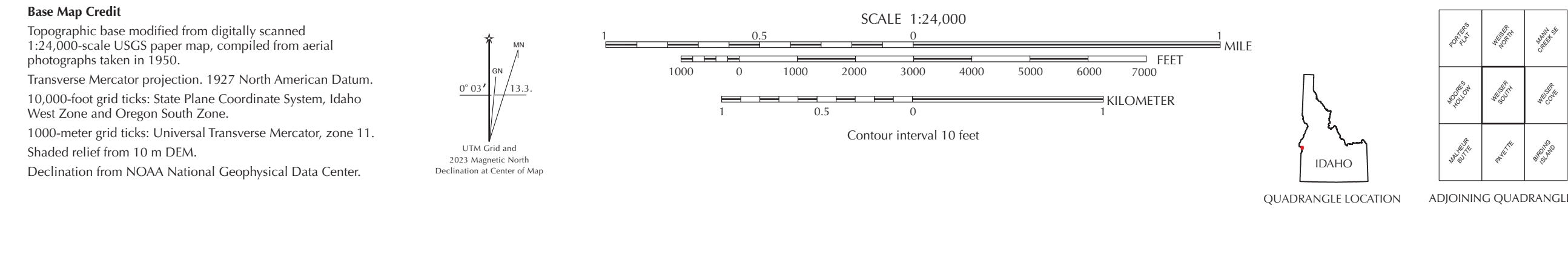
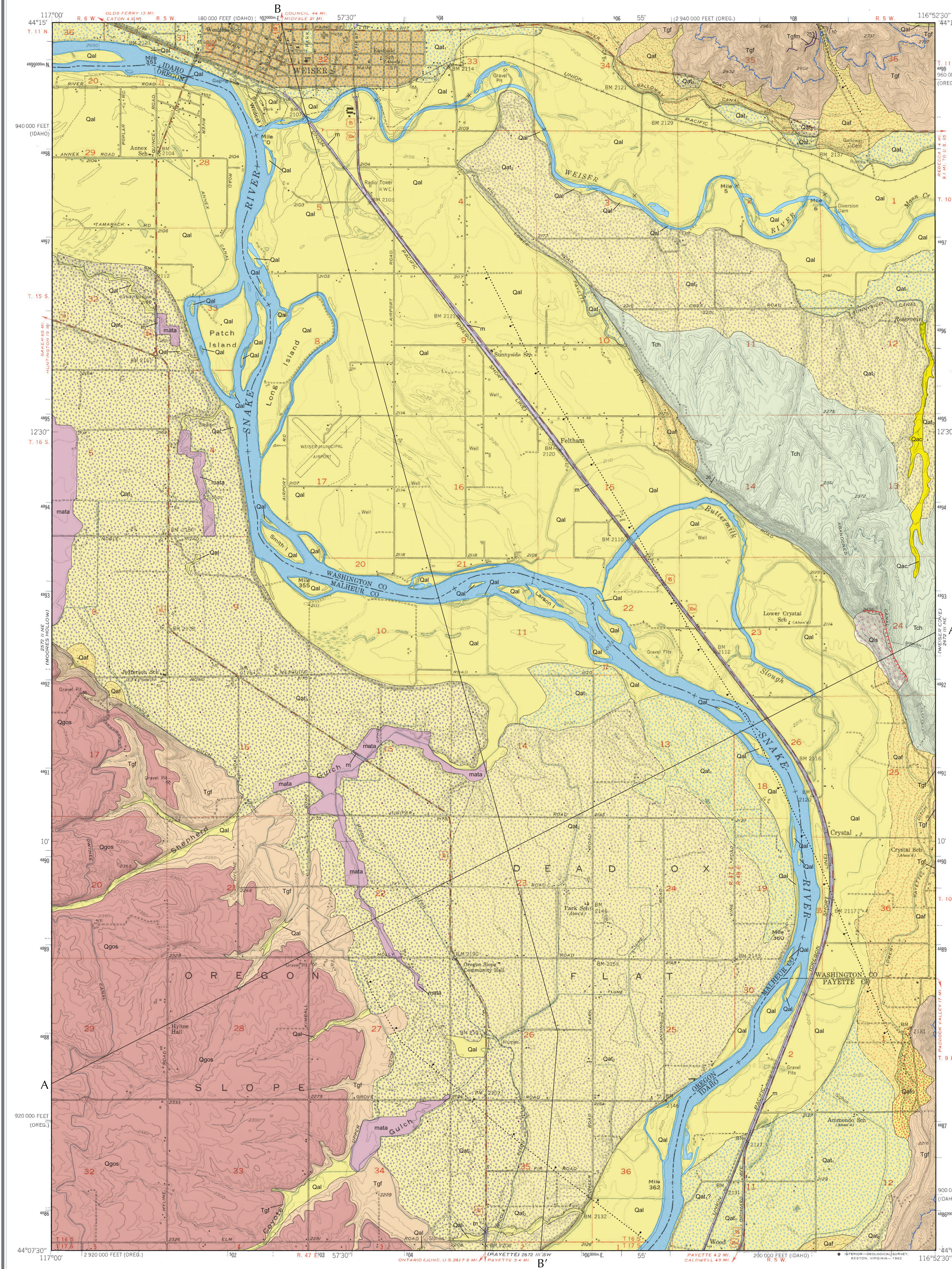


GEOLOGIC MAP OF THE WEISER SOUTH QUADRANGLE, PAYETTE AND WASHINGTON COUNTIES, IDAHO AND MALHEUR COUNTY, OREGON

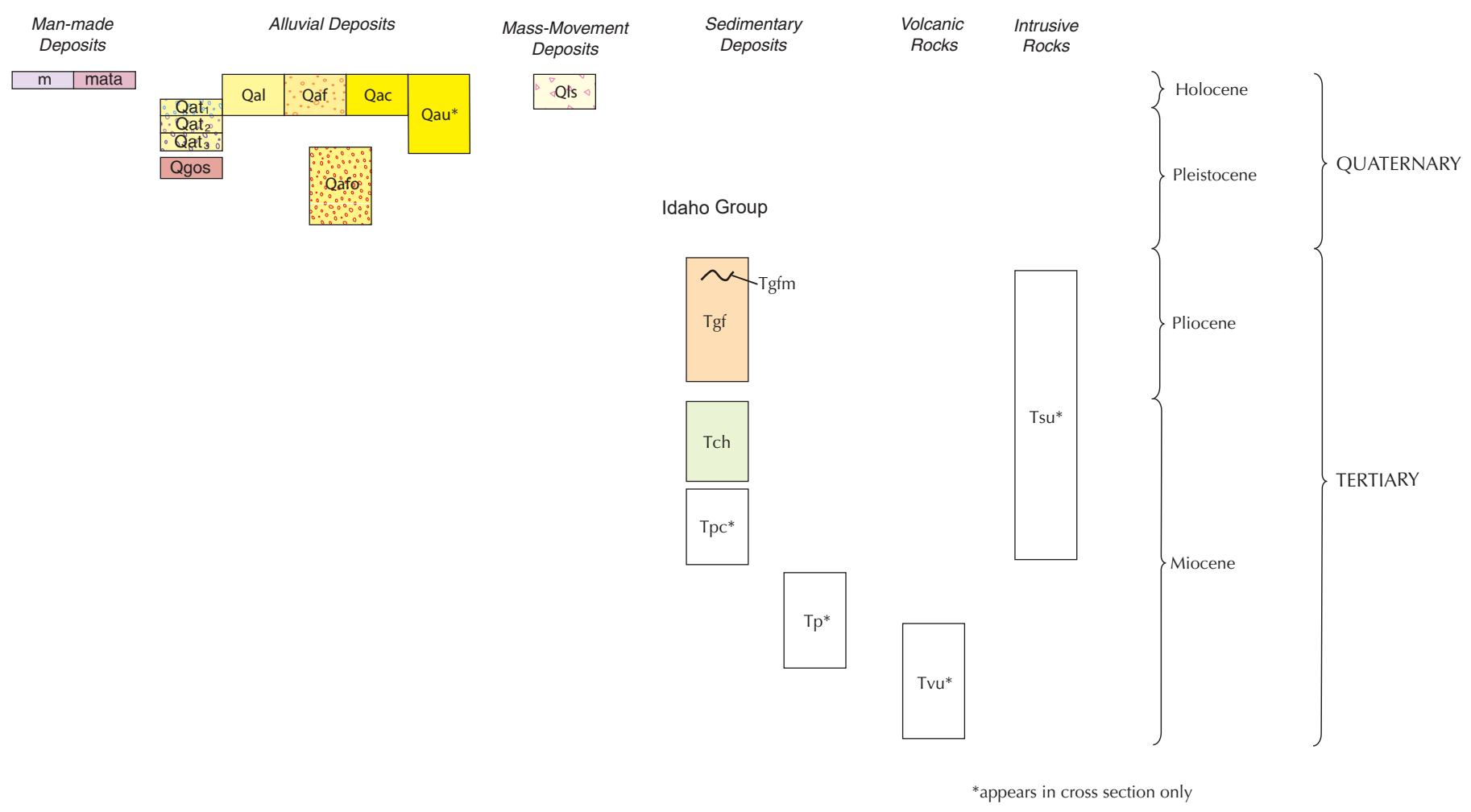
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2023



CORRELATION OF MAP UNITS



INTRODUCTION

The geologic map of the Weiser South 7.5' quadrangle depicts rock units exposed at the surface or underlying a thin cover of soil or colluvium and man-made deposits are depicted where they form significant map-scale units. This map is the result of field work performed in the summer and autumn of 2022 by Feeney and McClaughry and from unpublished mapping in the state of Oregon conducted by Mark L. Ferns. This map was produced concurrently with the geologic map of the Payette 7.5' quadrangle (Feeney and others, 2023b). Previously published work in the area includes Kirkham (1931), Idaho side; Savage (1961), Idaho side; Brooks and others (1976), Oregon side; and Fitzgerald (1982), Idaho side. Water well data (IDWR, 2022; OWRD, 2022) and Civil Gas logs (CGS, 2022; DGRMI, 2022), and 2-D seismic lines were used to support subsurface interpretations. Soils information was accessed via the USDA Natural Resources Conservation Service Web Soil Survey Soil Survey Staff, 2023).

The Weiser South 7.5' quadrangle is underlain by the Pliocene to Miocene sedimentary rocks of ancient Lake Idaho. Regional geothermal and petroleum well information and geophysical data indicate tertiary igneous intrusions and volcanic rocks are interbedded with and underlie the Lake Idaho sedimentary rocks at depth (Wood, 2019). In the southwestern part of the map area the Lake Idaho sedimentary deposits are overlain by Early to Middle Pleistocene gravels. The Snake River Plain is the path of the Late Pleistocene Bonneville Flood, and the quadrangle includes remnants of Bonneville Flood slack-water deposits. Quaternary alluvial deposits related to the modern Snake and Weiser rivers are prominent features, as well as Quaternary alluvial fans, a landslide, and man-made deposits.

DESCRIPTION OF MAP UNITS

Grain-size classification of unconsolidated sediment and consolidated sedimentary rocks employs the Wentworth scale (Lane, 1947), and bedding thickness is after McKee and West (1953). Where possible grain sizes are listed in order of decreasing abundance; otherwise listed in decreasing grain size. Time scale is from the Geological Society of America (Wolter and Grotzinger, 2022), integrated with the global chronostratigraphic correlation table for the last 2.2 million years (Cohen and Gibert, 2016). Measurements are given in abbreviation of metric units (e.g., dm=decimeter). Unit thicknesses, distances, and elevations are in both metric and English units.

MAN-MADE DEPOSITS

Made ground (late Holocene)—Riprap, gravel, sand, silt, and concrete employed by anthropogenic activities. Natural materials are locally derived. Includes fills for road bases for Highway 95, bridge abutments, and railroad subgrade more than 2 m (7 ft) above the surrounding landscape. To emphasize the underlying geology, municipal and rural infrastructure, mostly buildings, canals, foundations, bridges, and small-scale modified ground were not mapped.

Modified alluvium and terrace deposits related to agricultural development (late Holocene)—Land excavated around streams emerging from the Oregon Slope to create flat farmland. Land has been excavated to an elevation just above the stream, which has largely been diverted to canals during this process. The surface of soils is a tilted sand to clay mix of terrace and alluvium deposits. Most of these areas are found in the third terrace (Tg₃) above Dead Ox Flat in the state of Oregon, though two shallower mesa zones are found in the Glens Ferry Formation (Tg₁). Elevation is 2 to 4 m (7 to 13 ft), and walks tend to be very steep. Modified land is readily mapped from LIDAR-derived imagery; it is not clear where the excavated sediments were redistributed.

ALLUVIAL DEPOSITS

Stream alluvium (Holocene to Late Pleistocene)—Unconsolidated, well-sorted, medium- to coarse-grained, sand, silt, gravel, cobbles, and clay deposited in channels, levees, and flood plains by rivers, tributary streams, and ephemeral streams. Thickness up to 15 m (50 ft) along the Snake River, up to 10 m (34 ft) along the Weiser River, and up to 5 m (18 ft) in tributary streams. The surface of floodplain deposits of the Snake and Weiser rivers have been heavily modified by agricultural practices.

Alluvial fan deposits (Holocene to Late Pleistocene)—Closely stratified sand, silt, and clay gravel in lightly dissected to undulating fans emerging from streams and ephemeral drainages from local highlands onto the plains. Thickness ranges from 2 to 20 m (6 to 66 ft).

Alluvium and colluvium (Holocene to Late Pleistocene)—Sand and clay-silt in the form of debris aprons, wedges, small alluvial fans, and deposited along ephemeral streams and in dry channels. Little to no sorting or bedding. Thickness varies but no more than 3 m (10 ft).

Older alluvial fan deposits (Pleistocene)—Moderate to highly dissected remnant fan deposits of sand, silt, clay, and gravel. Base is difficult to discern from neighboring units, unit contains light soil development and is defined mostly based on morphological expression in LIDAR derived imagery. Maximum 15 m (50 ft) thick.

Stream alluvium, terraces, and man-made deposits, undivided (Quaternary)—Appears in cross section only; individual units of modern stream alluvium and gravels are too thin to subdivide in the cross section at this scale.

BONNEVILLE FLOOD SLACK-WATER DEPOSITS

Around 17.4 ka (Jansack and Oaks, 2013), Utah's Lake Bonneville overflowed and incised its banks at Red Rock Pass in southeast Idaho. The subsequent draining of the lake led to a catastrophic flood along the Snake River Plain (Malde, 1966). After tearing through southern Idaho, the Bonneville Flood waters were constricted and temporarily impinged at Jarvisville Bend, 20 km (12 mi) to the northwest of the quadrangle, where the wide and shallow Snake River Plain meets the narrow and deep Hell's Canyon. From this point the voluminous and raging flood waters were backed up and transformed into an enormous slack-water pond, impeding the flows of Snake, Weiser, Payette, Boise, Malheur rivers, and numerous other minor drainages. Slack-waters of the Bonneville Flood inundated these drainages to a minimum elevation of 742 m (2,435 ft) and a maximum at 760 m (2,493 ft) (O'Connor, 1993) resulting in the deposition of up to 6 m (19 ft) of brown to dark-brown clay, silt, and sand (Figure 1). The sediments are massive to finely laminated and bury older soils

developed in the underlying deposits. Locations below 760 m (2,493 ft) elevation in the map area may contain remnant Bonneville Flood slack-water deposits, which have not been ended by younger fluvial systems. To maximize the utility of the map, we show units underlying the Bonneville Flood deposits and denote with a line on the map the upper limit of the Bonneville Flood slack-water (see symbols).

ALLUVIAL TERRACE DEPOSITS

Pleistocene to Holocene alluvial terraces are composed of moderately sorted gravelly sand, silt, and clay. Gravel clasts are rounded to sub-rounded pebbles, cobbles, and some boulders. Clast lithologies are diverse; mostly composed of granitic rocks, felsic volcanic rocks, quartzites, and mafic volcanic rocks. The terrace sequence records long-term episodic incision of the western Snake River Plain, which was largely driven by glacial-climate fluctuations during the Pleistocene, and potentially minor influences from local tectonics.

First alluvial terrace deposits (Holocene to Late Pleistocene)—Lightly dissected and continuous surface 2 to 6 m (6 to 20 ft) above the Payette and Weiser rivers. Unit has a slight surficial gradient (1 to 3) to depress down towards the river for the deposits found on Dead Ox Flat and south of Weiser River. Nyctanion silt, claystone silt loam, gravelly silt loam, clay silt loam soils series are present (Soil Survey Staff, 2023). Thickness as much as 12 m (39 ft). Surface highly modified by agricultural practices.

Second alluvial terrace deposits (Late Pleistocene)—Light to moderate dissection, mostly continuous surface 9 to 19 m (30 to 62 ft) above the Payette and Weiser rivers. Unit has a slight surficial gradient (1 to 3) to depress down towards the river for the deposits found on Dead Ox Flat and south of Weiser River. Nyctanion silt, claystone silt loam, gravelly silt loam, clay silt loam soils series are present (Soil Survey Staff, 2023). Thickness as much as 12 m (39 ft). Surface highly modified by agricultural practices.

Third alluvial terrace deposits (Late Pleistocene)—Moderately dissected, continuous surface found between Dead Ox Flat and Oregon Slope and on two perched surfaces north of the Weiser River. Surface is 20 to 20 m (65 to 92 ft) above the Snake River and 32 to 35 m (105 to 115 ft) above the Weiser River. Greenfield, McLaughlin, Lofstad sandy loam, claystone silt loam soils series are present (Soil Survey Staff, 2023). Thickness as much as 12 m (39 ft). Surface highly modified by agricultural practices.

HIGH GRAVELS

Gravel of the Oregon Slope (Middle to Late Pleistocene)—Gravel, sand, and silt forming the planar Oregon Slope. The Oregon Slope dips shallowly to the east. Unit is equivalent to the intermediate terrace deposits of the Malheur Butte quadrangle (Madsen and Ferns, 1997). Cobble- and pebble-size clasts are granitic, tertiary porphyritic felsic, intrusive rock, quartzite, black chert, and ash-rich basalt (Figure 2). Since there is no proximal chert bearing formations in Idaho, the chert is likely derived from the Elkhorn Ridge Formation in the Blue Mountains of Oregon to the north-west. The headwaters and tributary drainages of the Burnt River pass through large segments of the Elkhorn Ridge Formation (Gallity, 1937; Brooks and others, 1976), however the results of the river is currently located 12 m (39 ft) north of the Oregon Slope. The mouth of the Malheur River divides the gravel of the Oregon Slope in two, but neither the headwaters nor any tributary streams of the Malheur River access any significant chert bearing deposits. Therefore, gravel of the Oregon Slope may represent an older stage of the Burnt River or record a time when the Malheur River was capturing more northerly drainage which would access the Elkhorn Ridge Formation. The porphyritic felsic volcanic clasts are unique in provenance to Idaho. The gravel of Oregon Slope deposit reflects the mixing of multiple drainage systems; the Snake River of Idaho area and possibly others, or both, an early stage of the Burnt River and the Malheur River of Oregon. Thickness varies but is generally less than 15 m (50 ft) as measured from water well data (OWRD, 2022).

MASS-MOVEMENT DEPOSITS

Landslide deposit (Holocene)—Clay- to pebble-sized debris in a rotational slide. Rotational block of poorly indurated chalk Hills formation sliding onto the Snake River floodplain. Tamarack cracks and ridges are visible in the field, aerial imagery, and in LIDAR-derived imagery. Thickness is difficult to determine but likely less than 12 m (40 ft).

SEDIMENTARY DEPOSITS

Idaho Group

Glens Ferry Formation (Pliocene)—Coarse to fine arkosic sandstone, siltstone, claystone, rare pebble-cobble conglomerate, and silty ash tuffs. Lightly consolidated and poorly to well indurated. Generally flat lying to dipping less than 5 degrees. Exposures of the Glens Ferry Formation in the quadrangle are generally limited, however deep exposures can be found in old sand extraction pits in the southwest corner of the map in Idaho (Figure 3). Exposures show buff to tan, medium to fine-grained sand and lower silt with orange to burnt-orange leucoging banding throughout. Bedding is mostly massive but large scale, 30 to 30 m (98 to 100 ft) long cross beds can be seen in Figure 3. The sandy clasts of the Glens Ferry Formation in Idaho are considered the sand front of progradational delta (Wood, 1994). Well logs and high-resolution 2-D seismic reflection data indicate that the sandy clasts overlie progradational clinoform beds of clay, silt, and fine sand at depth. Water-well data from the state of Oregon confirm most of the formation in the quadrangle is brown clay to silt with rare sand lenses (OWRD, 2022). In aerial imagery the Glens Ferry Formation appears as a banded unit with alternating 3 to 5 meter (10 to 16 ft) horizons of light and faint maroon. The maroon sections are produced by iron and manganese staining or cementation in coarse-grained sands (see description below) in Oregon. 3 km (3 mi) west of the quadrangle along state highway 201 on a bend in the Snake River a landslide created a 70 m (230 ft) exposure of fine-grained lacustrine Glens Ferry Formation, with multiple thin ash beds, conglomerates, and sand. Dates from two of the ten ashes present revealed circa fusion track ages of 13.3 ± 0.0 Ma (midline) and 5.5 ± 0.4 Ma (base) (Thompson, 1991). At the Hagerman fossil beds, near the type locality of the Glens Ferry Formation ash beds are dated from 4.2 to 1.2 Ma (Thompson, 1991). From the ash dates of Thompson (1991) and the type of deposits seen we interpret the Glens Ferry Formation present in this quadrangle to be Pliocene in age. Unit thickness as mapped is 103 m (340 ft). If the lower fine-grained progradational delta beds interpreted from geophysical data were to be included in the unit would be as much as 400 m (1,312 ft) thick (see alternative Tg₁-Tg₂ contact in cross sections).

Manganese-stained sandstone beds of Glens Ferry Formation—Black-stained arkosic sandstone cemented with manganese oxide. Sand grains are subangular to well-sorted and coarse. Massively bedded, and typically less than 2 m (6 ft) thick. May be equivalent to black sand found in water well data.

Chalk Hills Formation (late Miocene)—White to light-tan tuffaceous silt and clay. Only the upper part of unit crops out in the quadrangle. Well consolidated with light to no induration. Exposure is pure interpreted from oil and gas wells and water wells at abundant appearance of "blue clay" (OWRD, 2022; OWRD, 2022).

- Poison Creek Formation (late Miocene)**—Interpreted from oil and gas wells, 2-D seismic data, and regional mapping (Feeney and others, 2023a, b). Appears in cross section only.
- Payette Formation (late to middle Miocene)**—Interpreted from oil and gas wells, 2-D seismic data, and regional mapping (Feeney and others, 2023a, b). Appears in cross section only.
- Volcanic rocks, undifferentiated (Miocene)**—Interpreted from regional mapping and 2-D seismic data. Appears in cross section only.
- Intrusive rocks**
- Sill rocks, undifferentiated (Pliocene to Miocene)**—Interpreted from 2-D seismic data. Appears in cross section only.

STRUCTURE

There are two concealed normal faults present in the map. The fault on the east side of the Snake River is interpreted from the offsetting of young or Glens Ferry Formation (Tg₁) cliffs on the west in Oregon and older Chalk Hills Formation (Tch) on the east in Idaho. The second fault in the southern part of the map was identified from a north-south 2-D seismic line. The seismic line indicates this fault is the northeastern half of a northeast-trending fault that continues southeast into the Payette quadrangle (Feeney and others, 2023b). The northwest trend of the fault is interpreted from the shallow dip of the fault in seismic data and following trends seen in regional structures (Fitzgerald, 1982).

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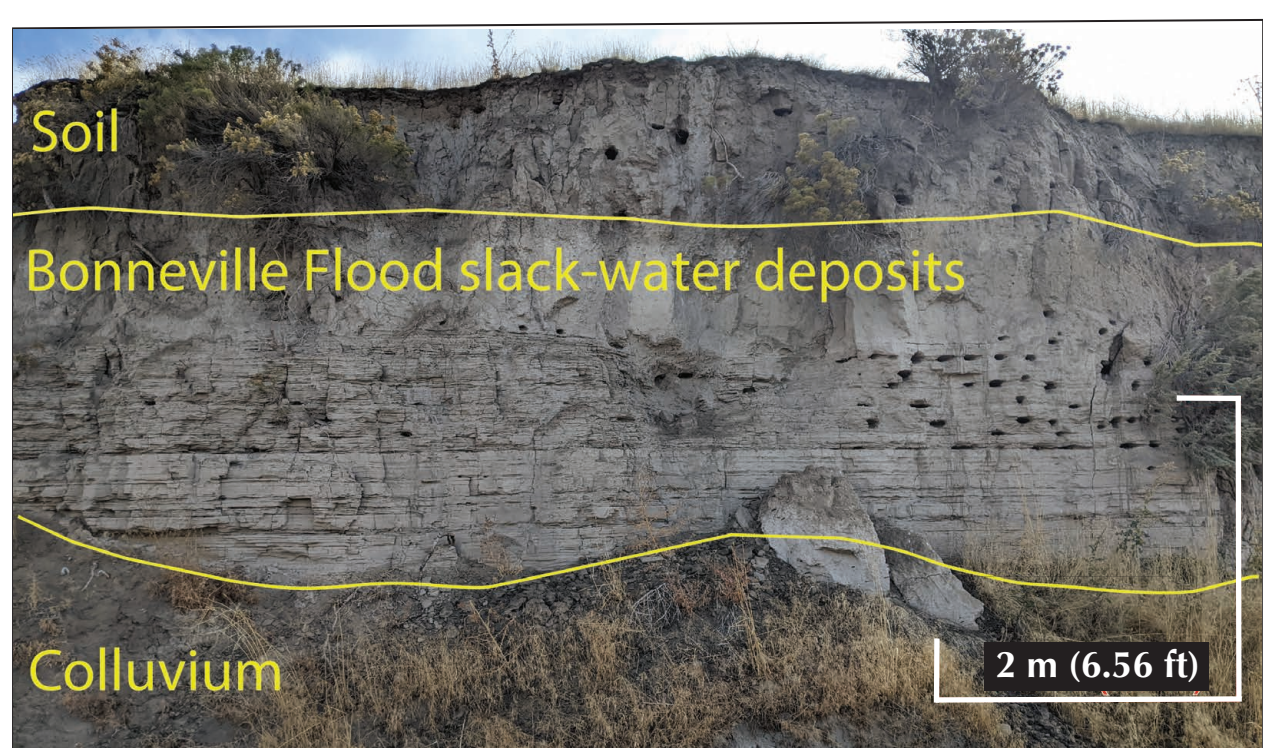


Figure 1. Light-brown, finely bedded, Bonneville Flood slack-water silt and clay deposit with soil cover and colluvium apron at the base of the cliff.



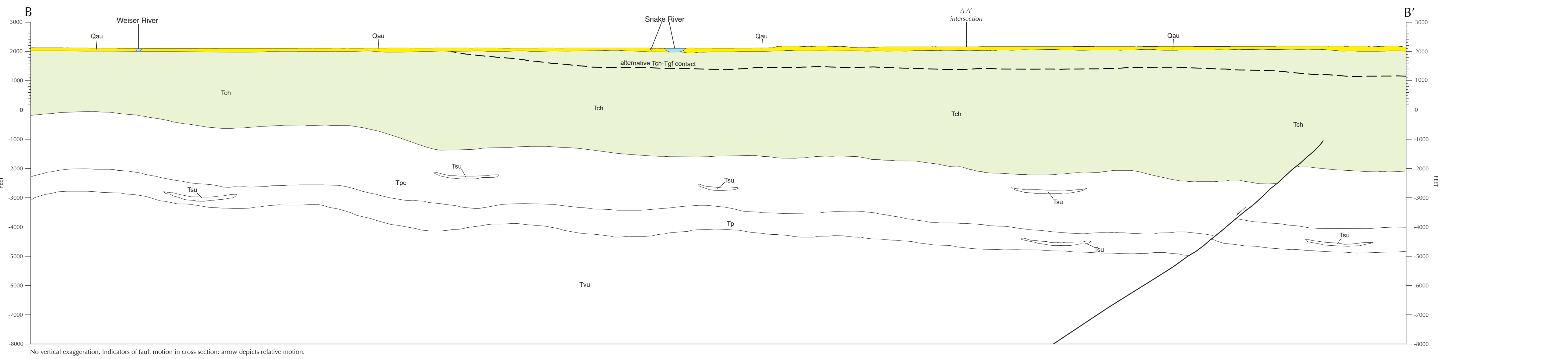
Figure 2. Aggregate pit showing typical appearance of gravel deposits of the Oregon Slope (Tg₁).



Figure 3. Sandy channel or possibly a river delta lowest bed belonging to the Glens Ferry Formation (Tg₁). Sage brush in foreground are approximately 0.5 m (1.6 ft) tall.

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No vertical exaggeration. Indicators of fault motion in cross section: arrow depicts relative motion.