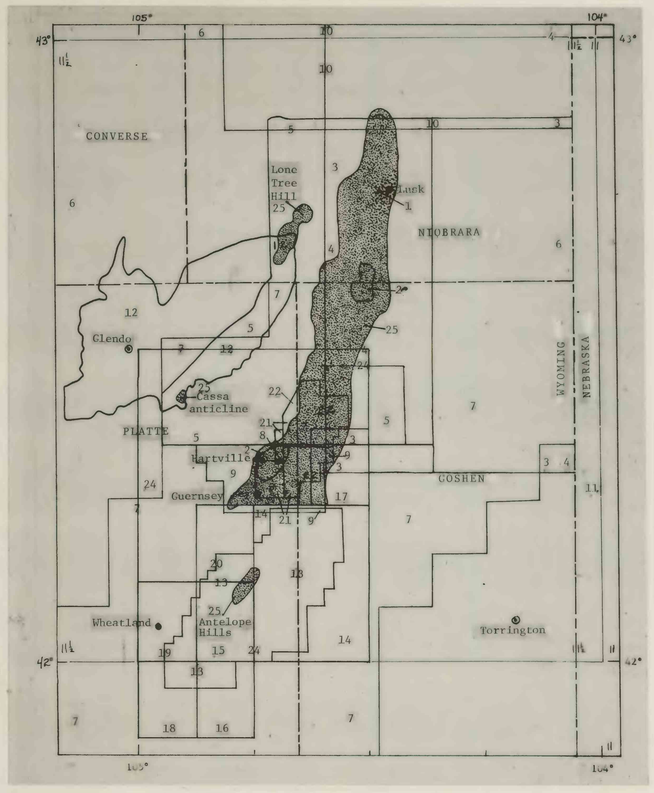
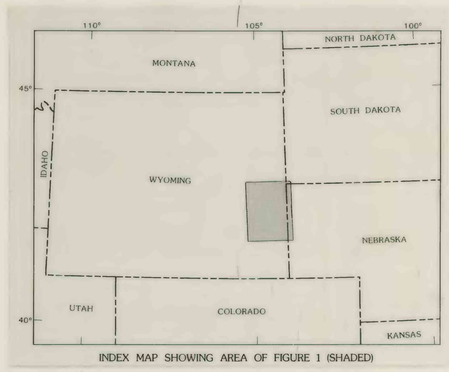


Figure 1.--Index of geologic mapping in the Hartville Uplift, Wyoming. 1, Bromley (1953, fig. 2, scale 1:12,245); 2, Carter (1963, fig. 1, scale 1:30,000); 3, Crist (1977, plate 1, scale 1:120,000); 4, Denson (1974, scale 1:125,000) 5, Denson and Botinelly (1949, sheet 1, scale 1:36,000); 6, Denson and Horn (1975, scale 1:125,000); 7, Droullard (1963, scale 1:250,000); Ebbett (1956, plate 1, scale 1:12,400 and 1:21,120); 9, Harper (1960, plate 3, scale 1:24,000); 10, Kramer and Dobbin (1943, scale 1:126,720); 11, Lidiak (1972, plate 1, scale 1:313,760); 11 1/2, Love and others (1980, scale 1:25,000); 12, Love and others (1949, sheet 1, scale 1:36,000); 13, McGrew (1953, plate 1, 1:47,520); 14, McGrew (1963, plate 1, scale 1:31,680); 15-20, McGrew (1967, GQ's 619-622, 627, and 628, respectively, 1:24,000); 21, Millgate, M. L. (1964, plate 1, 1:24,000); 22, Millgate, M. L. (1964, plate 1, scale 1:24,000); 23, Millgate, M. L. (1966, scale 1:12,000); 24, Smith, W. S. T. (1903, scale 1:125,000); 25. Snyder, G. L. (this report, (shaded areas), scale 1:48,000).



INDEX MAP SHOWING AREA OF FIGURE 1 (SHADED)

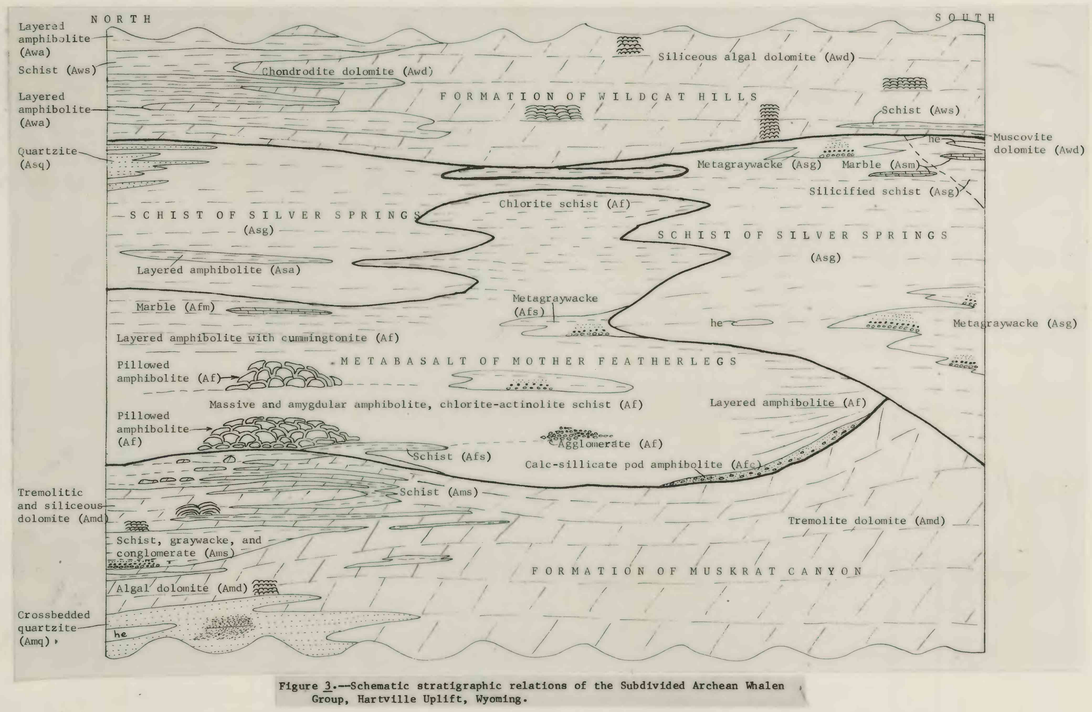


Figure 3.--Schematic stratigraphic relations of the Subdivided Archean Whalen Group, Hartville Uplift, Wyoming.

SCHEMATIC STRATIGRAPHIC RELATIONS OF SUBDIVIDED ARCHEAN WHALEN GROUP

The mapped Archean stratigraphic units and the accompanying stratigraphic diagram (fig. 3) are the first Precambrian stratigraphic reconstructions for the Hartville Uplift based both on complete geologic mapping of the entire uplift and, most importantly, on numerous observations critical to determining stratigraphic tops. Previous maps of Precambrian rocks and associated stratigraphic reconstructions are flawed by the failure of the mappers to recognize suitable evidence for determining stratigraphic tops. For example, the isoclinal fold north of Graves Ranch, where the dolomite near the core of the fold stands topographically higher than the enclosing schists near the eastern nose, has been referred to by all previous workers as an anticline; in contrast my data show that the Graves Ranch fold is a syncline. All previous stratigraphic sections are at least partly inverted; several geologists correlated areas of dolomite now believed by me to be in two stratigraphic units; one geologist recognized two thick pelitic units (said to be separated by over 3000 feet of section) that are here believed to be stratigraphic correlatives. All previous studies concentrated on the area of most complicated structure and greatest secondary alteration between the Chicago Mine and Graves Ranch, which may have contributed to the erroneous interpretations.

Smith (1903) named the Whalen Group and described its prominent lithologies but made no attempt at subdivision. Ball (1907a, p. 193-195) first subdivided the Precambrian rocks at the area of the Sunrise Mine with the recognition of fifteen basal beds of dolomitic limestone, muscovite schist and biotite schist, succeeded by an unconformity, a single local conglomerate, quartzose rocks and jasper beds, and uppermost chlorite and hornblende schists (presumably the upper three formations of the present subdivided Whalen Group in essentially reverse order). Lovering (1933, p. 276), quoting unpublished work by J. B. Stone in the same area, repeated this inverted section as follows: basal dolomite with interbeds of quartzite and schist, medial quartz sericite schist and hematite ore, unconformity, and upper quartz actinolite schist. Noble and Harder (1948, p. 955, also crediting J. B. Stone) described the Hartville Precambrian succession in one sentence: white dolomite, iron carbonate (which alters to iron ore), phyllites, pyritic black slates, and graphitic quartzites. Ebbett (1956, p. 7, 10) made a detailed study of Precambrian rocks in a small area near the Good Fortune Mine, and was the first to cite a stratigraphic top criteria, layering truncations said to be crossbedding (I think they are due to shearing) in a single thin quartzite, while ignoring excellent algal tops criteria in the same vicinity. Ebbett erected the following local stratigraphic section: greater than 1,300 feet of siliceous dolomite in the core of the Graves Ranch "anticline", followed by 30-90 feet of hematite phyllite, 30-100 feet of phyllites and quartzites, 300-600 feet of jasper and phyllite including a hematitic conglomerate, about 350 feet of muscovite phyllite, and an upper biotite phyllite over 800 feet thick. I see this as essentially my upper two stratigraphic units in reverse order. Harper (1960, p. 15), reverting back to the sequences of Ball and Lovering, recognized fifteen basal units of dolomite, thin mica schist and quartzite (fine exposures cited along the North Platte River) succeeded by an unconformity and an upper quartzose amphibole schist with quartzite, conglomerate and hematite ore near its base.

The latest and most regionally thorough work was done by Millgate (1964, 1965, 1966), who made excellent detailed maps of critical Precambrian areas in the Haystack Range and Copper Belt Mines area, Millgate offered the most detailed Precambrian stratigraphic section yet (1964, fig. 3, p. 13) starting with about 8,000 feet of muscovite quartz schist, biotite quartz schist, mica garnet schist, graphite schist and other rocks that I judge to be intrusive. This sequence is followed by over 3,000 feet of pink to gray dolomite and micaceous dolomite with interlayers of chlorite phyllite, and finally by about 6,000 feet of chlorite phyllite and garnet phyllite, and with lenses of hematite, quartzite and conglomerate near its base. Despite the wealth of details, Millgates's stratigraphic reconstruction failed in the following ways: (1) His section relied only on Ebbett's supposed quartzite crossbeds for tops criteria with the result that the half section near the Good Fortune Mine is inverted. (2) The detailed dolomite-schist interbeds are described from the Graves Ranch "anticline" (the formation of Wildcat Hills of this report) but the thickness (following Harper) is measured along the North Platte River (the formation of Muskrat Canyon of this report). (3) Millgate's basal schist of the Haystack Range, in my view, is the same stratigraphic unit as his upper phyllites exposed between the Chicago and Good Fortune Mines and also southwest of Graves Ranch, but with the Arikaree cover in Whalen Canyon obscuring the continuity. I believe the lithologic differences in the two areas are due to secondary silicification and different metamorphic grade. I also believe Millgate was mistaken when he claimed that the top of the schist in the Haystack Range was not exposed and the base of the dolomite was probably not exposed: his maps omit the good exposures of this contact at the head of Whalen Canyon just southeast of Frederic Ranch and the algal, graded bed, and crossbed tops within a mile of this locality that clarify the stratigraphic relations.

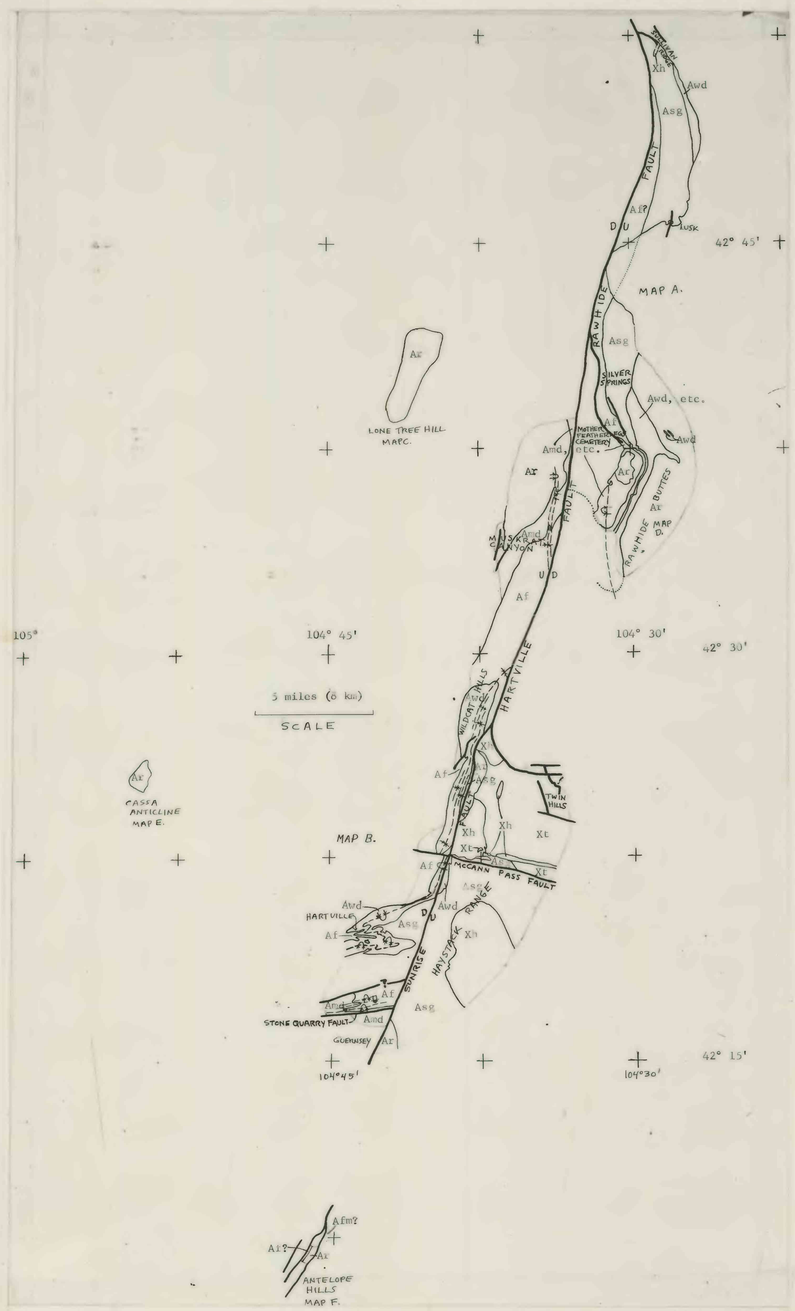
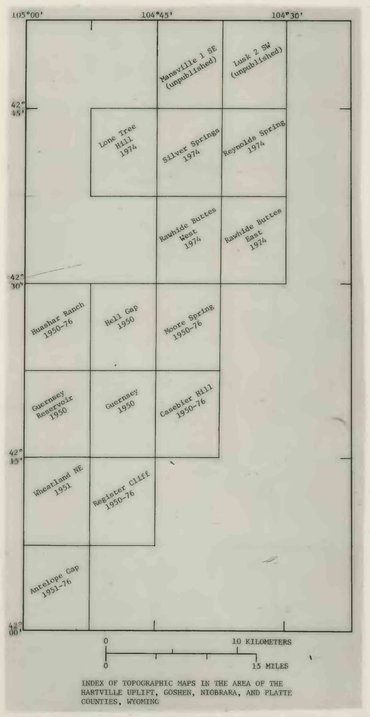


Figure 2.--Geologic summary map showing distribution of Precambrian map units and structures extrapolatable from surface exposures.



INDEX OF TOPOGRAPHIC MAPS IN THE AREA OF THE HARTVILLE UPLIFT, GOSHEN, NIOBRARA, AND PLATTE COUNTIES, WYOMING

LIST OF MAP UNITS

Qal	ALLUVIUM
Qt	TERRACE GRAVEL
Tu	ARIKAREE FORMATION
	GOOSE EGG FORMATION
Pgg	Red mudstone, siltstone, gypsum, and minor limestone of Glendo Shale Member at base and some higher members
Pgm	Minnekahta Limestone Member
Pgo	Opeche Shale Member
	HARTVILLE FORMATION
Ph1	Unit 1
IPh2	Unit 2
IPh3	Unit 3
IPh2-3	Units 2 and 3
IPh4-5	Units 4 and 5
PIPhu	Units 1 through 5 undifferentiated
IPHm6	Unit 6
Mg	GUERNSEY FORMATION
Dēq	QUARTZITE
pe	PEGMATITE
Xa	AMPHIBOLITE
Xh	Feldspar-quartz biotite quartz monzonitic and granitic augen gneiss
Xhf	Granite phase
Xt	DIORITE OF TWIN HILLS
Aa	AMPHIBOLITE
Ar	Feldspar-quartz-biotie coarse-grained granitic augen gneiss to medium-grained uniform gneiss
Ars	Local sillimanite-pod phase of granite
he	HEMATITE
	Formation of Wildcat Hills
Awd	Southern facies, northern facies
Awa	Hornblende-plagioclase amphibolite
Aws	Plagioclase-quartz-muscovite-biotite Schist of Silver Springs
Asg	Plagioclase-quartz-biotite schist and quartz-granule metagraywacke to micaceous garnet-sillimanite schist
Asa	Amphibolite
Asq	Quartzite
Asm	Rare marble interlayers
Af	Metabasalt of Mother Featherlegs
Afm	Calcareous marble interlayers
Afs	Biotite and muscovite schist and graded shale-pebble and quartz-granule feldspathic metagraywacke,
Afc	Calc-silicate pod amphibolite
	Formation of Muskrat Canyon
Amd	Dolomite and tremolite dolomite with tremolite
Ams	Biotite, muscovite, and sillimanite schist (metashale) and graded quartz-granule metagraywacke and local quartzite
Amq	Siliceous to ferruginous quartzite

CONTACT--Showing dip; dotted where concealed; solid triangle indicates good exposure

HIGH ANGLE FAULT--Showing dip; dotted where concealed; U, upthrown side; D, downthrown side

TRACE OF PRECAMBRIAN FOLD--Shown only on geologic summary map

Crest of anticline

Trough of syncline

Overturned syncline

Overturned anticline

Nature of criteria

Poor to fair — Good to excellent

STRATIGRAPHIC TOP CRITERIA--Arrow points toward top of bed

Layering of algal stromatolites in dolomine

Truncation of channel crossbeds in metagraywacke, quartzite, or dolomite

Preserved graded bedding--Quartz granules and grit

Metamorphically reversed graded bedding--Muscovite and sillimanite enlarged by recrystallization in formerly finer grained layers

Lava pillow facing

Local basal conglomerate

PLANAR FEATURES

STRIKE AND DIP OF BEDS

Inclined

Horizontal

Overturned

Folded

STRIKE AND DIP OF METAMORPHIC SCHISTOSITY OR IGNEOUS FOLIATION

Inclined

Vertical

Folded

GENERAL STRIKE AND RANGE OF DIP OF GENTLY FOLDED SCHISTOSITY OR FOLIATION

Inclined

Near-vertical

STRIKE AND DIP OF ZONE OF PROMINENT JOINTS--May be combined with foliation symbol

Inclined

Vertical

INCLINED MYLONITE

LINEAR FEATURES

BEARING AND PLUNGE OF LINEATION--May be combined with planar features. Tail of arrow at point of observation. Abbreviations indicate nature of lineation: Amygs, amygdules; FA, minor fold axis; F-AUG, feldspar augen; FSP, feldspar; Hb, hornblende; Mu Pods, muscovite pods; P, stretch pebbles; Qtz, quartz; Sill, sillimanite; Si-pods, sillimanite pods; TOURM, tourmaline; Trem, tremolite. Also some andalusite, clay pebbles, quartz pebbles, and zoned elongate amygdules

Inclined

Horizontal

Vertical

BEARING AND PLUNGE OF AXIS OF MINOR FOLD--One fold or a group; map sense of fold shown where determinable

Anticline

Syncline

Multiple rounded fold

Multible chevron fold

Known map sense

MINE SYMBOLS

Borrow pit

Quarry

Prospect pit

MAP OF PRECAMBRIAN AND ADJACENT PHANEROZOIC ROCKS OF THE HARTVILLE UPLIFT, GOSHEN, NIOBRARA, AND PLATTE COUNTIES, WYOMING

By
George L. Snyder
1980