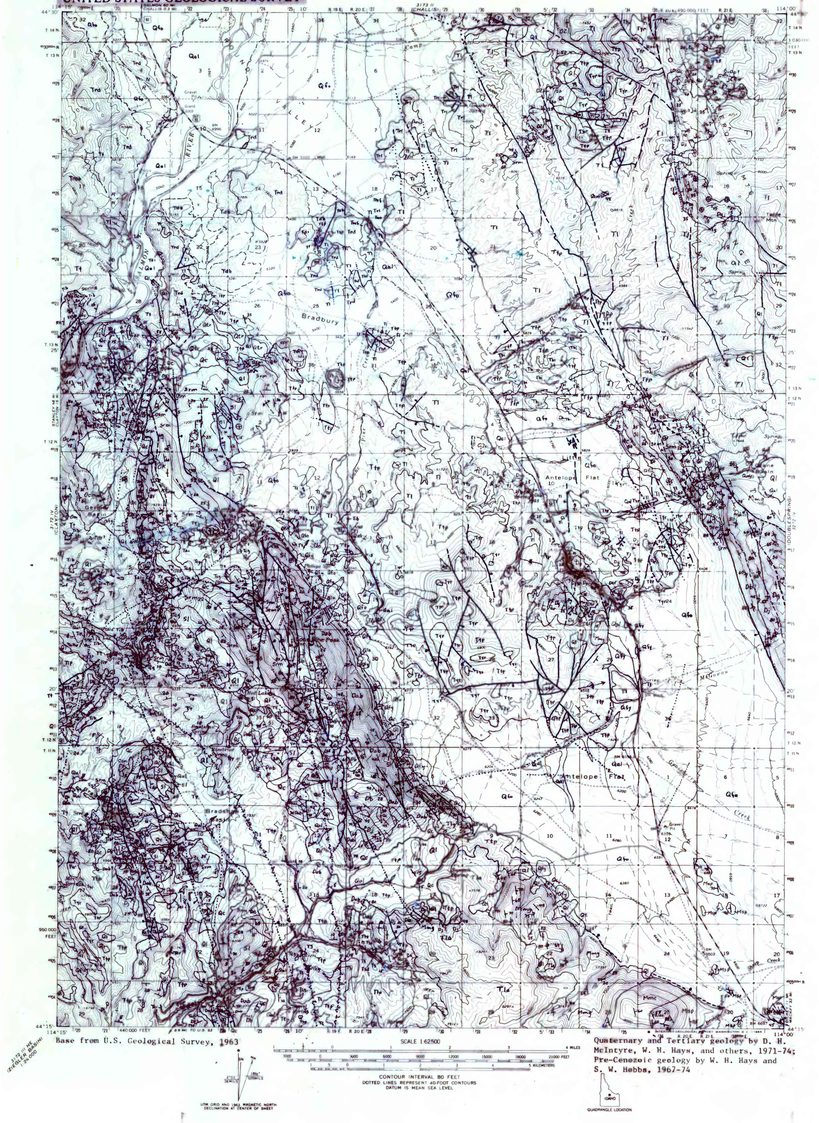
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

OPEN-FILE REPORT
78-1060
LONE PINE PEAK QUAD., IDAHO



GEOLOGIC MAP OF THE LONE PINE PEAK QUADRANGLE, CUSTER COUNTY, IDAHO

W. H. Hays, D. H. McIntyre and S. W. Hobbs

1978

CORRELATION OF MAP UNITS

Qal, Qfy, Qfo, Qc, Qla, Ql	Qtr	Holocene, Pleistocene — QUATERNARY
UNCONFORMITY		
Tdi, Tdr		
UNCONFORMITY		
Tyr		
UNCONFORMITY		
Tib, Tip, Tai, Ts, Tsd, Tla		
UNCONFORMITY		
Tl, Ttp, Tbi, Tmt, Tt		Eocene — TERTIARY
UNCONFORMITY		
Trd, Trp, Trl, Tsd, Trdb, Tb, Tfg		
UNCONFORMITY		
Msp, Mmc, Mmg		MISSISSIPPIAN
UNCONFORMITY		
Dtf, Dg, Dgj, Dj, Db, Dab		DEVONIAN
UNCONFORMITY		
Sl, Srm, Osm, Ok, Oe, Ocmu, Ocm, Om		SILURIAN, ORDOVICIAN
THRUST FAULT (?)		
Or		ORDOVICIAN(?)
UNCONFORMITY OR THRUST FAULT		
OZl		ORDOVICIAN(?) AND PRECAMBRIAN Z (?)
THRUST FAULT		

EXPLANATION

- Contact — Dashed where inferred
- Contact of magnetic reversal — N, normal magnetism; R, reversed magnetism
- Fault — Dashed where approximately located, dotted where concealed; queried where postulated. Bar and ball on downthrown side
- Thrust fault — Dashed where approximately located; dotted where concealed; queried where postulated. Sawteeth on upper plate
- Folds — Showing trace of axial plane
- Anticline
- Overturned anticline
- Syncline
- Overturned syncline
- Strike and dip of beds: Inclined; Overturned; Vertical; Horizontal

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

Qal ALLUVIUM (HOLOCENE AND PLEISTOCENE)--Gravel, sand, silt, and clay associated with present drainage. Includes recent channel and flood-plain deposits of main river and tributaries as well as locally thick fill-terraces and gravel-capped rock-cut terraces along main Salmon River. Rock-cut and fill terraces probably Pleistocene

Qfy YOUNG ALLUVIAL FAN DEPOSITS (HOLOCENE)--Relatively small, steep, conical deposits of subangular to subrounded boulders, cobbles, and intermixed sand and silt in fans related to fault scarps or young erosional scarps. Deposited by present streams upon older fan deposits or alluvial valley bottoms

Qfo OLD ALLUVIAL FAN DEPOSITS (HOLOCENE AND PLEISTOCENE)--Subangular to subrounded boulders, cobbles, and pebbles mixed with sand, silt, and clay deposited in broad coalescing fans in major basins between block-fault ranges. These fans are being dissected and planed by present streams and, in places, overlapped by young alluvial fans and colluvium

Qc COLLUVIUM (HOLOCENE AND PLEISTOCENE)--Loose, incoherent accumulations of soil and rock fragments mantling land surface and obscuring bedrock. Deposited by processes of mass wasting; locally includes talus

Qla AVALANCHE DEPOSITS (HOLOCENE)--Accumulations of unsorted, angular rock fragments, soil, and commonly, plant debris piled in and at the toe of snow avalanche chutes on steep mountain slopes

Ql LANDSLIDE DEPOSITS (HOLOCENE AND PLEISTOCENE)--Mass of rock material in source area displaced relatively short distances downslope by gravity. Comprises blocks, angular fragments, or disintegrated material of bedrock. Most numerous in tuffaceous units of Challis Volcanics; characterized by irregular hummocky topography. Older slide deposits show morphology that has been subdued and modified by erosion or overridden by younger slides

Qtr TRAVERTINE (PLEISTOCENE)--Yellowish-white or cream-colored, thin- to medium-, irregularly bedded, locally finely banded, deposits of travertine showing varying degrees of irregular cellular and concentric texture with local cavities and encrustations. Nearly horizontal, but, where undercut, slumped blocks at margins may be steeply tilted. Estimated to be 100 m thick, and to have covered approximately 2.5 km^2 at an elevation of 1,760 m (5,800 ft) on the southwest side of Bradbury Flat. Probably related to now-extinct hot springs that issued along faults in the underlying Paleozoic carbonate strata

CHALLIS VOLCANICS AND RELATED INTRUSIVES

Tdi RHYODACITE DOMES AND PLUGS AT BRADBURY FLAT (EOCENE)--Black, columnar, glassy, and gray, grayish-brown or red-purple devitrified rhyodacite containing as much as 30 percent phenocrysts, 4 mm or less in diameter, of plagioclase, orthopyroxene, clinopyroxene, biotite, apatite and opaque oxides

Tdi Cross-cutting plugs of rhyodacite in bluff exposures on both sides of Salmon River west of Bradbury Flat, and in hills north of Bradbury Flat. Normal magnetic polarity. A northeast-dipping slab of similar rock that overlies basalt at the southwest margin of Bradbury Flat has reverse magnetic polarity. Uplifted mass of silicic tuff capped by basalt in north-central sec. 31, T. 13 N., R. 20 E., probably is underlain by rhyodacite intrusion

Tdb Irregular domelike masses of rhyodacite in hills northwest of Bradbury Flat. K-Ar age for columnar rhyodacite exposed near reservoir in northeast corner of sec. 17, T. 13 N., R. 19 E., is 42.2 ± 1.2 m.y. (Armstrong, 1975, p. 24)

Tyr RHYOLITIC ASH-FLOW TUFF (EOCENE)--Red, reddish-purple, yellowish-brown, or white, densely welded, devitrified ash-flow tuff containing 5-20 percent crystals as large as 3 mm of iridescent alkali feldspar and smoky quartz in a fine shardy matrix. Locally contains abundant pumice. Visible only in thin section are sparse zircon, allanite, and biotite. Apparent normal magnetic polarity. K-Ar age of sample from outcrop near Challis and northwest of map area, is 43.8 ± 1.3 m.y. (Armstrong, 1975, p. 24)

Ti BASALTIC AND ANDESITIC INTRUSIONS (EOCENE)--Dark-gray, greenish-gray, and black, variably altered, dense rocks, containing as much as 10 percent microphenocrysts smaller than 0.5 mm of olivine, clinopyroxene and plagioclase. Quartz xenocrysts, some of which are polycrystalline, common. Alteration products chiefly green clay and carbonate. Intrusion northeast of Bradshaw Gulch also contains orthopyroxene microphenocrysts. Intrusions along Salmon River and around Main Gulch have reverse magnetic polarity

Ttp PYROXENE PHENOCRYST INTRUSIONS (EOCENE)--Dark-gray, greenish-gray, and black rocks that form dikes and sills in Main Gulch area. Most contain conspicuous green pyroxene phenocrysts, both clinopyroxene and orthopyroxene

Tai ANDESITE SILL OR FLOWS (?) (EOCENE)--Black vitrophyric to gray-brown devitrified rocks with microphenocrysts of olivine, clinopyroxene, and, in a few places, biotite. Normal magnetic polarity. Intercalated as thin sheets within tuff sequence between Spar Canyon and vicinity of Main Gulch

Ts SYENITE INTRUSION (EOCENE)--Irregular, sill-like mass of sedium- to coarse-grained quartz-nornative syenite that contains potash feldspar, clinopyroxene, biotite, apatite, and magnetite. Clinopyroxene commonly altered to carbonate; both clinopyroxene and biotite may be altered to green phyllosilicate. Some carbonate may be primary. Age relations of syenite mass and other, nearby, intrusive bodies and lavas unknown

Tsd "DARK SYENITE" (EOCENE)--Dark, fine-grained marginal facies of syenite

Tla LATITE FLOWS EAST OF SPAR CANYON (EOCENE)--Dark brown weathering, grayish-brown, nearly aphyric lavas with microphenocrysts 1 mm in size of olivine and clinopyroxene in partly to wholly devitrified matrix. Biotite commonly present in matrix and as partial replacements of clinopyroxene. Apatite commonly abundant. Devitrification often forms potash feldspar(?) spherulites several centimeters in diameter that are freed from matrix by weathering to form surface accumulations of "ball bearings"

Tl SILICIC TUFF AND SEDIMENTARY ROCKS (EOCENE)--Chiefly thin-bedded, locally massive, brown, yellowish-brown, and gray altered vitric tuff and pumice lapilli tuff containing sparse crystals of quartz, plagioclase, sanidine, biotite, amphibole, sphene, zircon, apatite, and allanite

Ttp INTERMEDIATE AND MAFIC LAVAS (EOCENE)--Dark-brown weathering dark-gray and greenish-gray rocks containing microphenocrysts of olivine, clinopyroxene, and rarely, plagioclase in varying proportions. Many flows are pillowed. Heterogeneous in detail; compositions range from K-rich clinopyroxene-bearing andesites interstratified with K-rich olivine basalts on Table Mt. to picrite basalt and plagioclase-bearing olivine basalt south and east of Bradbury Flat. Both normal and reverse magnetic polarities

Tbi MUDFLOWS (EOCENE)--Poorly exposed, white quartzite-bearing mudflow breccia within unit Tl in hills southeast margin of Round Valley; usually covered by clay-rich soil. Also mudflow of tuffaceous material within unit Tt north of Main Gulch

Tti MAFIC INTRUSIVE COMPLEX (EOCENE)--A cluster of irregular masses of altered basaltic rock that intrude silicic tuff north of Little Antelope Flat. Causes slight updoming of surrounding rocks

Trd RHYODACITE LAVAS AND BRECCIAS (EOCENE)--Yellowish- to reddish-brown weathering, reddish-brown, yellowish-brown and grayish-purple rock containing 20 to 40 percent phenocrysts as much as 5 mm of plagioclase, biotite, clinopyroxene, orthopyroxene, apatite, and magnetite in devitrified, commonly zeolitized (ailithic, heulandite) groundmass. Locally altered to celadonite. Both normal and reverse magnetic polarity. Unit with reverse polarity, exposed in cliffs along Highway 93, has K-Ar age of 48.0 ± 1.4 m.y. (Armstrong, 1975, p. 24)

Trp RHYODACITE OF LOWER LEATON GULCH (EOCENE)--Part of sequence established in Challis quadrangle to north

Trp Pyroclastic rocks--Orange and orange-brown weathering green and pink, altered, poorly sorted, thin-bedded rocks containing biotite, quartz, devitrified rock fragments, alkali feldspar, and allanite in clay matrix

Trl Lower flows--Orange and orange-brown weathering, altered, deeply weathered, craggy flows containing phenocrysts of plagioclase and altered mafic minerals. Formed bold bluffs when Tl flows extruded; flows of Tl in draw 1.5 km east of Beardsley Hot Springs (north of quadrangle boundary) plastered against cliff face of Trl

Trdb RHYODACITE LAVAS AND BRECCIAS OF BLUE MTN. (EOCENE)--Lithologically identical to unit Trd; portion of unit in map area is eastward extension of dome-like mass centered on Blue Mountain (west of quadrangle boundary). Normal magnetic polarity. Map unit locally includes some thin flows of olivine basalt

Tb K-RICH OLIVINE BASALT (EOCENE)--Brown and reddish-brown weathering dark-gray to dark greenish-gray lava that crops out locally beneath unit Trdb. Normal magnetic polarity

Tt MUDFLOW BRECCIA-SILICIC TUFF-SEDIMENTARY ROCK SEQUENCE (EOCENE)--Exposures near Salmon River include yellowish-, grayish- or olive-brown mud-flow breccia with intercalated light-gray to white silicic tuff and thin-bedded sandstone that locally contains fossil leaves. Mud-flow breccia clasts and matrix contain crystals of plagioclase, quartz, biotite, amphibole, and minor sanidine, allanite and zircon. Exposures of mudflows adjacent to quartzite ridge in Bradbury Gulch area contain angular quartzite blocks as much as 0.6 m thick from adjacent ridge. In Main Gulch area, carbonized or partly silicified wood fragments, and, locally, rooted tree stumps are common

Tcg ALLUVIAL CONGLOMERATE--Conglomerate composed of angular to subrounded stones that have considerable size range within individual deposits; size ranges from pebbles to small or medium boulders (maximum commonly 0.5-1.2 m). Mainly quartzite in a wide range of colors and grain size; some green and gray siltstone or silite, occassional dark chert, and various amounts of dolomite similar to dolomites in the local Silurian-Devonian section. Occurs as bodies of alluvial conglomerate within tuffaceous units of the Challis Volcanics at many places, but particularly along Spar Canyon and between Main Gulch and Jenson Cabin Spring. The conglomerate commonly has a tuffaceous matrix and tuffaceous sandy interbeds. The bodies commonly are too small to be mapped, or form such indistinct outcrops that the boundaries can only be inferred

Tfg FANGLOMERATE (PRE-CHALLIS, EOCENE)--Grayish-red to reddish-brown fanglomerate. The pebbles, cobbles, and few small boulders are predominantly of local derivation and subangular to subrounded; sparse matrix of sandy mudstone and muddy sandstone. Beds mainly 0.5 to 1.5 m thick and defined by differences in fragment sizes; lenticular. Exposed near Spar Canyon summit and on Main Gulch. Lithologies of fragments in Spar Canyon occurrence indicates derivation as a fanglomerate from formations in ridge to northwest and west and, at lower elevations, partly from ridges to southwest; deposit in Main Gulch has more characteristics of high energy stream deposit. Thickness between 100-200 m

PALEOZOIC ROCKS

Msp SCOTT PEAK FORMATION (MISSISSIPPIAN)--Medium dark-gray, chert-bearing bioclastic limestone; weathers medium dark- to medium light-gray; chert medium dark to medium gray, weathers brownish tan, fairly abundant as discontinuous thin layers or in globular form scattered along bedding. Medium to thick bedded; moderately resistant to erosion; forms ledgy outcrops; contains much crinoidal debris, horn corals, and brachiopods. Thickness at least 750 m; rests concordantly on Middle Canyon Formation; top not exposed. Occurs only in southeast corner of quadrangle

Mmc MIDDLE CANYON FORMATION (MISSISSIPPIAN)--Sequence of mudstone and impure limestone exposed as smooth, float-covered slopes in southeastern corner of quadrangle. Upper half is impure, medium dark to medium-gray, microgranular limestone; weathers to medium to light gray, slightly yellowish- or pinkish-colored small irregular blocks; surfaces commonly mottled or laminated in these colors. Lower half is partly very fine grained sandy mudstone that is calcareous in small part. Float is more strongly colored and more angular than that of the upper half; surfaces yellowish brown and other shades of yellow and red; some brown-weathering silty laminae

Mmg MCGOWAN CREEK FORMATION (MISSISSIPPIAN)--Poorly exposed unit of mudstone (or argillite), subordinate siltstone, claystone, and sandstone, and a little pebble conglomerate

Mudstone, siltstone and claystone probably originally dark gray but has weathered or altered to range from dark to light gray or locally greenish or brownish gray; partly sandy; locally siliceous. Beds thin to thick. Laminae common, silty or sandy, partly graded and commonly weathered brown. Slaty or phyllitic, cleavage common. Small plant particles frequent near base south of Grand View Canyon.

Sandstone forms scattered beds and is dominant in a few intervals as much as 15 m thick; medium to light gray and grayish orange. Sand mainly rounded quartz grains of very fine to fine-medium size; some beds contain partly angular chert or silliceous argillite grains, dark to light gray, locally coarse to very coarse.

Pebble conglomerate seen only in a few beds in lower part of formation south of Grand View Canyon; only rare scattered pebbles farther south. Small (as much as 9 mm) subrounded pebbles of gray or brown chert and a few of quartz and sandstone in sandy argillaceous matrix.

Formation forms few outcrops but sustains steep slopes covered by slabby or platy, locally finely blocky or pencil-like fragments; weathers medium to light gray, yellowish gray, or light olive gray. No complete continuous section of formation known in quadrangle

Dtf THREE FORKS FORMATION (UPPER DEVONIAN)--A thin unit of calcareous shale and basal impure dolomite.

Clay or mud shale is almost uniformly medium-gray, locally faintly laminated, variably calcareous and with a little shaly limestone. Almost no outcrops. Float of semi-tabular chips and slabs range in surface color from light, slightly yellowish gray to light yellowish brown. Thickness 32 m.

Dolomite is medium dark to medium gray, commonly with olive cast, mostly microgranular, partly very fine-grained, silty or muddy. Beds thick, little obvious lamination, but commonly clevwe parallel to bedding. Weathered surfaces are light orange gray, grayish orange, and light yellowish brown; distinctly lighter colored than upper, partly sandy Grand View Dolomite. Thickness 15 m; total thickness of formation 47 m

Dg GRAND VIEW DOLOMITE (DEVONIAN)--Includes microgranular, medium-dark to medium light-gray dolomite that weathers medium light gray and lighter, and much recrystallized medium light to very light gray, fine- to coarse-grained dolomite that weathers grayish orange or pale yellowish-brown. Scattered sandy intervals; a few shaly beds. Beds thick, commonly laminated. Formation moderately to highly resistant; forms blocky ledges and, locally, cliffs. Includes dark weathered intervals indistinguishable from Jefferson Dolomite. Best exposed in cliffy type section in Grand View Canyon

Dj JEFFERSON DOLOMITE (DEVONIAN)--Resistant, well-exposed unit of medium dark- to medium-gray and subordinate dark-gray dolomite. Weathers to similar dark colors, partly mottled, commonly with a brown cast; a few beds weather medium light gray. Grain size ranges from microgranular to fine; little silt or sand; commonly fetid. Beds thick to very thick (0.3-1.5 m); some thin regular lamination. Light-colored, coarsely recrystallized Amphipora, stromatoporoids, and algal structures common in some beds. Near eastern edge of quadrangle, large parts of formation locally recrystallized to lighter color and coarser grain size or are replaced by medium light to very light gray, red, and brown jasperoid (ja). Highly resistant ledge and cliff former. Thickness about 300 m

Dgj GRAND VIEW DOLOMITE (DEVONIAN) AND JEFFERSON DOLOMITE (DEVONIAN)--Where mapped together because of similar lithologies or alteration that makes delineation impossible

Db UNIT B (MIDDLE? AND LOWER DEVONIAN)--Dolomite and minor dolomitic sandstone.

Upper part notably variable; mostly medium dark to medium-gray but partly dark, medium light, and olive-gray, mostly microgranular or very fine grained, but ranges from subilthographic to medium-grained; near top, some dark beds indistinguishable from Jefferson Dolomite; a few beds markedly silty or muddy. Medium to thick bedded (generally less than 1 m), beds better defined than lower in unit and commonly laminated. Weathered surfaces olive gray and yellowish gray as well as purer grays.

Middle and lower parts medim dark to medium gray, weathered to almost uniform medium to medium light gray ("bluish" to many eyes); microgranular to very fine; small crinoid ossicles common locally. Beds thick to very thick (maximum 1.5 m), massive, commonly poorly defined. As much as 30 m near middle of unit and basal 3-60 m variably sandy and include a little dolomitic sandstone; locally silicified; sand grains very fine to medium. Moderately to highly resistant to erosion; ledge and cliff former. Thickness of entire unit in western half of quadrangle 180-370 m

Almost everywhere in the Lost River Range along the eastern edge of the quadrangle, all exposed dolomite between the Jefferson and Lakatoon Dolomites was tentatively and rather arbitrarily mapped as this unit. The rock so mapped includes intervals of dolomite and sandy dolomite closely resembling common lithologies in unit B farther west, but it is more variable in color and grain size than most of the unit there and may include age equivalents of Dab. Dolomite locally replaced by jasperoid (ja) similar to that replacing Jefferson Dolomite. Thickness probably falls within limits of thickness in western half of quadrangle

Dab UNIT A AND BEARTOOTH BUTTE FORMATION (LOWER DEVONIAN)--Well-bedded sequence of variably impure dolomite and basal sandstone and siltstone

Unit A--Forms upper and middle parts of map unit. Mainly medium dark to medium light gray dolomite; weathers medium light to light gray or yellowish- to light olive gray. Upper part of unit A distinguished by lighter colors, by distinctly muddy dolomite of various orange, red, brown, and yellow hues, and by being partly sublithographic. Scattered beds in lower part weather medium dark to medium gray. Dolomite is microgranular and moderately silty. Beds medium to thick (maximum 1 m); lamination common. Some limestone locally below middle of unit. One or more highly silty and sandy intervals near base. Contact with underlying Beartooth Butte Formation gradational. Unit moderately resistant to erosion except for weak muddy intervals in upper part; commonly forms blocky ledges; colorful float. Thickness 260 to at least 395 m in western half of quadrangle; probably thicker in Lone Pine Peak ridge; apparently absent along most of east edge of quadrangle in Lost River Range; one small probable occurrence near Line Creek

Beartooth Butte Formation--Forms lower part of map unit and consists entirely of highly sandy or silty rocks. Quartzite and siltite medium gray to near white; sandstone and siltstone variably dolomitic, medium to very light gray or brownish gray, commonly with limonitic surfaces; small proportion of highly silty or sandy dolomite of similar colors. Quartzite and sandstone mainly very fine grained, but may be medim grained; commonly feldspathic; tends to be coarser grained and more siliceous in lower part. Medium to thick bedded (maximum 1 m), mostly with little or no lamination. Resistance to erosion high to weak depending on grain size and on presence or absence of interstitial silica. Basal contact disconformable. Thickness 67-215 m. Formation not indentified along east edge of quadrangle in Lost River Range

Sl LAKETOWN DOLOMITE (SILURIAN)--Upper member is dolomite that varies widely in impurity, color, and outcrop form and thereby appears strongly layered. Purer beds mainly medium light to very light gray or pink; form light-gray to grayish-orange blocky ledges. More silty and muddy intervals are weakly resistant and weather to grayish orange, brown, or reddish slabby float; other intervals are thinly laminated and weather to light olive gray blocky float. A few beds of dolomitic siltstone and sandstone. Thickness of upper unit 0 to at least 125 m in west half of quadrangle; absent along east edge of quadrangle.

Lower member is strikingly light-colored dolomite that commonly forms ridges and peaks. Dolomite is predominantly medium light to light gray, mostly very fine to fine grained, and almost pure. Few scattered sandy intervals. Beds medium to very thick, mainly 0.3 to 1 m; massive and obscurely defined. Joints common. Resistance to erosion high and forms rounded light- to very light gray ledges and cliffs. Thickness of lower unit 215 to 395 m

Sra ROBERTS MOUNTAINS FORMATION (SILURIAN)--A very thick, laterally variable unit characterized by medium dark to medium-gray carbonate-bearing fine-grained detrital rocks and impure carbonate rocks. Most are mudstone, siltstone, and very fine silty sandstone, mainly dolomitic, partly calcareous; less abundant and irregularly distributed are muddy, silty, or finely sand microgranular to very fine grained limestone and dolomite; some small amount of silitite and quartzite. Medium to very thick bedded. Regular lamination, 3 mm or less thick, and cleavage that may be parallel or oblique to bedding common. Resistance to erosion moderate to weak; forms scattered outcrops and abundant brownish red, light red and yellow, and purplish gray platy to flaggy float. Upper 60 to 160 m commonly is less silty and includes discontinuous ledge-forming intervals of blocky dolomite that are lighter colored and coarser grained and that are almost pure except for varied content of medium-grained sand that is coarser than that lower in the formation. Some blocky dolomite is intraformational conglomerate. Thickness approximately 800 m in western half of quadrangle; may be considerably thinner near eastern edge. Upper part contains fossils of late Wenlock and probably Ludlow age

Oam SATURDAY MOUNTAIN FORMATION (ORDOVICIAN)--Resistant, thick-bedded unit of predominantly medium dark to medium-gray, microgranular to very fine-grained, and fairly pure dolomite; sandy in lower part. Mainly medium to very thick bedded (rarely thicker than 1.5 m); a little lamination, commonly silty or sandy, mainly in lower part. Chert present in scattered intervals, most as nodules and discontinuous layers, characteristically in fairly continuous thin layers near top. Highly resistant to erosion; forms ledges and cliffs of mainly medium dark to medium light gray and partly yellowish-gray surface colors; sandy base is light brownish gray. Upper part may be Silurian in age. Thickness about 300 m

Ok KINNIKINIC QUARTZITE (ORDOVICIAN)--Light-colored, fine-grained quartzite exposed only near west edge of quadrangle; mostly in highly sheared bodies associated with fault zone. Quartzite is mainly light to very light gray, partly with yellowish or brownish cast; locally as dark as medium gray or mottled medium dark and lighter gray; very fine to fine to medium rounded grains; exceptionally clean. Medium to thick bedded; bedding commonly obscured by shearing and partial recrystallization; local faint lamination. Formation highly resistant to erosion; commonly forms cliffs. Thickness at least 180 m; no exposure in quadrangle includes complete formation

Oe ELLA DOLOMITE (MIDDLE ORDOVICIAN)--A varied unit of dolomite, subordinate dolomitic sandstone and quartzite, and a little siltstone and shale. Dolomite has wide color range but predominantly dark to medium light gray and yellowish gray; dominantly medium dark gray in lower part. Intraformational conglomerate fairly common. Beds thick (0.3 to 0.7 m); thin discontinuous silty or sandy laminae and crude color laminae very common. Weathered surfaces mainly medium dark to medium light gray, commonly brownish gray on sandy dolomite; yellow tints in upper part of formation. Sandstone grayish yellow, medium dark to medium gray, and yellowish brown; ranges from very fine to medium grained; thick to very thick bedded (usually less than 1 m); commonly laminated; weathers to various brown and gray colors. Quartzite most common in lower part, generally medium light to very light gray or light-brownish-gray and very fine grained to medium grained, uncommonly feldspathic, mostly clean. Beds thick to very thick. Siltstone and shale in various light-gray and brown colors, mainly dolomitic and thick-bedded. Resistance of formation varies with lithology; quartzite is highly resistant ledge and cliff-former; most dolomite and sandstone moderately resistant; muddy dolomite and siltstone weakly resistant. Formation highly faulted and partly overturned where exposed north of Bishop Spring in northwest corner of quadrangle. Thickness uncertain; probably at least 200 m

CLAYTON MINE QUARTZITE (MIDDLE ORDOVICIAN OR OLDER)--Type section in Clayton Quadrangle adjoining Lone Pine Peak quadrangle on west. Unit in Lone Pine Peak quadrangle differs mainly in occurrence of a thick, light-colored, fine-grained quartzite unit at the top and more intense red coloration of the main lower part of the unit

Ocmu Upper part of Clayton Mine Quartzite--Medium- to thick-bedded, light-gray to creamy- or pinkish-white quartzite, locally vitreous with concholial fracture; predominantly fine to medium grained with scattered coarse grains; generally very clean with well-rounded and well-sorted quartz grains; little if any feldspar; cross-lamination prominent in some beds; few shale partings

Ocm Main body of Clayton Mine Quartzite--A sequence of dominantly light reddish gray, red, and purple quartzites that are heterogeneous in composition, degree of sorting, and bedding characteristics. Most is composed of poorly sorted coarse- to medium-grained feldspathic quartzite that includes conglomerate layers, pebbly quartzite, and scattered pebbles, mostly in the upper two-thirds of the section. A widespread conglomeratic zone about 100 meters thick marks the top of a dark-red quartzite and is overlain by the unit Ocmu described above. Very thin shale partings occur throughout. Pebbles are well rounded and range from 0.6 cm to 5 cm in diameter. Feldspar, usually more angular than the quartz grains, is distributed throughout the section and most is highly altered. Bedding ranges from very thick to thin. Cross-lamination in both thin and very thick beds occurs throughout, but more common in the lower half. Shale and siltstone is mainly pale yellowish green, but includes some grayish green, dark purplish gray, and deep maroon. More than 1,000 m were measured in Rattlesnake Creek immediately west of the quadrangle where the base is a thrust fault and the top concealed by Challis Volcanics. Base in thrust contact with Ramshorn Slate (Or) or mixed lithology sequence (Om)

Om INTERBEDDED SILTSTONE AND QUARTZITE (ORDOVICIAN)--Siltstone and quartzite in various proportions with subordinate dolomite; occurs as a group of beds between overlying Clayton Mine Quartzite (Ocm) and underlying Ramshorn Slate (Or). Small outcrop in shear zone west of Gerser Basin

Or RAMSHORN SLATE (ORDOVICIAN?)--Mostly thin bedded, well-laminated, argillaceous and phyllitic rock with well-developed cleavage at an angle to the bedding; includes thin, slabby, impure sandstone layers, mostly in upper part. Slate is medium to dark gray, greenish gray, and purple, locally light greenish gray to silvery gray or dark brownish gray; weathers gray and brown; comprises very fine quartz, sericite, chlorite, and clay minerals; some carbonate in widely scattered sandy layers; small isoclinal folds prevalent throughout the unit with well-developed axial plane cleavage; breaks on cleavage into small plates and slabs

PALEOZOIC? AND PRECAMBRIAN ROCKS

OZl INTERBEDDED QUARTZITE, DOLOMITE, AND ARGILLITE OF LEATON GULCH AND PENNAL GULCH AREAS (ORDOVICIAN? AND PRECAMBRIAN Z?)--Sequence as exposed in the Challis quadrangle adjoining the Lone Pine Peak quadrangle on the north consists predominantly of quartzitic strata with subordinate dolomite interbeds and some thin argillitic interbeds with local thicker argillite intervals. Quartzite generally deep red to dark purplish gray to medium gray with some thick zones of light pinkish or tannish gray and very light gray to white; medium grays and purple-grays predominate; thin to medium bedded, platy, laminated, with some massive units that are thick bedded and structureless; most medium to fine grained, locally coarse grained and pebbly; lamination prominent in some thick layers; includes several horizons of coarse conglomerate or intraformational breccia. Much of thin-bedded platy quartzite shows ripple marks, worm casts, worm trails; abundant magnetite in parts of section. That part of sequence in northern part of the Lone Pine Peak quadrangle is predominantly light pinkish gray to very light gray to white, medium bedded to massive quartzite; most medium to fine grained with some coarse-grained and pebble-bearing layers. Some beds show worm trails and other bedding-plane features. Complex structure and discontinuity of exposure makes sequence of rock types indeterminate. General characteristics of strata and structural relations to Swauger Formation suggests possible correlation with Precambrian Wilbert and Ordovician Summerhouse Formations

REFERENCES

Armstrong, R. L., 1975, The geochronometry of Idaho: Isochron/West, no. 14, p. 1-50.