Geologic Map of the Bliss Quadrangle, Gooding, and Twin Falls Counties, Idaho

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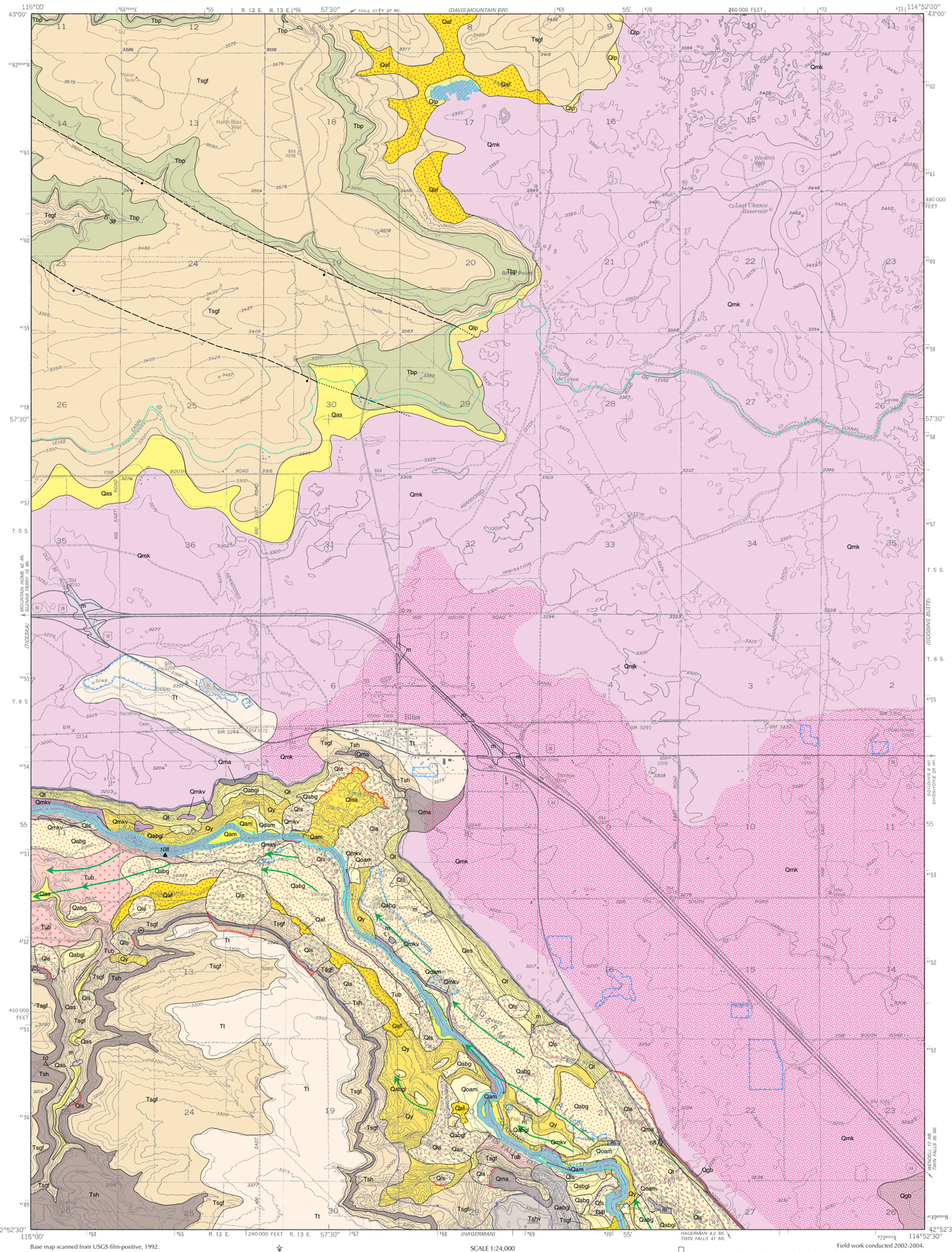

Base map scanned from USGS film-positive, 1992.

Topography by photogrammetric methods from aerial photographs taken 1948. Information shown has been updated from aerial photographs taken 1987 and field checked. Map edited 1992. Conflicts may exist between some updated features and previously mapped contours.

1927 North American Datum.

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

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

National geodetic vertical datum of 1929.

UTM Grid and 1992 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 25 feet
Contour interval on river surface 5 feet.

QUADRANGLE LOCATION

Field work conducted 2002-2004.

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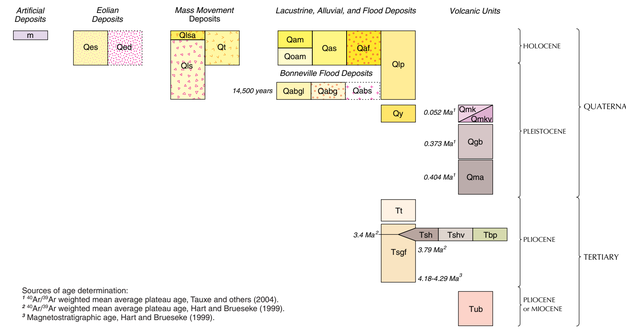
Digital cartography by Jane S. Freed at the Idaho Geological Survey's Digital Mapping.

Map version 11-29-2005.

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

CORRELATION OF MAP UNITS



Sources of age determination:
[1] $^{40}Ar/^{39}Ar$ weighted mean average plateau age, Tauxe and others (2004).
[2] $^{40}Ar/^{39}Ar$ weighted mean average plateau age, Hart and Brueseke (1999).
[3] Magnetostratigraphic age, Hart and Brueseke (1999).

INTRODUCTION

The geologic map of the Bliss quadrangle identifies both the bedrock and surficial geologic units. It shows the geographic distribution of rock types at the surface and in the shallow subsurface. The geologic units in the area control soil development, groundwater movement and recharge, and geotechnical factors important in construction design and waste management. Land uses in the area include irrigated agriculture, rural and urban residential development, industrial and commercial enterprises, and dairy farms with confined animal feeding operations. Part of the Snake River Plain aquifer discharges as springs along the east side of the Snake River valley. Recent conflicts over water rights, water quantity and the conjunctive use of groundwater and the surface spring discharges have and will continue to affect economic development in the region.

Earlier geologic mapping by Malde and others (1963), Malde and Powers (1972), and Covington and Weaver (1990) was reviewed. Field checking of their maps was combined with new field investigations in 2003-2004 of both bedrock and surficial geology. Exposures of the geologic units were examined and selectively sampled. Aerial photographs were studied to aid in identifying boundaries between map units through photogeologic mapping of landforms. The information depicted at this scale furnishes a useful overview of the area's geology but is not a substitute for site-specific evaluations.

The Bliss quadrangle lies near the center of the Snake River Plain, a large arcuate, lava-filled depression crossing southern Idaho. Pleistocene basalt flows from shield volcanoes form the upland surface northeast of the Snake River canyon. Older basalt and sediments form upland surfaces in the northeast and southwest areas of the quadrangle, and are exposed in the Snake River canyon. Pleistocene lake clay was deposited in the Snake River valley when basalt flows from McKinney Butte dammed the ancestral Snake River near Bliss. Approximately 14,500 years ago the Bonneville Flood filled the Snake River valley (O'Connor, 1993) and eroded the lake clay, scoured basalt surfaces, and deposited gravel in giant bars. A large landslide adjacent to Bliss forms a distinct arc in the north wall of the Snake River canyon. In addition to prehistoric movement, the landslide reactivated in 1993 damaging roads and temporarily damming the Snake River.

DESCRIPTION OF MAP UNITS

ARTIFICIAL DEPOSITS

m — **Made ground (Holocene)**—Artificial fills composed of excavated, transported, and emplaced construction materials typically derived locally. Primarily areas modified for highways and fish ponds.

ALLUVIAL AND LACUSTRINE DEPOSITS

Qam — **Alluvium of mainstreams (Holocene)**—Channel and flood-plain deposits of the Snake River. Stratified silt, sand, and gravel of channel bars, islands, and shorelines. Typically 1-10 feet thick.

Qoam — **Older alluvium of mainstreams (Holocene)**—Channel and flood-plain deposits of the Snake River that form terraces 10-50 feet above river level. Primarily beds of sand and pebble gravel overlain by bedded to massive silt and sand. Grades and interfingers laterally into colluvium and alluvial-fan deposits along valley sides. The terraces may have formed in response to a temporary higher base-level caused by prehistoric movement of the Bliss landslide (see *Qlsa*).

Qaf — **Alluvial-fan deposits (Holocene)**—Stratified silt, sand, and minor gravel that form alluvial fans at the base of steep canyon slopes. On the west side of the Snake River valley, commonly coalesce to form an apron from the canyon side onto Bonneville Flood deposits. Thickness probably 5-30 feet.

Qas — **Alluvium of side streams (Holocene)**—Channel and flood-plain deposits in Shoestring Gulch and in the marginal drainage along the north edge of basalt of McKinney Butte (*Qmk*). Primarily stratified silt, sand, and minor gravel.

Qlp — **Playa deposits (Holocene and Pleistocene)—**Fine sand, silt, and clay sorted into thin beds and laminae. Sediments largely derived from erosion of Glenns Ferry Formation (*Tsgf*) from hills adjacent basalt of McKinney Butte and washed into areas of internal drainage or nearly flat slopes along the edge of the basalt. Deposited by runoff from heavy rain and rapid snow melt, which may have been more prevalent during the Pleistocene.

Bonneville Flood Deposits

Qabg — **Sand and gravel in giant flood bars (Pleistocene)**—Stratified deposits of boulders, cobbles, and pebbles of basalt in a matrix of coarse sand. Forms giant bars and broad benches. Deposited during highest-energy, maximum stage of flood. Similar to Melon Gravel (Malde and Powers, 1962; Malde and others, 1963; and Covington and Weaver, 1990), but restricted to Bonneville Flood constructional forms and deposits.

Qabgl — **Sand and gravel in eddy deposits and lower-energy bars (Pleistocene)**—Stratified coarse sand to sandy pebble-cobble gravel deposited in eddies, side-channel positions, and lower-energy, waning-stage flood channels.

Qabs — **Scabland of flood pathways (Pleistocene)—**Flood-scoured surface with variable amounts of flood deposits. Where sedimentary cover has been stripped, basalt surfaces are plucked, gouged, and smoothed. Includes minor deposits of coarse sand that are not mapped at this scale.

Qy — **Yahoo Clay (Pleistocene)**—Laminated to thin-bedded clay and silty clay. Pinkish white to light yellowish brown and conchoidal fracture when dry. Common partings along bedding and vertical jointing produce small blocks when exposed. Malde (1982) described the type locality near the mouth of Yahoo Creek, the lava-dam origin, and the distribution of the clay in the Snake River canyon from near Bliss to the Melon Valley. Malde (1982) attributes the clay to McKinney Lake, a temporary lake formed by damming of the Snake River by basalt of McKinney Butte (*Qmk*). Malde's interpretation of the lake is compelling and his stratigraphic evidence was confirmed by our field mapping. The clay originally filled most of the Snake River valley (Malde, 1982), but was extensively eroded by the Bonneville Flood.

Tt — **Tuana Gravel (Pliocene)**—Well-bedded and sorted pebble and cobble gravel interbedded with layers of sand, silt, and clay. Gravel clasts are well rounded and commonly disc-shaped. Imbrication of clasts is common. South of the Snake River, gravel-clast lithologies and imbrication directions suggest the gravel was deposited by north-flowing branches of the ancestral Salmon Falls Creek that prograded braided-stream deposits across a high, nearly flat plain formed on the Glenns Ferry Formation. Imbrication exposed in gravel-pits near Bliss suggest northwest stream flow. Original extent unknown owing to erosion. Highest erosion remnants are mantled by 10-25 feet of loess with several buried soils. A thick duripan in the loess often forms an erosion-resistant cap "rock." South of the Snake River valley, late Pleistocene loess with a weakly developed soil commonly mantles gently sloping surfaces of irrigated farmland. Named by Malde and Powers (1962). Sadler and Link (1996) describe lithofacies and interpret provenance, paleocurrents, and age of the Tuana Gravel, which largely corroborate the descriptions of Malde and Powers (1962). In the adjacent Hagerman quadrangle, the Tuana Gravel overlies upper Glenns Ferry Formation which records the base of the Kaena reverse polarity subchron with an estimated age of 3.11 Ma (Neville and others, 1979; Hart and Brueseke, 1999). The age of Tuana Gravel remains poorly constrained, but Malde (1991) and Othberg (1994) suggest the Tuana Gravel and the Tenmile Gravel near Boise, apparently graded to the same base level, are correlative. A minimum age for Tuana Gravel mapped to the northwest is 1.92 ± 0.16 Ma (Malde, 1991). A minimum age for the Tenmile Gravel is 1.58 ± 0.085 (Othberg, 1994). These gravels represent fluvial and glacial regimes driven by cooler climate in late Pliocene but before Pleistocene incision of the western Snake River Plain (Othberg, 1994).

Tsgf — **Glenns Ferry Formation (Pliocene)**—Poorly consolidated, bedded lake and stream deposits. In the Bliss quadrangle primarily flood plain lithofacies that include calcareous olive silt, dark clay, sand locally cemented, and fine-pebble gravel (Malde and Powers, 1962; Malde and Powers, 1972; Malde, 1972; McDonald and others, 1996). The formation includes intercalated basalt flows (*Tsh*, *Tpb*). Repenning and others (1995) interpret the ages of various localities included in the Glenns Ferry Formation, and present a paleogeographic history of Pliocene to early Pleistocene lake and stream deposits in the western Snake River Plain. The basin-filling contribution of the Glenns Ferry Formation to the western Snake River Plain's tectonic subsidence is described by Wood and Clemens (2002). Mammalian fossils in deposits at the Hagerman Fossil Beds National Monument are Blancan (Pliocene) in age (Repenning and others, 1995). Hart and Brueseke (1999) corroborate the Pliocene age with Ar-Ar dates on intercalated basalt flows and ash beds ranging from 3.4 to 3.8 Ma.

EOLIAN DEPOSITS

Qed — **Dune sand (Holocene)**—Stratified fine sand of stabilized wind dunes. Fills swales between basalt pressure ridges but sand is generally less than 4 feet thick. Agricultural modifications to the land have tended to smooth dune morphology.

Qes — **Eolian sand of the Snake River Canyon (Holocene)**—Uncompacted fine sand deposited by wind along the base of canyon walls.

MASS MOVEMENT DEPOSITS

Qt — **Talus of Snake River Canyon walls (Holocene)**—Angular pebble-, cobble-, and boulder-size fragments of basalt that have broken off nearly vertical rock walls and accumulated below. Deposits are characterized by a steeply sloping surface that is at or near the angle of repose. Not mapped where thin talus partially covers older units.

Qlsa — **Deposits of active landslides (Holocene)**—Unsorted and unstratified silt and clay in slumps, slides, and debris flows of the July, 1993 reactivation of the Bliss landslide (Gillerman, 1993) and subsequent minor slope movements. Originated through slope failure in Yahoo Clay (*Qy*) and Glenns Ferry Formation (*Tsgf*). Aerial photographs flown in 1998 and were used to map the landslide.

Qls — **Landslide deposits (Holocene and Pleistocene)**—Unsorted and unstratified deposits comprised of fragments of sediments to broken clasts of basalt depending on location. The largest landslide mass is adjacent to Bliss where prehistoric slumps, slides, and debris flows originating in the Yahoo Clay and Glenns Ferry Formation are composed of unsorted and unstratified silt and clay. Although smaller, other landslides in the Snake River canyon have similar origins. At least one landslide mass south of the Bliss landslide may be older than the Bonneville Flood because it is partly eroded by the floodwaters. Other landslide deposits either date to the Bonneville Flood, are Holocene, or have been recently active (*Qlsa*). 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).

BASALT UNITS

In the east part of the quadrangle Pleistocene basalt flows form the capping units along the east bluff of the Snake River canyon. These lava flows were extruded from several shield volcanoes to the northeast and east. Nearly all of the basalt is slightly to very vesicular and most of the units are also diktytaxitic to some degree (i.e., containing voids with protruding crystals). Even units with a fine-grained groundmass commonly have a coarse, grainy texture. Older basalt flows are exposed at several locations in the Snake River canyon and in association with Pliocene sediments. These older units are generally grainy textured, less vesicular, and commonly altered. These characteristics cause the basalt to weather into fine granular detritus.

Qmk — **Basalt of McKinney Butte (Pleistocene)**—Fine-grained basalt with very abundant plagioclase phenocrysts as crisscrossed interlocking crystals up to 1 cm in length, or as glomerocrysts commonly with olivine grains and clots. Voids are common among the interlocking crystals. The abundance of phenocrysts and the voids gives the rock a coarse-textured appearance. Remanent magnetic polarity is normal (Malde, 1971). Source is McKinney Butte located 9 miles northeast of Bliss. Named McKinney Basalt by Stearns and others (1938); name retained by Malde (1971), Malde and Powers (1972) and Covington and Weaver (1990). Tauxe and others (2004) report an $^{40}Ar/^{39}Ar$ weighted mean plateau age of 0.052 Ma (their sample sr16, McKinney Basalt). Thin flows cap preexisting basalt surfaces and fill an ancestral Snake River canyon west of Bliss (Malde, 1982). Canyon filling dammed the river and formed McKinney Lake in which Yahoo Clay was deposited (see *Qy*). Eolian sand (*Qed*) partly buries and smooths the unit's surface east of the Snake River valley, but the sand diminishes within a few miles. In the absence of sand cover, the basalt's surface is characterized by youthful flow features such as lava channels, tubes, collapse pits, and pressure ridges. Surface drainage is undeveloped.

Qmkv — **Volcaniclastic deposits of McKinney Butte (Pleistocene)**—Black glassy spatter, phyric to glomerophyric pillows, and tephra deposited where flows from McKinney Butte entered and dammed the Snake River and flowed into the resulting lake. Forms thick tephra deposits in the Snake River canyon west of Bliss. Crude layering and foreset bedding is common.

Qgb — **Basalt of Gooding Butte (Pleistocene)**—Fine-grained basalt with scattered to abundant plagioclase phenocrysts up to 1 cm in length, and plagioclase-olivine intergrowths up to 1 cm in diameter; olivine olive-greenish-brown in color; olivine mostly as clusters; diktytaxitic and vesicular; vesicles small and circular to large and irregular. Common carbonate filling and coating in voids. Remanent magnetic polarity normal as determined in the field. Source is Gooding Butte, ten miles east of Bliss. Surface subdued, soil covered and generally farmed. Outcrops uncommon. Equivalent to Qtm (Thousand Springs Basalt, Malad Member) of Malde and others (1963). Tauxe and others (2004) report an $^{40}Ar/^{39}Ar$ weighted mean plateau age of 0.373 Ma for this unit (their sample sr11, Malad Basalt). Although this age is slightly younger than that reported for Flat Top Butte, stratigraphic relations indicate Gooding Butte is older. It may be that some eruptions from the two buttes overlap.

Qma — **Basalt of Madson Spring (Pleistocene)**—Fine- to medium-grained, dark gray basalt with very abundant olivine grains and clots up to 4 mm in diameter. Where exposed it rests on Glenns Ferry sediments. Equivalent to the Madson Basalt of Malde and Powers (1972). Remanent magnetic polarity is normal, as determined in the field and through laboratory analysis. Tauxe and others (2004) report an $^{40}Ar/^{39}Ar$ weighted mean plateau age of 0.404 Ma for this unit (their sample sr12, Madson Basalt). Source undetermined, but Malde (1971) suggests the source was likely to the east. It may represent early eruptions from Gooding Butte located 10 miles east of Bliss.

Tsh — **Basalt of Shoestring Road (Pliocene)**—Medium-grained, gray to sooty brown basalt with common to abundant plagioclase laths as long as 1 cm and weathered olivine crystals. Remanent magnetic polarity is reverse, as determined in the field and as reported by Neville and others (1979). Forms a thin layer within the Glenns Ferry sediments on the south side of the Snake River and up Shoestring Gulch. Source may be vent of *Tshv* unit, or may be from an unidentified source to the north. Equivalent to the Shoestring Basalt of Malde and Powers (1972). May include the Deer Gulch basalt of Hart and Brueseke (1999) who dated the Shoestring basalt at 3.68 Ma and the Deer Gulch basalt at 3.40 Ma, although they report that both units occupy the same stratigraphic horizon in the Glenns Ferry Formation, and chemical compositions of the two units are very similar (Hart and Brueseke, 1999). Similar in stratigraphic position and chemical composition to *Tbp* unit below.

Tshv — **Basalt and vent material, basalt of Shoestring Road? (Pliocene)**—Basalt and vent-derived scoriaceous and ropy rubble, spatter, and basalt fragments. Basalt is fine grained and glassy in places with abundant plagioclase laths and glomerocrysts up to 1 cm long, and common to abundant olivine grains and clots 0.5-3 mm in diameter. Some olivine and plagioclase intergrowths. Invasive into Glenns Ferry Formation sediments, which are baked for several inches at the basalt-sediment contact. Malde and Powers (1972) considered this a vent for the Shoestring Basalt, but we did not confirm that correlation in the field and therefore have mapped it as a separate unit. Its position within the Glenns Ferry sediments, however, gives credence to their interpretation.

Tbp — **Basalt of Bliss Point (Pliocene)—**Fine-grained, aphyric to slightly plagioclase-phyric basalt consisting of one flow 50 feet or less thick within Glenns Ferry Formation sediments. Locally thins and pinches out. Remanent magnetic polarity probably reverse, although field magnetometer readings from the same outcrop were inconsistent. Mapped as Shoestring Basalt (our *Tsh*) by Malde and Powers (1972). Chemical composition indistinguishable from *Tsh* and may be same unit. Unit has slight dip to the south suggesting the source area may be to the north, but the dip may also be related to the northwest-southeast faults.

Tub — **Older basalt flows, undivided (early Pliocene to late Miocene)**—Medium- to coarse-grained, gray to sooty brown, dense to altered or weathered basalt flows exposed along the Snake River or in Bonneville-Flood scoured benches in the valley. Source(s) unknown but may be from the south and southwest. Age is poorly constrained, but underlies sediment of the Glenns Ferry Formation (*Tsgf*). All flows in this unit that were analyzed for remanent magnetism have reverse polarity, although all may not be age-equivalent and not all flows were analyzed. Malde and Powers (1972) included most of these flows in their "Banbury Basalt, basalt of upper part". Stearns and others (1938) included them in the Banbury volcanics.

SYMBOLS

*Data available at Idaho Geological Survey, igs@uidaho.edu.

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