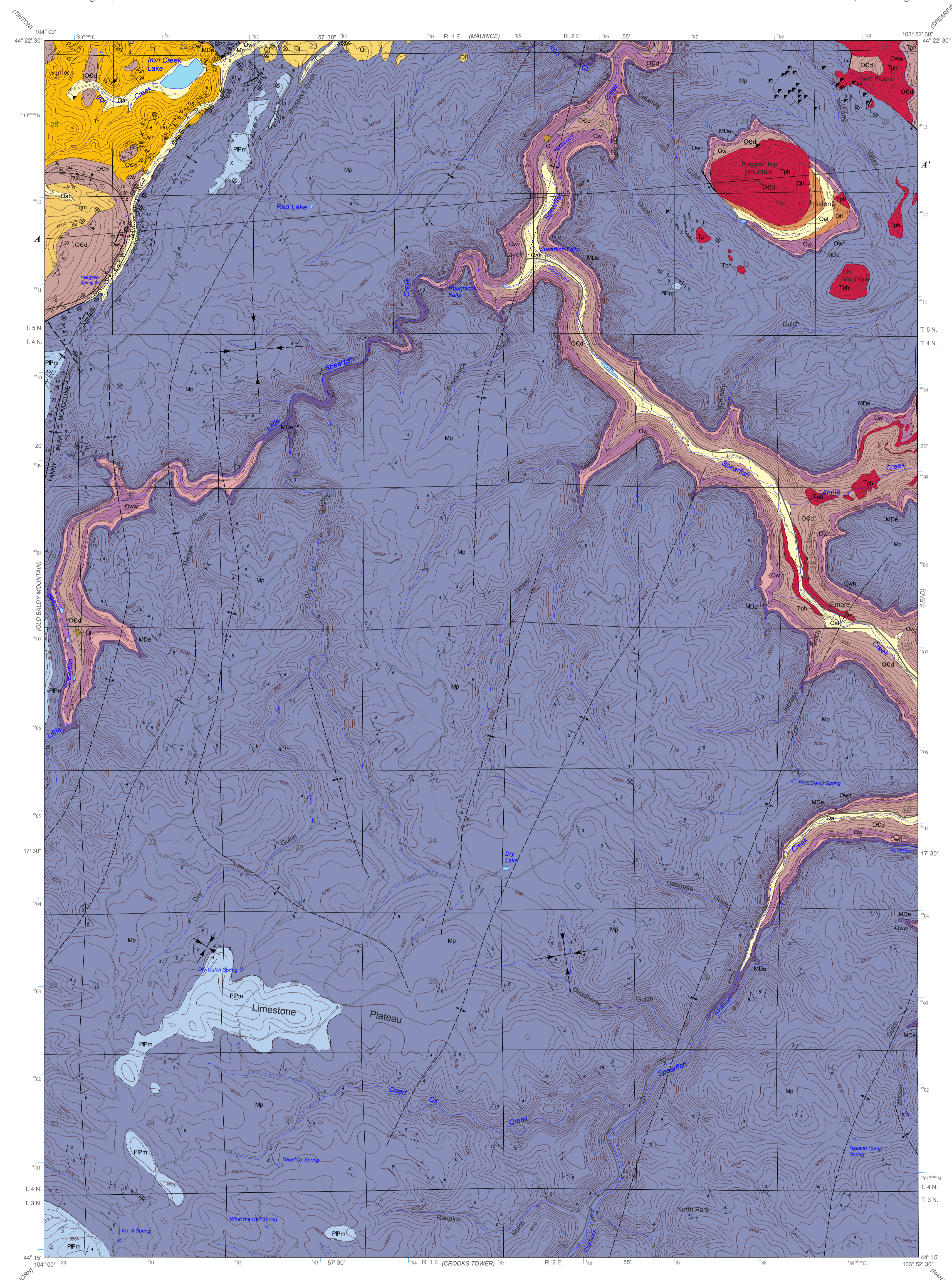


Geologic Map of the Savoy Quadrangle, South Dakota

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2013

State of South Dakota
Dennis Daugaard, Governor

South Dakota Geological Survey
Derric L. Iles, State Geologist

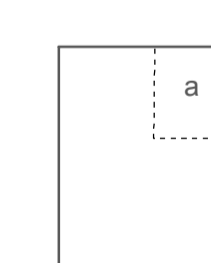


Prepared in cooperation with the South Dakota School of Mines
and Technology, Rapid City, South Dakota

EXPLANATION

Quaternary	Qal	Alluvium - Unconsolidated to loosely consolidated clay, silt, sand, and gravel. Deposited in present-day drainages. Maximum thickness of 70 ft (21.3 m) reported from well logs	
	Qt	Terrace deposit - Unconsolidated clay- to boulder-sized clasts. Deposited up to 40 ft (12.2 m) above present-day stream drainages. Estimated maximum thickness 30 ft (9.1 m)	
	Ql	Landslide deposit - Unconsolidated, randomly oriented angular blocks of locally derived bedrock and debris deposited along steep slopes as slumps and rockfalls	
		Unconformity	
	Tph	Phonolite - Dark gray, dark bluish-gray to greenish-gray with brownish weathering. Aphanitic to porphyritic, with a fine-grained phenitic groundmass of orthoclase with aegirine, becoming finer-grained along all margins. Contains 1-30 percent phenocrysts of orthoclase, sanidine, and plagioclase up to 0.75 in (2 cm) long that are typically zoned, and often kaolinized. Also contains up to 40 percent Na-pyroxene crystals up to 0.31 in (8 mm) long, often enclosing feldspar and as clots and radial sprays to several millimeters. May have up to 20 percent euhedral grains of nepheline and sodalite up to 0.004 in (0.1 mm) across with some altered to zeolite. Accessory minerals include zircon, apatite, hematite, leucocene, titanite, and magnetite. Some intrusions weather along planes of trachytic texture with a platy, foliated appearance, especially along intrusion margins (Sofronoff, 1979)	
	Tt	Trachyte - Gray to brownish-gray with some orange iron oxide staining. May be porphyritic with a fine-grained equigranular potassic feldspar groundmass. Contains up to 2 percent acicular aegirine-augite to 0.12 in (3 mm) long having poikilic feldspar intergrowths, and up to 35 percent anhedral to euhedral phenocrysts of plagioclase and sanidine to 0.47 in (12 mm) diameter. Feldspars may be kaolinized and have fracture fillings of hematite or carbonate. The plagioclase has albite twinning and is normally zoned. Contains up to 7 percent hematite commonly rimming leucocene, and a trace of euhedral titanite crystals to 0.08 in (2 mm) long (Sofronoff, 1979)	
	Tqm	Quartz Monzonite - Mesocratic; brownish- to pinkish-gray to tan, weathering to reddish-tan to dark-brown. Porphyritic, containing 20-40 percent zoned and unzoned euhedral to subhedral phenocrysts of anorthite and plagioclase up to 0.4 in (10 mm) diameter. Finely crystalline phenitic groundmass of plagioclase with minor anhedral quartz contains up to 5 percent prismatic crystals of ironblende up to 0.3 in (8 mm) long, with many altered to iron oxide or dissolved to form iron oxide-stained cavities	
		Intrusive Contact	
Permian	PPm	Minnelusa Formation - Red, brown, yellow, to beige sandstone and shale. Reddish terra rossa siltstone and local conglomerate of angular chert fragments derived from the Pahasapa Limestone occur along the lower contact. Exposed thickness approximately 140 ft (42.7 m)	
Pennsylvanian		Disconformity	
	Mp	Pahasapa Limestone - Gray, beige, to white massive limestone. Very fine- to coarse-grained. Contains two brownish-orange sandstone beds up to 15 ft (5 m) thick approximately 60 ft (18 m) and 180 ft (55 m) below the top of the formation. Vuggy and cavernous in the upper 125-150 ft (38-46 m). Typically forms prominent cliffs. Upper contact is an irregular erosional surface. Thickness of 435-637 ft (132.6-194.1 m) reported from well logs	
Mississippian		Disconformity	
	MDe	Englewood Limestone - Lavender, pink, to purple-gray, argillaceous dolomitic limestone and shale. Finely- to very finely-crystalline, laminated to medium-bedded. Typically bioturbated. Locally contains botryoidal, chalcodony-replaced evaporite nodules, and coarse sand along the upper contact. Thickness 35-50 ft (11-15 m)	
Devonian		Disconformity	
	Owh	Whitewood Limestone and Winnipeg Formation (undifferentiated) - Combined thickness 115-200 ft (35.1-60.9 m)	
	Owh	Whitewood Limestone - Variegated orange, beige, and gray dolomite and dolomitic limestone with thin shaly partings. Finely crystalline, slightly calcareous. Thin-bedded to massive, typically bioturbated. Thickness 35-80 ft (11-24 m)	
	Ow	Winnipeg Formation - Lower portion is the Icebox Shale Member; 45-66 ft (13.7-19.8 m) of fissile, green to gray shale containing small, black phosphatic nodules. Upper portion is the Roughlock Siltstone Member; 35-55 ft (10.7-16.8 m) of greenish-gray to yellowish siltstone and fine-grained sandstone. Total thickness of 80-120 ft (24.4-36.6 m) reported from well logs	
Ordovician		Disconformity	
	Ocd	Deadwood Formation - Lower units are brown, gray, to green massive sandstone overlain by glauconitic shale, minor intraformational conglomerate, and bioturbated siltstone. Middle units are brown to green intraformational conglomerate, glauconitic shale, and sandstone with minor limestone. Upper units are dark green to light gray, bioturbated, glauconitic sandstone and intraformational conglomerate. The uppermost 10-20 ft (3.0-6.1 m) is the vertically burrowed "Scolithus sandstone." Exposed thickness approximately 275-300 ft (84-91 m). Total thickness of 440-470 ft (134.1-143.2 m) reported from well logs	
Cambrian		Unconformity	
	Xu	Undifferentiated Early Proterozoic rocks - Shown only in cross section	
Precambrian			

Index to sources of geologic data
(letters correspond to those listed in Selected References)



Selected References

Shapiro, L.H., 1971. *Structural geology of the Black Hills region and implications for the origin of the uplifts of the Middle Rocky Mountain Province*. Minneapolis, Minn., University of Minnesota, Ph.D. dissertation, 213 p.

a) Shapiro, L.H., and Gries, J.P., 1970. *Ore deposits in rocks of Paleozoic and Tertiary age of the northern Black Hills, South Dakota*. U.S. Geological Survey Open-File Report 70-300, 235 p.

Sofronoff, S.E., 1979. *Geology, alteration and mineralization of the Carbonate mining district and surrounding area, Lawrence County, South Dakota*. Rapid City, S. Dak., South Dakota School of Mines and Technology, M.S. thesis, 150 p.

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Map base modified from U.S. Geological Survey 1:24,000 scale Savoy quadrangle digital line graph.
Projection is Universal Transverse Mercator, Zone 13N.
Datum is 1983 North American.

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