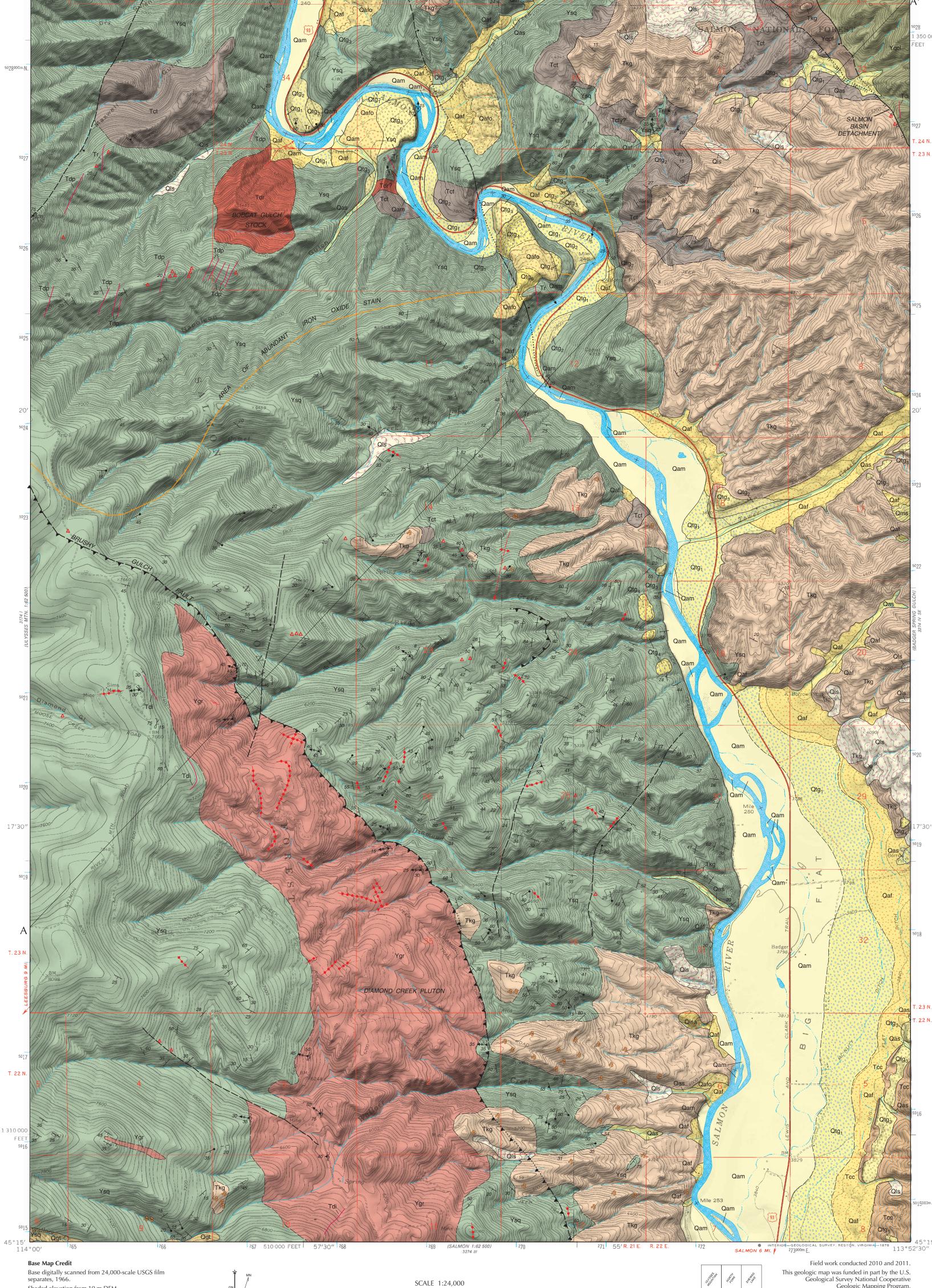
Geologic Map of the Bird Creek Quadrangle, Lemhi County, Idaho

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SCALE 1:24,000 Shaded elevation from 10 m DEM. Topography by photogrammetric methods from aerial photographs taken 1965. Field checked 1966. HHH HH FEET 1000 2000 3000 4000 5000 6000 7000 Projection: Idaho coordinate system, central zone (Transverse Mercator). 1927 North American Datum. 10,000-foot grid ticks based on Idaho coordinate system, central zone Contour interval 40 feet 1000-meter Universal Transverse Mercator grid ticks,

QUADRANGLE LOCATION

ADJOINING QUADRANGLES

USGS Award No. G11AC20207.

Digital Mapping Lab.

Map version 11-20-2012.

at www.idahogeology.org.

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PDF (Acrobat Reader) map may be viewed online

ane S. Freed at the Idaho Geological Survey's

MESOPROTEROZOIC

CORRELATION OF MAP UNITS

DESCRIPTION OF MAP UNITS

Intrusive rocks are classified according to International Union of Geological Sciences nomenclature using normalized values of modal quartz (Q), alkali feldspar (A), and plagioclase (P), on a ternary diagram (Streckeisen, 1976). Mineral modifiers are listed in order of increasing abundance. Grain size classification of unconsolidated and consolidated sediment is based on the Wentworth scale (Lane, 1947). Bed thicknesses are given in abbreviation of metric units (e.g., cm=centimeter). Formation thickness, distances, and elevation are listed in both meters and feet. Multiple lithologies within a rock unit description are listed in order of decreasing abundance.

ALLUVIAL DEPOSITS

stratified pebble to boulder sandy gravel of the Salmon River. Gravel clasts

mostly quartzite, siltite, granite, and volcanic rocks. Includes flood-plain

areas of silt, clay, and sand. Deposits are 3-9 m (10-30 ft) thick. Soils

Side-stream alluvium (Holocene)—Pebble to boulder sandy gravel in stream

valleys of tributaries to the Salmon River. Angular to subrounded to well-

rounded, poorly to moderately sorted, moderately stratified pebble to

boulder sandy gravel; includes minor sheet wash, colluvium, and fan

deposits. Interfingers with Qaf or Qam at confluences with Salmon

River. Gravel clasts primarily quartzite and siltite. Silty and clayey east

of Salmon River. Soils undeveloped to weakly developed. Deposits are

Alluvial-fan and debris-flow deposits (Holocene to late Pleistocene)—East

slope of Salmon River Mountains steep valley-side alluvial and debris-flow

fans. Angular to subrounded, poorly sorted, matrix-supported pebble to

fans are primarily composed of sand, silt, and clay with common

matrix-supported gravel clasts. Commonly grades into, interfingers

greatly, ranging from 1 to 24 m (3 to 80 ft). Soils weakly developed to

sorted, matrix-supported pebble to boulder gravel in a matrix of sand, silt,

and clay. Thickness highly varied, ranging from 1 to 15 m (3 to 50 ft). Soils

GRAVEL TERRACE DEPOSITS

Gravel deposits of Holocene to Pleistocene alluvial terraces are composed

of moderately sorted and clast-supported sandy gravel. Clasts vary from

subangular to rounded pebbles, cobbles, and few boulders at mountain

front, to subrounded to rounded pebbles and cobbles near the confluence

with the Salmon River. Clasts primarily quartzite and siltite from the

adjacent mountains. Terrace deposits form a relatively thin (3-9 m; 10-30 ft)

cap over streamcut bedrock surfaces. Several levels of terraces and terrace

remnants are preserved 3-152 m (10-500 ft) above the modern streams.

These record long-term episodic incision of the Salmon basin, which was

probably driven by glacial climate during the Pleistocene. Near the Salmon

River Mountains front and adjacent to hills of Tertiary sediments, terrace

gravels commonly are capped by and interfinger with alluvial-fan deposits

(Qaf), which are included in the terrace unit locally.

Cravel of first terrace (Holocene to Late Pleistocene)—Forms terrace 3-9 m

(10-30 ft) above the modern streams. Weakly developed soils.

Gravel of second terrace (Late? Pleistocene)—Forms terrace 12-24 m (40-80 ft)

Gravel of third terrace (Middle? Pleistocene)—Forms terrace 37-49 m (120-

Oracle of fourth terrace, (Middle? Pleistocene)—Forms terrace 61-90 m (200-

Gravel of fifth terrace (Early? Pleistocene)—Forms terrace 110 m (360 ft) above

above the modern streams. Soils of original terrace surface eroded away.

MASS MOVEMENT DEPOSITS

clay and gravelly silty clay. Deposited by slumps, slides, and debris flows

from slope failures in Tertiary sediments. Many are directly related to and

clay and gravelly silty clay. Deposited by slumps, slides, and debris flows

that primarily occur in Tkg. For some, map shows the landslide scarp and

the headwall (steep area adjacent to and below the landslide scarp) from

poorly sorted silty and clayey gravel. Includes solifluction deposits, collu-

GLACIAL DEPOSITS

to clayey boulder till. Clasts subangular to subrounded. Forms end

moraines. Late Pinedale Glaciation equivalent. Weakly developed soils.

TERTIARY SEDIMENTARY DEPOSITS AND VOLCANIC

ROCKS OF THE SALMON BASIN

Janecke and Blankenau (2003) interpreted the Salmon basin as one of

several supradetachment basins that formed in east-central Idaho and

western Montana between 46 and 31 Ma (late middle Eocene to early

Oligocene). Previously, sedimentary rocks of the Salmon basin were

described, subdivided, and mapped by Anderson (1956, 1957, and 1959)

and Tucker (1975). Harrison (1985) studied the sedimentology of the

basin-filling sediments, identified a series of gradational facies, and

described and sketch-mapped several lithostratigraphic units. She demon-

strated that the basin sediments are conformable, and their lithologic

distribution resulted from depositional environments that varied by proxim-

ity to the active, basin-bounding fault on the east. The sediments were

deposited in alluvial-fan, braided-stream, mixed-channel and flood-plain,

and lake environments in a downfaulted subsiding basin. Harrison (1985)

defined laterally gradational and interfingering, coarser and finer grained

lithostratigraphic units. The units are local and informal: Harrison's "Forma-

tion" is changed to "formation." Most units are semi-consolidated; cemen-

tation is restricted to thin beds of sandstone and conglomerate, which are

not laterally extensive. As a result, outcrops are rare and many slopes are

covered with thin sheet wash and colluvium.

Till deposits of last local glacial maximum (Pleistocene)—Poorly sorted sandy

the modern streams. Soils of original terrace surface eroded away.

Gravel of sixth terrace (Early? Pleistocene)—Forms terrace 152 m (500 ft)

Deposits of active landslides (late Holocene)—Unstratified, poorly sorted silty

Landslide deposits (Holocene to Pleistocene)—Unstratified, poorly sorted silty

Mass-movement deposits (Holocene to Pleistocene)—Angular to subangular

vium, and some alluvial-fan gravel, mostly derived from Tkg.

formed after development of water ditches and irrigation.

which material broke away (see Symbols).

Thickness as much as 20 m (65 ft).

above the modern streams. Moderately developed soils.

160 ft) above modern streams. Well developed soils.

300 ft) above modern streams. Well developed soils.

moderately developed.

moderately developed to well developed.

boulder gravel in a sand, silt, and clay matrix. East of Salmon River, alluvial

Qam Main-stream alluvium (Holocene)—Well-rounded, moderately sorted and

INTRODUCTION

The geologic map of the Bird Creek quadrangle shows rock units exposed Thicker surficial alluvial, glacial, and landslide deposits are shown where they are mappable. Semi-consolidated to consolidated Tertiary sedimentary and volcanic rocks form the undulating low hills east of the Salmon River and some of the foothills to the west.

The map is the result of our research and field work in 2010 and 2011, and previous work in the region by others. Many concepts for geologic units were developed in the Beaverhead Mountains to the east (e.g., Lonn and others, 2008; Lewis and others, 2009, 2011) during a 1:24,000-scale collaborative mapping project by the Idaho Geological Survey and the Montana Bureau of Mines and Geology that started in 2007. Attitudes from previous mapping by Anderson (1959 and unpublished mapping), Brown (1973), and Biddle (1985) were used to supplement the structural data collected by the authors. Soils information is from Hipple and others

The oldest rocks in the quadrangle are metasedimentary rocks of Mesoproterozoic age that form the mountains in the west but also underlie the Salmon River valley and Tertiary rocks to the east. West of a regional thrust fault, the metasedimentary rocks are intruded by granite that is also Mesoproterozoic. Tertiary volcanic and sedimentary rocks of the Challis Volcanic Group and Tertiary Salmon basin sedimentary rocks, which vary from coarse conglomerate to shale, record a wide range of depositional environments as the basin was forming. Much of the basin sedimentary section has been subsequently eroded. The Quaternary deposits show evidence of glaciation, terracing, incision, and landsliding. These are characteristic of Quaternary processes that formed the thin alluvial, glacial, and mass move-

SYMBOLS

Contact: dashed where approximately located. Normal fault: ball and bar on downthrown side; dashed where approximately located; dotted where concealed.

Thrust fault: teeth on upper plate; dashed where approximately located; dotted where concealed. Detachment fault: hachures on upper plate; dashed where approximately located; dotted where concealed.

- Anticline axial trace, approximately located; arrow indicates plunge direction. Strike and dip of bedding.

X Strike of vertical bedding. 35 Strike and dip of bedding where sedimentary structures show bedding to be upright.

10 Strike and dip of bedding, strike approximate.

 10 Strike and dip of bedding, strike variable.

Strike and dip of bedding where sedimentary structures show bedding to be overturned.

47% Strike and dip of bedding interpreted to be overturned. Horizontal bedding.

 $\frac{4}{35}$ Strike and dip of flow foliation. 50 Strike and dip of foliation.

 $\stackrel{\star}{\triangleright}_{15}$ Strike and dip of foliation, strike approximate.

80) Strike and dip of cleavage.

Strike and dip of joint. ⁴⁰ ← Bearing and plunge of lineation, type unknown.

²⁵ Bearing and plunge of mylonitic lineation. ²⁵ Bearing and plunge of asymmetrical small fold showing counter-

clockwise rotation viewed down plunge. ⁵ Bearing and plunge of asymmetrical small fold showing clock-

Bearing and plunge of small fold axis

wise rotation viewed down plunge.

Vein: arrow indicates bearing and plunge. Location of Mesoproterozoic granite boulder.

△ Tectonic breccia.

Mylonite. → Debris flow chute; most recently active in 2011.

Gravel pit or rock quarry that exposes a map unit. --- Area of abundant iron oxide stain.

outcrop. Common interbeds of massive and trough cross-stratified conglomerate, similar to those in the Kriley Gulch formation (*Tkg*) into which it grades and interfingers to the north and toward the detachment fault to the east. Forms low-relief hills and valleys in nearly Kriley Gulch formation (Oligocene and Eocene)—Matrix-poor breccia,

Tcc Carmen Creek formation (Oligocene and Eocene)—Trough cross-stratified

sandstone beds that vary from well-sorted quartz arenites to vitric and lithic

wackes. Resistant beds cemented with silica and hematite. Buff colored in

matrix-supported conglomerate, and clast-supported conglomerate. Includes interbeds of ash, vitric siltstone, and sandstone. Silica and hematite cement are common near basin faults. Clasts commonly pebbles and cobbles, but large boulders locally occur as lag deposits from weathered and eroded beds. Beds are predominantly breccia and matrix-supported conglomerate lower in the unit, but transition upward to better sorted and cross-stratified clast-supported conglomerate. East of the Salmon River, large clasts are primarily *Yqcl*, *Yqff*, and fine-grained rocks derived from the Beaverhead Mountains farther east. West of the Salmon River, unit is predominantly debris-flow breccia and conglomerates with boulders of *Ygr.* Biddle (1985) reported volcanic clasts low in the section there. Forms steep slopes with coarse gravelly soils and resistant ridges capped with common lag pebbles, cobbles, and boulders. Near Lemhi Pass 48 km (30 miles) to the southeast, conglomerate with similar granite clasts is associated with ~49 Ma tuff near the base of the Challis section, indicating an Eocene age (Janecke and others, 2000). In contrast, Tkg overlies tilted younger Challis tuff (*Tcty*) in this quadrangle, indicating a younger age (late Eocene or Oligocene). We suggest that the southeast-flowing Eocene paleoriver postulated by Janecke and others (2000) persisted into the Oligocene and continued to drain areas of the Mesoproterozoic granite northwest of Salmon.

CHALLIS VOLCANIC GROUP

Rocks of the Challis Volcanic Group in the Bird Creek quadrangle are northeast of the main Challis volcanic field that erupted in the Eocene (about 51-44 Ma). Remnants of these lava flows, tuffs, and subordinate sediments are widespread in east-central Idaho and were mapped by D.H. McIntyre, E.B. Ekren, and R.F. Hardyman in the Challis 1° x 2° quadrangle to the southwest (Fisher and others, 1992). A stratigraphic section has also been established 48 km (30 miles) to the southeast, northwest of Lemhi Pass (Blankenau, 1999).

Challis tuff, undivided (Eocene)—Mixed unit of predominantly rhyolitic composition. Most or all of unit is welded tuff, but wide compositional range is suggestive of several extrusive events. Tuff from ridge northwest of Bobcat Gulch contains flattened pumice, quartzite lithics, and quartz well in excess of sanidine phenocrysts. Exposures along and north of Kriley Creek include stratigraphically low biotite-plagioclase vitrophyre and hornblende-bearing dacite(?). Stratigraphically higher (eastward) is rhyolite tuff with abundant dark quartzite clasts and quartz, sanidine, and biotite phenocrysts. Highway exposure west of the mouth of Kriley Creek is a exposure of sandine(?)-quartz tuff with sparse quartzite lithics on the opposite side of the river 1 km to the west, are unusual in that they occupy low elevations. Either they filled a paleovalley, or they have been downdropped

INTRUSIVE ROCKS

Rhyolite dikes (Eocene)—Sparsely porphyritic rhyolite dikes with guartz phenocrysts. Locally coexist with basalt dikes that are too small to map. Tdp / Porphyritic dacite dikes (Eocene)—Highly porphryritic dacite dikes with plagioclase, quartz, hornblende, and biotite phenocrysts. Proportions of

Tdi / Diorite dikes (Eocene)—Dark gray to dark green fine-grained mafic dikes. Biddle (1985) termed them "gabbronorite.

with, and caps side-stream alluvium (Qas). Thickness of deposits varies **Rhyolite or dacite intrusive (Eocene)**—Porphyritic rhyolite or dacite in shallow intrusive bodies. Likely composite bodies with abundant dikes of similar composition. Extensively altered. Includes the Bobcat Gulch stock. Older alluvial-fan deposits (Pleistocene)—Angular to subrounded, poorly

> coarse-grained, porphyritic, slightly peraluminous granite. CIPW norm from single chemical analysis (upper Diamond Creek; Evans and Zartman, 1990) is 39 percent quartz, 32 percent alkali feldspar, and 29 percent plagioclase. Modes have 35-40 percent quartz and rapakivi microcline, 10-20 percent plagioclase, and 7-10 percent biotite as the only mafic mineral (Biddle, 1985). Microcline megacrysts typically range from 3 to 8 cm in length. Minor aplite most common near contacts as are xenoliths. Unit occurs as the Diamond Creek pluton (Evans and Zartman, 1990) and a small outlier. These are the easternmost and perhaps least deformed and shallowest exposures of similar rock that extends west and northwest to Elk City and continues on to near Moscow, Idaho. Contact metamorphism of Ysq to schist is confined to 2-3 m (Biddle, 1985). Outcrops weather to rounded shapes, producing coarse grus with whole microcline phenocrysts. Boulders of this distinctive lithology are found in some saddles and at least 65 km (40 mi) away along Eocene drainages (Janecke and others, 2000) and are incorporated in proximal Tkg strata. U-Pb zircon analyses yield an age of about 1,370 Ma (Evans and Zartman, 1990; Doughty and Chamberlain, 1996). Rb-Sr systematics of samples near the south edge of the map and in the Salmon quadrangle have been interpreted to reflect Sr loss due to heating at about 100 Ma (Evans and Zartman, 1990).

> Megacrystic granite (Mesoproterozoic)—Light gray to pink, medium- to

MESOPROTEROZOIC STRATA

Metasedimentary rocks of Mesoproterozoic age are exposed in the northeast and west parts of the quadrangle. The lowest metamorphic grade and youngest strata are in the northeast. These have been correlated with the Swauger and Gunsight formations in the quadrangle to the east where they are better exposed (Burmester and others, 2011). The Gunsight there was included in the Lemhi Quartzite by Anderson (1959) as were all higher grade strata to the west. Biddle (1985) subdivided western rocks based on presence or absence of phyllite. He correlated them with Yellowjacket units B and C of Hughes (1983), showing contacts as gradational and thrust, both older over younger and younger over older. Hahn and Hughes (1984) correlated unit C (unit E of the "Cobalt Yellowjacket" (Winston and others, 1999)) with the Hoodoo Formation, but later work assigned it to the Gunsight Formation (Tysdal, 2000). Apparently consistent with this, the strata in the west were assigned to the Gunsight and Apple Creek (?) formations by Evans and Green (2003). However, we question these assignments for two reasons. Those formations are shown juxtaposed by a youngerover-older thrust, and all those rocks have much lower quartzite content and thinner beds than Gunsight Formation described farther south

Yqpf Pink feldspathic quartzite (Mesoproterozoic)—Well-sorted, fine-grained, medium- to thick-bedded, pale pink to medium gray, feldspathic quartzite and darker siltite and argillite. Poorly and incompletely exposed in quadrangle. One sample contains about 9 percent potassium feldspar and about 13 percent plagioclase. Correlated with the Lawson Creek Formation of the Lemhi Group (Hobbs, 1980) based on similarity with

(McBean, 1983; Othberg and others, 2011).

Conglomeratic quartzite (Mesoproterozoic)—White to light gray, poorly sorted, fine- to coarse-grained, trough and planar crossbedded, feldspathic quartzite in beds as thick as 2 m. Very little exposed in quadrangle. See Badger Spring Gulch (Burmester and others, 2011) and Homer Youngs Peak (Lonn and others, 2008) maps for description. One sample contains about 15 percent potassium feldspar and about 12 percent plagioclase. Correlated with the Swauger Formation based on stratigraphic position above Yaff to the east and on previous assignment of this unit to the Swauger by

Yqff Fine-grained feldspathic quartzite (Mesoproterozoic)—Well-sorted, fine-grained, medium- to thick-bedded, medium gray to pale pink, light-weathering feldspathic quartzite and darker siltite and argillite. Present only in cross section. See Badger Spring Gulch (Burmester and others, 2011) for description.

Siltite, quartzite, and argillite (Mesoproterozoic)—Laminated siltite, intervals of feldspathic quartzite, minor argillite. Siltite very dark green in 1-3 dm thick tabular beds. Lamination typically planar, but difficult to see in siltite because of its dark color. Quartzite very fine grained and dark gray to fine grained and lighter gray, with color likely reflecting biotite content. Some fine-grained quartzite may be recrystallized siltite. Parting surfaces on some thinner beds east of Brushy Gulch fault have abundant very fine white mica, more likely metamorphic than detrital, and even rarer thin black argillite flakes and hematite-rich chips. Coarser beds on both sides of the fault as thick as 1 m in sets 5 to 15 m thick may be at bottoms of thinning and fining-upward sequences. They constitute about 5 percent of the section and show soft sediment deformation, convolute lamination, loads and truncation, and rare ripple drift and climbing ripple cross lamination, but most lack dark (hematite) mineral laminations typical of Yaff. More commonly, bed tops have low-angle cross lamination or grade to siltite above planar-laminated bases. Argillite interbeds as thick as 30 cm typically very dark, locally with white scapolite spots that suggest carbonate or evaporite minerals in the protolith. Scapolite more common in upper plate of Brushy Gulch fault, which suggests that different stratigraphic levels of Ysq are exposed across it. Thickness uncertain because of deformation, but 6,600 m (22,000 ft) according to Biddle (1985). Except for higher apparent metamorphic grade, unit is similar to rocks mapped as Ysq in the Goldstone Pass quadrangle to the southeast (Lonn and others, 2009). Dominance of siltite, occurrence of scapolite, and paucity of quartzite favors correlation with Big Creek Formation or possibly type Inyo Creek Formation of the Lemhi Group (Ruppel, 1975) and rocks below the Inyo Creek

STRUCTURE

Structures range in age from Proterozoic to Tertiary, with most deformation probably during Cretaceous Sevier contraction and Eocene-Oligocene extension. Proterozoic deformation may have preceded, accompanied, and followed intrusion of the megacrystic granite (*Ygr*). Intrusion was reported to postdate regional metamorphism and folding of host strata (Biddle, 1985; Evans and Fischer, 1986; Evans and Zartman, 1990 and references therein). Migmatite along the Salmon River to the north-northwest is the same age as the Proterozoic granite there; its host rock increased in burial depth from 14 to 20 km (9-12 mi) during prograde metamorphism (Doughty and Chamberlain, 1996). Therefore, it is probable that some structures of this age are present in the quadrangle and may have controlled location of *Ygr*.

that are not described.

SALMON BASIN DETACHMENT

The Salmon Basin detachment, mapped by Tucker (1975) and later interpreted as a low-angle detachment fault by Blankenau (1999), crosses the northeast corner where it drops conglomerate (Tkg) and volcanic deposits (*Tct*) down on the southwest against *Yaff*. Dominant northeast dip of *Tct* is consistent with listric rotation of the fault's hanging wall. The fault may be a reactivated segment of an earlier thrust, placing Ysq over Yqff and Yqcl.

BRUSHY GULCH FAULT

The Brushy Gulch fault, where it was named about 30 km (20 mi) to the north-northwest, juxtaposes higher grade rocks on the west that include a deformed version of Ygr against lower grade rocks east of an intensely mylonitized zone. It was traced through the Bird Creek quadrangle as a mylonite zone bounding Ygr on its east (Evans and Green, 2003). In detail, it is more a web of mylonite zones that crosses Ygr and probably Ysq. The main mylonite zone has fairly constant western dips of about 30-40 degrees, westward plunging stretching lineations, and top-to-the-east kinematic indicators, which is consistent with the fault farther north. However, displacement may be considerably less, based on similarity of lithologies and apparent metamorphic grade across it. Here the fault may merely repeat the same section. Interpretation that Rb-Sr systematics of the Diamond Creek pluton (Ygr) were reset during heating at about 100 Ma (Evans and Zartman, 1990) is consistent with activity on the fault at

Folds formed before intrusion of *Ygr* and during Cretaceous contraction and Eocene extension. Microcline veinlets attributed to Ygr cut foliation and folds but are not themselves folded (Biddle, 1985). Patterns in fold trends that Anderson (1959) used to infer locations of low-angle thrusts east of the Brush Gulch fault likely result from an asymmetrical eastsoutheast-verging fold system, consistent with Sevier thrusting (Brown, 1973) and perhaps contemporaneous with motion on the Brushy Gulch fault. Folds near steep normal faults in the north-central part of the map that are associated with Tertiary magmatic rocks likely date from Eocene or later extension.

HYDROTHERMAL ALTERATION

Proterozoic rocks in the northwestern part of the quadrangle are pervasively iron stained as a result of hydrothermal alteration. Sericite is common. The most extensively altered rocks are outlined (see Symbols) but local areas of alteration persist southward for several kilometers. The alteration appears to be centered on the shallow intrusive rocks (*Tdr*) of the Bobcat Gulch stock and associated felsic dikes. Areas near the stock were drilled for copperporphyry mineralization in 1980 (Nisbet and Scales, 1989). A second zone of alteration that is less pervasive extends in a northwest direction from the center of sec. 25, T. 23 N., R. 21 E., to the center of sec. 23, T. 23 N., R. 21 E. This zone of alteration is at least a kilometer in width and appears to be associated with southwest-dipping shears, at least some of which are mylonitic. Biddle (1985) mapped this zone, which he characterized as sericitic alteration, as well as additional altered areas to the northwest

MINERALIZATION

Anderson (1959) visited many of the mines and prospects in the area and described both gold and Th-REE occurrences. Biddle (1985) studied the mineralization in the central and southern parts of the quadrangle and many of the quartz veins shown on the map are taken from his more detailed work. He recognized two periods of gold mineralization. Effects of the first occur along northeast- and west-trending structures and along the contact between the granite (Ygr) and Proterozoic metasedimentary rocks (Ysq). A second period of mineralization produced gold alone, or gold with thorium and rare earth elements. Thorium was detected by Biddle (1985) at six localities. Only one of these Th-bearing deposits, the Diamond Creek prospect in sec. 26, T. 23 N., R. 21 E. (Contact claim group of Anderson, 1959), was visited during our study. It is characterized by at least three north-northeast striking shear zones dipping about 30-55 degrees to the west. The easternmost structure, accessible in a short adit, contained a 0.6-1 m (2-3 ft) wide limonite (after siderite?) vein along a mylonitic fault zone. The gulch in the central part of the prospect likely formed along a fault as well. Grab samples from there contained muscovite as much as 2 mm across. Altered rocks adjacent to quartz veinlets in these samples contain specular hematite(?) and albite(?). The westernmost structure contains limonitic breccia, chalcedonic quartz, and minor fluorite. The only goldbearing deposit visited was the Comet Mine, located immediately south of Comet Creek in sec. 14, T. 23 N., R. 21 E. An open adit there contains a quartz vein, 0.3-1 m (1-3 ft) wide, striking northwest and dipping 22 degrees to the southwest. Mylonitic quartzite in the hanging wall has a west-northwest plunging lineation. Jim Riggan, owner of the property, reported that oxidized ("punky") ore from the dump contained 5-7 oz. of

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