Preliminary Reconnaissance Bedrock Geologic Map of the Shrewsbury Quadrangle, Worcester County, Massachusetts

by

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DESCRIPTION OF MAPPED UNITS
RECONNAISSANCE BEDROCK GEOLOGIC MAP
SHREWSBURY QUADRANGLE
WORCESTER COUNTY, MASSACHUSETTS

J. Christopher Hepburn, 1977

Stratified Rocks
(youngest to oldest)

DSw
Worcester Phyllite
(Devonian-Silurian?)

Gray, well-foliated micaceous phyllite and schist with interbeds of impure quartzite and quartz-rich granulite a few cm. to one metre thick. Garnet porphyroblasts are locally abundant in the pelitic beds, and calc-silicate minerals are locally present in the granulites.

DSwm Gray to "punky-brown" weathering impure marble, calc-silicate granulite, and marble "breccia" in beds 2 to 4 metres thick, interbedded with mica schist.

So
Oakdale Formation
(Silurian?)

Green-purple to gray, quartz-rich granulit
gray phyllite predominate. Ankerite and c
are common. Bedding commonly is on the order of 0.25 to 0.5 metres, although it ranges from a few cm. to 2 metres in thickness. Gray to gray-green phyllite with a few interbeds to 0.5 metres thick of calc-silicate bearing granulite predominates in the Andrews Harbor area of Wachusett Reservoir.

St
Tower Hill Quartzite
(Silurian?)

White to light-gray vitreous quartzite and orthoquartzite in beds to several metres thick, with interbeds of dark-gray to more rarely rusty-weathering mica schist and quartz-rich granulite. Locally quartzite and schist are interlaminated on the scale of several mm.

Sts Dark-gray to rusty-weathering phyllite, and silty phyllite, locally with thin interbeds of quartzite or quartz-feldspar-mica ±calc-silicate granulite. Thin laminae of light-pink coticule are present in a few localities. Includes in part low grade rocks mapped as the Boylston Formation by Grew (1970).

?lPb

Boylston Schist

(Lower Paleozoic?)

Gray to dark-gray sillimanite-bearing quartz-muscovite schist, commonly lacking fissility. Larger muscovite flakes commonly have grown across the foliation. Locally prominent interbeds of quartzo-feldspathic granulite to 0.5 metres thick are present. Also included are rusty-weathering dark-gray sillimanite bearing mica schist and tan-to light-greenish-gray calc-silicate bearing quartzo-feldspathic granulite.

The Boylston Schist as shown here in the Shrewsbury quadrangle is essentially the same as that originally defined by Emerson (1917, p. 67-8) from the type area in Boylston and is restricted here to the sillimanite grade schists. Grew (1970) modified Emerson's original definition of the Boylston and included in it a series of lower grade micaceous phyllites, granulites, and calc-silicate granulites in the Shrewsbury, Worcester North and Worcester South quadrangles. Because the correlation of these units with the Boylston Schist in Boylston is still in question, it is felt the name Boylston Schist should be restricted to the rocks originally so designated by Emerson in the Boylston area. The Boylston Schist in the Shrewbury quadrangle is believed to correlate in the Worcester North quadrangle with the informally named "Science Park" unit of Hepburn (1976).

pЄvh

Vaughn Hills Formation?

(Precambrian Z?)

Light-gray to locally rusty-weathering muscovite-biotite phyllite and mica schist, interbedded with gray to purplish-gray quartzo-feldspathic granulite and light-gray quartzite on a scale of several cm. to 1.5 metres. The granulites are locally calc-silicate bearing.

This unit can be traced along strike to exposures of the Vaughn Hills Member of the Tadmuck Brook Schist mapped by Peck (1975) in the Clinton quadrangle. Whether this unit is correlative with the Vaughn Hills Member of the Worcester Phyllite mapped by Hansen (1956) is still in question. The Vaughn Hills as mapped in the Shrewsbury quadrangle undoubtedly includes in part rocks mapped as DSm (metasiltstone inclusions in

the Fitchburg Granite) in the Clinton quadrangle by Peck (1975).

pCtb

Tadmuck Brook Schist

(Precambrian Z?)

Rusty-weathering, gray to dark-gray, well-foliated sulfidic mica schist and phyllite. Locally prominent thin beds of gray to brown weathering quartzite to 0.5 metres in thickness are present, particularly near the western contact of the formation where they may make up more than 20% of the formation. Locally, sillimanite, garnet and biotite are present as accessory minerals. Included within the Tadmuck Brook Schist belt, particularly near Straw Hollow, Boylston, are sills of the Straw Hollow Diorite too small to map separately.

pCn

Nashoba Formation

(Precambrian Z?)

pCnu Nashoba Formation undifferentiated.
Gray to dark-gray, medium-grained biotite-quartz-feldspar gneisses predominant, with lesser amounts of interlayered biotite-rich schist, amphibolite, calc-silicate granulite, marble, gray sillimanitic mica schist, and quartzo-feldspathic granulite to gneiss. The interlayering takes place on all scales from a few cm. to tens of metres. Included within the Nashoba Formation are considerable amounts of pegmatite, granite, and migmatitic granitic veins and lenses.

pCnr Rusty-weathering, dark-gray, well-foliated sulfidic sillimanite bearing mica schist. Interlayers or sills of hornblende amphibolite are common in the schist.

pCnc Marble and calc-silicate granulite.

pCm

Marlboro Formation

(Precambrian Z?)

pCmu Marlboro Formation undifferentiated.
Dark-gray to black, fine- to coarse-grained hornblende amphibolite, biotite amphibolite, biotite schist, and biotite-plagioclase gneiss. Lesser amounts of rusty-weathering mica schist, quartzo-feldspathic granulite and calc-silicate granulite. Near the base of the formation adjacent to the Lake Char fault the rocks have been extensively altered and sheared.

p€mg Gray to tan, homogeneous, massive, fine-to medium-grained granulite consisting of biotite, muscovite, plagioclase, and quartz.

p€w

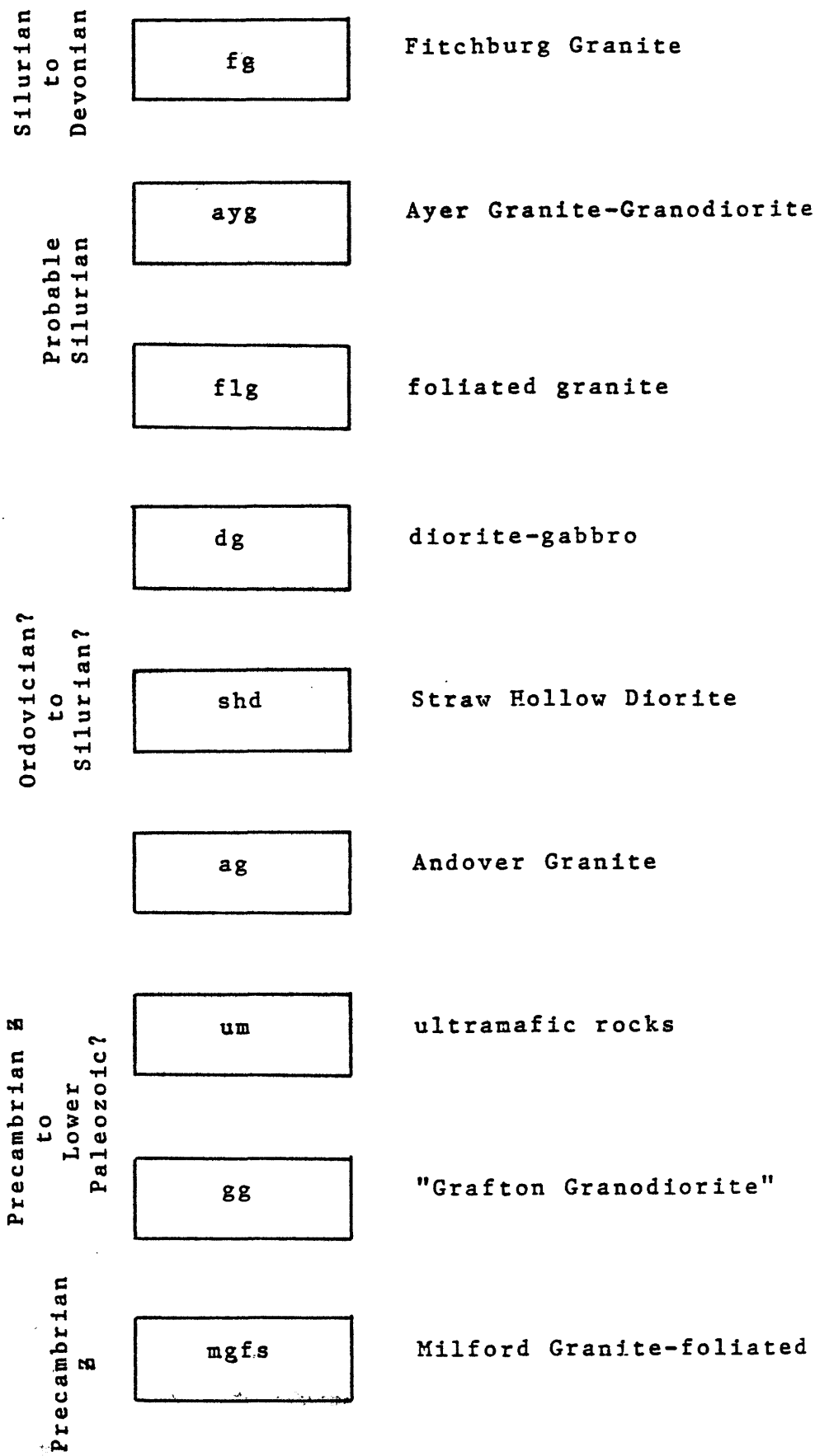
Westboro Formation

(Precambrian Z?)

Light-gray to tan quartzite, feldspathic quartzite and micaceous quartzite predominate. Lesser amounts of interbedded biotite schist, muscovite schist, calc-silicate bearing quartzite, and amphibolite.

SHREWSBURY QUADRANGLE, WORCESTER CO. MASS.

COLUMNAR SECTION FOR PLUTONIC ROCKS



Plutonic Igneous Rocks
(youngest to oldest ?)

fg

Fitchburg Granite

Light-gray to white, medium- to fine-grained massive to well foliated, two-mica to muscovite granite to granodiorite. Micas generally make up less than 5% of the rock. Biotite, where present, generally reveals the foliation. In addition to the large outcrop area in the north-central portion of the quadrangle, this granite also forms many smaller intrusions, some large enough to be shown separately on the map.

This granite in the Shrewsbury quadrangle is tentatively correlated with the Fitchburg Granite on the basis of lithological similarity. It is continuous with the Fitchburg Granite as mapped by Peck (1975) in the Clinton quadrangle. Grew (1970) also correlated this rock with the Fitchburg Granite. Goldsmith (personal communication, 1977) and others have suggested this rock may be correlated with portions of the Ayer Granite complex.

ayg

Ayer Granite-Granodiorite

Gray, medium- to coarse-grained, massive to well foliated, biotite granodiorite to granite. Locally potassium feldspar phenocrysts to 3 cm. in length are present. Commonly, the feldspar crystals are somewhat lensoid in shape and surrounded by biotite.

flg

Foliated Granite

Light- to medium-gray, predominantly medium-grained, well foliated, massive, muscovite-biotite granite to quartz monzonite. Feldspar and to a lesser extent quartz occurs as small phenocrysts in a foliated micaceous groundmass.

dg

Diorite-Gabbro

Lenses of dark gray to dark gray-green, medium- to fine-grained, massive, hornblende-biotite gabbro to diorite. Included in this unit is a small lens of talc-chlorite-actinolite schist.

This unit was first recognized by Grew (1970). Its correlatives are unknown at the present time.

shd

Straw Hollow Diorite

Dark gray to dark gray-green, medium-grained, poorly foliated hornblende-biotite-quartz diorite with accessory magnetite, pyrite, and locally garnet. Porphyritic varieties with plagioclase phenocrysts to 1 cm. in length occur locally, particularly near Emerson's type area of Straw Hollow, Boylston. In addition to the mapped bodies, small sills are locally present, particularly associated with some of the rusty-weathering schists in the quadrangle.

ag

Andover Granite

Numerous small bodies (some mappable) of medium-to coarse-grained two-mica or muscovite bearing granite or quartz monzonite and pegmatite, commonly associated with the Nashoba Formation are tentatively correlated with the Andover Granite. Small garnet phenocrysts are common accessory minerals. Smaller bodies of the granite tend to be well foliated; larger bodies may be essentially unfoliated near their centers.

um

Ultramafic Rocks

Dark gray-green, fine-grained serpentinite and talc-carbonate form one small body of altered ultramafic rock large enough to map separately in Shrewsbury.

gg

"Grafton Granodiorite"

Tan-gray to dark gray, medium-grained, well foliated biotite granodiorite (may range from quartz monzonite to diorite). The biotite comprises approximately 5% of the rock. Locally, the Grafton has been altered and chloritized. Within the Grafton are numerous large inclusions of rocks typical of the Marlboro Formation, including amphibolite and biotite schist.

Grafton is an informal name given to this rock by Dixon (personal communication, 1977) for exposures in the town of Grafton to the south of the Shrewsbury quadrangle. The Grafton Granodiorite can be traced continuously from this area to the Shrewsbury quadrangle.

mgfs

Foliated Milford Granite = Scituate Granite Gneiss

Light pink-gray to gray to light pink, foliated, medium- to coarse-grained granite to granodiorite. Biotite is the principal mafic mineral and ranges from 5% to 12%. Muscovite is generally absent. Magnetite, ilmenite, and apatite are the most common accessory minerals. A conspicuous foliation is formed by biotite and elongated and flattened, lensoid-shaped, granular aggregates of light-bluish quartz to 0.5 cm. in size.

Problems Yet To Be Resolved:

1. The single most important problem yet to be resolved by further work in the Shrewsbury quadrangle is to determine what happens to the belt of rocks mapped as the Tadmuck Brook Schist and Vaughn Hills Formation south of Interstate I290. The outcrop is very poor in this area. Two sillimanite bearing schist lenses near the town of Shrewsbury in the southwestern portion of the quadrangle are possible correlatives of the Tadmuck Brook Schist (as has been tentatively shown on the map by dotted lines). However, these two lenses are identical to other rusty schist lenses common in the Nashoba Formation (pCnr). Also, the Tadmuck Brook Schist along I290 is at the biotite and garnet zones of metamorphism. The lenses of rusty schist near Shrewsbury have been metamorphosed to the sillimanite zone. No rocks similar to those mapped as the Vaughn Hills Formation have been found, as yet, near the town of Shrewsbury. Thus, the correlation of these rusty schist lenses with Tadmuck Brook Schist must be considered questionable at present.

2. Abrupt metamorphic grade changes in the Tadmuck Brook Schist in the north-central portion of the quadrangle may indicate that faulting in this area is more extensive than has been indicated.

3. An alternative interpretation for the belt of rusty schists mapped as pCnr in the south-central portion of the quadrangle

is that it correlates with the rusty schist member of the Marlboro Formation as mapped by Hepburn and DiNitto (1978) in the adjoining Marlborough quadrangle. If this is the case, then the thrust fault shown on the southeastern side of the pЄnr unit in the Shrewsbury quadrangle, should be placed instead along its northwestern boundary. This interpretation is not favored at the present time. It is likely that this rusty schist unit (pЄnr) correlates with the rusty unit mapped by Dixon at the base of the Tatnic Hill Formation in areas to the southwest near the Massachusetts-Connecticut border (H. R. Dixon, personal communication, 1977).

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Symbols used on map

Strike and dip of bedding

Strike and dip of schistosity in a stratified rock

Strike and dip of parallel bedding or layering and schistosity

Strike and dip of foliation in plutonic igneous rock

Outcrop containing cataclastic foliation or field evidence of shearing

Contact

dashed where approximately located; dotted where inferred or gradational

Fault

dashed where approximately located; dotted where inferred

Thrust Fault

sawteeth on upper plate, dashed where approximately located; dotted where inferred

SHREWSBURY QUADRANGLE, WORCESTER CO. MASS.

COLUMNAR SECTION STRATIFIED ROCKS