Table 1.—Major-oxide analyses of Middle Proterozoic volcanic rocks in the Powder Mill Ferry quadrangle, Missouri.
[Sample locations shown on map. Whole-rock geochemistry using fusion/inductively coupled plasma emission spectrometry with 0.01 percent detection limits provided by Actlabs, Inc., Wheat Ridge, Colorado. LOI, Loss on ignition]

Sample no.	Unit	Location	SiO_2	Al_2O_3	Fe_2O_3	MgO	MnO	CaO	TiO_2	Na_2O	K_2O	P_2O_5	LOI	Total
P1	Ysi	NW1/4,NE1/4 sec. 2, T. 28 N., R. 3 W.	72.66	11.99	3.18	<0.01	0.02	0.36	0.19	0.2	10.2	0.01	0.55	99.36
P2	Ysi	SW1/4,NW1/4 sec. 1, T. 28 N., R. 3 W.	78.44	10.14	2.88	<.01	.03	.02	.18	.18	8.64	<.01	.13	100.64
P3	Ysi	SW1/4,SW1/4 sec. 25, T. 29 N., R. 3 W.	77.37	10.64	2.97	.06	.02	.06	.23	1.37	6.87	<.01	.46	100.05
P4	Ysi	SW1/4,NW1/4 sec. 19, T. 29 N., R. 2 W.	77.75	9.64	2.09	.02	.01	.04	.16	.3	7.99	.02	.36	98.38
P5	Ysi	SE1/4,NE1/4 sec. 24, T. 29 N., R. 3 W.	69.83	11.89	3.79	.01	.01	.38	.19	.2	10.46	.07	.46	97.29
P6	Ysi	NW1/4,NW1/4 sec. 5, T. 28 N., R. 2 W.	72.33	11.55	2.66	.16	.03	.22	.19	2.49	6.07	.02	1.13	96.85
P7	Ysi	SW1/4,SE1/4 sec. 30, T. 29 N., R. 2 W.	74.01	11.73	1.99	.03	.01	.01	.19	.3	9.82	.02	1.19	99.3
P8	Ysi	SE1/4,SE1/4 sec. 30, T. 29 N., R. 2 W.	74.65	11.67	2.38	.04	.03	.04	.19	2.43	6.4	.02	.84	98.69
P9	Ysi	NW1/4,NE1/4 sec. 31, T. 29 N., R. 2 W.	75.18	11.13	2.5	.02	.02	<.01	.18	.94	8.12	1.27	.71	100.07
P10	Ysi	NW1/4,SW1/4 sec. 36, T. 29 N., R. 3 W.	67.99	15.03	3.02	.07	.03	.01	.22	.21	12.4	.02	1.17	100.17
P11	Ysi	SE1/4,SE1/4 sec. 36, T. 29 N., R. 3 W.	72.81	12.31	2.77	.1	.02	.01	.2	.86	8.55	.02	1.15	98.8
P12	Ysi	SE1/4,SE1/4 sec. 36, T. 29 N., R. 3 W.	75.17	11.08	2.43	.08	.01	<.01	.17	.28	8.1	.09	1.17	98.58
P13	Ysi	SW1/4,NW1/4 sec. 33, T. 29 N., R. 2 W.	77.56	11.22	2.05	.04	<.01	.02	.13	.16	8.81	.02	.74	100.75
P14	Ysi	SW1/4,SE1/4 sec. 29, T. 29 N., R. 2 W.	77.42	9.46	2.39	.02	<.01	.02	.15	.23	7.95	.01	1.41	99.06
P15	Ysi	SE1/4,SE1/4 sec. 36, T. 29 N., R. 3 W.	76.56	11.22	2.44	.1	.01	.01	.18	.5	8.08	<.01	1.3	100.4
P16	Ysi	NW1/4,NE1/4 sec. 32, T. 29 N., R. 2 W.	75.12	12.33	2.54	.09	.01	.03	.2	1.73	7.31	.07	1.27	100.7
P17	Ycu	SW1/4,SE1/4 sec. 14, T. 29 N., R. 3 W.	72.92	11.64	4.5	.07	.01	.21	.3	1.74	7.52	.04	.44	99.39
P18	Ycu	SE1/4,SW1/4 sec. 14, T. 29 N., R. 3 W.	68.58	13.03	5.75	.48	.07	1.09	.62	3.12	5.98	.15	1.49	100.36
P19	Ycu	SE1/4,SW1/4 sec. 14, T. 29 N., R. 3 W.	72.96	12.45	3.3	.02	.02	.15	.21	.2	10.5	.01	.54	100.36
P20	Ycu	SE1/4,SE1/4 sec. 1, T. 29 N., R. 3 W.	75.1	11.95	3.4	.07	.02	.07	.28	1.53	7.99	.06	.45	100.92
P21	Ycu	SW1/4,SE1/4 sec. 11, T. 29 N., R. 3 W.	72.86	11.47	3.47	.04	.02	.11	.34	1.03	8.6	.07	.35	98.36
P22	Ycu	NE1/4,NE1/4 sec. 14, T. 29 N., R. 3 W.	76.31	10.3	2.06	<.01	.01	.03	.14	.68	8.47	.02	.27	98.29
P23	Ycu	SW1/4,NW1/4 sec. 12, T. 29 N., R. 3 W.	71.44	12.15	5.86	.18	.03	.11	.59	.54	8.69	.08	.92	100.59
P24	Ycu	SW1/4,NW1/4 sec. 12, T. 29 N., R. 3 W.	72.4	12.47	4.29	.06	.02	.13	.36	2.07	7.89	.04	.46	100.19
P25	Ycu	NE1/4,NE1/4 sec. 12, T. 29 N., R. 3 W.	68.84	12.87	4.22	.09	.05	1.21	.42	1.37	8.87	.1	1.59	99.63
P26	Ycu	NW1/4,SE1/4 sec. 12, T. 29 N., R. 3 W.	67.28	13.46	5.99	.19	.04	.25	.6	1.75	8.1	.16	1.43	99.25
P27	Ycu	SW1/4,NE1/4 sec. 12, T. 29 N., R. 3 W.	68.78	12.46	5.66	.13	.02	.23	.41	1.29	8.22	.09	2.13	99.42
P28	Ycu	SE1/4,SE1/4 sec. 2, T. 29 N., R. 3 W.	71.46	12.4	3.87	.13	<.01	.03	.27	.24	9.36	.05	1.18	98.99
P29	Ycl	NE1/4,NW1/4 sec. 23, T. 29 N., R. 3 W.	74.33	11.18	5.67	.06	.01	.1	.41	.53	8.63	.05	.46	101.43
P30	Ycl	NE1/4,NW1/4 sec. 23, T. 29 N., R. 3 W.	71.21	12.47	6.34	.23	.02	.16	.6	2.05	6.8	.12	1.01	101.01
P31	Yrm	NW1/4,SE1/4 sec. 34, T. 29 N., R. 2 W.	72.56	12.06	3.67	.04	.03	.06	.27	.55	9.74	.06	.87	99.91
P32	Yrm	SE1/4,SW1/4 sec. 35, T. 29 N., R. 2 W.	69.29	12.63	4.89	.41	.04	.18	.39	1.23	7.94	.09	1.75	98.84
P33	Yrm	NE1/4,NW1/4 sec. 2, T. 28 N., R. 2 W.	68.3	13.22	6.61	.33	.04	.27	.59	3.05	6.22	.16	1.35	100.14
P34	Yrm	SE1/4,SW1/4 sec. 20, T. 29 N., R. 2 W.	73.1	12.27	3.5	.02	.02	.01	.29	.16	10.46	.05	.83	100.71

Table 2.—Summary of drillhole data on Federal land in the Powder Mill Ferry quadrangle, Missouri.
[All drillhole numbers are from Missouri Division of Geology and Land Survey file numbers. Og, Gasconade Dolomite; O€e, Eminence Dolomite; €p, Potosi Dolomite; €dd, Derby-Doerun Dolomite (usage of Anderson, 1979); €d, Davis Formation; €b, Bonneterre Formation; €l, Lamotte Sandstone; Y, Middle Proterozoic rocks. Datum is mean sea level]

Drillhole no.	Location	Collar elevation, in feet	Contact elevation, in feet	Bottom elevation, in feet
4185	SE1/4,SE1/4 sec. 14, T. 29 N., R. 3 W.	665	None (O€e)	505
4195	NE1/4,SW1/4 sec. 14, T. 29 N., R. 3 W.	650	None (O€e)	550
7099	SE1/4,SW1/4 sec. 13, T. 29 N., R. 3 W.	725	No data	
14151	SW1/4,SW1/4 sec. 8, T. 29 N., R. 2 W.	590	385 O€e-€p	120
14168	SE1/4,SE1/4 sec. 4, T. 29 N., R. 2 W.	650	550 O€e-€p	190
17514	NW1/4,SW1/4 sec. 2, T. 29 N., R. 2 W.	890	525 Og-O€e	205
17515	SE1/4,SE1/4 sec. 35, T. 30 N., R. 2 W.	916	691 Og-O€e	106
21516	SE1/4,SE1/4 sec. 11, T. 29 N., R. 2 W.	1000	815 Og-O€e 490 O€e-€p 62 €p-€dd -77 €dd-€d -265 €d-€b -616 €b-Y	-675
21591	NE1/4,SW1/4 sec. 23, T. 29 N., R. 2 W.	957	432 O€e-€p 37 €p-€dd -125 €dd-€d -276 €d-€b -658 €b-€l -720 €l-Y	-743
25627	SE1/4,SW1/4 sec. 9, T. 29 N., R. 2 W.	644	499 O€e-€p	349
28079	NE1/4,NE1/4 sec. 21, T. 29 N., R. 2 W.	600	425 O€e-€p	300

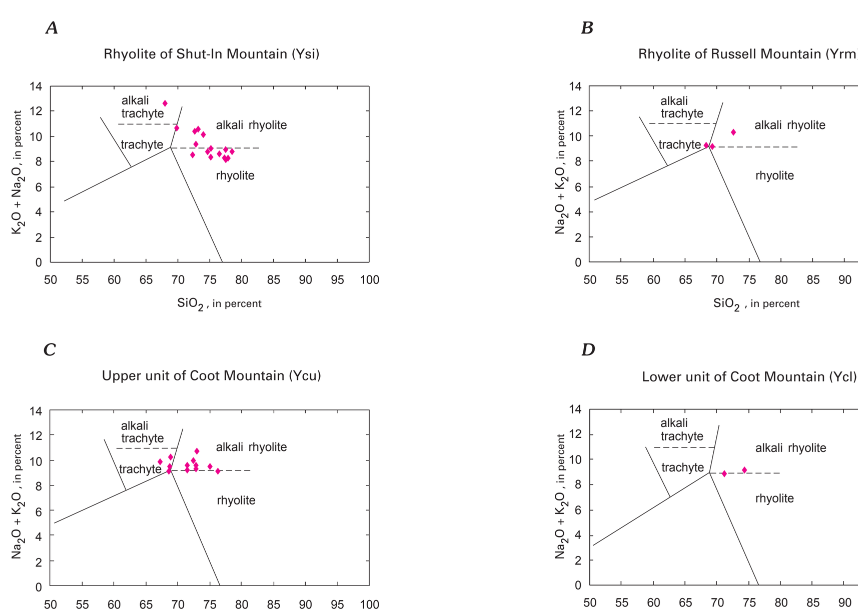


Figure 1.—Total alkali versus silica diagrams for Middle Proterozoic volcanic rocks of the Powder Mill Ferry quadrangle. *A*, Rhyolite of Shut-In Mountain (Ysi); *B*, Rhyolite of Russell Mountain (Yrm); *C*, Upper unit of Coot Mountain (Ycu); *D*, Lower unit of Coot Mountain (Ycl).

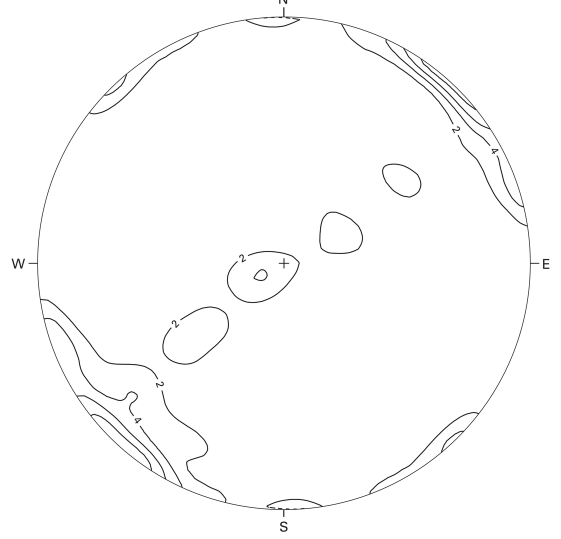
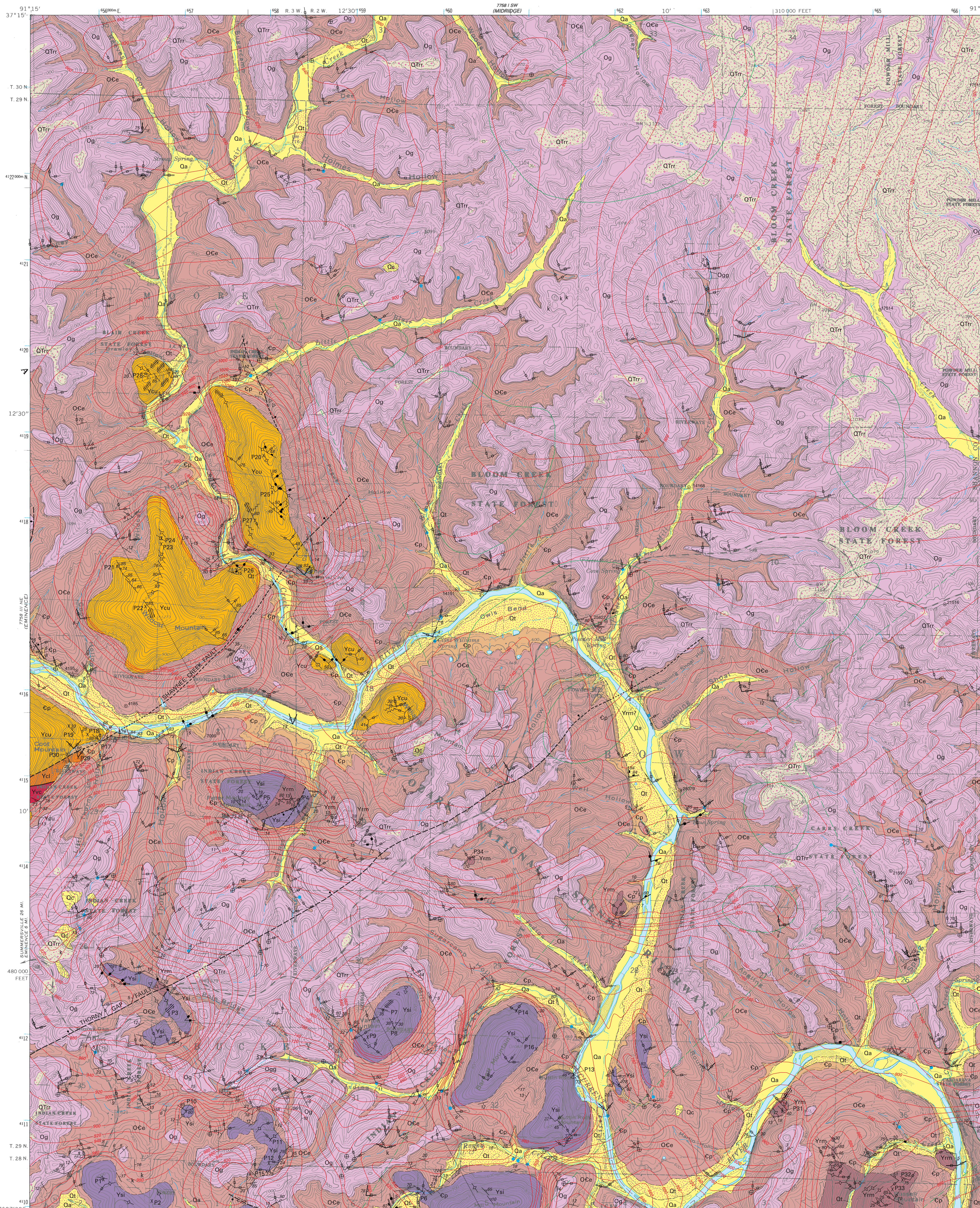
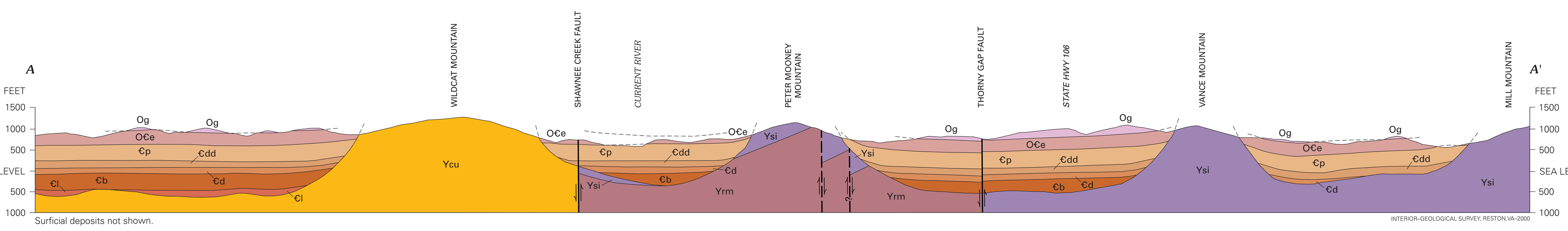


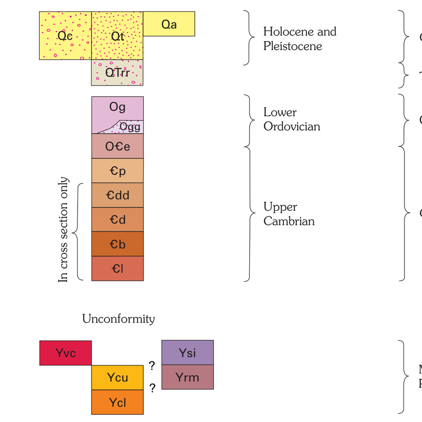
Figure 2.—Lower hemisphere equal-area stereographic projection of poles to foliation of Middle Proterozoic volcanic rocks in the Powder Mill Ferry quadrangle. Contour intervals at 2, 4, 6, 8, and 10 percent of 1 percent area. n, number of measurements.





Surficial deposits not shown.

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qa **Alluvium (Holocene)**—Silt, clay, sand, and gravel that form unconsolidated flood plain and streambed deposits; occurs along most streams; shown where thickest and most extensive. As much as 30 ft thick along the Current River, thinner along tributaries. Gravel composed of rounded to subangular pebbles and cobbles of chert, sandstone, and quartzite as much as 8 in. in longest dimension

Qc **Colluvium (Holocene and Pleistocene)**—Boulders, cobbles, and pebbles of sandstone derived from weathering of the Roubidoux Formation, forms gravity-creep deposits a few feet thick on steep slopes in the upper part of the Gasconade Dolomite below Roubidoux residuum. Widely distributed, common on steep slopes; shown on map only where thickest and most extensive

Qt **Terrace deposits (Holocene and Pleistocene)**—Silt, sand, and gravel along the sides of stream valleys; consist of older, dissected alluvium and locally younger deposits of intermittent major floods; deposit in southwestern corner of map includes loess. Probably as much as 40 ft thick

QTrr **Residuum derived from Roubidoux Formation (Quaternary and Tertiary)**—Sand, clay, sandstone, and chert that form unconsolidated deposits on the crests of hills and ridges; formed by removal of dolomite beds by weathering processes. Contains angular to subangular boulders and cobbles of sandstone and chert as much as 10 ft in longest dimension. Sandstone commonly crossbedded, ripple-marked; locally preserved in irregular, near-coherent layers. Chert includes oolitic, banded, and porcelaneous varieties. Unit ranges in thickness from a few feet on isolated hilltops to as much as 160 ft in northeastern part of quadrangle

Og / Ogg **Gasconade Dolomite (Lower Ordovician)**—Dolomite, chert, and sandstone. Dolomite, light- to medium-gray, locally pinkish-gray, fine- to coarse-grained, thin- to thick-bedded; contains nodules, beds, and stringers of chert, generally white to light gray, mostly porcelaneous, locally oolitic; most abundant in lower part of unit, the Van Buren Formation of Bridge (1930); nodules as much as 3 in thick, beds 1 ft thick. Stromatolitic chert bed 2 to 3 ft thick about 125 to 130 ft above base of formation. Gunter Sandstone Member (Ogg), locally mapped separately where it forms valley floor, at base of formation; composed of interbedded sandstone, orthoquartzite, sandy dolomite, dolomite, and minor amounts of chert. Sandstone, light-yellowish-gray to medium-gray, medium- to coarse-grained, weathers brownish to reddish gray or light gray; ripple marks, crossbeds, and mud cracks common. Orthoquartzite, very light gray, medium- to coarse-grained. Dolomite, light- to medium-gray, medium- to coarse-grained, sandy in part, in bedding sets as much as 5 ft thick. Chert, light gray, in nodules or thin beds in dolomite. Gunter best exposed on Cardareva Bluff in southeastern corner of quadrangle. Member 10 to 50 ft thick, thickest in southeastern part of map area; formation 200 to 280 ft thick. Basal contact placed at base of lowest sandstone or orthoquartzite bed

O€e **Eminence Dolomite (Lower Ordovician and Upper Cambrian)**—Dolomite, chert, and sandstone. Dolomite, light-gray to light-yellowish-gray, medium-gray, tan, or pink, fine- to coarse-grained, thin- to medium-bedded; commonly mottled with rust-colored spots; some beds slightly calcareous; generally weathers to a pitted surface; upper beds locally form pinnacles. Chert, light-gray, in part oolitic, in sparse stringers and nodules. Sandstone, light-gray to tan, medium-grained, in bed 2 to 5 ft thick, in lower part of formation in south-central and southeastern part of quadrangle. Thickness ranges from 125 to 325 ft; thinnest near knobs underlain by Middle Proterozoic rocks; may also be thinned locally by erosion before deposition of the Gasconade. Unit well exposed in bluffs along the Current River. Base characterized by interbedding of light-gray dolomite with brownish-gray, fetid dolomite with drusy chert typical of underlying Potosi Dolomite; contact placed at top of highest brownish-gray, fetid, vuggy dolomite bed; locally marked by a 3- to 6-ft-thick chert bed

€p **Potosi Dolomite (Upper Cambrian)**—Dolomite and chert. Dolomite, pale-yellowish-gray, grayish-orange, or brownish-gray, very fine to coarse-grained, thick-bedded, vuggy; darker beds commonly fetid when broken. Some beds pelletal. Contains angular granules to cobbles of rhyolite in lower few feet of unit where in contact with underlying Middle Proterozoic rocks. Chert, light-gray, in nodules, stringers, and large botryoidal masses; cavities in chert drusy. Unit well exposed at base of bluffs along Current River. Base of unit not exposed; as much as 125 ft thick in outcrops along Little Blair Creek; 428 ft reported in drill hole 21516 (table 2)

€dd **Derby-Doerun Dolomite (usage of Anderson, 1979) (Upper Cambrian) (shown in cross section only)**—Dolomite, interbedded with siltstone and shale. Dolomite, buff or brown to light-gray, fine- to medium-grained, thin- to medium-bedded, argillaceous, silty, with minor amounts of chert and sparse sulfide minerals. Siltstone and shale, thin-bedded. Glauconite is present in lower 40 to 50 ft of formation. Thickness about 140 to 160 ft

€d **Davis Formation (Upper Cambrian) (shown in cross section only)**— Interbedded shale and limestone with minor amounts of dolomite. Shale, dark-green, fissile, thin- to thick-bedded; as much as 50 percent of formation. Limestone, light-gray, fine-grained to cryptograined, dense; locally glauconitic. Thickness about 150 to 190 ft

€b **Bonneterre Formation (Upper Cambrian) (shown in cross section only)**—Dolomite and minor amounts of interbedded limestone, siltstone, and shale. Dolomite, light-gray, fine- to medium-grained, medium-bedded; commonly contains algal structures; locally glauconitic and shaly; sparse sulfide minerals. Limestone, brownish-gray to pink, fine-grained, thin-bedded, fossiliferous, locally oolitic; more common in lower part of formation. Siltstone, quartzose, light- to dark-gray, laminated. Shale, dark-green, thin-bedded; occurs as sparse thin interbeds and partings. Thickness about 350 to 380 ft

€l **Lamotte Sandstone (Upper Cambrian) (shown in cross section only)**—Sandstone, quartzose, light-gray, yellow, brown, or red, medium-grained, moderately to well-sorted, well indurated; locally contains interbeds of red to purple silty shale and, in upper part, scattered lenses of arenaceous dolomite. Felsite pebble or boulder conglomerate is present locally at base. Overlies Middle Proterozoic rocks. Regional thickness ranges from a few feet to 500 ft; absent in drillhole 21516 (table 2)

Yvc **Volcaniclastic conglomerate and breccia (Middle Proterozoic)**—Interbedded volcaniclastic conglomerate and breccia. Conglomerate consists of subrounded cobbles 3 to 5 in. in diameter and large pebbles of rhyolite of the upper unit of Coot Mountain (Ycu) and unidentified volcanic rocks. Matrix strongly altered, greenish, fine-grained volcaniclastic material. Conglomerate is overlain by strongly silicified volcanic breccia, possibly an autobrecciated flow, that consists of aphanitic pink rhyolite and quartz clasts in a quartz matrix. Mapped only from float on the southeastern side of Coot Mountain

Ysi **Rhyolite of Shut-In Mountain (Middle Proterozoic)**—Named for exposures on and around Shut-In Mountain (secs. 2 and 11, T. 28 N., R. 3 W.) in the Stegall Mountain quadrangle to the south. Massive rhyolite to alkali trachyte lava (Orndorff and others, 1999); moderately crystal-rich, containing 15 to 20 percent phenocrysts of pink feldspar (10 to 20 percent) and quartz (5 to 10 percent) in a dark maroon matrix. When present, flow layering is poorly developed and typically contorted. Magnetite content is from 1 to 3 percent, relatively low compared to other volcanic units; pods and disseminations of fluorite are sporadic but common. Unit locally autobrecciated; in places intruded by small breccia dikes a few fractions of an inch to a few inches wide; locally contains xenoliths of aphanitic rock. This unit is interpreted as representing a coalesced rhyolite dome field. Probably, in part, the same as the Stegall Rhyolite of Tolman and Robertson (1969, p. 14–15)

Yrm **Rhyolite of Russell Mountain (Middle Proterozoic)**—Ash-flow tuff, moderately crystal-rich with 10 to 20 percent phenocrysts of pink feldspar, locally altered to a pale-green color, and sparse to no quartz; typically densely welded and displays well-developed flow layering, although locally massive with poorly developed or no layering; contains 5 to 10 percent magnetite. Interpreted as consisting of multiple flows of both simple and compound cooling units. Unit may be correlative with upper unit of Coot Mountain (Ycu)

Ycu **Upper unit of Coot Mountain (Middle Proterozoic)**—Ash-flow tuffs and minor lavas, dominantly alkali rhyolite; generally less than 10 percent phenocrysts of pink feldspar, locally altered to a pale-green color, and sparse or no quartz; contains 4 to 10 percent disseminated magnetite grains; dominantly densely welded with well-developed flow layering, although locally massive with poorly developed or no flow layering; massive intervals commonly contain aggregates and large (as much as 0.4 in across) phenocrysts of feldspar; contains sporadic but common disseminations and pods of fluorite. Interpreted as consisting of multiple flows of both simple and compound cooling units. Approximately the same as upper unit of Coot Mountain of Fisher (1969)

Ycl **Lower unit of Coot Mountain (Middle Proterozoic)**—Interbedded ash-flow tuffs and lesser amounts of air-fall tuffs. Ash-flow tuffs, alkali rhyolite to rhyolite to trachyte (Orndorff and others, 1999); mostly massive and dense with poorly developed to no flow layering; locally flow layering is moderately well developed; 5 to 25 percent phenocrysts of pink feldspar and sparse to no quartz in a dark maroon matrix; contains 4 to 10 percent disseminated magnetite grains. Quartz veinlets and areas of silicification are common. Interpreted as consisting of multiple flows of both simple and compound cooling units. Ash-fall tuffs approximately the same as middle unit of Coot Mountain of Fisher (1969). Air-fall tuffs, rhyolite; aphanitic; massive to thin-bedded; typically silicified; contains disseminated pyrite grains. Petrographically consists of feldspar microlites and devitrified glass. Air-fall tuffs approximately same as lower unit of Coot Mountain of Fisher (1969)

EXPLANATION OF MAP SYMBOLS

Contact—Dashed where approximately located; dotted where concealed

Structure contour—Drawn on base of Gunter Sandstone Member of Gasconade Dolomite; projected where above land surface. Generally not shown above or adjacent to Middle Proterozoic volcanic rocks. Contour interval 20 ft

Fault—Long-dashed where approximately located; short-dashed where inferred; dotted where concealed. Bar and ball on downthrown side; arrows show relative direction of movement

Strike and dip of beds—Symbols in Qa represent small bedrock outcrops in streambed
- Inclined
- Horizontal

Strike and dip of flow layering in Middle Proterozoic rocks
- Inclined
- Vertical

Strike and dip of joints—Point of observation at intersection of multiple symbols. Apertures are narrow (<0.5 in) except where noted by w. Symbols in Qa represent small bedrock outcrops in streambed
- Throughgoing, vertical
  - Widely spaced (>6 ft)
  - Moderately spaced (2–6 ft)
  - Closely spaced (<2 ft)
- Throughgoing, inclined
  - Widely spaced (>6 ft)
  - Moderately spaced (2–6 ft)
  - Closely spaced (<2 ft)
- Non-throughgoing, vertical
  - Widely spaced (>6 ft)
  - Moderately spaced (2–6 ft)
  - Closely spaced (<2 ft)
- Non-throughgoing, inclined
  - Widely spaced (>6 ft)
  - Moderately spaced (2–6 ft)
  - Closely spaced (<2 ft)

Structural and textural features in Middle Proterozoic rocks
- Shear
- Dextral shear
- Sinistral shear
- Flow lineation
- Quartz veinlet
- Zone of hydrothermal alteration

Breccia

Basement topographic high indicated by aeromagnetic contour

Prominent aeromagnetic gradient

Small sinkhole

Drillhole—Number refers to Missouri Division of Geology and Land Survey well records; see table 2 for summary of well data

Abandoned mine or prospect pit

Sample locality for geochemistry of Middle Proterozoic rocks

Spring

DISCUSSION

INTRODUCTION

The Powder Mill Ferry 7.5-min quadrangle covers an area of about 60 mi^2 in Shannon County and a very small portion of Reynolds County, south-central Missouri, in the southern part of the Salem Plateau of the Ozark Plateaus province. It is underlain by flat-lying to gently dipping Upper Cambrian and Lower Ordovician strata, mostly dolomite, and by scattered knobs of Middle Proterozoic volcanic rocks. The Paleozoic strata, as much as 1,800 ft thick, overlie an irregular buried basement surface of Middle Proterozoic rhyolite and granite, and are overlain themselves by unconsolidated surficial materials of Tertiary and Quaternary age. The terrain is a dissected karst plain with abundant sinkholes, caves, springs, and losing streams. Altitudes range from about 510 ft on the Current River in the southeastern corner of the map to 1,273 ft on the crest of Wildcat Mountain. The area is predominantly forested. About one half of the quadrangle lies within the Ozark National Scenic Riverways and as much as a third of the remainder of the quadrangle is State Forest land.

The Powder Mill Ferry quadrangle was first mapped in detail by Bridge (1930) at a scale of 1:62,500, and the general geologic setting is shown on the Rolla 1°x2° quadrangle at a scale of 1:250,000 (Pratt and others, 1992) and on the geologic map of Missouri at a scale of 1:500,000 (Anderson, 1979). Orndorff and others (1999) mapped the adjacent Eminence quadrangle at 1:24,000. The present investigation was begun in the Winter of 1997 and completed in the Spring of 1998. Geologic mapping included the use of a Paulin altimeter and locally global positioning system instrumentation for location of field stations. Structural contours, derived from outcrop data, were used to plot the formational contacts of the Paleozoic rocks. In addition to the outcrop data, drillhole locations from well records, sample localities, abandoned mineral workings, sinkholes, and springs not shown on the base map also are plotted.

STRATIGRAPHY

Exposed bedrock in the quadrangle includes Middle Proterozoic volcanic rocks, informally subdivided into five stratigraphic units, and three Paleozoic sedimentary formations of Late Cambrian and Early Ordovician age. The exposed Paleozoic strata, which range from about 520 to 700 ft in thickness, are, from oldest to youngest, the Potosi Dolomite, the Eminence Dolomite, and the Gasconade Dolomite. The Potosi overlies subsurface Upper Cambrian strata, as much as 1,200 ft thick, as shown in drillholes in this and adjacent quadrangles. These subsurface formations are, from oldest to youngest, the Lamotte Sandstone (locally absent), the Bonneterre Formation, the Davis Formation, and the Derby-Doerun Dolomite (usage of Anderson, 1979). The Paleozoic strata, which are included in the Sauk sequence of Sloss (1982, p. 30), were deposited as sediments in shallow epicontinental seas upon a paleotopography of scattered islands composed of Middle Proterozoic volcanic rocks, which were eventually buried. The higher of these buried volcanic rocks were later exposed by erosion, forming knobs that now protrude through the younger Paleozoic rocks. These strata are generally thinner near the knobs underlain by Middle Proterozoic rocks, and all of the units below the Eminence are locally absent because of erosion or nondeposition over the basement topographic highs. Bedrock units are locally overlain by mapped surficial deposits of Quaternary and Tertiary age.

The Middle Proterozoic volcanic rocks, mapped as rhyolite porphyry by Bridge (1930), have been characterized as chiefly rhyolitic ash-flow tuffs (Pratt and others, 1979). In the Powder Mill Ferry quadrangle the rhyolites were subdivided and mapped at a scale of 1:20,000 by Fisher (1969), and they were shown by Pratt and others (1979) as alkali rhyolites assigned to a three-member stratigraphic sequence. They are presumed to be correlative with the volcanic rocks of the St. Francois Mountains to the northeast (Kisvarsanyi, 1979), which have been assigned a radiometric age of about 1,500 Ma (Bickford and Mose, 1975). This age assignment is supported by granite from a corehole in the Round Spring quadrangle nearby to the northwest, which yielded a U-Pb age of 1.473±15 Ga (Bickford and others, 1981), and by a preliminary U-Pb age of 1.47 Ga recently obtained for a sample of rhyolite of Shut-In Mountain from the Stegall Mountain quadrangle, adjacent to the south (Dan Unruh, oral commun., 1999). In this report, the five informal units of the volcanic rocks were subdivided on the basis of mineralogy, texture, and chemical composition. These are the lower and upper units of Coot Mountain (Ycl and Ycu) (Orndorff and others, 1999), rhyolite of Russell Mountain (Yrm), rhyolite of Shut-In Mountain (Ysi), and volcaniclastic conglomerate and breccia (Yvc). Thirty-four samples of Middle Proterozoic volcanic rocks analyzed for major oxides are shown in table 1. Classifications based on the total alkali versus silica diagrams (Le Maitre, 1984) show that the volcanic units in the quadrangle are mostly alkali rhyolite with lesser amounts

STRUCTURE

MINERAL RESOURCES AND GEOLOGIC HAZARDS

REFERENCES CITED

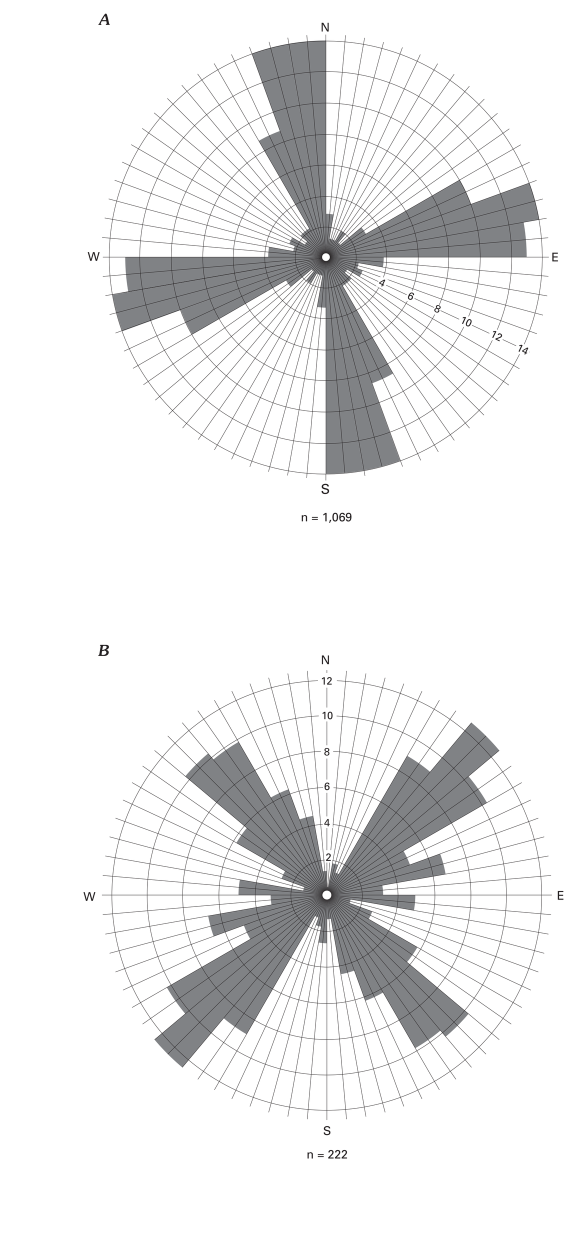


Figure 3.—Compass-rose diagrams of joints in the Powder Mill Ferry quadrangle. n, number of joints. Numbers on diagrams are percent of total. *A*, Paleozoic rocks; *B*, Middle Proterozoic volcanic rocks. Interval is 5 degrees.

GEOLOGIC MAP OF THE POWDER MILL FERRY QUADRANGLE, SHANNON AND REYNOLDS COUNTIES, MISSOURI

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