Surficial Geologic Map of the Peck Quadrangle, Clearwater, Lewis and Nez Perce Counties, Idaho

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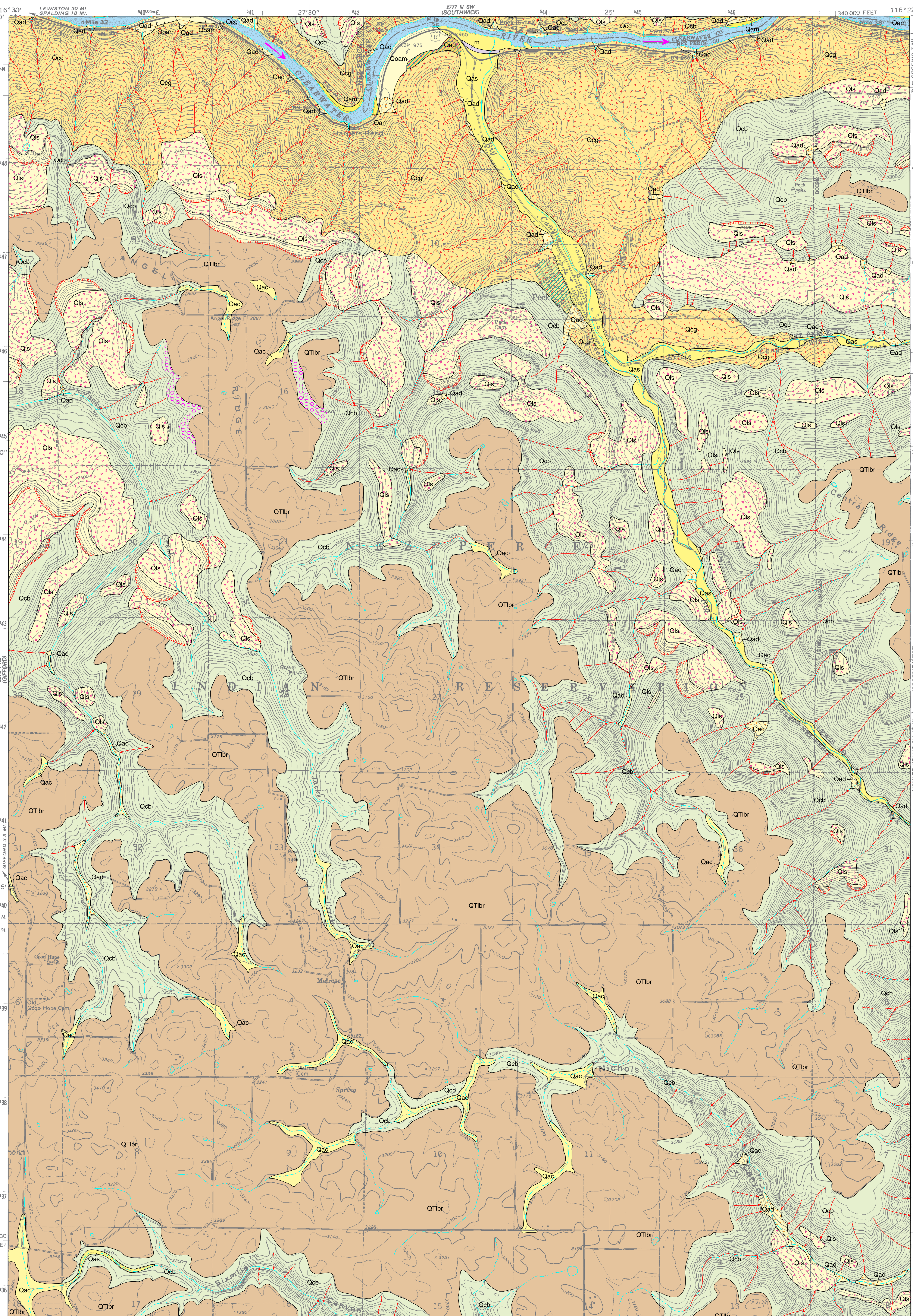


Base map from USGS digital raster graphic 1967.

Topography by photogrammetric methods from aerial photographs taken 1966. Field checked 1967.

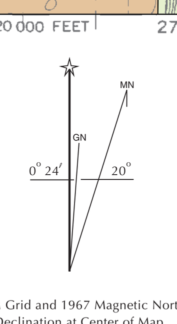
1927 North American Datum.

Projection and 10,000-foot grid ticks based on Idaho coordinate system, west zone.

1000-meter Universal Transverse Mercator grid ticks, zone 11.

National geodetic vertical datum of 1929.

Note on printing: The map is reproduced at a high resolution of 600 dots per inch. The inks are resistant to run but not to the fading caused by long-term exposure to light.



UTM Grid and 1967 Magnetic North Declination at Center of Map

SCALE 1:24,000

1 0.5 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0.5 0 1 KILOMETER

Contour interval 40 feet
Supplementary contour interval 20 feet

QUADRANGLE LOCATION

Field work conducted 2001.

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Digital cartography by B. Benjamin E. Studer and Loudon R. Stanford at the Idaho Geological Survey's Digital Mapping Lab.

Map version 7-8-2003.

DESCRIPTION OF MAP UNITS

INTRODUCTION

The surficial geologic map of the Peck quadrangle 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.

The canyons of the Clearwater River and Big Canyon Creek are the prominent features on the map. Angel Ridge, Central Ridge, and the southern part of the map are part of the Camas Prairie. The Camas Prairie is a portion of the Columbia River Plateau and is composed of Miocene basalt flows of the Columbia River Basalt Group. The Clearwater River is deeply entrenched into the plateau, and the canyon exposes Precambrian metamorphic rocks that compose the underlying basement rocks. During the Miocene, lava flows of the Columbia River Basalt Group filled 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. Sediments of the Latah Formation are interbedded with the basalt flows, and landslide deposits occur where major sedimentary interbeds are exposed along the valley sides. In this quadrangle Pleistocene loess forms a thin discontinuous mantle on the weathered and slightly eroded basalt plateau surface. In the late Pleistocene, multiple Missoula Floods inundated the Clearwater River valley, locally depositing silt, sand, and ice-rafted cobbles and boulders in the lower elevations of the canyon.

SURFICIAL DEPOSITS

m **Made ground (Holocene)**—Large-scale artificial fills composed of excavated, transported, and emplaced construction materials of highly varying composition, but typically derived from local sources.

Qam **Alluvium of mainstreams (Holocene)**—Channel and flood plain deposits of the Clearwater River. Two grain-size suites are typically present: Well-sorted and rounded sandy gravels of river bars and islands, and coarse sand forming thin shoreline deposits. The gravel clasts include granitic and metamorphic rocks derived from distant sources, and a large component of Columbia River Basalt from more local sources. These deposits are "riverwash-aquents" in the soil survey (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

Qoam **Older alluvium of mainstreams (Holocene)—**Fine- to coarse-grained bedded sands and silty sands overlying river channel gravels. These alluvial deposits form one or more levels of old point bars and flood plains which are younger than the Missoula Floods backwater events, but older than deposits of the present Snake River. The sands overlying channel gravels are several feet thick. Soils developed in older mainstream alluvium include the Uhlig soil series (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

Qas **Alluvium of sidestreams (Holocene)**—Channel and flood plain deposits of Big Canyon Creek and Little Canyon Creek. Subrounded to rounded pebbles, cobbles, and boulders of basalt in a sand matrix. Moderately stratified and sorted. Includes intercalated colluvium and debris flow deposits from steep side slopes. Soils developed in these deposits include the Bridgewater, Joseph, and Lapwai series (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

Qac **Alluvium and colluvium (Holocene)**—Stream, slope-wash, and. Alluvium and colluvium (Holocene)—Stream, slope-wash, and gravity deposits. Predominantly silty reworked loess that may be interbedded with muddy basalt gravel. Stream deposits typically are thin and interfinger with laterally thickening deposits of slope wash and colluvium derived from local loess deposits and weathered basalt. Soils developed in these deposits include the Latahco, Westlake, and Wilkins series (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

Qad **Alluvial fan and debris flow deposits (Holocene and Pleistocene)**—Crudely bedded, poorly sorted brown muddy gravel. Gravel is composed of subangular and angular pebbles, cobbles, and boulders of basalt in a matrix of granules, sand, silt, and clay. May include beds of silt and sand derived from reworked loess, Mazama ash, and Missoula Flood backwater deposits. Thickness varies, but typically ranges from 6-50 feet. Fans composed of alluvium and debris flows occur in canyon bottoms below steep debris chutes (see Symbols).

Qls **Landslide deposits (Holocene and Pleistocene)**—Poorly sorted and poorly stratified angular basalt cobbles and boulders mixed with silts and clays. Landslide deposits include debris slides and blocks of basalt and sedimentary interbeds that have been rotated and moved laterally. Debris slides mainly composed of unstratified, unsorted gravel rubble in a clayey matrix. In addition to the landslide deposit, the unit comprises the landslide scarp (see Symbols) and the headwall area from which material broke away (steep area adjacent to and below the landslide scarp). The headwall area may include talus formed after landslide movement. Location of landslide deposits in canyons is controlled by the presence of sedimentary interbeds, the occurrence of basalt overlying clay-rich weathered basement rocks, and the hydrogeologic regime. The largest landslides occur where canyon-cutting has exposed landslide-prone sediments to steep topography. Slope failures have occurred where the fine-grained sedimentary interbeds and weathered basement rocks are saturated by ground water moving toward the valleys. This is so prevalent that the major sedimentary interbeds may be traced by locating landslide deposits along the valley sides. The landslides range in age from ancient, relatively stable features, to those that have been active within the past few years. In most cases, the stratigraphic, lithologic, and hydrologic conditions that cause landslides are the same today as in the past. Even small landslide activity on the upper parts of canyon slopes can transform into high-energy debris flows that endanger roads, buildings, and people below (see *Debris chutes* under Symbols). Landslide debris is highly unstable when modified through natural variations in precipitation, artificial cuts, fills, and changes to surface drainage and ground water.

Qcb **Colluvium from basalt (Holocene and Pleistocene)**—Primarily poorly sorted brown muddy gravel composed of angular and subangular pebbles, cobbles, and boulders of basalt in a matrix of silt and clay. Emplaced by gravity movements on steep-sided canyons and gullies cut into Columbia River basalt. Includes outcrops of basalt that are common on steep, dry, southerly aspects where colluvium is thinner and the more erosion-resistant basalt flows form laterally traceable ledges. More gently sloping areas mantled with thin loess (typically 1-5 feet thick), especially near boundaries with loess mantling basalt residuum (*QTlbr*). Distribution and thickness of colluvium dependent on slope aspect, upper and lower slope position, basalt and sediment stratigraphy, and association with landslides. Thin colluvium is predominant on dry, southerly facing slopes, is associated with many basalt outcrops, and may have a patterned ground of regularly spaced, subround to oblate silty mounds separated by areas of colluvial gravel (see Symbols). Thicker colluvium is predominant on north- and east-facing slopes, and is associated with landslides (*Qls*) and debris chutes (see Symbols), especially where slopes are wetter and where sedimentary interbeds are present. Areas of thicker colluvium have fewer outcrops of basalt, and the surface may have a patterned ground of crescent-shaped lobes of colluvium, probably solifluction relicts. Unit includes landslides too small to map separately, and talus below cliffs and ledges of basalt. Colluvium typically increases in thickness toward the base of slopes where it interfingers with alluvium in valley bottoms. May include all of valley-bottom sediment where streams have little discharge or are ephemeral. Soils developed in basalt colluvium include the Gwin, Jacket, Kettenback, Keuterville, and Klickson, Meland, and Uptmor series (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

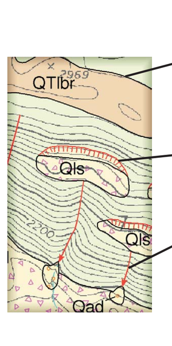
Qcg **Colluvium from granitic and metamorphic rocks (Holocene and Pleistocene)**—Primarily poorly sorted muddy gravel composed of angular and subangular pebbles, cobbles, and boulders in a matrix of sand, silt, and clay. Includes local debris-flow deposits and isolated outcrops of granitic and gneissic rocks. Colluvium and debris-flow deposits from overlying basalt section may be present. Grades laterally, as slope gradients descrease, into areas where thin loess (typically less than 5 feet) and clayey saprolite mantle bedrock. Distribution and thickness of colluvium depend on slope, aspect, upper and lower slope position, and association with landslide deposits. Colluvium typically increases in thickness toward the base of slopes and may interfinger with alluvium in valley bottoms. Soils developed in these deposits include the Dragnot and Johnson series (U.S. Department of Agriculture, Natural Resources Conservation Service, unpublished data).

Qm **Missoula Floods backwater deposits (Pleistocene)**—Rhythmite deposits of cross-bedded, dark-gray, basalt-rich granule gravel and coarse sands grading upward into quartz- and feldspar-rich tan sands and silts. Includes cut and fill structures and sandy clastic dikes. Similar depositional environment, sedimentology, and age as Missoula Floods rhythmites of eastern Washington (Smith, 1993; Waitt, 1980, 1985). Commonly reworked into sandy, silty colluvium. Mapped as a pattern where sandy, silty rhythmites mantle lower canyon slopes of basalt colluvium (*Qcb*), granitic colluvium (*Qcg*), Pleistocene deposits of debris flows and alluvial fans (*Qad*), and Pleistocene alluvial gravel (*Qag*). Downstream in the Snake River valley, Missoula Floods deposits overlie Bonneville Flood deposits. In the Clearwater River drainage, Bonneville Flood deposits have not been recognized. Soils developed in Missoula Flood deposits include the Uhlig series (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

Qag **Alluvial gravel (Pleistocene)—**Pebble and cobble gravels of remnant point bars located about 80 feet above the Clearwater River. Few exposures of gravel owing to mantle of Missoula Floods backwater sediments (*Qm*). Probably includes slope deposits of colluvium and debris flows on side of unit next to canyon slope. These ancestral Clearwater gravels were deposited prior to the latest Missoula Floods. They may have formed during periodic greater discharges of the Clearwater River during the last major glaciation of the Pleistocene. Soils developed in Pleistocene alluvial gravel include the Uhlig series (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

QTlbr **Loess mantling basalt residuum (Quaternary and Tertiary)—**Thin Quaternary loess mantling Tertiary residuum on remnant surfaces of the basalt plateau. Loess 1-6 feet thick mantles basalt residuum which is spheroidally weathered and is commonly weathered to a clayey saprolite. An eastward increase in weathering of the basalt probably corresponds to the eastward increase in precipitation and to the great age of this late-Tertiary remnant basalt surface. Includes gravelly basalt colluvium on local steeper slopes where stream incision has occurred. Includes local deposits of thin alluvium (*Qac*) too small in area to show at this scale. Soils in this unit include the Driscoll, Joel, Larkin, Southwick, and Taney series (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

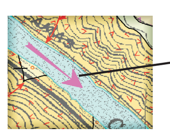
SYMBOLS



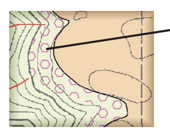
Contact: Line showing the approximate boundary between one map unit and another. The apparent ground width of the line representing the contact is about 80 feet at this scale (1:24,000).

Landslide scarp: Ticks show top of scarp.

Debris-flow chute in canyons. Thin and discontinuous alluvial fan and debris flow deposits (*Qad*) may be present, but are not mappable at this scale. High-energy, short duration floods and debris flows may occur in these chutes in response to severe climatic conditions, such as thunderstorms and rain-on-snow events. These events are historically infrequent, dependent on weather, with a recurrence cycle on the order of years to decades. Debris flows can also be triggered by landslides. The most prominent debris-flow chutes are shown on the map, but any steep-gradient valley sides and canyon bottoms have the potential for these catastrophic events.



Flow direction of Missoula Floods backwater inundation.



Patterned ground associated with the weathered, differentially eroded surface of basalt. Pattern consists of regularly spaced, subround fracture system in basalt with silty mounds between fractures. Silty mounds give way to fractured basalt downslope, but thicken upslope where they gradually obscure the fracture pattern and merge with loess deposits or weathered basalt. Probably formed by stripping of loess from the basalt surface through periglacial processes. Original patterned ground features destroyed by field plowing in many locations.

REFERENCES

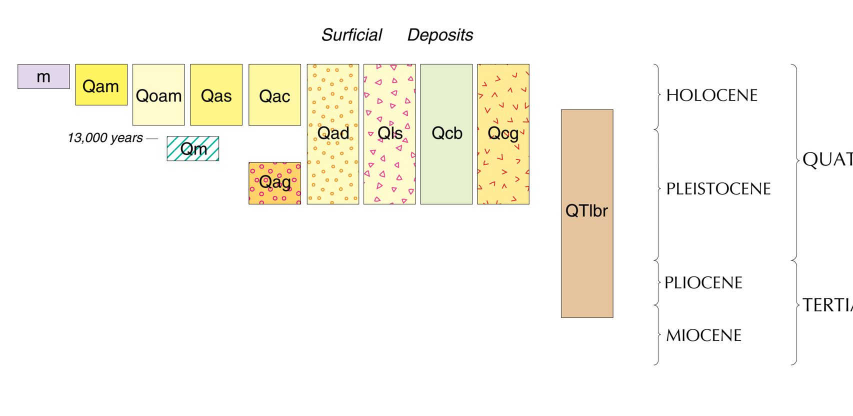
Smith, G.A., 1993, Missoula flood dynamics and magnitudes inferred from sedimentology of slackwater deposits on the Columbia Plateau, Washington: Geological Society of America Bulletin. v. 105, p. 77-100.

U.S. Department of Agriculture, Natural Resources Conservation Service, 1999, Soil survey geographic (SSURGO) database for Lewis and Nez Perce counties: USDA-NRCS Soil Survey Division, National SSURGO Database Data Access, ID611, http://www.ftw.nrcs.usda.gov/ssur-data.html.

Waitt, R.B., Jr., 1985, Case for periodic, colossal jökulhaups from Pleistocene glacial Lake Missoula: Geological Society of America Bulletin, v. 95, p. 1271-1286.

Waitt, R.B., Jr., 1980, About 40 last-glacial Lake Missoula jökulhaups through southern Washington: Journal of Geology, v. 88, p. 653-679.

CORRELATION OF MAP UNITS



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