Surficial Geologic Map of the Green Knob Quadrangle, Latah and Nez Perce Counties, Idaho

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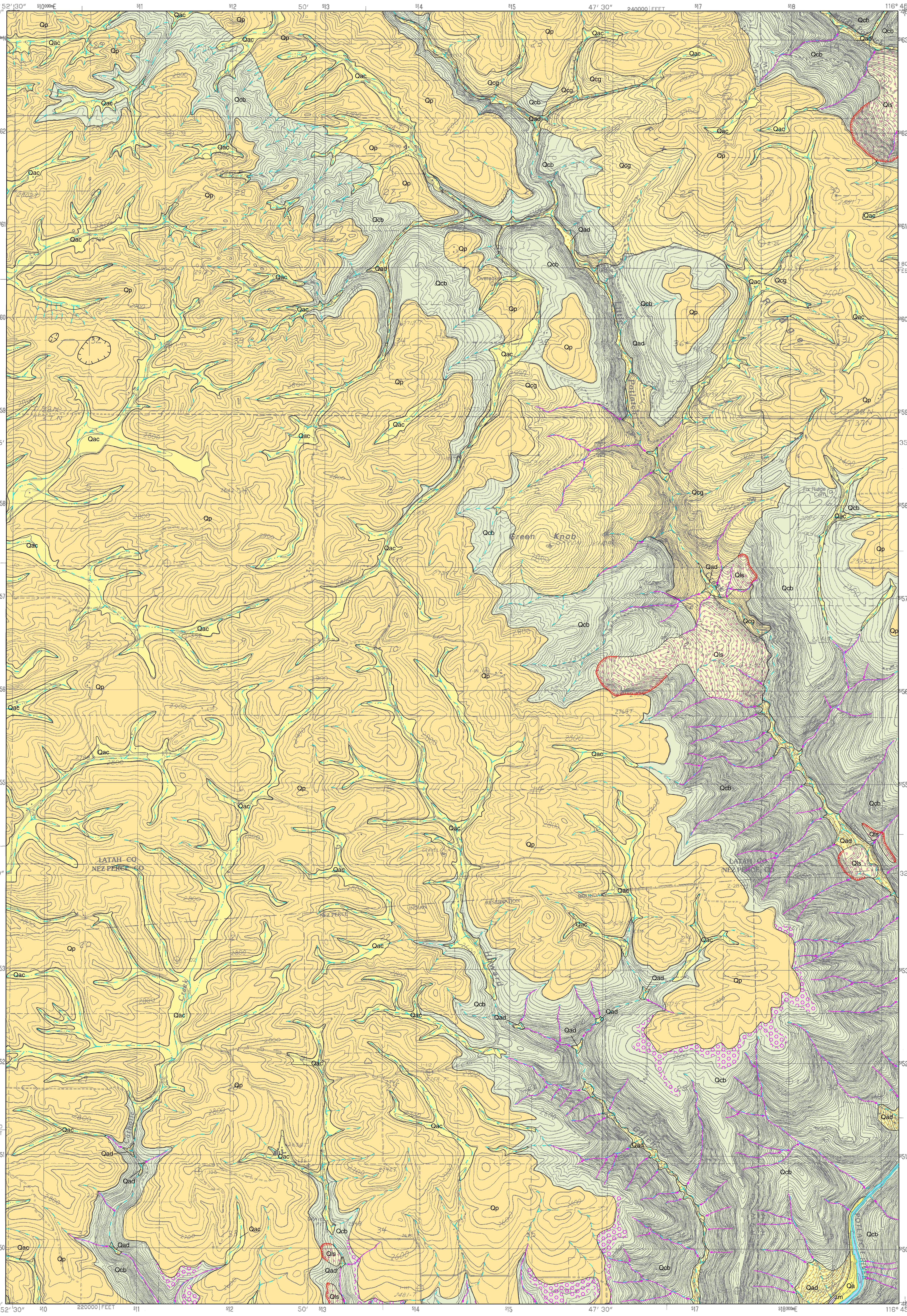
2001



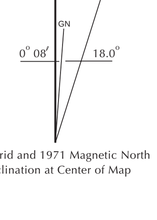
Base map USGS digital raster graphic, 1990.

Control by USGS and NOS/NOAA.

Topography by photogrammetric methods from aerial photographs taken 1957. Revised from aerial photographs taken 1987. Field checked 1988. Map edited 1990.

Polyconic projection. 10,000-foot grid ticks Idaho coordinate system, west zone. 1927 North American datum.

National Geodetic vertical datum of 1929.



UTM Grid and 1971 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 20 FEET

QUADRANGLE LOCATION

Field work conducted 1998-1999.

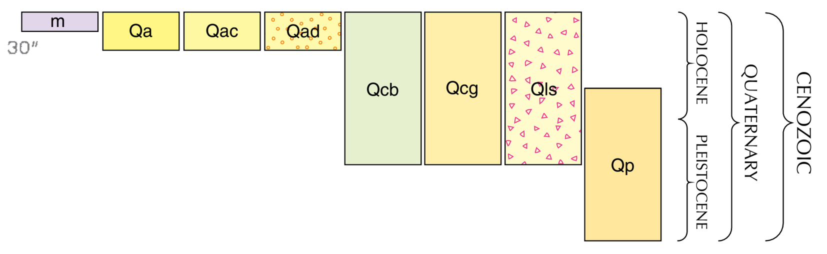
Field work and map preparation funded in part by U.S. Geological Survey's STATEMAP program.

Reviewed by John Kauffman, Idaho Geological Survey.

Digital cartography by Jane S. Freed 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 Green Knob 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 prominent feature on the map is the Little Potlatch Creek canyon that drains foothills north of the quadrangle and dissects this part of the Columbia River Plateau. These foothills are remnants of the Northern Rocky Mountains, which are composed of Cretaceous and Precambrian igneous and metamorphic rocks that form the area's underlying basement rocks. An example is Green Knob, a foothill protruding slightly above the plateau. 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. 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, buries the plateau basalts, and blankets the foothills.

The map on the bedrock geology of the Green Knob quadrangle by Bush and others (2001) shows the basement rocks, the Columbia River basalt flows, and the Miocene sediments. The cross section on that map is 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

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.

Qa **Alluvium (Holocene)**—Channel and flood-plain deposits of the Potlatch River. Primarily coarse channel gravels ranging from pebbles to boulders deposited during high-energy stream flows. Silty coarse sand overbank deposits occur along margins of the flood plain. Soils developed in these deposits include the Lapwai and Bridgewater series (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

Qac **Alluvium and colluvium (Holocene)**—Stream, slope-wash, and gravity 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 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 Latah and Latahco series (Barker, 1981; U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

Qad **Alluvium and debris-flow deposits (Holocene)**—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 derived from reworked loess. Thickness varies but typically ranges from 6 to 50 feet. Fans composed of alluvium and debris flows occur in canyon bottoms below steep debris chutes (see Symbols).

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 bluffs of 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. Includes areas mantled with thin loess (typically 1-5 feet thick), especially near boundaries with the Palouse Formation (*Qp*). Distribution and thickness of colluvium depend on slope aspect, upper and lower slope position, and basalt and sediment stratigraphy. Includes landslides too small to map separately and talus that occurs below cliffs and ledges of basalt. Colluvium typically increases in thickness toward the base of slopes and interfingers with alluvium in valley bottoms. May include all of valley-bottom sediment where streams have little discharge or are ephemeral. Thicker colluvium is more prevalent 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. Soils developed in colluvium include the Bluesprin, Flybow, Kettenbach, Klickson, and Linville series (Barker, 1981; 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. Emplaced by gravity movements on steep valley sides in areas of pre-Tertiary granite, syenite, gneiss, schist, and quartzite. Includes local debris-flow deposits, isolated outcrops of pre-Tertiary rocks, and many areas of thin loess (typically less than 5 feet). Loess thickens near boundaries with the Palouse Formation (*Qp*). Distribution and thickness of colluvium depend on slope, aspect, and upper and lower slope position. Colluvium typically increases in thickness toward the base of slopes and interfingers with alluvium in valley bottoms. Soils developed in these deposits include the Bluesprin and Flybow series (Barker, 1981).

Qls **Landslide deposits (Holocene and Pleistocene)**—Poorly sorted and poorly stratified angular basalt cobbles and boulders mixed with silts and clays. Clay is derived from liquified sedimentary interbeds or deeply weathered pre-Tertiary rocks. Landslides include coherent rotated and slumped blocks and earth flows. Slump blocks primarily are intact to broken-up sections of basalt. Flows are mainly unstratified, unsorted gravel rubble in a clay matrix derived from liquified fine-grained Tertiary sediments. Unit includes the steep area below the landslide scarp (see Symbols), which may include talus formed after landslide movement. Location of landslides is controlled by the location of sedimentary interbeds, weathered pre-Tertiary rocks, and the hydrogeologic regime. The largest landslides occur where valley incision has exposed sedimentary interbeds to steep topography. The fine-grained sediments, when saturated by ground water moving toward the valleys, can fail and produce slumps, slides, and flows. 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. Landslide debris is highly unstable when modified, either through natural variations in precipitation or through artificial cuts, fills, and changes to surface drainage and ground water.

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 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 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). Loess under 6 feet thick is not mapped but occurs discontinuously on gentle slopes throughout the quadrangle. Along the break in slope at the top of canyon walls, thick loess gradually thins into a patterned ground formed on the upper surface of basalt units (see Symbols). 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 Thatuna series (Barker, 1981; U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

SYMBOLS

Contact: approximately located.

Landslide scarp: Ticks point downscarp and toward landslide deposits.

Closed topographic depression located on high-elevation, nearly flat-topped loess hill. Origin unknown.

Debris-flow chute in canyons. Thin and discontinous 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, and can be triggered by landslides. These events are historically infrequent, dependent on weather, with a recurrence cycle of years to decades. 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.

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.

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