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Stratigraphic Sections of Middle Paleozoic
Rocks in the Vicinity of Spar Canyon,
Custer County, Idaho

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By W. H. Hays, A. G. Harris, J. T. Dutro, Jr.,
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Introduction

The Spar Canyon vicinity in Custer County, Idaho (fig. 1), contains the thickest sections of the Roberts Mountains Formation and of Lower Devonian miogeosynclinal carbonate rocks presently known in Idaho. Measured sections of middle Paleozoic rocks in this vicinity are significant to regional interpretations of both stratigraphy and tectonics.

The measured sections overlap stratigraphically, so that, excepting minor structural omissions, they include all rocks of Silurian and Early Devonian age. The base of the lowest of the six sections, the Lower Bradshaw Basin section (A-1 in figs. 2, 3), is in the basal part of the Saturday Mountain Formation, well below the Silurian-Ordovician boundary. The tops of the highest sections, the Tub Spring--South and Spar Canyon Summit sections, are in the basal part of the dark Jefferson Dolomite, well above the boundary between the Lower and Middle Devonian. Figure 3 summarizes the age ranges and measured thicknesses of the principal stratigraphic units in the sections. Hays and others (1978) provided data on thickness ranges within the whole Lone Pine Peak quadrangle.

The formations and members designated in the sections are units utilized in mapping the Lone Pine Peak quadrangle (Hays and others, 1978), in which the sections are almost entirely located, though a few of them were combined in compilation of the map. The Saturday Mountain Formation was named by C. P. Ross (1934) in the Clayton quadrangle, about 23 km west of the exposure measured in section A-1. The names "Laketown Dolomite" and "Jefferson Dolomite" were introduced into this part of Idaho by Ross (1934, 1937), and the exposures to which he applied them include those described in this report. In his mapping, which was of a pioneering, reconnaissance nature, Ross placed the base of the Jefferson at about the same level as that chosen here, but he misused the name "Laketown" and included in it a thick sequence of varied dolomitic rocks, many of which differ markedly from the Laketown in northeast Utah and southeast Idaho. In their mapping, Hays and others (1978) divided Ross' "Laketown Dolomite," supposed by him to be entirely of Silurian age, into the Roberts Mountain Formation, the Laketown Dolomite, the Beartooth Butte Formation, unit A, and unit B, and they mapped as Laketown only a rock unit that is mostly similar lithologically to a large part of that unit in southeast Idaho and northeast Utah. Paleontologic data in this report indicate that even this restricted application of the name is inappropriate, and quotation marks have been placed around it. Further changes in local stratigraphic nomenclature, including reassigning or renaming the "Laketown" Dolomite and applying formal names to units A and B, which are of formational character, are beyond the scope of this open-file report.

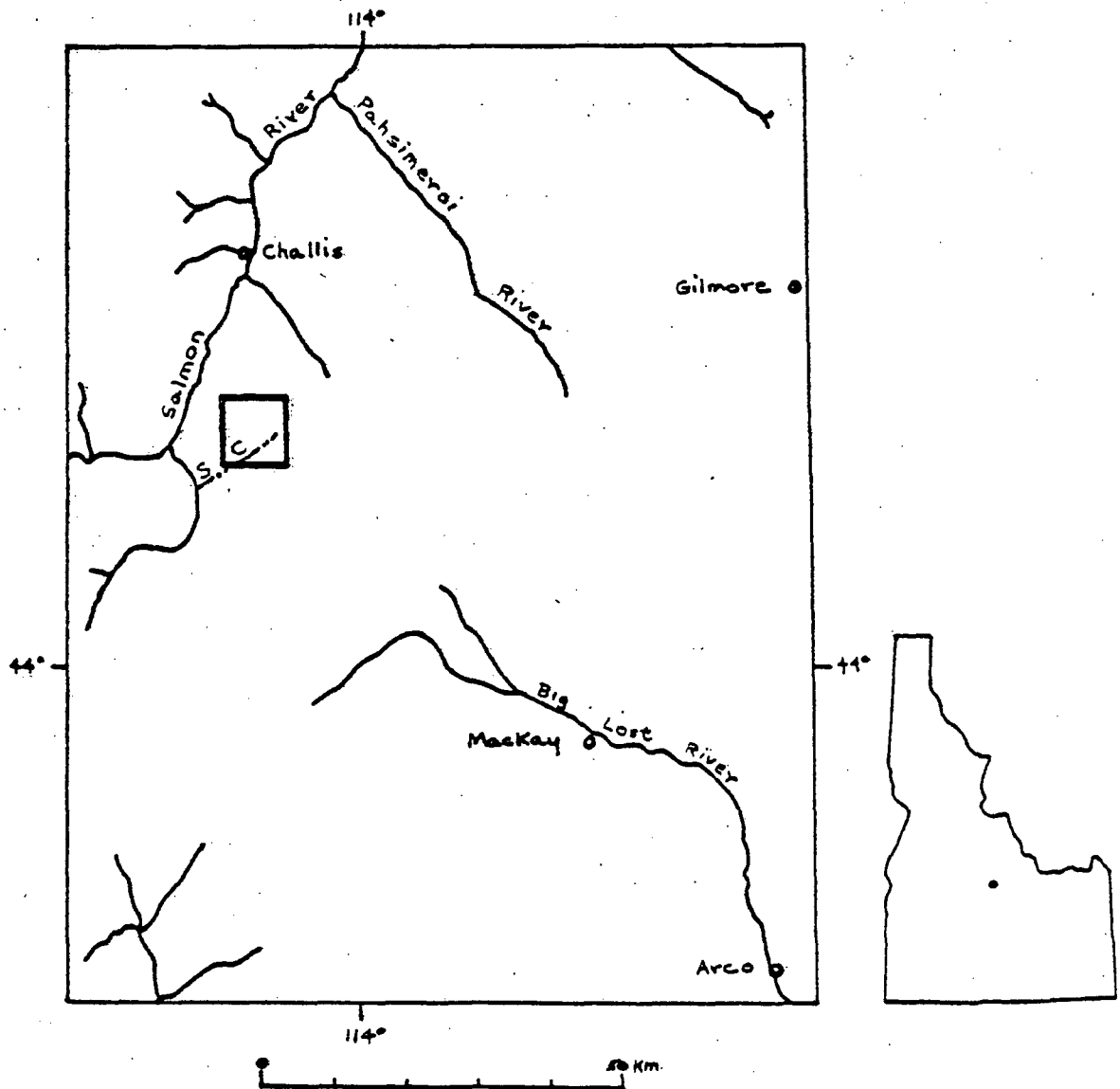
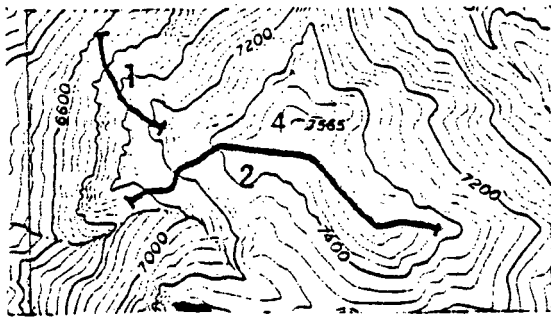
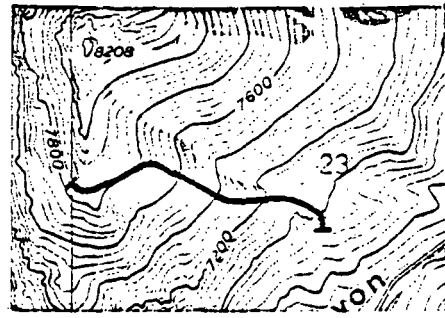


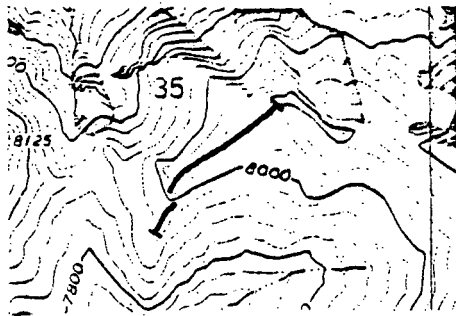
Figure 1.--Area in central Idaho in which sections were measured is indicated by the dot in the outline of the State and by the heavily outlined rectangle in the map of the Mackay-Challis region. SC, Spar Canyon.



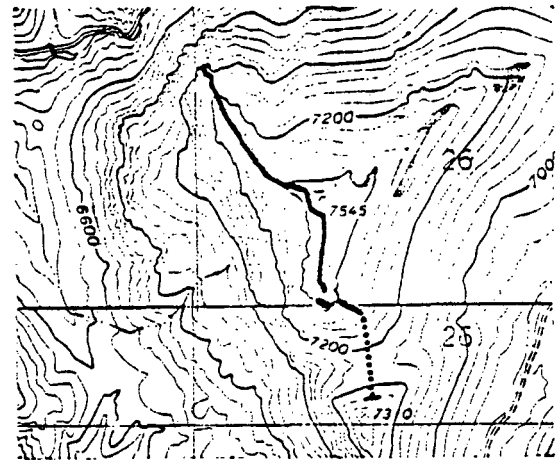
A



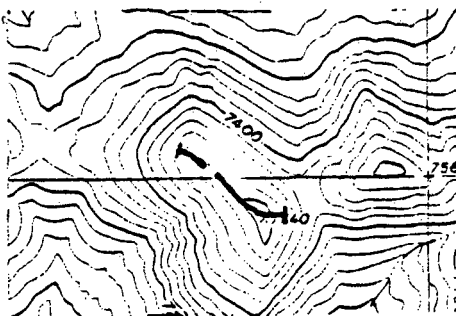
B



C



D



E

Figure 2.--Lines of measured sections, drawn on copies of parts of the Lone Pine Peak and The Paint Pot topographic quadrangles, Idaho (1:24,000 scale; 40-ft contour interval). A-1, Lower Bradshaw Basin Section; A-2, Higher Bradshaw Basin Section (sec. 4, T. 11 N., R. 19 E.); B, Tub Spring--North Section (sec. 23, T. 11 N., R. 19 E.); C, Red Lake Section (sec. 35, T. 12 N., R. 19 E.); D, Tub Spring--South Section (sec. 26, T. 11 N., R. 19 E.); E, Spar Canyon Summit Section (secs. 18 and 19, T. 11 N., R. 20 E.).

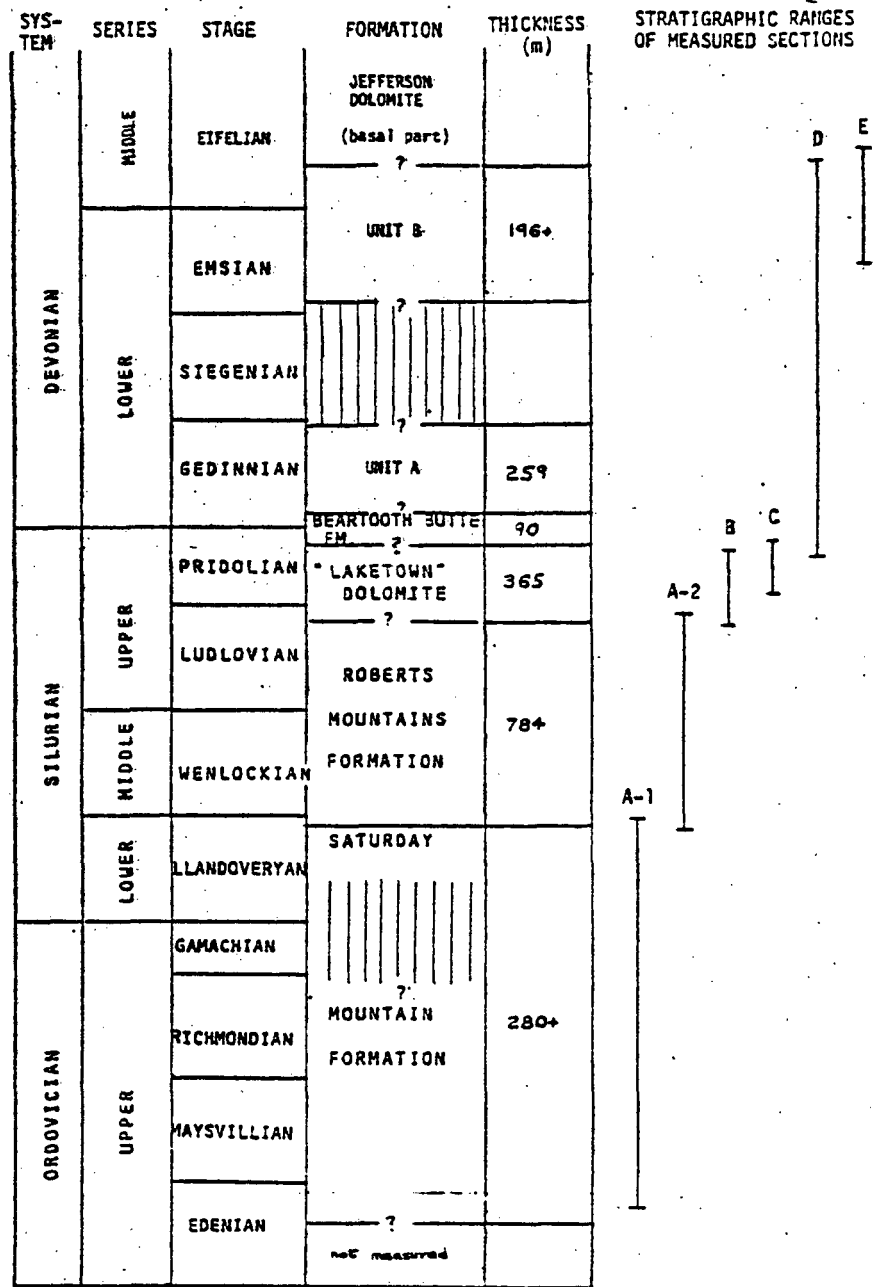


Figure 3.--Ages of some Paleozoic formations in the vicinity of Spar Canyon, Custer County, Idaho, as determined chiefly from conodonts; measured thicknesses; and stratigraphic ranges of individual measured sections. Vertical ruling delimits intervals that may not be represented. Queries indicate uncertainty regarding the age ranges of formations.

Our data do not closely define the age of the Beartooth Butte Formation in this area. No useful fossils were collected from the formation itself. Latest Silurian conodonts were collected closely below the boundary (tables 4, 5), and latest Silurian to earliest Devonian conodonts were collected above it (table 5). The Beartooth Butte may be Silurian or Devonian in age, or, conceivably, it may contain the systemic boundary. The probable disconformity at its base (see Sections C and D) may favor a Devonian age.

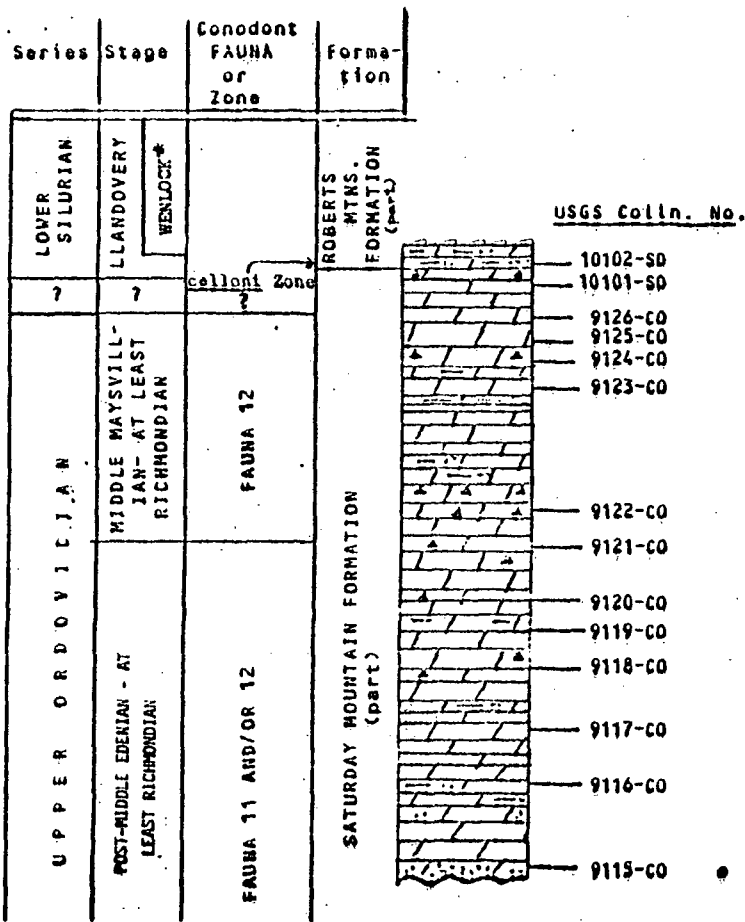
For the most part, rock thicknesses were measured with a steel tape; a Jacob's Staff was used locally. Rock descriptions were written by W. H. Hays while on the outcrop, with the aid of hand lenses, acid, and a rock-color chart, and have been augmented very little by laboratory study. Samples were collected systematically by A. G. Harris from all of the sections, except the Tub Spring--North Section, for conodont analysis. Well-preserved megafossils are uncommon, but J. T. Dutro, Jr., and R. J. Ross, Jr., made several collections. Some of the results of the fossil studies are included in tables 1-6, which are grouped together in the section on paleontology that follows this introduction.

The Tub Spring--South Section was measured and described earlier by Churkin (1961, p. A47-A50) and was called to Hays' attention by C. A. Sandberg. The other sections were located in the course of mapping and, to the writers' knowledge, are described here for the first time. The writers acknowledge the encouragement and cooperation of S. W. Hobbs throughout much of the fieldwork underlying this report.

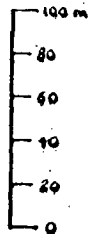
Paleontology

Tables 1-6 are based on fossil collections from the sections measured for this report. They provide fossil identifications, age determinations, conodont zonations, and data on the distribution of selected conodont species. In the right-hand halves of the tables of conodont zonation and distribution, vertical lines connect collections of the same species (if known) or genera.

Table 1A.--Conodont zonation and distribution of selected species in Section A-1, The Lower Bradshaw Section, Lone Pine Peak 7 1/2' Quadrangle, Idaho (by A. G. Harris).



DISTRIBUTION OF SELECTED CONODONT SPECIES



- Apheleognathus cf. A. politus
- Belodina n. sp. ♂
- Brepambistodus suberectus
- Eulodus ulrichi
- Panderodus spp.
- Pseudobelodina dispansa
- Staufferella n. sp. of Sweet
- Plectodina sp.
- Belodina confluens
- Phracnodus undatus
- Plectodina tenuis
- Staufferella? sp.
- Protopanderodus insculptus
- Pseudoneotodus mitratus
- "Acodus" mutatus
- Amorphognathus ordovicianus
- Eulodus n. sp.
- Ozarkodina idhamensis
- Ambalodus galenus s.f.
- Pterospirifer pennatus angulatus

* Based on graptolite collection D374-SD, table 1B

Table 1B.--Other fossil collections from Section A-1

Roberts Mountains Formation

USGS Collection D374-SD, 6.4 m (21 ft) above base of formation recorded in measured section and 11.6 m (38 ft) above alternate lower base discussed in section description.

Graptolites:

CYRTOGRAPTUS? sp.

MONOGRAPTUS of the type of *M. VOMERINUS*

Age: Almost certainly Wenlockian (R. J. Ross, Jr.)

Saturday Mountain Formation

Note: Two collections, 9400-SD and 9144-SD, from near top of formation at locations elsewhere in the Lone Pine Peak 7 1/2' quadrangle suggest late Llandovery ages (J. T. Dutro, Jr.).

USGS Collection 9400-SD, about 3 m below top of Saturday Mountain Formation.

Collection contains:

RESSERELLA Aff. R. SEFINENSIS Walmsley and Boucot

CLORINDA? sp.

ALISPIRA? sp.

CYCLONEMA sp.

Most likely a C1 equivalent.

USGS Collection 9144-SD, about 1 m below top of Saturday Mountain Formation.

Collection contains:

ANTIRHYNCHONELLA? sp.

EOSPIRIFER? sp.

EOCOELIA sp.

SKENIDIODES sp.

DICAELOSIA? sp.

Late Llandovery (C3-C6).

USGS Collection D1947-C0, 276 m (905 ft) below top of formation, in measured section.

Brachiopods: All specimens are fragmented and small.

Identifications to species are virtually impossible; genera are identified with some qualms.

HYPSIPTYCHIA sp. (no cardinal process)

LEPIDOCYCLUS? sp. (very small specimens, only brachial hinge area preserved)

ZYGOSPIRA sp.

dalmanellid (one poorly preserved, small shell).

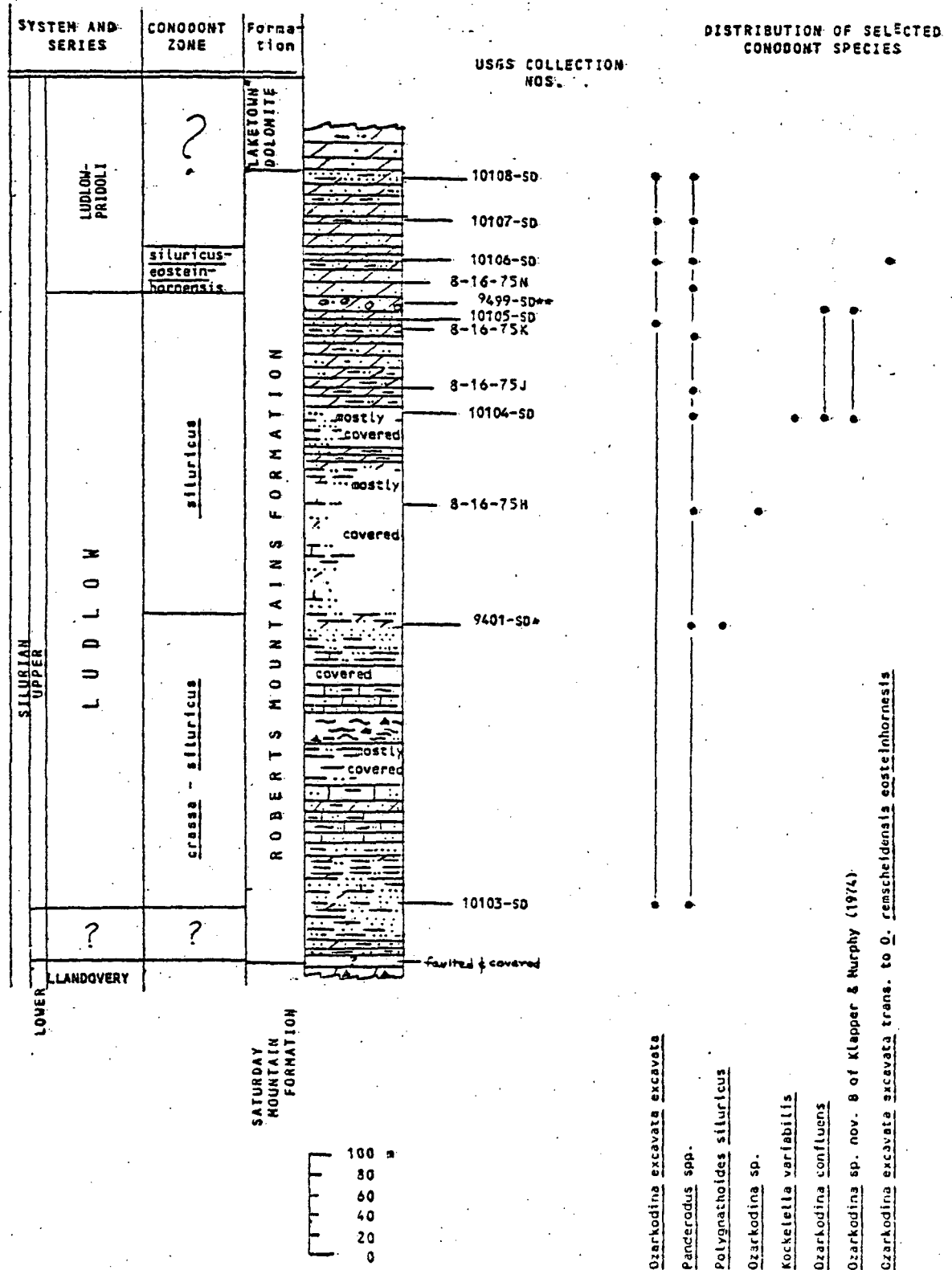
Pelmatozoans--a few plates, coarsely silicified

Conodonts--collections by A. G. Harris cover this interval.

Age: Brachiopods suggest that this is Upper Ordovician but

I cannot pin them down any closer than that (R. J. Ross, Jr.).

Table 2A.--Conodont zonation and distribution in Section A-2, The Higher Bradshaw Basin Section, Lone Pine Peak 7 1/2' Quadrangle, Idaho (by A. G. Harris).



* Conodont collection reported on by J. W. Huddle in 1973 and updated by A. G. Harris.
 ** Conodont collection reported on by A. G. Harris in 1974 and updated as of 1979.

Table 2B.--Other fossil collections from Section A-2 (J. T. Dutro, Jr.)

Roberts Mountains Formation

Note: A brachiopod collection, 9352-SD, from west flank of Pahsimeroi Range, near east edge of Lone Pine Peak 15' quadrangle, suggests that top of formation there is probably no younger than Ludlow.

USGS Collection 9352-SD (field no. Y86A).

Idaho, Custer Co., Lone Pine Peak 15' quadrangle; SW cor. NW 1/4, sec. 1, T. 12 N., R. 20 E.; 487,000 E.; 995,800 N.;
brachiopod from close below base of light-gray "Laketown."
Collector: W. H. Hays, 1973.

This partial pedicle valve of a pentamerid is coarsely recrystallized but shows the spondylium and faint traces of costae on the umbo. It is most likely CONCHIDIUM and thus would indicate a late Wenlock-Ludlow age for the beds from which it was collected.

USGS Collection 9353-SD (field no. Y100H). About 67 m (220 ft) top of Roberts Mountains Formation.

Collection contains:

EOCOELIA? sp.
HARPIDIUM? sp.

Age possibly Ludlow.

USGS Collection 9499-SD (field no. Y98X). About 130 m (427 ft) below top of Roberts Mountains Formation.

Collection contains:

echinoderm debris, indet.
EOCOELIA sp.
eospiriferids, indet.
pentameroids, indet. (may be HARPIDIUM).

Age possibly Ludlow, but pentameroids not definitive.

USGS Collection 9365-SD (field no. Y97A). About 289 m (950 ft) below top of Roberts Mountains Formation.

Collection contains:

CONCHIDIUM sp.
eospiriferoid, indet.
rhynchonelloid, indet.

Age most probably Ludlow.

Note: Dutro has other collections of fragmentary, large pentameroids at 153 and 233 m below top of Roberts Mountains Formation that appear to include both CONCHIDIUM and HARPIDIUM; therefore, probably of Ludlow age.

USGS Collection 9401-SD (field no. Y104 P). About 453 m (1489 ft) below top of Roberts Mountains Formation.

Collection contains:

orthoïd, undet.
STROPHOCHONETES? sp.
CONCHIDIUM sp.
HARPIDIUM? sp.
PENTAMERIFERA? sp.
PLICOCYRTINA sp.
ATRYPA sp.

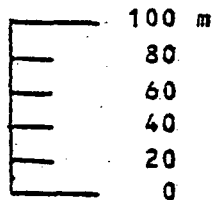
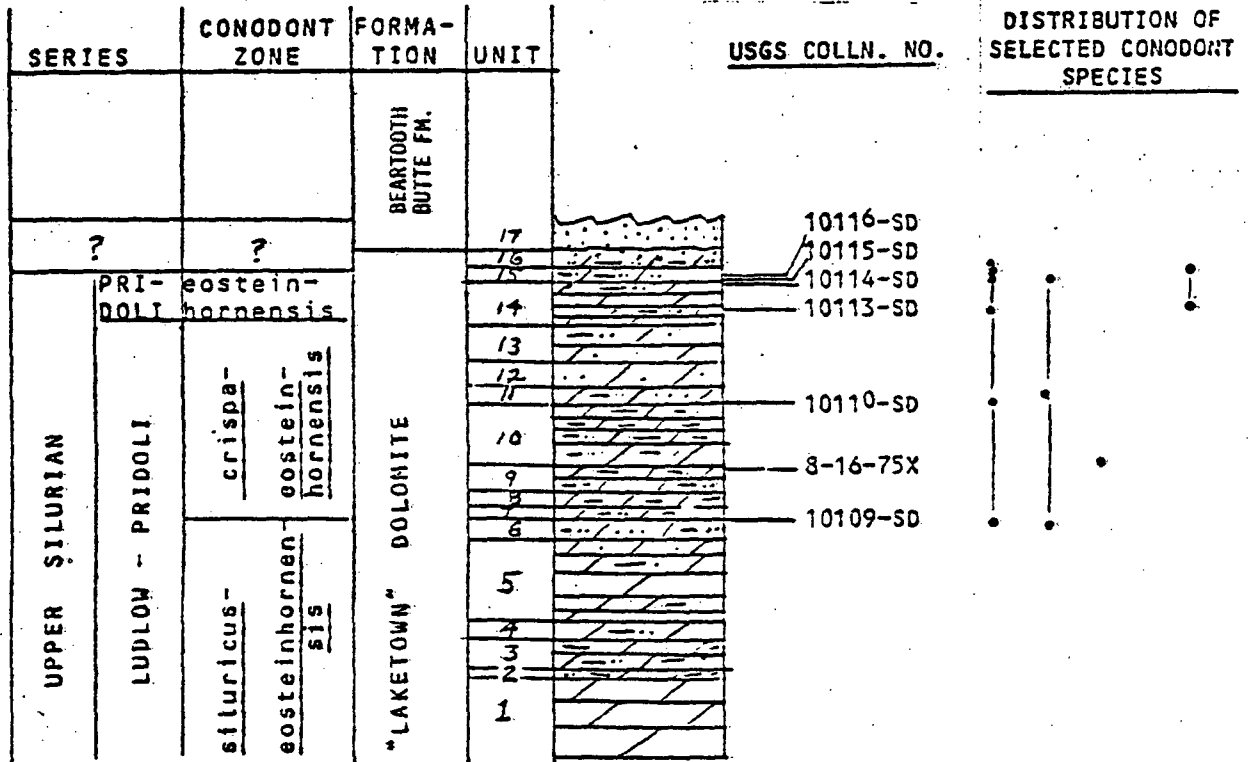
Age is most likely early Ludlow.

Table 3.--Fossil collection from Section B

Roberts Mountains Formation

USGS Collection 9403-SD, 8.7 m below top of formation: Conodonts indicate Late Silurian (early Ludlow, crassa Zone) to Early Devonian age (A. G. Harris).

Table 4.--Conodont zonation and distribution of selected species in Section C, The Red Lake Section, Lone Pine Peak 7 1/2' Quadrangle, Idaho (by A. G. Harris).



Ozarkodina confluens

Pelekysgnathus index

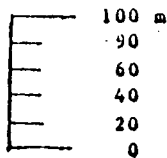
Ozarkodina sp.

Ozarkodina cf. O. remscheidensis
eosteinhornensis

Table 5.--Conodont zonation and distribution in Section D, The Tub Spring--South Section, Lone Pine Peak 7 1/2' Quadrangle, Idaho (by A. G. Harris).

SERIES	STAGE	CONODONT ZONE	FORMATION	UNIT	USGS Colln. nos.	
MIDDLE DEVONIAN	?	?	JEFFERSON DOLOMITE	UNIT B	22	9602-SD
					21	10128-SD
	EIFELIAN	Upper patulus		20	10127-SD	
	?	?		19	10126-SD	
LOWER DEVONIAN	?	?	UNIT A	EMSIAN	18	10125-SD
					17	10124-SD
	?	?		16	10123-SD	
	GEDINNIAN	O. n. sp. D to pasavis		15	10122-SD	
UPPER SILURIAN-LOWER DEVONIAN	Uppermost PRIDOLI to Lowermost GEDINNIAN	O. n. sp. D	BEARTOOTH BUTTE FORMATION	UNIT A	14	10121-SD
					13	covered
					12	covered
					11	9500-SD
UPPER SILURIAN-LOWER DEVONIAN	Uppermost PRIDOLI to Lowermost GEDINNIAN	Uppermost eastainhornensis to westainhornensis	BEARTOOTH BUTTE FORMATION	UNIT A	10	10120-SD
					9	9412-SD
UPPER SILURIAN-LOWER DEVONIAN	Uppermost PRIDOLI to Lowermost GEDINNIAN	Uppermost eastainhornensis to westainhornensis	BEARTOOTH BUTTE FORMATION	UNIT A	8	9608-SD
					7	10119-SD
UPPER SILURIAN-LOWER DEVONIAN	Uppermost PRIDOLI to Lowermost GEDINNIAN	Uppermost eastainhornensis to westainhornensis	BEARTOOTH BUTTE FORMATION	UNIT A	6	10118-SD
					5	10117-SD
Upper Sil.	PRIDOLI	eastainhornensis	LAKETOWN DOLOMITE	UNIT A	4	10117-SD

DISTRIBUTION OF SELECTED CONODONT SPECIES



Ozarkodina confluens

Ozarkodina cf. O. n. sp. E
or C of Klapper & Johnson (1977)

Panderodus spp.

Ozarkodina sp. nov. E of Klapper & Murphy (1974)

Ozarkodina remscheidensis remscheidensis

Ozarkodina buchenensis

Ozarkodina cf. O. stygia

Ozarkodina n. sp. C of Klapper & Johnson (1977)

Ozarkodina johnsoni

Ozarkodina remscheidensis repetitor

Belodella devonica

Belodella triangularis

Panderinellina exigua exigua

Icriodus huddlei celtibericus

Pseudoneotodus beckmanni

Polyanathus inversus

Icriodus corniger retrodepressus

Table 6.--Conodont collections from Section E (by A. G. Harris).

Unit B:

USGS Collection 10130-SD, 5.9 m (19.3 ft) below top of map-unit B and of measured-section unit 6. Conodonts indicate Lower Devonian (upper Emsian) to basalmost Middle Devonian (gronbergi to upper patulus Zones).

USGS Collection 10129-SD, 177 m (581 ft) below top of map unit B and 3.2 m (10.5 ft) above base of measured section unit 1. Conodonts indicate same range of possible age as for Collection 10130-SD above.

Measured Sections

Definitions of terms used in stratigraphic descriptions

Terms used in describing finer grained carbonate rocks:

microscopic grains--grains smaller than sand size
microgranular--composed of microscopic grains
sublithographic--finely microgranular, showing few grains of coarse silt size

Terms denoting the grain sizes of coarser grained carbonate rocks (very fine, fine, medium, coarse, and very coarse) are based on the same size limits as those generally applied to sand grains.

Terms denoting thickness of strata:

very thick beds--thicker than 1.0 m
thick beds--0.3-1.0 m
medium beds--0.1-0.3 m
thin beds--0.03-0.1 m
very thin beds--0.01-0.03 m
thick laminae--3-10 mm
thin laminae--less than 3 mm

Terms denoting type or absence of laminae:

color laminae--laminae defined principally by color to the naked eye
massive--lacking internal stratification, as in case of bed without laminae
ridge-and-groove laminae--laminae evident mainly as alternating ridges and grooves on weathered surfaces; relationship to compositional variation is commonly obscure

Terms denoting shape of float fragments:

flaggy--in almost perfectly tabular bodies thicker than 1 cm
platy--in almost perfectly tabular bodies 1 cm or less thick
slabby--in crudely tabular bodies thicker than 1 cm
thinly slabby--in crudely tabular bodies 1 cm or less thick
blocky--in angular crudely cubical bodies

Some practices followed in describing rock units

Colors of freshly broken surfaces are stated at the beginnings of the descriptions. Colors applied to the rocks in the discussion of the forms of their outcrops and float, generally near the ends of the descriptions, are those of natural surfaces that are weathered to various degrees.

Qualitative terms for relative resistance of the various rocks and rock units (weakly resistant, moderately resistant, highly resistant) are based on observations, at and near the lines of sections, of weathering and erosion of the rocks.

The numbers assigned to collections of fossils from a measured unit are given, in parentheses, at the end of the description of the unit. The stratigraphic distance above the base of the unit of the point at which the collection was made is stated, in meters, following the collection number.

Section A-I, The Lower Bradshaw Basin measured section

[Measured west of Bradshaw Basin, in Lone Pine Peak 7 1/2-minute quadrangle, Idaho, in W. 1/2 sec. 4, T. 11 N., R. 19 E., by J. T. Dutro, Jr., A. G. Harris, W. H. Hays, R. J. Ross, Jr., and L. A. Wilson, August 15, 1975]

	<u>Thickness</u>	
	<u>Meters</u>	<u>Feet</u>

Roberts Mountains Formation (incomplete):

Top of section is at west edge of a covered interval within which there is a concealed high-angle fault of relative east-down displacement. The scale of the geologic map prevented showing these basal beds of the formation west of the fault (Hays and others, 1978.)

14. Dolomite, medium-dark-gray and a little dark-gray, microgranular, variably muddy; a few beds sandy (very fine sand). Thick beds; abundant thin (<1-3 mm) regular laminae, produced by variations in silt or sand content that are expressed on weathered surfaces by variations in gray color and by light-gray probably secondary silica. A little intraformational flat-pebble conglomerate. Cleavage parallel to lamination common. Graptolites fairly common in float, 2-7 m above base. Weakly resistant; forms low angular outcrops and float of plates and small blocks on flat topographic step supported by the more resistant dolomite below. Weathered colors are medium dark gray to medium gray, commonly with a yellow cast. Basal contact appears conformable in outcrop. (Fossil collections: D 374-SD, 6 m; 10102-SD, 3 m)-----

9	30
---	----

Total of Roberts Mountains Formation
(incomplete)-----

9	30
---	----

Section A-1, The Lower Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Saturday Mountain Formation:

13. Dolomite, dark- to medium-dark-gray, microgranular, slightly silty, thick-bedded. Fairly continuous tabular bodies of dark-gray chert, 0.6-4 cm thick, common in interval 1-3 m above base. Few laminae other than crude ridge-and-groove laminae on surfaces near base. Moderately resistant; forms blocky ledges of almost pure medium-dark-gray surface color. (Fossil collection: 10101-SD, 0.3 m)
- The top of this dark unit is an horizon of topographic as well as lithologic change and was selected as the top of the Saturday Mountain Formation in mapping the Lone Pine Peak quadrangle (Hays and others, 1978). The base of this unit, 0.3 m below fossil collection point 10101-SD, is an alternate top for the formation and is favored by R. J. Ross, Jr., on the basis of regional lithologic correlations. It is surely closer to the systemic boundary (table 1-A)-----
- | | | |
|--|----|----|
| | 5 | 17 |
| | | |
| 12. Dolomite, medium-dark- to medium-light- and light-olive-gray, microgranular, fairly pure. Medium to thick beds (mainly about 0.3 m) are well defined; little lamination. Moderately resistant; forms blocky but clearly layered ledges with fairly smooth medium-light- and light-gray, and yellowish-gray surfaces. (Fossil collection: 9126-CO, 2 m)----- | 18 | 59 |
| | | |
| 11. Dolomite, very similar to that in underlying unit but without chert. Weathers to nearly pure medium-dark- to medium-light-gray; some poorly defined color banding on weathered surfaces in lower part. (Fossil collection: 9125-CO, 3 m)----- | 11 | 36 |
| | | |
| 10. Dolomite, medium-dark-gray, microgranular, rather pure, thick-bedded. Medium-dark- to medium-gray chert in varying amounts, in nodules and discontinuous layers as much as 5 cm thick, commonly weathering brownish. Moderately resistant; forms irregularly angular ledges and low outcrops of rather pure medium-dark- to medium-gray surface color; local white specks mark fossil debris. (Fossil collection: 9124-CO, 0.1 m)----- | 8 | 26 |

Section A-1, The Lower Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Saturday Mountain Formation--Continued

- | | | |
|---|----|-----|
| <p>9. Dolomite, medium-dark- to medium-gray, microgranular, purer than underlying unit, thin- to thick-bedded. Numerous thin to thick, brown-weathering, discontinuous siliceous laminae; some consist of groups of paper-thin anastomosing layers; some are probably silty or muddy. Moderately resistant; forms blocky cliffs; surface colors are medium light gray with yellow or pink cast, and light olive gray. (Fossil collection: 9123-C0, 33 m)-----</p> | 44 | 143 |
| <p>8. Dolomite, medium-dark- to medium-gray, microgranular, muddy, thin- to medium-bedded (mainly 5-20 cm); few laminae. Weakly to moderately resistant; represented near base only by float; ledges and low outcrops higher in unit; weathered colors grayish orange to medium light gray with yellow cast.</p> | | |
| <p>Some change in attitude of beds and possible faulting at base of unit-----</p> | 12 | 40 |
| <p>7. Dolomite, medium-dark-gray, microscopic and very fine grains; very thick, poorly defined beds. Prominent lamination in almost all of unit; thin to thick laminae weather medium dark to medium light gray and also vary in grain size, the darker laminae being finer grained; laminae commonly contorted and broken, probably tectonically. Some medium-dark- to light-gray chert in upper half of unit in contorted laminae and nodules; weathers brownish. Moderately resistant; forms irregularly surfaced ledges and cliffs. Line of section passes through west half of a prominent cleft in a rock ledge within this unit-----</p> | 10 | 32 |

Section A-1, The Lower Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Saturday Mountain Formation--Continued

- | | | |
|--|----|-----|
| <p>6. Dolomite, medium-dark- to medium-gray, very fine to fine-grained; scattered coarser grains; rather pure. Almost massive; poorly defined, very thick beds as much as several meters thick. Medium-dark-gray chert in irregular bodies as much as 4 cm thick in a few beds; fairly continuous layer of brown-weathering chert and cherty dolomite, as much as 5 cm thick, 22 m above base. Moderately resistant; forms fairly smooth to irregularly angular ledges and cliffs; surfaces are medium dark to medium gray and, in small part, medium light gray, commonly mottled; white specks representing pelmatozoan fragments common. Upper 15 m tend to weather a little lighter and to contain less pelmatozoan debris. (Fossil collections: 9122-CO, 48 m; 9121-CO, 30 m; 9120-CO, 18 m)-----</p> | 51 | 168 |
| <p>5. Dolomite, medium-dark- to medium-gray, very fine grained, slightly clayey or muddy. Beds very thick (maximum 1.5 m), but numerous thick laminae give thin-bedded appearance; laminae are discontinuous, siliceous, and partly sandy (very fine sand). Moderately resistant; forms yellowish-gray, blocky ledges and cliffs on which siliceous laminae weather brown-----</p> | 7 | 23 |
| <p>4. Dolomite, medium-dark-gray; mixed microscopic and very fine grains; much purer than underlying unit, partly a little silty or very sparsely sandy. Medium to very thick beds (maximum 1.3 m); rare dark chert nodules; secondary quartz veinlets common. Moderately resistant; forms blocky to irregularly angular ledges and cliffs; surfaces fairly smooth, mainly medium- to medium-light-gray, partly mottled. (Fossil collections: 9119-CO, 49 m; 9118-CO, 33 m; 9117-CO, 4 m)-----</p> | 49 | 161 |

Section A-1, The Lower Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Saturday Mountain Formation--Continued

<p>3. Dolomite, medium-gray, light-olive-gray, and yellowish-gray, mixed microscopic and very fine grains; argillaceous or muddy. Bedding obscured by prominent crude oblique cleavage; some silty and sandy (very fine sand) laminae. Weakly to moderately resistant; forms low outcrops and slabby float; weathered surfaces are grayish orange, yellowish gray, and light-brownish gray. (Fossil collection: 9116-C0, 11 m)-----</p>	32	104
<p>2. Dolomite, similar to that below but containing less sand; some beds without sand. Sand is very fine to mixed fine and medium. Some medium-dark-gray chert nodules and lenses 20 m above base; siliceous veinlets common. Moderately resistant; forms irregularly angular ledges and angular float of medium-light-gray to light-brownish-gray-----</p>	24	80
<p>1. Dolomite, sandy, and subordinate dolomitic sandstone, brownish-gray. Dolomite is very fine grained; sand is in mixtures of fine to medium or fine to coarse grains and becomes less common upward. Medium to thick beds (maximum 50 cm); some sandy laminae and cross laminae; partly silicified, most commonly in sandy laminae; crosscutting quartz veinlets. Moderately resistant; forms irregularly angular ledges of light-brownish-gray. (Fossil collections: 9115-C0, 6 m; D 1947-C0, 5m)-----</p>	9	31
<p>Total of Saturday Mountain Formation (incomplete)-----</p>	280	920

Base of section is at altitude of about 6,640 ft, a little above and west of the lowest outcrops on the slope. Below base, beds of sandy dolomite and dolomitic sandstone appear to be contorted. Observations elsewhere in Lone Pine Peak quadrangle suggest that base of section is within several tens of meters of base of Saturday Mountain Formation (top of Middle Ordovician Kinnikinic Quartzite).

Section A-2, The Higher Bradshaw Basin measured section

[Measured west of Bradshaw Basin, in the Lone Pine Peak 7 1/2-minute quadrangle, Idaho, in N 1/2 S 1/2 sec. 4, T. 11 N., R. 19 E., by W. H. Hays, 1973]

Thickness
Meters Feet

"Laketown" Dolomite (incomplete):

- | | |
|--|--------------|
| 41. Dolomite, medium-light- to (mainly) light-gray, very fine to fine-grained, generally no more than slightly silty, very slightly to moderately sandy (very fine to medium sand grains); thick, mainly weakly defined beds; very few laminae. Characterized by light color and relative purity and coarse grain size. Moderately resistant; forms small ledges and lower surfaced outcrops with blocky to rounded, fairly smooth surfaces of light- to very light gray, commonly with a yellow cast. Basal contact probably conformable----- | 27.9 92 |
| Total of "Laketown" Dolomite (incomplete)----- | |
| | 27.9 92 |

Roberts Mountains Formation:

- | | |
|---|--------------|
| 40. Sandstone, silty, and sandy siltstone, interbedded in about equal proportions; dolomitic, locally siliceous; medium gray and mottled gray; sand is predominantly very fine but as coarse as medium. Thick beds; few laminae. Forms abundant slabby float and scattered low-surface outcrops of yellowish-gray and grayish-orange to yellowish-brown surface colors. Locally, south of line of section, includes discontinuous bodies, as much as 4 m thick, of dolomite similar to that of unit 41. (Fossil collection: 10108-SD, 12 m)-- | 16.7 55 |
| 39. Dolomite, medium-dark- to medium-gray, microgranular to fine-grained, moderately to highly silty and sandy or highly silty. Sand is mainly mixed very fine and fine, partly mixed very fine to medium. Thick to very thick beds; irregular inconspicuous lamination common. Moderately resistant, except for thinly cleaved interval near top; forms blocky ledges with rough surfaces of medium-light- to light-gray and a little medium-gray----- | 9.0 30 |

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation--Continued

38. Dolomite, medium-dark- to light-gray, mostly highly sandy, partly highly silty with little or no sand. Sand ranges from very fine to mixed very fine to medium. A few beds in lower part contain coarse bioclastic dolomite grains. One bed, below middle, is dolomitic, variably siliceous sandstone. Medium to thick beds, mostly massive; a few thin, siliceous laminae and small irregular siliceous nodules; a few thick, brown-weathering, especially sandy laminae; local crude oblique cleavage. Unit is weakly to moderately resistant; forms low ledges and float-covered slopes. Outcrops are blocky and range from smooth to jaggedly cleaved; surfaces are mainly light gray to yellowish gray and light olive gray. (Fossil collection: 10107-SD, 12 m)----- 36.9 121
37. Two intervals of moderately resistant, mainly ledge-forming dolomite separated by an interval, 6.1-9.2 m above base, of weakly resistant dolomite and a little quartzite. The ledge-forming dolomite is medium dark to medium gray and, in small part, light gray; very fine to fine grained except for varying amounts of coarser, bioclastic, commonly crinoidal grains; almost all is sparsely to highly sandy, the sand ranging from very fine to mixed very fine to medium. Some of the ledge-forming dolomite is intraformational conglomerate, containing angular to subrounded fragments of dolomite mostly less than 5 cm long but as long as 12 cm. Thick to very thick (maximum 1.4 m) beds; almost no lamination. Nearly all beds contain small irregular siliceous bodies, 0.5-3.0 cm in long dimension, many of which are highly sandy and some of which contain or consist of crudely silicified corals, brachiopods, and other fossils. Forms irregular-surface ledges, somewhat mottled but mostly medium brownish or medium light gray. The upper 5.6 m of the unit differs somewhat in containing almost no sand, weathering medium dark gray, and containing both silicified and nonsilicified fossils of the types mentioned, and probable large crinoid ossicles.

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation--Continued

The weakly resistant interval intercalated in the lower part of the unit consists of 2.8 m of dolomite similar to that of unit 36, medium dark to medium gray, microgranular to very fine grained, silty, mostly a little sandy (very fine to mixed very fine and fine sand); obscurely defined beds. Many very light gray, thin, siliceous laminae that are variously continuous; most are fairly regular, and some are grouped in sets as much as 1 cm thick; a few thicker siliceous laminae. Represented by float and low, angular, irregular outcrops; surfaces are medium to medium light gray. Immediately below this interval is 30 cm of quartzite, distinctly laminated, that appears to contain mixed, very fine to medium sand grains. (Fossil collections: 9353-SD, 25 m; 10106-SD, 3m)-----

29.0 95

36. Dolomite, medium dark- to medium-gray, microgranular to very fine grained, silty; mostly a little sandy (very fine) and some, in upper part, highly sandy. Bedding indistinct; thin siliceous laminae abundant, somewhat more regular and continuous than in unit 35. Bed near middle contains many small, irregular siliceous bodies, some of which are probably poorly preserved fossils. Tends to cleave parallel to lamination. Weakly resistant; underlies nearly flat shelf on ridge crest; low outcrops with irregular, angular, medium-gray surfaces-----

12.4 41

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet.

Roberts Mountains Formation--Continued

35. Dolomite, medium- to medium-light-gray in lower part, medium-dark- to medium-gray in upper part; microgranular to very fine grained; mainly highly sandy; in lower part, a few beds more silty than sandy; sand is very fine to mixed very fine and fine. Beds medium to thick; light-colored, thin, irregular, discontinuous, siliceous laminae, like the wispy laminae of unit 32, common throughout, partly appearing braided on weathered surfaces. Discontinuous layers of sandstone, 0.5-2.0 cm thick, in lower 6 m weather out as brown ridges. Crudely silicified corals and other fossils in bed at top. Moderately resistant; forms low, irregular-surface ledges of medium- to medium-light-gray. (Fossil collection: 8-16-75N, 17 m)----- 22.5 74
34. Dolomite, medium-dark- to medium-gray, microgranular to very fine grained, silty, slightly sandy (very fine) in part. Not clearly divisible into beds. Very light gray, siliceous laminae abundant in most of unit; they are thin, fairly regular, variably continuous, and 1-20 mm apart. Thicker and more irregular siliceous laminae and crosscutting veinlets common near base. Moderately resistant; forms low, irregular, blocky ledges that tend to break parallel to bedding and weather medium gray.
- Base of unit 34 is at peak of hill, at altitude of about 7,580 ft----- 3.3 11

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation--Continued

33. Dolomite, much of which is intraformational conglomerate, in three beds, 0.3-3.0 m thick, interlayered with subordinate sandy and silty dolomite and bioclastic dolomite. Dolomite in the three conglomeratic beds is mostly medium dark gray; it is very fine to fine grained, except for some microgranular pebbles in conglomerate; mainly sparsely to moderately sandy. Sand ranges from very fine to mixed fine and medium with a few coarse grains. Dolomite stones in conglomerate are angular to subrounded, as large as 10 cm. Many small, irregular silicified bodies, some of which are crudely preserved brachiopods, corals, bryozoa, and crinoid ossicles. Moderately resistant; forms blocky ledges, medium dark gray to light gray, from which brown-weathered silicified bodies protrude.

Interlayered with the above is dolomite, medium dark gray, very fine grained, rather highly sandy (mainly very fine) or silty, locally silicified. Some shows many thin, siliceous laminae similar to those in unit 32. Weakly resistant; low angular outcrops.

One thick bed of bioclastic dolomite, medium dark gray, coarse grained, partly silicified, at top. Beds near top are contorted, probably by minor faulting. (Fossil collection: 9499-SD, 9 m)-----

9.5

31

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation--Continued

- | | | | |
|-----|--|------|----|
| 32. | Dolomite, medium-dark-gray, locally mottled or streaked with dark-gray, very fine grained, highly silty, partly sandy (very fine); very thick beds, poorly defined. Abundant, very light gray, siliceous laminae, discontinuous, thin (mainly 1 mm or less), spaced a few millimeters to 20 mm apart throughout unit; some are planar and continuous for many centimeters; some are wispy (wavy or irregular and no more than a few centimeters long); some are grouped in ropelike sets a few centimeters thick. A few thicker, silicified sandy layers, a few centimeters thick. Tends to break parallel to bedding or to jointing. Weakly resistant; slabby to blocky float and many low-surface medium- to medium-light-gray outcrops that are smooth surfaced except for tiny ridges formed by siliceous laminae. (Fossil collection: 10105-SD, 2 m)----- | 12.4 | 41 |
| 31. | Dolomite, upper half is medium dark gray, sandy (very fine to coarse grains), partly silicified, moderately resistant; forms small brownish ledge; pinches and swells along strike. Lower half is medium gray, silty, thinly laminated (both faint-color laminae and siliceous laminae), weakly resistant----- | 2.7 | 9 |
| 30. | Sandstone, dolomitic, and dolomite, sandy; medium dark to medium gray; dolomite partly bioclastic. Partly silicified; highly resistant; seems to vary in thickness along strike----- | .9 | 3 |
| 29. | Dolomite, microgranular, finely silty. Upper 4 m is medium dark gray to medium gray; very thin to thin, discontinuous siliceous laminae common; weathers medium light to light gray. Lower 1 m strongly color banded, consisting of fairly continuous layers, 10-50 mm thick, of dark- to medium-dark-gray dolomite, weathering medium dark gray, light gray, and grayish orange. Unit partially silicified, moderately resistant; forms ledge together with unit 30----- | 5.1 | 17 |

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation--Continued

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|--|----------------------------|
| <p>28. Single bed of dolomite, mostly intraformational conglomerate. Matrix is medium dark to medium gray, mainly very fine to fine grained; scattered coarser bioclastic grains; much is sandy (very fine to mixed fine to medium sand); numerous small, irregular silicified bodies, many of which are corals and brachiopods. Angular to subrounded dolomite stones in the conglomerate are mainly less than 5 cm long but are as large as 15 cm; subequant to tabular; variable in grain size, color, and sand content. Moderately resistant; forms blocky ledge; surface roughened by protruding, brown-weathering, siliceous bodies-----</p> | <p>2.0 7</p> |
| <p>27. Dolomite, silty and sandy, and dolomitic siltstone and sandstone, medium-dark- to medium-light-gray to grayish-red. Dolomite microgranular to very fine grained. Sand, most abundant near top, is mostly very fine but ranges to mixed very fine to medium. Medium to thick beds; some fresher rock shows faint, thin color laminae and wavy, thin to thick, highly silty or sandy laminae. Most is obliquely cleaved. Weakly to moderately resistant; upper part forms small cleaved ledges; lower part forms slope of slabby float and low outcrops. Weathers to medium and medium light gray to yellowish brown and pale red. (Fossil collection: 8-16-75K, 35.5 m)-----</p> | <p>36.1 117</p> |
| <p>26. Dolomite, dark- to (most) medium-dark-gray, microgranular, muddy or silty. Several types of layering on weathered surfaces of much of unit: color bands, 3-10 cm thick, in medium dark to medium light gray, commonly with yellow or olive cast; thin to thick siliceous laminae, weathered brown, fairly regular and continuous, commonly in clusters; and faint, thin color laminae. Moderately resistant. Lower 3 m is only float; rest forms irregularly blocky ledge. Beds somewhat contorted; probably minor faulting at both upper and lower contacts-----</p> | <p>16.3 53</p> |

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation--Continued

25. Dolomite, medium-dark- to medium-gray, thick-bedded. Two interlayered lithologies: (1) microgranular to very fine grained silty dolomite, a little of which is sandy, showing abundant thin laminae--faint, fairly continuous color laminae in most of rock and discontinuous light-colored siliceous laminae in part; (2) subordinate, less silty, little laminated dolomite that is mainly very fine to fine grained, some of which is intraformational conglomerate and most of which contains scattered fossil debris and silicified horn corals, brachiopods, and segments of crinoid stems. A few beds of both lithologies contain thick (0.5-8 cm), brown-weathering, silicified layers and pods, at least some of which were originally especially sandy or silty. Moderately resistant; crops out fairly continuously in gentle slope and low ledges. Silty dolomite is thinly slabby to blocky; purer dolomite is blocky. Surface colors are mainly medium to medium light gray, commonly with olive, orange, or pink cast. Large pentamerid brachiopods in medium (nearly 1 m) bed that weathers light olive gray, about 5 m above base. (Fossil collection: 8-16-75J, 20 m)----- 22.3 73
24. Dolomite, muddy, and dolomitic mud shale, medium-gray to pale-red, microgranular; faint, thin color lamination; fissile parallel to bedding; weakly resistant. A bit of silty and sandy jasperoid near base. (Fossil collection: 10104-SD, 2 m)----- 6.6 22
23. Float only. Mainly brown slabs of dolomitic siltstone and sandstone and highly silty or sandy dolomite, some partly silicified; some blocks of purer dolomite came from outcrops to east. Concealed fault crosses lower part of this interval; displacement probably thins the section (east relatively down) and is probably not large----- 35.2 115

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation--Continued:

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|---|-------------------------------------|
| <p>22. Dolomite, dark-gray to, more commonly, medium-dark-gray and brownish-gray; microgranular to very fine grained and highly muddy, silty or sandy (very fine), except for two bioclastic beds a little below the middle, which are coarser grained and purer. Thick beds; some show thin laminae, either faint color laminae or discontinuous silty and sandy laminae. A few crudely silicified corals in a few beds. Moderately resistant; forms low-surface outcrops and mainly blocky float; weathered surfaces medium gray with olive or brown cast or olive gray. (Fossil collections: 9365-SD, 9 m; 8-16-75H, 2 m)-----</p> | <p>19.5 64</p> |
| <p>21. Covered interval. Float indicates that interval consists of calcareous and dolomitic, silty, very fine sandstone and smaller amounts of dolomitic siltstone, siltite, very fine quartzite, and impure, thinly cleaved limestone. (About middle of interval is the highest occurrence of this limestone lithology, which is common lower in the section.) The dolomitic and calcareous rocks are mainly light brownish gray to pale red, weathering moderate to grayish brown; some quartzite and siltite is light gray. Float mainly thin slabs, partly small blocks-----</p> | <p>146.0 479</p> |
| <p>20. Siltstone, dolomitic and partly calcitic, partly sandy (very fine sand), and a little dolomite, silty; light brownish gray to pale red; some faint color laminae; partly roughly cleaved about parallel to bedding. Weakly resistant; fairly continuous low-surface outcrops of moderate brown. Upper 2 m brecciated, partly silicified, more resistant-----</p> | <p>6.4 21</p> |
| <p>19. Dolomite, medium-dark-gray, microgranular, silty, thick-bedded; some faint, thin color laminae; low outcrops with surface color of medium to medium light gray, mostly with pink, yellow, or orange cast. Associated with and, in part, passes laterally into subordinate siltier dolomite and dolomitic siltstone that is cleaved and forms reddish slabby float. (Fossil collection: 9401-SD, 1 m)-----</p> | <p>3.3 11</p> |

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation--Continued

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|---|---------------------------|
| <p>18. Quartzite, silty, very fine except for few fine grains (lowest sand as coarse as fine that is recorded in this section of formation); siltite, commonly sandy; and siliceous, slightly calcareous sandstone and siltstone. Rocks are brownish gray, pale red, and medium gray; thick beds; common faint color banding like that in unit 17. Resistant; forms small ledges, low outcrops, or angular float; brownish-gray, light-brown, and medium- to medium-light-gray surfaces. Breccia at and near top suggests shearing about parallel to bedding-----</p> | <p>20.2 66</p> |
| <p>17. Siltstone and, about equally, silty, very fine grained sandstone, variably calcareous and siliceous; pale red, medium to light brownish gray, and medium light gray; thick to very thick, mostly obscure beds; subdued color banding, 1 mm to several centimeters thick and fairly regular and continuous, common on weathered surfaces; tends to cleave parallel to bedding or at higher angle. Moderately resistant hard rock; forms prominent ledge of sharply angular, irregularly blocky form and a talus slope-----</p> | <p>17.6 58</p> |
| <p>16. Interval covered by talus; cobble and small boulder-size angular slabs from unit 17. Top of unit drawn in talus where lowest outcrops of rock of unit 17 type project to line of section-----</p> | <p>20.3 67</p> |

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation--Continued

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|---|------|-----|
| <p>15. Impure limestone (about 75 percent), siltstone, and very fine sandstone. Impure limestone, medium-dark to medium-light-gray, light-brownish-gray, and purplish-gray; microgranular; muddy, silty, or sandy (very fine). Bedding obscure; little lamination; cleavage well developed, at low angle to bedding. Weathers to medium light to light gray, pale red, and light brownish gray. Subordinate siltstone and very fine sandstone, calcareous, light brownish gray, pale red, and medium light gray; thick to very thick beds (maximum 2 m); some faint color laminae; crude cleavage; weathers pale to moderate brown. Whole unit is weakly resistant, forming gentle slope of many low-surface outcrops and float of plates and thin slabs-----</p> | 40.0 | 131 |
| <p>14. Sheared, partially silicified interval of (a) jasperoid, (b) partly silicified silty, muddy, and sandy (very fine sand) rock, and (c) a little quartzite. Fresh surfaces are moderate and grayish red to very light gray. Original lithology of most is uncertain. Shearing apparent on steeply dipping surfaces that strike almost parallel to beds; some brecciation preceded silicification. Highly resistant; forms large brown and reddish-brown ledge-----</p> | 18.7 | 61 |
| <p>Line of section leaves crest of ridge here, and lower units are measured on slope to southwest.</p> | | |
| <p>13. Covered interval. Float of very fine sandstone, siltstone, and a little sandy siltite, calcareous or dolomitic, pale red or light brownish gray, weathering to pale to moderate brown and pale reddish brown-----</p> | 40.2 | 132 |
| <p>12. Limestone, medium-dark-gray and light-brownish- and light-purplish-gray; microgranular; muddy, silty, or sandy (very fine sand); a little lamination; strongly cleaved. A little mudstone, siltstone, and sandstone, calcareous, light brownish gray to pale red. Unit is weakly resistant; forms platy and thinly slabby float and scattered low-surface outcrops-----</p> | 16.2 | 53 |

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation--Continued

11. Dolomite, dark- to medium-gray, partly with brown cast; microgranular; muddy, partly sandy (very fine sand); medium to thick beds, commonly almost massive, locally shows faint, thin color laminae or brown-weathered sandy laminae. Unit somewhat sheared; includes a little reddish siltstone that may be sheared, altered dolomite. Moderately resistant; forms low ledges with irregular blocky surfaces of olive gray to moderate or pale yellowish brown----- 13.4 44

10. Limestone and subordinate interlayered mudstone, siltstone, and sandstone. Limestone, medium-gray and, more commonly, light-brownish-gray to light-purplish-gray, weathering the same; microgranular; muddy or silty and partly sandy (very fine sand). Beds very thick (maximum at least 3 m) and poorly defined; many without lamination; some show faint color laminae, mostly thin. Strong cleavage oblique to bedding causes disintegration into thin, slightly irregular plates.

Subordinate mudstone, siltstone, and very fine sandstone, light-gray to pale-red, dolomitic, and perhaps partly calcareous. Bedding and lamination similar to those of limestone. Cleavage much poorer than that of limestone, more irregular and more widely spaced, locally almost absent. Disintegrates into small slabs and blocks of various brown colors. These poorly cleaved dolomitic rocks form only about 25 percent of unit at line of section. Viewing this slope more widely, it is clear that these rocks and the limestone are commonly lateral equivalents, the change occurring rather abruptly. To the northwest, the dolomitic rocks are dominant.

Unit is weakly to moderately resistant; forms low, discontinuous ledges, mostly thinly cleaved or flaggy, and float-covered slope----- 34.3 112

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation--Continued

9. Sandstone, siltstone, and minor dolomite. Sandstone, very fine, silty, and siltstone, partly sandy; medium light gray to pale red; thick to very thick beds; faint, thin, regular color laminae common; fair to good cleavage common, parallel to bedding or more steeply dipping. Weakly resistant; forms low, discontinuous ledges of moderate to pale brown and mostly jagged cleaved forms.

At top of unit and near base are thin discontinuous layers of dolomite, medium dark gray, very similar to unit 8. Layers are sheared and are much thicker (maximum more than 1 m) 15 m northwest of line of section-----

9.2 30

Base of unit 9 is on small shelf, at altitude of about 7,220 ft. Slope on underlying units is steeper.

8. Dolomite, dark- to medium-gray, microgranular, silty or muddy, sandy (very fine sand) near base and at top. Beds medium to very thick, weakly defined; many distinct, regular, thin to thick color laminae; probable planar cross lamination locally. Resistant; forms blocky ledge with fairly smooth surfaces of medium gray with olive cast, light olive gray, grayish yellowish brown, and a little grayish orange---

4.8 16

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation--Continued

7. Siltstone, mudstone, dolomite, and minor limestone and sandstone. Siltstone and mudstone dominant; mainly light brownish gray to pale red, partly medium light gray, yellowish gray, and light purplish gray, weathering about the same; partly sandy (very fine sand); mainly dolomitic, probably partly calcareous. Beds thick to very thick (maximum 3 m); many are massive; many show fairly continuous thin to thick, faint to prominent color laminae, accompanied locally by minor ribbing of surfaces; a few highly sandy laminae; a little cross lamination; partly cleaves parallel to bedding or more steeply. Weakly resistant; forms low ledges, lower outcrops and a few thin intervals of only float; outcrops either jagged and cleaved or fairly smooth and rounded; float platy and thinly slabby.

Several intervals, 1-2 m thick, of dolomite, medium dark to medium gray and a little dark gray, microgranular to very fine grained; a little is coarser grained and bioclastic; mostly muddy; partly silty and sandy (very fine sand). Thick beds, many faint, thin to thick color laminae; a few sandy laminae and secondary siliceous laminae. Moderately resistant; forms low ledges of light olive gray, medium gray, moderate yellowish brown, and grayish orange.

A little muddy limestone and dolomitic very fine grained sandstone of appearance similar to that of the siltstone and mudstone. Unit is variably sheared about parallel to bedding----- 42.4 139

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation--Continued

6. Siltstone and subordinate interlayered dolomite. Siltstone, partly sandy and grading in upper part of unit into slightly silty, very fine grained sandstone; light brownish gray, pale red, and grayish to moderate red; mainly dolomitic, partly probably calcareous. Beds thick to very thick (maximum 2 m); some very faint color lamination; some cleavage about parallel to bedding. Moderately resistant; forms ledges and cliffs with irregular angular form; float mainly thinly slabby to flaggy. Weathers colorfully to various brown and red hues.
- Subordinate (about 30 percent of unit)
interlayered dolomite, much like that of units 7 and 8; a little is bioclastic. Layers, probably originally as thick as 2 m, have been sheared about parallel to bedding, so as to pinch and swell; local evidence of soft-sediment deformation; a few small quartz veins. (Fossil collection: 10103-SD, 31 m----- 32.8 108
5. Silty sandstone and siltstone, light brownish gray, dolomitic, commonly laminated, very similar to that of unit 3 except for absence of slump structures and intraformational conglomerate. Upper half represented only by float----- 6.0 20
4. Dolomite, dark- to medium-dark-gray, microgranular and a little very fine grained, muddy; beds medium to thick; regular, continuous, thin, siliceous laminae abundant; sheared; forms ledge----- 1.0 3

Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation--Continued

<p>3. Equal parts of siltstone, partly sandy, and silty sandstone. Both are mainly light brownish gray, partly light purplish gray; all sand very fine. Beds thick to very thick; faint to fairly prominent, thin to thick color laminae and thicker color bands common, mostly regular and continuous. A few beds show evidence of soft-sediment deformation; several contain intraformational conglomerate. Weakly to moderately resistant; forms ledges interspersed with slopes of lower-surface outcrops and float. Most outcrops have rounded, smooth or slightly ribbed surfaces of light brownish gray to moderate brown. Probable minor fault, trending about parallel to strike of beds, a little below top of unit; upper contact sheared-----</p>	<p>9.8 32</p>
<p>2b. Interval covered by talus from overlying units. Concealed high-angle fault, forming base of unit, has dropped eastern (stratigraphically higher) block relatively down, thinning the section and eliminating lower part of Roberts Mountains Formation here. Location of fault under talus is estimated-----</p>	<p>3.0 10</p>
<p style="text-align: right;">Total of Roberts Mountains Formation-----</p>	<p><u>784.0 2,572</u></p>

The measured thickness of the formation can only approximate the true thickness. Obvious faults and shear zones are mentioned but are ignored in measurement. Two obvious faults, between units 2a and 2b and within unit 23, probably thin the section moderately. Other faults, perhaps concealed by float or represented by shear zones, may affect the thickness measured here.

Saturday Mountain Formation:

<p>2a. Lower part of talus interval whose upper part is described above as 2b; assigned to uppermost Saturday Mountain Formation-----</p>	<p>0.9 3</p>
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Section A-2, The Higher Bradshaw Basin measured section--Continued

Thickness
Meters Feet

Saturday Mountain Formation--Continued

1. Dolomite, dark- to medium-dark-gray, very fine grained; rather pure, in contrast to overlying rocks; thick bedded. Lower 2.5 m contains tabular bodies of dark-gray chert, generally 0.5-2.0 cm thick, that weather dark brownish gray. A few faint, thin to thick color laminae near base. Moderately resistant; forms low blocky ledges whose rather smooth surfaces are medium dark gray to medium gray. Correlates with measured unit 13 in Lower Bradshaw Basin

Section----- 4.6 15

Total of Saturday Mountain Formation
(incomplete)----- 5.5 18

Section B, The Tub Spring--North measured section

[Measured north of Spar Canyon, northwest of Tub Spring, in Lone Pine Peak 7 1/2-minute quadrangle, Idaho, by W. H. Hays, 1973. Base is near middle of eastern edge of sec. 22, T. 11 N., R. 19 E.; top is a little south of middle of sec. 23, T. 11 N., R. 19 E.]

	<u>Thickness</u>	
	<u>Meters</u>	<u>Feet</u>

"Laketown" Dolomite (probably almost complete)

Impure upper member (probably almost complete)

Top of section is at stratigraphic base of interval of float and scattered small outcrops in which rock similar to that of unit 12 appears contorted and fractured. This interval is bounded, downslope, by the Eocene Challis Volcanics; and there is no evidence of the Beartooth Butte Formation, which stratigraphically overlies the "Laketown" Dolomite, on this northern side of Spar Canyon.

- | | | |
|---|-------------|-----------|
| <p>12. Dolomite, mostly medium gray, partly medium light gray; slight pinkish cast common. Microgranular to very fine grained. Most is slightly to moderately silty or sandy or both; a little is highly so. Beds medium and well defined. Lamination common; most common are variably well developed, thin ridge-and-groove laminae and commonly thicker regular laminae that show variation in crystal size or in silt or sand content and commonly show slight color contrasts on weathered surfaces; a few thin, brown-weathering siliceous laminae. Unit is mainly weakly resistant and represented by float; scattered blocky outcrops have fairly smooth surfaces of light olive gray, yellowish gray, and light gray with a yellowish cast; locally stained reddish. Faulting of unit is not indicated but is possible-----</p> | <p>22.2</p> | <p>73</p> |
|---|-------------|-----------|

Section B, The Tub Spring--North measured' section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (probably almost complete)--Continued

Impure upper member (probably almost complete)--Continued

- | | |
|--|---------------------------|
| <p>11. Dolomite, a little lighter colored than that of unit 12, mostly medium light gray; pinkish cast common. Microgranular and very fine grained except in basal 4.6 m, where it is very fine to fine grained. Slightly to moderately silty or sandy or both; sand is very fine, except for rare floating fine and medium grains. Beds of medium thickness and well defined; few laminae other than well-developed, thin ridge-and-groove laminae in few beds, mainly near base. Unit weakly resistant. Low-surface outcrops fairly continuous at line of section, their blocky form controlled by the bedding; they disintegrate into blocks with smooth surfaces. Weathered surfaces light olive gray in lower part of unit and mainly light gray, yellowish gray, and pale grayish orange in upper part, which is locally hematite stained---</p> | <p>19.8 65</p> |
| <p>10. Dolomite, medium-light- to light-gray, partly with a pink cast, microgranular to very fine grained, generally moderately silty and partly sandy. A few highly sandy or silty beds. Sand is very fine, rarely with a few rounded, fine, medium, and even coarse grains. Beds medium to thick. Siliceous, fairly continuous, thin, brown-weathering laminae common, at least in part siltier or sandier than rest of rock; a few fairly continuous ridge-and-groove laminae. A few highly silty, weakly resistant beds cleave parallel to bedding and show greenish phyllitic partings. Unit mainly moderately resistant, forming small blocky ledges with finely irregular surfaces of grayish orange to light gray, locally mottled with medium light gray-----</p> | <p>7.4 24</p> |

Section B, The Tub Spring--North measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (probably almost complete)--Continued

Impure upper member (probably almost complete)--Continued

- | | |
|--|--------------------------|
| <p>9. Dolomite, medium-light to light-gray, commonly with olive cast, and light-olive-gray. Microgranular (most) to very fine grained, mainly moderately to highly silty or muddy, partly highly sandy (very fine sand). Beds thick, mostly rather obscure; some thin, brown-weathering, highly silty or sandy, discontinuous laminae, variably siliceous. Most of silty and sandy rock tends to break into flags, 1.5-5.0 cm thick; the muddy rock tends to break into thinner slabs. Unit weakly to moderately resistant; forms small ledges, blocky overall, but slabby in detail, interspersed with float. Weathers mainly pale grayish orange to dark yellowish orange and moderate brown; bed near base weathers light gray-----</p> | <p>7.1 23</p> |
| <p>8. Dolomite, medium-light- to light-gray with pink cast, to pale-red. Microgranular to fine grained, mostly very fine grained; mostly only slightly silty, partly moderately silty and sandy (very fine sand). Beds thick to very thick (maximum 1.4 m); some thin, irregular, brown-weathering, siliceous laminae and a few thin ridge-and-groove laminae. Unit moderately resistant; forms blocky ledge having fairly smooth surfaces of grayish orange to light gray-----</p> | <p>2.5 8</p> |

Section B, The Tub Spring--North measured section--Continued

	<u>Thickness</u>	
	<u>Meters</u>	<u>Feet</u>

"Laketown" Dolomite (probably almost complete)--Continued

Impure upper member (probably almost complete)--Continued

7. Interval covered by colluvium at line of section. Exposure of upper 12 m of unit on small ridge about 30 m northeast of line of section consists of variably silty or silty and sandy dolomite and about an equal amount of dolomitic siltstone and sandstone. Siltstone and sandstone are grayish orange, yellowish gray, and pale red; medium- to very thick bedded (maximum 3 m); cleavage parallel to bedding forms slabs, 2 cm or less thick. Impure dolomite is similarly colored except that some is light gray; microgranular; thick bedded; mostly breaks into flags, 2-20 cm thick. Sand in unit is very fine, partly with a few fine grains. Both lithologies show some greenish phyllitic partings. Unit weakly resistant; commonly marked by abruptly reduced steepness of slope, relative to that of underlying units; forms slabby float and some small ledges and lower surface outcrops of grayish-orange, yellowish-gray, and pink. Covered base of unit approximately located-----

17.0	59
------	----

Measured impure upper member (probably almost complete, judging from measured section D nearby)-----

76.0	249
------	-----

Section B, The Tub Spring--North measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (probably almost complete)--Continued

Lower member:

- | | |
|--|--------------------|
| <p>6. Dolomite, mainly medium-light to light-gray, partly very light gray, light-brownish-gray, and light-olive-gray; microgranular to fine grained, mostly very fine grained. Much of lower 8 m and most of rest of unit contains a little silt or silt and sand (very fine to mixed fine and medium sand). Bioclastic grains probably rare or absent. Beds well defined, mostly thick, partly of medium thickness near top. Faint, thin, ridge-and-groove laminae fairly common; some secondary siliceous veinlets. Unit moderately resistant; forms blocky ledges with finely irregular surfaces; elephant-hide texture fairly common on bedding surfaces. Weathered color mainly light gray, commonly with yellow, orange, or pink cast; a little pale grayish orange, yellowish gray and pale yellowish brown. Breccia zone, 20 m above base, 1 m thick, trends N. 10° E.; does not appear to be continuous to north. Upper several meters of unit covered-----</p> | <p>33.0 108</p> |
| <p>5. Dolomite, mostly light-gray, partly medium-light-gray, rarely medium-gray or very light gray; pinkish or brownish cast common. Grain size ranges from microscopic to mixed medium and coarse but is predominantly in range of very fine to mixed fine and medium; few grains have clearly bioclastic forms. Almost pure; rarely slightly sandy (mixed very fine and fine sand) or silty. Thick beds, mostly poorly defined, partly well defined near base and at a few higher levels; generally massive; a little thin ridge-and-groove lamination. Unit moderately resistant; forms almost continuous outcrops, including many ledges. Outcrops mostly somewhat rounded, blocky only where beds are well defined; joints common. Surfaces predominantly light gray, some approaching very light gray; grays partly almost neutral but commonly surfaces are pale grayish orange, and surfaces of rare medium-gray dolomite are medium to medium light gray-----</p> | <p>99.0 325</p> |

Section B, The Tub Spring--North measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (probably almost complete)--Continued

Lower member--Continued

<p>4. Dolomite, medium-light- to very light gray, microgranular to fine-grained, generally sparsely to moderately sandy and commonly a little silty. Sand is mixture of very fine or fine to medium grains. Beds well defined, medium to thick. Bed near top shows thin, discontinuous, brown-weathering laminae and cross laminae. Unit moderately to highly resistant; forms rather blocky ledges with fairly smooth surfaces of light- and very light gray to yellowish-gray-----</p>	13.1	43
<p>3. Dolomite, mostly light gray, partly very light gray; some near top and base has pink or yellow cast. One thick bed, 5.2 m below top, is medium gray. Generally very fine to fine grained; some coarser grains in central and upper parts that are at least partly crinoidal; a few crinoid stem segments. Almost pure; some beds close to base and top contain sparse, very fine to medium sand grains. Beds predominantly thick; partly very thick (maximum 1.5 m) in middle and upper parts; generally massive and poorly defined, so that attitude is unclear. Joints oblique to bedding common. Unit generally moderately resistant, forming low, rounded ledges. Surfaces fairly smooth except for irregularities produced by jointing. Basal several meters is highly resistant, forming ledges and small cliffs on crest of ridge. Weathered colors are generally light to very light gray, commonly with yellow, orange, or pink cast; a bit of yellowish gray and pale grayish orange-----</p>	144	472
<p>Total lower member-----</p>	289	948
<p>Measured "Laketown" Dolomite (probably almost complete)-----</p>	365	1,197

Section B, The Tub Spring--North measured section--Continued

Thickness
Meters Feet

Roberts Mountains Formation (incomplete):

2. Dolomite, medium-dark- to medium-gray, microgranular to very fine grained. Some highly silty with little sand; most highly sandy. Sand mainly very fine; a few grains as coarse as medium. Beds medium to thick. Thin, irregular, discontinuous, brown-weathering, siliceous laminae common; many are grouped so as to resemble ropes on surfaces normal to them. A little poorly developed oblique cleavage. Unit weakly to moderately resistant; forms small ledges and lower outcrops at line of section, and upper 2.5 m forms lower part of small cliff whose upper part is in unit 3. Outcrops have irregular blocky form and are light olive gray, pale yellowish brown, and grayish yellowish brown. Forty-five meters to the south, along strike, unit is largely represented by float of cleavage slabs and blocks weathering moderate yellowish brown. Upper 1.5 m of unit differs from general description in its being gradational into "Laketown" Dolomite in its lighter colors and lower silt and sand content. Top of unit drawn rather arbitrarily, within a few meters, at base of slightly lighter weathering bed----- 7.8 26

Section B, The Tub Spring--North measured section--Continued

	<u>Thickness</u>	
	<u>Meters</u>	<u>Feet</u>
Roberts Mountains Formation (incomplete)--Continued		
1. Dolomite, medium-dark to medium-gray, partly red or brown stained. Ranges from dolomite that is very fine or fine grained, locally contains coarser crinoidal grains, and contains little silt or sand to dolomite that is microgranular to very fine grained and contains much sand, silt, or both. Most sand is very fine; some includes numerous fine and medium grains. Beds thick to very thick (maximum 2.0 m); little lamination except in upper 2.0 m, where thin, regular, fairly continuous, brown-weathering, sandy laminae are common. Unit mainly moderately resistant, forming blocky ledges; base is highly resistant, forming small cliff. Surfaces are medium to light gray, partly with yellow or olive cast and partly mottled yellowish gray. (Fossil collection: 9403-SD, 10 m-----	11.1	36
Measured Roberts Mountains Formation (incomplete)-----	18.9	62

Slope below unit 1 is covered by slabby talus of Roberts Mountains Formation for a long distance.

Section C, The Red Lake measured section

[Measured south of Red Lake, on and near ridge crest in S 1/2 sec. 35, T. 12 N., R. 19 E., Lone Pine Peak quadrangle, by W. H. Hays, 1973. Base of unit 1 is at westernmost peak above 8,200 ft altitude on ridge crest near north edge of SE 1/4 of section]

	<u>Thickness</u>	
	<u>Meters</u>	<u>Feet</u>

Beartooth Butte Formation (incomplete):

Top of section is at top of basal, well-exposed part of Beartooth Butte Formation. To the southwest, higher parts of the formation are represented by float and widely scattered outcrops of light-gray to medium-light-gray quartzite.

17. Quartzite, generally very light gray; a little near base is as dark as medium light gray; some brown and orange stain. Mostly very fine grained or mixture of very fine and fine grains, but some is fine grained or mixture of fine and medium grains; well sorted. Most apparently feldspathic; most of finer grained quartzite highly so. Beds mainly poorly defined, medium to thick (maximum 65 cm); some faint lamination and cross lamination. Moderately resistant; forms low blocky outcrops and coarse, angular float with smooth, mainly very light gray, partly grayish orange and light-brownish-gray surfaces.

Base of unit probably a sedimentary disconformity. Southwest of top of unit and of measured section, float and widely scattered outcrops of very light gray to medium-light-gray quartzite form all of end of ridge-----

	16.5	54
Measured Beartooth Butte Formation (incomplete)-----	<u>16.5</u>	<u>54</u>

Section C, The Red Lake measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (incomplete):

Impure upper member:

16. Dolomite and sandstone. Upper part is sandstone, grayish orange pink and pale brown; mainly very fine grained; some fine and medium and rare coarse grains; silty; slightly dolomitic; no feldspar visible. Lower 6 m of unit predominantly dolomite, pale red and light red, highly silty, partly phyllitic and partly sandy (very fine or mixed very fine to medium sand grains); minor dolomitic sandstone of similar color near base. Beds of unit apparently medium to thick; some sandy laminae; stratification obscured by strong oblique cleavage. Unit weakly to moderately resistant; partly discontinuous in outcrop but mostly forms low ledges, mainly with jagged surfaces and grayish-orange to light- and moderate-brown surface colors----- 8.8 28.9

15. Upper 4.5 m covered by float of Challis Volcanics. Lower 3 m dolomite, medium light gray, grayish pink, and pale red, microgranular, silty and partly sandy (very fine sand), forming low-surface, blocky, isolated outcrops surrounded by float similar to that of unit 14, upslope. (Fossil collections: 10116-SD, 2 m; 10115-SD, 1.3 m)--- 7.5 24.6

14. Dolomite and minor sandstone. Dolomite, generally light- and medium-light-gray to pale- and light-red; the highly silty beds tend to the red colors; one medium dark-gray bed near top. Mainly microgranular, partly very fine grained, generally moderately to highly silty; about a third of beds are sandy, containing either very fine sand or mixtures of very fine to medium or fine to medium sand; one interval near top is muddy and shows phyllitic cleavage surfaces.

Dolomitic sandstone forms 1-m interval in middle of unit and few thin beds and laminae in sandy intervals of dolomite; similar to sandy dolomite except for local very light gray color.

Section C, The Red Lake measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (incomplete)--Continued

Impure upper member--Continued

Unit well bedded; beds thin to medium (6-20 cm), commonly massive; some thin to thick, markedly sandy laminae and faint color laminae; crude oblique cleavage common in siltiest and sandiest beds. Resistance weak to moderate; forms gentle slope interrupted by small discontinuous ledges of blocky or jaggedly cleaved form; float mainly thin to thick slabs whose long dimensions were parallel to bedding, cleavage, or incipient jointing. Dolomite weathers mainly light gray with yellow or orange cast and pale grayish orange; a little silty dolomite weathers pink or pale red; sandstone and highly sandy dolomite weathers mainly moderate brown. (Fossil collections: 10114-SD, 24.5 m; 10113-SD, 10 m)-----

28.0 92.0

13. Dolomite in wide range of colors; mainly light and medium light gray to light brownish gray and pale red and partly variegated in these colors; about 20 percent medium to medium dark gray, mainly near base of unit and at top. Microgranular to very fine grained; a little of lighter colored rock is sublithographic. Slightly to highly silty; partly sandy; sand mainly very fine, partly mixtures of very fine to medium and, rarely, coarse grains. Well-defined beds, mainly of medium thickness. Lamination well developed; most common are (a) mainly of faint to distinct, thin to thick color laminae that are fairly continuous and reflect, in at least many cases, differences in content of sand, silt, and finer impurities, and (b) thin to thick, discontinuous ridge-and-groove laminae, which are common to purer beds and partly correspond with color laminae. Moderately resistant; includes western-most peak on ridge; forms blocky ledges with fairly smooth surfaces.

Section C, The Red Lake measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (incomplete)--Continued

Impure upper member--Continued

Weathered surfaces mainly light gray with orange, yellow, or pink casts; partly medium to medium-light-gray with orange or yellow casts; uncommonly grayish orange, yellowish gray, and moderate orange pink. At top of unit is rather distinctive interval, about 2 m thick, of medium-dark-gray, silty, partly laminated, slabby dolomite that is recognizable on ridges southeast of line of section-----

21.3 70.0

12. Impure slabby dolomite and minor sandstone at the base grade to purer blocky dolomite at the top. Dolomite, mainly pinkish gray to pale red, partly light gray and moderate red, the less pure dolomite tends to be most reddish. Microgranular to very fine grained; ranges gradationally from highly silty and sandy and partly phyllitic near base, which includes a few beds of dolomitic sandstone, to moderately silty and only a little sandy near top; sand mainly very fine but locally includes fine and medium grains. Beds thin to thick (maximum 40 cm); thick beds uncommon in purer dolomite. Thin to thick laminae, siltier or sandier than enclosing rock and fairly regular, are closely to widely spaced in many beds, weathering to brownish colors; some faint ridge-and-groove lamination on purer beds. Weakly to moderately resistant; forms ledges except in basal 2 m, which is mainly covered by float. Ledges of highly impure dolomite in lower half roughened by irregular but well-developed oblique cleavage and weather to grayish-orange to moderate-brown colors and slabby float; blocky ledges of purer dolomite weather light gray with orange or pink cast-----

15.0 49.3

Section C, The Red Lake measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (incomplete)--Continued

Impure upper member--Continued

11. Dolomite and one bed of sandstone. Purer dolomite, mainly light (most) to medium light gray, commonly with slight pink cast and uncommonly pale red; microgranular or mixture of microscopic and very fine grains; slightly to moderately silty; partly sparsely sandy (mixed very fine and fine sand). Subordinate less pure dolomite forms two intervals near middle of unit, pale red to light red, microgranular, rather highly silty and commonly a little sandy (very fine sand), obliquely cleaved. One thin bed of slightly dolomitic sandstone, light gray, consisting of mixed fine and medium quartz grains, near base of unit.

Unit well bedded; beds mainly of medium thickness, partly thin. Faint ridge-and-groove laminae fairly common in purer dolomite and thin, brown-weathering, irregular siliceous laminae in all dolomite. Unit moderately resistant. Purer dolomite forms blocky ledges weathering to light-gray with orange or yellow cast; surfaces smooth except for small ribs produced by laminae and siliceous veinlets. Less pure dolomite forms low-surfaced jagged outcrops mainly grayish orange to moderate orange pink. (Fossil collection: 10110-SD, 2 m)-----

10.1 33.1

Section C, The Red Lake measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (incomplete)--Continued

Impure upper member--Continued

10. Dolomite and a little sandstone; dolomites similar to those of unit 11 but proportions differ. Impure dolomite dominant, mainly grayish orange pink to pale red and moderate red, partly yellowish gray and light gray with brownish cast, generally microgranular or mixture of microscopic and very fine grains, silty or muddy; about half sandy, at least in laminae; some highly sandy (sand mainly mixture of very fine and fine grains but commonly includes a few medium and rarely a few coarse grains). Crude oblique cleavage common; some cleavage surfaces very light greenish gray and phyllitic. Subordinate purer dolomite similarly colored but none so red as moderate red, microgranular to very fine grained, less silty or muddy and less commonly sandy than dominant dolomite, not cleaved. A few thin beds of dolomitic sandstone and siltstone in upper part of unit.

Unit well bedded; beds mainly of medium thickness, partly thin and thick. Silty and sandy, partly siliceous laminae common, especially in upper third; laminae irregular to fairly regular, thin to thick, weather brownish and commonly protrude from surfaces; some contorted by soft-state deformation.

Resistance ranges from moderate to weak, depending mainly on development of cleavage. Impure dolomite forms jagged cleaved outcrops and thinly slabby float; weathers mainly grayish orange and partly pale grayish orange, moderate brown, grayish orange pink, and pale red. Subordinate purer dolomite forms blocky, fairly smooth surface ledges whose colors range from light gray with orange cast to pale grayish orange-----

34.2 112.0

Total impure upper member----- 125.0 410.0

Section C, The Red Lake measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (incomplete)--Continued

Lower member (incomplete):

- | | | |
|---|-------------|-------------|
| <p>9. Dolomite, light-gray, commonly with slight pinkish, yellowish, or brownish cast. Grain size ranges from microgranular to mixture of very fine to coarse grains; mainly slightly to moderately silty; scattered grains of very fine or mixed very fine to medium sand in few beds. Beds mainly medium to thick (maximum 40 cm), thin to medium in upper 7 m. Thin, silty, and locally sandy siliceous laminae fairly common, especially in lower part; they are irregular and fairly continuous and project as brownish ridges on weathered surfaces. A few thin ridge-and-groove laminae. Some bull quartz in upper part, but virtually continuous outcrops give no indication of appreciable faulting. Unit moderately resistant; forms blocky ledges and lower outcrops that have fairly smooth to finely hackly surfaces; weathering colors mainly light-gray with orange or yellow cast, partly very pale grayish orange, mainly grayish orange near base. (Fossil collection: 8-16-75X, 18 m)-----</p> | <p>19.3</p> | <p>63.4</p> |
| <p>8. Dolomite and a little sandstone. Dolomite, light brownish gray (most) and pale red, microgranular, silty or muddy. Beds of medium thickness (10-15 cm); a few show thin silty laminae; a few paper-thin greenish shaly partings; cleavage parallel to bedding common. A few thin beds of light-gray, dolomitic, very fine grained sandstone in lower part. Unit weakly to moderately resistant; outcrops discontinuous, blocky to cleaved, and grayish orange or light gray with orange cast; thinly slabby float-----</p> | <p>8.1</p> | <p>26.6</p> |

Section C, The Red Lake measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (incomplete)--Continued

Lower member (incomplete)--Continued

7. Dolomite, light-gray, generally with slight yellow, brown, or pink cast; a little irregularly distributed pale-red color. Ranges from microgranular to mixture of very fine and fine grains; commonly slightly to moderately silty; sparse very fine and fine sand in a few beds. Beds medium to thick (maximum 65 cm) and fairly well defined; few laminae other than thin, widely spaced, irregular, partly sandy, siliceous laminae in some beds. Moderately resistant; forms ledgy outcrops of blocky form; surfaces fairly smooth to hackly; weathered colors light gray, pale grayish orange, and a little grayish orange pink. (Fossil collection: 10109-SD, 1.5 m)----- 8.4 27.6

6. Dolomite and minor siltstone and sandstone. Dolomite, mainly light gray, commonly with slight brownish cast; partly pale red; uncommonly light olive gray. Microgranular to very fine grained; moderately to highly silty; a few beds contain sparse to abundant very fine sand. Beds thin to medium (5-15 cm), sharply defined. Thin laminae produced by concentrations of silt and sand common, fairly regular and continuous; range from obscure to prominent; partly siliceous and brown weathering. Minor interbedded sandy dolomitic siltstone and dolomitic sandstone similar in color and appearance to dolomite; sand very fine or mixture of very fine and fine.

Unit weakly resistant; forms low-surface outcrops with blocky to cleaved surfaces of yellowish brown, yellowish gray, grayish orange, and (less common) pale red; most disintegrates into thin slabs, 0.5-3 cm thick, elongate parallel to bedding. A little breccia at base indicates probably minor faulting about parallel to bedding----- 5.8 19.0

Section C, The Red Lake measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (incomplete)--Continued

Lower member (incomplete)--Continued

5. Dolomite, generally light-gray, very light gray, or light-pinkish-gray; a little light brownish gray; orange pink to pale red patches prominent discontinuously in a few beds. Mostly very fine grained or partly so; rarely fine grained; commonly microgranular near top. Mostly almost pure; some distinctly silty; silty rock commonly contains very fine sand and uncommonly contains sand as coarse as medium. Beds medium to thick, well defined, generally massive except for common, thin, obscure ridge-and-groove laminae; several beds in upper 7.5 m contain one or more irregular, siliceous, brown-weathering, sandy, or silty and sandy laminae, some of which stand out as ridges on weathered surfaces. Moderately resistant; crops out fairly continuously as blocky ledges with smooth to hackly surfaces; weathered surfaces mainly light to very light gray with slight yellow, orange or pink cast; partly pale grayish orange, grayish pink and pale red. Low thin float-covered interval near middle of unit shows a little float of brecciated dolomite that suggests minor faulting----- 51.0 168.0

Section C, The Red Lake measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (incomplete)--Continued

Lower member (incomplete)--Continued

- | | |
|---|---------------------|
| <p>4. Dolomite, light-gray, generally with a pink or brown cast, mostly microgranular or very fine grained; a little fine grained; slightly to highly silty. Upper 1.5 m and basal 0.2 m sandy; sand grains mainly very fine but as coarse as medium. Beds thick in available outcrops; faint, thin, ridge-and-groove laminae common. In one highly sandy bed near top, sandiest areas are irregularly distributed on surfaces normal to bedding and weather out yellowish brown. Fissility parallel to bedding common; some oblique cleavage in lower part. Weakly to moderately resistant; lower two-thirds of unit represented mainly by thinly slabby float. Weathers light-gray with yellow or pink cast and yellowish gray. A little breccia and iron stain near base suggest minor faulting about parallel to bedding-----</p> | <p>9.4 30.8</p> |
| <p>3. Dolomite, mainly light gray with slight pink cast; a little medium light and very light gray; secondary pale-red color irregularly distributed locally in upper part of unit. Mostly fine-grained or mixture of fine and medium grains; almost pure or, less commonly, sparsely sandy (mixture of very fine to medium sand). A little ranges from microgranular to mixture of very fine and fine grains; this type commonly contains much silt or silt and very fine sand and sparse sand grains as coarse as medium. Beds generally thick, mainly poorly defined, massive. Moderately resistant; forms ledgy outcrops roughened by joints but having generally rounded form. Weathered surfaces fairly smooth or pitted; light gray with slight yellow, orange, or pink cast; pale-red rock in upper part weathers pink-----</p> | <p>16.8 55.2</p> |

Section C, The Red Lake measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (incomplete)--Continued

Lower member (incomplete)--Continued

2. Dolomite, predominantly light gray, partly medium light gray; ranges from microgranular to a mixture of very fine and fine grains. Nearly all is at least slightly silty and sparsely to highly sandy; sand very fine or mixture of very fine to medium grains. Beds thick. Thin ridge-and-groove laminae common; a few cross laminae; laminae of both types commonly associated with variations in sand and silt content, locally siliceous. Highly resistant; forms small peak on ridge and ledgy outcrops of blocky form. Weathered surfaces light gray with slight yellow cast, locally mottled with very pale orange, partly ribbed by resistant laminae----- 8.6 28.2

1. Dolomite, light-gray, commonly with slight pink cast. Mainly mixtures of very fine and fine or fine and medium grains; a little microgranular or medium grained. Mostly almost pure; some finer grained beds contain much very fine or mixed very fine to medium sand; some other beds contain sparse sand. Beds thick, generally massive, commonly indistinct; rare thin sandy laminae. In upper half of unit, pink and pale-red color irregularly distributed in some beds, apparently related to local, irregular silicification. Joints common, oblique to beds. Moderately resistant; forms ledges cut by joints but having generally rounded form; surfaces commonly roughened in detail by small irregular pits, a few centimeters in diameter. Except for surface expression of local secondary pink and pale-red colors, weathered surfaces are light-gray with slight pink, yellow, or orange cast----- 44.4 146.0

Measured lower member (incomplete)----- 172 565

Total measured "Laketown" Dolomite (incomplete)- 297 975

Top of unit 1 and of measured section placed arbitrarily at peak on ridge. Similar dolomite continues in outcrop to east.

Section D, The Tub Spring--South measured section

[Measured south of Spar Canyon and south-southwest of Tub Spring in the Lone Pine Peak and The Paint Pot 7 1/2-minute quadrangles, Idaho, in W 1/2 sec. 26, T. 11 N., R. 19 E., by W. H. Hays, 1972-74]

Thickness
Meters Feet

Jefferson Dolomite (incomplete):

23. Dolomite, dominantly medium-dark-gray, weathering medium dark to medium gray; grain size ranges from microscopic to mixture of fine and medium; rather pure; thick to very thick bedded. Not measured.

Unit B:

22. Largely covered interval. Not described in detail (see Section E, the Spar Canyon Summit measured section); mostly float, derived from slopes on north and south sides of saddle crossed in measuring unit. Discontinuous outcrops in lower part of unit are dolomite, medium dark to medium gray, whose beds are medium to thick and well defined. Laminae common, generally thin, expressed on weathered surfaces as small ridges and grooves and commonly by color differences. Weathering colors vary widely; most abundant are medium dark to medium light gray, commonly with yellow or olive cast, and light olive gray. Exposures west of line of section show that thick to very thick beds of dark dolomite suggestive of Jefferson Dolomite become common about 17 m below base of unit 23 but remain subordinate up to that base. Unit probably thinned by minor fault, concealed near line of section. Paucity of outcrops limits knowledge of attitude and reduces accuracy of measurement-----

71.4 234

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

Unit B--Continued

21. Dolomite, predominantly medium-dark-gray to medium-gray; grains microscopic or mixed microscopic and very fine; some near base is slightly coarser grained, and some of this is lighter gray; almost pure to sparsely silty. Beds thick and mainly poorly defined; lamination uncommon, limited to thin ridge-and-groove laminae, reflecting variations in grain size, on a few weathered surfaces. Some beds contain numerous small (1-10 mm) irregular blebs of cherty silica and fracture fillings of similar silica and vein quartz. At least moderately resistant; forms low ledges on this near dip slope; surfaces partly smooth but mostly finely hackly, owing to siliceous veinlets, or grooved in elephant-hide pattern. Weathered color is medium to light gray, uncommonly medium dark gray; despite this range, the neutrality (lack of chroma) of the gray colors produces a semblance of uniformity and a resemblance to the "bluish" grays of units 17-19. Jasperoid irregularly distributed through unit, owing probably to former covering of volcanic tuff. (Fossil collection: 10128-SD, 0.3 m)-----

31.2 102

At base of unit 21, line of section is offset about 15 m in S. 70° W. direction and about 8 m upward in altitude, with very little, if any, change in stratigraphic level. Measurement continues with top of unit 20 at top of small cliff.

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

Unit B--Continued

20. Dolomite and a little dolomitic sandstone, jasperoid, and quartzite. Dolomite and sandstone are medium to medium light gray and subordinately light gray. Dolomite ranges in grain size from mixed microscopic and very fine to mixed fine and medium; about 80 percent is variably sandy. Sand ranges in size from mixed very fine and fine to mixed fine and medium; rare coarse grains. Base of unit, picked where medium-gray dolomite typical of underlying unit 19 first becomes markedly sandy, appears conformable. Jasperoid and quartzite, medium to light gray, form upper 2.5 m; along strike to east, they commonly form more of unit and locally extend into adjacent units. Beds of unit are thick; some near base and a few higher contain discontinuous layers, less than 1-30 cm thick, of especially sandy dolomite or sandstone. Ridge-and-groove lamination fairly continuous in some beds; some irregular cross laminae near top suggest soft-state deformation.

At least moderately resistant; most forms low-surface blocky or irregularly angular outcrops on near dip slope; siliceous top forms ledge and cliff. Surfaces mostly medium light to light gray and grayish brown to brown; some mainly light-colored beds are strikingly banded by the sandy layers described above, which weather out with brown color. Jasperoid and quartzite weather light gray, except for variable iron stain. (Fossil collections: 10127-SD, 8.3 m; 10126-SD, 1.2 m)-----

16.9 55

At base of unit 20, which is top of steep southwest-facing slope, the line of section is offset a little east of north to top of unit 19 at altitude of about 7,430 on crest of ridge.

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

Unit B--Continued

19. Dolomite, mainly medium gray, partly medium dark gray; minor medium light gray near top; a little lighter colored and coarser grained, overall, than units 17 and 18. A little is microgranular, but mixtures of microscopic to very fine or to fine grains predominate; some contain scattered, sparse to numerous grains of even coarser size, many of which are crinoid ossicles. Almost pure; generally very little if any sand. Upper 15 m is a little finer grained, shows fewer crinoid ossicles, and is slightly silty and sandy in a few beds near top. Beds of unit are thick, massive, and poorly defined; almost no laminae except for a few thin siliceous laminae of probable secondary origin; tiny irregular cherty blebs (mainly less than 5 mm long) in some beds. Moderately resistant, but, on this near dip slope, forms only scattered low-surface outcrops, crudely rounded to irregularly angular, and fine angular float. Most surfaces are about medium light gray; a few are medium gray and a few almost light gray; some are mottled with various grays. Much of the gray is almost neutral (without chroma) and appears bluish; some has a slight to marked yellowish cast. Crinoid ossicles and perhaps other fossil debris appear as white specks. Attitude of beds can be determined only roughly, reducing accuracy of measurement; unit probably thinned a little by concealed north-trending fault. (Fossil collections: 10125-SD, 39.9 m; Y125D, 26 m; 10124-SD, 0.1 m)----- 42.2 139
18. Dolomite, medium-dark to medium-gray, microgranular or mixture of microscopic and very fine grains; generally very similar to unit 17, in which rock is much better exposed. Chiefly near top, some beds contain scattered grains coarser than very fine, and light-gray specks on weathered surfaces suggest partly recrystallized fossil debris, including crinoid ossicles. Low blocky ledges and float. (Fossil collection: 10123-SD, 6 m)----- 12.7 42

Base of unit 18 is on crest of ridge, about 15 m south of peak 7545.

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

Unit B--Continued

<p>17. Dolomite with uniform, massive appearance; medium-dark-gray to medium-gray; microgranular to mixture of microscopic and very fine grains; almost pure, rarely slightly sandy (mixed very fine and fine sand). Beds thick to very thick (maximum 1.5 m), commonly very poorly defined, massive appearing. Almost only laminae are a few that are thin, siliceous, and related to small crosscutting fracture fillings. Near top, however, a discordant body of jasperoid is strongly cross-laminated, suggesting that the silicification revealed an otherwise invisible structure that may be widespread. Tiny (most less than 1 cm long) irregular cherty blebs in some beds. Highly resistant; forms ledges and cliffs that are blocky to irregularly angular in general form. Most surfaces are almost uniform, almost neutral medium to medium light gray and appear bluish; some have a slight yellowish cast. In detail, surfaces are almost smooth to slightly hackly or are roughened by siliceous veinlets and blebs. Light-gray specks on some suggest fossil (crinoid?) debris. (Fossil collection: 10122-SD, 8.4 m)-----</p>	18.0	59
<p>16. Dolomite, sandy, and a little sandstone. Dolomite is medium gray, partly with a slight brownish cast; microgranular, fairly pure except for sparse to high content of mixed very fine to medium or fine to medium sand; thick bedded. Scattered irregular laminae of variably siliceous, highly sandy dolomite and sandstone; one medium bed of siliceous to dolomitic sandstone; a little probable cross lamination is obscured by siliceous fracture fillings. Highly resistant; forms blocky ledge or cliff. Surfaces medium light to light gray and yellowish gray; roughened and color streaked by brown-weathering fracture fillings and sandy laminae-----</p>	3.4	11
<p>Total unit B (moderately thinned within unit 19 by faulting)-----</p>	195.8	642

Conodont zonation suggests possible absence of rocks of Siegenian age in this section (table 5) and, accordingly, a possible unconformity at or near base of unit B.

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

Unit A:

- | | | |
|---|------|-----|
| <p>15. Dolomite, mainly medium- to medium-light-gray, partly lighter and darker; rarely the muddiest beds are yellowish gray or pale red. Microgranular; less commonly sublithographic than dolomite in units 12 and 13; ranges from only slightly silty or muddy to moderately so; not as muddy as some beds in units 12 and 13. About 20 percent of beds, mostly in lower part, are sparsely to highly (rare) sandy; sand ranges from very fine to mixture of very fine to coarse grains. Beds are mainly thick and rather well defined. Little lamination; a few beds show laminae of distinctly muddy, silty, or sandy laminae; a few show thin irregular siliceous laminae. Siliceous fracture fillings common; tiny cherty looking irregular blebs abundant in some beds are at least partly secondary. Moderately to highly resistant except for a few weakly resistant muddy beds; forms continuous blocky ledges where not buried by coarse slide rock from up slope. Surfaces mostly hackly; surface colors mainly light gray with yellow or orange cast, yellowish gray, and pale grayish orange; a few beds have nearly neutral gray colors; some muddy beds are grayish orange. (Fossil collection: 10121-SD, 27.1 m)-----</p> | 34.1 | 112 |
| <p>14. Interval covered by float from overlying units. A few outcrops and some probable float from this unit on ridge crest northeast of line of section indicates that unit includes both the muddy and the purer dolomite lithologies of unit 13-----</p> | 15.2 | 50 |

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

Unit A--Continued

13. Muddy dolomite and minor pure dolomite. Muddy dolomite forms about three-fourths of unit, partly light olive gray but mainly various hues of orange, red, and brown, microgranular, partly sublithographic; commonly contains sparse very fine to mixed very fine to medium sand. Beds probably medium to thick; few laminae other than secondary thin irregular siliceous laminae associated with siliceous fracture fillings. Weakly resistant; forms scattered, small, low-surface, blocky outcrops but is represented mainly by colorful float and soil. Float is mainly thin slabs with grayish-orange to light-yellowish-brown, light-brown, grayish-orange-pink, and pale-red weathered surfaces; soil is light grayish orange, pinkish gray, or pink.

Minor pure dolomite is no more than slightly muddy or silty; medium to medium light gray, rarely lighter; microgranular or consisting of mixed microscopic and very fine grains; partly sublithographic. Beds thick; very little lamination. A few beds contain many tiny irregular blebs of light-colored chert, several millimeters in long dimension. Moderately resistant; forms blocky low ledges. Surfaces, mainly hackly or roughened by cross fractures, are very light to light gray, yellowish gray, and very pale orange.

Unit contains considerable irregularly distributed jasperoid replacing the lithologies described, probably as a consequence of being formerly covered by Challis Volcanics----- 34.6 114

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

Unit A--Continued

12. Dolomite similar to that of unit 13 but forming more outcrops and containing almost no jasperoid. Muddy dolomite forms about three-fourths of unit and is similar in color, grain size, bedding, and resistance to that of unit 13. A few beds contain sparse to abundant sand, very fine to mixed very fine to coarse, disseminated or in laminae. Faint laminae, variably continuous and mainly thin, are common, reflecting varying quantity and grain size of silt, clay and sand impurities. Forms scattered outcrops and much colorful, commonly thinly slabby float like that of unit 13----- 39.6 130

11. Dolomite, mainly medium-dark-gray to medium-light-gray, partly with an olive or brown cast, weathering to medium-light- to light-gray with a yellow or olive cast, yellowish gray, or (uncommonly) grayish orange. These light-weathering dolomites are microgranular or, rarely, very fine grained and are moderately silty. A few beds or parts of beds are sparsely to moderately sandy; sand is very fine or mixed very fine to medium, rarely with a few coarse grains.

Scattered through the unit are several intervals, as much as 1 m thick, of dark- to medium-dark-gray dolomite that are conspicuous for their dark- to medium-gray weathered surfaces. They are microgranular to very fine grained and less silty than most lighter weathering beds.

A little muddy dolomite, containing more fine silt and clay than rest of unit, is mainly interlayered in upper 11 m and resembles muddy dolomite of units 12 and 13. Fresh surfaces are yellowish and locally reddish; weathered surfaces are yellowish gray, grayish yellow, and pink.

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

Unit A--Continued

Beds of all dolomites are medium to thick and fairly well defined. Laminae common; mainly thin, near-white, brown-weathering, discontinuous, siliceous (quartz-rich) laminae, which are mostly widely spaced but locally closely spaced and subparallel or braided; these are associated with very similar thin fracture fillings. Vaguely to sharply defined, thin, ridge-and-groove laminae on some weathered surfaces, apparently related to variations in silt and sand content. Tiny gray, highly irregular bodies of chert common in many beds, 1-8 mm in longest dimension, apparent only because they etch out on weathered surfaces, locally associated with thin fracture fillings of similar material. Unit is moderately resistant, except for weaker muddy beds near top; forms almost continuous blocky ledges at line of section and steep slope farther east. Many surfaces moderately hackly; some ribbed by resistant laminae and veinlets; some smooth. (Fossil collection: 9500-SD, 13 m)-----

49.1 161

10. Dolomite and minor siltstone and sandstone. Dolomite dominant, mainly medium gray, microgranular, moderately silty, weathering to medium light or, less commonly, light gray with olive or yellow cast or to yellowish gray or light olive gray. Scattered through the unit are distinctly darker weathering, probably slightly purer intervals very similar to those of unit 11 and as thick as 1.5 m. A few beds of both types of dolomite contain scattered grains of very fine or mixed very fine to medium sand. Beds are medium to (most) thick. Lamination is common; thin siliceous laminae resemble those of unit 11; ridge-and-groove laminae are more prominent than in that unit; a few brown-weathering laminae are clearly highly silty or sandy. Some beds contain tiny chert blebs like those more common in unit 11.

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

Unit A--Continued

Dolomitic siltstone and sandstone and highly silty or sandy dolomite are minor components of unit and almost limited to lower 18 m. The sand is very fine or mixed very fine to medium grained. These rocks tend to weather yellowish brown and suggest unit 9.

In lower half of unit there is scattered silicification, and 1.4 m above base a thin zone of probably minor shear and partial silicification crosses line of section with N. 10° E. bearing. Unit is weakly to moderately resistant; several intervals are represented only by float; above 21 m, less than 25 percent crops out; float suggests that some dolomite is more slabby and perhaps more impure than that in outcrop. Low ledges and lower surface outcrops are blocky, locally hackly, and commonly finely ribbed by lamination. (Fossil collections: 10120-SD, 49.7 m; 9412-SD and 9608-SD, 20 m)-----

51.7 170

9. Dolomite, silty or, less commonly sandy, interbedded with an equal amount of dolomitic siltstone and sandstone. A little above middle, an interval of several meters is locally silicified to siltite and quartzite. All rock types generally medium dark gray to medium gray. Dolomite is microgranular to very fine grained. Sand is mostly very fine, but in some beds includes fine and medium and even coarse grains. Silty dolomite is mainly highly silty. Beds predominantly of medium thickness; a thin interval in middle of unit is thick bedded. Lamination common, owing to variation in sand and silt content; laminae range from fairly well defined, regular, and continuous to vague, irregular, and discontinuous. Weakly to moderately resistant; forms gentle slope of low-surface angular outcrops and float and a small ledge in middle. Surfaces range from medium or medium light gray with yellow or orange cast to yellowish brown, the more sandy and silty beds tending to weather darker brown. Fossil collections: 10119-SD, 12.6 m; 10118-SD, 10.7 m)-----

16.6 54

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

Unit A--Continued

<p>8. Dolomite, predominantly medium light gray, partly medium gray; grains microscopic, mixed microscopic and very fine, or, rarely, a little coarser grained; moderately (most) to highly silty. Some beds in upper 1.4 m are highly sandy; a few lower beds are sparsely so; sand is very fine or mixed very fine and fine. Beds thick. Common brown-weathering, wavy to regular siliceous laminae, thin, discontinuous, and mainly widely spaced, that probably result from silicification of silty laminae; a few beds near top show thin to thick, highly sandy laminae; some siliceous fracture fillings. At line of section, on ridge crest, part of unit has been silicified to grayish orange weathering formless jasperoid. Unit is moderately resistant, forming fairly continuous ledges and lower surface outcrops of blocky form. Fairly smooth surfaces are mainly yellowish gray, partly medium light to light gray with yellowish cast; some mottling of these colors and, locally, of grayish orange----</p>	<p><u>18.0 59</u></p>
<p>Total unit A-----</p>	<p><u>259.0 850</u></p>

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

Beartooth Butte Formation:

7. Dolomitic siltstone, subordinate siltite, and minor silty dolomite, dolomitic sandstone and quartzite. Silty dolomite, mostly highly silty, limited to upper 7 m. Some siltstone and sandstone is siliceous as well as dolomitic and grades into the siltite and quartzite. All rocks medium to light gray, partly with green or olive cast. Siltstone and siltite commonly sandy. Almost all sand is very fine; some probably feldspathic. Beds medium to thick. Relatively smooth, light-colored surfaces on siltite and quartzite commonly show faint thin laminae, some of which are regular and continuous, and, much less commonly, small scale cross laminae. Most rocks show cleavage parallel to bedding and tend to break into irregular to fairly tabular slabs, 0.3-5 cm thick. Resistance ranges from weak (most) to moderate, depending on amount of cleavage and silica content. Forms low-surface outcrops, a few small ledges, and thin intervals of only float. Outcrops range from blocky and smooth surface to (more common) irregularly angular and cleaved. The more dolomitic rocks weather moderate brown to grayish and yellowish orange; highly siliceous rocks, mainly pale yellowish brown and brownish gray-----

33.4 110

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

Beartooth Butte Formation--Continued

6. Sandstone, slightly less quartzite, and minor sandy siltstone and siltite. Sandstone and siltstone are brownish gray and medium light to light gray where freshest, but they commonly have leached porous appearance, very light gray color and a variably thick limonitic rind. They are dolomitic and locally also siliceous and grade into the medium- to very light gray quartzite and siltite. Sand in lower half of unit is generally very fine; it contains coarser grains in upper half and in upper 10 m is commonly a mixture of very fine or fine to medium grains. Much is feldspathic, some highly so. Beds medium to thick, commonly without lamination. Weathered surfaces on a few beds show regular, thin, continuous, gray laminae, spaced less than 1 mm to several millimeters apart. Some faint cross lamination of trough or planar type, in sets mainly less than 4 cm but locally 10 cm thick. Indeterminate Linguloid brachiopods abundant 18.7 m above base. Unit weakly to highly resistant; forms many ledges and a few intervals of gentle slope with only float and low-surface outcrops. Quartzite ledge at top. Outcrops mainly blocky with fairly smooth surfaces of pale to moderate yellowish brown and grayish orange; some quartzite surfaces are medium light to very light gray----- 36.0 118

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

Beartooth Butte Formation--Continued

5. Quartzite and a little sandstone, siltite, and siltstone; mainly medium light gray to white, partly with brown cast; a little light brownish gray. In basal 1.5 m, quartzite is mixture of very fine or fine to medium grains; above that, most is very fine, some is silty, and there is a little sandy siltite. Upper 4.5 m includes some dolomitic or porous sandstone and siltstone. Much is clearly feldspathic. Basal bed is very thick (1.5 m); higher beds are generally medium to thick and rarely thin. Lamination and cross lamination fairly common, mostly inconspicuous, similar to that of unit 6. Worm tubes on one bedding surface. Unit is moderately to highly resistant; forms low cliff at base and many ledges. Most outcrops are blocky and sharply angular; a few have slabby appearance. Surfaces range from light and very light gray, through brownish gray, to light and moderate brown. Basal contact appears to be conformable here but is disconformable in other exposures-----

20.6 68

Total Beartooth Butte Formation-----

90.0 296

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (incomplete):

Impure upper member:

4. Dolomite, medium-light- to very light gray near base, darkening upward to medium-light- to medium-dark-gray; microgranular to very fine grained; slightly to highly silty and, in about half of beds, slightly to highly sandy; tends to become more sandy and silty upwards. Sand mostly very fine but fairly commonly a mixture of very fine to medium. Beds medium and thick. Laminae abundant; common are thin ridge-and-groove laminae, which vary in regularity and continuity; common also are thin to thick laminae showing slight color contrasts that are clearly related to variations in grain size of dolomite and in silt or sand content; 15.7 m above base is interval, 3 m thick, that contains many fairly continuous laminae and thicker layers, less than 0.5 to 4 cm thick, of brown-weathering dolomitic sandstone. A few beds have strong cleavage parallel to bedding. Some local silicification. Unit mostly weakly resistant; some moderately resistant beds; forms slope of float and low-surface outcrops and some small ledges; upper 2 m forms base of large ledge capped by highly resistant base of unit 5. Outcrops generally blocky. Surfaces smooth, hackly, or ribbed; some elephant-hide texture. Surface colors mainly light gray with olive or yellow cast to light olive gray and yellowish gray; near top, some surfaces medium light to medium gray, partly mottled with grayish orange. (Fossil collection: 10117-SD, 20 m)----- 24.9 82

Section D, The Tub Spring--South measured section--Continued.

Thickness
Meters Feet

"Laketown" Dolomite (incomplete)--Continued

Impure upper member--Continued

3. Dolomite, mostly light- to very light gray, partly with pink or yellow cast; a little light olive gray; some pink to pale red, especially near top. Grain size ranges from microscopic to mixture of very fine and fine; slightly (most) to moderately silty; some beds slightly sandy (very fine or mixed very fine and fine sand) and one highly sandy bed near base. Beds mostly thick, partly medium. Many beds contain widely spaced, thin, brown-weathering siliceous laminae, at least some of which are more silty or sandy than rest of rock. Tendency to break into flags parallel to bedding is weaker and less common than in unit 2. Some silicification locally. Unit is moderately resistant; forms cliffs with blocky form and smooth to finely irregular surfaces. Surfaces range from light gray and almost very light gray to yellowish gray and grayish orange----- 12.4 41

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (incomplete)--Continued

Impure upper member--Continued

2. Mostly covered interval. Float and small outcrops are dolomite, yellowish gray, pale red to pale reddish brown, and subordinately light to very light gray. Grain size ranges from microscopic to mixture of very fine and fine and, uncommonly, predominantly fine; slightly to highly silty and partly sandy; sand mainly very fine but rarely includes fine and medium grains. Beds mainly thick, partly medium. Part of rock is strongly but crudely cleaved subparallel to bedding, cleavage slabs being mainly 0.5-4 cm thick; part forms blocky beds without cleavage; some beds seem to change from one habit to other along strike. Rock without cleavage tends to be less red or brown, coarser grained, and less silty. Thin, fairly continuous, ridge-and-groove laminae common; some blocky beds contain thin to thick, brown-weathering, partly siliceous, highly silty or sandy (very fine sand) laminae. Unit weakly resistant; forms slope of float, low-surface outcrops and a few small ledges; upper few meters locally forms base of cliff. Common surface colors are pale grayish orange to grayish orange, yellowish gray, and pinkish gray to pale red. Upper contact drawn at top of highest bed that consistently breaks into slabs subparallel to bedding-----

26.0 85

Total impure upper member-----

63.3 208

Section D, The Tub Spring--South measured section--Continued

Thickness
Meters Feet

"Laketown" Dolomite (incomplete)--Continued

Lower member (incomplete):

1. Dolomite, mainly light-gray, partly almost very light gray, a little medium-light-gray and light-olive-gray; partly stained to pale brown or a pink cast. Mainly very fine grained; some as coarse as medium grained; a little microgranular. Rather pure; commonly slightly silty and uncommonly slightly sandy (very fine to mixed very fine to medium sand); a few beds slightly muddy. Beds mainly thick to very thick (maximum 2 m), mostly massive. Some faint thin ridge-and-groove lamination, mainly near base; a few thin siliceous laminae that may be entirely secondary. Unit highly resistant; forms cliffs and ledges. Surfaces are blocky to somewhat rounded and mostly finely irregular; most are light gray, commonly with a slight yellow cast; a few are grayish orange to very pale orange. Forms blocky float, except for a few slightly muddy beds that break into slabs parallel to bedding. Upper 3.6 m differs from rest in being mainly medium bedded and a little less resistant and in weathering mainly to grayish and very pale orange-----

23.1 76

Base of unit and of measured section is at base of cliff at altitude of about 6,970 ft. Cliffs and ledges of "Laketown" Dolomite continue down the slope below base of measured section.

Measured lower member (incomplete)-----

23.1 76

Measured "Laketown" Dolomite (incomplete)-----

86.4 284

End - 74

Start - 75-

Section E, The Spar Canyon Summit measured section

[Measured on ridge crest southeast of head of Spar Canyon, in Lone Pine Peak 7 1/2-minute quadrangle, Idaho, in secs. 18 and 19, T. 11 N., R. 20 E., by W. H. Hays, 1974. Base of section is at altitude of 7530 ft, near middle of south edge of sec. 18; top is at altitude of about 7550 ft, about 230 ft east-northeast of peak 7640, in NE 1/4 of sec. 19]

Thickness
Meters Feet

Jefferson Dolomite (incomplete):

Section includes only the lower part of the Jefferson Dolomite. Measurement was terminated upward where exposure becomes poorer and many beds appear to be partly recrystallized.

7. Dolomite, predominantly medium dark gray, subordinately medium gray, in small part dark- and medium-light-gray. Lighter colors most common near base; color changes along strike of some beds. Grain size independent of color; ranges commonly from mixed microscopic and very fine to mixed fine and medium and rarely medium. Rather pure; little or no silt; no sand. Beds thick to very thick (maximum 1.5 m). Faint to distinct laminae of various thicknesses common, mostly fairly regular and continuous; much clearly related to variations in grain size; some expressed as small ribs and troughs on weathered surfaces. A few beds contain numerous small, irregular bodies that are wholly or partly silicified; some of these show concentric laminae suggestive of algal or stromatoperoid colonies. Vugs and fracture fillings of very pale orange, coarse-grained dolomite are locally common. Fossils occur as light-gray dolomite in the generally dark rock; spherical or hemispherical sections of algal or stromatoporoid colonies and Amphipora(?) most common. Unit moderately to highly resistant; forms peak of hill and many low blocky ledges with fairly smooth surfaces. Weathered surfaces mainly medium dark gray and, except near base, almost entirely in range of medium to dark gray. Some of lighter colored dolomite weathers medium light to light gray, commonly with yellow or orange cast.

Base of unit and formation drawn at base of dolomite occurring mainly as thick, to very thick partly fossiliferous, medium-dark- to medium-gray weathering beds-----

72.1 237

Measured Jefferson Dolomite (incomplete)-----

72.1 237

Section E, The Spar Canyon Summit measured section--Continued

Thickness
Meters Feet

Unit B:

6. Dolomite, mainly (about 3/4) medium to medium-light-gray, partly medium-dark-gray; rarely light gray; grains range generally from microscopic to mixed very fine and fine; a little of lighter colored dolomite is sublithographic, and a little is as coarse as mixture of medium and coarse grains. Dolomite mainly almost pure; only a few distinctly silty beds. Scattered sand in a few beds; markedly sandy (mixed very fine to medium grains) only in interval, 0.7 m thick, near top. Beds mainly thick, partly very thick (maximum 1.4 m), poorly defined in part; most show faint to conspicuous, mainly fairly regular and continuous laminae, related to minor variations in grain size and commonly expressed on weathered surfaces as small ridges and grooves and minor color variations. Poorly preserved possible Amphipora in a few beds in middle and upper parts. Bed of medium-dark-gray dolomite, 1.5 m above base of unit is locally crowded with globular bodies of dark chert, some of which suggest, in shape and faint concentric lamination, that they were algal colonies. Bed in upper part contains many highly irregular brown-weathering bodies of chert and crystalline quartz. Unit moderately resistant; forms almost continuous low-surface outcrops and a few small blocky or irregular ledges. Weathered surfaces commonly finely ribbed, partly hackly. The medium- and medium-light-gray dolomite weathers medium light or light gray to yellowish gray and light olive gray. Subordinate darker dolomite weathers medium dark to medium gray and locally dark gray and suggests Jefferson Dolomite; base of lowest bed of this type is base of unit. (Fossil collection: 10130-SD, 45.8 m)-----

51.7

170

Section E, The Spar Canyon Summit measured section--Continued

Thickness
Meters Feet

Unit B--Continued

5. Dolomite, predominantly medium-dark- to medium-gray, uncommonly dark- and medium-light-gray. Finer grained than unit 8; microgranular dolomite dominant and about half sublithographic; some dolomite is mixture of microscopic and very fine grains; a little includes fine grains. Generally almost pure; only a little is distinctly silty. A few beds near top contain small to moderate amounts of sand in mixtures of very fine to coarse or medium to coarse grains; a few lower beds are slightly sandy. Beds of medium thickness or, more commonly, thick (maximum 1 m), mainly massive or almost so; a few beds have thin, fairly continuous laminae expressed as small ribs and grooves and minor color variations on weathered surfaces; a few show thick irregular ribs. Unit moderately resistant; forms small blocky ledges, lower surface outcrops, and thin intervals of only float. Surfaces commonly sharply angular in detail--hackly, or irregularly and discontinuously ribbed--and medium to light gray or, uncommonly, medium dark gray; some have marked yellow cast, but many, especially the darker surfaces, are almost neutral gray and suggest units 1 and 3--- 28.1 92

Section E, The Spar Canyon Summit measured section--Continued

Thickness
Meters Feet

Unit B--Continued

4. Dolomite, mainly medium-dark- to medium-gray, partly olive-gray and medium-light-gray. Predominantly microgranular or as mixtures of microscopic and very fine grains, partly sublithographic, uncommonly as coarse as mixed very fine and fine grains. Mostly almost pure; some moderately silty or muddy; several lighter colored beds scattered through unit are sparsely to moderately sandy (very fine to mixed very fine to coarse sand). Well-defined beds, medium to (most) thick; few exceed 0.5 m in thickness, unlike many in adjacent units. Lamination common on weathered surfaces and very prominent on some mainly dark beds; some color lamination, some ridge-and-groove lamination, and commonly a combination of these types; many laminae are thin, and many regular and continuous; some clearly related to variation in silt content or in grain size of dolomite; a few related to planar distribution of tiny irregular blebs of cherty silica. Unit moderately resistant; forms small blocky ledges, lower surface outcrops, and thin intervals of only float. Surfaces commonly smooth, partly finely ribbed or hackly. Weathered colors vary widely. They include range from medium dark to light gray, partly with olive cast; common mottling of medium light or light gray with yellowish gray; solid yellowish gray; and, on several beds, distinctive olive gray to light olive gray. Strong color contrasts between adjacent beds common-----

21.4 70

A little northwest of (down section from) base of unit 4 is fault zone that contains slices of parts of units 4 and 3. Measurement resumes northwest of fault zone, with no loss of section, at top of unit 3.

Section E, The Spar Canyon Summit measured section--Continued

Thickness
Meters Feet

Unit B--Continued

3. Dolomite, medium-dark- to medium-gray in lower 17 m, medium- to medium-light-gray above that. Most is microgranular; some mixtures of microscopic to very fine or to fine grains. Almost pure; a little silt. Beds mainly thick, some a little thicker or thinner; commonly poorly defined; many strongly suggestive of unit 1. Color laminae, ridge-and-groove laminae, or a combination of the two, common on weathered surfaces in middle and upper parts of unit, are obscure to distinct, fairly continuous, generally thin; compositional origin unclear; locally warped or broken, probably during early diagenesis. Unit moderately to highly resistant; forms small peak at northwest end of near-horizontal ridge crest; crops out as low ledges with irregularly angular to blocky form and smooth to hackly or faintly ribbed surfaces. Weathered colors are mainly medium to light gray, the grays ranging from almost pure to slightly yellowish; a little medium dark gray in lower and middle parts; a little yellowish gray near top----- 26.9 88

Section E, The Spar Canyon Summit measured section--Continued

Thickness
Meters Feet

Unit B--Continued

2. Dolomite, thick-bedded, and very minor sandstone. Lower 18 m is almost entirely moderately to highly sandy. Dolomite in this part is medium light to light gray, mainly a mixture of microscopic and very fine grains, partly a little coarse grained. Sand ranges from mixtures of very fine and fine grains to mixtures of fine to coarse grains. Basal 10.5 m contains many prominent, fairly continuous laminae and cross laminae of especially sandy dolomite or, less commonly, sandstone, forming ribs on surfaces of outcrops. Some of these laminae and parts of associated unlaminated dolomite are partly silicified and weather with resistant brown surface. Otherwise, surfaces of lower 18 m weather medium light to light gray, mainly with an olive or yellowish-brown cast. Between 18 and 26.9 m above base of unit, most dolomite contains very little or no sand and resembles that of unit 1. It ranges from medium dark to light gray; most is about medium gray. It ranges from mixtures of microscopic and very fine grains to mixtures of very fine and fine grains; a little is sandy. Lamination uncommon; weathered surfaces medium to light gray.

Upper 1.8 m is moderately to highly sandy dolomite, medium- to medium light-gray, a mixture of microscopic to very fine or fine grains. Rather evenly distributed sand in mixtures of very fine to medium or coarse grains. Locally whole interval comprises a thick set of gently dipping cross laminae. Weathered surfaces light olive gray.

Unit at least moderately resistant; forms ledges and lower surface outcrops of blocky to irregularly angular form with fairly smooth surfaces-----

28.7

94

Section E, The Spar Canyon Summit measured section--Continued

Thickness
Meters Feet

Unit B--Continued

<p>1. Dolomite, medium-dark- to medium-gray, mostly as mixtures of microscopic and very fine grains; partly a little coarser grained, especially in lower half; mostly almost pure. Some a little silty; one bed, 5 m below top, sparsely sandy. Beds thick, poorly defined, massive; a few thin, faint ridge-and-groove color laminae. Small crinoid ossicles common in few beds near base. Unit moderately resistant; forms scattered low-surface angular outcrops and steep float-covered slope. Surfaces mostly almost smooth and medium to medium light gray; gray colors almost neutral or with yellow cast. (Fossil collection: 10129-SD, 3.2 m)----</p>	<p>23.4 77</p>
<p>Measured unit B (incomplete)-----</p>	<p><u>180.2 591</u></p>

Outcrops widely scattered below base of measured section, and local breccia suggests possibly significant faulting.

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