillside Rd. The other Great Road connected Elizabethtown (the first NJ capital now Elizabeth) in the east and Phillipsburg NJ in the west. Part of this road is Chester's Main Street. It would later be part of the Washington Turnpike.

In 1867 there was a remarkable discovery on Main St. (Rt. 24), just a couple of miles from the future Furnace Site. Perry Skellenger, while digging an icehouse behind his buildings at 2 and 11 Main St. found "a block of black rock" which he recognized as iron ore[5]. A vein of iron ore was soon identified, running behind the buildings on Main St. all the way to North Road. The Chester iron boom was born.

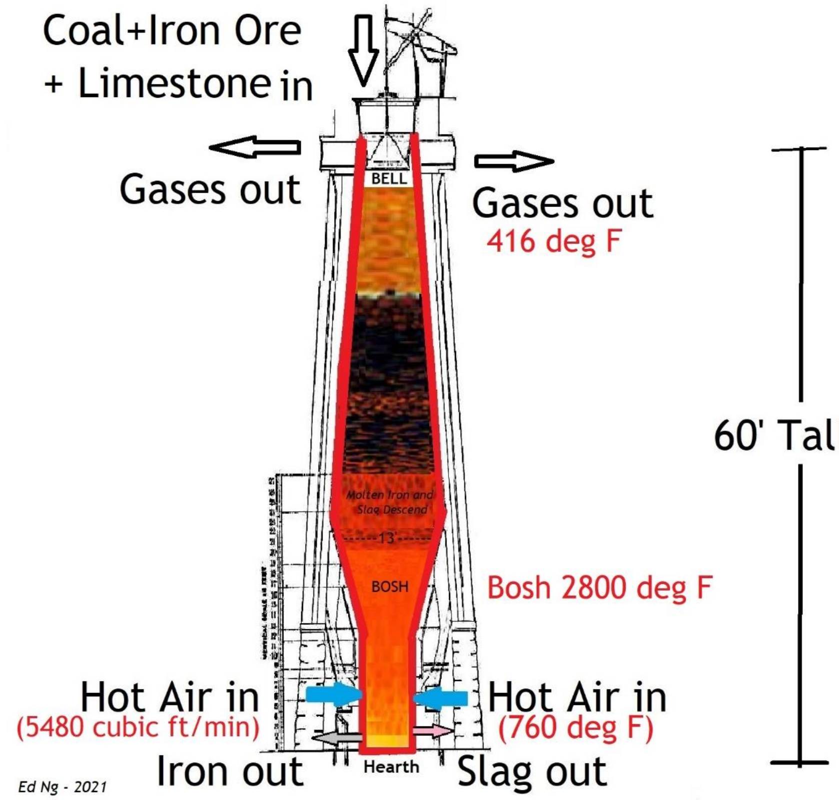


Chester was blessed with seams of iron ore mostly in the form of magnetite which could be found in the diorite bedrock which transverses Chester in a southwest to northeast direction encompassing Main St. The USGS Bedrock map shows the diorite bedrock (orange band) punctuated by over 20 mines . The most common type of Chester iron ore was magnetite. The iron in magnetite is composed of three iron atoms bound to four oxygen atoms (Fe_3O_4). There are two major challenges to converting the ore to metal. The first challenge was how to remove the four oxygen atoms from the magnetite to yield metallic iron, Fe. The second challenge was that even the rich Chester iron ores were only 50-60% Fe and there were many extraneous materials, such as sand and sulphury minerals, mixed in with the ore.

The solution to the two challenges was the blast furnace. Basically, a blast furnace is a tall, irregular cylinder with an inverted bottle shape, lined in firebrick. The top of the cylinder had a mechanism called the bell to allow raw materials to drop in. A firebrick-lined hearth was at the bottom. There were small openings above the hearth to allow blasts of hot air to enter called "tuyeres" and opening(s) at the top to allow gases out. Below the tuyeres are openings or taps, just above the hearth, to allow molten iron to flow out and openings or taps above the iron taps to allow lighter waste, slag, to flow out.

[5] Greenidge in her book cites this reference: Tuttle, Joseph F. 1876. *The Annals of Morris County*

The Chester Furnace. One of the most advanced blast furnaces of that era was built by William Johnston Taylor. We don't have engineering drawings of the Chester Furnace, but I have used his writings on furnaces to make a sketch. Taylor was an engineering genius[6].



The Chester Furnace's blast furnace was an inverted bottle shaped, 60-foot-tall chimney, enclosed and supported by an iron and masonry shell. The inside walls were lined with firebricks. The opening at the top of the Furnace was 5 feet wide. The widest part of the Furnace was 13 feet and was at the top of the main combustion chamber, called the "bosh". The furnace enclosed and facilitated the chemical reactions needed to remove the oxygen atoms from the magnetite and remove the extraneous materials in the ore.

In addition to the ore, the reactions require four other inputs: a carbon source, limestone, oxygen, and heat. The carbon for the chemical reactions came from a combination of anthracite coal and coke (a form of coal that has been roasted without air and is a contraction of "coal-cake"[7]). Since the combination was 90% anthracite coal, for simplicity let's call it "coal". Limestone is another critical input. It is not only a source of carbon, but its byproducts react with the ore impurities to form a removable waste material called slag. The two other critical inputs to the chemical reactions were heat and oxygen. Heat and oxygen came from air-blast ovens outside the furnace. A great deal of heat came from coal combustion inside the furnace.

The overall process is illustrated in the above diagram. Air was heated to 760 degrees F. by a blast oven. A nearby steam engine provided power to air pumps which blew 5480 cubic feet of air per minute through the inlets near the base. The hot air rose. As the iron ore, coal, and limestone slowly descended, chemical reactions occurred. The combustion of the coal created a great deal of heat. A molten mixture of those materials collected above the hearth in the bosh where temperatures reached 2800 degrees F., the melting point of iron. The chemical reactions in the molten mixture removed the oxygen from the iron. Metallic iron formed, sank, and pooled above the hearth. The extraneous materials in the ore reacted with products from the combusted limestone to form slag which also collected above the hearth. Since slag is lighter than the iron metal, it floated on top. Taps were opened at the level of the slag, and it flowed out. Taps were opened at the level of the iron metal, and it flowed out to the casting area.

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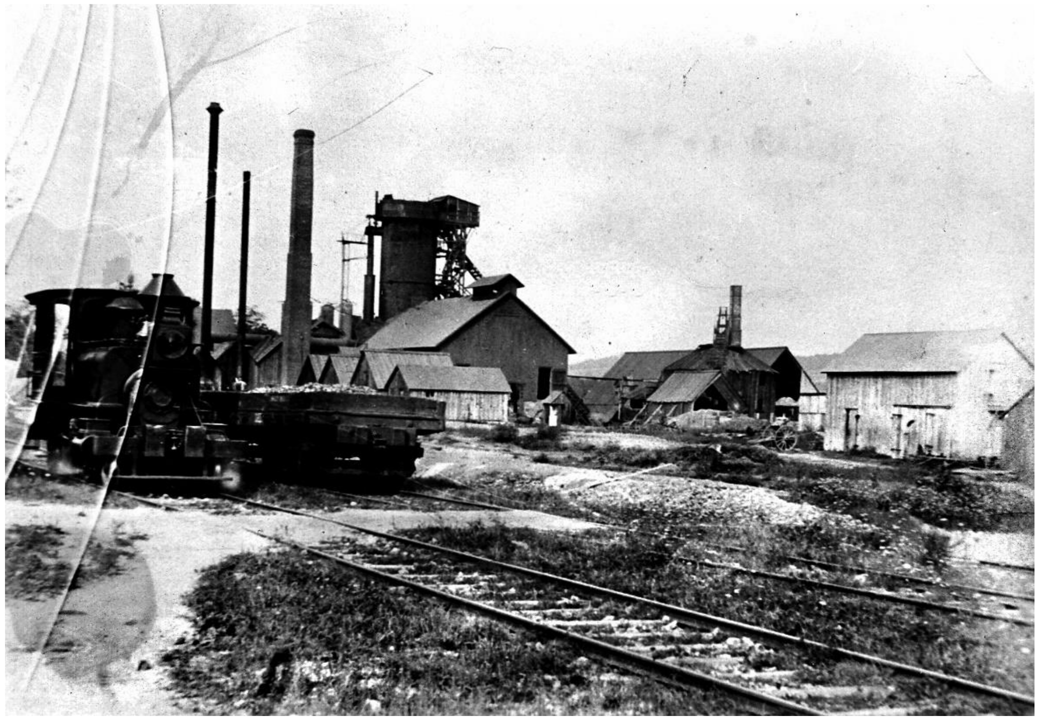
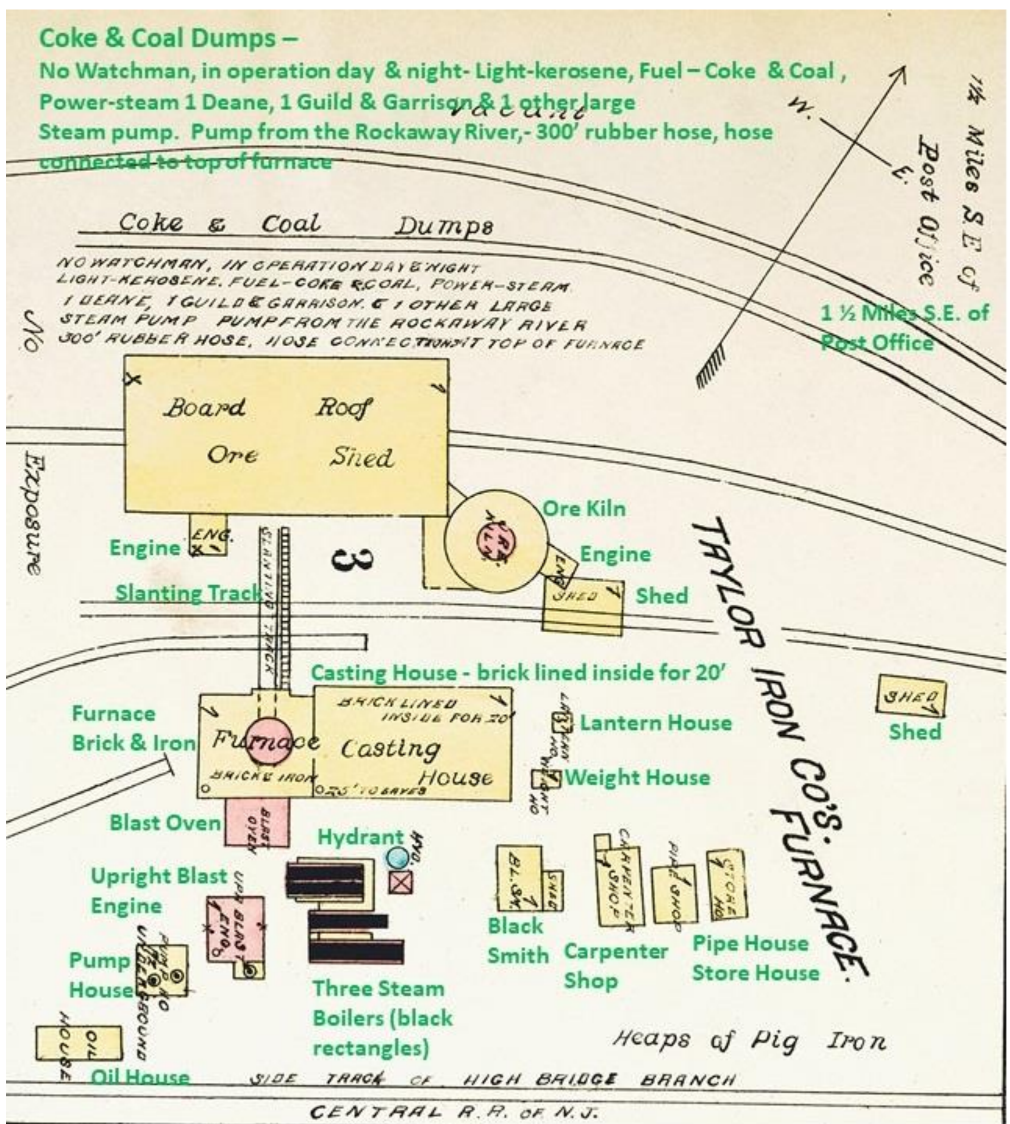
[6] Ng, Edward. 2015. "William J. Taylor and the Chester Furnace". Chester Historical Society News & Views December 2015.
[7] http://www.anselm.edu/homepage/dbanach/h-carnegie-steel.htm

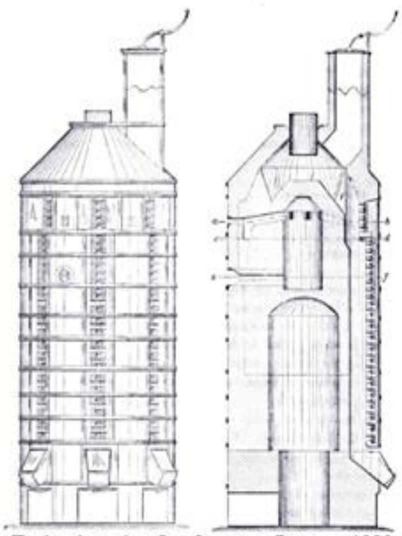
To better understand the layout of the Chester Furnace Historic Site, we have the benefit of the Sanborn Insurance map of the "Taylor Iron Co.'s Furnace", dated1886. To provide a more three-dimensional view, the only known image of the Furnace is placed above the Sanborn map. We don't have a date for the photo, but it seems to correspond to the map. I have annotated the Sanborn map in green text to make the map text readable and translate the Sanborn symbols and abbreviations to English. The paragraph under "Coke & Coal Dumps" provides useful information about the site. Using the Sanborn map, one can identify the major elements in the photo. In the center is the wide, cylindrical "Furnace" which is made of "Brick & Iron". It is topped by a housing for machinery to add coal/coke, iron ore, and limestone into the Furnace. The "Slanting Track" can be seen on the right in the photo, was used for carts to transport the materials. On the left side of the Furnace are pipes to capture and convey hot waste gases back to the Furnace. To the right of the Furnace complex is the "Casting House" which is "Brick lined inside for 20'" and the walls were "25' to





the eaves". Molten iron drained from the right side of the hearth of the blast furnace into the Casting House then into a sand trough which fed several smaller lateral troughs in a configuration resembling a sow suckling a litter of piglets. Iron produced in this way thus came to be called pig iron[8]. In the photo, to the left of the Furnace and Casting House are three smokestacks which on the Sanborn map correspond to steam boilers ("1 Deane, 1 Guild & Garrison & 1 other large steam pump"). The boilers are the black rectangles on the map. A steam boiler would have powered the nearby "Upright Blast Engine" which would have blown air into the "Blast Oven" to heat the air before it was blown into the Furnace. On the left side of the Upright Blast Engine was the "Pump House" which pumped water from the "Rockaway River", now named the Black River. A copious amount of water was needed for the steam boilers and to cool the tuyeres and keep them from melting when the furnace was in blast.

In the above photo, to the right and above the Furnace stack was the very large "Board Roof Ore Shed". In front and to the right of the Ore Shed was the "Ore Kiln". W.J. Taylor developed, patented, and published a paper in 1881 on "An Ore Roasting Furnace"[9]. The problem with many Chester iron ores was that they contained almost 5% sulfur compounds which were difficult to remove in the blast furnace process. Taylor and his assistant N.M. Langdon developed an ore roasting process to remove the sulfur from the ore using the kiln shown above. The desulfurized ore was then stored in the Ore Shed. The ore roasting furnace was so successful that it was not only used at the Chester Furnace, but also sold and used at other furnaces as shown in the ad above that appeared in the Bulletin of the American Iron and Steel Association, Vol. 19, 1885. In the photo, the top of the ore roasting furnace (Ore Kiln) can be seen by the Ore Shed.



Taylor-Langdon Ore Roasting Furnace 1880
36' high and 14' outside diameter. Capable of roasting 50 tons/day. (TAME vol 9 1880)

THE TAYLOR-LANGDON

ORE ROASTING FURNACE.

This is the only reliable Furnace or Kiln using gaseous fuel, and it is well known that a thorough roasting and desulphurization of sulphurous iron ores can not be effected with solid fuel. Furnaces now in operation by

W. J. Taylor & Co., Chester Furnace, Chester, N. J.
Phoenix Iron Company, Phoenixville, Pa.
E. & G. Brooke Iron Company, Birdsboro, Pa.
Joseph E. Thropp & Co., Edge Hill Furnace, Edge Hill, Pa.
Chester Iron Company, Hackelbarney Mines, Chester, N. J.

These Ore Roasting Furnaces, with the necessary gas producers, will be built by contract, or licenses will be granted to parties desiring to build them themselves. For full particulars address

W. J. TAYLOR, *Chester, N. J.*

Finally, both the map and the photo show that the Furnace site had a well-developed rail system. The photo shows a small "switcher" locomotive on the tracks of the Central Railroad of New Jersey (CNJ). The switcher was used to move cars around the Furnace Site. The CNJ Chester Hill Branch ran north of Main St. and serviced the mines closer to Chester such as the Hedges and Samson Mines. An important western destination for the CNJ was to take pig iron from the Furnace to the Taylor Iron Works in High Bridge. The Delaware-Lackawanna-and Western Railroad (DL&W) tracks also brought iron ore from the mines closer to the Black River. The DL&W continued east to Ironia and Dover. In 2021, 150 years later, part of the DL&W track bed is the West Morris Greenway and part of the CNJ track bed is the Columbia Trail. Both are well used and appreciated walking, running, and biking routes.

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[8] http://www.anselm.edu/homepage/dbanach/h-carnegie-steel.htm

[9] Taylor W.J., 1881. "An Ore Roasting Furnace". *Trans. of the American Inst. Of Mining Engineers*: Vol 9. May 1880 – Feb. 1881

W.J. Taylor published information on the operation of the Chester Furnace for a 20-week run in 1881[10]. To be profitable, a blast furnace had to operate 24 hours a day, 7 days a week for as long as possible. Taylor kept track of many aspects of the Furnace including the time not operating. Over the 20-week period in 1881, the average production was 34 tons of iron per day. The fuel used was about 90 percent coal and 10 percent coke. Each ton of iron produced, required 1.24 tons fuel. The amount of limestone used was 0.91 tons per ton of iron. Since the yield per ton of iron from the iron ore was 47.8%, each ton of roasted iron ore required 2.59 tons of coal/coke and 1.90 tons of limestone. The Furnace operated 98% of the time over those 20 weeks.

The Feb. 2, 1884, Dover-based Iron Era newspaper reported that even better production was achieved several years later: 43.4 tons of iron per day! Process details were also provided. ***The Chester furnace of W.J. Taylor & Co., 13x60, reached an output last week of 304 tons, exceeding its usually good weekly average of 290 tons. This is probably the best work ever done in a furnace of this size with anthracite fuel. The ores used were three-quarters Chester sulphury ores which previous to going into the blast furnace were roasted in the Taylor-Langdon Ore Roasting Furnace. The iron made from these ores is very strong and tough, and is used almost entirely for special mill purposes, thus demonstrating their value when properly prepared and desulphurized. The roasting is done with gas made in separate gas producers and no coal is used in the Roasting Furnace. One and a half cwt. of pea coal or screenings from the furnace is used per ton of ore roasted. We are informed that this is the only roasted ore in the country in which gaseous fuel only is used for heating the ore.***

FOR SALE.

ANTHRACITE BLAST FURNACE.

THE Chester Furnace, at Chester, Morris county, New Jersey, is now for sale. It is 13 by 60 feet, is in good repair, and can be put in blast in a month. The furnace, together with 100 acres of land, dwelling houses, etc., will be sold at a bargain. It has direct connections with the New Jersey Central and Delaware, Lackawanna, and Western railroads. For further particulars inquire of or address

W. J. TAYLOR, *Brown Building, Philadelphia.*

The Chester Furnace started operating July 4, 1879 and ceased operating only 10 years later in 1888. A tiny snippet in the Iron Era (June 30, 1888) announced "The Chester Furnace has ceased operation on account of tariff and poor sale of iron." The entire Chester mining and iron ore industry was done in by economics. Iron ore was easier and cheaper to extract from the open pit mines of the Lake Superior region. With improved rail transport to Western Pennsylvania, where bituminous coal was readily available, centers such as Pittsburgh became the leaders in iron production. In 1890 with no commercial improvement in sight, the Chester Furnace was put up for sale at a "bargain price" in the ad shown above[11]. However, there were no takers.

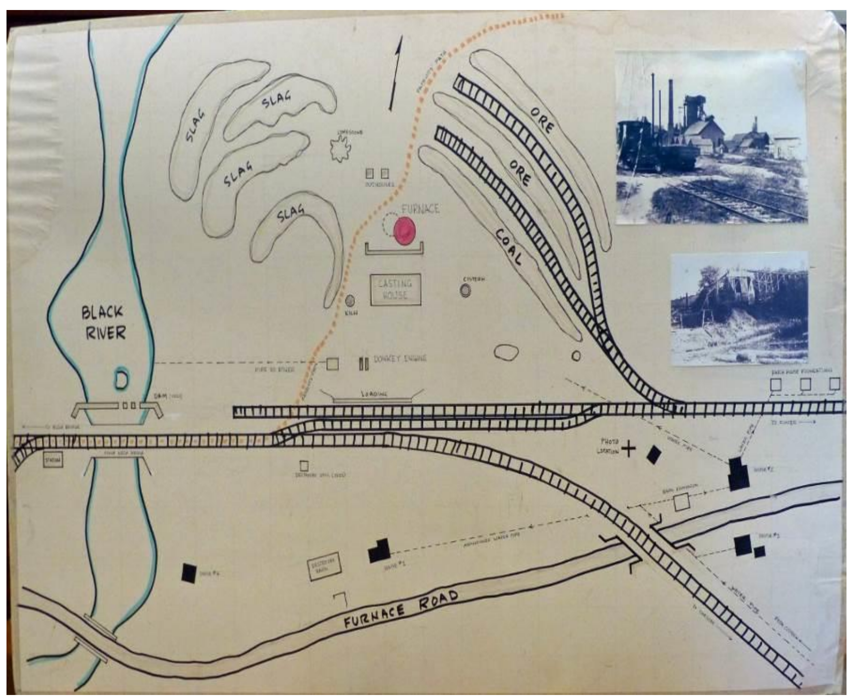
Finally, several lines appeared in the July 31, 1891, edition of the Iron Era, "The mines have all suspended operations" and "The Chester Furnace is being torn down. It will be taken to High Bridge and converted into a steel plant." That is why there is scant physical evidence of the Chester Furnace at its site by the Black River. After a series of owners, the Furnace site property was bought in 1919 by the Central Jersey Power Company, the precursor to JCP&L.

[10] Taylor, W.J. 1886. "Comments on the Operation of the Warwick Furnace". *Trans. of the Inst. of Mining Engineers.* Vol 14, 1886.
[11] 1890. *Bulletin of the American Iron and Steel Association*, page 47.

They had plans to dam the Black River and create Lake Takene[12] as a resort area for their employees. They knocked down and cleared the remaining Furnace buildings[13]. The plans for Lake Takene failed after the dammed Black River flooded the roads and areas east of the Furnace. Remnants of the dam in the Black River at the Furnace Site are the only surviving evidence of the Lake Takene folly.

Another Taylor to the Rescue. So, it is not surprising that without much physical evidence, memories of the Chester Furnace faded, and the site lay in obscurity for nearly 74 years. However, another Taylor family came to the rescue, i.e., Len and Lois Taylor (nee Key), when in 1964 they bought the house at 40 Furnace Rd. That house has a special history. It was originally built by William J. Taylor when he first moved to Chester[14]. In 1875 he moved in, with his second wife Mary, daughters Virginia, Margaret and Helen and son Knox.

So how did the 20th Century Taylors do? In their memoir, "Finding the Chester Furnace[15]", Len and Lois Taylor recount: *Imagine how (we) the Taylors felt when they discovered their property bordered the former site of the Chester Furnace. Our love affair with the Furnace started about the first month we moved to Chester Township, along with years of research. That research proved difficult since the residents who could still remember the standing buildings and who played among the structures as children had "zero" interest in the history of the site.*



Len not only kept his passion for uncovering the Furnace's past for almost 50 years but passed it onto anyone who would show an interest. He was well known for leading tours of the Furnace Site for the Chester Historical Society. He would use the map to the right to orient hikers on his Furnace tours. The 27" x 43" poster was redrawn, and a more polished version appears in Larry Lowenthal's book, *Chester's Iron Heyday* published by CHS in 1980. Above is a picture from the Observer Tribune of Len Taylor and Dana Taylor (no relation) sitting on a slag heap on a tour on a cold day on Nov. 27, 1987. Len led tours annually

[12] For background see Clark, Bruce. Lake Takene Unfulfilled, April 2015 Chester Historical Society News & Views.
[13] Taylor, Len. 1981. History of the House at 40 Furnace Road, Chester Township. CHS Archives
[14] For more information on William J. Taylor, see Ng, Edward, 2015, W.J. Taylor and the Chester Furnace, December 2015 Chester Historical Society News & Views.
[15] Taylor, Len and Lois. 2008. Finding the Chester Furnace. March 2008 Chester Historical Society News & Views.

until he passed away in 2013. We will keep that tradition alive, physically and virtually.

Len didn't want to sentimentalize Chester's history. He believed the projects to preserve and use our history for education would take lots of work and be never ending. That is true for the work to establish the Chester Furnace Historic Site. It was through hard work by the Patriots' Path Trail Steward Bruce Clark, the building skills of Eagle Scout Jack Suter, and Chester Historical Society's Ed Ng in 2015 to set the trail and create the informational kiosks and placards. The work continues. Len's map is the basis for the map developed by Bruce Clark and most recently published in the May 2020 CHS News & Views which is also available online[16]. As Len predicted the work goes on. The upcoming video by videographer Alex Louie and Trail Steward/narrator Bruce Clark, will walk you through the Chester Furnace Historic Site. Enjoy the soon-to-be-released video, visit the Furnace Site, use your imagination, and keep Chester history alive. ☼


Bruce Clark, Jack Suter and Ed Ng - Chester Furnace Historic Site Kiosk 12/2015

Upcoming Events, Thank You, Acknowledgments and Contact Information

Looking Ahead: There will be additional articles and videos featuring the Chester Volunteer Fire Company's 100th Anniversary on the CHS YouTube Channel. Videos on the tour of the Chester Furnace Historic Site, how the Chester Furnace operated, and the people of the Chester Furnace Historic Site will be coming to the CHS YouTube channel soon.

Support Your Historical Society. We thank our CHS members for your support. Thank you for renewing your membership or being a Life Member. Thank you for helping to keep Chester's history alive. Grateful thanks to members who made donations (which are tax deductible). If you would like to do more with planning or supporting CHS activities, such as programming, displays, or archives, please let us know. Contact information is given below.

CHS Newsletter Editor: Ed Ng - Historical photos and maps are usually from the CHS archives except as noted. Modern photos are by Ed Ng except as noted. Many thanks to Alison Dahl and Sandy Jacobson for their much-appreciated proofreading and editing prowess.

If you would like to join CHS or if you have stories or pictures to share, please talk to a Board member or contact us at (908) 844-6717 or chester.historical.society@gmail.com, or CHS Box 376 Chester NJ 07930. Membership information and a downloadable membership form are available at http://historicchesternj.com/home/membership.html .

16 http://historicchesternj.com/images/CHS_Newsletter_May_2020_Covid19_Charles_Tippett_bottles_Historic_Chester_Furnace_Site_compact_file.pdf