GEOLOGIC MAP OF THE FALLS CITY QUADRANGLE, JEROME COUNTY, IDAHO

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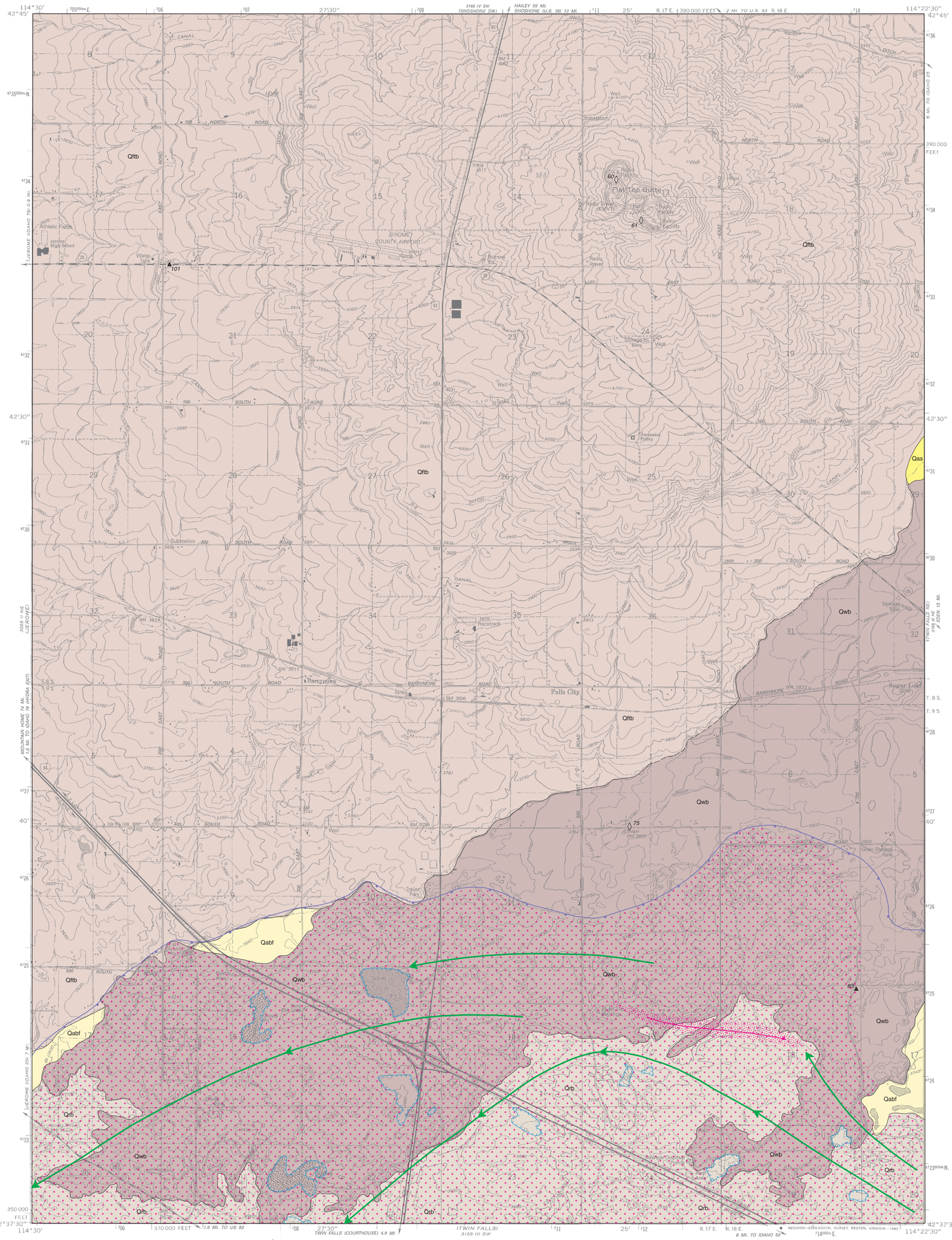


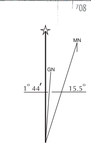
Base map scanned from USGS film positive, 1992.

Topography by photogrammetric methods from aerial photographs taken 1962. Updated from aerial photographs taken 1987 and field checked. Map edited 1992. Conflicts may exist between some updated features and previously mapped contours.

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.



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 10 feet

QUADRANGLE LOCATION

Field work conducted 2003.

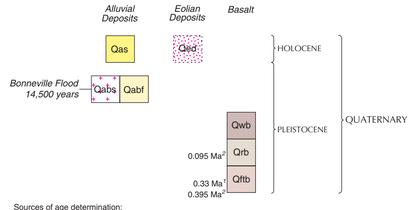
This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program.

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

Map version 11-29-2005.

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

CORRELATION OF MAP UNITS



Sources of age determination:
[1] $^{40}Ar/^{39}Ar$ weighted mean age, Esser (2005).
[2] $^{40}Ar/^{39}Ar$ weighted mean av erage plateau age, Tauxe and others (2004).

INTRODUCTION

The geologic map of the Falls City 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 Falls City 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, such as Flat Top Butte in this quadrangle, form the land surface. The older basalt flows are mantled with alluvium and wind-blown sand and silt which form the soils that are cultivated. Approximately 14,500 years ago the Bonneville Flood filled and overtopped the Snake River Canyon (O'Connor, 1993). Across the south part of the quadrangle, the Bonneville Flood stripped soils from the basalts of Rocky and Wilson buttes and locally deposited flood gravels. 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. The Snake River Plain aquifer underlies the area and discharges to the west of the Falls City quadrangle as springs in the Snake River Canyon.

Earlier geologic mapping by Malde and others (1963) was reviewed, and field checking of their map was combined with new field investigations in 2003-2004 of both bedrock and surficial geology. Exposures of the geology 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.

DESCRIPTION OF MAP UNITS

ALLUVIAL DEPOSITS

Qas **Alluvium of side-streams (Holocene and Pleistocene)**—Silt and sand flood-plain and sheet-wash deposits in the drainage systems formed between older and younger basalt units.

Bonneville Flood

Scabland of flood pathways (Pleistocene)—Flood-scoured basalt surface. Loess stripped, basin and butte topography is common. Unit adapted from Scott (1982) and O'Connor (1993). Original basalt morphology stripped of pre-flood loess and soils in contrast with area north of maximum flood extent but in same basalt unit. Includes patchy sheets and bars of thin sand and gravel that are not mapped, but have been locally used for gravel (see Symbols).

Qabf **Fine-grained deposits in slack-water basins (Pleistocene)**—Sand and silt deposited in basins of basalt surface that were protected from high-energy water flow.

EOLIAN DEPOSITS

Qed **Dune sand (Holocene)**—Thin, stratified fine sand of stabilized wind dunes. Shown only where identified on aerial photographs.

BASALT UNITS

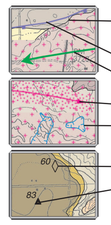
The surface geology of the Snake River Plain north of the Snake River is primarily Pleistocene basalt flows of the Snake River Group. On the Falls City quadrangle, the basalt flows originated from the shield volcanoes of Flat Top Butte within the quadrangle, Rocky Butte east of the quadrangle, and Wilson Butte northeast of the quadrangle. Each volcano probably extruded numerous lava flows or flow lobes, although individual flows cannot easily be mapped, especially on the older surfaces now subdued by surficial deposits. Nearly all of the basalt is vesicular to extremely 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 have a coarse, grainy texture. Older basalt surfaces tend to be less rugged and more subdued than younger surfaces, primarily the result of greater accumulation of loess over a longer period of time. Over time, drainage patterns change from essentially no drainage on young, very rugged topography, to radial drainage on older buttes. Likewise, young basalt surfaces support little or no agriculture because of the lack of soil, while the older surfaces with thin to thick soil development support a wide variety irrigated crops and grazing pastures.

Qwb **Basalt of Wilson Butte (Pleistocene)**—Dark gray to black, fine-grained basalt with common to abundant plagioclase phenocrysts 1-3 mm in length and fairly common olivine grains up to 1 mm in diameter, and some plagioclase-olivine intergrowths. Remanent magnetic polarity is normal, as determined in the field and through laboratory analysis. Source is Wilson Butte northeast of the Falls City quadrangle. Land surface is rough from common pressure ridges and has little or no drainage development. North of the maximum extent of the Bonneville Flood (see Symbols), thin loess covers the surface of the unit except for tops of pressure ridges, and soil caliche is present but generally thin and weakly developed (Baldwin, 1925; Ames, 2003). Some of the land is cultivatable; most of the area is sagebrush and grasses. Gruhn (1961) reports a radiocarbon date of 15,000 years on tooled camel bones found inside a lava tube from Wilson Butte, constraining the eruption of the lava to before that time (Matthews, 2000).

Qrb **Basalt of Rocky Butte (Pleistocene)**—Fine-grained, dark gray to black, glassy basalt with common to abundant olivine grains 0.5-1 mm and clusters 1 to 3 mm in diameter. Common to abundant small plagioclase laths to about 1 mm in length. Remanent magnetic polarity is normal, as determined in the field and through laboratory analysis. Erupted from a shield volcano located 22 miles northeast of the city of Twin Falls in the Eden NE topographic quadrangle, which shows a permanent horizontal-control mark labeled "Rocky" at 4526 feet on the south rim of the vent (Sec. 14, T. 8 S., R. 20 E.). Equivalent to Sand Springs Basalt of Malde and Powers (1962), Malde and others (1963), Covington (1976), and Covington and Weaver (1990). Covington and Weaver (1990) identified the source as "Butte 4526." In the Falls City quadrangle, all of unit was scoured by Bonneville Flood (*Qabs*) and is mostly outcrop. Little of the land is cultivatable. Tauxe and others (2004) report an $^{40}Ar/^{39}Ar$ weighted mean plateau age of 0.095 Ma for "Sand Springs" basalt. Their sample location is on the north rim of the Snake River canyon near Shoshone Falls, 1.5 miles south of the Falls City quadrangle. The sample is from the unit we map as basalt of Rocky Butte.

Qftb **Basalt of Flat Top Butte (Pleistocene)**—Fine-grained, medium gray basalt with scattered to very abundant plagioclase-olivine intergrowths 4-7 mm, and olivine grains and clots 1-4 mm. Flows typically vesicular near the top and more dense in the center, but diktytaxitic throughout with abundant fine-grained plagioclase laths. Carbonate coatings and fillings common in voids but not pervasive. Remanent magnetic polarity is normal, as determined in the field and through laboratory analysis. Erupted from the Flat Top Butte shield volcano. Equivalent to Thousand Springs Basalt of Malde and Powers (1962), Malde and others (1963), and Gillerman and Schiappa (1994, 2001). Tauxe and others (2004) report an $^{40}Ar/^{39}Ar$ weighted mean plateau age of 0.395 Ma for this unit (their sample sr09, Thousand Springs Basalt). An $^{40}Ar/^{39}Ar$ weighted mean age of 0.33±0.8 Ma was obtained on our sample 02P002B (Esser, 2005). Topography contrasts with surface of the younger basalt flows. Almost no basalt pressure ridges rise above a nearly complete mantle of loess. Surface drainage is moderately developed. Thickness of mantle ranges 3-25 feet; commonly 3-12 feet thick. Soil caliche (duripan) is typically well developed within the soil profile (Ames, 2003) and at the soil-basalt contact, but the thickness of caliche is varies considerably. Most of the land is cultivatable.

SYMBOLS



Contact: Line showing the approximate boundary between one map unit and another. The location accuracy of an approximate contact is more than 80 feet on the ground.

Approximate extent of Bonneville Flood at maximum stage.

Bonneville Flood flow direction.

Trend of dune field. Arrow points in the downwind direction.

Gravel pit that exposes a map unit.

Sample site for paleomagnetic analysis.*

Sample site for chemical and paleomagnetic analyses.*

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

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