Nittany Mineralogical Society Bulletin

Nittany Mineralogical Society, Inc., meeting in State College, Pennsylvania
Contact information on back page

March, 2020 **Visit our web site: www.nittanymineral.org** *Editor (see back page): David C. Glick*

We regret to announce that our **March 18th meeting has been canceled.** Penn State is not holding classes on campus due to the coronavirus and has directed that "All non-essential events should be canceled."

Here's what we had been planning for the meeting; we will try to reschedule Dr. Scheetz's presentation for a future meeting:

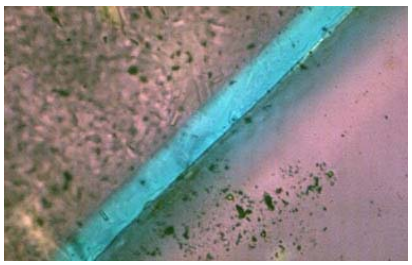
Cross over Geology/Archaeology Lecture Series Part IV:

Obsidian Hydration Dating

by Dr. Barry Scheetz

The concept of Obsidian Hydration Dating (OHD) was first introduced in 1966 with the hope of coming up with a chronometric approach of placing artifacts within a framework of calendar years. The technique relies upon the physical phenomena which occurs when a fresh surface of obsidian is exposed to the atmosphere. Knapping exposes fresh glass surfaces to water from the relative humidity in the atmosphere where it begins to enter the glass structure of the artifact, changing the optical characteristics of the obsidian. By cutting a sample from an archaeological artifact, preparing a thin section and observing it with a petrographic microscope, the depth of penetration of water into the fresh surface of the obsidian can be observed and measured. If the rate of water up take for that specific obsidian is known then the depth can be related to a calendar time.

It was hoped that the methodology would compete with ^{14}C for establishing actual calendar years in measured artifacts. Several inherent problems with components of the measurement protocol have contributed to not reaching the original objective of the method. That being said, over the past seven decades significant improvements in the understanding of the physical phenomena and the methodology for conducting the measurements in the protocol have been addressed and significant improvements to the protocol have been made, moving the OHD methodology closer to the initial objectives. The methodology for the measurement will be discussed and placed into perspective.



An obsidian hydration rind under the microscope; colors enhanced with a gypsum retardation plate.

Minerals Junior Education Day

Sadly,we have canceled

Minerals Junior Education Day. We will investigate the possibility of holding it later in the year. We thank everyone - students, parents, volunteers - for your support.

See **www.nittanymineral.org** *for updates.*

NMS's 25th Annual Minerals Junior Education Day had been set for Saturday, March 28, at Central Pennsylvania Institute of Science & Technology at Pleasant Gap, the same location as the last few years. Please save the date and volunteer to help with one of the stations at the event.

At this event, kids get an empty egg carton when they check in, then go to a series of stations where they learn about a topic and get a pertinent specimen to build a collection in their egg carton. There is also a sales table with kid-friendly prices (bring cash!). The cost this year is only $6 per child; parents come along for free. Please watch the NMS web site for any updates. Stations being planned include:

- Gold panning
- Gemstones
- Fiber optic minerals
- Caves & karst
- Hailstones
- Ultraviolet fluorescence
- Minerals & rocks in your home
- Iron ore minerals & iron making
- Fossil shells (invertebrates)
- Sphere grinding machine
- Crystals & atomic structure
- Archaeology & flintknapping

We are now **seeking volunteers** to help at the various stations by talking to the children about the topics, handing out the giveaway samples, etc. Help at the sales table will also be needed. We can always find a spot for a volunteer to help. We also welcome advance donations of identified minerals, etc., which can be sold at child-friendly prices. **To volunteer or get more details, please contact Frank J. Kowalczyk:** frank.j.kowalczyk@gmail.com or 814-404-9854

Junior Rockhounds
Weekly Meetings for Kids & Parents

Free, fun, hands-on learning about minerals, rocks & fossils! Meetings are now planned for Mondays, April 6 through May 11 or beyond, 6:15-6:50 p.m. at Boalsburg Fire Hall, 113 E. Pine St., Boalsburg PA 16827. Best for 3rd through 8th graders WITH their parents. PLEASE WATCH FOR UPDATES at **www.nittanymineral.org**

FEDERATION NEWS

Nittany Mineralogical Society, Inc., is a member of EFMLS, the Eastern Federation of Mineralogical and Lapidary Societies, and therefore an affiliate of AFMS, the American Federation of Mineralogical Societies. The **Federations and our Society strongly encourage all members to read the monthly Federation Newsletters, available on their web sites**, which are linked from our web site, www.nittanymineral.org . We present brief summaries here in order to encourage readers to see the entire newsletters. There's a lot there!

EFMLS leaders want **you** - the club member - to see the **Newsletter**. Please see it at <https://efmls.org/newsletter> (also linked from the NMS home page). The March issue notes of the annual convention (March 27-30). "It is getting close!" The convention schedule and nominating committee report (of the slate of officers up for election at the convention) are presented. The Club Rockhound of the Year program is described, and the featured Committee of the Month is the Wildacres Workshop Committee. "The Speed of Safety" is examined - accidents can happen quickly, and tiredness can reduce our ability to react quickly. The Club Spotlight article is on the Catawba Valley Gem and Mineral Club which will host the 2020 EFMLS Convention in Hickory, North Carolina, and has hosted numerous conventions in the past.

EFMLS representative Cassie Meyers has started a **Region 3 Newsletter**; part is included on p. 10-11.

The **AFMS Newsletter** March issue <http://www.amfed.org/news/> again discusses setting up competitive displays at mineral shows. Quartzsite, Arizona, site of the huge annual Quartzsite Pow Wow Rock, Gem & Mineral Show and the American Lands Access Association (ALAA) meeting, is discussed. AFMS Recreational Rockhounds continued their tradition of removing trash and litter from nearby BLM-managed public lands (about 20 acres). The ALAA recommends that clubs display a case of specimens from now-closed public lands, to call attention to the problem. The Junior article discusses a writers' workshop for kids. *-Editor*

Eastern Federation of Mineralogical and Lapidary Societies

Annual Convention

Catawba Valley Gem and Mineral Club, Inc.
Hickory Metro Convention Center
March 27-30, 2020

The Catawba Gem and Mineral Club invites all delegates and guests to their **50th Annual Catawba Valley Gem and Mineral Show** to be held in association with the annual EFMLS Convention in Hickory, NC March 27-29, 2020.

For more information, registration forms, etc., see
http://cvgmc.com/SpecialEvents.html

Geo-Sudoku

by David Glick

This puzzle contains the letters AGKILMNPS; one row or column includes a process common in geological studies. As usual, if you've read this issue, you've seen it. Each block of 9 squares, each row, and each column must contain each of the nine letters exactly once. The solution is on page 12.

A				M				
	M	I		N	S	K		
G			I	A			M	L
		P	S			M		N
		S	M	P			K	A
M		A				P		
			A	S		L	I	M
N						A		
							G	K

Northern Alleghenies Geological Society

Will meet Tuesday evening Mar. 17th, 2020 at 5:30 PM (*talk begins at 7:00 p.m.*) at La Fiesta in Ebensburg, PA. What better way to spend St Patrick's Day than surrounded by beer-loving geologists!!!! Dan Billman of Billman Geologic Consultants will speak about: **Marcellus and Utica Shales: Pennsylvania's 3rd (or 4th) Bite at the Energy Apple.** RSVP by 3/16 to <northalleggeo@gmail.com>.

CLASSIFIEDS

Sphere Machine For Sale

Homemade but durable sphere making machine has two opposing gear motors with two spindles, all on a wheeled cart. Makes rock spheres 2-6 inches in diameter. Includes numerous diamond, cast iron and PVC grinding cups, a wide array of abrasive grits & several polisheses. $500. Contact Jim Garthe 814.667.2409 or jwgarthe10@gmail.com

The Slab Cabin Run Watershed Study with Applications to Instructional Courses

Charles E. Miller, Jr.
State College, Pennsylvania

INTRODUCTION

Watersheds or drainage basins are fundamental concepts in water-resource management. They define areas of surface and groundwater flow. Within watersheds, conservation districts and environmental groups strive to balance water resources with land development. This is a continuing challenge. Watershed studies assist in this by providing assessments and developing data bases for future comparisons.

A watershed study of Slab Cabin Run at State College in Centre County, Pennsylvania (Figures 1-3), is described. Slab Cabin Run is an 11.2-mile tributary to Spring Creek (Figures 2-3) - a High Quality, Cold Water Fishery (HQ-CWF) often rated as the top trout stream in the state (Young, 2018). With an area of 16.8 square miles, Slab Cabin Run Watershed represents approximately 19 percent of surface flow to Spring Creek (Fulton, et al, 2005). Because smaller watersheds flow into larger ones, adverse changes in the former can show up in the latter.

Figure 1: Site map showing State College (red circle) in Centre County, Pennsylvania. (d-maps.com)

This study is an outgrowth of a geology field-mapping course at The Pennsylvania State University. The primary objective was mapping local bedrock geology. In conjunction with that information, a watershed study of Slab Cabin Run was done that included geochemical analyses, flow measurements, and assessments. Those findings are the basis for this article.

While watershed studies are useful in water-resource management, they are also suitable for instructional courses. Concepts such as delineating watershed boundaries, water analyses and flow measurements, aquatic surveys, land-use associations, and data interpretations are adaptable to courses ranging from high-school earth science to graduate-level geology.

Applying the Slab Cabin Run Watershed Study to instructional courses is also discussed. This study uses the best available geological map (Hoskins and Root, 1976) with an update by Fulton et al, 2005 (Figure 3).

GEOLOGIC SETTING

Slab Cabin Run Watershed is at the northwestern edge of the Appalachian Ridge and Valley Physiographic Province in Pennsylvania. Ridges are of sandstone and shale while valleys are largely of carbonates (limestone and dolostone). Major landforms are: Mount Nittany, Nittany Valley, and Tussey Mountain (Figure 2). Rides represent edges of drainage basins.

The headwaters of Slab Cabin Run are on Tussey Mountain in sandstone and shale of the Juniata and Reedsville formations (Figures 2 and 3). Downstream flow is across Nittany Valley (Figures 2 and 3), in carbonates (limestone and dolostone) of the Stonehenge, Nittany, and Axemann formations, to its confluence with Spring Creek (Figures 2-3, Table 1).

Carbonate bedrock in Nittany Valley is developed into karst topography. Local karst features include soluble, fractured rock at or near the surface; sinkholes; caves; sinking streams; solutionally enlarged bedding planes, joints, and fractures; and low stream density.

The study area includes portions of the following Pennsylvania 7.5-minute topographic quadrangles: Julian, McAlevys Fort, Pine Grove Mills, and State College.

THE WATERSHED STUDY - AN OVERVIEW

The Slab Cabin Run Watershed Study involves stream sampling and flow measurements from its headwaters to confluence with Spring Creek. A bedrock-geology base map (Figure 3) includes the watershed and stream sampling points. The map is supplemented with a stratigraphic column for the watershed (Table 1). Using the map and stratigraphic column together, relationships between bedrock geology, water quality and quantity, and land-uses can be noted.

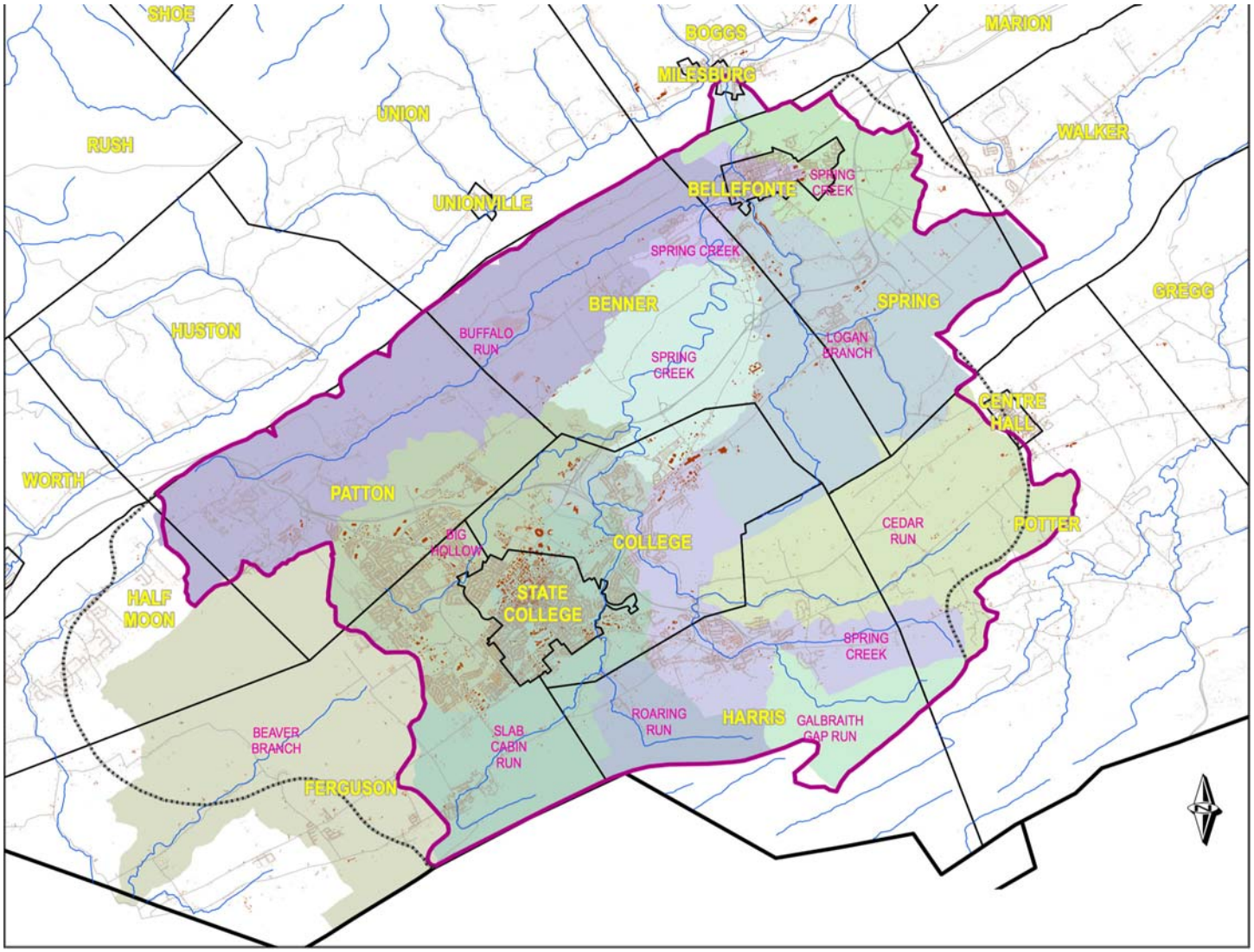


Figure 2: Map showing State College and major landforms including Spring Creek drainage (outlined in magenta) and Slab Cabin Run sub-basin (bottom center) (from The Spring Creek Watershed Atlas).

Stratigraphic column for Slab Cabin Run Watershed		
Formation name	**Map symbol**	**Lithology**
Juniata	Oj	Siltstone/shale/sandstone
Reedsville	Or	Shale
Coburn, Salona	Osc	Limestone with shale
Nealmont, Linden Hall, Snyder, Loysburg	Oln (Olt in Figure 1)	Limestone
Bellefonte	Obf (Ob on Figure 1)	Dolostone
Axemann	Oa	Limestone
Nittany	On	Dolostone
Stonehenge	Os	Limestone

Table 1: Stratigraphic column for Slab Cabin Run Watershed.

A sampling sequence of stations 25, 29, 26, 30, 31, 34, and 35 (Figure 3, Table 2) begins in the headwaters and continues downstream to Spring Creek. Sampling stations 32 and 33 are of a tributary to Slab Cabin Run and are not addressed. Water-data analyses and flow measurements are in Table 2.

Water-quality parameters include: pH, alkalinity, hardness, calcium, magnesium, calcium/magnesium ratio, and nitrate. Concentrations are in parts per million (ppm). Flow measurements are in cubic feet per second (cfs) (Table 2). Water analyses were done using Lamotte water-sampling kits. Flow measurements were from a Pygmy Flow Meter.

WATER DATA

Water-quality and flow data of Slab Cabin Run - from its headwaters to its mouth - are best observed by comparing Figure 3 with Tables 1 and 2. From these, a number of observations are made.

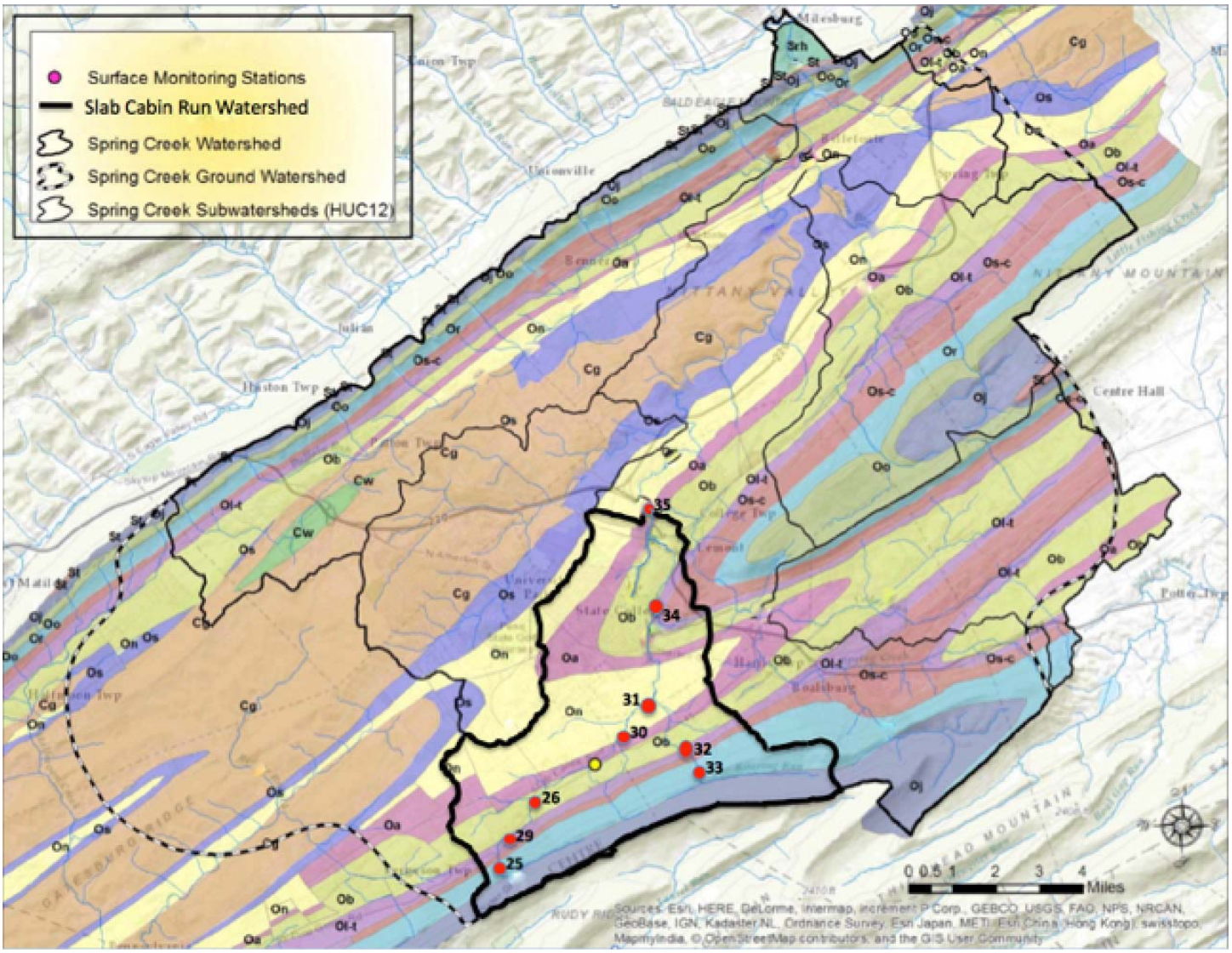


Figure 3: Geologic map showing Slab Cabin Run Watershed (bold outline). (Modified from Fulton, et al, 2005). Formation symbols are updated in Table 1.

Slab Cabin Run Hydrogeologic Observations

Alkalinity, hardness, calcium, magnesium, and nitrate are in parts per million, ppm
NM = Not Measured
cfs = cubic feet per second

Station #	Formation (Figure 3)	pH	Alk	Hardness	Ca	Mg	Ca/Mg ratio	Nitrate	Flow, cfs
25	Or	5.6	20	50	25	25	1:1	<0.44	1.58
29	Olt	6.8	90	125	75	50	1.5:1	<0.44	NM
26	Ob	7.3	80	130	60	70	0.86:1	2.64	0.16
30	Oa	7.3	110	180	100	80	1.25:1	1.32	0.27
31	On	7.0	170	200	125	75	1.67:1	>1.32, <2.64	0.25
34	Ob	7.1	170	187	87	100	0.9:1	>1.32, <2.64	0.54
35	Oa	7.1	180	275	130	145	3:1	>1.32, <2.64	1.95

Table 2: Geochemical analyses and flow measurements for Slab Cabin Run. Data from 1975.

Slab Cabin Run chemistry reflects bedrock over which it flows. This is evident when considering pH, alkalinity, hardness, calcium, and magnesium concentrations as well as calcium/magnesium ratios (Table 2). The latter three are among the most useful parameters for obtaining water-quality information characterizing carbonates (Langmuir, 1971). Although the source of Slab Cabin Run is in the Juniata Formation (Oj, Figure 3), the first sampling station is in the Reedsville Formation (Station 25, Figure 3; Tables 1 and 2). The Reedsville has little

buffering capacity. However, pH levels as well as alkalinity, hardness, calcium and magnesium concentrations markedly increase as the stream crosses carbonates (Stations 29, 26, 30, 31, 34, and 35; Figure 3). For example, pH rises from 5.6 in the Reedsville to 6.8 and 7.3 in carbonates (Osc, Olt; Figure 3 and Table 2). Similar increases occur for the other referenced parameters. One parameter - hardness - is noteworthy. Hardness is a measure of dissolved minerals in water, mostly of calcium and magnesium (Bates and Jackson, 1980). Nittany Valley is known for hard water, largely due to high solubility of carbonates. Comparison of Slab-Cabin hardness concentrations in the Reedsville (Station 29; Figure 3 and Table 2) to contact with carbonates (Station 26; Figure 3 and Table 2) shows marked increase from 50 to 125 parts per million (ppm). That concentration increases to 275 ppm at Station 35 (Figure 3; Table 2) farther downstream.

Nittany Valley carbonates consist of limestone and dolostone. The former is calcium carbonate ($CaCO_3$) and the latter is calcium magnesium carbonate ($CaMgCO_3$). Elevated magnesium concentrations (Table 2) largely associate with dolostone exposures, specifically the Nittany and Bellefonte Formations (On and Ob, respectively; Table 2). The high magnesium concentration at Station 35 appears, at first, as anomalous since it is associated with predominantly limestone strata of the Axemann Formation (Oa; Table 2). However, the Axemann contains alternating dolostone and limestone strata. In addition, this station is the most downstream sampling point along Slab Cabin Run. Therefore, it collectively reflects the sum of dissolved minerals for the watershed.

Of the water-quality parameters in this study, nitrates (Table 2) best reflect land-use impacts. Nitrate concentrations in Slab Cabin Run headwaters are virtually nil. However, concentrations increase significantly for sampling points in Nittany Valley (29, 26, 30, 31, 34, and 35; Figure 3; Table 2). Primary sources of elevated nitrates in this watershed are manure, chemical fertilizers, and on-site septic systems. The first two are mostly associated with agricultural practices. Chemical fertilizers, however, can also originate from other land uses such as golf courses and residential lawns.

Slab Cabin Run flow is related to lithology (Figure 3, Tables 1 and 2). Typically, flow increases with stream length. This is because more drainage area contributes recharge as downstream distance increases. However, this is not always true for Slab Cabin Run. Flow in its headwaters (Figure 3; Station 25, Table 2) is 1.58 cubic feet per second (cfs). Upon contacting carbonate strata (Ob; Table 2), there is a marked decrease in flow to 0.16 cfs (Station 26). This represents a 90 percent flow reduction from Stations 25 to 26. Reduced flow continues downstream until Station 35 where it increases to 1.95 cfs. Streams can have gaining and losing segments. The referenced section of Slab Cabin Run with flow loss is a "losing stream." Surface water is lost to carbonates that have high transmissivity due to their soluble nature. Water is lost via swallow holes (sinkholes in stream channels) and fractures enlarged through solution. At Station 35, there is sufficient inflow into Slab Cabin Run to more than compensate for loss to underlying carbonates. The gaining and losing characterization of stream segments is not necessarily a permanent one. It is contingent upon precipitation. During high precipitation periods, all of Slab Cabin Run may be a gaining stream.

LAND USES

One application of watershed studies is identification of land uses and their potential impacts. Virtually all land use - referring to human use - within a watershed has potential impact on receiving streams. Slab Cabin Run Watershed is no exception. This watershed is: 37 percent agriculture, 35 percent forest, and 27 percent residential (Osmond, et al, 2012). Land-use impacts in this watershed are discussed.

Agriculture is a major source of total suspended solids (TSS) and nitrates. Elevated TSS concentrations largely result from livestock grazing along stream banks and land disturbances associated with crop planting. High TSS concentrations can impact aquatic ecosystems. Brown trout, as in Slab Cabin Run and Spring Creek, require clean, coarse gravel for reproduction (Carline, et al, 2004). Primary agricultural sources for elevated nitrates were discussed under "Water Data." Nitrates can indirectly affect trout because nitrogen is a nutrient for aquatic plants, causing them to proliferate. When this happens, dissolved oxygen concentrations can decline, affecting trout and other aquatic fauna. Because flow from Slab Cabin Run eventually goes to the Chesapeake Bay, nitrate levels are of concern due to their impact on the Bay's ecosystem.

Forest is probably the most stabilizing land use in the watershed. However, tree removal for roads and developments increases runoff, decreases groundwater recharge, and increases TSS. One consequence of increased runoff and decreased recharge is more rapid and more frequent flash flooding.

Residential land use is another name for urbanization - i.e. making an area more urban. Urbanization creates a litany of watershed impacts. Waterproofing land surfaces with impervious materials for roofs, sidewalks, roads, and parking lots leads to reduced infiltration with increased flash flooding; increased total suspended solids; chemical residues; and increased surface-runoff temperatures detrimental

to trout. Construction projects can increase TSS concentrations. Schueler (1994) found that stream biodiversity declined when impervious surfaces exceeded 10 percent. Wang et al (2003) found trout were largely eliminated when connected imperviousness exceeded 10 percent of the watershed. These examples suggest there may be an upper limit to which watershed land surfaces are waterproofed before trout are unsustainable.

Sedimentation and pollution are the two major sources of impairment to Slab Cabin Run (Spring Creek Watershed Atlas). As discussed, both can be linked to the three referenced land uses: agriculture, forest, and residential.

IMPLICATIONS OF A KARST SETTING

Soluble carbonates present potential hydrogeologic issues as Slab Cabin Run flows across Nittany Valley. Much groundwater in local carbonates travels via solution channels, ranging up to the size of large caves. An out-of-area example is shown in Figure 4. This is known as conduit flow. The channels act as underground pipes capable of conveying large volumes of water rapidly over great distances. Similarly, they can just as easily transfer other fluids such as gasoline.

In Slab Cabin Run Watershed are storage tanks, some for gasoline. Pennsylvania has had 14,766 releases from storage tanks since regulations were passed in 1989. A large majority of the tanks stored gasoline (Baniewicz, 2010). Lost gasoline can infiltrate to the water table, degrade water quality, and yield explosive vapors. Within the watershed, at least one underground storage tank in Nittany Valley is known to have leaked (Yoxtheimer, 2015).

Two examples of gasoline leaking in Pennsylvania's karst settings are described as they demonstrate what could happen in Nittany Valley. From 1969-1970, 216,000 gallons of gasoline were pumped from wells at Mechanicsburg (Rhindress, 1971). In 1970 an underground gasoline storage tank at Spring Mills, Centre County, leaked 200 to 250 gallons of gasoline into limestone. Fuel migrated to a water well, causing an explosion that created a crater 25 feet in diameter and 12 feet deep (Figure 5) (Gold, et al, 1970).

Closer to Slab Cabin Run Watershed is Thornton Spring in State College, near Lemont. Recharge to this spring is also in carbonates. Thornton Spring has the distinction of being a Superfund site in State College. It is a classic example of groundwater contamination in karst when 29 chemicals, including Kepone and Mirex, were detected (EPA, 2004).

WATERSHED PROTECTION

Slab Cabin Run Watershed is a valuable resource. It contributes surface flow to Spring Creek, a premier trout stream, and to Chesapeake Bay, a protected estuary. In addition, the watershed is a groundwater recharge area in Nittany Valley. This is particularly important because all of Penn State's drinking water at

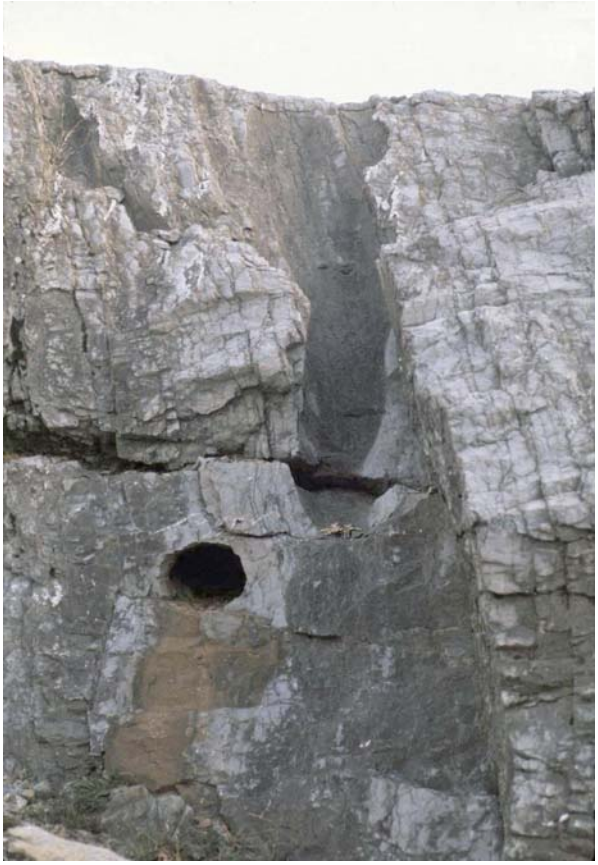


Figure 4: Solution channels in limestone at Pinesburg, MD; 4-11-76. Image by the author.

Figure 5: Ejecta material in crater resulting from well-water explosion in limestone at Spring Mills, PA. Image by R.R. Parizek. (Used with permission) 1970.

University Park and most of State College's is groundwater. Several ways to protect the watershed are discussed, some of which have been implemented.

Giddings (2016) describes several protective measures that relate to Slab Cabin Run Watershed. A 2010 local ordinance requires grouting boreholes, such as for drilled wells and vertical heat pumps. This requirement replaces an old practice using finely-crushed limestone to backfill boreholes. Crushed limestone is very permeable, and its use, as described, allows surface-water and/or contaminants to flow into groundwater aquifers. The ordinance increases groundwater-quality protection in the watershed. Another watershed water-resource protection measure is use of storm-water detention basins. These enhance groundwater recharge, control total suspended solids, and reduce flash flooding. Their efficacy is increased if lateral or serpentine flow paths are incorporated in the basins. Within the watershed, another ordinance establishes surface-water protection areas of Tussey Mountain. This involves setback distances for seeps, springs, and streams. Water from Tussey Mountain represents much of the groundwater recharge for Nittany Valley (Konikow, 1971). Implementation of this ordinance enhances groundwater quality and quantity.

Farm animals grazing along banks of Slab Cabin Run can be a major source of total suspended solids. One way to reduce this is by creating riparian (vegetated) zones along the stream. Vegetation retards overland surface flow, causing suspended sediment to be contained prior to reaching the stream. Carline, et al (2004) describes these efforts for Slab Cabin Run. When done in conjunction with other stream-bank improvements, there are reductions in TSS and increased macro-invertebrate densities are noted.

ADAPTING THE WATERSHED STUDY TO INSTRUCTIONAL COURSES

The Slab Cabin Run Watershed Study is adaptable to a variety of earth science, environmental science, and geology classes ranging from high school to graduate level. Most of its component parts can be applied to these courses, contingent upon student academic background. These include water-data interpretations with reference to geology and land use.

Of any watershed study, the most basic component is the watershed, i.e. its areal extent. Topographic maps are requisite for delineating the boundaries. Whereas a watershed includes both surface and groundwater flow, delineation largely reflects the former. There are situations, however, where watershed boundaries of associated groundwater and surface flow may not coincide, as in Spring Creek Watershed (Figure1). Difference in areal extent of the two related watersheds is largely due to a combination of structural control and topographical slope. Groundwater delineation uses observations from groundwater instruments such as piezometers and from point-source flows such as springs and seeps.

The Slab Cabin Watershed Study combines geology, chemistry, and land uses. This interdisciplinary approach can be expanded to include biology when incorporating electroshocking (Figure 6) and other aquatic assays. In Pennsylvania, these surveys are generally under auspices of the Pennsylvania Fish and Boat Commission. In electroshocking, electricity from portable generators stuns fish. After being identified, weighed, and measured, fish are released. Aquatic surveys can also include benthic larvae that are food for fish. These surveys assist in assessing a stream segment's health and are used in determining whether certain land uses impact a receiving stream. For example, pre-mining stream surveys provide a base for comparison during or after potential polluting activities. The surveys complement water analyses of the same stream segments. Introducing biology into a watershed study complements geology, chemistry, and land-use considerations.

Figure 6: Action image of Pennsylvania Fish and Boat Commission personnel electroshocking a stream in Clinton County. 1987.

CONCLUSION

Slab Cabin Run is a major tributary to Spring Creek, one of the best trout streams in the State. The watershed transitions from headwaters in siliciclastic rocks on Tussey Mountain to karst topography in Nittany Valley. Relationships between bedrock geology, water chemistry, stream-flow characteristics, and land-use effects are evident. Karst topography in the watershed creates hydrogeologic scenarios conducive to groundwater pollution. Some watershed land-use issues have implications as far away as the Chesapeake Bay.

It is likely the watershed will continue being challenged from land-use impacts as the State College area grows. Each change has potential to impact the watershed relative to water quantity and quality, both in regard to Slab Cabin Run and to groundwater recharge for State College. As a result, growth should be in concert with watershed protection measures.

This watershed study has applications in a wide variety of instructional courses, ranging from high-school to graduate-level. The study is interdisciplinary by incorporating geology, chemistry, and geography (land use). It can be extended to include biology in the form of aquatic stream surveys.

ACKNOWLEDGEMENTS

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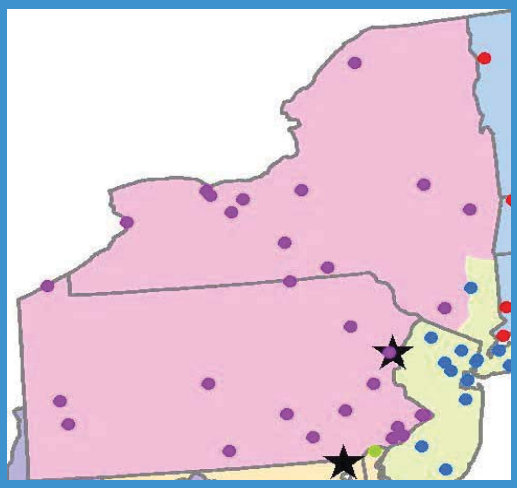
Eastern Federation of Mineralogical & Lapidary Societies

Winter 2020

EFMLS Region 3 *News*

Where you'll find all kinds of info about our great region!



EFTA has begun...

Eastern Field Trip Alliance

The EFMLS Field Trip Sharing Program is underway. Here's an opportunity for all of us to go on many more field trips.

Just click share below...

Share the love of collecting

2020 Annual EFMLS Convention

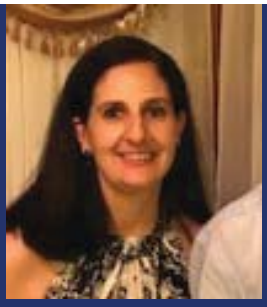
We cordially invite you to rock with us in Hickory, NC. I was guaranteed this will not be one of those regular Conventions.

Click for more & come to the 2020 *Show-Con* !

We have the most!

We lead the nation

Region 3 has the most Societies out of the 8 EFMLS Regions. Question is, do we have the most members of the est. 50,000 members within the American Federation? Stands to reason, we may very well!



Carrie Meyers, Region 3 RVP

Greetings Region 3 Members of EFMLS Affiliate Societies!

Some of you may know me from the Central PA Rock & Mineral Club. I recently became your representative to the Eastern Federation as the Region 3 - Regional Vice President (RVP). Though I am new to the position, I wanted to extend my warmest welcome to all of you to join me in our journey to connect with each other.

Carrie Meyers -feel free to email me at: cmeyers8@comcast.net

Eastern Federation of Mineralogical & Lapidary Societies

Winter 2020

Your Feedback wanted!

This is the inaugural edition of our regional newsletter. Let's join forces to promote our Society's well-being, our goals and most importantly, our fun! Please send us your feedback in what you would like to see in upcoming issues. We need to have your local interests and concerns represented here as well as elsewhere in order to get the word out. We want to take a closer look at the many issues that are important to us and the challenges we face in keeping our Societies thriving.

PA State Fossil: Phacops

Calling all Region 3 Societies

GROUP GATHERING

Besides our regular meetings, shows, etc., let's plan a get together with our fellow regional members. Could be a summer picnic & swap or maybe some of you have even better ideas?

COMING SOON

The brand new EFMLS.org will debut in the next few months. Region 3 will have its very own page! This will be our page so we would like to hear your input on content related matters. Email me at cmeyers8@comcast.net

Thank you to all the Region 3 Societies who sent in their 2020 Annual Membership Renewals. We understand your time is valuable but for those we haven't heard from, it's important that we hear from you. Please get your membership information in very soon so that we can spend our time on more important things. If you haven't submitted your renewal, please contact efmls.directory@gmail.com

REGIONAL SHOWS -
go to *EMFLS*.org for full show listings.

Do you belong to more than one Mineral Society?

Do you go to other Society's meetings a few times per year?

Well then, you should be an Ambassador!

The Regional Vice Presidents of the Eastern Federation are seeking individuals to become Ambassadors for their region.

If you or someone you know is interested, please email EFMLSinc@gmail.com to find out more!

NY State Fossil: Eurypterid

Collection photo by David Nock

Some Upcoming Shows and Meetings

Our web site http://www.nittanymineral.org has links to more complete lists and details on mineral shows and meetings around the country. See www.mineralevents.com for more. Verify show schedule before traveling!

Mar. 21-22, 2020: 56th Annual Gem, Mineral, Fossil Show; Montgomery County Fairgrounds. 16 Chestnut St., Gaithersburg, MD Saturday 10 a.m.-5 p.m., Sunday 11 a.m. - 5 p.m. www.glmsmc.com

Mar. 27-30, 2020: EFMLS Convention. See page 2.

Mar. 28-29, 2020: 51stAnnualGem & Mineral Show, by Che-Hanna Rock and Mineral Club. Wysox Volunteer Fire Company Social Hall, 111 Lake Rd., Wysox PA 18854 Sat 9:00 a.m. to 5:00 p.m., Sun 10:00 a.m. to 4:00 p.m.. See http://www.chehannarocks.com/show.html

Mar. 28-29, 2020: Philadelphia Mineral Treasures and Fossil Fair, by Phila. Mineral. Soc. & Delaware Valley Paleontological Soc. LuLu Temple, 5140 Butler Pike, Plymouth Meeting, PA Sat. 10:00 a.m. to 5:00 p.m., Sun. 10:00 a.m. to 4:00 p.m. See www.phillyrocks.org.

Apr. 18-19, 2020: Gem, Mineral & Fossil Show, by Monongahela Rockhounds. Skyview Hall, West Mifflin Volunteer Fire Co. #4, 660 Noble Dr., West Mifflin PA 15122. Sat 10-6, Sun. 10-4. http://www.monongahelarockhounds.org/events.php

Apr. 23-26, 2020: Rochester Mineralogical Symposium http://www.rasny.org/MinSymp/

Apr. 25-26, 2020: Gem & Mineral Show, by New Jersey Earth Science Association. Littel Community Center, 12 Munsonhurst Rd., Franklin NJ 07416. Sat 9-5:30, Sun. 10-5. http://njesa.org/index.html

Geo-Sudoku Solution

A	S	K	L	M	P	I	N	G
L	M	I	G	N	S	K	A	P
G	P	N	I	A	K	S	M	L
K	G	P	S	I	A	M	L	N
I	N	S	M	P	L	G	K	A
M	L	A	N	K	G	P	S	I
P	K	G	A	S	N	L	I	M
N	I	L	K	G	M	A	P	S
S	**A**	**M**	**P**	**L**	**I**	**N**	**G**	K

** CLASSIFIED ADS - See page 2 **

NMS BOARD MEETING NOTICE

NMS members are invited to attend Board of Directors meetings, which are generally held at 7:00 p.m. about two weeks prior to the general monthly meeting, although we do not meet every month. **The next date is May 7.** Members who would like to attend should contact president David Glick to verify time and place; those who would like to have their discussion item placed on the agenda should contact him at least one week in advance of the meeting.

INVITE A FRIEND TO JOIN THE SOCIETY

The Nittany Mineralogical Society prides itself on having among the finest line-up of speakers of any earth sciences club in the nation. Everyone is welcome at our meetings. If you'd like to be part of our Society, dues are $20 (regular member), $7 (student rate), $15 (seniors), $30 (family of two or more members, names listed). Those joining in March or later may request pro-rated dues. Your dues are used for programs and speakers, refreshments, educational activities, Bulletins, and mailing expenses. Please fill out a membership form (available at www.nittanymineral.org), make checks payable to "Nittany Mineralogical Society, Inc." and send them in as directed, or bring your dues to the next meeting.

We want to welcome you!

CONTACT INFORMATION

mailing address:

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c/o S. Bingham, Treasurer
145 Goddard Cir.
Penna. Furnace PA 16865

SOCIETY OFFICERS

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e-mail: raltamura@comcast.net
John Dziak (Secretary) e-mail: jjd264@psu.edu
Stuart Bingham (Treasurer)
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OTHER CONTACTS

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Membership Chair: David Glick (see above)
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e-mail: gold@ems.psu.edu
Door Prizes: Dr. Bob Altamura (see above)
Facebook & Publicity: John Dziak: jjd264@psu.edu

The **Bulletin Editor** will welcome your submissions of articles, photos, drawings, cartoons, etc., on minerals, fossils, collecting, lapidary, and club activity topics of interest to the members. Please contact:

David Glick E-mail: xidg@verizon.net
209 Spring Lea Dr. phone: (814) 237-1094 (h)
State College, PA 16801-7226

Newsletter submissions are appreciated by the first Wednesday of the month. Photographs or graphics are encouraged, but please do not embed them in word processor files; send them as separate graphics files (TIF, or good to highest quality JPEG files, about 1050 pixels wide, are preferred). Please provide captions and name of photographer or artist.

Visit us at www.nittanymineral.org