DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

COAL INVESTIGATIONS
MAP C-105

Base from U.S. Geological Survey, 1974
10,000-meter Universal Transverse Mercator grid, zone 13
50,000-foot grid ticks based on Wyoming coordinate system, east zone

SCALE 1:100 000

5 0 5 MILES

5 0 5 10 KILOMETERS

CONTOUR INTERVAL 100 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

APPROXIMATE MEAN DECLINATION, 1981

WYOMING

QUADRANGLE LOCATION

Geology compiled in 1981

CORRELATION OF MAP UNITS

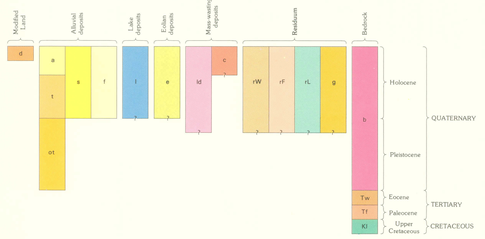


Table 1.—*General characteristics of map units*
[Leaders (—) indicate that thickness and slope of deposit were not measured]

Map unit	Name and age of unit	Description of unit	Origin of unit	Typical position in landscape	Common thickness (m)	Common slope (percent)
			MODIFIED LAND			
d	DISTURBED TERRAIN (HOLOCENE)	Primarily bulldozer-graded residuum, artificial fill, bedrock, and mine spoil.	Mapped only where terrain modification by mining and construction obscures former character of surficial deposits.	Coal mines, the city of Gillette, and roadfill.	----	----
			ALLUVIAL DEPOSITS			
a	FLOOD-PLAIN AND LOW TERRACE ALLUVIUM (HOLOCENE)	Silt and sand; rare pebbles of sandstone, ironstone, and baked and fused rock (b). Interbedded with silty clay or gravel.	Fine sediment deposited as overbank material during flooding; interfingers with coarse streambed alluvium. Some deposits occur as terraces isolated by incision of streams, and these terraces are seldom flooded.	Flood plains and low terraces as much as 3 m above streambeds.	0.5–5	0–4
t	HIGH TERRACE ALLUVIUM (HOLOCENE)	Sand, silt, and clay; rare pebbles, mostly of baked and fused rock (b). May contain buried soil horizons rich in clay and organic material. Upper 1 m commonly contains calcium carbonate.	Channel and overbank sediments deposited by streams prior to their incision to present-day levels. Above level of present-day flooding. Many deposits of fan alluvium are graded to surfaces of these terraces.	Terraces occur 5–10 m above streambeds. Commonly a nearly level surface at toe of alluvial fan.	1.5–8	0–4
alt	OLDER ALLUVIUM (PLEISTOCENE)	Gravel and sand; minor silt. Pebble gravels consist of sandstone, chert, chalcedony, fossil wood, baked and fused rock (b), and quartz. Locally cemented and crusted with iron and manganese oxides or calcium carbonate.	Deposited by streams when landscape was less dissected; now perched above stream level.	Occurs as caps on hills and ridges 5–20 m higher than present stream level.	0.5–6	2–10
s	SHEETWASH ALLUVIUM (HOLOCENE)	Sand, silt, and clay; few interbeds of gravel. Mostly reworked material derived from higher slopes. Includes small areas of residuum (rW, rF, rL).	Deposited by unchannelled flow of water (sheetwash) on lower hillslopes and in depressions.	In gently sloping valley bottoms and in upland depressions.	1–3	0–10
f	FAN AND PEDIMENT DEPOSITS (HOLOCENE)	Upper 0.3–3 m sheetwash alluvium; commonly grades downward into stream alluvium containing small lenses of angular to subangular gravel composed of baked and fused rock (b), sandstone, and ironstone. On pediments, sheetwash alluvium can overlie bedrock.	Deposited by ephemeral streams and by sheetwash. Fan-shaped surface formed primarily by deposition, but some areas were cut on bedrock and thinly veneered with alluvium. Most fan surfaces are inactive because of entrenchment of streams, but active deposition occurs on some surfaces.	Gently sloping fan-shaped or coalescing fan-shaped surfaces at base of moderate to steep slopes.	1–16	0–15
			LAKE DEPOSITS			
l	LAKE SEDIMENTS (HOLOCENE AND PLEISTOCENE?)	Massive gray clay and silt; white alkali visible in some places.	Deposited by wind and by sheetwash in ephemeral lakes.	Natural closed depressions in gently sloping terrain.	0.5–7	0–15
			EOLIAN DEPOSITS			
e	EOLIAN DEPOSITS (HOLOCENE AND PLEISTOCENE?)	Sand occurring in dunes, or sand and silt in discontinuous sheets of irregular thickness. Massive to faintly bedded.	Eroded from poorly cemented sandstone outcrops of the Wasatch Formation (Tw) and deposited downwind in low dunes or as irregular blankets.	Downwind from exposures of poorly cemented sandstone.	0.5–7	0–15
			MASS-WASTING DEPOSITS			
c	COLLUVIUM (HOLOCENE)	Angular bedrock fragments as large as boulders mostly of baked and fused rock (b) in an unsorted matrix of sand, silt, and clay. Locally includes small areas of baked and fused bedrock, residuum (rW, rF), and small or indistinct landslide deposits (ld).	Movement downslope by rockfall and sliding over moderate to steep slopes.	Steep slopes flanking hills or plateaus capped by baked and fused rock.	1–7	10–75
ld	LANDSLIDE DEPOSITS (HOLOCENE AND PLEISTOCENE)	Blocks of sandstone, siltstone, and baked and fused rock (b) that have been moved, broken, and mixed with fine sediments. Characterized by hummocky terrain bounded upslope by crescentic scarps and downslope by lobate toes.	Downslope movement by slumping and earth flow. Some older landslide deposits are vegetated and their topography has been modified by erosion; younger deposits have fresh scarps and little vegetation.	Most common below scarps that skirt uplands of baked and fused rock; mapped northeast of Gillette.	5–30	10–50
			RESIDUUM			
rW	RESIDUUM ON WASATCH FORMATION (HOLOCENE AND PLEISTOCENE?)	Gray to brown sand and silt with variable clay content. Grades downward into unweathered Wasatch Formation (Tw). Locally includes sheetwash alluvium (s) in upper 1 m, and small areas of Wasatch bedrock, and colluvium (c).	Material derived from weathering of Wasatch Formation in place; may be modified by sheetwash and soil creep.	Flat to moderately steep dissected terrain.	1–5	0–15
g	LAG GRAVEL ON WASATCH FORMATION (HOLOCENE AND PLEISTOCENE?)	Boulders and cobbles of brown to purple arkosic conglomeratic sandstone, commonly occurring free of a finer matrix. Underlain by unweathered Wasatch Formation (Tw).	Material derived from weathering of Wasatch Formation in place and lowered by erosion of finer sediment with little lateral transport.	Caps hilltops in southwestern part of quadrangle.	1–15	10–75
rF	RESIDUUM ON FORT UNION FORMATION (HOLOCENE AND PLEISTOCENE?)	Gray to brown silt and sand with variable clay content. Grades downward into unweathered Fort Union Formation (Tf). In places includes sheetwash alluvium (s) in upper 1 m, and small areas of small areas of Fort Union bedrock and colluvium (c).	Material derived from weathering of Fort Union Formation in place; may be modified by sheetwash and soil creep.	Flat to moderately steep dissected terrain.	0.3–2	0–20
rL	RESIDUUM ON LANCE FORMATION (HOLOCENE AND PLEISTOCENE)	Dark-gray to brown clay and silt with some sand. Grades downward into unweathered Lance Formation (Kl). Locally includes sheetwash alluvium (s) in upper 1 m, and small areas of Lance bedrock.	Material derived from weathering of Lance Formation in place; may be modified by sheetwash and soil creep.	Flat to gently rolling terrain mapped on eastern side of quadrangle.	0.3–5	0–5
			BEDROCK			
b	BAKED AND FUSED ROCK (HOLOCENE AND PLEISTOCENE)	Bedrock altered when coal beds were burned. Mostly hard, dense, red to orange, baked shale and siltstone (porcellanite). Black, bubbly, sometimes glassy rock (buchite); resembles volcanic rocks. Gray or white coal ash occurs as a layer 5–30 cm thick at base of or within porcellanite zone. Locally includes small areas of colluvium (c).	Overlying rocks baked when coal beds in Wasatch and Fort Union Formations (Tw, Tf) burned.	Thick layer caps relatively flat upland surfaces on Fort Union Formation; occurs as tops of hills and ridges and as narrow hillside bands. Wasatch Formation.	3–33	5–50
Tw	WASATCH FORMATION (EOCENE)	Yellowish-gray to light-brown fine-grained sandstone, light-gray siltstone and shale, brown carbonaceous shale, and coal. Poorly consolidated except for a few well-cemented sandstone beds. In places includes small areas of residuum (rW), colluvium (c), and sheetwash alluvium (s).	Deposited in streams, swamps, and lakes; later consolidated and deeply buried; now exposed by erosion.	Hilltops and steep hillslopes.	0–6107	0–40
Tf	FORT UNION FORMATION (PALEOCENE)	Light-gray to yellowish-brown fine-grained sandstone, light-gray siltstone, mudstone, and shale, brown carbonaceous shale, and coal. Locally includes small areas of residuum (rF), colluvium (c), and sheetwash alluvium (s).	Deposited in streams, swamps, and lakes; later consolidated and deeply buried; now exposed by erosion.	Hilltops and steep hillslopes.	0–1485	0–100
Kl	LANCE FORMATION (UPPER CRETACEOUS)	Dark-gray to brown shale and light- to yellowish-gray drab massive to crossbedded lenticular concretionary sandstone. Locally includes small areas of residuum (rL).	Deposited in streams and lakes; later consolidated and deeply buried; now exposed by erosion.	Flat to rolling, dissected terrain; mapped on eastern side of quadrangle.	0–20	0–15

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1981—[24475]

INTRODUCTION

Knowledge of the distribution and properties of unconsolidated surficial materials is essential if informed decisions on land use are to be made. Surficial materials in the Gillette 30′ x 60′ quadrangle are derived primarily from local bedrock, composed mainly of shale, sandstone, and coal beds; most of these rocks weather to fine-grained material. The physical and chemical properties of the weathered materials depend upon the following: (1) the characteristics of the parent rock; (2) the chemical and mechanical weathering processes that have acted on the rocks; and (3) the modes of transportation and deposition, whether by wind, water, or gravity, that account for the present position of the weathered materials.

The information on this map was compiled from various sources listed in the Sources of Surficial Geologic Data. The contact between the Fort Union Formation and the Wasatch Formation was mapped by N. E. Denson (written communs., 1979, 1981). Contacts were extended from the areas of detailed field mapping primarily by interpretation of 1:80,000-scale black and white aerial photographs; these contacts were later field checked and adjusted where necessary. Table 1 shows the general descriptions of surficial and bedrock units, as well as the processes that formed them; table 2 shows special characteristics and limitations of these units. Descriptions of all map units, except that of the Lance Formation, are modified from published maps by V. S. Williams and D. S. Fullerton (see Sources of Surficial Geologic Data). The description of the Lance Formation is modified from Robinson and others (1964).

DISCLAIMER

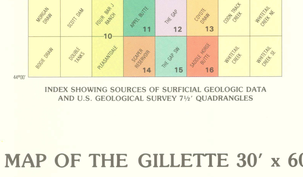
The Surface Mining Control and Reclamation Act (U.S. Congress, 1977) defines "alluvial valley floors" as "the unconsolidated stream laid deposits holding streams where water availability is sufficient for subirrigation or flood irrigation agricultural activities but does not include upland areas which are generally overlain by a thin veneer of colluvial deposits composed chiefly of debris from sheet erosion, deposits by unconcentrated runoff or slope wash, together with talus, other mass movement accumulation and windblown deposits."

Some of the higher terraces, as well as some of the valley bottoms of ephemeral streams, that were mapped as flood-plain and low-terrace alluvium (unit a) on this map may not fit that definition. Although this map shows where "alluvial valley floors" may exist, the geologic definition is different from the legal definition and detailed on-site mapping would be required in order to delineate the boundaries for regulatory purposes.

REFERENCES

Robinson, C. S., Mapel, W. J., and Bergendahl, M. H., 1964, Stratigraphy and structure of the northern and western flanks of the Black Hills uplift, Wyoming, Montana, and South Dakota: U.S. Geological Survey Professional Paper 404, 134 p.

U.S. Congress, 95th, 1977, Surface mining control and reclamation act of 1977: U.S. Public Law 95-87, 91 STAT. 516, Title VII, Sec. 701.



INDEX SHOWING SOURCES OF SURFICIAL GEOLOGIC DATA AND U.S. GEOLOGICAL SURVEY 7½′ QUADRANGLES

SOURCES OF SURFICIAL GEOLOGIC DATA

1. Reheis, M. C., 1980, reconnaissance mapping and airphoto interpretation.
2. Williams, V. S., 1978, Surficial geologic map of the Oriva NW quadrangle, Campbell County, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-978, scale 1:24,000.
3. _____1978, Surficial geologic map of the Rawhide School quadrangle, Campbell County, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-976, scale 1:24,000.
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5. _____1978, Surficial geologic map of the Green Hill quadrangle, Campbell County, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-948, scale 1:24,000.
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15. Fullerton, D. S., and Kirkham, R. M., 1977, Surficial geology of The Gap SW quadrangle, Campbell County, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-896, scale 1:24,000.
16. Kirkham, R. M., and Fullerton, D. S., 1977, Surficial geology of the Saddle Horse Butte quadrangle, Campbell County, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-898, scale 1:24,000.

Table 2.—*Special characteristics and limitations of map units*
[A, in most places; B, locally; leaders (—), if few or no places]

Map unit	Suitable for aggregate	Potential source of sand	Subject to seasonal or high water table	Forms deep gullies when wet	Contains swelling soils	Exposed in rough terrain	Access land	Steep slopes likely to be unstable	Subject to wind erosion when disturbed	Difficult to excavate
d	——	——	——	——	——	B	——	——	——	——
a	——	——	A	B	——	——	B	——	——	——
t	——	——	——	——	——	——	A	——	——	——
alt	B	B	——	——	——	——	B	——	——	——
s	——	——	B	B	——	——	B	——	——	——
f	——	——	B	——	——	——	A	——	——	——
l	——	——	A	A	B	——	——	——	A	——
e	——	A	——	——	——	——	B	——	A	——
c	B	——	——	——	——	A	——	A	——	——
ld	——	——	——	——	——	A	——	A	——	——
rW	——	B	——	——	B	B	B	B	B	——
g	A	——	——	——	B	B	——	B	——	A
rF	——	——	——	——	B	B	B	B	——	——
rL	——	——	——	A	A	——	B	——	B	——
b	A	——	——	——	——	B	——	——	A	A
Tw	——	B	——	——	B	B	——	A	B	B
Tf	——	——	——	——	B	A	——	A	——	B
Kl	——	——	——	A	A	——	——	——	——	B

SURFICIAL GEOLOGIC MAP OF THE GILLETTE 30′ x 60′ QUADRANGLE, CAMPBELL AND CROOK COUNTIES, WYOMING

By
Marith C. Reheis

1987

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