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52)'z'82)'S WCFT CPI NG.'WESTERN MONTANA

Compiled and mapped by Richard B. Berg and Jeffrey D. Lonn

Montana Bureau of Mines and Geology
Open File Report MBMG 339

1996

This report has been reviewed for conformity with Montana Bureau of Mines and Geology's technical and editorial standards.

Partial support has been provided by the STATEMAP component of the National Cooperative Geology Mapping Program of the U.S. Geological Survey under contract Number 1434-94-A-91368.

PRELIMINARY GEOLOGIC MAP OF THE NEZ PERCE PASS
30' X 60' QUADRANGLE, MONTANA

Compiled and Mapped by Richard B. Berg and Jeffrey D Lonn

DESCRIPTION OF MAP UNITS

- Qls LANDSLIDE DEPOSITS (HOLOCENE)
Unsorted and unstratified mixtures of locally derived material transported down adjacent steep slopes and characterized by irregular hummocky surfaces. Occurs most often as earthflow movement on slopes underlain by Tertiary sedimentary (Tgc) and volcanic (Tv) rocks with high clay content.
- Qal ALLUVIAL DEPOSITS OF THE PRESENT FLOOD PLAIN (HOLOCENE)
Fresh, well-sorted, well-rounded gravel and sand with a minor amount of silt and clay. Beneath modern flood plains and streams. Well logs show an average thickness of 40 feet (McMurtrey and others, 1972).
- Qat RIVER TERRACE DEPOSIT (LATE PLEISTOCENE?)
Not exposed in outcrop, but the surfaces consist of unweathered, well-rounded, mostly granitic cobbles. These surfaces stand 15-25 feet above the present flood plain. Well logs indicate a thickness of 60-70 feet of sand, gravel, and cobbles. At least two terraces have been recognized (Uthman, 1988), but they are cannot be distinguished everywhere.
- Qaf ALLUVIAL FAN DEPOSIT (HOLOCENE AND PLEISTOCENE)
Well- to poorly sorted, well-rounded to subangular locally derived cobbles and boulders in a matrix of sand and gravel deposited in alluvial fan and glacial outwash environments. Includes deposits of several ages and topographic levels.
- Qgt GLACIAL TILL (PLEISTOCENE)
Unsorted mostly unstratified, clay, silt, sand, gravel, and boulders up to 25 feet in diameter deposited by glaciers in moraines. Moraines record at least three glaciations (Weber, 1972). Mass movement and Lake Missoula shoreline processes have modified some of these deposits.
- Taf ALLUVIAL FAN DEPOSIT (LATE MIOCENE TO PLIOCENE)
Brown, unconsolidated to weakly lithified, poorly sorted, moderately stratified, sub-angular to rounded boulders, cobbles, and sandy silt deposited in alluvial fan environments. Includes abundant brown, massive micaceous silt beds. Found as interfluvial remnants perched 200 feet or more above the present Bitterroot flood plain, and capping pediments or strath terraces formed on older units. Clasts are locally derived, and are often coated with brown iron oxide or caliche. Surface of this unit is often a pediment surface. Unit is probably correlative with the Sixmile Creek Formation of southwestern Montana.

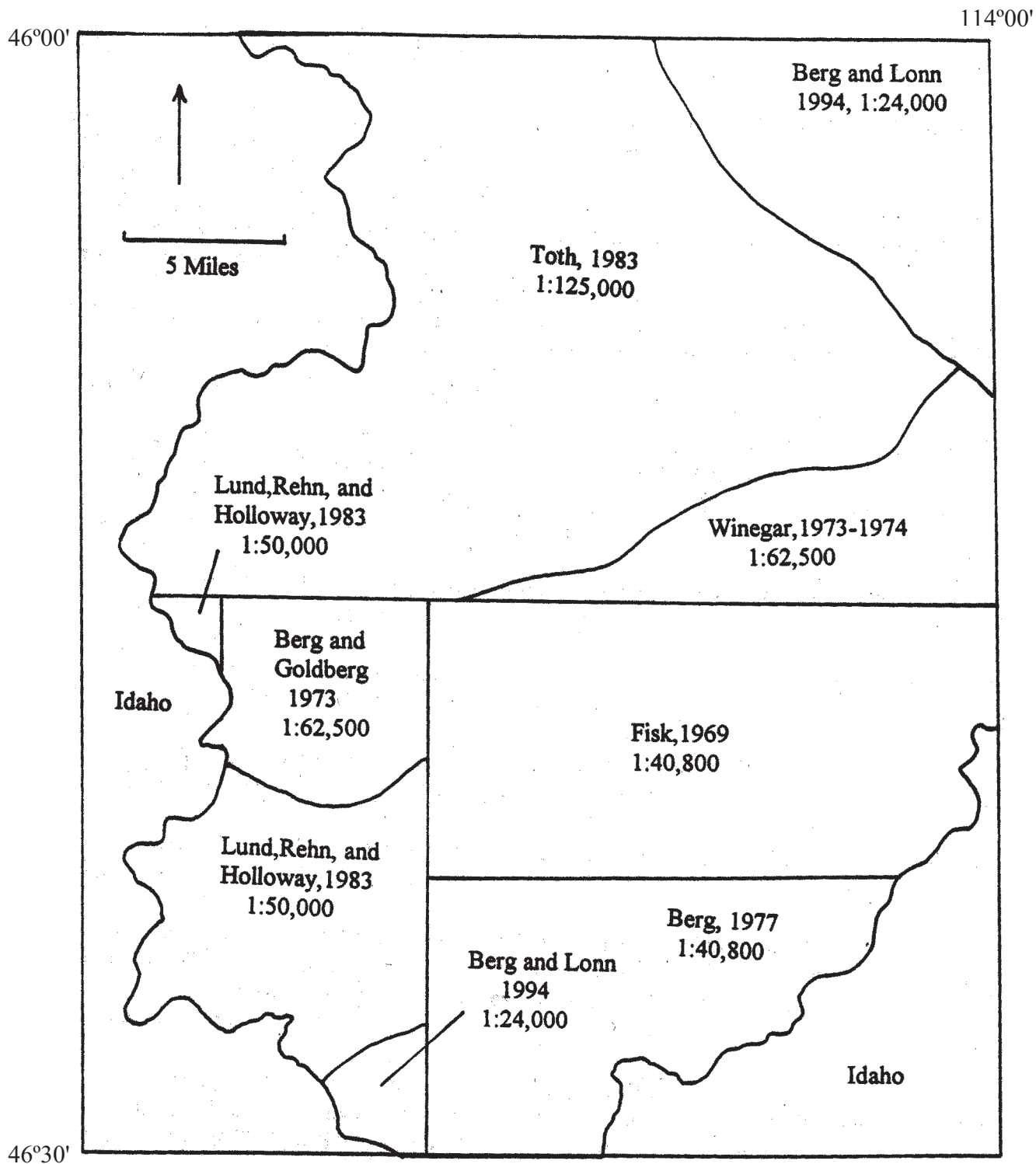
- Tgc **GRAVEL AND CLAY (LATE EOCENE TO MIDDLE MIOCENE?)**
 Unit includes two facies, undivided on the map. Possibly correlative with the Renova Formation of southwestern Montana.
- Fluvial Gravel of the Ancestral Bitterroot River Channel (“ABR Facies”) – Predominantly light gray to white, unconsolidated, well-sorted, well-rounded, well-stratified sand pebbles, and cobbles. Clast lithologies are representative of rocks from the entire drainage basin and include granitic rocks, Bitterroot mylonite, Belt quartzite, Belt carbonate, high-grade metamorphic rocks, extrusive volcanic rocks, and black and red chert. Informally called the “ancestral Bitterroot River (ABR) facies” (Lonn and Sears, 1998). Contains interbedded light tan clay and silt that predominate in the blue clay facies with which the ABR facies interfingers. The ABR facies hosts most of the developed sand and gravel deposits in the Bitterroot Valley and is also a productive aquifer.
- Clay, Silt, and Tephra of the Ancestral Bitterroot River Channel (“Blue Clay Facies”) – Informally called the “blue clay facies” (Lonn and Sears, 1998) after drill log descriptions. Mostly light gray clay and silt in beds 6 inches to 5 feet thick, with abundant interbedded tephra. Contains lenses of well-sorted, cross-stratified, fluvial gravel like that described for the ABR facies. Some brown, ledge-forming massive silty layers with root casts and burrows are present and interpreted to be paleosols. Fossil assemblages indicate an Oligocene to late Miocene age (Konizeski, 1958). Landslides commonly develop where this unit underlies steep slopes, especially where irrigated. Swelling clays are also common.
- Tv **VOLCANIC ROCK, UNDIFFERENTIATED (EOCENE?)**
 Includes flows, welded tuff, tuff, and various volcanoclastic rocks. Composition is generally rhyolitic to quartz latitic.
- Tvi **DIKES AND SILLS AND OTHER IRREGULAR SHALLOW INTRUSIVE BODIES (EOCENE)**
 Mainly rhyolitic, but composition ranges from rhyolite to basalt. Mostly thin (less than 100 feet thick) dikes that are more resistant to erosion than the surrounding rock.
- Tm **MYLONITE ZONE (MID-EOCENE)**
 A 600- to 1500-foot thick east dipping zone in which Precambrian metasedimentary rocks, Cretaceous, and Tertiary plutons have been intensely deformed to produce a well-foliated rock which is locally ultramylonitic (Toth, 1983).
- Tgpr **PAINTED ROCKS PLUTON (EOCENE)**
 This pluton consists of four phases (Lund and others, 1983). Pink, coarse-grained syenogranite shows evidence of nearly ubiquitous deuteric alteration. Monzogranite is gray and medium grained. Coarsely porphyritic monzogranite contains euhedral, 3- to 6-mm long, microperthitic gray orthoclase phenocrysts. Gray, salmon, or white granophyric granite occurs near the roof of the Painted Rocks pluton.
- Tgb **BURNT RIDGE PLUTON (EOCENE OR PALEOCENE)**
 Medium-grained, light gray equigranular muscovite-biotite granodiorite (Toth, 1983).
- Tgpi **PIQUETT CREEK PLUTON (EOCENE OR PALEOCENE)**

Pink, strongly porphyritic biotite monzogranite with potassium feldspar phenocrysts 5-6 cm long (Toth, 1983).

- Tg GRANODIORITE, GRANITE, AND SYENITE (EARLY TERTIARY)
Undivided, small epizonal plutons of medium- to coarse-grained nonfoliated rock.
- TKp PARADISE PLUTON (PALEOCENE AND OR UPPER CRETACEOUS)
Medium-grained equigranular to porphyritic monzogranite and granodiorite (Toth, 1983).
- TKg FOLIATED GRANODIORITE AND MONZOGRANITE (PALEOCENE TO UPPER CRETACEOUS)
A granitic complex of muscovite-biotite granodiorite and monzogranite, and local but related quartz diorite, quartz monzodiorite, and syenogranite that makes up much of the Idaho batholith. Mainly light gray, slightly porphyritic (feldspar phenocrysts) biotite granodiorite with 2-5% biotite which defines a weak, but obvious primary flow foliation (Toth, 1983).
- TKgc CANYON LAKE PLUTON (PALEOCENE AND OR UPPER CRETACEOUS)
Biotite granodiorite, monzogranite, syenogranite, quartz diorite, and quartz monzodiorite. In a few outcrops it can be seen that as many as twelve texturally and mineralogically distinct varieties were emplaced comagmatically (Toth, 1983).
- TKh HYPABYSSAL INTRUSIVES OR FLOWS (CRETACEOUS OR TERTIARY)
Quartz latite porphyry is the dominant rock type with lesser dacite and rhyodacite. Prominent phenocrysts of potassium feldspar, plagioclase and quartz are typical of these rocks (Fisk, 1969).
- Ymg METAGABBRO (MIDDLE PROTEROZOIC)
Occurrences are limited to dikes and sills within the quartzite and quartzitic schist. Xenoblastic hornblende and plagioclase are the principal minerals.
- Yagn AUGEN GNEISS (MIDDLE PROTEROZOIC)
Microcline metacrysts up to 5 cm long and less commonly plagioclase metacrysts are surrounded by a matrix composed of quartz, muscovite, biotite, and feldspars.
- Yam AMPHIBOLITE (MIDDLE PROTEROZOIC)
Amphibolite weathers dark green to brown and consists mainly of hornblende and plagioclase with lesser biotite. Concordant layers of augen gneiss occur within the amphibolite.
- Yq QUARTZITE (MIDDLE PROTEROZOIC)
Ranges from massive white to pink quartzite composed almost entirely of quartz to greenish gray feldspathic quartzite that contains beds of siltite and argillite. The quartzite is of green schist grade of metamorphism (Berg, 1977).
- Yqs QUARTZITIC SCHIST (MIDDLE PROTEROZOIC)
Quartzitic schist weathers tan to reddish brown and consists of micaceous layers that

alternate with quartzose layers. Flexural slip folds are abundant in this unit.

- Yqf QUARTZOFELDSPATHIC GNEISS (MIDDLE PROTEROZOIC)
Quartz ranges from 35 to 50% in this gneiss, and feldspar, mainly plagioclase, ranges from 32 to 60%.
- Ybm GNEISSIC METASEDIMENTARY ROCKS, UNDIVIDED, OF BELT SUPERGROUP
(MIDDLE PROTEROZOIC) Mostly migmatitic quartzofeldspathic gneiss with lesser amounts of calc-silicate gneiss, pelitic schist, and amphibolite.



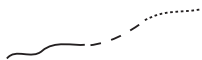
Map of the Montana part on the Nez Perce Pass 30' X 60' quadrangle showing sources of geologic information. Berg and Lonon, 1994, indicates unpublished mapping at 1:24,000. In some instances, geology was slightly modified from indicated source.

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Map Symbols



Contact; dashed where approximately located, dotted where concealed.



Line between mapped areas of undivided and divided metamorphic rocks.



Strike and dip of bedding



Strike and dip of foliation



Vertical foliation



Fault; sense of movement and dip of fault plane unknown. Dashed where approximate, dotted where concealed.



Normal fault; ball and bar on downthrown side. Dashed where approximate, dotted where concealed.



Thrust Fault; teeth on upper plate



Rhyolite and andesite in dikes or sills. Thin reddish, topographically resistant, rhyolitic to andesitic, porphyritic dikes. Flow banding is common.



Pediment surface of mid-Miocene (Sears, 1996) and Pliocene (Fields and others, 1985) age, irregularly mantled with thin pediment gravel or lag deposits of sub-angular boulders. Pediment surfaces appear to cut all Tertiary and older units regardless of resistance