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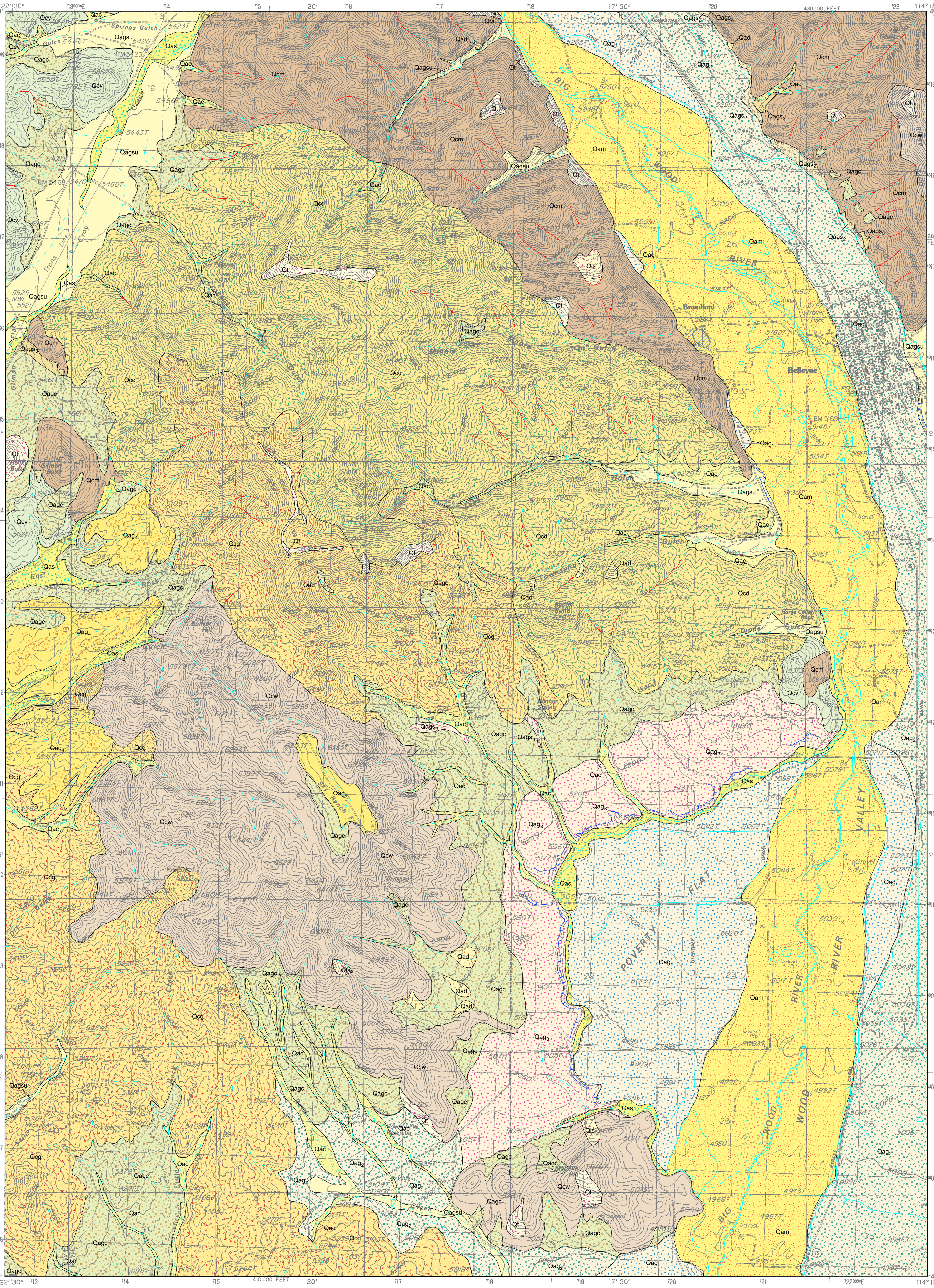
Surficial Geologic Map of the Bellevue Quadrangle, Blaine County, Idaho

Roy M. Breckenridge and Kurt L. Othberg

2006



Base map from USGS digital raster graphic 1986.

Topography by photogrammetric methods from aerial photographs taken 1980. Field checked 1981. Map edited 1986.

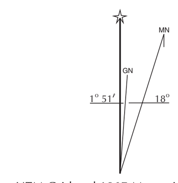
Polyconic projection. 1927 North American Datum.

10,000-food grid ticks based on Idaho coordinate system, central zone.

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

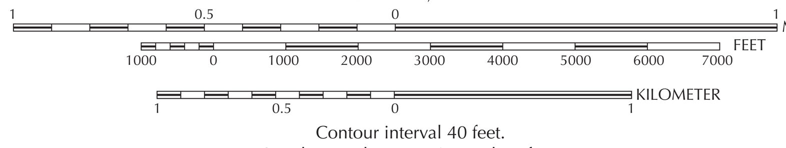
National geodetic vertical datum of 1929.

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



Contour interval 40 feet.
Supplemental contour interval 20 feet.

QUADRANGLE LOCATION

Field work conducted 2001-2002.

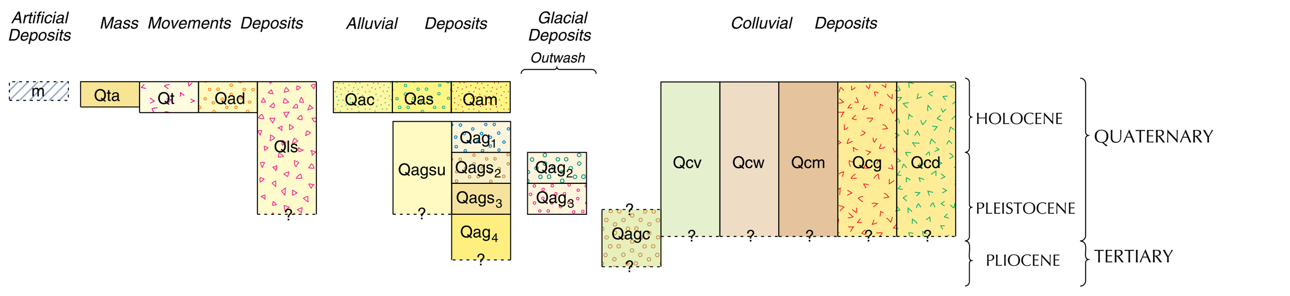
This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program.

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

Map version 2-14-2006.

PDF map (Acrobat Reader) may be viewed at www.idahogeology.org.

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

INTRODUCTION

TThe surficial geologic map of the Bellevue quadrangle provides basic data on the geologic materials found at the surface and shallow subsurface, and is essential for planning the area's growth. This map is among several produced at 1:24,000 scale for the Wood River Valley. They are combined in an overall publication at a scale of 1:50,000 (Breckenridge and Othberg, 2006). The information is directed at a broad range of specialists concerned with land development and its consequences as population growth and changes in land use place greater demands on the region's natural resources. Details from the map assist, for example, in assessing slope stability, foundation design, sewage drainage, solid waste sites, and the factors affecting recharge of the potable ground-water supply. The information depicted at this scale furnishes a useful overview of the area's geology but is not a substitute for site-specific geotechnical evaluations. All soil-series names are taken from Johnson (1991).

The Bellevue Quadrangle is located in the Wood River Valley of central Idaho and is surrounded by the Boulder, Pioneer, and Smoky mountains. The bedrock geology of this area is complex and comprised of several plates of Paleozoic marine rocks. Geologists have focused much attention to the stratigraphy and structure of the bedrock units in the area as summarized by Worl and Johnson (1995). Bounding structures originally interpreted as low-angle thrusts are now known to include normal (extensional) faults. These plates are intruded by the Cretaceous Idaho batholith and overlain by sedimentary and volcanic rocks of the Eocene Challis Volcanics. Base- and precious-metal mineralization in the area is hosted by the Paleozoic sedimentary rocks and the Idaho batholith. Although no active faults are known in the quadrangle, this area is located in the Idaho Seismic Belt one of the most seismically active areas in Idaho (Sprenke and Breckenridge, 1992). Earthquakes in 1944, 1945, several in the 1960s, 1983, and 1984, resulted in intensity V to VI shaking and some building damage in Ketchum and in Hailey, the county seat. Mines in the Wood River area date back to the 1860s and are partly responsible for the establishment of the Idaho Territory. The mines produced silver, gold, lead, and zinc, some as recently as the 1960s. While no mines are currently active they still play a major role as significant cultural and historical resources as well as posing some environmental concerns. The present valley is a topographic reflection of the Wood River graben, which is filled by Cenozoic deposits. Quaternary geology of the quadrangle is predominantly a reflection of Pleistocene glaciation in the upstream source areas in the form of outwash deposits and terraces developed in the Wood River Valley. South of Bellevue, the Wood River Valley opens onto the margin of the Snake River Plain where the Big Wood River built an extensive braided plain. Post-glacial surficial deposits are mainly the result of active slope processes including landslides. Snow and debris avalanches are common and dangerous.

ARTIFICIAL DEPOSITS

m **Made ground (Holocene)**—Large-scale artificial fills composed of excavated, transported, and emplaced earth materials of highly varying composition, but typically derived from local sources. Includes areas of modified landscape and soils, and constructed wetlands. Many smaller areas of made ground are too small to map at this scale. Does not include made ground within the City of Bellevue or gravel-pit excavations that expose a map unit.

ALLUVIAL DEPOSITS

Qam **Alluvium of mainstream (Holocene)**—Channel and flood-plain deposits of the Big Wood River. Moderate- to well-sorted sandy pebble and cobble river gravel with occasional boulders, and very cobbly coarse sand deposits with sand and silt matrix. The gravel clasts are subrounded to rounded and mostly of resistant rocks. Lithologies include Paleozoic siltite, argillite, sandstone, limestone, and quartzite; Cretaceous monzonite and granodiorite; and andesite, rhyolite and tuff of the Eocene Challis Volcanics. Soil series include the Adamson, Balaam, and Bruneel. The gravel symbol shows the active-channel riverwash of the Big Wood River which was delineated from the larger areas of active riverbed seen on 1998 aerial photography. Therefore, the riverwash may not coincide with the earlier channel positions shown on the 1986 topographic base map. Most coarse riverwash forms bedded bars that may change position in response to seasonal and annual flow and snowmelt conditions. At flood stage, the channel is full and inundation of the flood plain is possible. Areas of overland blackwater deposits and abandoned meanders are mostly fine-grained sand and silt. Localized ice and log jams can result in flooding and re-channeling in areas of the flood plain that appear to be stabilized.

Qas **Alluvium of sidestreams (Holocene)**—Channel and flood-plain deposits of tributaries of the Big Wood River, mainly in Croy Creek valley and Poverty Flat. Poor- to moderate-sorted stream and channel gravel ranging from pebbles to boulders deposited during high-energy stream flows. Silty coarse sand and pebbly sand overbank deposits occur along margins of the flood plain. Subrounded to subangular clasts mostly derived from local rocks. Grain size generally finer than in mainstream alluvium, but clasts lack maturity in sorting and shape. Contains localized areas of muck and peat. Soil series include the Bruneel, Hutton, and Marshdale.

Qac **Alluvium and colluvium (Holocene)**—Stream, slope-wash, alluvial-fan, and debris-flow deposits. Mostly unsorted and non-bedded sandy gravel and pebbly sand. Stream deposits typically are thin and interfinger with laterally thickening deposits of slope wash and colluvium. Soil series include the Drage, Isknat, and Molyneux.

ALLUVIAL GRAVEL DEPOSITS

Qag_1 **Gravel terrace deposits of Big Wood River (Holocene-Pleistocene?)**—Mostly sorted and coarsely bedded fluvial channel gravel. Cobbly and pebbly sandy gravel with sandy matrix. Forms a post-glacial cut-in-fill terrace 10-20 feet above present flood plain. Soil series include the Gimlett and Little Wood.

Qag_2 **Gravel terrace deposits of Big Wood River (Pleistocene)**—Pebble and cobble gravel, and some boulders. Poor to moderate sorting. Subangular to rounded clasts, mostly thick bedded with some cross-bedding. Glacial outwash gravels from late Wisconsin alpine glaciers in headwaters of adjacent Boulder and Pioneer mountains. Equivalent to the Pinedale gravels of Schmidt (1962) and the Boulder Creek outwash gravels of Pearce and others (1988). Forms terrace 30-50 feet above present flood plain. Soils series include the Isknat and Little Wood. The Hutton series developed where smaller tributaries and slope processes contribute finer material.

Qag_3 **Gravel terrace deposits of Big Wood River (pre-Late Pleistocene)**—Pebble and cobble gravel, and some boulders. Poor to moderate sorting. Subangular to rounded clasts, mostly thick bedded with some cross-bedding. Glacial outwash gravels derived from pre-Pinedale glaciations in headwaters of adjacent Boulder and Pioneer mountains. Equivalent to Bull Lake gravels of Schmidt (1962) and Prairie Creek outwash gravels of Pearce and others (1988). Forms terraces and remnant fans 60-75 feet above the present flood plain. Soil series include the Drage.

Qag_4 **Older gravel deposits (Pleistocene-Pliocene?)**—Older gravel deposits deposited in the Wood River graben. Well-rounded mature cobble and pebble gravels. Predominantly quartzite clasts. Remnant surfaces, graded to a base level that is a hundred or more feet above present flood plain, are shown by pattern only (see *Symbols*). Soil series include Peevywell and Simonton.

Qagc **Gravel deposits in colluvium (Pleistocene-Pliocene?)**—Silty gravel colluvium. Derived from remnant gravel deposits of older gravel deposits (Qag_4) incorporated into colluvial slopes. Includes well-rounded clasts of resistant quartzite. Probably represents eroded remnants of Qag_4. Soil series include the Peevywell and Simonton.

$Qags_2$ **Gravel deposits of sidestreams (Pleistocene)**—Mainly poorly sorted and crudely bedded gravels derived from periglacial sources in unglaciated tributary valleys. May be equivalent to mainstream gravel terrace deposits of Pinedale age (Qag_2), Pinedale gravels of Schmidt (1962), and the Boulder Creek outwash gravels of Pearce and others (1988). Forms terraces in sidestreams 15-30 feet above present flood plain. Soil series include the Drage.

$Qags_3$ **Gravel deposits of sidestreams (pre-Late Pleistocene)**—Mainly poorly sorted and crudely bedded gravels derived from periglacial sources in unglaciated tributary valleys. May be equivalent to mainstream gravel terrace deposits of Bull Lake age (Qag_3), Bull Lake gravels of Schmidt (1962), and Prairie Creek outwash gravels of Pearce and others (1988). Soil series include the Drage.

Qagsu **Gravel deposits of unglaciated sidestreams, undivided (Holocene-Pleistocene)**—Crudely bedded and poorly sorted coarse pebbly sandy gravels derived from periglacial, colluvial and fluvial activity in unglaciated sidestreams. Probably equivalent to mainstream gravel terrace deposits of Pinedale age (Qag_2), but not graded to the mainstream owing to periglacial aggradation in the unglaciated valleys. Soil series include the Carey Lake and Drage.

MASS MOVEMENT DEPOSITS

Qta **Deposits of active talus (Holocene)**—Angular cobble and boulder gravel and local pebble gravel that form fresh, active coalescing aprons and fans. Active talus is forming in response to undercutting by the Big Wood River along the west side of the Wood River Valley, possibly caused by tectonic tilting of the valley floor. Slopes are steep and unstable, and include outcrops of disintegrating bedrock cliffs.

Qt **Talus deposits (Holocene)**—Angular cobble and boulder gravel and local pebble gravel that form coalescing aprons and fans along the valley slopes. Talus slopes are partially stabilized, but include outcrops of disintegrating bedrock cliffs and steep, unstable colluvial slopes. Thin soils include the Dollarhide series.

Qad **Alluvial-fan and debris-flow deposits (Holocene and Pleistocene)**—Crudely bedded, poorly sorted gravel. Gravel is composed of subangular and angular pebbles, cobbles, and boulders in a matrix of granules, sand, silt, and clay. Thickness varies, but typically ranges from 6-50 feet. Fans composed of alluvium and debris flows occur in canyon bottoms below steep avalanche tracks and debris chutes (see *Symbols*). Includes variable amounts of trees and stumps mixed with rock and soil emplaced by avalanches. Soil series include the Drage.

Qls **Landslide deposits (Holocene and Pleistocene)**—Poorly sorted and poorly stratified angular cobbles and boulders mixed with silts and clays. Mainly translational earth flows. Slump blocks primarily composed of volcaniclastic sediments from the Eocene Challis Volcanics. In addition to the landslide deposit, the unit includes the landslide scarp and the headwall (steep area adjacent to and below the landslide scarp) from which material broke away (see *Symbols*).

COLLUVIUM

Qcv **Colluvium from Eocene volcanic rocks (Holocene and Pleistocene)**—Poorly sorted gravel comprised of angular and subangular volcanic pebbles, cobbles, and boulders in a matrix of silt and sand. Emplaced by gravity movements on steep-sided canyons. Includes outcrops of resistant andesite dacite, and rhyolite of the Eocene Challis Volcanics, slopes of tuffs and pyroclastic deposits, and outcrops of Eocene dikes. Distribution and thickness of colluvium dependent on slope aspect, upper and lower slope position, and erodability of volcanic units. Includes landslides too small to map separately and unmapped areas of talus. Soil series include the Gaib.

Qcw **Colluvium from sedimentary rocks of the Permian Wood River Formation (Holocene and Pleistocene)**—Primarily poorly sorted gravel comprised of angular and subangular pebbles, cobbles, and boulders in a matrix of sand and silt. Clasts of sedimentary rock include siltstone, sandstone, and limestone. Occasional clasts of quartzite and conglomerate. Includes outcrops of more resistant quartzites and limestones. Emplaced by gravity movements on steep valley sides in areas of sedimentary rocks. Includes local debris-flow deposits, isolated outcrops, and areas of unmappable talus. Colluvium typically increases in thickness toward the base of slopes and interfingers with alluvium in valley bottoms. Soil series include the Povey and Vitale.

Qcm **Colluvium from metasedimentary rocks of the Devonian Milligen Formation (Holocene and Pleistocene)**—Primarily poorly sorted gravel comprised of angular and subangular pebbles, cobbles, and boulders in a matrix of silt and sand. Clasts of low grade metamorphic rocks include argillite, siltite, quartzites, and limestone. Emplaced by gravity movements on steep-sided canyons. Includes outcrops of resistant quartzites and limestones. Colluvium typically increases in thickness toward the base of slopes and interfingers with alluvium in valley bottoms. Includes landslides too small to map separately and unmapped areas of talus. Soil series include the Povey and Vitale.

Qcg **Colluvium from Cretaceous granitic rocks (Holocene and Pleistocene)**—Poorly sorted pebbles, granules, and sand. Grus-rich deposit mainly derived from Cretaceous granodiorite. Emplaced by gravity movements on steep-sided canyons. Includes outcrops of resistant granitic knobs and quartz veins. Colluvium typically increases in thickness toward the base of slopes and interfingers with alluvium in valley bottoms. Includes landslides too small to map separately and unmapped areas of talus. Soil series include the Earcree and Moonstone.

Qcd **Colluvium from Cretaceous(?) diorite rocks (Holocene and Pleistocene)**—Dark black to gray poorly sorted pebble, granule, and sand derived from Eocene diorite. Contains a high percentage of weathered biotite and dark minerals forming soft colluvium. Emplaced by gravity movements on steep-sided canyons. Includes outcrops of resistant diorite, pegmatites and quartz veins. Colluvium typically increases in thickness toward the base of slopes and interfingers with alluvium in valley bottoms. Includes landslides too small to map separately and unmapped areas of talus. Soil series include the Earcree and Moonstone.

SYMBOLS

Contact, approximately located.

Landslide scarp and headwall: ticks show top of scarp.

Avalanche tracks and debris-flow chutes in steep mountain gullys and ravines. Tracks and chutes locally include thin and discontinuous alluvial-fan (*Qad*) and debris-flow deposits (*Qdf*) that are unmappable as a polygon at this scale. High-energy, short duration snow avalanches, debris flows and debris floods may occur in these chutes. These events are seasonal and unpredictable. Each chute is capable of recurring, life- and property-threatening, high-energy events. Many prominent debris-flow chutes are shown on the map based on field observations and aerial photographs, but any steep-gradient valley sides, as well as run-out areas on the valley floors and run-up areas on the opposite side of narrow valleys and gullies, are susceptible to these catastrophic events. See avalanche-hazard figure.

Terrace scarp: scarp of discontinuous but prominent sub-terraces in gravel deposits of mainstreams and tributaries. Represents episodes of downcutting that are not presently traceable between drainages in this area. Solid line represents top of scarp and hachures point down the scarp.

Gravel capped surfaces: aprons of gravel that approximate original surface of deposition graded to a common base level. Mostly relate to geomorphic development of the ancestral Big Wood River drainage in the Wood River graben and early(?) Pleistocene glaciation of the area.

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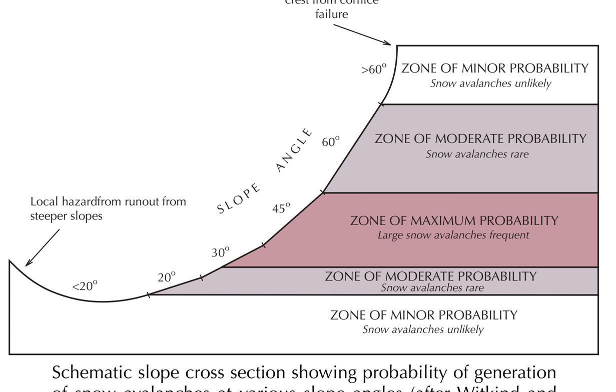
* Source of information for some surficial units.

Probability Of Generation Of Snow Avalanches At Various Slope Angles



Schematic slope cross section showing probability of generation of snow avalanches at various slope angles (after Witkind and others, 1972). The three main factors that affect snow avalanches are terrain, weather, and snow conditions.

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