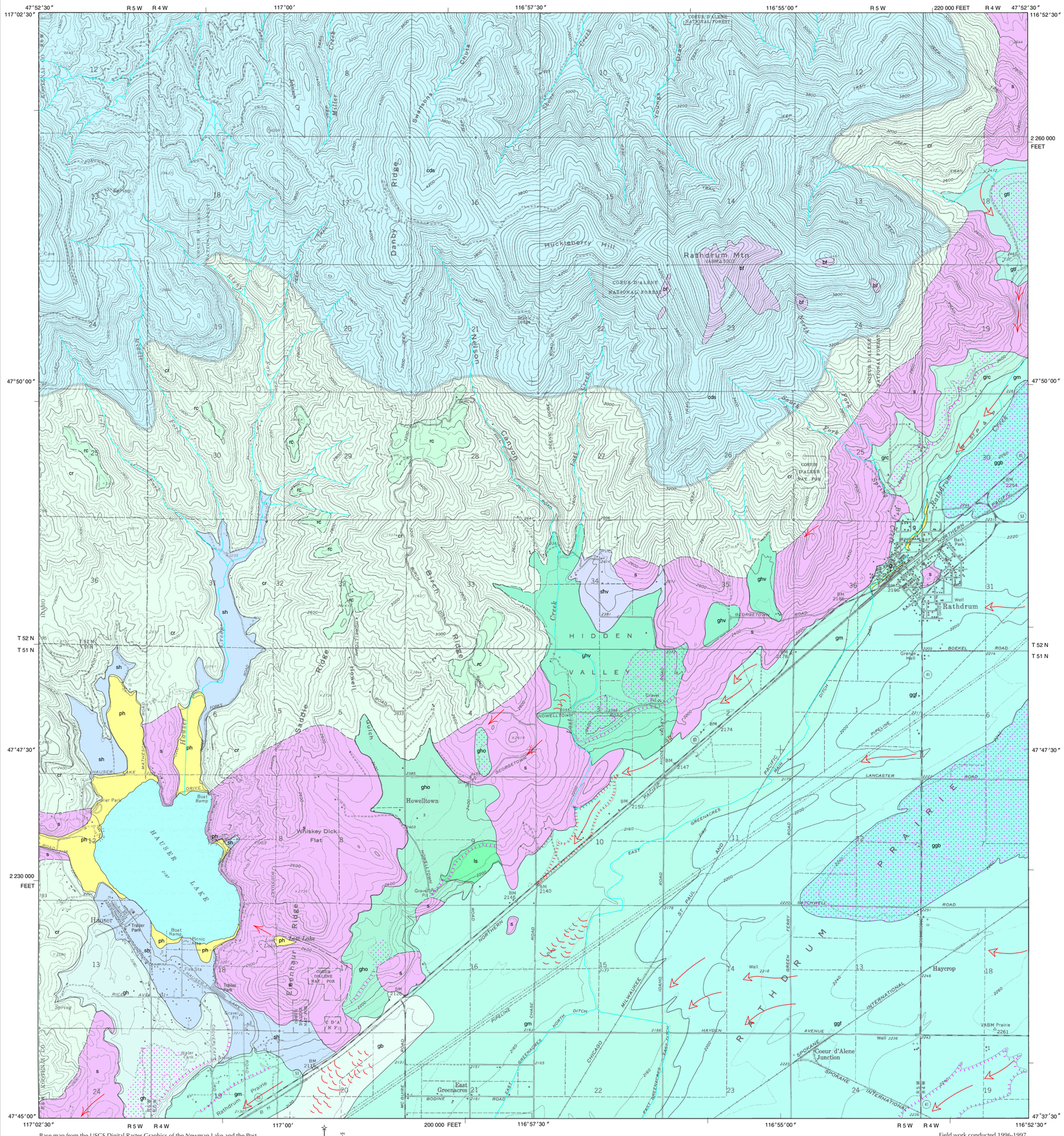
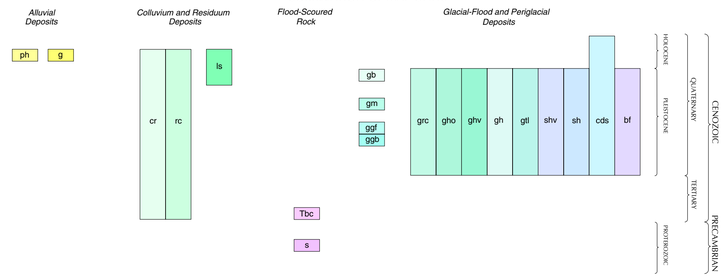
Surficial Geologic Map of the Rathdrum Quadrangle and Part of the Newman Lake Quadrangle, Kootenai County, Idaho

Roy M. Breckenridge and Kurt L. Othberg

1998



Correlation of Map Units



Introduction

This map product addresses the increasing demand for geological information in urban areas. The area covered by the map is experiencing the most rapid growth in Idaho. The geologic mapping was funded in part by STATEMAP, a national cooperative program of the U.S. Geological Survey with the state geological surveys.

The map represents the geology of the materials and soils exposed near the earth's surface. The thickness of these deposits varies from a few feet in the upland areas to hundreds of feet in the Rathdrum Valley. The map is useful for determining the type and characteristics of the materials found at the surface and in the shallow subsurface by agricultural activities, building excavations, construction material excavations, ditches, and well holes. The information can be used by government, private industry and the public for planning, development, and resource characterization. In particular, the map provides new information about the Rathdrum Aquifer, the sole source water supply for over 200,000 people in Idaho and Washington. The map can be used as a guide for site locations but is not intended as a substitute for a detailed site-specific geotechnical evaluation.

Most users are more familiar with traditional geologic maps that show bedrock. Surficial maps show units with more diverse characteristics than rock type and lithology. Most surficial deposits are geologically young, Quaternary in age, and unconsolidated. The mapping criteria used here to subdivide the Quaternary units are based on their physical characteristics and the boundaries between them (allostratigraphy). In most places the boundaries between these units are manifested in morphologic features.

Description of Map Units

Lacustrine and Alluvial Deposits

g **Alluvial gravels (Holocene)**—Sandy gravels and sands. Mostly consists of reworked Pleistocene outwash and flood deposits along Rathdrum Creek.

ph **Lake deposits (Holocene)**—Sandy silts and peat deposits in modern Hauser Lake and Lost Lake basin.

Colluvium and Residuum

cr **Colluvium and residuum of intermediate depth (Quaternary and Tertiary)**—Colluvium is composed of gravelly silty sand. The coarseness of the gravel typically increases with depth. Colluvium is formed by Holocene slope movements and predominates over residuum, which is mostly a sandy silt saprolite, or grus, that grades with depth into granite and gneiss. Colluvium mostly occurs on steeper slopes typically lower than 3,000 feet in elevation. Residuum is thickest on more gentle slopes. Most surfaces have a 3- to 6-foot mantle of loess and volcanic ash with weakly developed, Holocene soil horizons (Weisel, 1981). A clayey soil horizon typically occurs within 1 to 2 feet below the loess (Weisel, 1981) on gentle, stable slopes, but may be eroded from steeper slopes. Slopes are variable, and the steepest ones are typically located where stream incision has cut deeply into the regolith. Locally, there may be slack-water deposits of Lake Missoula Floods that inundated the Howelltown, Hidden Valley, and Hauser Lake basin to an elevation of 2,600 feet.

rc **Residuum and colluvium composing deep regolith (Quaternary and Tertiary)**—Residuum is mostly a sandy silt saprolite, or grus, that grades with depth into granite and gneiss. Colluvium is shallow to deep, pebbly and cobbly silty sand that mantles the residuum and formed from backwasting of adjoining slopes. The residuum is relict from Tertiary weathering of bedrock and is thickest on stable remnant surfaces where it may be overlain by Tertiary lag gravels. Locally, a silty clay soil horizon occurs within 1.5 to 3 feet of the surface (Weisel, 1981). The unit is discontinuously mantled by loess and volcanic ash with weakly developed, Holocene soil horizons (Weisel, 1981). Locally, there may be slack-water deposits of Lake Missoula Floods that inundated the Howelltown, Hidden Valley, and Hauser Lake basin to an elevation of 2,600 feet.

ls **Landslide deposits (Holocene and Pleistocene)**—Landslide deposits of variable age but mostly post-Lake Missoula Floods. Along the margin of the Rathdrum Prairie, they may represent failure of Latah Formation beneath Columbia River basalt flow. However, in the mapped area no basalts are exposed at the surface.

Glacial-Flood and Periglacial Deposits

Gravels of Rathdrum Prairie

The gravel deposits of the Rathdrum Prairie are the result of repeated catastrophic flood releases from Pleistocene glacial Lake Missoula that ended about 12,000 years ago. The map area is about 40 miles downstream from the Clark Fork ice dam and 18 miles from the end of Lake Pend Oreille where most of the flood waters were channeled. As much as 500 cubic miles of water was released during a large flood. Within the Rathdrum Prairie, the proximal deposits consist mostly of boulder gravels with interbedded sands implaced by high flow regimes. Crude bedding and clast-supported boxwork textures are common. Early geologists in the region interpreted the valley gravels as glacial deposits. The actual limits of the Pleistocene advances of the Purcell Trench lobe are unknown due to catastrophic floods sweeping the area. Today's understanding of the repeated ice dam failures has led most researchers to consider the gravels as flood, not glacial, in origin. Tributary valleys along the sides of the Rathdrum Prairie are filled with more finely bedded flood deposits of sands and gravel. Early geologic reports attributed the tributary valley fills and associated lakes to damming by lateral moraines or kame terraces. We now know they are giant eddy bars. The gravels are irregularly mantled with loess, volcanic ash, and a component of silt from the Lake Missoula beds. They are also sporadically cemented with calcium carbonate in varying stages of development from only rinds on the bottom of clasts to a near complete matrix filling most of the pore space (Breckenridge and others, 1997b).

Proximal Deposits on the Floor of Rathdrum Prairie

gb **Gravel of Beck Road (Pleistocene)**—Flood gravels graded to the lowest valley-filling episode of flooding continuous with the Spokane Valley, about 2,100 feet at the Idaho-Washington state line. The gravels include the most developed incision representing a large abandoned river channel meandering eastward into Washington (Gerstel and Palmer, 1994). Two separate sets of thick-bedded foresets are exposed in deep gravel pits. Thickness exceeds 80 feet.

gm **Gravel of McGuire (Pleistocene)**—Sandy flood gravels graded to an intermediate level of 2,140 feet near Post Falls. Though extensive, the gravel unit appears to be characterised by incision and scour unconformities; the surface is marked by channel erosion and lag deposits.

Gravel of Green Ferry (Pleistocene)—Coarse flood gravels. Consists of an extensive sheet of flood deposits in the quadrangle. Has poor sorting and variation in bedding, graded to about 2,200 feet at Post Falls. Probably represents the last episode of major flood events. Thickness in excess of 100 feet.

ggf **Gravel of Green Ferry, fan facies (Pleistocene)**—Poorly sorted, sandy flood gravels with channel cut and fill structures. The deposits form a large coalescing fan complex characterised by scour and fill features and concentrations of lag boulders, dissected by waning phases of flooding and smaller, later flood events. The depositional facies of the fan tend to take the form of lobes in the fan complex. Thickness 10 to 80 feet.

ggb **Gravel of Green Ferry, bar facies (Pleistocene)**—Bouldery flood gravels channel bar. Facies shown by stippled pattern. Coarse, poorly sorted imbricate flood gravels with large-scale foreset bedding. Forms a large channel bar with well-developed current ripples at the surface. Thickness up to 40 feet.

Distal Deposits Along Valley Sides and Tributaries

gh **Gravel of Hauser (Pleistocene)**—Sandy flood gravels on the valley side in mouths of tributary drainages. These deposits form eddy bars at the mouths of the tributary valleys. Lower energy eddy flows deposit finer facies behind the main bar form. Thickness up to 120 feet.

gho **Gravel of Howelltown (Pleistocene)**—Sandy flood gravels of the Howell Gulch drainage. The deposits form an eddy bar, shown by the stippled area at the mouth of the valley. Lower energy eddy flows deposited finer facies behind the main bar form. Some gravels interbedded in the Howell Gulch embayment represent slack-water sediments in waning floodwaters, or finer facies of pendant bar deposits. In places, may be mantled by post-flood lacustrine silts and alluvial deposits. Thickness up to 200 feet.

ghv **Gravel of Hidden Valley (Pleistocene)**—Sandy flood gravels in the tributary drainage of Lost Creek. The deposits form an eddy bar, shown by the stippled area, at the mouth of the tributary valley. Lower energy eddy flows deposited finer facies behind the main bar. Includes silt, sand, and some gravels interbedded in the embayment that represent slack-water sediments in waning floodwaters, or finer facies of pendant bar deposits. May be mantled by post-flood lacustrine silts and alluvial deposits. Thickness up to 200 feet.

shv **Sand of Hidden Valley (Pleistocene)**—Silty sand deposits in lee of Hidden Valley eddy bar (ghv). Fine-grained slack-water silts and sands deposited at high flood stages that backed water into the Lost Creek drainage. Forms a terrace above Hidden Valley. Thickness 10 to 30 feet.

grc **Gravel of Rathdrum Creek (Pleistocene)**—Bouldery flood gravels deposited by high energy flood waters focused directly in lee of Round Mountain, a bedrock knob. Probably a remnant pendant bar that was dissected by waning flood flows at the margin of the Rathdrum Prairie. Thickness as much as 120 feet.

gtl **Gravel of Twin Lakes (Pleistocene)**—Bouldery flood gravels deposited as a major pendant bar in the lee of Round Mountain, a bedrock knob northeast of the map. Thickness up to 80 feet.

sh **Silts of Hauser Lake (Pleistocene)**—Silt, sand, and some gravels deposited in lower energy Lake Missoula Floods regime; may represent slack-water sediments in waning flood waters or finer facies of pendant bar deposits (gha). Overlain by post-flood lacustrine silts and peat deposits (ph). Thickness 10 to 20 feet.

Periglacial Deposits in Uplands

cds **Colluvium including debris-flow and solifluction deposits (Quaternary)**—Composed of gravelly silty sand; gravel clasts typically range in size from pebbles to cobbles. Relict periglacial debris-flow and solifluction deposits occur on steeply sloping, northerly and easterly aspects at elevations typically above about 3,000 feet, and are more pervasive on all slopes above 4,000 feet. Colluvium formed by Holocene slope movements is predominant at lower elevation, south-facing slopes. On lower elevation gentle slopes, colluvium overlies and grades into grus with depth. Surface typcially mantled by 3- to 6-feet of loess and volcanic ash with weakly developed, Holocene soil horizons (Weisel, 1981).

bf **Block fields and stone stripes (Pleistocene)**—Frost-wedged and fractured bedrock forming fields, up to 6 feet thick, of cobbles and boulders. Prominent on Rathdrum Mountain, 5,000 feet in elevation. Probably periglacial in origin and largely relict.

Flood-Scoured Bedrock

Tbc **Basalt scoured by Lake Missoula Floods (Miocene)**—Not exposed; shown only on geologic cross section. Basalt of Columbia River Basalt Group (Breckenridge and others, 1997a). Forms sporadic rimrock along the margins of Rathdrum Prairie. Mostly eroded by Pleistocene glaciation and repeated Lake Missoula Floods. May be present in the subsurface of Rathdrum Prairie.

s **Precambrian metamorphic rocks of the Belt Supergroup and gneiss, schist, and granite**—Mapped as Prichard Formation and Tertiary-Cretaceous granite by Griggs (1973). Includes granitic intrusive rocks that are part of a large pluton north of Rathdrum Prarie, as seen on cross section.

Symbols

- Contact: dashed where approximately located.
- Gradational contact.
- Abandoned channels of Lake Missoula Floods drainageways; generally erosional pathways during waning flows.
- Channels scoured in bedrock by Lake Missoula Floods; mostly on margins of Rathdrum Prairie on spurs and divide crossings.
- Giant current ripple field; rolling topography from ground level. Crests visible from the air and on aerial photographs.
- Stippled areas represent active surfaces of remnant flood bars.
- Slope face of gravel flood bar or erosional scarp.
- Plunge pool depression formed by erosion of Lake Missoula floodwaters.

References

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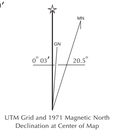
Base map from the USGS Digital Raster Graphics of the Newman Lake and the Post Falls quadrangles.

Control by USGS and USC&GS.

Topography by photogrammetric methods from aerial photographs taken 1958 (Rathdrum), 1972 (Newman Lake). Field checked 1961 (Rathdrum), 1973 (Newman Lake).

Polyconic projection. 1927 North American datum 10,000-foot grid based on Idaho Coordinate system, west zone.



UTM Grid and 1971 Magnetic North Declination at Center of Map

SCALE: 1:24,000

1/2 0 1 MILE

1 0.5 0 1 KILOMETER

Contour Interval 40 Feet
Dotted Lines Represent 20-Foot Contours

QUADRANGLE LOCATION

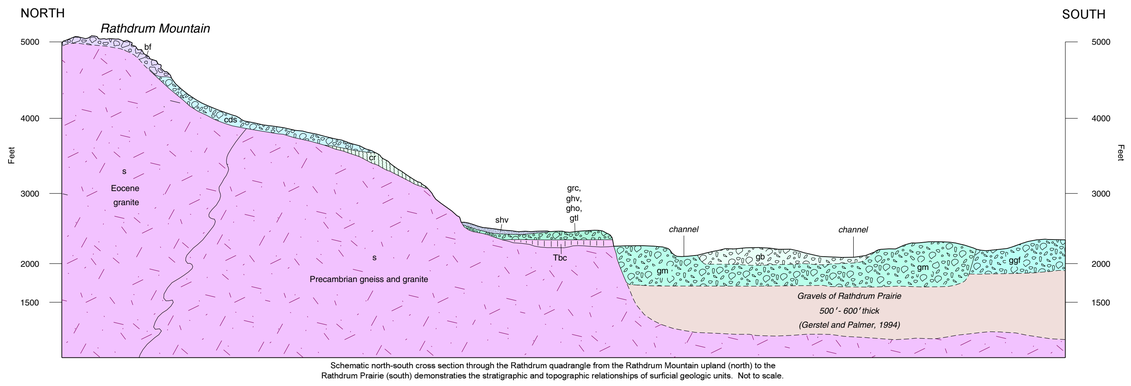
Field work conducted 1996-1997.

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

Reviewed by Wendy J. Gerstel, Washington State Division of Geology and Earth Resources.

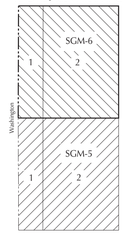
Digital cartography by Jane S. Freed and Loudon R. Stanford at the Idaho Geological Survey's Digital Mapping and Information Lab.

Idaho Geological Survey Digital Mapping & Information



Schematic north-south cross section through the Rathdrum quadrangle from the Rathdrum Mountain upland (north) to the Rathdrum Prairie (south) demonstrates the stratigraphic and topographic relationships of surficial geologic units. Not to scale.

INDEX TO QUADRANGLES AND ADJACENT MAPPING



SGM-6
1. Newman Lake
2. Rathdrum

SGM-5
1. Liberty Lake
2. Post Falls

Vertical Aerial Photo Mosaic of the Area (1992)*

*Compiled from Idaho Department of Lands digital orthophoto quadrangles.

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