UNITED STATES DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
NEVADA BUREAU OF MINES

OPEN-FILE REPORT 83-303

BASE FROM UNITED STATES GEOLOGICAL SURVEY
SUMMER CAMP QUADRANGLE , 1968
AND BLACK BUTTE QUADRANGLE, 1967

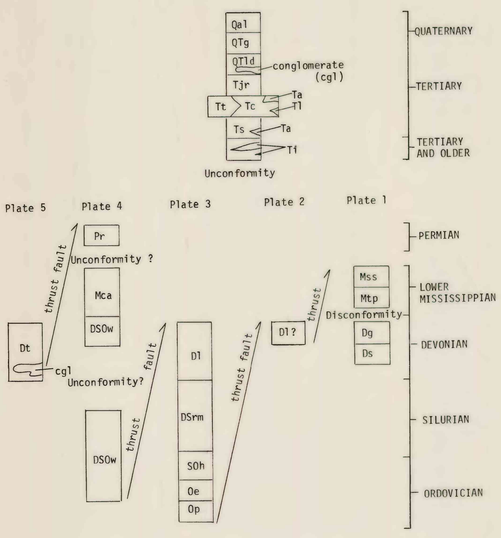
SCALE 1:24 000

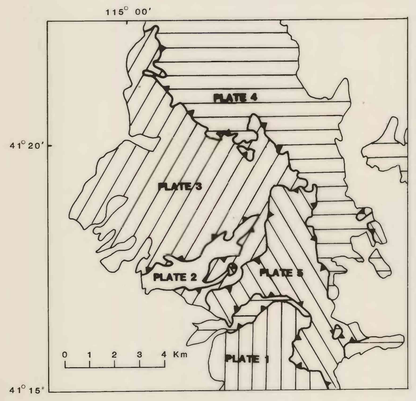
CONTOUR INTERVAL 20 AND 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

NEVADA
QUADRANGLE LOCATION

GEOLOGY BY J. FRED SMITH, JR., 1977; AND GILBERT X. HERNANDEZ, 1979;
ASSISTED BY PATTY BILLINGS, 1978; MARJORIE C. SMITH, 1979-1981;
ADDITIONAL MAPPING AND SLIGHT REVISION BY KEITH B. KETNER, 1982

CORRELATION OF MAP UNITS





Principal structural plates of the southern Snake Mountains

DESCRIPTION OF MAP UNITS

Qal ALLUVIUM (QUATERNARY) Sand and gravel along streams and dry washes

QTg GRAVEL, TALUS, AND COLLUVIUM (QUATERNARY AND TERTIARY) Upland gravel talus, thick soil, and colluvium; includes some gravels of probable Tertiary age on east side of range

QTld LANDSLIDE DEPOSIT (QUATERNARY OR TERTIARY) Jumbled mass consisting of giant slabs of conglomeratic limestone in a heterogeneous matrix; probably derived mainly from Devonian rocks of Plate 5

Tjr JARRIDGE RHYOLITE (TERTIARY, MIOCENE) Porphyritic rhyolite flows and minor tuff and welded tuff

Tt TUFF (TERTIARY) Crystal and vitric tuff, locally welded where overlain by rhyolite flows; interbedded with Tc; may be related to Tjr

Tc CONGLOMERATE (TERTIARY) Silica cemented green conglomerate; pebbles derived from Paleozoic rocks such as those of the Snake Mountains; lenses of vitric ash (Ta) and lenses of cream-colored lacustrine limestone with pods of light-green chert (Tl); interbedded with Tt

Ta

Tl

Ts SAND AND GRAVEL (TERTIARY) Weakly consolidated sand and gravel on

Ta west side of range; lenses of vitric ash (Ta); strong development of caliche; underlies Tt and Tc; may include some Tt and Tc east of Burnt Creek

Ti SMALL DIKES AND SILLS (TERTIARY AND OLDER) Siliceous rocks and greenstone

PLATE 1

Mss SANDSTONE AND SHALE (MISSISSIPPIAN) Chert-quartz arenite in graded beds a few centimeters to several meters thick alternating with black silty shale; probably equivalent to the Diamond Peak Formation of Oversby (1972) and the Lower Mississippian sandstone of Ketner and Ross (1983)

Mtp TRIPON PASS LIMESTONE (LOWER MISSISSIPPIAN) Calcarenite in graded beds; similar to the type section in the nearby Windermere Hills (Oversby, 1973)

Dg GUILMETTE FORMATION (UPPER AND MIDDLE DEVONIAN) Thick-bedded limestone and minor dolomite of shelf facies

Ds SIMONSON DOLOMITE (MIDDLE DEVONIAN) Thick-bedded dolomite and minor limestone of shelf facies

PLATE 2

D1(?) LIMESTONE (AGE RANGE UNCERTAIN, PART DEVONIAN, PART RESEMBLES TRIASSIC) Fine-grained, thinly laminated limestone and minor interbedded green shale; some limestone beds are graded; commonly displays axial plane cleavage

PLATE 3

D1 LIMESTONE (UPPER, MIDDLE, AND LOWER DEVONIAN) Bioclastic detrital, pelletal limestone ranging from conglomerate to very fine grained micrite; thick- to thin-bedded; some beds graded; interbeds of argillaceous limestone, argillite, chert, shale, and black, bedded chert; lithic variety indicates this facies is intermediate between shelf and basin facies but abundance of limestone allies it more closely with shelf facies

DSrm ROBERTS MOUNTAINS LIMESTONE (LOWER DEVONIAN AND SILURIAN) Platy, thinly laminated, fine-grained limestone and thicker, graded, bioclastic calcarenite beds; the thinner beds weather to shades of yellow, pink, and lavender; some of the thinly laminated beds possess weakly developed cleavage that cuts the bedding; sporadic massive limestone bodies several tens of meters in three dimensions could represent debris flows or poorly developed reefs; upper contact is gradational with overlying unnamed Devonian unit

SOh HANSON CREEK FORMATION (LOWER SILURIAN AND UPPER ORDOVICIAN) Black dolomite commonly in beds 3 to 15 cm thick and less commonly more than a meter thick, laced with white quartz veins; scarce fossils; prominent 3 m bed of black chert near top evidently formed by replacement of dolomite; the gradational contact zone with the overlying Roberts Mountains Formation consists of interbedded dolomite like that of the Hanson Creek Formation and thin-bedded limestone both of which contain abundant specimens of monoserial graptolites of Silurian age

Oe EUREKA QUARTZITE (MIDDLE ORDOVICIAN) Medium-grained, well-sorted, thick-bedded quartzite that weathers reddish-brown; upper contact is abrupt

Op POGONIP GROUP (MIDDLE AND LOWER ORDOVICIAN) Cherty limestone, and poorly exposed shale; contact with overlying Eureka quartzite is gradational

PLATE 4

Pr SANDSTONE AND SILTSTONE (PERMIAN) Platy, quartz-chert arenite and siltstone with abundant brachiopods and meandering trails; contact with underlying DSOw not exposed

Mca CHAINMAN SHALE, AND ARGILLITE (MISSISSIPPIAN) Black siliceous shale with chert-quartz arenite beds; black argillite and siltstone with scarce bedded chert and fine-grained sandy beds--probably equivalent to the Webb Formation of the Pinon Range (Smith and Ketner, 1975); sporadic bedded barite beds; upper and lower contacts are thrust faults

DSOw SHALE, SILTSTONE, CHERT, GREENSTONE, SANDSTONE, LIMESTONE, CONGLOMERATE (DEVONIAN, SILURIAN, AND ORDOVICIAN) Western facies rocks commonly assigned to Roberts allochthon; Devonian beds are quartz sandstone. siltstone, quartz sandy limestone, limestone, limestone conglomerate, and black chert; the dated limy beds are of Late Devonian age; Silurian beds consist of basal black, white, red, and green chert of Early Silurian age overlain by graptolite-bearing , yellow-weathering, greenish gray micaceous siltstone, chert, and argillite of Middle to Late Silurian age; contact with overlying Devonian is probably unconformable; Ordovician beds consist mainly of black, graptolite-rich shale overlain by black, bedded chert containing sparse graptolites; these beds range from upper Middle Ordovician to uppermost Ordovician; contact with overlying Silurian beds is gradational

PLATE 5

Dt LIMESTONE, SANDSTONE, ARGILLITE, CHERT (UPPER, MIDDLE AND LOWER DEVONIAN) Limestone ranges from thick-bedded limestone conglomerate (cgl) and pelletal calcarenite to yellow weathering micrite; calcarenite is commonly quartz sandy and grades into quartz sandstone; lithic variety indicates this unit is transitional between shelf and basin facies but prominence of siliceous rocks ally it more closely with basin facies

— — — Contact, dashed where position uncertain
— — — Steep fault, dashed where position uncertain
—▲—▲— Thrust fault, dashed where position uncertain
70 Strike of beds showing degree of dip
Strike of vertical beds
Horizontal beds
70 Strike of cleavage showing degree of dip
Strike of vertical cleavage
•16 Location and map number of fossil collection

PALEONTOLOGIC AGE DETERMINATIONS

Map No.	Stratigraphic range (many conodonts were redeposited and therefore may not represent true age of beds)	USGS No.	Paleontologist
1	Upper Ordovician	D2778CO	R. J. Ross, Jr.
3	Lower Devonian	9769SD	W. A. Oliver, Jr.
5	lower Middle Devonian	9809SD	A. G. Harris
6	Lower or Middle Devonian	9770SD	W. A. Oliver, Jr.
7	lower Upper Devonian	9808SD	A. G. Harris
8	Upper Ordovician	D2779CO	R. J. Ross, Jr.
9	Upper Ordovician	D2780CO	R. J. Ross, Jr.
10	Upper Ordovician	D2781CO	R. J. Ross, Jr.
12	lower Middle Ordovician	D2752CO	R. J. Ross, Jr.
15	Upper Silurian to Lower Devonian	--	A. G. Harris
16	Middle Devonian	9771SD	W. A. Oliver, Jr.
18	Upper Silurian	9954SD	A. G. Harris
20	lower Middle to lower Upper Devonian	9959SD	A. G. Harris
22	Lower Devonian	9955SD	A. G. Harris
24	Middle Ordovician	D2879CO	R. J. Ross, Jr.
25	upper Middle Devonian	9960SD	A. G. Harris
27	lower Upper Devonian	9957SD	A. G. Harris
30	lower Middle Ordovician	D2880CO	R. J. Ross, Jr.
31	lower Upper Devonian	9958SD	A. G. Harris
36	upper Lower to lower Middle Devonian	9979SD	A. G. Harris
38	Middle Silurian to lower Upper Silurian	D3735D	W. R. N. Berry
39	lower Upper Devonian	9980SD	A. G. Harris
42	lower Upper Devonian	9962SD	A. G. Harris
45	Middle to lower Upper Devonian	10295SD	A. G. Harris
48	lower Upper Devonian	10290SD	A. G. Harris
49	Middle to lower Upper Devonian	10296SD	A. G. Harris
50	lower Upper Devonian	--	A. G. Harris
53	upper Middle Devonian	10224SD	A. G. Harris
55	upper Middle Devonian	10284SD	A. G. Harris
56	upper Middle Devonian	10285SD	A. G. Harris
57	upper Middle Devonian	10286SD	A. G. Harris
59	upper Middle Devonian	10287SD	A. G. Harris
60	lower Upper Devonian	10288SD	A. G. Harris
61	lower Upper Devonian	10289SD	A. G. Harris
62	Upper Silurian to Lower Devonian	10292SD	A. G. Harris
64	lower Lower Devonian	10300SD	A. G. Harris
68	Upper Silurian to Lower Devonian	10293SD	A. G. Harris
70	Middle Devonian	10297SD	A. G. Harris
71	Middle Devonian to Upper Devonian	10298SD	A. G. Harris
75	upper Middle Devonian	10299SD	A. G. Harris
76	lower Lower Mississippian	27735PC	A. G. Harris
78	lower Upper Devonian	10294SD	A. G. Harris
112	middle Middle Devonian	10659SD	A. G. Harris, Kirk Denkler
115	middle Lower Devonian	10660SD	A. G. Harris, Kirk Denkler
120	lower Middle Devonian	10661SD	A. G. Harris, Kirk Denkler
123	upper Upper Devonian	10662SD	A. G. Harris, Kirk Denkler
124	middle Lower Devonian	10663SD	A. G. Harris, Kirk Denkler
126	upper Lower Devonian	10664SD	A. G. Harris, Kirk Denkler
128	upper Upper Devonian	10665SD	A. G. Harris, Kirk Denkler
129	Upper Devonian	10666SD	A. G. Harris, Kirk Denkler
78RJ55	Lower Silurian	--	A. G. Harris
78RJ56	Silurian	9909SD	A. G. Harris
78RJ57	upper Upper Silurian to lower Lower Devonian	9910SD	A. G. Harris
78RJ58	Silurian to Lower Devonian	9911SD	A. G. Harris
78RJ60	Upper Silurian to Lower Devonian	9913SD	A. G. Harris
78RJ61	Lower Devonian	9914SD	A. G. Harris
FP56F	lower Lower Mississippian	27838PC	A. G. Harris
JG6	Lower Devonian	--	J. G. Johnson
JG7	Lower Devonian	--	J. G. Johnson
JG8	Lower Devonian	--	J. G. Johnson
75NC34	upper Lower Permian	26118PC	B. R. Wardlaw

STRUCTURE OF THE SOUTHERN SNAKE MOUNTAINS

Five complex structural plates are superposed in the southern Snake Mountains. Plate 1 of the accompanying map, the lowermost plate, is regarded as autochthonous because the Devonian units are of shelf facies and resemble correlative rocks of the surrounding areas that are conventionally regarded by most geologists as autochthonous. However, in view of the fact that Plate 3, composed of formations conventionally regarded as autochthonous, is actually allochthonous, the status of Plate 1 cannot be absolutely certain. Most of Plate 1 is relatively undeformed but the least competent formation in the plate, the thinly bedded Tripon Pass Limestone, is irregularly folded. Some of this folding may represent soft sediment deformation rather than tectonism. The Devonian and Mississippian parts of this plate are separated by a high angle fault but remnants of the Tripon Pass too small to show on the map lie concordantly on the Guilmette indicating the Devonian and Mississippian units are parts of the same stratigraphic sequence. Part of the contact between the Tripon Pass and the overlying sandstone unit is probably a thrust fault of small displacement.

Plate 2, the lowermost of the clearly allochthonous plates, consisting of thinly laminated, fine-grained limestone and less abundant clay shale, is tightly folded and displays axial plane cleavage in many places. The full range in age of this plate is uncertain. Some parts have yielded Devonian conodonts but other parts closely resemble Lower Triassic limestone of the Adobe Range. Both the tightly folded beds and the axial plane cleavage strike generally in the northeast quadrant and are vertical or dip steeply northwest. The extensive development of cleavage in this formation is quite unusual.

Plate 3, the next higher plate, includes such shelf deposits as the Pogonip Group, Eureka Quartzite, and Hanson Creek Formation. Where its base cannot be seen this sequence is generally regarded as autochthonous but here it is clearly part of a far-travelled allochthonous plate. The formations comprising this plate are folded in a nearly symmetrical anticline whose axis plunges northeast. The plate is cut internally by faults which may be either compressional thrust faults or extensional gravity faults. Near the contact with Plate 2, this plate is intensively brecciated and veined by conspicuous white calcite. The Devonian part of Plate 3 is contemporaneous with the Devonian Simonson and Guilmette Formations of the autochthonous Plate 1, but it is of a very different facies. Whereas the Devonian of Plate 1 consists of massive shelf limestone and dolomite the Devonian of Plate 3 consists of relatively thin clastic limestone units interbedded with black shale and bedded chert. The points of origin of these two partly contemporaneous plates are therefore evidently widely separated.

Plate 4 consists mainly of units normally assigned to the Roberts allochthon and, in addition structurally interleaved Mississippian rocks and a patch of Permian sandstone.

Plate 5, the highest structurally, lies discordantly on each of the other plates.

It is certain that the structures of the southern Snake Mountains are younger than Early Mississippian because various thrust plates overlie the Lower Mississippian Tripon Pass Limestone of Plate 1. Moreover, Plate 4 includes fault slices of Lower Mississippian units such as the Chainman Shale. In the neighboring Pequop Mountains the autochthonous sequence includes the Tripon Pass Limestone, the concordantly overlying Chainman Shale, and a concordant stratigraphic sequence that continues through the Permian (Thorman, 1970). In extensive areas of northeastern Nevada the autochthonous sequence includes Lower Triassic rocks that concordantly overlie the Permian. In none of the autochthonous sequences of the region is there any structural record of intense orogeny through the Lower Triassic. One therefore is forced to conclude that the intense deformation of the southern Snake Mountains is of post-Early Triassic age. The structures of the southern Snake Mountains are not merely slight rearrangements of pre-existing older structures but represent an intense orogenic event involving shelf, slope, and basin facies.

MAP CREDITS

J. Fred Smith, Jr., mapped almost all of the Paleozoic rocks prior to his death in early 1982. Gilbert Hernandez mapped the Tertiary rocks in the Black Butte area and assisted Smith in other parts of the map area. James N. Surabian and Patty Billings also assisted Smith in the field. Marjorie C. Smith, Fred's wife, assisted him in the field and drafted the map. Keith Ketner completed the mapping, slightly revised the original mapping in the Trout Creek area, and provided the structural interpretation. Investigation of the complex geologic relations and refinement of the map are continuing.

REFERENCES

Ketner, K. B., and Ross, R. J., Jr., 1983, Preliminary Geologic Map of the northern Adobe Range, Elko County, Nevada: U.S. Geological Survey Open-File Map 83-290

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PRELIMINARY GEOLOGIC MAP OF THE SOUTHERN SNAKE MOUNTAINS ELKO COUNTY, NEVADA

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1983