Mine Falls Park – Revisited

Tom Mortimer

The Mine Falls area of the Nashua River is one of the oldest known mineral occurrences in New Hampshire. When New Hampshire's first state geologist, Charles Jackson, reported on the silver rich galena occurrence here in 1844, it had already been known to locals for many years. However, the value of the vein was grossly overestimated and those who invested in it never recovered their money. The notoriety of this mineral occurrence has persisted to modern times, being referenced in Phillip Morrill's *New Hampshire Mines and Mineral Localities* and Meyers and Stewart's *The Geology of New Hampshire, Part III Minerals and Mines*. I searched the Mine Falls Island area in the late 1970's looking for collectable specimens. I came away empty handed.

A *Nashua Telegraph* article, (in 1983, I believe) announced the construction of a hydro-electric power station to be built on the site of the Mine Falls dam. The ledge was to be blasted for the station and outflow channel. If minerals were to be found at Mine Falls, this was a one time opportunity! A Sunday visit to the site revealed the Nashua River had been diverted from its traditional path and the channel had been blasted about twenty feet deeper on its eastern bank. There was lots of freshly exposed ledge and rock. Portions of the river bed that had always been under water, were now exposed. Searching through this I found ….nothing!

I told fellow Nashua Mineral Society member Scott Whittemore about the activity at Mine Falls and he went over for a look. A phone call a few days later related that Scott had found many interesting minerals: arsenopyrite, galena, sphalerite, as well as zeolite and carbonate species. I was dumbfounded and embarrassed that I could have missed so much! In hindsight, I would attribute my failure to lack of experience with sulfide ore vein occurrences. Up to this time my field collecting experience had been limited to pegmatite mine dumps, Moat Mtn. smoky quartz collecting, and trips to the Herkermer, NY areas. The following week I arranged a return visit to Mine Falls with Scott. It did not take Scott long to point out what I had over-looked. Soon I had a bucket full of arsenopyrite, galena, sphalerite, and calcite seam specimens that promised zeolite minerals. Scott was also a skilled and observant micro mineral collector. On subsequent trips he began finding micro crystals anatase, brookite, and chabazite in millimeter thick quartz seams that traversed the phyllite country rock. This was an eye-opening experience for me. I would have never thought to look at these almost inconspicuous seams for collectable specimens. This was my introduction to field micro-mineral collecting. My enjoyment of the hobby transitioned to a new level.

Scott ultimately identified fourteen species at Mine Falls. Micro mineral collector Bob Janules, Scott, and myself spent many hours going over the ledges and rock below the dam. Fellow Nashua mineral club member Curt LaPlante and myself made several excavations of the quartz-sulfide ore vein and recovered many larger pieces of massive galena, sphalerite, and pyrrhotite. The pair of us opened one large (foot diameter) pocket that yielded about a dozen cabinet-sized milky quartz crystal specimens.

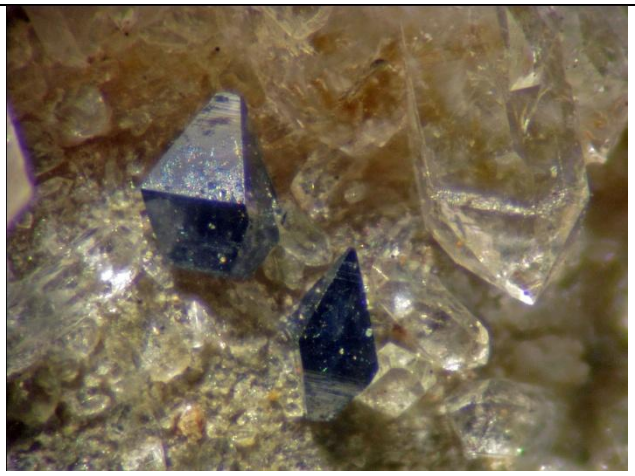
An article authored by Scott Whittemore, "Recent Mineral Discoveries at MINE FALLS PARK Nashua, Hillsborough County, New Hampshire" appeared in the Sept./Oct 1990 issue of *Rocks & Minerals*. The article presents an excellent overview of the history and geology of Mine Falls. A single color photo page contains images of five specimens. (Budget constraints greatly limited color photos in early 1990's R&M issues.) Eight other species were illustrated with black and white photos.

Advances in digital photography, image stacking, and web publishing now present an opportunity to compile an expanded reference of Mine Falls locality species. All specimens are from the collection of Tom Mortimer, except as noted.

The MINE FALLS LOCALITY - Google image

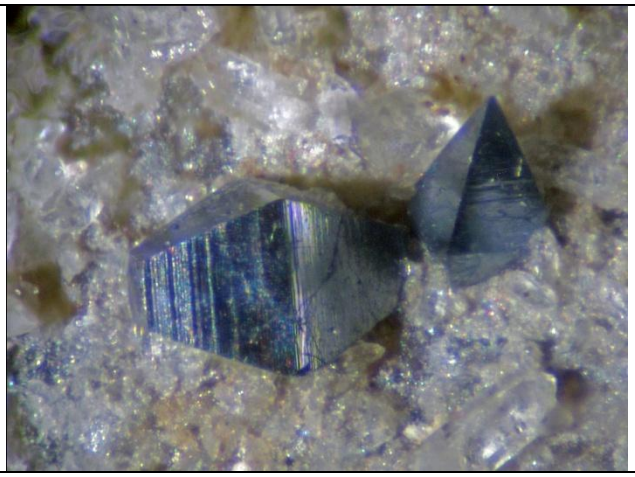
View of Mine Falls hydro-electric station looking upstream. Blasting in 1983-4 for the hydro-station and river bed channel exposed the minerals found at this locality. The lowering of the river bed enabled the ledge seen on the right side of the photo to be available for mineral prospecting.

The MINE FALLS LOCALITY - annotated
Annotation:
RED: This vertical (approx 20 ft.) ledge zone hosted a one to two inch wide vein of arseno-pyrite in white quartz. Some zones of this vein were solid arsenopyrite, as shown by the 12 pound slab below. No evidence remains of this vein today.
BLUE: This vertical zone dipping into the river channel was the location where most zeolite minerals, carbonate minerals, and prehnite were found. None of these minerals were found after the deepened channel was flooded.
YELLOW: The phyllite rock ledge contains thin (1 - 2 mm) quartz crystal seams that host micro anatase, brookite (rarely), and chabazite crystals.
ORANGE: A quartz dyke, 4 to 12 inches wide, traverses the exposed ledge below the dam. Sulfide minerals galena, sphalerite, pyrrhotite, and pyrite were found in this dyke. A one foot diameter pocket containing quartz crystals was opened on the "island side" of the vein, lower left.
WHITE: The west side of the river bed ledge may be accessed via a path originating between two houses on Cheyenne Drive, opposite intersection with Inca Drive. Although unmarked, it is believed this path is a public "right of way."



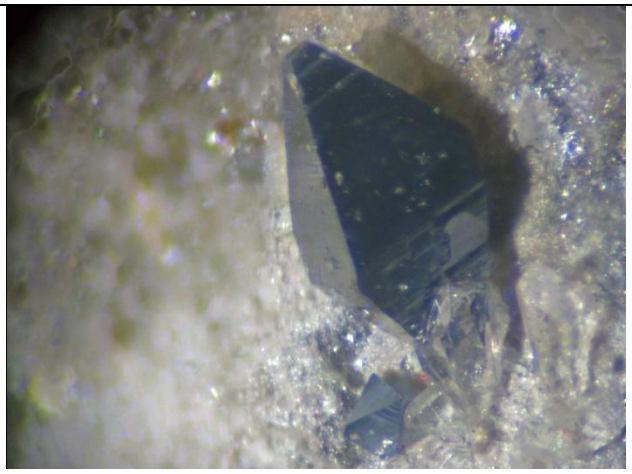
ANATASE TiO_2

Locality: Mine Falls Park, Nashua, NH
Specimen Size: Pair of deep-blue anatase crystals with quartz crystals. Largest anatase is 1 mm.
Field Collected: Scott Whittemore



ANATASE

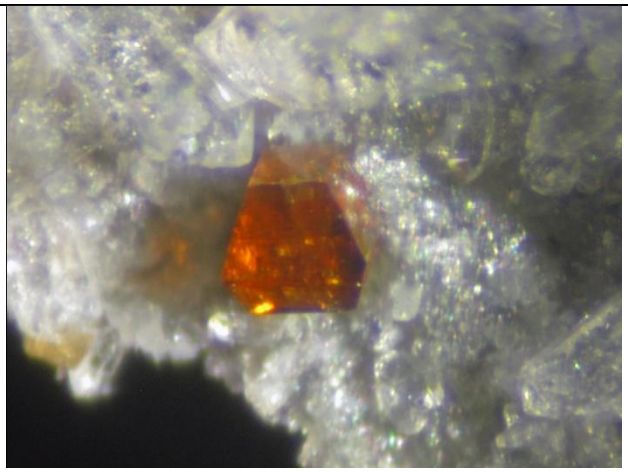
Locality: Mine Falls Park, Nashua, NH
Specimen Size: Another pair of deep-blue anatase crystals with quartz crystals. Largest anatase is 1 mm.
Field Collected: Scott Whittemore



ANATASE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 1 mm anatase crystal.
Field Collected: Scott Whittemore

Notes: It is difficult to avoid some "washed-out" appearance with these dark blue crystals on a bright reflective background.



ANATASE

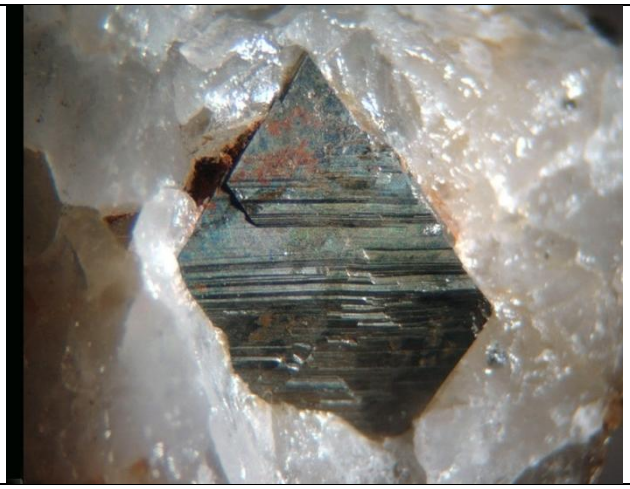
Locality: Mine Falls Park, Nashua, NH
Specimen Size: 0.3 mm orange-red anatase crystal in quartz crystal seam.
Field Collected: Tom Mortimer

Notes: This anatase crystal has prominent pinacoid faces.

ANKERITE $Ca(Fe^{2+},Mg,Mn^{2+})(CO_3)_2$

Locality: Mine Falls Park, Nashua, NH
Specimen Size: Broken 3.5 cm tan rhombic ankerite crystal cross-section, with limonite rind, embedded in sphalerite.
Field Collected: Tom Mortimer

Notes: Specimen backside is mostly galena. This tan carbonate was originally thought to be siderite. Ankerite was confirmed by EDS analysis.



ARSENOPYRITE FeAsS

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 8 mm arsenopyrite crystal in quartz.
Field Collected: Tom Mortimer

ARSENOPYRITE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 4 mm arsenopyrite crystal in quartz-mica matrix
Field Collected: Tom Mortimer

ARSENOPYRITE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: A 12 inch wide, 20 pound chunk from a large sheet-like vein of arsenopyrite that was exposed at Mine Falls Park during construction of the hydro-electric plant in 1984.
Field Collected: Tom Mortimer

Notes: Definitely NOT a micro! This chunk is about 80% arsenopyrite, mixed with some quartz and mica. Slickenside surfaces are present on both sides.

ARSENOPYRITE - (casts)

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 9 cm specimen with many diamond cross-section voids formally occupied by arsenopyrite crystals.
Field Collected: Tom Mortimer

Notes: This specimen is a testimony of the dissolution of arsenopyrite releasing arsenic into the groundwater. Arsenic in groundwater has been a topic of several local newspaper articles during the past decade.

ARSENOPYRITE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 7 cm specimen of intergrown steel-gray arsenopyrite crystals with minor mica-quartz.
Field Collected: Tom Mortimer

Notes: A typical Mine Falls Park arsenopyrite vein rock chunk. After the blasting for the hydro-station out-fall channel, hundreds of pounds of this vein were lying on the channel floor.

ARSENOPYRITE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 5 mm arsenopyrite crystal in quartz.
Field Collected: Tom Mortimer

BROOKITE TiO_2

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 0.5 mm brookite crystal group on quartz crystals.
Field Collected: A Bob Janules specimen

Notes: Brookite is rare at the Mine Falls Park locality. Anatase, brookite and rutile are titanium dioxide trimorphs. Bob Janules recalls collecting a small rutile example, but is unable to locate the specimen. (TJM photo)

CALCITE $CaCO_3$

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 2 mm calcite crystal in center.
Field Collected: Scott Whittemore

Notes: Massive calcite is also present at Mine Falls as a fracture vein filling mineral.

CALCITE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 4 mm field of view. Calcite scalenohedrons with stilbite.
Field Collected: Scott Whittemore

CHABAZITE $K_2NaCa_{0.5}(Al_4Si_8O_{24}) \cdot 11.5H_2O$

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 9 mm field of view
Field Collected: Scott Whittemore

CHABAZITE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 8 mm field of view. Chabazite on stilbite.
Field Collected: Scott Whittemore

GALENA PbS

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 5 mm crystal group in quartz pocket
Field Collected: Tom Mortimer

Notes: Euhedral crystals of galena are rare at Mine Falls, only a few examples are known. An analysis performed for Charles Jackson's 1844 New Hampshire survey indicated the galena was argentiferrous, i.e. contained a significant amount of silver. A recent EDS analysis for Tom Mortimer confirmed the presence of silver in the galena.

GALENA

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 6.5 cm specimen of galena in milky quartz.
Field Collected: Tom Mortimer

Notes: Massive galena in milky quartz is the form of this mineral more commonly found at Mine Falls.

HEULANDITE
generalized formula: $(Ca,Na)_{2-3}Al_3(Al,Si)_2Si_{13}O_{36}\cdot 12H_2O$
Locality: Mine Falls Park, Nashua, NH
Specimen Size: 2.7 mm heulandite crystal
Field Collected: Tom Mortimer

Notes: Heulandite is the rarest of the three zeolite species found at Mine Falls Park.

HEULANDITE

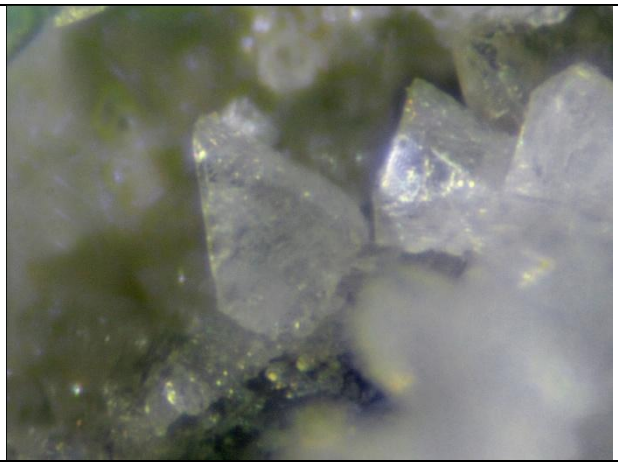
Locality: Mine Falls Park, Nashua, NH
Specimen Size: 2.6 mm heulandite crystal
Field Collected: Tom Mortimer

Notes: The characteristic coffin shape face with the pearly luster of heulandite is visible in this view.

HEULANDITE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 7 mm complex heulandite crystal
Field Collected: Tom Mortimer

Notes: The heulandite crystals have little contrast with the surrounding matrix.



ORTHOCLASE var. Adularia $KAlSi_3O_8$

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 0.3mm orthoclase var. adularia crystals
Field Collected: Tom Mortimer

Notes: Not an outstanding example of this species for New Hampshire. A voucher photo for this species at Mine Falls Park.

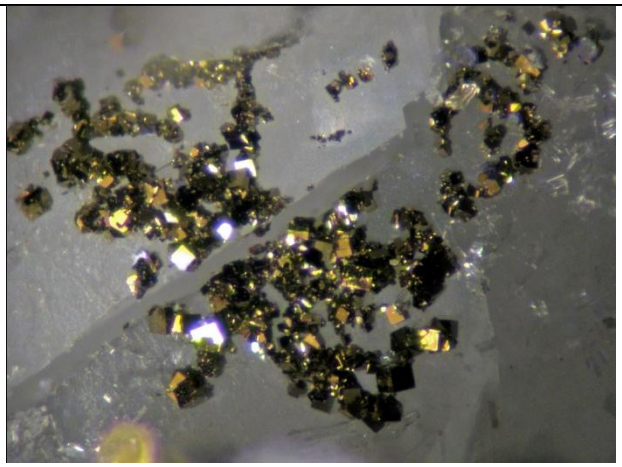
PREHNITE $Ca_2Al_2Si_3O_{12}(OH)$

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 5 mm field of view
Field Collected: Tom Mortimer

Notes: These tabular prehnite crystals were found in calcite filled seams. Sharp, clean, crystals are exposed by dissolving the calcite with vinegar or muriatic acid.

PREHNITE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 5 mm field of view. Stilbite crystal protruding from top.
Field Collected: Tom Mortimer



PYRITE FeS_2

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 3 mm field of view. Tiny pyrite cubes on calcite
Field Collected: Tom Mortimer

Notes: It is difficult to avoid a few reflections on these tiny, lustrous, cubes.

PYRITE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 0.6 mm cubo-octahedral pyrite crystal on oxidized pyrrhotite
Field Collected: A Bob Janules specimen. (TJM photo)

PYRITE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 1.8 mm pyrite crystal
Field Collected: A Bob Janules specimen. (TJM photo)

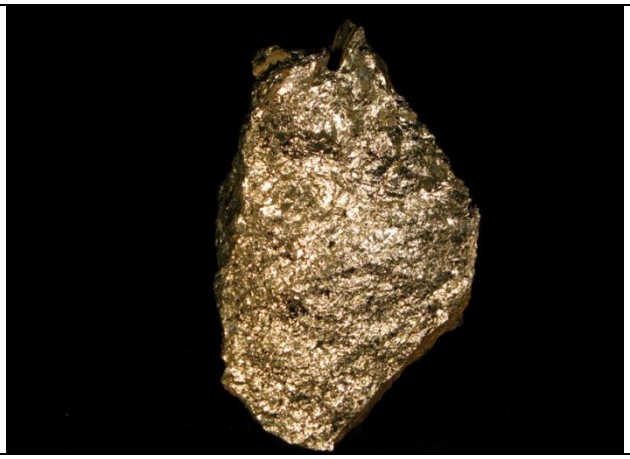
PYRRHOTITE $Fe_{1-x}S$ (x = 0 - 0.2)

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 4.5 mm pair of co-planer, oxidized, pyrrhotite crystals with small pyrie crystal, top right.
Field Collected: A Bob Janules specimen. (TJM photo)

PYRRHOTITE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 5 cm specimen of massive pyrrhotite on milky quartz.
Field Collected: Tom Mortimer

Notes: Pyrrhotite is slightly magnetic, distinguishing it from pyrite.



PYRRHOTITE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 3 cm specimen of massive Pyrrhotite
Field Collected: Tom Mortimer

QUARTZ SiO_2

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 7.5 cm specimen
Field Collected: Tom Mortimer

Notes: Some crystals have a bright white quartz over-growth.

QUARTZ

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 6 cm specimen
Field Collected: Tom Mortimer

Notes: These quartz crystal clusters came from a basket-ball sized pocket from the "mine island" side of the principal quartz vein. Limonite residue in this pocket indicated that much of the space not occupied by quartz was filled with a sulfide mineral, perhaps pyrrhotite. As New Hampshire quartz specimens go, these are not particularly attractive, but for a southern NH locality, they are relatively large.

QUARTZ

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 2.6 cm double terminated "floater" quartz crystal from large pocket.
Field Collected: Tom Mortimer

QUARTZ

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 2.3 cm quartz crystal
Field Collected: Tom Mortimer

SPHALERITE ZnS

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 4 cm specimen of massive sphalerite
Field Collected: Tom Mortimer

STILBITE $NaCa_4[Al_9Si_{27}O_{72}] \cdot nH_2O$

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 8 mm field of view. Limonite coated stilbite crystals on quartz.
Field Collected: Tom Mortimer

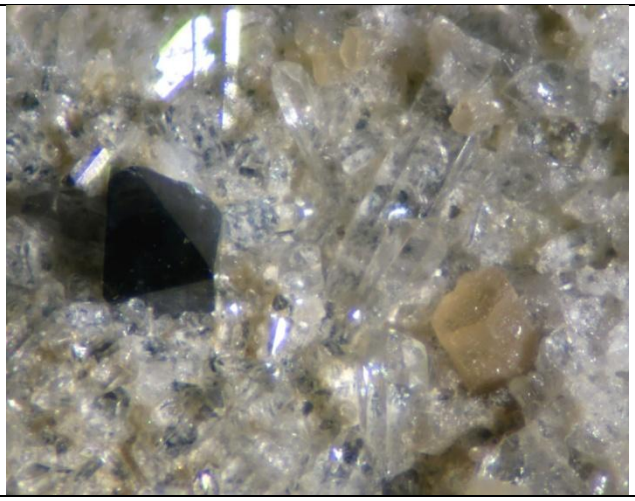
STILBITE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: Largest stilbite crystal is 4 mm
Field Collected: Tom Mortimer

STILBITE

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 9 mm field of view
Field Collected: Tom Mortimer

Notes: A stack of 26 images processed with Helicon Focus. Multiple crystal habits of stilbite were observed at Mine Falls Park.



SYNCHYSITE-(Ce) $Ca(Ce,La)(CO_3)_2F$

Locality: Mine Falls Park, Nashua, NH
Specimen Size: 0.3 mm pale yellow, hexagonal Synchysite-(Ce) crystal with deep blue Anatase crystal
Field Collected: Tom Mortimer

Notes: Synchysite-(Ce) confirmed by EDS analysis performed by the late Dr. Eugene Foord of the USGS.

Scott Whittemore's article reported the occurrence of siderite at Mine Falls. Scott did not report the similar carbonate, ankerite. The Mine Falls "siderite" specimen in my collection was analyzed to be ankerite. The orthoclase var. adularia was not previously reported as well.

Barring future construction at the Mine Falls dam, the "heyday" of collecting for this site is likely past. There remains the potential for micro crystal collecting in the thin quartz seams in the phyllite rock on both sides of the river. The diligent collector may find anatase and chabazite, and, if very fortunate, brookite and synchesite-(Ce). The larger milky quartz vein that traverses the site is still visible. Extracting rock from this seam is difficult, but a concerted effort might produce several sulfide ore species. Caution is recommended accessing the river bed ledge area from the path on the west side, as the final decent to the river is quite steep. Exploratory field trips here will be best during summer and early fall, when the river level is low and the ledges dry.

Per the Mine Falls Park web page (2013), "Visitors enjoy numerous passive recreation opportunities." The request on this web page: "Don't ...Damage or deface signs or structures, such as bridges, rocks, etc." is hopefully directed at graffiti vandals and not intended to prohibit the acquisition of a few mineral samples by the hobbyist collector. The Nashua Parks and Recreation Dept. provides a Trail Map for Mine Falls Park.

All photos in this article are available on mindatnh: http://mindatnh.org/MineFalls%20Gallery.html The web site provides the images in a much higher definition than possible with this printed article.