1981

Geologic Map of the Steamboat Mountain and Bible Spring Quadrangles, Western Iron County, Utah

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U.S. Geological Survey

DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

GEOLOGIC MAP OF THE STEAMBOAT MOUNTAIN AND BIBLE SPRING QUADRANGLES, WESTERN IRON COUNTY, UTAH

By

Myron G. Best and Robert L. Davis

Geology mapped in 1980 with the assistance of Lehi F. Hintze and students in the Brigham Young University summer geology field course

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1981

DESCRIPTION OF MAP UNITS

Qac ALLUVIUM AND COLLUVIUM (QUATERNARY)--Unconsolidated, poorly sorted stream-, fan-, and slope-wash deposits of sand and gravel. Includes colluvial debris and talus from units Tf, Trs, and Tbm. Northwest and west of Meadow Spring, in the east-central part of the map area, the unit consists in part of a high-level erosional remnant of older fan or pediment deposits consisting chiefly of debris from unit Trs with sparse boulders from unit Tf. Thickness ranges from 0 to more than 40 m

Tf BASALT LAVA FLOWS (MIOCENE)--Dark-gray, locally vesicular and amygdaloidal lava flows with sparse phenocrysts of olivine. Boulders in unit Qac northwest of Meadow Spring, possibly derived from flows that once capped Steamboat Mountain, also have phenocrysts of augite and plagioclase and closely resemble flow rocks of potassic basalt in the southwest corner of the Frisco quadrangle to the northeast which have yielded whole-rock K-Ar ages of about 13 m.y. (Abbott and others, 1981). Thickness west of North Trough Spring along the south margin of the map area is 10 m

Td DACITE OF SPANISH GEORGE SPRING (MIOCENE)--Variegated pale-red, brown, gray to purple, strongly porphyritic dacite with prominent phenocrysts of sanidine and plagioclase ranging up to 3 cm across and minor smaller phenocrysts of quartz, biotite, hornblende, and augite in a microcrystalline felsic matrix. Probably a lava flow-volcanic dome complex that is more than 250 m thick

Trs RHYOLITE OF STEAMBOAT MOUNTAIN (MIOCENE)--Pale-gray, red-brown, and lavender felsic lava flows and intrusive-extrusive volcanic domes with locally autobrecciated margins and vitrophyric bases. Massive to strongly flow layered, locally spherulitic; vugs and lithophysae contain vapor-phase crystals of quartz and topaz. Some rocks are virtually aphyric but most are porphyritic with as much as 30 percent phenocrysts 3 mm or less in diameter of smokey quartz, sanidine, sodic plagioclase, and rare biotite. Locally includes some of unit Tt, especially in hydrothermally altered areas, as at Bob Leroy Peaks and south of Typhoid Spring, near the center of the map area. The rhyolite body on the west side of Wilson Canyon in secs. 6 and 31 is interpreted to be a shallow intrusion emplaced along a major fault zone, although the alternative view that it is an extrusion predating deposition of the tuff of Ryan Spring (Tr) cannot be ruled out. Several K-Ar determinations on sanidines (H. H. Mehnert, written commun., 1981) indicate an age of about 12 m.y. Maximum thickness of individual flows is locally as little as 30 m, whereas their aggregate thickness at Steamboat Mountain is about 500 m

Tt RHYOLITIC TUFFS AND RELATED CLASTIC DEPOSITS UNDIVIDED (MIOCENE)--A heterogeneous sequence of generally poorly exposed volcaniclastic and minor epiclastic deposits associated with eruption of the rhyolite of Steamboat Mountain (12 m.y.) and rhyolite units in the formation of Blawn Wash (22-20 m.y.). Is widespread in the southern Wah Wah Mountains northeast of map area (see Abbott and others, 1981). Tan to pale-green-brown or pink, weakly welded ash-flow and minor air-fall tuff is most common and occurs as layers a few centimeters to a few meters thick containing as much as 30 percent pumice lapilli; sparse phenocrysts less than 3 mm across of quartz, feldspar, biotite; and variable quantities of dark-colored lithic fragments from units Trs, Tcb, Ti, and Tnl. Locally, as at White Cliff, angular lithic fragments as large as 1 m across and composing as much as half of the rock were derived entirely from unit Trs, probably indicating disintegration of a nearby volcanic dome. These tuffs represent explosively erupted material from many local vents that later were sources of viscous lava flows. Unit includes sparse crudely stratified beds of tan, coarse sandstone, locally with cobbles of unit Tnl, and beds of red, poorly sorted angular volcanic debris of sand to cobble size. Locally silicified to form resistant masses of white to tan jasperoid. Commonly 100-200 m thick, but locally may be more

Trt RHYOLITE OF TYPHOID SPRING (MIOCENE)--A strongly porphyritic lava flow or possibly a sill about 50 m thick within unit Tt. Phenocrysts of sanidine and plagioclase ranging up to 2 cm across constitute almost half of the rock; some feldspar crystals have rims of chalky plagioclase surrounding glassy sanidine cores. Sparse small phenocrysts of hornblende and biotite are as much as a millimeter in diameter. The unit is similar to the rhyolite of Pink Knolls exposed in the Tetons and Observation Knoll quadrangles to the northeast of the map area (Best and Keith, 1979)

Tlf LANDSLIDE AND FLUVIAL DEPOSITS (MIOCENE)--Pink to red-brown monolithologic and heterolithologic breccias and megabreccias that apparently formed by slumping and fluvial transport of debris from older rock units into fault-controlled basins at the south end of the Bible Spring fault zone. In the main area of exposure in sec. 13 the unit forms a hillslope rubble derived from units Ti, Tcb, Tha, and Tt; clasts range from sand size to shattered and pervasively slickenslided slabs tens of meters long. Elsewhere, this unit consists mostly of monolithologic breccias derived from unit Tcb; clasts range up to several meters in diameter. Local sandstones and conglomeratic mudflows contain clasts derived mainly from unit Tha. The rocks were commonly affected by weak hematitic alteration and silicification. Thickness may be as much as several hundred meters

Tha HORNBLENDE ANDESITE (MIOCENE AND OLIGOCENE)--Locally vesicular intermediate-composition lava flows that are gray to black where fresh and red brown where altered. Prominently porphyritic with 25 percent phenocrysts consisting mainly of acicular hornblende and zoned plagioclase, and lesser small augite and hypersthene grains. Matrix is a felty aggregate of feldspar and glass. Unit ranges up to 250 m in thickness

Tbm MAFIC FLOW MEMBER OF THE FORMATION OF BLAWN WASH (MIOCENE)--Massive to slightly vesicular porphyritic lava flows that weather red brown with liesegang bands; phenocrysts of amber to white plagioclase as much as 1 cm long and smaller augite and hypersthene compose 10 percent or less of the rock and lie in a black microcrystalline to glassy matrix. Locally, consists of weakly porphyritic lava flows with microphenocrysts of olivine, plagioclase, and sparse small plates of phlogopite in an aphanitic matrix. Similar lava flows of trachyandesite occur in about the same stratigraphic position in the Wah Wah Mountains east and north of map area, where a whole-rock K-Ar age of 23.2±1.0 m.y. (Abbott and others, 1981) has been determined. A local lava flow containing phenocrysts of biotite and hornblende in addition to plagioclase and pyroxene, exposed about 1.5 miles (2 km) northeast of Spanish George Spring in southwest part of map area is included in the unit, as is a well-sorted green sandstone near Bob LeRoy Peaks. Thickness is at least 100 m in Trail Draw in south-central part of map area

Tcb BAUERS TUFF MEMBER OF THE CONDOR CANYON FORMATION (MIOCENE)--Gray, buff, pink, and lavender, firmly welded ash-flow tuff containing about 10 percent phenocrysts of plagioclase, sanidine and biotite and locally conspicuous light-colored collapsed pumice lapilli. The K-Ar age is about 22 m.y. (Fleck and others, 1975). Thickness ranges from 20 to 120 m

Tl LEACH CANYON FORMATION (MIOCENE)--Generally poorly exposed, weakly welded, very crystal poor rhyolitic ash-flow tuff. White pumice lapilli and sparse darker colored lithic fragments are set in a red matrix of welded ash. Thickness ranges from 0 to about 120 m

Ti ISOM FORMATION (OLIGOCENE)--Red-brown to purple, crystal-poor ash-flow tuffs and lava flows that weather to small plates and popcorn-like grus. Phenocrysts generallly constitute less than 15 percent of the rock and include plagioclase with minor, much smaller pyroxenes and Fe-Ti oxides. Tuffs are vuggy and densely welded with intensely compacted and locally elongated pumice fragments. Age is about 25 m.y. (Fleck and others, 1975). Thickness ranges from as little as 10 m in the northeast corner of the map area to possibly more than 800 m just north of Negro Liza Wash where a variety of lava flows and ash-flow tuff units with lithologies similar to the Isom are exposed

Tnl LUND TUFF MEMBER OF THE NEEDLES RANGE FORMATION (OLIGOCENE)--Red-brown moderately to intensely welded ash-flow tuff with about 10 percent quartz, 25 percent plagioclase, and 10 percent biotite and lesser hornblende. Flattened, light-colored pumice lapilli are prominent in most outcrops but small lithic fragments are present only locally. Biotite from this unit yields a K-Ar age of about 28 m.y. (H. H. Mehnert, written commun., 1981). Thickness is uncertain because of extensive and probably undetetcted faulting but may be as great as 750 m; this thickness is believed to reflect accumulation in a deep moat between the now-buried southeast topograhic wall of the Indian Peak caldera (Best and others, 1979), and theresurgent dome of the caldera that now exposes units Tnb and Tnwl in the northwest part of the map area

Tr TUFF OR RYAN SPRING (OLIGOCENE)--Variegated light-gray to lavender crystal-poor ash-flow tuffs. Phenocrysts of plagioclase and minor biotite less than 2 mm across constitute 20 percent or less of the rock. Dark-colored flattened pumice lapilli are locally conspicuous. Ash-flow tuffs may be as thick as 500 m along the north margin of the map area but probably thin southward

Tnwl LITHIC INTRACALDERA UNIT OF THE WAH WAH SPRINGS TUFF MEMBER OF THE NEEDLES RANGE FORMATION (OLIGOCENE)--Slightly to intensely altered, crystal-rich, firmly welded, ash-flow tuff. Phenocrysts of plagioclase and lesser hornblende and biotite are as much as 4 mm across. Phenocrysts of quartz are generally less than 1 mm and constitute only a few percent of the rock. Pumice lapilli are rare, but lithic fragments of dark-colored volcanic rocks and sparse quartzite constitute as much as 20 percent of the rock. In the northwestern part of the map area the unit is slightly altered propylitically to a massive gray, green, and brown rock. Elsewhere, owing to hydrothermal activity in Miocene time, the rock is intensely argillized, and is purple, orange brown, and white. Hill 7213 in sec. 2 on the west side of the map area is capped by a lavender-brown flow-layered lava flow with 10 percent phenocrysts of chalky plagioclase and altered mafic minerals. In the southeastern part of the map area the unit appears to be less than a hundred meters thick, whereas to the northwest within the area of the resurgent dome of the Indian Peak caldera the unit, locally including some of unit Tnb, is several hundred meters thick (Grant and Best, 1979)

Tnb INTRACALDERA BRECCIA UNIT OF THE WAH WAH SPRINGS TUFF MEMBER (OLIGOCENE)--Poorly exposed heterogeneous breccias formed by caving of the unstable walls of the Indian Peak caldera during its episodic collapse. Clasts as much as 0.5 m in diameter are from units Tnwl and Te as well as from stratigraphically undivided volcanic units of intermedite composition. In the northeast corner of sec. 36, T. 31 T., R. 18 W., gneisses and other deep crustal rock types are included in the breccia

Te ESCALANTE DESERT FORMATION (OLIGOCENE)--Sandstone, welded ash-flow tuff, and porphyritic andesitic lava. Where undivided in the southeastern part of the map area the unit includes: (1) a well-sorted but poorly bedded green-brown sandstone; (2) pink to lavender, firmly welded ash-flow tuff with about 20 percent plagioclase and biotite phenocrysts, conspicuous lithic fragments, and flattened pumice lapilli; and (3) a red, gray to green-black plagioclase-phyric lava flow

Tea Andesite member--Gray, red-brown weathering, generally non-vesicular lava flows with phenocrysts of pyroxene and plagioclase in a finely granular matrix. Thickness about 100 m

Tem Tuff member of Marsden Spring--Light-gray to tan, firmly welded, ash-flow tuff with only a trace of feldspar and quartz phenocyrsts that are less than 1 mm in diameter. Small green chips of aphanitic volcanic rock are common. Unit includes purple quartzose sandstone and conglomerate. Locally as much as 400 m thick

Tsp SAWTOOTH PEAK FORMATION (OLIGOCENE)--Gray to pale-lavender, moderately to weakly welded ash-flow tuff. Phenocrysts are as much as 5 mm in diameter and are chiefly quartz (20 percent) and lesser plagioclase and biotite. Ranges from 0 to over 200 m thick

Tv VOLCANIC ROCKS, UNDIVIDED (MIOCENE AND/OR OLIGOCENE)--Hydrothermally altered rocks of uncertain stratigraphic identity along the Bible Spring fault zone

Kbpz BRECCIA OF PALEOZOIC ROCKS (CRETACEOUS?)--Brecciated and silicified carbonate rocks. In many outcrops the breccia has been wholly silicified to form jasperoid that has experienced a second episode of brecciation. The voids between clasts are partly filled with quartz crystals. The first brecciation was likely associated with imbricate thrusting before deposition of Sawtooth Peak Formation (Tsp), possibly during the same episode of attenuation faulting documented in areas to the north (Hintze, 1978; Best and Hintze, 1980)

Pq QUARTZITE (PERMIAN)--Tan to light-red-brown, fine-grained quartzite that forms both ledgy and rubble-covered slopes. Thickness uncertain but probably about 150 m

Mm MONTE CRISTO LIMESTONE (MISSISSIPPIAN)--Gray, thin-bedded limestone and dolomite containing thin beds of black chert, and fossils of brachiopods, rugose corals, crinoid ossicles, and bryozoan fragments. This unit has been described in an area 70 km to the east of map area near Milford by Welsh (1973). A thickness of only 60 m is exposed in map area

Dg GUILMETTE FORMATION (UPPER AND MIDDLE DEVONIAN)--Interbedded sandstone, dolomite, and minor limestone. The sandstone is tan and forms ledgy slopes, is thin bedded, fine to medium grained, and composed mostly of subrounded quartz grains. Dolomite is dark gray to black, thin to thick bedded, fine to coarse grained, locally cherty, and contains stromatoporoid structures. The faulted section is at least 200 m thick

Dcp CRYSTAL PASS DOLOMITE MEMBER OF SULTAN LIMESTONE (UPPER DEVONIAN)--Fine-grained, light-gray to tan dolomite. Incomplete section of uncertain total thickness

Sl LAKETOWN DOLOMITE (SILURIAN)--Fine- to medium-grained ledge- and cliff-forming dolomite that is somewhat brecciated and light gray in lower half of unit and light-gray with darker gray interbeds in upper half. Irregularly shaped masses of chert are sparse. Unit appears to be about 500 m thick

Oel ELY SPRINGS DOLOMITE (UPPER ORDOVICIAN)--Brecciated, medium-grained brown-gray dolomite. More poorly exposed than the overlying Laketown Dolomite. Upper part is somewhat fossiliferous and cherty. Unit is about 150 m thick

Oe EUREKA QUARTZITE (MIDDLE ORDOVICIAN)--Thick beds of tan to light-gray, medium- to fine-grained orthoquartzite that weathers orange brown to white. Commonly pock-marked by weathering and stained by limonite. Section is folded and brecciated and is estimated to be about 30 m thick

Ou ORDOVICIAN ROCKS UNDIVIDED--Includes in descending order, Middle Ordovician Crystal Peak Dolomite, Watson Ranch Quartzite, Lehman Formation, Kanosh Shale, Juab Limestone, and Lower Ordovician Wah Wah Limestone. These units are thick and well defined to the north (see Best and Hintze, 1980), but are too thin in much of the map area to be subdivided. Total thickness just southeast of Arrowhead Pass is 320 m

Ok KANOSH SHALE (MIDDLE ORDOVICIAN)--Thin-bedded, fossiliferous shaly limestone interbedded with fissile, phyllitic, dark-brown to olive shale. Typically is a slope-forming unit, and tends to be poorly exposed. Regional thickness is about 150 m

Of FILLMORE FORMATION (LOWER ORDOVICIAN)--Interbedded thin-bedded, ledgy gray limestone and poorly exposed slope-forming yellow-gray shale. The limestone is commonly an intraformational conglomerate of flat pebbles of sandy limestone in a finer matrix. Only faulted sections 300 m thick are exposed

Oh HOUSE LIMESTONE (LOWER ORDOVICIAN)--Gray, medium- to thick-bedded, fine-grained limestone that has sparse chert and bioclastic beds. 100 m thick

O€n NOTCH PEAK FORMATION (LOWER ORDOVICIAN? AND UPPER CAMBRIAN)--Only a partial section of light- to medium-gray dolomite exposed

Pz PALEOZOIC ROCKS UNDIVIDED--Locally brecciated and silicified. Possibly of Devonian or Mississippian age

NOTABLE STRUCTURAL FEATURES

The rocks in the Steamboat Mountain and Bible Spring quadrangles reflect three episodes of deformation: (1) thrusting and attenuation of Paleozoic units presumably during the Late Cretaceous as documented in areas to the north (Hintze, 1978; Best and Hinze, 1980); (2) caldera subsidence accompanying extrusion of the Wah Wah Springs Tuff Member of the Needles Range Formation during Oligocene time about 30 m.y. ago, followed by resurgent doming apparently within 2 million years; (3) Miocene block faulting and tilting. The nature of the Oligocene events are obscured by Miocene volcanism and tectonism. The mostly undeformed 12-m.y.-old rhyolite flows of Steamboat Mountain rest unconformably on tilted and eroded older units.

Indian Peak Caldera

The Indian Peak caldera is a major collapse structure that formed during eruption of the Wah Wah Springs Tuff Member 30 m.y. ago. It is clearly exposed in the Miners Cabin Wash, Buckhorn Spring, and Pinto Spring quadrangles to the north (Best and others, 1979; Grant and Best, 1979), but is mostly concealed beneath younger Miocene volcanic rocks and Quaternary alluvium in the Steamboat Mountain and Bible Spring quadrangles. Unequivocal caldera fill units belonging to the Wah Wah Springs Member (Twwl and Tnb) are exposed in the northwest part of the map area. Exposures of the Wah Wah Springs Member around Bible Spring are of the lithic unit (Twwl), mainly in fault slices, and no breccia (Tnb) is exposed. The Wah Wah Springs here appears to be only a hundred meters or so thick compared to a more normal thickness within the caldera of a kilometer or more. Conceivably, this abnormally thin Wah Wah Springs lithic tuff could have accumulated outside the caldera where there were no topographic restraints to cause puddling. Alternatively, these exposures may be only the top of a very thick section of the unit and the spatially associated exposures of Escalante Desert Formation (Te) could represent landslide masses within the Wah Wah Springs unit, such as occur north of Indian Peak in the Miners Cabin Wash quadrangle (Best and others, 1979). To the east in the eastern part of the adjacent Mountain Spring Peak quadrangle, exposed Wah Wah Spring Member rocks belong entirely to the nonlithic outflow unit, but the position of the structural rim of the caldera has not been located closely and could lie either east or west of the exposures at Bible Spring. The best indirect evidence of the position of the caldera margin comes from opposing dips in the compaction foliaton forming an antiform in the Lund Tuff Member (Tnl) in secs. 9 and 16 one mile east of Bible Spring. These dips may reflect compaction over a buried topographic prominence, possibly the topographic wall of the caldera, or of intrusion to shallow levels of Miocene silicic magma, along the structural margin.

Although caldera fill composed of the Wah Wah Springs Member (Tnwl and Tnb) is structurally and topographically high from the Steamboat Mountain quadrangle northward for 16 miles to Indian Peak, the exact time of this uplift is uncertain. In the model of Smith and Bailey (1968), resurgent uplift of the caldera floor occurs soon after subsidence. In the central part of the Steamboat Mountain quadrangle, the mafic member of the formation of Blawn Wash (Tbm) was deposited directly on the lithic intracaldera unit of the Wah Wah Springs Tuff Member that is perhaps an order of magnitude thinner than to the north in the Pinto Spring quadrangle (Grant and Best, 1979); this suggests considerable erosion before the mafic member was deposited. Locally in the central part of the Steamboat Mountain quadrangle there are thin deposits of the tuff of Ryan Spring (Tr) on caldera fill that are capped by the Lund Member (Tnl), or else the Lund lies directly on fill; these relations suggest, but do not prove, uplift of the caldera fill had occurred prior to

deposition of the Lund Tuff Member that has an age of 28 m.y. The tuff of Ryan Spring (Tr) is thicker to the southeast and especially to the northeast which would be expected if the core of the resurgent uplift lay to the north and west of the Steamboat Mountain quadrangle.

In the southeastern part of the Steamboat Mountain quadrangle and the southern Bible Spring quadrangle there is a remarkably thick section, over 4 km, of post-caldera-fill rocks below the mafic flow member (Tbm) that is essentially absent in the central and northwestern parts of the Steamboat Mountain quadrangle (see cross-section BB'). This thick section plus the rhyolitic tuffs (Tt) and the mafic flow member (Tbm) have been tilted to the southeast along a postulated concealed Miocene fault (see below). The post-caldera-fill units thicken abruptly southeast of a northeast-striking fault zone along which the last movement dropped the northwest side down. However, prior to deposition of the abnormally thick section, there must have been considerable displacement in the opposite sense along a precursor fault zone in about the same place. It is uncertain whether this Oligocene faulting was associated in some way with resurgence of the Indian Peak caldera or with caldera subsidence accompanying extrusion of the voluminous Lund Tuff Member.

Possible Source Caldera for the Isom Formation

Rocks assigned to the Isom Formation compose a section at least 800 m thick just north of Negro Liza Wash in the southwest corner of the quadrangle and then thin abruptly to as little as 80 m farther north. A variety of extrusive rocks with sparse phenocrysts of plagioclase and pyroxene make up this section, but only the upper part has ash-flow tuff typical of the Isom seen in surrounding areas. Bedded volcanic sandstones within the thick section occur along the boundary of secs. 12 and 13, T. 32 S., R. 18 W. The thickened pile of Isom-like rocks suggests accumulation in a subsiding caldera accompanying their extrusion. However, there are no intermingled breccias that could manifest crumbling of the topographic wall of such a caldera. Younger Miocene rocks and Quaternary alluvium conceal this possible caldera to the south and west and make interpretation difficult.

Miocene faulting

The northest-trending Bible Spring fault zone in the southeastern part of the map area localized major displacement and associated hydrothermal alteration that involved most of the volcanic rock units. Movement along the zone formed a network of horsts and grabens, and locally produced sufficient topographic offset to result in local debris slides, now seen as landslide and fluvial deposits (Tlf). The faults dip steeply and appear to have had predominant dip-slip offset; the latest movement, however, was largely strike-slip as shown by many exposures of fault surfaces with subhorizontal slickensides. Nothing in the pattern of map units, however, indicates that the principal displacement in the zone is strike slip.

A north-trending vertical fault with apparent left-lateral strike-slip displacement lies just west of Bull Valley.

A major fault, offset down to the northwest, appears to exist beneath the rhyolitic rocks in the south-central part of the map area. Conceivably, it runs from the vicinity of Pace and Mustang Springs along the south edge of the map area northeastward so that it passes near Typhoid Spring. This postulated fault would account for the repetition of the post-Tr units between Wilson Canyon and the Bible Spring fault zone as well as their southeast dip.

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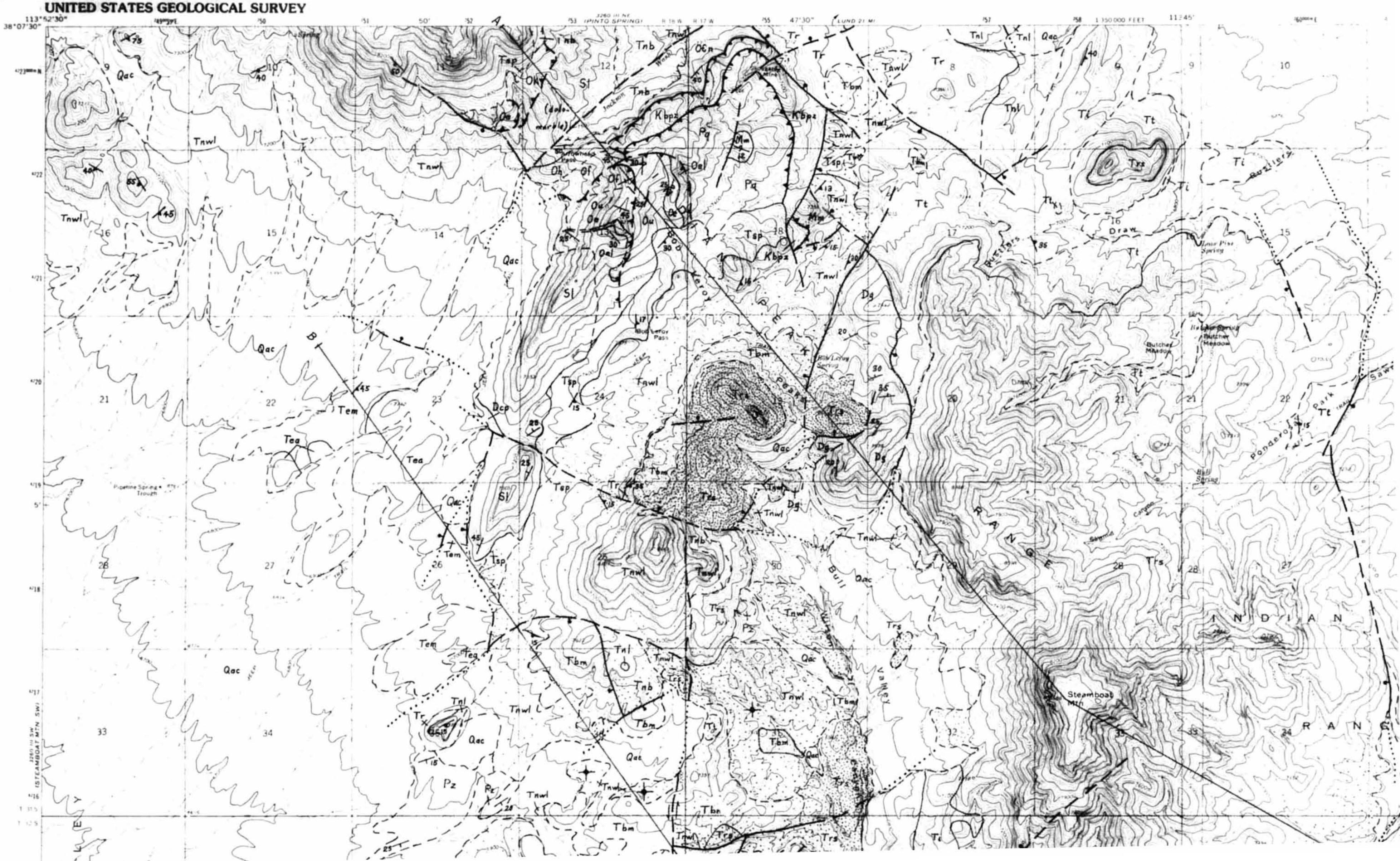

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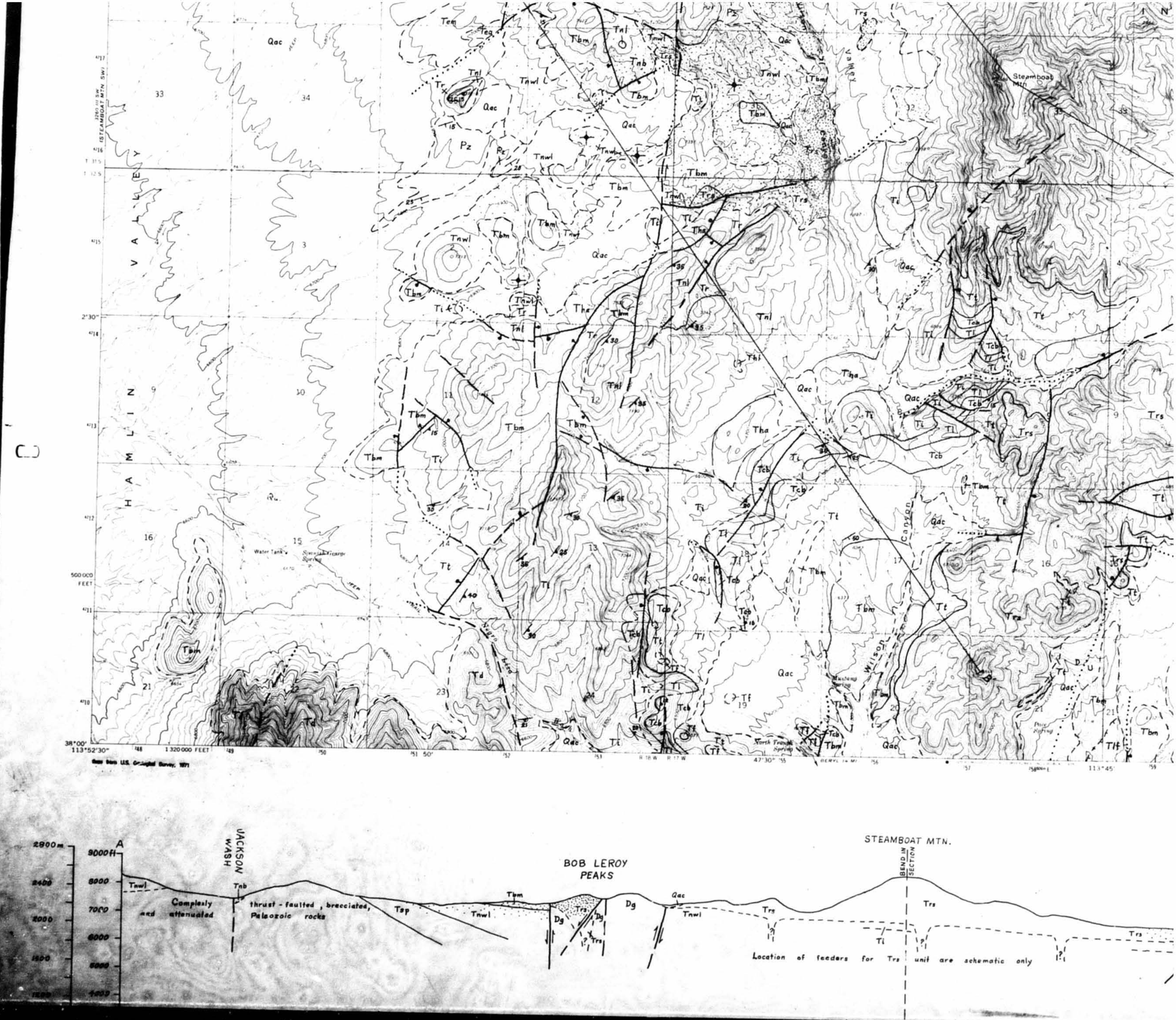
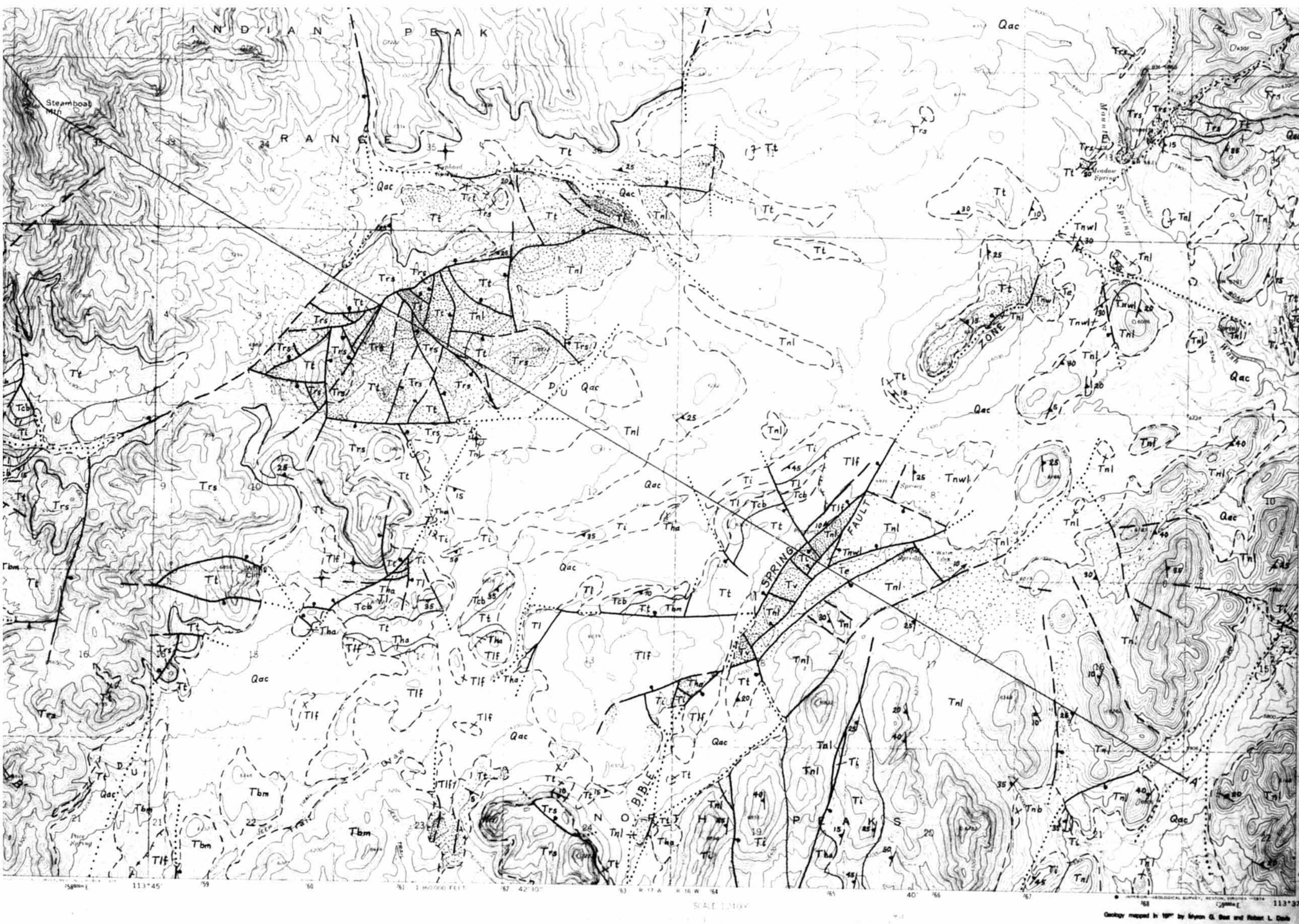
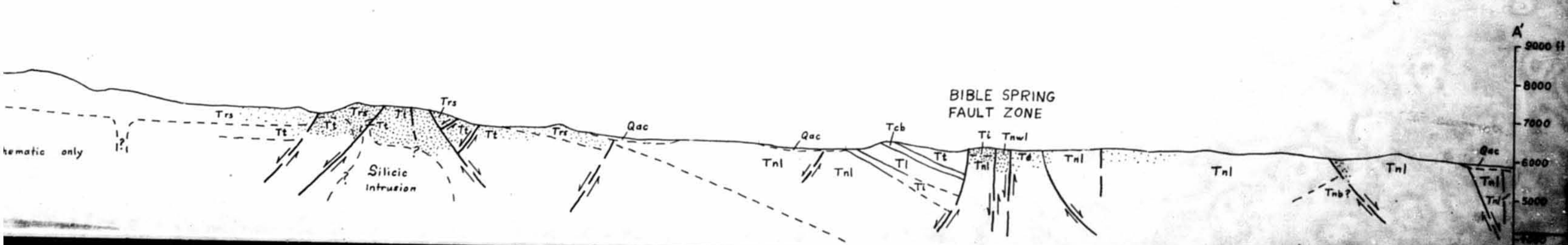


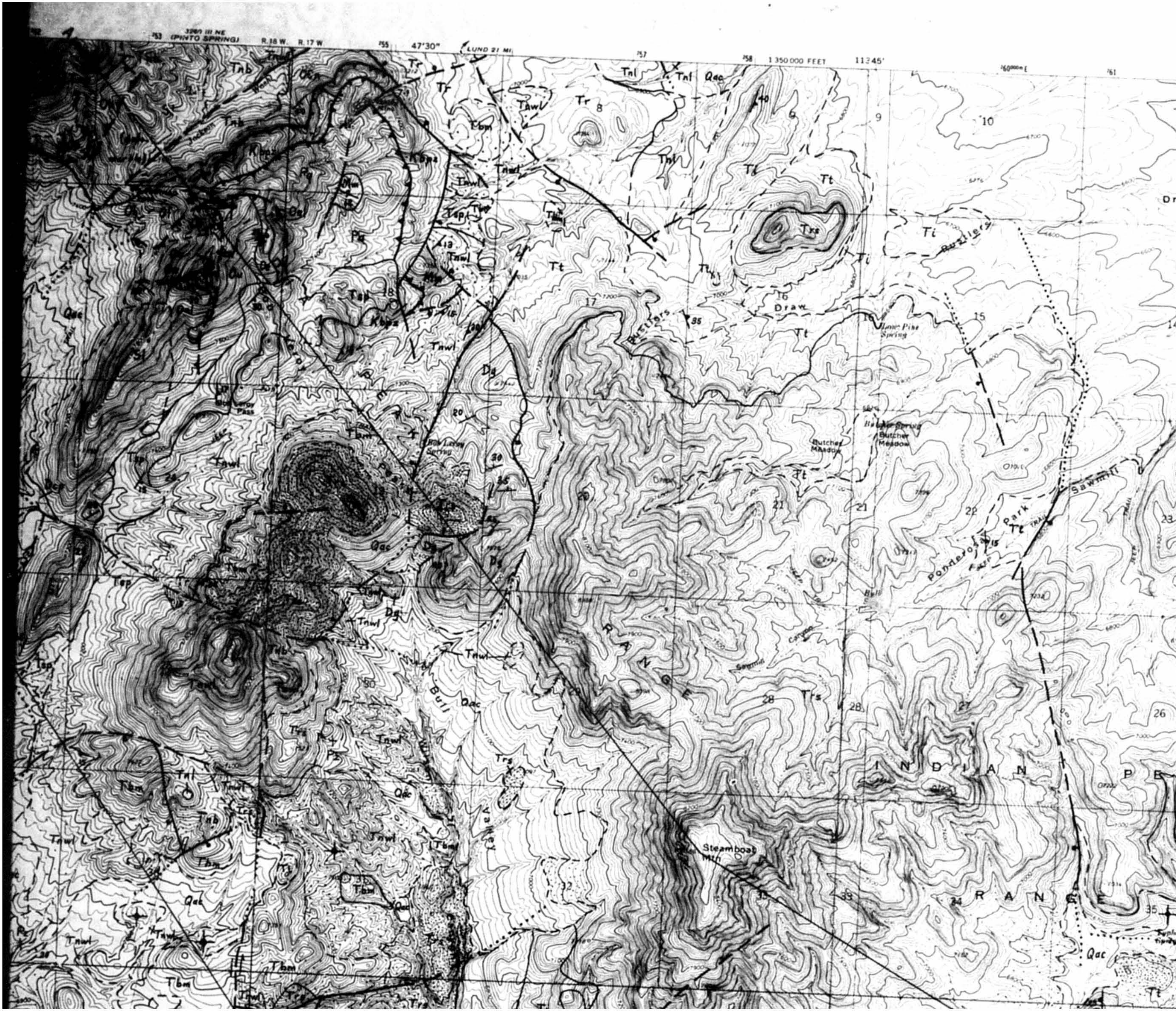
Base from U.S. Geological Survey, 1971



INDIAN PEAK RANGE
Steamboat Mtn
BIBLE SPRING FAULT ZONE
NORTH PEAKS
Meadow Spring
Mountain Spring
White Cliff
Warm Spring
Qac
Tt
Trs
Tnl
Tnwl
Tlf
Tl
Ti
Tcb
Tha
Tbm
Tnb
Tv
Te
D U
A'
T 31 S
T 32 S
R 17 W
R 16 W
2°30"
113°45'
42'30"
40'
113°37'30"
MOUNTAIN SPRING PEAK
LUND 15 MI.



BIBLE SPRING
FAULT ZONE
A'
9000 ft
8000
7000
6000
5000
hematic only
Silicic
Intrusion
Trs
Tt
Tl
Qac
Tcb
Ti
Tnwl
Tnl
Tnb?



3260 III NE
(PINTO SPRING)
R. 18 W.
R. 17 W.
47'30"
LUND 21 MI.
1 350 000 FEET
113°45'
Rustlers
Draw
Lone Pine Spring
Butcher Meadow
Sawmill
Ponderosa
Park
R A N G E
I N D I A N
Bull
Valley
Steamboat Mtn

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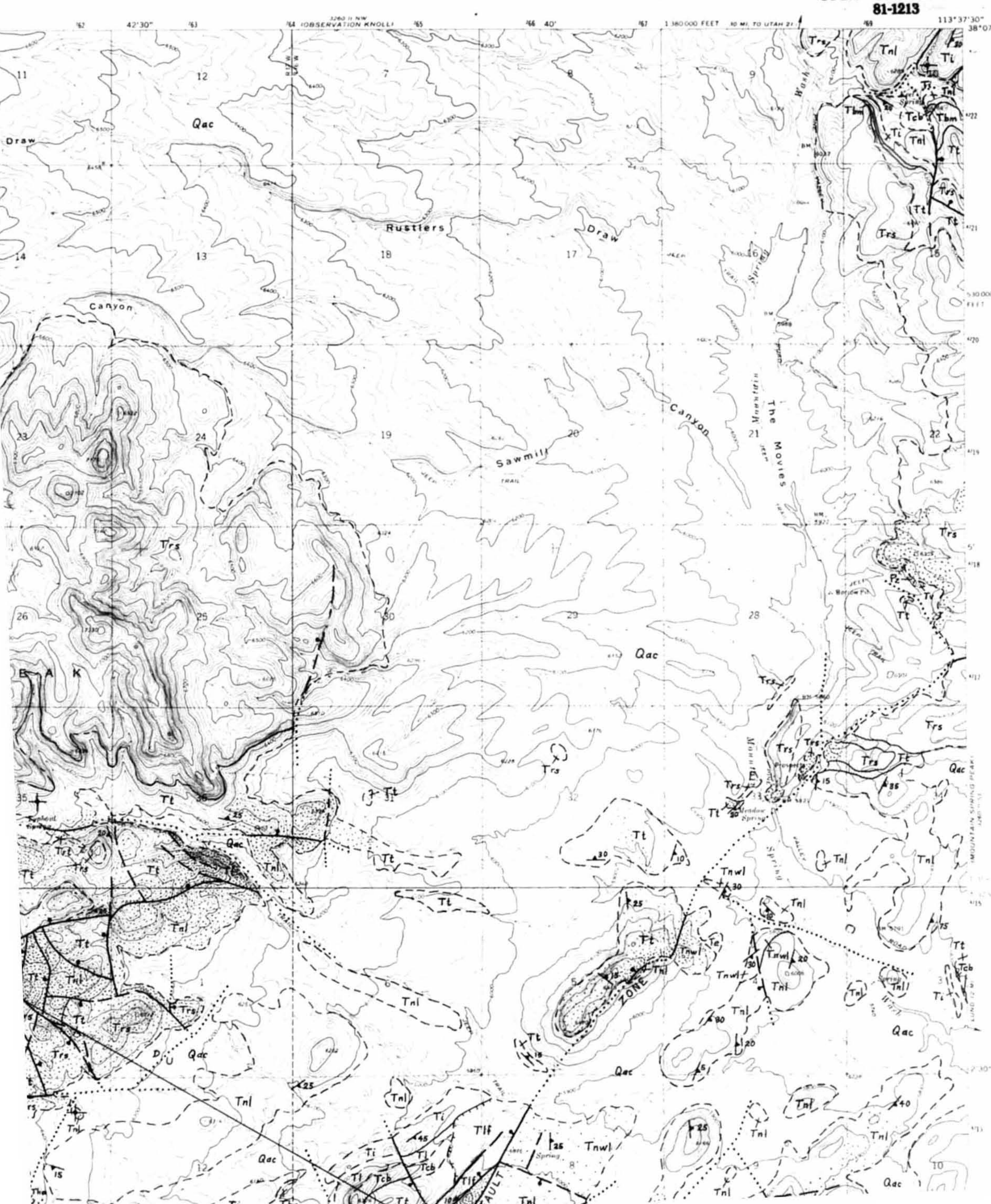
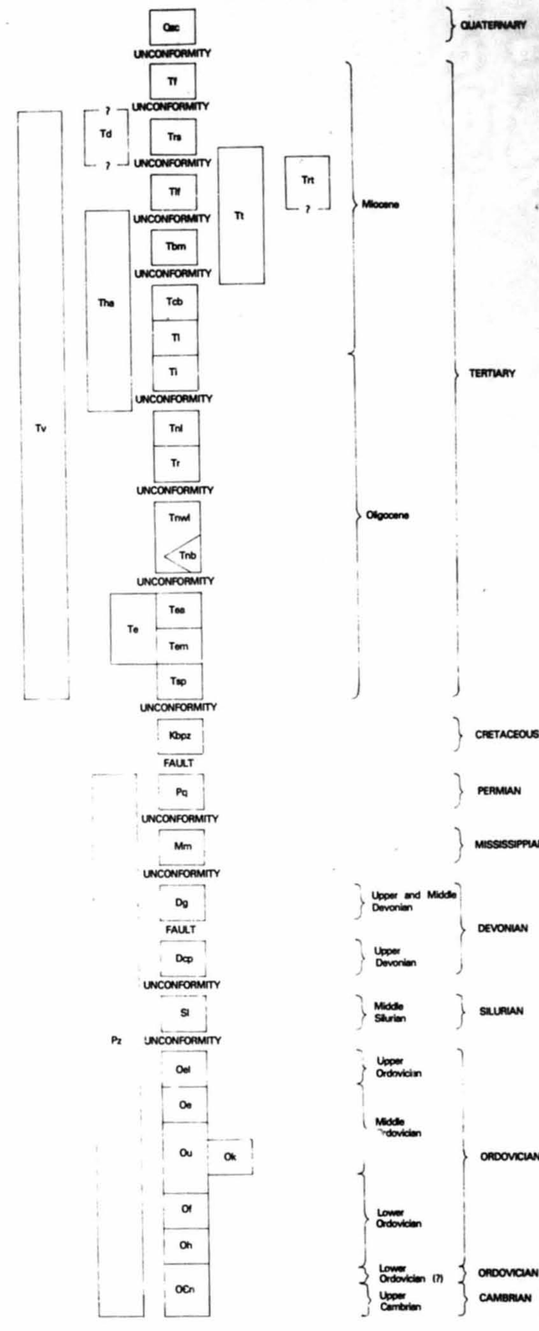
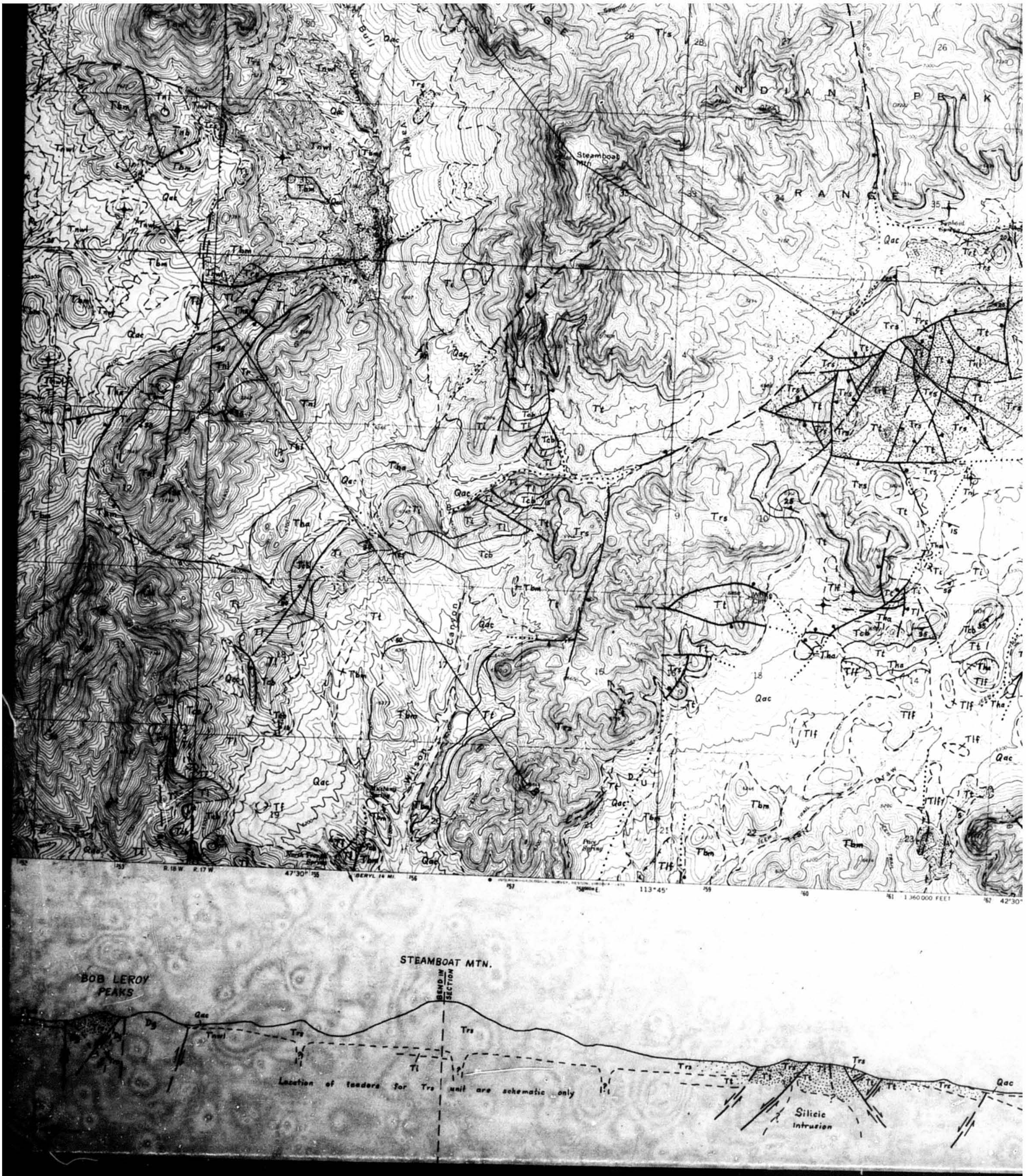
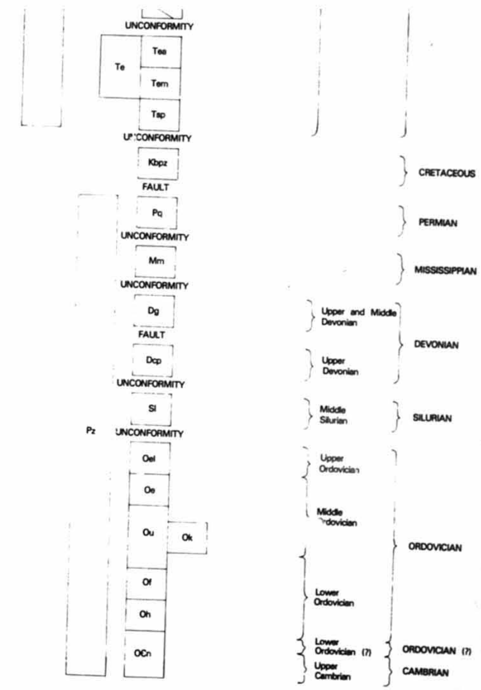


CORRELATION OF MAP UNITS




INDIAN PEAK
RANGE
Steamboat Mtn
Bull Valley
Wilson Canyon
R.18 W. R.17 W.
47'30"
113°45'
1 360 000 FEET
STEAMBOAT MTN.
BOB LEROY PEAKS
BEND IN SECTION
Location of feeders for Trs unit are schematic only
Silicic Intrusion



EXPLANATION OF SYMBOLS

HYDROTHERMALLY ALTERED ROCKS--Intense silicification (dense stippling) of volcanic units with weaker hematitic argillic, alunitic alteraton more widespread (light stippling)

DEPOSITIONAL OR INTRUSIVE CONTACT--Dashed where approximately located or inferred

FAULT--Dashed where approximately located and as seen on aerial photographs as a lineament; dotted where concealed. Ball and bar, or "D" on downthrown side. Possible strike-slip fault denoted by arrows showing sense of displacement

STRIKE AND DIP OF BEDDING

Inclined

Vertical

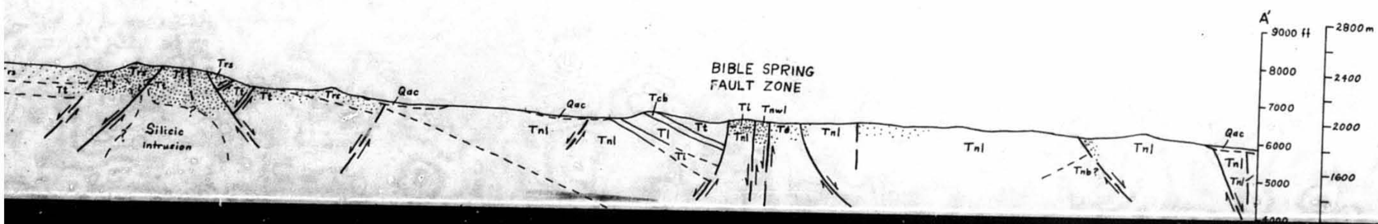
Overturned

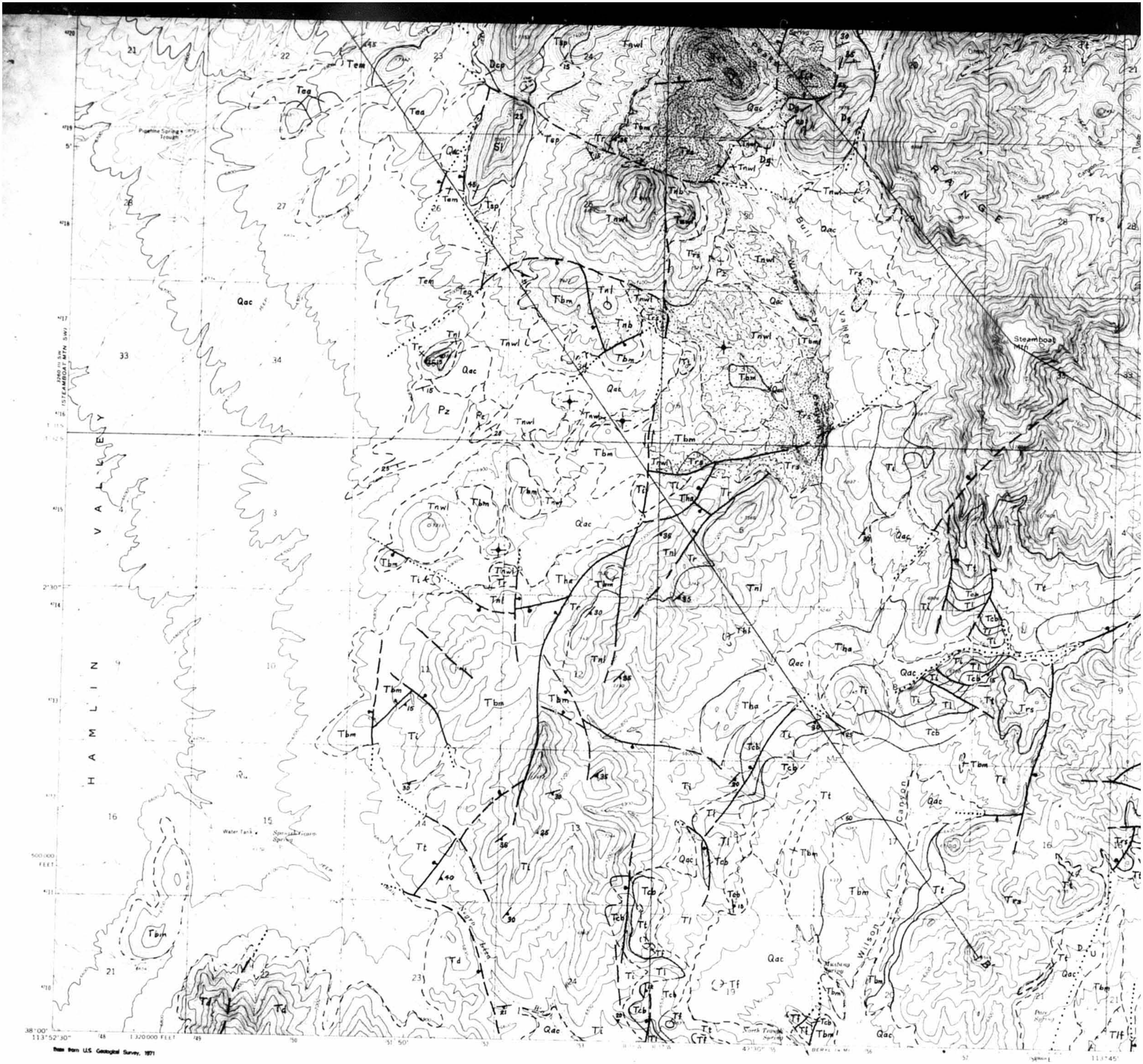
STRIKE AND DIP OF FOLIATION IN ASH-FLOW TUFFS

Inclined

Horizontal

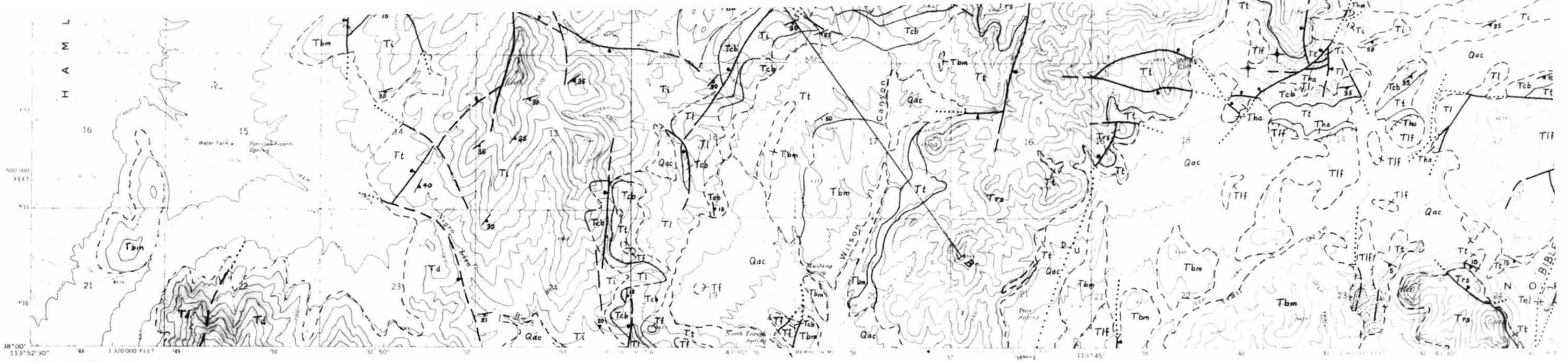
TREND AND PLUNGE OF SLICKENSIDES ON STEEPLY DIPPING FAULT SURFACES



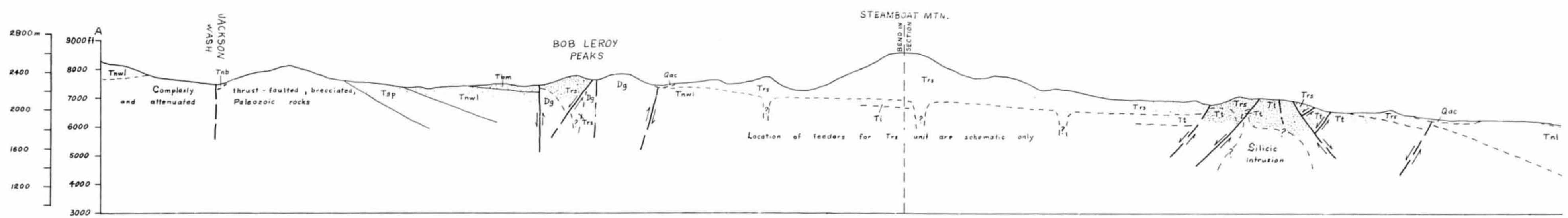


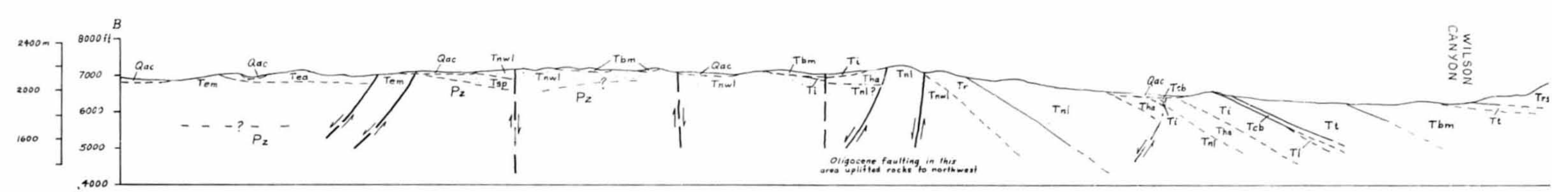
Base from U.S. Geological Survey, 1971

Geology mapped in 1980 by Myron G. Best and Robert L. Davis



Base from U.S. Geological Survey, 1971



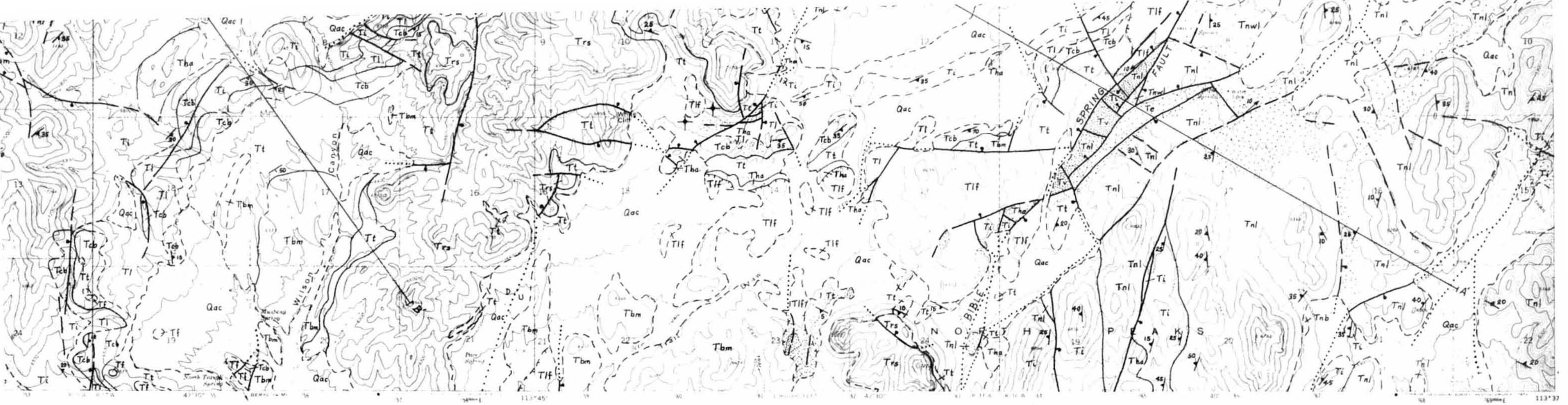


GEOLOGIC MAP OF THE STEAMBOAT MOUNTAIN AND BIBLE SPRING QUADRANGLES, WESTERN IRON C

By

Myron G. Best and Robert L. Davis

1981



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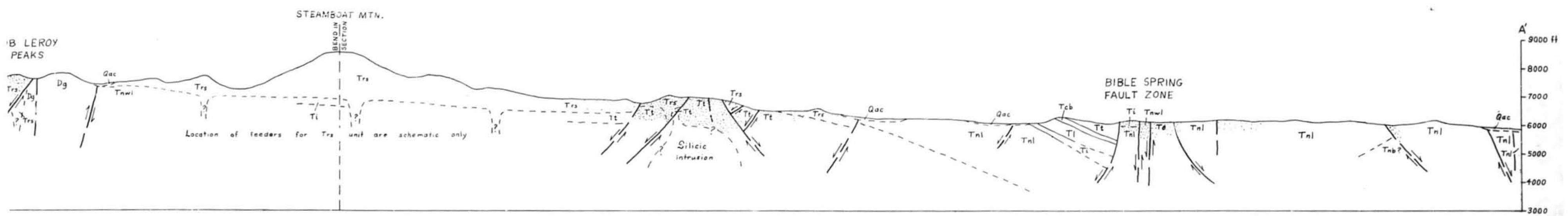
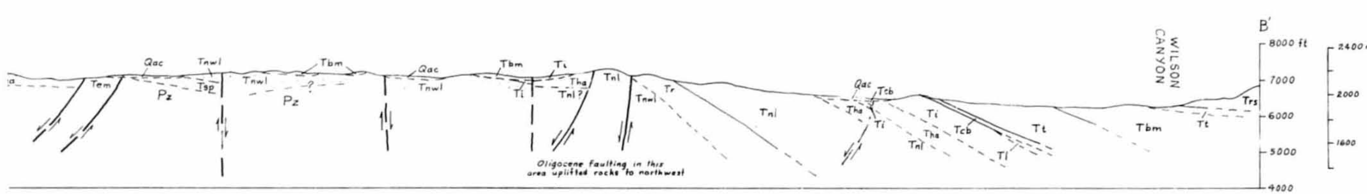




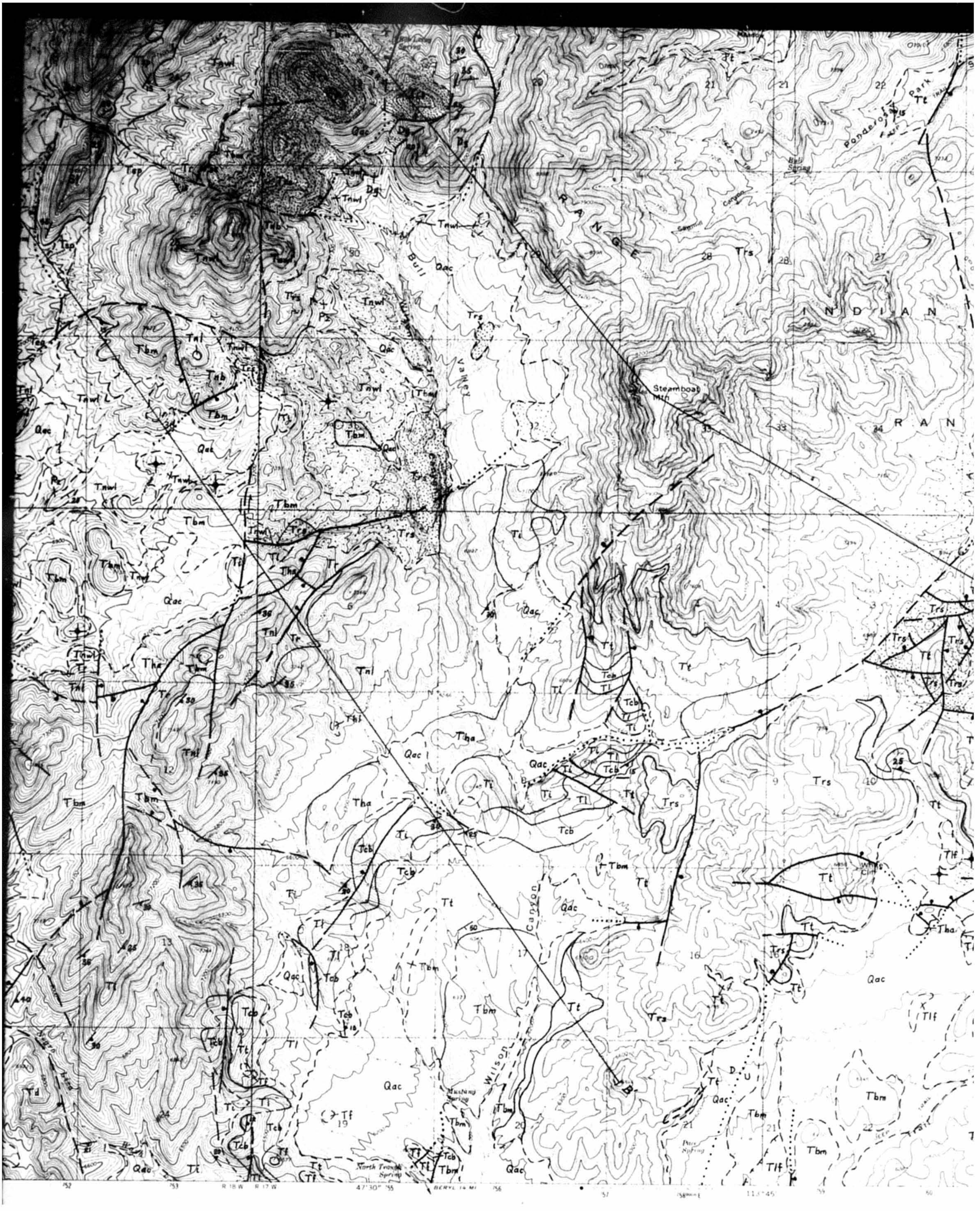
U.S. Geological Survey
OPEN FILE REPORT
This map is preliminary and has not been edited or reviewed for conformity with Geological Survey standards or nomenclature.

GEOLOGIC MAP OF THE STEAMBOAT MOUNTAIN AND BIBLE SPRING QUADRANGLES, WESTERN IRON COUNTY, UTAH

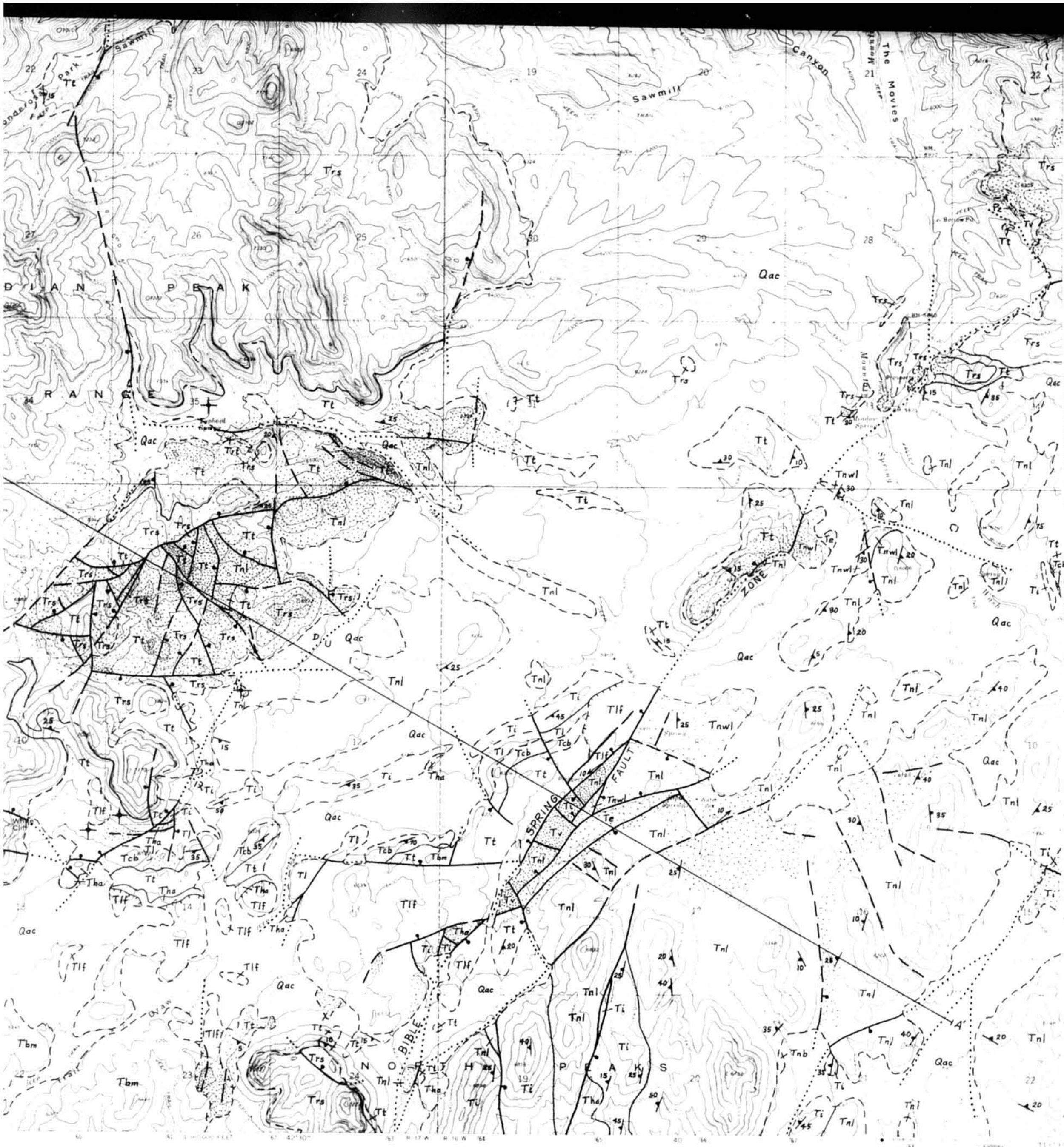
By

Myron G. Best and Robert L. Davis

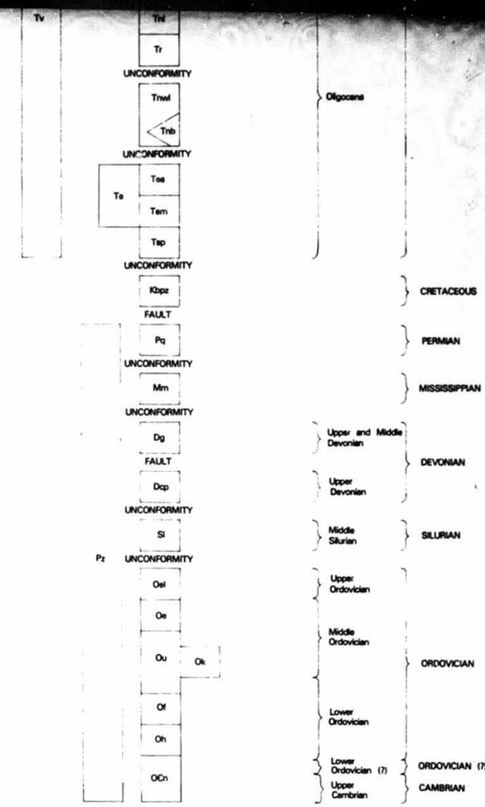
1981



Steamboat Mtn
Bull Valley
Wilson Canyon
INDIAN
RANGE
Mustang Spring
Ponderosa Park
Qac
Tbm
Tt
Trs
Tcb
Tha
Tnl
Tnwl
R 18 W
R 17 W
BERYL 14 MI



Geology mapped in 1980 by Myron G. Best and Robert L. Davis



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STRIKE AND DIP OF FOLIATION IN ASH-FLOW TUFFS

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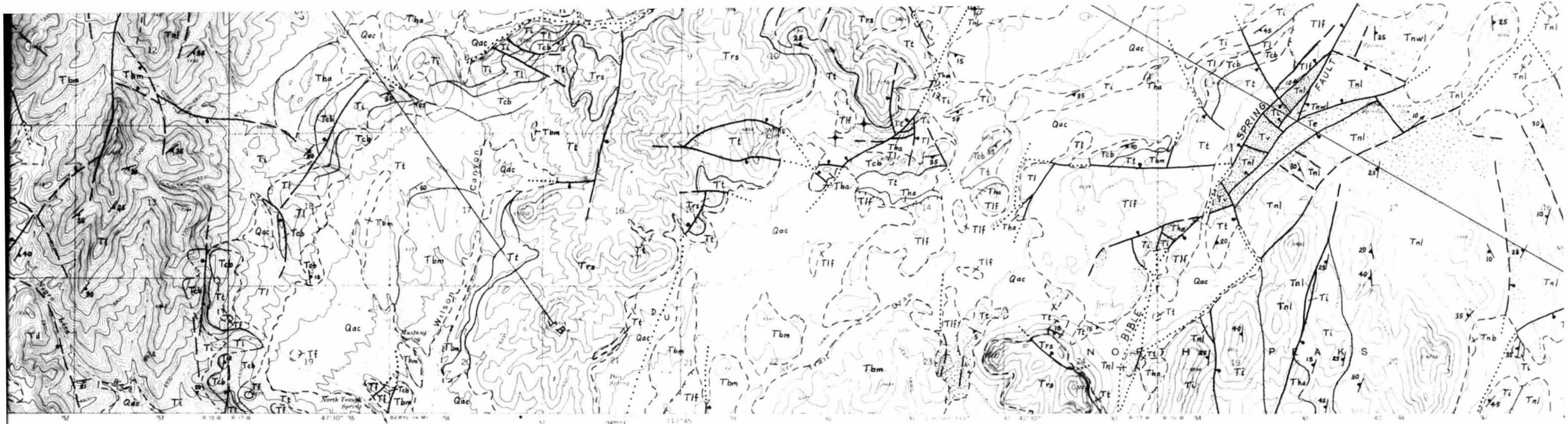

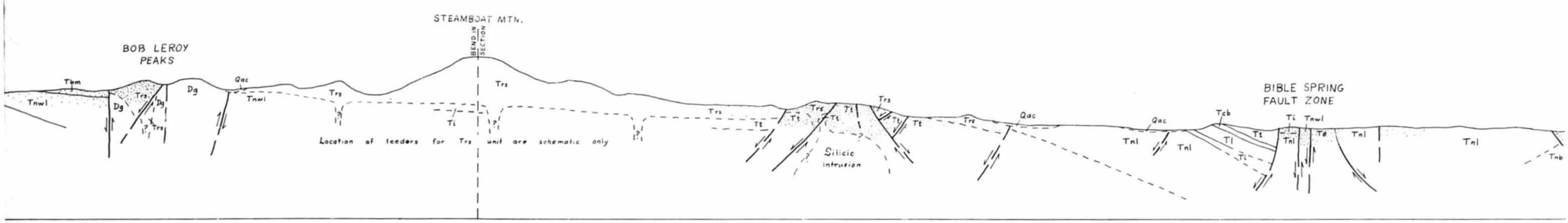

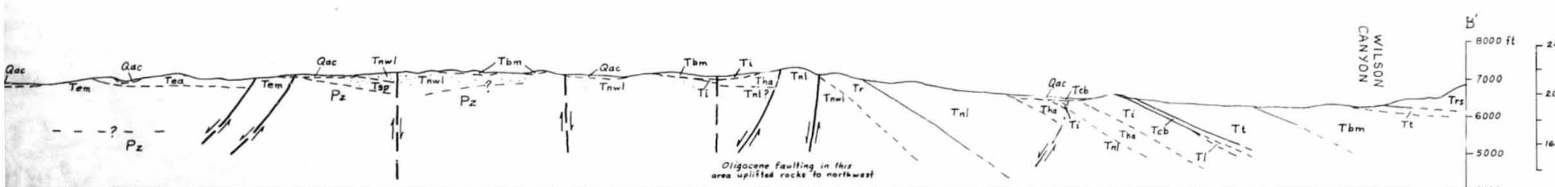

GEOLOGIC MAP OF THE STEAMBOAT MOUNTAIN AND BIBLE SPRING QUADRANGLES, WESTERN IRON COUNTY, UTAH

By

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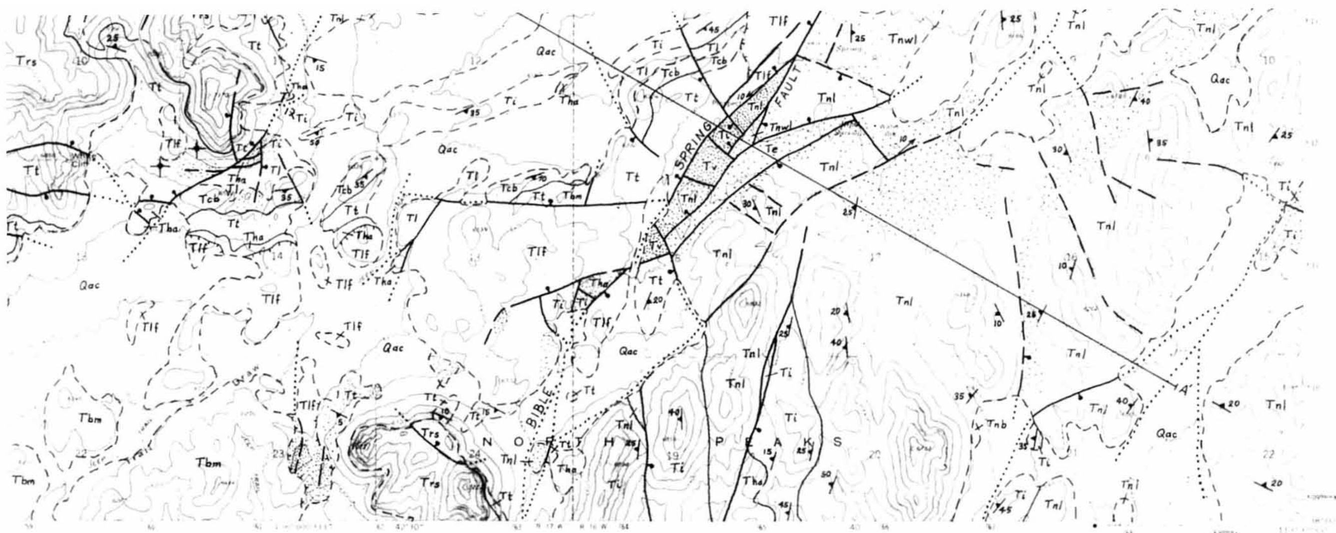
1981

Cambrian



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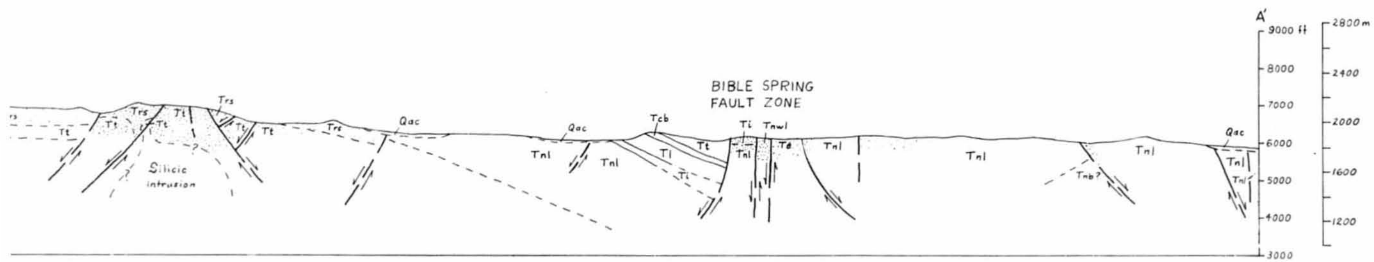

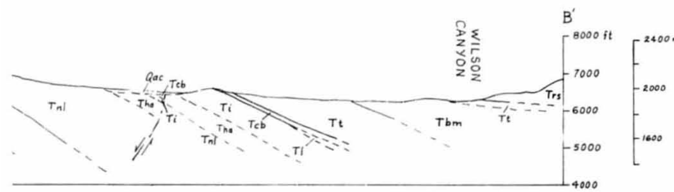

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N AND BIBLE SPRING QUADRANGLES, WESTERN IRON COUNTY, UTAH

By

. Best and Robert L. Davis

1981