

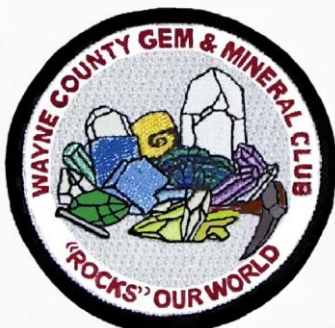
Wayne County Gem and Mineral Club News

February, 2014

Always Looking for Places to Dig!



Wolf Creek Dam in central Kentucky (see story starting on page 1)



Website

<http://www.wcgmc.org/>



See story on Benson Mines (p. 4)

Photo From mindat.com

Next Meeting: February 14, 2014

7:00 PM, First Presbyterian Church, Newark, NY

Selleck Road, West Pierrepont, NY

This St. Lawrence County collecting site has been rejuvenated by recent activity, discoveries, and literature. The club has a slide show put together by Steve Chamberlain in 2011 with maps, field pictures and photos of lots of mineral specimens. Fred Haynes has updated it with recent information, also from Dr. Chamberlain. In addition, members should bring in any specimens they have from the location or others in St. Lawrence County that they would like to show and tell about.

Further, the 2014 Field Trip Committee will meet prior to the club meeting to plan this summer's field season. Anyone interested in helping is invited to join us in the church basement meeting room from 5:30-7:00 PM on Feb. 14th.



Three inch diameter core from seepage remediation work at Wolf Creek Dam in Kentucky. Pink dolomite crystals partially fill cavities in the karsted limestone. The "gold" colored material on the left side of the photo is fine grained pyrite. Jamie Fisher won WCGMC's Best Mineral of 2013 Youth Division with this unique piece.

Geology in Action, Wolf Creek Dam, Lake Cumberland, Kentucky
By Fred Haynes



Tremolite (left) and fluor-uvite (right) from Selleck Road.

Photos by M. Walter

The construction of Wolf Creek Dam in central Kentucky began in 1941, but work was interrupted by WW2 and the dam was not completed until 1951. Potential problems with the integrity of the underlying Ordovician Leipers limestone were appreciated during construction and extensive cement was placed in a number of cave features that

(see **Wolf Creek Dam** on page 6)



Mineral Musings by Fred Haynes



In this Groundhog Day issue of WCGMC News, I introduce a new feature. **“New York Site of the Month”** will highlight a collecting or otherwise geologically interesting location in our fine state. The idea is to present a little of everything, some history, some geology, some nice pictures, and, of course, the rocks, minerals, or fossils that make the site of special interest to us.

I'm hoping to feature some of the lesser known, but interesting locales across our state. There has probably been enough written about Herkimer diamond locations to fill several books and the special collecting sites like Bower Powers Farm in Pierrepont or the Penn-Dixie Fossil site near Buffalo are well known to all. But our state is blessed with many lesser known mineral and fossil collecting sites with interesting geology and history.

To kick start the idea I have chosen Benson Mines in Star Lake. The mineral specimens are not world famous, but the iron mines of St. Lawrence and Jefferson County are historically and economically important in New York history and the open pit at Benson Mines was the largest of these occurrences. Of course, it is helpful that I was able to visit the mine last September with the St. Lawrence County Rock and Mineral Club.

If you have an idea for a mine, mineral, or fossil location to feature, please let me know. Perhaps we can work them around our upcoming field season. Or perhaps one of you had an interesting experience at a lesser known New York site, or have some great pictures to share. I'm easily reached at fredmhaynes55@gmail.com or at any club meeting. I don't think we will run short of locations for many years.

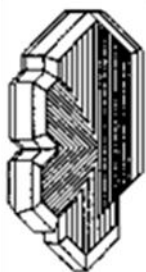
Another new feature in this month's WCGMC news requires some work from you! On page 7 you will find a crossword puzzle that was designed to occasionally challenge the experienced digger among you, but also be friendly to the younger generation (most of whom are quite capable of “googling” for needed answers to the more difficult clues). The goal for puzzles of this type is to both fun and educational for folks of all ages and backgrounds. I hope to hear from you whether I succeeded.

Let's hope that there groundhog does not see his shadow and we can commence digging soon!

Our first scheduled dig is on opening Day at the Ace of Diamonds Mine, that's Tuesday April 1.

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41st Rochester Mineralogical Symposium



April 24-27, 2014

Radisson Hotel
Rochester Airport
175 Jefferson Road
Rochester, NY 14623

Check the RMS link at www.rasny.org for details of the 4 day event including the list of speakers and registration information

Another quality paper on a historic New York state mineral site can be found in the final 2013 issue of Rocks and Minerals (v. 88, #6), an issue featuring pegmatites:

Minerals of the Scott Farm Pegmatite near Fine, St. Lawrence County, NY (by S. Chamberlain, M. Lupulescu, and D. Bailey) provides a systematic description of the mineralogy and geology of a location first referenced by Dana in 1892. From a quarry mined for feldspar for ceramics come some of the finest crystallized specimen of zircon and titanite ever recovered in New York state.

Benson
Mines



SITE OF THE MONTH

Have you driven Route 3 in southern St. Lawrence County? Did you know that as you pass just east of the small hamlet of Star Lake you are just hundreds of feet south of what was once the largest open pit iron mine in the world? That's right, in 1958, during the height of its life, the Benson Mines open pit iron mine held that lofty title. The pit was 4 kilometers long, 250 meters across and 400-600' deep. Today the pit is host to a whole lot of brilliant blue water and the surrounding Appalachian Park region is forest covered and virtually pristine wilderness.

The high concentration of iron in the rocks of the region was first recognized in 1810 when engineers surveying for a military road found their compasses wandering. But until the timber industry built a railroad to the region the iron ore could not be exploited. Even with rail, the area was still remote

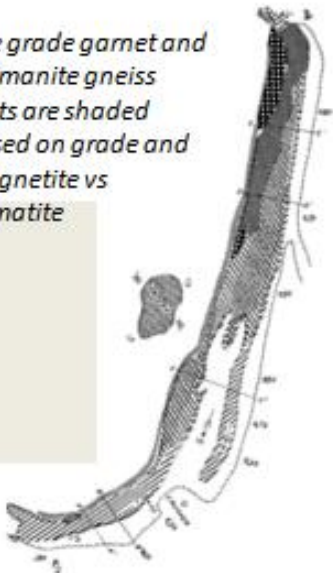
and from 1890 to 1940 mining was sporadic and limited. In 1941, Jones and Laughlin Steel Company leased the properties and constructed plant facilities.



Looking south, note the steep pit walls on the right (west) side of the lake at Benson Mines. Photo by F. Haynes

Three "map" views of the Benson Mine open pit near Star Lake, NY

Ore grade garnet and sillimanite gneiss units are shaded based on grade and magnetite vs hematite



Geologic map of Benson Mine open pit: modified from Crump and Beutner, 1968



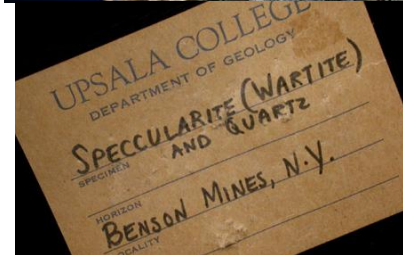
Topographic map of Benson Mine open pit. Note Route 3 near bottom of map. Star Lake is 1 mile west.



Satellite view of Benson Mine open pit filled with water. Lake is 4 km long.



15 cm sillimanite on quartz from Benson Mines (Lupulescu, 2008)



Martite (hematite pseudomorph after magnetite) from the Upsala College museum. Note both specularite and martite are misspelled on the label

For over four decades the region thrived as iron ore was extracted and concentrated on site. The ore averaged 23% iron and was concentrated to over 60% for shipment to steel centers like Pittsburgh. Mining ceased to be economic in 1978 when the US steel industry declined and taconite processes in Minnesota captured the remaining demand. The Benson Mine deposit is not mined out. Rather, iron can be recovered less expensively elsewhere.

As is true across the Adirondack region, the original character of the rocks in the iron district surrounding Star Lake has been virtually obliterated by upper amphibolite to granulite facies metamorphism during the Grenville orogeny some 1.1 Billion Years ago. However, geologists working with the full rock exposures available when the open pit was being mined ascribed the origin of the iron to precursor sedimentary processes. In 1970, in a professional journal article on the mine, Palmer wrote "In view of the impressive conformity of ore to a single horizon in the paragenesis, the ore is believed to have a metasedimentary origin". This would suggest an origin similar to the banded iron formations in northern Minnesota except that those rocks were not buried, metamorphosed, and intensely folded.

The product of all the metamorphism and structural activity in the Benson Mines area was a series of mafic gneisses with minor granitic component and skarn bodies that are now overturned and steeping dipping along a N-S trend. Some units are rich in garnet, others contain abundant sillimanite, but the economically important minerals are magnetite and hematite, presumably marking the locations of the original iron-rich sedimentary units. The hematite often occurs as martite (i.e. pseudomorph after magnetite). None of the iron oxides make for spectacular mineral specimens, but what the region may lack in quality specimens, it makes up for in quantity, not to mention the scenic beauty of the newly formed lake.

Sillimanite is not only found in the host gneiss, but also in pegmatites that crosscut the metasediments. The alumino-silicate is associated with chrysoberyl, muscovite, and quartz and forms crystals up to 20 cm in length. The muscovite books are also large in some of the pegmatites. A few rare molybdenite specimens were found there (see page 1).

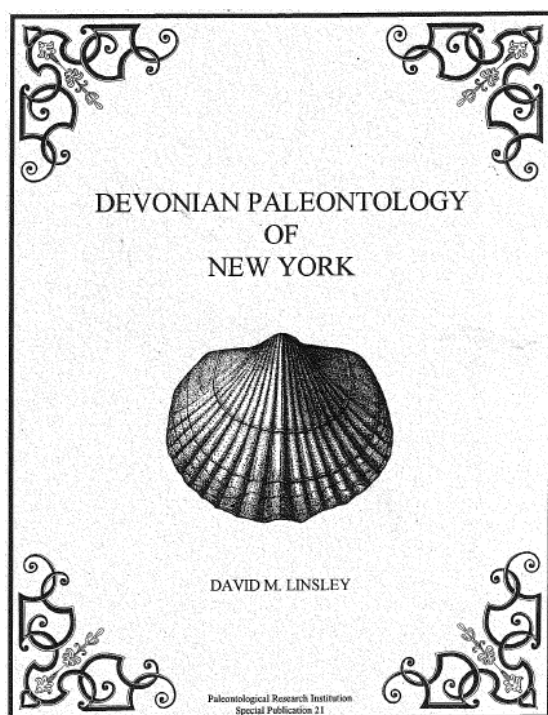
A visitor to the site today likely won't find sillimanite like that depicted in Lupulescu's 2008 Rocks and Minerals article (see photo upper left), but one will find abundant large sillimanite phenocrysts within the gneiss of the mine dumps and the muscovite site is most impressive on a sunny day. Magnetite ore is everywhere; the non-magnetic ores with martite can be distinguished from magnetite if you remember to bring your magnet. But remember, your compass won't help you here should you get lost.

References:

- Buddington, A.F., and Leonard, B.F., 1972**, Regional Geology of the St. Lawrence County Magnetite District, Northwest Adirondacks, NY, USGS Prof. Paper 376, including a 1:62,500 scale geologic map of the entire mining district
- Crump., R. M., and Beutner, E. L., 1970**, The Benson Mines Iron Ore Deposit , St. Lawrence County, NY, in *Ore Deposits of the US, 1933-1967*, p.49-71.
- Hall, Russell, J., 2005**, *Gem of the Adirondacks: Star Lake, Benson Mines, and the Global Economy*, published by Lighthall Books, Gainesville, FL., 190 p.
- Lupulescu, M., 2008**, *Minerals from the Iron Deposits of New York State, Rocks and Minerals*, v. 83, p. 248-266
- Palmer, D., P. 1970**, *Geology and Ore Deposits Near Benson Mines, New York, Economic Geology*, vol. 65, p. 31-39.

An Online Fossil Guide for New York

Ever wanted to identify a fossil and wondered what resources might be available to you? Did you know that Special Publication #21 of the Paleontological Research Institute is available online? The 472 page volume entitled Devonian Paleontology of New York was authored by David Linsley in 1994. The treatise contains 342 full page plates with wonderful line drawings of all your favorite Devonian friends. For those interested in the sedimentary rock formations cropping out in western New York, there is a thorough discussion of the local stratigraphy. And the best part is the download is free.



To Download, visit www.museumoftheearth.org and navigate to Publications/Special publications. Then open the Book List and go to Result page #3 for PRI SP #21. The full document can be downloaded with the push of a button.

Best of the Year Specimens for 2013



The picture does not do justice to this past year's award specimens, but no one ever claimed rockhounds could moonlight as photographers. At our November meeting, votes were cast and awards were given for the best specimen collected (or obtained) by club members during 2013.

And the winners were:

- Upper left: the mold and body of a full trilobite collected by **Bill Lesniak** at Penn Dixie won in the Best Fossil Adult Division,
- Upper middle: **Roxanna Rowe's** creations with agate, amethyst and other goodies was awarded Best Jewelry/Craft in Adult Division.
- **Fred Haynes'** copper fulgarite found atop Rose Road Hill in Pitcairn won Best Mineral in the Adult Division (upper right).
- Pictured in the lower left are two cephalopods that **Jamie Fisher** collected on Lake Ontario in Wolcott. They were awarded the Best Fossil in the Youth Division.
- The drill core with pink dolomite crystals is from recent work on the Wolf Creek Dam, Lake Cumberland in central Kentucky and it won first prize in the Best Mineral Youth Division for **Jamie Fisher** (see article in this issue for more on this piece)..

21st Annual James Campbell Memorial Gem, Mineral, and Fossil Show

Sponsored by
Capital District Mineral Club & New York State Museum
February 15, 2013 10:00–5:00 PM
February 16, 2013 10:00–5:00 PM

New York State Museum
222 Madison Ave., Albany, NY

46th Gem, Mineral, and Fossil Show Lapidary: "The Magic of Cut Stones"

Sponsored by
Buffalo Geological Society
March 22, 2013 10:00–6:00 PM
March 23, 2013 10:00–5:00 PM

"The Fairgrounds", Market and Grange Bldgs., Hamburg NY

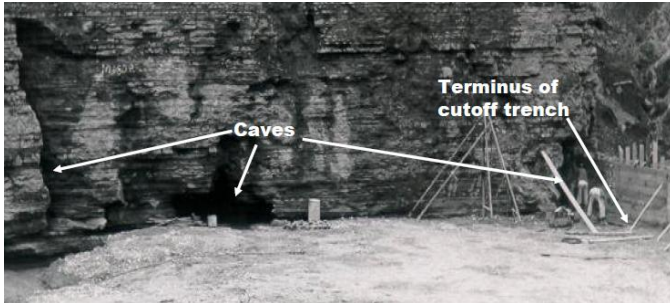
45th Annual Gem and Mineral Show

Sponsored by
Che-Hanna Rock & Mineral Club
March 22, 2013 9:00–6:00 PM
March 23, 2013 10:00–4:00 PM

Athens Township Vol. Fire Hall
211 Herrick Avenue, Sayre, Pa.

Wolf Creek Dam (continued from page 1)

were known to exist before the earthen dam was built above. However, that early work proved to be insufficient in preventing seepage from Lake Cumberland through the underlying karst.



1947 photograph highlighting cavernous regions in the dam's base that were filled with cement.

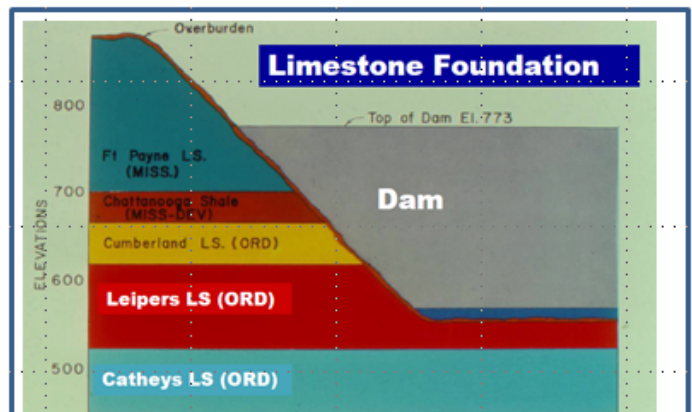
In 1968, it was observed that seepage was occurring through (and/or below) the embankments and foundation of the dam, and sinkholes were observed at the toe of the dam. Geologists suspected that the known karst geology was the culprit and a short-term solution involving grouting of all known channels was quickly initiated. In the mid 1970's, a cement cut-off wall was emplaced extending through the embankment and into the bedrock. It was hoped this would permanently seal the dam and its foundation.

Despite the remedial action of the 1970's, continuous monitoring of the dam revealed that the seepage had not been completely alleviated. When increased seepage rates were documented in 2005, Lake Cumberland water levels were lowered to reduce pressure on the foundation while another "permanent" solution was sought. During the investigative work, drill core was collected from the full length of the dam foundation. The drill core on page 1 is from that work and clearly shows the solution karst in the underlying limestone.

In 2006, the entire length of the dam's foundation was regouted and in 2009, a \$340 concrete barrier was installed within the earthen dam embankment. Over 1200 pilings were drilled through the earthen dam and into the karsted basement. Over 300,000 tons of cement were pumped into these vertical pilings. The work was completed last summer and it is hoped that Lake Cumberland can be restored to its originally designed level.



Construction workers place cement in one of 1197 piles that are approximately four feet in diameter and extend 275 feet into bedrock below the foundation of the 4000' long earthen dam and embankment.



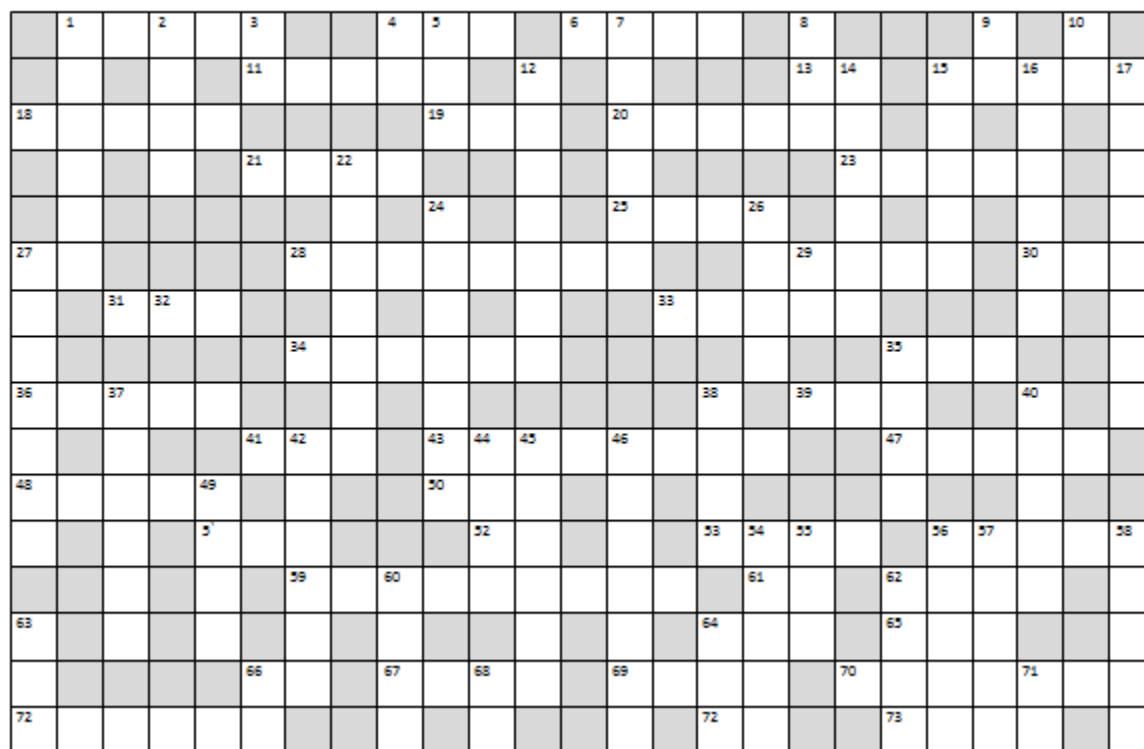
The Wolf Creek Dam foundation rests on a karst limestone, the Ordovician Leipers Formation. So, what is a karst? Karst formations are created when limestone bedrocks are, over time, attacked by water through natural precipitation seepage. Rain water, or snowmelt, contains dissolved carbon dioxide from the atmosphere, which forms a weak carbonic acid in solution. That acid dissolves the limestone along fractures leading to voids within the rock formation. When a reservoir several hundred feet in elevation is placed above this style of foundation, the hydraulic pressure of the water can dislodge the cementing clays in the cracks and void spaces of the underlying karst limestone foundation. Formation that had previously been rendered impermeable becomes permeable and the lake water is able to seep through the underlying foundation of the dam.

References:

US Army Corp Engineers, 2013, Nashville District Completes Wolf Creek Dam Barrier Wall, March 2014
 Wikipedia entries for Wolf Creek Dam and karst
 Zoccal, M., 2007, Wolf Creek Dam Seepage Major Rehabilitation Evaluation, ppt. file found online.

Mineral Crossword: Fun for all Ages

(WCGMC PUZZLE 1)

**ACROSS**

1. pegmatite mineral
4. found in mines or in baseball
6. midwestern state
11. fossil with age information
13. transition element (abbr.)
15. pyrite and galena are this
18. color of bixbyite
19. long period of geologic time
20. this stuff covers rocks
21. vein/fissure of ore in rock
23. forms in vugs in volcanic rock
25. type of saw mineral folks use
27. computer major (abbr.)
28. hardened soil
29. mixture of metals
30. we travel to collect in one of these
31. Canadian Province (abbr.)
33. recovered from drilling
34. mafic intrusive rock with calcic plagioclase and pyroxene
35. just a wildebeest (Xword favorite)
36. a gem with hardness 8
39. Marcellus shale has this
41. opposite of beginning
43. arsenic sulfide and yellow
47. the tourmaline at Bush Farm
48. pumice & scoria are full of these
50. humans have ten (singular)
51. 78% of this is nitrogen

52. Continent (abbr.).
53. a bird with rock in his name
54. a really fun group (abbr.)
59. think Ni, think S, think Antwerp
61. stalagmites point ____
62. we all love a garage ____
64. professional sports league (abbr.)
65. they protect us at airports (abbr.)
66. element in bauxite (abbr.)
67. mineral hardness scale
69. the color of aurichalcite
70. a warm field breakfast.
72. a black tourmaline
73. element #4 (abbr.)
74. last one, time to ____

DOWN

1. Zinc district in New York
2. granite, shale, schist (i.e.)
3. element in spodumene (abbr.)
4. element in bertrandite (abbr.)
5. a logging tool
7. salt by any other name
8. same as 49 across
9. element in diopside (abbr.)
10. ore mineral is ilmenite (abbr.)
12. rock with orthoclase and epidote
14. gastropods
15. mineral collectors are this
16. used to clean lichen off rocks
17. first Paleozoic Period

22. carbon from the mantle
24. gemmy olivine
26. lime-rich mudstone
27. same element, different number of neutrons
29. French definitive article
35. we repair specimens with this
37. a red garnet
38. a cold mineral
40. a short geologic time unit
42. synonym for perpendicular
44. a color of quartz
45. calcium carbonate found in clams
46. hematite after magnetite
- 49.. sylvite is one
54. monetary unit in Russia
55. a gov't agency (abbr.)
56. mines pile this to the side
57. pelecycods by any other name
58. very fine calcium carbonate rock
60. CaO for the lawn
62. sapphire or North
63. universal distress symbol (abbr.)
64. to catch or arrest a suspect
66. an element in kyanite (abbr.)
68. element in party balloons (abbr.)
71. famous movie alien

**attend Feb. mtg. for answers or
wait until next WCGMC news**

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Club meets 2nd Friday of each month.

Mini-miner meeting at 6:30 PM.

Regular meeting at 7:00 PM

Park Presbyterian Church, Maple Court, Newark, NY

Website – <http://www.wcgmc.org/>

Dues are only \$15 individual or \$20 family for a full season of fun. Send to WCGMC, P. O. Box 4, Newark, NY 14513

Mark your calendar:

June 7-8, 2013

Wayne County Gem and Mineral Club Show

St. Michael's School, Newark NY

More details in the months ahead



The Public is always welcomed
First Class: Dated Meetings & Time Valued



Wayne County Gem and Mineral Club
P.O. Box 4
Newark, New York 14513