DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

GEOLOGIC MAP OF THE UPPER VALLEY QUADRANGLE CARIBOU COUNTY, IDAHO

By Robert L. Rioux, Robert J. Hite, John R. Dyni,
and Willard C. Gere

GEOLOGIC QUADRANGLE MAP
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GEOLOGIC MAP SYMBOLS

COMMONLY USED ON MAPS OF THE UNITED STATES GEOLOGICAL SURVEY

(Special symbols are shown in explanation)

Contact – Dashed where approximately located; short dashed where inferred; dotted where concealed

Contact – Showing dip; well exposed at triangle

Fault – Dashed where approximately located; short dashed where inferred; dotted where concealed

Fault, showing dip – Ball and bar on downthrown side

Normal fault – Hachured on downthrown side

Fault – Showing relative horizontal movement

Thrust fault – Sawteeth on upper plate

Anticline – Showing direction of plunge; dashed where approximately located; dotted where concealed

Asymmetric anticline – Short arrow indicates steeper limb

Overturned anticline – Showing direction of dip of limbs

Syncline – Showing direction of plunge; dashed where approximately located; dotted where concealed

Asymmetric syncline – Short arrow indicates steeper limb

Overturned syncline – Showing direction of dip of limbs

Monocline – Showing direction of plunge of axis

Minor anticline – Showing plunge of axis

Minor syncline – Showing plunge of axis

Strike and dip of beds – Ball indicates top of beds known from sedimentary structures

Inclined Horizontal

Vertical Overturned

Strike and dip of foliation

Inclined Vertical Horizontal

Strike and dip of cleavage

Inclined Vertical Horizontal

Bearing and plunge of lineation

Inclined Vertical Horizontal

Strike and dip of joints

Inclined Vertical Horizontal

Note: planar symbols (strike and dip of beds, foliation or schistosity, and cleavage) may be combined with linear symbols to record data observed at same locality by superimposed symbols at point of observation. Coexisting planar symbols are shown intersecting at point of observation.

Shafts

Vertical Inclined

Adit, tunnel, or slope

Accessible Inaccessible

Prospect

Quarry

Active Abandoned

Gravel pit

Active Abandoned

Oil well

Drilling Shut-in Dry hole abandoned

Gas Show of gas

Oil Show of oil

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ECONOMIC GEOLOGY

The Upper Valley quadrangle was mapped as a part of a U.S. Geological Survey mineral land classification program on public lands and as a contribution to a more comprehensive investigation of the western phosphate field. (See index map.)

Paleozoic and Mesozoic rocks exposed in the quadrangle have an aggregate thickness of about 11,000 feet and include both marine and nonmarine rocks. Detailed stratigraphic measurements of these rocks have been combined and are shown on the accompanying composite section. Fossils collected from these rocks were useful as guides to both stratigraphic and age assignments. Foraminifera were of particular value in distinguishing between the Pennsylvanian and Permian sections of the Wells Formation. The *Meekoceras* zone is helpful in locating the base of the Thaynes Formation.

The relatively thick Paleozoic and Mesozoic rocks and the presence of several major anticlinal folds indicate some potential for oil and gas accumulations. This potential has yet to be realized in this general area. A thin, uneconomic phosphorite bed of Pennsylvanian age occurs in the lower member of the Wells Formation, and relatively thick, economically attractive phosphorite beds occur in the Permian Meade Peak Phosphatic Shale Member of the Phosphoria Formation. There has been some prospecting for copper in the Deadman Limestone and for nitrate in the Nugget Sandstone.

Cenozoic rocks include poorly exposed conglomerate, two flows composed of olivine basalt, and a wide variety of unconsolidated surficial deposits. These deposits represent potential sources of road metal, riprap, and aggregate.

PHOSPHATE ROCK

The most important mineral commodity in the Upper Valley quadrangle is phosphate rock, which is interbedded with mudstone and a few thin beds of carbonate rock and chert in the Meade Peak Phosphatic Shale Member of the Phosphoria Formation. The Meade Peak is poorly exposed but commonly forms a distinct swale between ridges formed by the resistant beds of the underlying Grandeur Tongue of the Park City Formation and the overlying Rex Chert Member of the Phosphoria Formation. The phosphate rock is black to dark brown and has a characteristic bluish-white cast on weathered surfaces. This rock is composed of carbonate fluorapatite minerals, occurring as nodules, pisolites, oolites, pellets, and fossil fragments, along with organic matter and quartz, muscovite, and calcite as accessory minerals and very small amounts of such metals as vanadium, uranium, chromium, nickel, and rare earths.

Details of the stratigraphy of the Meade Peak are obtained primarily from artificial cuts, trenches, drill holes, and pits, inasmuch as the beds are seldom naturally exposed. Caution must be exercised in utilizing shallow trench data. Thickness values usually are unreliable, owing to distortion by near-surface creep, and the minor faults and folds within these generally incompetent rocks are apt to be missed. The P_2O_5 content of surface or near-surface samples are unreliable, also, in that values obtained will be higher than the P_2O_5 content on the same unweathered bed, due to removal of carbonate and organic matter with resulting concentration of phosphate minerals.

Detailed sections were measured in the quadrangle from four trenches (lots 1233, 1232, 1259, and 1258) cut across the Meade Peak Member by the U.S. Geological Survey as a part of a comprehensive investigation of the western phosphate field (McKelvey and others, 1953; O'Malley and others, 1953). A generalized columnar section of each of the four trenches and the percent of P_2O_5 for individual units are shown in the Generalized Stratigraphic Sections. The sections show that, although phosphate rock is found throughout the Meade Peak, the phosphatic intervals of greatest economic importance (greater than 24 percent P_2O_5) are in two intervals—one in the lower part and one in the upper part of the member.

Data from Geological Survey sample localities, within and adjacent to the quadrangle, show that cumulative thicknesses of intervals of high-, medium-, and low-grade phosphate rock range about as follows (only intervals 3 ft thick or more are included): high grade (31 + percent P_2O_5), 6 to 20 feet; medium grade (24 + percent P_2O_5), 25 to 60 feet; and low grade (18 + percent P_2O_5), 35 to 115 feet. For calculations of any one grade cutoff, no bed was used more than once, but the same bed may be averaged with adjacent beds for different grades. Along Dry and Rasmussen Ridges and the west side of Dry Valley, the Meade Peak Member crops out on dip slopes in such a manner that large tonnages of phosphate rock can be strip mined.

Large areas of outcrop and the area immediately downdip from the outcrop of the Meade Peak Member are either presently (1972) under Federal phosphate prospecting permits and leases, issued to both individual and corporate prospectors and developers, or privately owned. Exploration has resulted in extensive trenching and some drilling within the Meade Peak Member, particularly along the southwest limb of the Snowdrift anticline on Rasmussen Ridge, the northeast limb of the Schmid syncline, and the exposures along Dry Ridge. In addition, the FMC Corporation has developed a test pit in the NE¼ sec. 6, T. 8 S., R. 44 E., and has mined a considerable amount of ore for test purposes.

Actual development and production of phosphate rock in the Upper Valley quadrangle prior to 1972 were limited to the El Paso Natural Gas Products Co.'s Mabie Canyon mine on Dry Ridge in the E½ sec. 33, T. 7 S., R. 44 E. and W½ sec. 3 and the E½ sec. 4, T. 8 S., R. 44 E. The mine consisted of two opencut mines—the first was developed in 1964, and the second, north of the first, was opened in 1966. Mining operations resulted in production of phosphate ore in 1965, 1966, and 1967. Production was from a Federal leasehold reported to contain about 30 million tons of proven phosphate rock with a grade range of 15–34 percent P_2O_5 (Anonymous, 1967). The phosphate ore was shipped about 20 miles on a railroad spur, built in 1965, from loading sites in Dry Valley to a fertilizer plant at Conda, Idaho, for processing. An estimated 1½ million tons of ore was shipped from the mine during the period 1965–67.

The Mabie Canyon mine was shut down in late 1967 because of the then prevailing unfavorable economic conditions. As of May 1972 mining had not been reactivated, although plans were in progress for reactivation under new ownership.

Although economically important thick phosphorite deposits in this area are confined to the Meade Peak Member, a few thin argillaceous phosphorite beds, about 1 inch thick, were observed near and at the top of the cherty shale member of the Phosphoria Formation. Similar thin beds have been reported locally from the uppermost part of the Grandeur Tongue of the Park City Formation (Cressman, 1964).

In addition, a thin-bedded phosphorite and platy mudstone unit, about 2 feet thick, occurs about 100 feet below the top of the lower member of the Wells Formation on Dry Ridge. A 2-inch-thick nodular phosphorite, exposed at the base of this unit in the SE¼ sec. 4, T. 8 S., R. 44 E., upon analysis gave an acid-insoluble content, determined gravimetrically, of 15.7 percent and a P_2O_5 content, determined volumetrically, of 31 percent (G. T. Burrows, analyst, 1960). A complete section of the Pennsylvanian phosphorite unit is exposed in the roadcuts on the road leading to the Mabie Canyon mine in the E½ sec. 4, T. 8 S., R. 44 E., on the west face of Dry Ridge

OIL AND GAS

The presence of a relatively thick section of sedimentary rocks, which include potential source beds and reservoir rocks, as well as structural and stratigraphic possibilities for entrapment of hydrocarbons, indicates that this area has some potential for oil and gas deposits. About 11,000 feet of Paleozoic and Mesozoic rocks is exposed in the quadrangle, but the details of the nature, thickness, and structural relationships of the older, concealed Paleozoic rocks are unknown. Intertonguing relationships that could offer stratigraphic-trap possibilities are known in Permian and Triassic rocks. The most obvious possibilities for petroleum entrapment, however, would seem to be structural.

Structural relationships in the quadrangle suggest the following sequence of tectonic events: (1) Folding, older than or contemporaneous with thrust faulting and no older than Late Jurassic; (2) thrust faulting; (3) tear faulting, younger than thrust faulting; (4) high-angle block or normal faulting, younger than tear faulting; and (5) volcanism. Major folds present include: The Schmid syncline, in the southwestern part of the area; the Dry Valley anticline, which passes northward under the Dry Valley thrust (the North Dry Valley anticline is considered to be a relatively minor fold on the upper plate of the Dry Valley thrust fault); and the overturned Georgetown syncline, concealed north of the Blackfoot fault; the Snowdrift anticline; the Lanes Butte syncline; the Little Gray anticline and the Webster syncline in the northeastern part of the area. Major thrust faults include the Dry Valley and Henry thrust faults. Major tear faults (left lateral) include the Blackfoot and Rasmussen faults. Major normal or block faults include the Enoch Valley, Lanes Creek, and Upper Valley faults.

Because of lack of exposures many of the fold and fault relationships are hypothetical. Several departures from the interpretations of Mansfield (1927) have been made in the mapping of this area, as follows: Addition of the Dry Valley thrust, extension of the Henry thrust south of the Blackfoot fault, addition of the Rasmussen fault, reinterpretation of the Enoch Valley-Lanes Creek fault relationships, addition of the Upper Valley fault, and interpretation of Upper Valley as a graben. Much of the reinterpretation results from details brought out by the 1:24,000-scale mapping as opposed to the 1:62,500-scale mapping of Mansfield (1927, pl 4).

Oil production has yet to be established in the State of Idaho. In addition, the structural complexity of the rocks will tend to discourage exploration for oil and gas in this quadrangle. The only oil and gas test in the quadrangle was drilled by the Standard Oil Company of California (now Chevron Oil Co.) in 1952. The resulting dry hole, in the NE¼NE¼ sec. 32, T. 7 S., R. 44 E., and started in the Monroe Canyon Limestone (Brazer Limestone of Mansfield, 1927), encountered a complexly folded and faulted sequence of rocks of the Chesterfield Range Group and penetrated only the uppermost part of the Lodgepole Limestone (Madison Limestone of Mansfield, 1927) at a total depth of 7,868 feet. (See cross section *B–B'*.) No shows of oil or gas were reported from the well. Young (1953) and Hite (1967) presented interpretations of the geologic conditions encountered in this well.

COPPER

Several old prospect pits in the Deadman Limestone were noted at several localities in the Webster Range on the east side of Upper Valley. Presumably, the formation because of its local green color was prospected for copper. Mansfield (1927, p. 345–347) reported a number of occurrences of copper in this general area. He also reported that the prospects for copper in the Deadman Limestone in Tps. 6 and 7 S., R. 44 E., were unfavorable and concluded that the green coloration that led to establishment of many of these prospects was not a result of the presence of copper but of iron.

Two samples of green-colored limestone from a prospect pit on the north side of Timothy Creek valley about half a mile east of the Upper Valley quadrangle were collected and analyzed by colorimetric methods for copper (D. L. Skinner, analyst, 1959) and were found to contain only 17 and 20 parts per million copper—much too low to be of economic importance.

NITRATE

The Nugget Sandstone has been prospected for potassium nitrate at a few places on the east side of Upper Valley. A small adit, opened many years ago, is located in a ravine in the SW¼ sec. 1, T. 7 S., R. 44 E. Mansfield (1927, p. 349–351) reported on this prospect in detail: "Potassium nitrate forms minor encrustations on the adit walls and roof and on joint or fracture surfaces in a small cave just above the mine. The nitrate crusts probably were deposited by downward-percolating waters charged with nitrate from decaying surface vegetation and possibly from animal guano. The quantity of nitrate is too small to have commercial value."

CONSTRUCTION MATERIALS AND AGGREGATE

Three small pits have been opened in the quadrangle for local sources of road metal and construction materials. One pit is in the Wells Formation at the south end of Rasmussen Ridge in the NE¼ sec. 9, T. 7 S., R. 44 E., a second pit is in the Dinwoody Formation in the SE¼ sec. 25, T. 7 S., R. 43 E., and the third is in alluvium in Dry Valley in the NE¼ sec. 5, T. 8 S., R. 44 E.

Other readily available sources of road metal are surficial deposits, the cherty shale member of the Phosphoria Formation, and basalt flows. A potential source of riprap is talus, chiefly Monroe Canyon Limestone, that occurs along the Blackfoot River in The Narrows. The limestones of the Monroe Canyon, as well as those in the Wells Formation, are also potential sources of cement rock. The gravels in the surficial deposits may also be a source for concrete aggregate.

FOSSIL COLLECTIONS

[Stratigraphic assignment and fossil collections by R. L. Rioux, R. J. Hite, J. R. Dyni, and W. C. Gere. Age assignment and fossil indentifications by W. J. Sando and J. T. Dutro, Jr. (Mississippian), Helen Duncan and E. L. Yochelson (Pennsylvanian bryozoans and gastropods), R. C. Douglass (Pennsylvanian and Permian Foraminifera), and N. J. Silberling (Triassic)]

USGS locality number	Fossil locality			Stratigraphic unit	Fossils identified	Remarks
	Section	T. S.	R. E.			
18878–PC	NW¼ 20	7	44	Monroe Canyon Limestone; about 450 feet below top of formation.	*Faberophyllum* spp. *Pleurosiphonella*? sp.	This coral assemblage is characteristic of Zone F of Sando and others (1969) and is of late Meramec age. Similar forms occur in the lower part of the Monroe Canyon Limestone in its type section in the Chesterfield Range (W. J. Sando, written commun., 1973).
18879–PC	S½ 20	7	44	Monroe Canyon Limestone.	*Multithecopora* sp. *Pseudodorlodotia*? sp.	These corals, though not diagnostic, are suggestive of Zone F (late Meramec) of Sando and others (1969). Similar fossils are known from the lower part of the type Monroe Canyon Limestone (W. J. Sando, written commun., 1973).
18880–PC	NW¼ 29	7	44	Monroe Canyon Limestone; about 20 feet below top of formation.	*Caninia* sp. *Composita* sp. *Spirifer* cf. *S. brazerianus* Girty	This faunal assemblage contains elements of Zone K (Chesterian) of Sando and others (1969). The Zone K fauna characterizes the upper part of the Monroe Canyon Limestone in its type section (W. J. Sando, written commun., 1973).
19873–PC (formerly unassigned)	NW¼ 29	7	44	Monroe Canyon(?) Limestone; Wells Formation; lower(?) member.	Echinoderm debris, indet. Orthotetid brachiopod, indet. *Linoproductus* sp. *Rugoclostus* sp. *Juresania*? sp. *Anthracospirifer occiduus* Sadlick	This brachiopod assemblage represents the *Rugoclostus* Zone of Gordon and Duncan (1970), which occurs in rocks of Early Pennsylvanian age in the Ely Limestone of Nevada, the Lake Point Limestone of Utah, and the Cameron Creek Formation of Montana. Inasmuch as fossils of this age are not known from the Monroe Canyon Limestone, this collection may have come from the Wells Formation (J. T. Dutro, Jr., written commun., 1973).

FOSSIL COLLECTIONS – Continued

USGS locality number	Fossil locality Section	T.S.	R.E.	Stratigraphic unit	Fossils identified	Remarks
19906-PC	SE¼ 4	8	44	Wells Formation; about 50 feet below top of lower member.	Bryozoa: *Rhombotrypella* sp. *Fenestella* sp. *Polypora* sp. *Penniretepora* sp. *Rhabdomeson* sp. Gastropoda: *Straparollus* (*Euomphalus*) *plummeri* Knight	"These are characteristic Pennsylvanian fossils" (Helen Duncan and E. L. Yochelson, written commun., 1961).
F21685	S½ 19	7	44	Wells Formation; lower member.	Foraminifera: *Climacammina* sp. *Bradyina* sp. Endothyrid Schubertellid *Millerella* sp. *Fusulina* sp.	"This sample represents Middle Pennsylvanian age" (R. C. Douglass, written commun., 1960).
F21686	SW¼ 19	7	44	----do----------	Foraminifera: *Staffella* sp. *Fusulina* sp. *Wedekindellina* sp.	"This sample is recrystallized, obliterating much of the detail. * * * forms are tentatively identified. This sample represents Middle Pennsylvanian (Des Moinesian) age" (R. C Douglass, written commun., 1961)
F21687	SE¼ 19	7	44	----do----------	Foraminifera: Endothyrids *Tetrataxis* sp. *Wedekindellina* sp.	"This sample represents Middle Pennsylvanian (probably Des Moinesian) age" (R. C. Douglass, written commun., 1960).
F21688	SW¼ 19	7	44	----do----------	Foraminifera: *Climacammina* sp. Endothyrid Schubertellid *Millerella* sp. ?*Staffela* sp. *Fusulina* sp. *Wedekindellina* sp.	"This sample represents Middle Pennsylvanian (Des Moinesian) age" (R. C. Douglass, written commun., 1960).
F21830	SE¼ 4	8	44	Wells Formation; about 130 feet below top of lower member	Foraminifera: Millerellids *Fusulinella* sp. *Fusulina* sp.	"Age suggested: Middle Pennsylvanian, probably late Atokan equivalent" (R. C. Douglass, written commun., 1960).
F21832	SW¼ 28	7	44	Wells Formation; about at top of lower member.	Foraminifera: *Bradyina* sp. Millerellids *Wedekindellina*? *Fusulina* sp.	"Age suggested: Middle Pennsylvanian, (Des Moinesian)" (R. C. Douglass, written commun., 1960).
F21836	NW¼ 19	7	44	Wells Formation; near top of lower member.	Foraminifera: *Fusulina* sp. *Wedekindellina*?	"Age suggested: Middle Pennsylvanian (Des Moinesian)" (R. C. Douglass, written commun., 1960).
F21689	SW¼ 18	7	44	Wells Formation; lower part of upper member.	Foraminifera: *Climacammina* sp. *Bradyina* sp. Schubertellid *Millerella* sp. *Pseudofusulinella* sp. *Schwagerina* spp.	"This sample represents Early Permian (Wolfcampian) age" (R. C. Douglass, written commun., 1960).
F21682	NW¼ 33	7	44	----do----------	Foraminifera: *Pseudofusulinella* sp. *Pseudoschwagerina*?	"The specimens of this form are all crushed in the outer volutions. None was found intact, and the indentification is, therefore, uncertain. I am confident, however, that this association is not older than Permian and not younger than Early Permian (possibly late Wolfcampian equivalent)" (R. C. Douglass, written commun., 1960).
F21683	SW¼ 36	6	43	----do----------	Foraminifera: *Pseudofusulinella* sp. *Schwagerina* sp.	"This sample represents an Early Permian age" (R. C. Douglass, written commun., 1960).
F21831	SE¼ 4	8	44	Wells Formation; about 400 feet above base of upper member.	Foraminifera: *Pseudofusulinella* sp. *Pseudofusulina* sp.	"Age suggested: Early Permian. Probably slightly older than F21683 and F21689 * * *" (R. C. Douglass, written commun., 1960).
F21833	SW¼ 21	7	44	----do----------	Foraminifera: *Bradyina* sp. *Pseudofusulinella* sp. *Pseudofusulina* sp. *Schwagerina* sp.	"Age suggested: Early Permian–about the same but possibly younger than F21831" (R. C. Douglass, written commun., 1960).

FOSSIL COLLECTIONS – Continued

USGS locality number	Fossil locality Section	T. S.	R. E.	Stratigraphic unit	Fossils identified	Remarks
F21834	NW¼ 19	7	44	Wells Formation; faulted section near contact between lower and upper members.	Form intermediate between *Triticites* and *Pseudofusulina*, suggesting latest Pennsylvanian to Early Permian age	
F21835	NW¼ 19	7	44	----do----------	*Triticites–Pseudofusulina*	"Essentially the same as F21834" (R. C. Douglass, written commun., 1960).
F21837	SE¼ 24	7	43	Wells Formation; upper member.	Foraminifera: *Bradyina* sp. *Pseudofusulinella* sp. *Schwagerina* sp.	"Age suggested: Early Permian, about equivalent to F21689" (R. C. Douglass, written commun., 1960).
Not assigned.	NE¼ 26	6	43	Dinwoody Formation; about 1,000 feet above base of formation.	Indeterminate minute gastropods	"These have no significance for refined dating of your section but may be of local value for lithic correlation" (N. J. Silberling, written commun., 1960).
M849	NW¼ 25	6	43	Thaynes Formation; base.	*Meekoceras gracilitatum* White *Submeekoceras mushbachanum* (White) *Flemingites russelli* Hyatt and Smith *Euflemingites cirratus* (White) *Wyomingites aplanatus* (White) *Cordillerites angulatus* Hyatt and Smith *Paranannites aspenensis* (Hyatt and Smith)	"The fauna is characteristic of the *Meekoceras gracilitatum* zone which occurs at the base of the Thaynes Formation throughout southeastern Idaho" (N. J. Silberling, written commun., 1960).
M850	NW¼ 31	6	44	----do----------	*Meekoceras gracilitatum* White *M. cristatum* Smith *Submeekoceras mushbachanum* (White) *Flemingites russelli* Hyatt and Smith *Euflemingites cirratus* (White) *Wyomingites aplanatus* (White) *Paranannites aspenensis* (Hyatt and Smith) *Aspenites acutus* Smith *Metussuria waageni* (Hyatt and Smith) *Pseudosageceras multilobatum* Noetling	Do.
Not assigned.	SW¼ 30	6	44	Thaynes Formation; about 150 feet above base.	Indeterminate impressions of ammonites	"Some of these ammonites bear prominent lateral nodes, a unique feature among Lower Triassic forms which suggests the genus *Wasachites*, a constituent of the *Anasibirites* zone" (N. J. Silberling, written commun., 1960.
Not assigned	NW¼ 25	6	43	----do----------	------do------------------------------	Do.
M851	S½ 30	6	44	Thaynes Formation; 10 feet below top of black limestone member.	*Aviculopecten*? sp.	"No significance for refined dating" (N. J. Silberling, written commun., 1960).
M852	SE¼ 13	7	44	Thaynes Formation; 15 feet above base of black shale member.	*Columbites spencei* Smith "*Meekoceras*" *curticostatum* Smith (probably not a *Meekoceras*). *Aviculopecten* cf. *A. bregeri* var. *parksi* Girty	"This fauna is representative of the *Columbites parisianus* zone and indicates a correlation between the lower part of the upper black limestone member at Sheep Creek and the middle shale member of Kummel's Paris Canyon section. Other evidence for this correlation is the occurrence near the contact between the upper black limestone and the underlying tan silty limestone member of *Pugnoides triassicus*, which also occurs just below the middle shale in the Bear Lake area. This correlation differs from that made by Kummel (1954) who implies that the *Columbites* zone may be much lower in the Sheep Creek section, i. e., in the lower black limestone member" (N. J. Silberling, written commun., 1960).
Not assigned.	W½ 18	7	45	Thaynes Formation; about 25 feet above base of lower part of Portneuf Limestone Member.	Indeterminate *Aviculopecten* and an indeterminate terebratuloid brachiopod	"No significance for refined dating" (N. J. Silberling, written commun., 1960).

FOSSIL COLLECTIONS – Continued

USGS locality number	Fossil locality Section	T. S.	R. E.	Stratigraphic unit	Fossils identified	Remarks
M853	NW¼ 13	7	44	Thaynes Formation; about 100 feet above base of upper part of Portneuf Limestone Member.	*Terebratula semisimplex* White	"Some beautifully preserved specimens of this brachiopod were freed from the matrix by etching in acid. Unfortunately, the stratigraphic position of this form in terms of ammonoid zones is not established. Of interest, however, is that this species was first described from the uppermost member of White's (1883, p. 106) section at 'locality no. 1' in the vicinity of Sheep Creek." (N. J. Silberling, written commun., 1960).

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