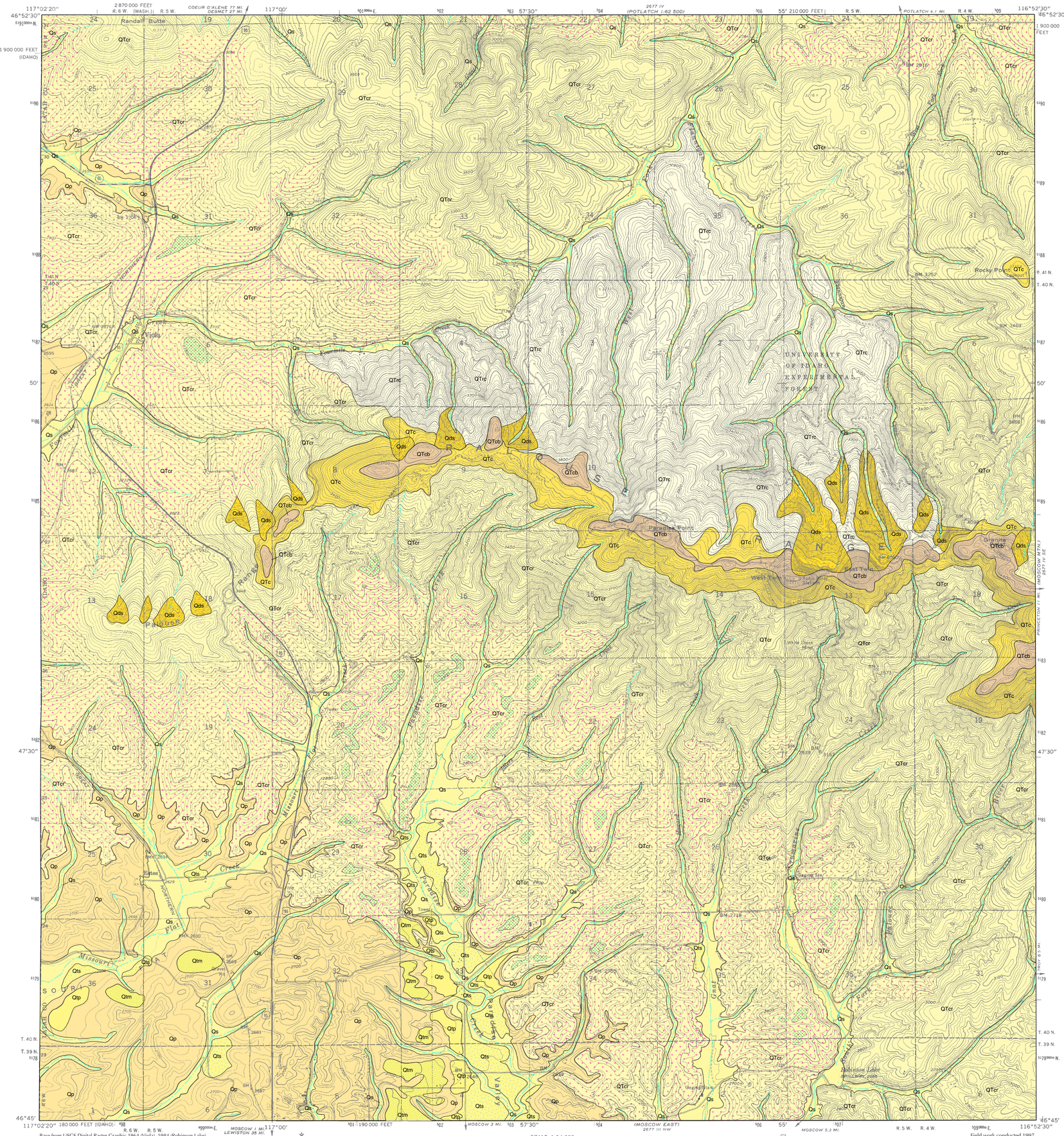
Surficial Geologic Map of the Robinson Lake Quadrangle and Part of the Viola Quadrangle, Latah County, Idaho

Kurt L. Othberg and Roy M. Breckenridge

2001



Base from USGS Digital Raster Graphic,1964 (Viola), 1984 (Robinson Lake).

Control by USGS and NOS/NOAA.

Topography from aerial photographs by photogrammetric methods. Aerial photographs taken 1957 (both maps). Field checked 1964 (Viola), 1960 (Robinson Lake). Robinson Lake revised from photographs taken 1982 and other sources. Partial field check by U.S. Forest Service. Map edited 1984.

Polyconic projection. 1927 North American datum. 10,000-foot grid based on Idaho coordinate system, west zone. 1,000-meter Universal Transverse Mercator gird ticks, zone 11.

Dashed land lines indicate approximate locations.

National Geodetic vertical datum of 1929.

SCALE 1:24,000

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10 FOOT CONTOURS

UTM GRID AND MAGNETIC NORTH

QUADRANGLE LOCATION

Field work conducted 1997.

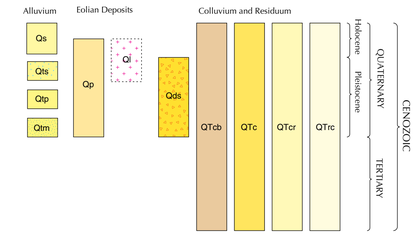
Field work and map preparation funded in part by U.S. Geological Survey's STATEMAP program.

Reviewed by Paul A. McDaniel, University of Idaho.

Digital cartography by Jane S. Freed and Loudon R. Stanford at the Idaho Geological Survey's Digital Mapping and GIS Lab.

Map version 10-10-2001.

CORRELATION OF MAP UNITS



INTRODUCTION

The surficial geologic map of the Robinson Lake and Viola quadrangles identifies earth materials on the surface and in the shallow subsurface. It is intended for those interested in the area's natural resources, urban and rural growth, and private and public land development. The information relates to assessing diverse conditions and activities, such as slope stability, construction design, sewage drainage, solid waste sites, and the recharge of potable ground water. Details depicted at this scale provide an overview of the area's geology. Further intensive analyses at specific locations should be arranged through independent geotechnical specialists.

Combined with the adjoining surficial geologic map of the Moscow East and Moscow West quadrangles (Othberg and Breckenridge, 2001), the two maps cover the city of Moscow and surrounding area, from just south of Paradise Ridge to just north of the Palouse Range. This area encompasses the eastern part of the Moscow basin, which is bounded by the Cretaceous and Precambrian igneous and metamorphic rocks that compose the underlying basement rocks and the Northern Rocky Mountains. The Moscow basin is a long-lived system draining water westward off the basement-rock uplands. During the Miocene, lava flows of the Columbia River Basalt Group filled the ancestral stream valleys eroded into the basement rocks. The flows created volcanic embayments that now form the eastern edge of the Columbia River Plateau where the relatively flat region meets the mountains. A characteristic of these embayments is the accumulation of Miocene sediments between and on top of the basalt flows. The sediments were deposited by streams in the Moscow basin as the basalt plateau formed. Later, the cooler and dryer climate of the Pleistocene brought on the cyclical deposition of wind-blown silt that constitutes the thick loess which composes the Palouse hills (see Figures 1 and 2), buries the plateau basalts, and blankets the foothills.

The maps on the bedrock geology of the Robinson Lake quadrangle by Bush and others (1998) and the Viola quadrangle by Bush and Provant (1998) show the basement rocks, the Columbia River basalt flows, and the Miocene sediments. The cross sections of these maps are especially useful for interpreting subsurface conditions suitable for siting water wells and assessing the extent and limits of ground water in the area.

DESCRIPTION OF MAP UNITS

ALLUVIUM

Qs **Stream valley deposits (Holocene)**—Stream, slope-wash, and debris-flow deposits. Predominantly silt interbedded with silty sand, granules, and pebbles. Silt is mostly reworked loess; gravel fragments are basalt, granitoid mineral grains, and vein quartz. Stream-channel and overbank deposits typically are thin and interfinger with laterally thickening deposits of slope wash and debris flows derived from erosion and mass wasting of the Palouse Formation. The channel and overbank sediments are deposited on beveled Miocene sediments (see Figures 1 and 2). Stream deposits in the upper reaches of drainages originating in the Palouse Range are less silty and dominated more by poorly sorted, subangular to subrounded quartz granules and pebbles. Soils developed in these deposits include the Latahco, Palouse, and Westlake series (Barker, 1981).

Terraces Associated With Drainages of
Paradise Creek and South Fork of Palouse River

Terrace surfaces were graded by ancestral streams that modified the typical rolling Palouse topography and beveled the Miocene sediments (see Figure 1); are composed of a laterally complex distribution of loess, reworked loess, and thin beds of granule to pebble stream gravel; and are graded to ancestral nick points that were probably controlled by the erosion-resistant Priest Rapids Member of the Wanapum Basalt and by periods of accelerated loess deposition during the Pleistocene.

Qts **Terrace alluvium of the South Fork of Palouse River (Pleistocene)**—First terrace above the Holocene flood plain; approximately 20 feet above the present channelway. Best preserved in secs. 10 and 15 T. 39 N., R. 5 W. (Moscow East quadrangle). Soils developed in these deposits include the Latahco and Palouse series (Barker, 1981).

Qtp **Terrace alluvium of Paradise Valley (Pleistocene)**—Second terrace above the Holocene flood plain; approximately 40 feet above the present channelway. Best preserved in sec. 33, T. 40 N., R. 5 W., and in sec. 4, T. 39 N., R. 5 W. (Moscow East quadrangle). Soils developed in these deposits include the Latahco and Palouse series (Barker, 1981).

Qtm **Terrace alluvium of Moscow (Pleistocene)**—Third terrace above the Holocene flood plain; approximately 60 feet above the present channelway. Best preserved in secs. 8 and 17, T. 39 N., R. 5 W. (Moscow East quadrangle). May be composed of more than one level. The Palouse series is the predominant soil developed in these deposits (Barker, 1981).

EOLIAN DEPOSITS

Qp **Palouse Formation (Holocene and Pleistocene)**—Silty and clayey loess of the Palouse hills. The Palouse Formation blankets Miocene basalt flows of the eastern Columbia River Plateau and forms hills of loess up to 200 feet thick in the western edge of the Moscow area. The loess thins eastward where it overlies Miocene sediments and pre-Miocene bedrock. From Moscow to the foothills surrounding the Moscow basin, the Palouse hills are increasingly composed of Miocene sediments, which have a cover of loess and are exposed in small outcrops and abandoned clay pits. In the Palouse hills, many layers of loess represent periods of rapid deposition followed by long surface exposure and soil development. These depositional and soil units form complex surface and subsurface patterns (Figure 2) that are discontinuous and difficult to map. Thick, welded, clayey B horizons of middle- to early-Pleistocene paleosols are locally exposed through erosion, particularly on steep amphitheater-shaped slopes with northerly aspects, and form low knobs below the high ridge crests of the Palouse hills. Where loess is thin, it is mostly Holocene and late Pleistocene in age. Previous usage mostly restricted the Palouse Formation to the Pleistocene (see Newcomb, 1961; Keroher, 1966; Richmond and others, 1965; Ringe, 1968; Griggs, 1973; Foley, 1982; Schuster and others, 1997). Holocene loess, however, was included in the Palouse Formation by Hooper and Webster (1982) and Hooper and others (1985). The soils developed in the loess form a pattern that reflects the complex interaction of erosion and deposition of loess throughout the Quaternary. These soils include the Naff, Palouse, and Tilma series (Barker, 1981).

Ql **Loess blanketing bedrock colluvium and residuum (Holocene and Pleistocene)**—Massive silty loess mostly deposited in the late Pleistocene and Holocene. Thickness is generally less than that of the Palouse Formation. Loess thins with the rise in elevation of the foothills. The transition from the plateau to the mountains at a local scale is gradual, so the boundary separating the Palouse Formation (*Qp*) from this unit is placed along the mapped contact between the Miocene and pre-Miocene rock units (Bush and others, 1998; Bush and Provant, 1998). Soils developed in these deposits include the Naff, Palouse, Southwick, and Taney series (Barker, 1981).

COLLUVIUM AND RESIDUUM

Qds **Debris-flow and solifluction deposits (Pleistocene)**—Deposits composed of angular pebbles and cobbles in a silty sand matrix. Overlies weathered bedrock on steep, north-facing mountain slopes at elevations above 3,000 feet. Probably periglacial in origin and Pleistocene in age. Surface typically mantled by 3-5 feet of loess soils (Barker, 1981).

QTcb **Colluvium and bedrock that form erosion-resistant ridges (Quaternary and Tertiary)**—Colluvium composed of silty, sandy gravel. The gravel consists of granules and pebbles where derived from granitic rocks, and pebbles and cobbles where derived from quartzites. Ridges parallel the strike of the regional foliation and are prominent at higher elevations where physical weathering and erosion predominate over chemical weathering and deposition. Lacks a mantle of loess. Soils developed in these deposits are predominantly the Spokane and Vassar series (Barker, 1981).

QTc **Colluvium and common small rock outcrops (Quaternary and Tertiary)**—Colluvium composed of a silty or sandy gravel layer from 1 foot to more than 10 feet thick. The gravel consists of granules and pebbles where derived from granite rocks, and pebbles and cobbles where derived from quartzites. In lower slope areas of rocks, colluvium may locally overlie deeply weathered rock. Soils developed in these deposits are predominantly the Spokane, Vassar, and Uvi series (Barker, 1981).

QTcr **Colluvium and residuum (Quaternary and Tertiary)**—Predominantly colluvium composed of a silty or sandy gravel layer from 1 foot to more than 10 feet thick. The gravel consists of granules and pebbles where derived from granite rocks, and pebbles and cobbles where derived from quartzites. Residuum is mostly a quartz-rich sandy saprolite that hardens with depth into solid rock. Colluvium is predominant at higher elevations and on steeper slopes, and is gradational with other units of colluvium and residuum. Residuum is thickest at lower elevations and on more gentle slopes. Soils developed in these deposits are predominantly the Spokane, Vassar, and Uvi series (Barker, 1981).

QTrc **Residuum and colluvium (Quaternary and Tertiary)**—Predominantly residuum composed of quartz-rich sandy saprolite from three to tens of feet thick that hardens with depth into solid rock. Colluvium is composed of a 1-foot-thick to more than a 10-foot-thick layer of silty or sandy gravel that mantles either the residuum or the bedrock. The residuum is relict from Tertiary weathering of bedrock and is thickest at lower elevations and on more gentle slopes. Soils developed in these deposits are predominantly the Vassar and Uvi series (Barker, 1981).

SYMBOLS

Contact: Approximately located.

Erosional or depositional surface graded to a base level ancestral to and higher than the present drainage system.

REFERENCES

Barker, R.J., 1981, Soil survey of Latah County area, Idaho: U.S. Department of Agriculture Soil Conservation Service, 116 p.

Bush, J.H., J.L. Pierce, and G.N. Potter, 1998, Bedrock geologic map of the Robinson Lake quadrangle, Latah County, Idaho: Idaho Geological Survey Geologic Map 24, scale 1:24,000.

Bush, J.H., and A.P. Provant, 1998, Bedrock geologic map of the Viola quadrangle, Latah County, Idaho, and Whitman County, Washington: Idaho Geological Survey Geologic Map 25, scale 1:24,000.

Foley, L.L., 1982, Quaternary chronology of the Palouse loess near Washtucna, eastern Washington: Western Washington University M.S. thesis, 137 p.

Griggs, A.B., 1973, Geologic map of the Spokane quadrangle, Washington, Idaho, and Montana: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-768, scale 1:250,000.

Hooper, P.R., and G.D. Webster, 1982, Geology of the Pullman, Moscow West, Colton, and Uniontown 7½′ quadrangles, Washington and Idaho: Washington Division of Geology and Earth Resources Geologic Map GM-26, scale 1:62,500.

Hooper, P.R., G.D. Webster, and V.E. Camp, 1985, Geologic map of the Clarkston 15-minute quadrangle, Washington and Idaho: Washington Division of Geology and Earth Resources Geologic Map GM-31, scale 1:48,000.

Keroher, G.C., 1966, Lexicon of geologic names of the United States, 1936-1960: U.S. Geological Survey Bulletin 1200, 4341 p.

Newcomb, R.C., 1961, Age of the Palouse Formation in the Walla Walla and Umatilla River basins, Oregon and Washington: Northwest Science, v. 35, p. 122-127.

Othberg, K.L., and R.M. Breckenridge, 2001, Surficial geologic map of the Moscow East quadrangle and part of the Moscow West quadrangle, Latah County, Idaho: Idaho Geological Survey Surficial Geologic Map 11, scale 1:24,000.

Richmond, G.M., R. Fryxell, G.E. Neff, and P.L. Weis, 1965, The Cordilleran ice sheet of the Northern Rocky Mountains and related Quaternary history of the Columbia Plateau, *in* H.E. Wright and D.G. Frey, eds., The Quaternary of the United States: New Jersey, Princeton University Press, p. 231-242.

Ringe, L.D., 1968, Geomorphology of the Palouse hills, southeastern Washington: Washington State University Ph.D. dissertation, 73 p.

Schuster, J.E., C.W. Gulick, S.P. Reidel, K.R. Fecht, and S. Zurenko, 1997, Geologic map of Washington–southeast quadrant: Washington Division of Geology and Earth Resources Geologic Map GM-45, scale 1:250,000.

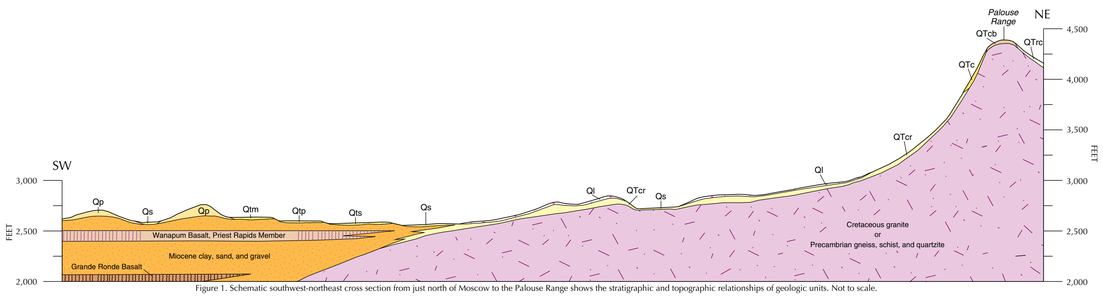


Figure 1. Schematic southwest-northeast cross section from just north of Moscow to the Palouse Range shows the stratigraphic and topographic relationships of geologic units. Not to scale.

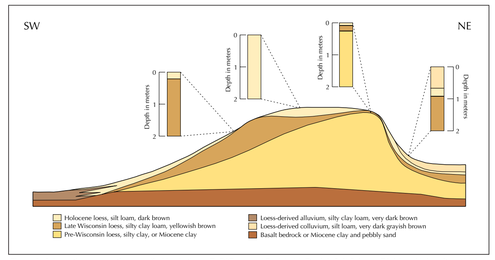


Figure 2. Schematic cross section supplied by Anthony T. O'Geen and Paul A. McDaniel, Soil Science Division, University of Idaho. Cross section is through a typical Palouse hill near Moscow and shows stratigraphy of loess units in the Palouse Formation (*Qp*) and soil textures at four different topographic positions. Clay mineralogy of soil B horizons is dominated by mica in the Holocene soil and by vermiculite in the late Wisconsin soil. Not to scale. Colors apply to this illustration only.

Published and sold by the Idaho Geological Survey
University of Idaho, Moscow, Idaho 83844-3014