

# Geologic Map of the Deadwood South Quadrangle, South Dakota

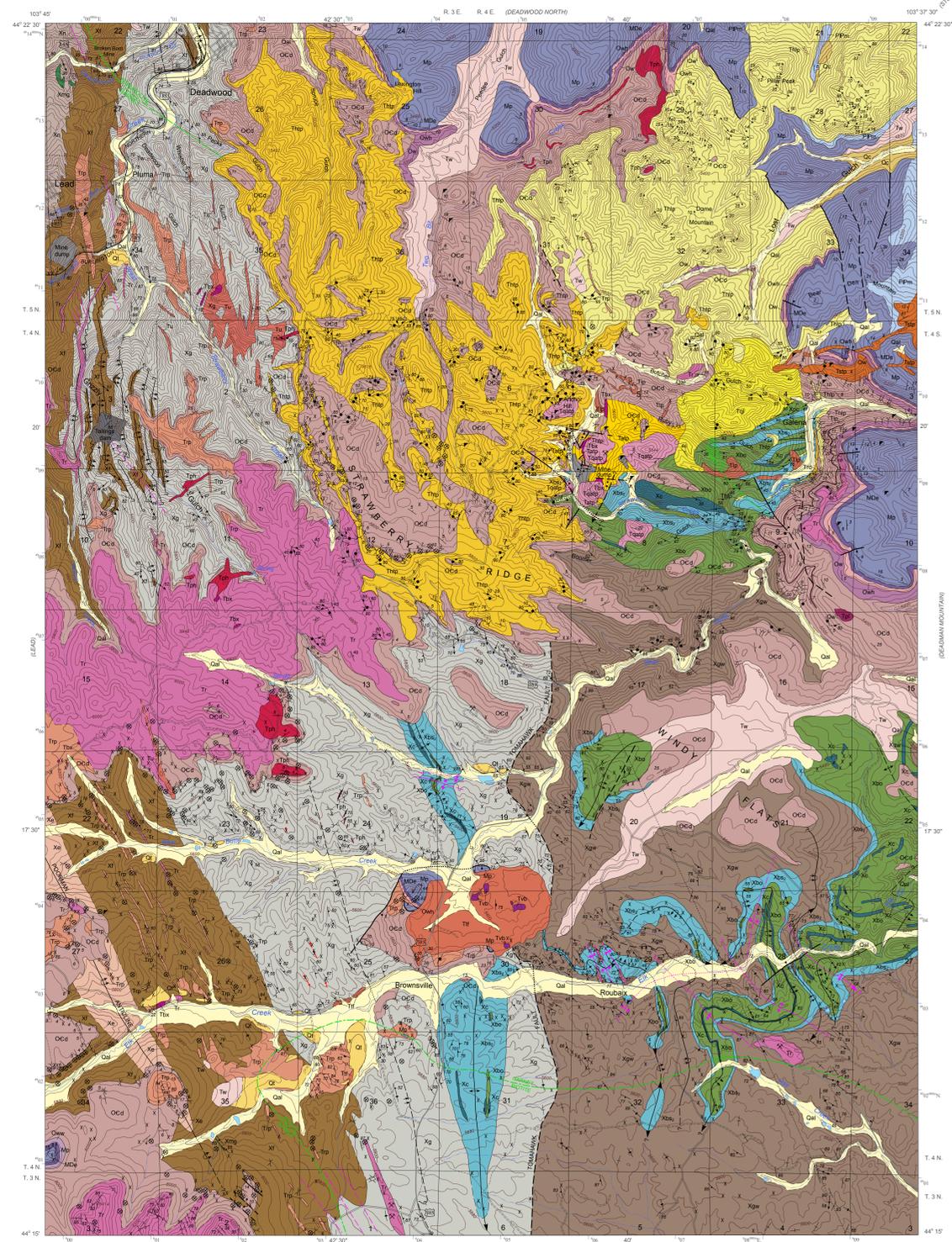
State of South Dakota  
M. Michael Rounds, Governor

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2010

South Dakota Geological Survey  
Derric L. Iles, State Geologist



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



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

The Geological Survey Program, Department of Environment and Natural Resources, engages in an ongoing data collection and interpretation process. An outcome of that process is to reflect those interpretations on maps such as this one. Reasonable efforts have been made to ensure that this map accurately reflects the source data used in its preparation. This map is date specific. As additional data become available, geologic interpretations may be revised and the map may be updated by the Geological Survey Program. This map should not be enlarged or otherwise used in an attempt to interpret more detail than can be seen at the 1:24,000 scale.

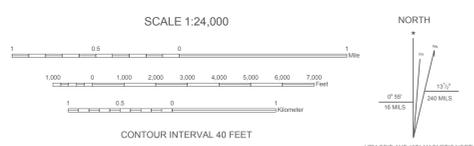
### Acknowledgements

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### Index Map of Geologic Data



Digital cartography by M.D. Fahrenbach and L.L. Roenstad  
Edited by M.D. Fahrenbach

Quadrangle location

## EXPLANATION

Quaternary	Qal	<b>Alluvium</b> - Unconsolidated to loosely consolidated, clasts to boulder-size. Deposited in present-day stream drainages. Estimated maximum thickness 40 ft (12.2 m)	--- ---	<b>Contact</b> Long dashed where approximately located. Arrow indicates contact dip direction and amount.	
	Qc	<b>Colluvium</b> - Unconsolidated, poorly sorted, randomly oriented angular blocks locally deposited along steep slopes.	---	<b>FAULTS</b>	
	Qt	<b>Terrace deposit</b> - Unconsolidated, clasts to boulder-size. Deposited as much as 40 ft (12.2 m) above present-day stream drainages. Estimated maximum thickness 20 ft (6.1 m)	---	--- ---	<b>Fault</b> Long dashed where approximately located; dotted where concealed; quartered where uncertain. Bar and ball on downthrown side. Arrows indicate lateral movement.
	<b>Unconformity</b>		---	<b>D<sub>1</sub> FOLDS</b>	
	Tw	<b>White River Group</b> - Typically stained pinkish to reddish, unconsolidated to loosely consolidated. Clasts to boulder-size. Dominantly of Precambrian origin but also with Paleozoic sedimentary and Tertiary igneous rocks in a fine-grained matrix. Benticonic clay content variable. Includes gravels of the Mountain Meadow terrace of Plumley (1948). Estimated maximum thickness 40 ft (12.2 m)	---	--- ---	<b>Generalized interpretation of earliest folds. Smaller D<sub>2</sub> folds are generally not shown, especially where concordant with younger folds and modified by later shearing. Trends are different on opposite sides of the Tomahawk Fault.</b>
	<b>Unconformity</b>		---	--- ---	<b>Anticline</b> Showing crestline and direction of plunge. Long dashed where approximately located; dotted where concealed; quartered where uncertain.
	Tph	<b>Phonolite</b> - Gray to greenish-gray, silts, dikes, and small stocks. Composition varies from alkali trachyte to phonolite. Contains up to 45% phenocrysts of andesine, nepheline, or sandine in a fine-grained to aphanitic plagioclase, biotite, nepheline and kaolinite groundmass. Typically has trachytic texture from aligned feldspar laths, or may have flow layering, especially along contacts	---	--- ---	<b>Overturned anticline</b> Approximate location of base of axial surface and dip direction of limbs, long dashed where approximately located; dotted where concealed; quartered where uncertain.
	Tvb	<b>Vent breccia</b> - Pink to tan, clast-supported breccia of angular, pebble- to cobble-size clasts of rhyolite, flow-banded rhyolite, rhyolite porphyry, pitchstone, and Precambrian schist in a groundmass of ash- to lapilli-size clasts of similar composition (Drake, 1967). The pitchstone has a K-Ar age of 55.8 ± 1.4 Ma (Redden and others, 1993)	---	--- ---	<b>Overturned syncline</b> Approximate location of base of axial surface and dip direction of limbs, long dashed where approximately located; dotted where concealed; quartered where uncertain.
	Tt	<b>Tuff</b> - Tan to brown, lapilli tuff with clasts of rhyolite, flow-banded rhyolite, rhyolite porphyry, and Precambrian schist in clay matrix. Gravel beds range from 0.6 to 2.0 m (2.0 to 6.6 ft) thick. Locally contains well-rounded xenoliths up to 3.9 in (9.9 cm) of Precambrian metamorphic and Phanerozoic rocks up to the Late Cretaceous Carlisle Shale (Drake, 1967)	---	---	<b>MINOR D<sub>2</sub> AND YOUNGER FOLDS</b> Includes smaller folds formed during development of major D <sub>2</sub> structures and younger folds developed largely by localized shear zones. Only generalized trends of axial surfaces are shown. Plunge commonly vary, even in individual folds. Small shear folds probably modify some structures. Trends are different on opposite sides of the Tomahawk Fault. Most minor D <sub>2</sub> folds are not shown at this map scale.
	Tbx	<b>Breccia</b> - Small dikes of clast- to porphyry-supported breccia composed of angular to sub-rounded, lapilli- to bomb-size clasts of Tertiary igneous and Precambrian metamorphic rocks. Matrix contains 5-10% iron oxide, quartz, and clay where oxidized; includes pyrite, fluorite, and calcite where unoxidized. Typically occurs along margins of larger Tertiary igneous bodies; contacts gradational (MacLeod, 1986)	---	---	<b>Antiform</b> Approximate location of base of axial surface and dip direction of limbs, long dashed where approximately located; dotted where concealed; quartered where uncertain.
Tertiary Eocene to Paleocene	Tql	<b>Quartz latite</b> - Light gray to yellowish-gray, aphanitic with 0.003 in (0.1 mm) biotite crystals, aggregates of fath-like plagioclase and sandine crystals, and rare quartz fragments. Contains minor magnetite and clinopyroxene (Grunwald, 1970)	---	---	
	Thp	<b>Hornblende latite porphyry</b> - Light gray to dark greenish-gray. Contains 40% euhedral plagioclase phenocrysts, 1-10% aligned hornblende, and 1-5% sandine up to 0.2 in (5.1 mm) in an aphanitic to glassy groundmass of orthoclase with up to 3% quartz. Small intrusives contain calcite- and quartz-filled amygdalites up to 0.16 in (4.1 mm). Traces pyroxene, magnetite, ilmenite, pyrite, and calcite. Local propylitic alteration (Grunwald, 1970). Has a K-Ar date of 60.5 ± 3 Ma (Mukherjee, 1968)	---	---	
	Tr	<b>Rhyolite</b> - White, tan, to pinkish where fresh, weathering gray to yellowish-brown. Finely crystalline to aphanitic groundmass of potassium feldspar, iron- and manganese-stained. Locally prominently flow banded. May have sericitic or argillic alteration (Grunwald, 1970)	---	---	
	Trp	<b>Rhyolite porphyry</b> - Light-tan, white, to pinkish where fresh, weathering gray to yellowish-brown. Aphanitic sandine groundmass contains up to 10% euhedral to subhedral quartz phenocrysts up to 0.24 in (6.1 mm) and 1-5% clinopyroxene. May have sericitic or argillic alteration (Grunwald, 1970)	---	---	
	Trp	<b>Pyroxene lamprophyre</b> - Dark gray silts. Hypocrystalline, with phenocrysts of pyroxene and garnet up to 0.08 in (2 mm) in an aphanitic groundmass of glass and aligned sandine, clinopyroxene, nepheline, pigeonite, garnet, and traces of calcite, titanite, oxhornblende, and apatite. Has local intense propylitic alteration (Grunwald, 1970)	---	---	
	Tstp	<b>Sandine trachyte porphyry</b> - Tan, pink to reddish-brown. Contains up to 75% euhedral sandine phenocrysts up to 1.4 in (3.6 cm), as much as 10% rounded and embayed quartz grains, and 1-5% clinopyroxene in an aphanitic groundmass. Has minor titanite, pyrite, magnetite, and ilmenite. Locally altered to sericite and clay (Grunwald, 1970)	---	---	
	Tqtsp	<b>Quartz alkali trachyte porphyry</b> - Tan to light greenish-gray, medium- to coarse-grained. Contains 45-55% phenocrysts of subhedral to euhedral sandine and perthite as much as 1.0 in (2.5 cm) across, subhedral plagioclase up to 0.2 in (5.1 mm), and oval to embayed anhedral quartz up to 0.2 in (5.1 mm) in a greenish-gray, aphanitic, K-feldspar groundmass. Finer-grained zones up to 50 ft (15.2 m) thick along stock margins have sharp contacts with country rock but are transitional to coarser interior. Contains less than 2% secondary calcite, clay, magnetite, pyrite, sericite, siderite, and fluorite (MacLeod, 1986)	---	---	
	Tatp	<b>Alkali trachyte porphyry</b> - Medium-gray to chalk-white, stained orange-brown to deep red-brown by iron oxide. Medium- to coarse-grained; contains 45-70% subhedral to euhedral K-feldspar phenocrysts up to 2.0 in (5.1 cm) in an aphanitic, K-feldspar and quartz groundmass. Fractured and brecciated; altered to quartz and clay in outcrop. Contains secondary pyrite, calcite, fluorite, and sericite (MacLeod, 1986)	---	---	
	Tip	<b>Latite porphyry</b> - Yellowish-gray, porphyritic to aphanitic. Contains anhedral to subhedral phenocrysts of sandine up to 1.2 in (3 cm) and plagioclase up to 0.2 in (5.1 mm) in an aphanitic K-feldspar groundmass with over 8% rounded and embayed quartz fragments as much as several millimeters across. Also has minor apatite, calcite, magnetite, and pyrite. Local propylitic alteration (Grunwald, 1970)	---	---	
	Trd	<b>Rhyodolite porphyry</b> - White to yellowish-gray, aphanitic to porphyritic. Contains phenocrysts of plagioclase up to 0.16 in (4 mm) and sandine up to 0.39 in (9.9 mm) in an aphanitic plagioclase groundmass. Highly altered and sericitic. Only one exposure is known and is just east of the town of Galena (Grunwald, 1970)	---	---	
Thp	<b>Hornblende trachyte porphyry</b> - Medium to dark greenish-gray, sill-like masses in the Deadwood Formation. Contains up to 50% subhedral to euhedral phenocrysts of plagioclase up to 0.47 in (11.9 mm), hornblende up to 0.2 in (5.1 mm), and 4-8% pyroxene in an aphanitic, K-feldspar groundmass. Local propylitic alteration (MacLeod, 1986)	---	---		
Tu	<b>Undifferentiated Tertiary igneous rocks</b> - Leucocratic to mesocratic, aphanitic to porphyritic, hypabyssal intrusive rocks. Includes Paleocene-Eocene phonolite, rhyolite, trachyte, and latite rock types	---	---		
Pennsylvanian	PPm	<b>Minnelusa Formation</b> - Red, brown, yellow to beige sandstone, shale, limestone, and dolomite. Red shale and siltstone occurs along Karlov lower contact. Exposed thickness approximately 50 ft (15.2 m)	---	---	
	<b>Disconformity</b>		---	---	
	MP	<b>Pahasapa Limestone</b> - White, beige to gray, limestone and dolomite. Contains thin lenses and beds of gray to brown chert and local solution breccia. Luggy, with caves occurring mainly in the upper half. Forms prominent cliffs. Thickness approximately 450 ft (137.2 m)	---	---	
	MD	<b>Englewood Limestone</b> - Pink, gray to purple-gray argillaceous limestone, dolomite, and shale. Laminated to medium-bedded, fine- to medium-crystalline, bioturbated. Thickness 30-50 ft (9.1-15.2 m)	---	---	
	<b>Disconformity</b>		---	---	
	Ow	<b>Whitewood Limestone and Winnipeg Formation (undifferentiated)</b> - Includes the Whitewood Limestone and Winnipeg Formation	---	---	
	Ow	<b>Whitewood Dolomite</b> - Variegated yellowish-brown, brownish-orange, to gray dolomitic limestone and dolomite. Thin-bedded to massive with thin shale partings; bioturbated. Thickness approximately 20-40 ft (6.1-12.2 m)	---	---	
	Ow	<b>Winnipeg Formation</b> - Includes the Iceberg Shale Member of greenish-gray, fissile shale and the Roughneck Siltstone Member of tan to yellowish-gray, calcareous siltstone. Combined thickness 20-60 ft (6.1-18.3 m)	---	---	
	OCd	<b>Deadwood Formation</b> - Greenish- to reddish-brown glauconitic sandstone, shale, limestone, intraformational conglomerate, and local basal conglomerate. Laminated to thick-bedded. Thickness 240-423 ft (73.2-128.9 m)	---	---	
	Mississippian	<b>Disconformity</b>		---	---
XPc		<b>Pegmatite</b> - Thin, light-colored, peraluminous dikes of pegmatitic granite composed of quartz, muscovite, sodic plagioclase, and perthite with mineral grains up to 0.79 in (2 cm) in diameter (Grunwald, 1970). Occurs in Butcher Gulch north of the town of Galena. Equivalent to the "Creek Mountain granite" which has a Pb <sup>207</sup> /Pb <sup>206</sup> age of 1.718 ± 0.22 Ma (Ghosh, 2009), and is probably equivalent to the Hankey Peak Granite in the southern Black Hills	---	---	
Xmg		<b>Metagabbro</b> - Grayish-green to greenish-black, fine- to coarse-crystalline. Composed of plagioclase, hornblende, biotite, and calcite. May have a schistose appearance. Protolith is gabbro	---	---	
Xg		<b>Grizzly Formation</b> - Gray, bluish-gray, to dark-gray phyllite, slate, platy mica schist, and minor metagraywacke. Some beds are carbonaceous. Protolith is dominantly shale and siltstone	---	---	
Xf		<b>Flag Rock Formation</b> - Light gray to greenish-gray mica schist, laminated pyritic and carbonaceous phyllite. Contains pillow metabasalt, streaked graphitic quartzite, metachert, and metamorphosed carbonate facies iron-formation with cummingtonite, biotite, and chlorite similar in appearance to the Homestake Formation. A quartz-pyrite replacement graphic bed locally known as the "iron dike" extends from the Broken Boot (Olaf Seim) mine south past Whitewood Creek to near the town of Kirk on the Lead quadrangle (U.S. Bureau of Mines, 1954). Occurs only at higher elevations and is interpreted to have been formed from White River age weathering of iron-rich beds similar to the Homestake Formation. Protolith of formation is pillow basalt with interbedded deposits of siltstone, carbonaceous shale, chert, and iron carbonate	---	---	
<b>Unconformity</b>		---	---		
Xn		<b>Northwestern Formation</b> - Gray to dark-gray phyllite, slate, and biotite schist. Thin- to medium-bedded, locally with laminations and identifiable bedding. May contain minor tourmaline and titanite. Protolith is shale, carbonaceous shale, and siltstone	---	---	
Xe		<b>Ellison Formation</b> - Tan, light-gray, to black, bedded, well-foliated sericite-quartz phyllite; thick-bedded to massive, biotite-quartz phyllite; light gray to pale-brown quartz-mica schist; gray to black, massive, fine-grained quartzite and metachert; and minor amphibolite. Conglomerate beds rare; locally with minor carbonate. Protolith is sandstone with siltstone and shale. A metabasalt in the lowermost Ellison Formation at the Homestake mine on the Lead quadrangle has an age of 1,974 ± 8 Ma (Redden and others, 1990)	---	---	
Xgr		<b>Metagraywacke</b> - Gray to brownish- and reddish-gray quartz-mica schist, phyllite, and carbonate schist. Protolith is distal to proximal turbidite deposits	---	---	
Precambrian		Xbs	<b>Phyllite and schist</b> - Xbs - Gray to black; thin-bedded phyllite and schist. Xc - Metachert and impure iron-formation. Xdo - Metabasalt. Correlation of units across Tomahawk Fault uncertain. Protolith is interbedded carbonaceous shale, chert, iron carbonate, sulfides, and basalt	---	---
	Xc		---	---	
	Xdo		---	---	
	Xgr		---	---	
	Xn		---	---	
	Xe		---	---	
	Xgr		---	---	
	Xbs		---	---	
	Xc		---	---	
	Xdo		---	---	