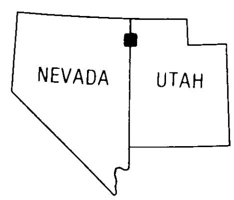
GEOLOGIC MAP OF THE TECOMA QUADRANGLE, BOX ELDER COUNTY, UTAH AND ELKO COUNTY, NEVADA

By David M. Miller and Joel D. Schneyer
U.S. Geological Survey



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INTRODUCTION

The Tecoma quadrangle is located in northwestern Utah along the Nevada-Utah border about 65 km. (40 mi.) south of the Idaho-Utah border. Part of the northern end of the Pilot Range is exposed within this quadrangle. The Pilot Range is a north-trending, fault-bounded mountain range typical of the ranges in the northern Basin and Range Province. In this range, sedimentary rocks typical of the Cordilleran miogeocline were deposited during Late Proterozoic and Paleozoic time. The area was the site of igneous intrusion, metamorphism, folding, and low-angle faulting during Mesozoic time. Cenozoic high- and low-angle faulting, igneous activity, and local metamorphism modified the Mesozoic structures, commonly making their recognition difficult.

Stratigraphic and structural studies were undertaken in the Pilot Range as part of a project to investigate the Mesozoic and Tertiary tectonics of northwestern Utah. This work and previous geologic mapping by Blue (1960) have revealed that complicated Tertiary and Mesozoic faults control the present distribution of sedimentary, metamorphic, and igneous rocks. Radiometric dating of low-grade metamorphic rocks and of plutons in the Pilot Range allowed partial resolution of the Mesozoic and Cenozoic structural and thermal history (Hoggatt and Miller, 1981). The Tecoma quadrangle is one of a series of maps that describe stratigraphic and structural relations in the Pilot Range (fig. 1). Mapping these quadrangles has revealed a chronology of Mesozoic metamorphism, low-angle faulting and folding, and Tertiary low- and high-angle faulting (Miller and others, 1982; Miller and Schneyer, 1983). Further data are given in Miller and Schneyer (1983) and a companion report on the neighboring Lucin quadrangle.

Bald Eagle Mountain, located in the northern end of the Pilot Range, is at 2,447 m. (8,028 ft.) the highest point in the Tecoma quadrangle. To the west the lowlands, ranging from 1,890 to 1,460 m. (6,200 to 4,800 ft.), are, in part, underlain by a pediment eroded on Tertiary strata. Surficial deposits of Pleistocene Lake Bonneville occur at the lowest elevations. Abrupt boundaries between the mountains and lowlands in the Tecoma quadrangle are typical of Basin and Range physiography.

STRATIGRAPHY

Proterozoic and Paleozoic strata in the Pilot Range belong to the Cordilleran miogeocline. Cenozoic deposits include thick Tertiary lacustrine deposits and felsic volcanic rocks, and varied Quaternary deposits. Detailed descriptions and discussions of problematical aspects for some of these stratigraphic units occurring in the Tecoma quadrangle are given in this section; additional data are given by Miller and Lush (1981), Miller and others (1982), and the companion report on the Lucin quadrangle.

ELY SPRINGS DOLOMITE (ORDOVICIAN)

Ely Springs Dolomite. *Dark dolomite and calcareous dolomite. Dark gray to black, cherty, and medium to thin bedded in lower 10 m.; dark gray and thick bedded in upper part.*

Dark-gray to black dolomite with abundant light-gray chert in the lower part rests conformably on the prominent cliffs of Eureka Quartzite at Quartzite Canyon. Overlying the cherty black dolomite is dark-gray, medium-bedded dolomite also assigned to the Ely Springs Dolomite. The unit is conformably overlain by lighter colored, poorly bedded dolomite of the thick-bedded dolomite unit at Quartzite Canyon. Following Sheehan (1979) and Sheehan and Pandolfi (1983), the Upper Ordovician dolomite resting on the Eureka Quartzite is here assigned to the Ely Springs Dolomite rather than to the temporally equivalent but lith-

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ologically somewhat different Fish Haven Dolomite to which the Upper Ordovician dolomite in the area was previously assigned (Blue, 1960). A structurally isolated block of the Ely Springs southeast of Bald Eagle Mountain yielded corals of Late Ordovician(?) age (table 1, sample 6).

THICK-BEDDED DOLOMITE (DEVONIAN AND SILURIAN)

Thick-bedded dolomite. *Grayish-white, light- and medium-gray, poorly bedded to structureless dolomite and calcareous dolomite. Upper part white to light gray and structureless. Middle part mostly medium gray, poorly bedded, and crinoid-bearing, with some light-gray and dark-gray layers. Lower part light gray and contains sparse chert nodules.*

A thick section of generally light-colored, nearly structureless dolomite underlies the Simonson Dolomite. Neither the distinctive tripartate division of the Laketown Dolomite nor the laminations characteristic of the Sevy Dolomite are present in the thick-bedded dolomite unit. Silty, platy limestone within the thick-bedded dolomite unit in the southern Pilot Range and in the nearby Silver Island Mountains (Sheehan, 1979; Sheehan and Pandolfi, 1983) suggests that the thick-bedded dolomite unit might be broadly correlative with the Roberts Mountains Formation and Lone Mountain Dolomite. However, platy limestone does not crop out in the northern Pilot Range, with the exception of a fault(?) slice of platy, silty dolomite about 6 m. thick which locally occurs above the Ely Springs Dolomite northeast of Copper Mountain. It is likely that the thick-bedded dolomite unit in the Tecoma quadrangle is partly equivalent to the Laketown and Sevy to the east and partly to the Roberts Mountains and Lone Mountain to the west (Poole and others, 1977); in the Pilot Range there is an intertonguing of these facies.

A disconformity evidently occurs between the thick-bedded dolomite unit and the overlying Simonson, because the upper beds of the thick-bedded dolomite unit are Early Devonian and (or) Late Silurian (Miller and others, 1982). The lower part of the thick-bedded dolomite unit is typically truncated structurally, but it rests concordantly on Ordovician strata at Quartzite Canyon. Silurian strata are not positively identified in the northern Pilot Range, but are presumably present, based on correlation of this unit with Silurian and Devonian strata nearby (Sheehan, 1979).

SIMONSON DOLOMITE (DEVONIAN)

Simonson Dolomite. *Interlayered dark- to medium-gray and light-gray calcareous dolomite; forms steep slopes with distinctive alternating light and dark bands. Medium to thick bedded; most beds finely laminated, but a few beds are extensively bioturbated. Contains beds of* ***Amphipora*** *sp.*

The generally dark, finely laminated dolomite assigned to the Simonson Dolomite sharply contrasts with the underlying pale, nearly featureless thick-bedded dolomite and the overlying pale-weathered cliffs of black limestone assigned to the Guilmette Formation. Blue (1960) considered the Simonson to be Middle Devonian in age on the basis of stromatoporoids and brachiopod fragments. In the Pilot Range south of the Tecoma quadrangle, a Middle Devonian age has been established for the uppermost part of the Simonson on the basis of conodont collections (Miller and others, 1982).There, the lowermost part of the unit is considered latest Early Devonian or earliest Middle Devonian on the basis of conodont identifications (A. G. Harris, 1983, written commun.).

GUILMETTE FORMATION (DEVONIAN)

Guilmette Formation. *Dark-gray, blue-gray, and black, cliff-forming limestone; weathering light-gray to white. Well bedded or laminated throughout; fossiliferous. Sedimentary breccia and soft-sediment slump features common. Lower part commonly contains stringers and beds of dolomite. Quartz sandstone beds and sandy limestone occur near top, as indicated by dot-dash lines. Minor diagenetic gray-brown chert occurs in irregular blebs and stringers. Active dissolution-reprecipitation is present in Crystal Cave (Doelling, 1980). Base of formation drawn at bottom of cliff-forming limestone and dolomite and at top of steep slope-forming Simonson Dolomite.*

The Guilmette Formation in the northern Pilot Range is a thick, cliff-forming limestone unit. Conodonts from the unit south of the Tecoma quadrangle indicate that the base of the unit is late Middle Devonian (Givetian) (Miller and others, 1982); the youngest conodonts recovered are Late Devonian (Fammenian) (W.A. Fuchs, 1984, written commun.). This age range is in accordance with that reported by Blue (1960) for his "massive limestone member" of the Guilmette, which more or less corresponds to the Guilmette Formation as used herein.

Dolomitization of lithologically distinctive beds in the basal part of the Guilmette makes it difficult to define the base of the unit. In general, the upward transition from the slope-forming, prominently laminated Simonson Dolomite to cliff-forming Guilmette Formation limestone occurs over a 10 to 20 m. (30 to 65 ft.) interval; at Copper Mountain the transition zone is wider. There, faunal data kindly provided by W. A. Fuchs (1984, written commun.) helped in locating the contact.

TRIPON PASS LIMESTONE (MISSISSIPPIAN)

Tripon Pass Limestone. *Dark-gray to black, regularly bedded, silty limestone and subordinate interbeds of calcareous siltstone. Weathers light-gray with a pinkish hue.*

The Tripon Pass Limestone typically forms rounded, grassy slopes that are covered by light-gray, fissile to platy, cleaved limestone fragments. Less common are cliffy exposures of medium- to thin-bedded limestone. Worm burrows, crinoids, and rare bryozoan fragments are present locally, but the unit is generally remarkably unfossiliferous.

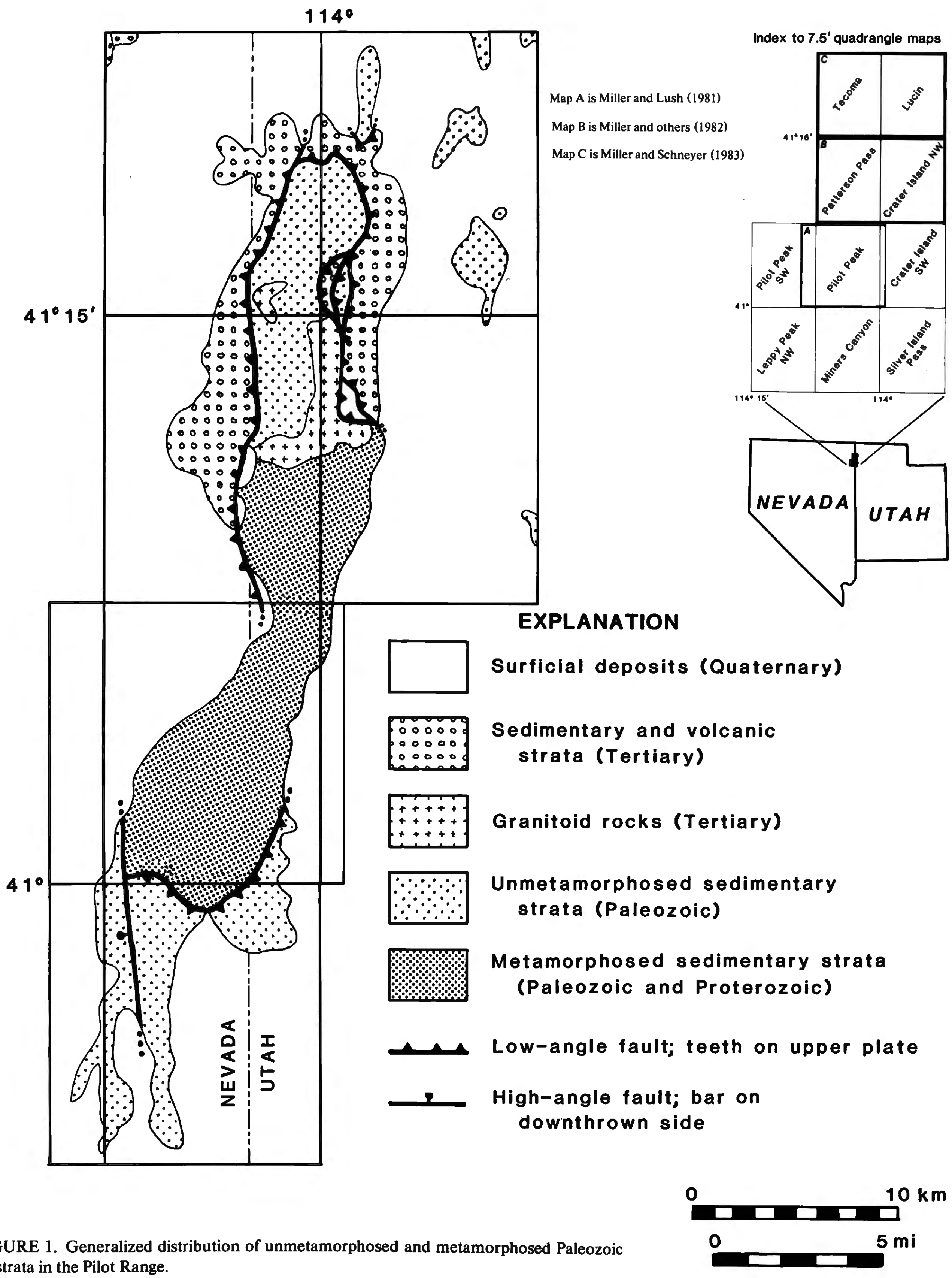

FIGURE 1. Generalized distribution of unmetamorphosed and metamorphosed Paleozoic strata in the Pilot Range.

Rusty-colored, sand-bearing laminae occur locally, and brown chert nodules occur locally near the top of the unit. The unit was designated the "shaly limestone member" of the Guilmette Formation by Blue (1960) in the absence of paleontologic data. Conodonts collected from the Tripon Pass Limestone in the Patterson Pass quadrangle (Miller and others, 1982) are Early Mississippian (Kinderhookian). Reworked Ordovician conodonts in one sample open the possibility that the Mississippian conodonts may also have been redeposited.

The Tripon Pass tectonically rests on the Guilmette Formation or intervening siliceous breccia. It is rarely more than 10 m. (30 ft.) thick in the Tecoma quadrangle, in contrast with sections greater than 400 m. (1300 ft.) thick just 3 km. (2 mi.) to the south.

The Tripon Pass Limestone in the Pilot Range is similar to the Tripon Pass Limestone exposed 40 km. (25 mi.) to the west in the Pequop Mountains (Poole and Sandberg, 1977) but differs from the temporally equivalent Joana Limestone exposed in the nearby Silver Island Mountains. There, the Joana Limestone is a dark, cliff-forming, bioclastic limestone containing only minor silt, and it is much thinner than the Tripon Pass Limestone (Schaeffer,1960; Poole and Sandberg, 1977).

CHAINMAN SHALE AND DIAMOND PEAK FORMATION, UNDIVIDED (MISSISSIPPIAN)

Chainman Shale and Diamond Peak Formation, undivided. *Dark-gray, dark-brown, and black siliceous sandstone and brown-weathering conglomerate, both containing quartzite, quartz, black and green chert, and feldspar clasts; and dark-gray shale and tan to gray siltstone. Medium to thick bedded; conglomerate beds are 0.5 to 2 m. (1.5 to 7 ft.) thick and form cliffs and resistant ledges. Shale and sandstone form brown slopes.*

Quartzite, with subordinate gray shale and siltstone, and heterolithic conglomerate crop out as a slope-forming, dark-weathering unit. Sandstone clasts are dominantly three types: (1) well-rounded undeformed quartz, (2) subrounded to subangular dark chert or siliceous siltstone, and (3) subangular to angular quartz with undulatory extinction. Rare plagioclase also occurs. The sandstone matrix is composed of fine sand- to silt-sized quartz and clay. Medium-gray shale, as much as 20 m. (65 ft.) thick, contains bryozoan and brachiopod fragments. Conglomerate is silicified and resistant, containing clasts of chert, sandstone, calcareous sandstone, and jasperoid. Clast diameters are generally 3 to 6 cm. (1 to 3 in.) and the maximum diameter is 20 cm. (8 in.).

The undivided Chainman Shale and Diamond Peak unit is cut by a low-angle fault at its structural base, where it is juxtaposed with the Mississippian Tripon Pass Limestone, silicified breccia, and Guilmette Formation. This contact is interpreted as a low-angle fault, rather than an unconformity, because (1) beds of the Tripon Pass Limestone below the contact are tightly folded and discordant with it, and (2) much or all of the undivided Chainman and Diamond Peak is truncated along much of its strike length, and yet no anomalous facies indicative of 150 to 200 m. (500 to 650 ft.) of relief on an unconformity are present in the unit.

Blue (1960) described fauna from shale in the northern Pilot Range that were identified as Late Mississippian in age. Poole and Sandberg (1977) described locations west of the Pilot Range for which an Early Pennsylvanian age for the upper part of the Diamond Peak has been established, but, in the absence of paleontological data, the undivided Chainman and Diamond Peak unit in the Pilot Range is considered to be entirely Mississippian.

PEQUOP(?) FORMATION (PERMIAN)

Pequop(?) Formation. *Predominantly laminated to thin-bedded, platy, charcoal-gray, silty limestone; interbedded with laminae and thin beds of tan to brown calcareous siltstone. Lower part commonly siltstone. Some limestone beds are bioclastic grainstone containing crinoid fragments, spirifer brachiopods, and recrystallized fusulinids. Typically forms tan-weathered grassy slopes.*

The Pequop(?) Formation has been divided into three informal members: a lower calcareous siltstone tc silty limestone member; a middle black, platy, silty limestone member, with debris flow beds of fossil "hash"; and an upper, coarsely bioclastic limestone member.

The middle and upper members of the Pequop(?) Formation yielded an Early Permian fauna (table 1, samples 1 to 5). Sample 3, probably from the upper member, was taken from an exposure of bioclastic limestone that is interbedded with conglomerate containing fossil debris and clasts of silty limestone. Because samples 3 and 4 were obtained from a thin faulted-bounded slice of the Pequop(?), their exact stratigraphic positions are uncertain.

SILICIFIED BRECCIA (AGE UNCERTAIN)

Silicified breccia. *Dense, resistant, dark-brown, brecciated jasperoid, silicified sandstone, altered carbonate rocks, and siliceous fracture and vug fillings. Some protolith material is Paleozoic; age of silicification and brecciation unknown. Breccia is probably of tectonic and hydrothermal origin; possibly also includes some primary cherty rocks.*

Distinctive dark-colored, cliff-forming, silicified and brecciated jasperoid forms a cap on cliffs of the Devonian Guilmette Formation. The unit may be of hydrothermal and tectonic origin. The jasperoid was cemented by silica following brecciation of earlier jasperoid, indicating either a long-lived silicification and brecciation event or two silicification events, prior to and following brecciation. Rock types occurring mainly as breccia fragments are calcite-cemented sandstone from the upper part of the Guilmette Formation and carbonate rock probably derived from the Guilmette. Rarely, silica filled voids between fragments. Disaggregated quartz sand grains that are morphologically identical to those in sandstone from the upper part of the

Guilmette occur locally in the matrix of the jasperoid. Primary chert possibly occurs as clasts in the breccia. Blue (1960) designated the breccia the "massive quartzite member" of the Guilmette, an assignment that is not supported by our study.

The silicified breccia unit rests discordantly on the Guilmette Formation, and any of the units ranging in age from Mississippian to Permian may occur above the breccia, suggesting that it is in part a tectonic fault breccia. An origin as a sedimentary breccia at an unconformity is ruled out because 1) silicified fragments are brecciated and re-silicified, 2) the necessary unconformity would have to have relief two orders of magnitude greater than a documented unconformity on the Guilmette in nearby ranges (Schaeffer, 1960), and 3) in places where the presumed unconformity cuts out section such as where the Tripon Pass Limestone is removed in the Patterson Pass quadrangle (Miller and others, 1982), the breccia thickens rather than thins on this presumed paleo-high. However, concentrically laminated calcite masses suggest that fillings of solution cavities occurred in the upper part of the Guilmette. Thus, any possible locally developed sedimentary breccia at the top of the unit has been accentuated and modified by faulting and hydrothermal activity, the main processes causing the siliceous breccia unit. The breccia formed in part during Mesozoic to Paleogene faulting (see section on structural geology). The silicification is of unknown age.

SEDIMENTARY ROCKS, VITRIC TUFF, DIABASE, AND RHYOLITE OF RHYOLITE BUTTE (MIOCENE)

Sedimentary rocks. *Lithified, but generally non-resistant, lake deposits including conglomerate, sandstone, siltstone, and limestone; and uncommon thin interbeds of altered white, waterlain vitric tuff. Lake deposits generally siliceous, thin bedded, fine grained, and rich in volcanic glass. Marker units of pebble conglomerate containing clasts of lineated metaquartzite in northwest corner of quadrangle indicated by dot-dashed line. Greater than 350 m. (1,150 ft.) thick.*

Vitric tuff. *White to light-gray, thin- to thick-bedded (5 mm. to 50 cm.) vitric tuff containing no phenocrysts. Graded bedding, cross-stratification, and interbeds of silt and sand suggest subaqueous deposition. Minimum thickness 50 m. (165 ft.).*

Diabase. *Dikes and sills of predominantly fine-grained pyroxene diabase, hornblende-pyroxene diabase, and hornblende-rich mafic rocks. Includes reddish-brown resistant diabase dikes as well as large nonresistant bodies that weathered to soft, loose, brown soils.*

Rhyolite of Rhyolite Butte. *Dark-brown weathering, glassy sanidine-quartz-plagioclase-pyroxene rhyolite flow. Thick vitrophyre at base contains abundant spherules. Typically columnar jointed, columns perpendicular to flow foliation. Overlies Miocene strata with slight angular unconformity. Flow about 100 m. (330 ft.) thick with erosional top; basal vitrophyre 5 to 12 m. (16 to 40 ft.) thick. About 9 m.y. old based on K-Ar age.*

The section of heterogeneous rocks occurring primarily in pediments is probably entirely Miocene, but may include some Oligocene strata. The rhyolite of Rhyolite Butte (Trb) overlies a thick section of sedimentary and volcanic rocks (Ts) and is dated at 8.8 ± 0.3 m.y. (W. C. Hillhouse, 1984, written commun.) and 8.6 ± 0.2 m.y. old (Armstrong, 1970, recalculated with new constants); both determinations were by K-Ar on sanidine. However, parts of the sedimentary section may be younger than the rhyolite of Rhyolite Butte because clasts of diabase (Td) that apparently intrude faults cutting the rhyolite are incorporated into conglomerate that is interbedded with tuffaceous siltstone about 1 km (0.6 mi.) south of Black Butte.

The sedimentary rocks unit (Ts) predominantly consists of waterlain tuffaceous sandstone and siltstone. These rocks are predominantly thin bedded, finely cross-laminated, well sorted, hard and platy, and contain as much as 90 percent volcanic glass. Mafic phenocrysts are absent and feldspar uncommon, indicating reworking of the volcanic sources. Rocks with no noticeable detrital component other than volcanic glass are mapped as vitric tuff (Tvt). Less common are gray, punky tuff, and heterolithic conglomerate bearing abundant jasperoid clasts and common soft-sediment rip-up clasts.

BASALT (MIOCENE)

Basalt flows. *Black, aphanitic olivine-pyroxene basalt occurring as remnants of flows and ponded flows. Locally complexly jointed. About 10 m.y. old.*

Basalt feeder dikes. *Resistant feeder dikes of aphanitic olivine-pyroxene basalt intruding Tertiary strata adjacent to ponded basalt flows. Joints form horizontal columns.*

Mesas underlain by basalt are morphologically youthful, and ponding of the flows against higher ground near the present Pilot Range front suggests that the basalt is younger than some of the faulting along the range front. K-Ar dates (on plagioclase) by W. C. Hillhouse (1984, written commun.) place the age of the basalt at 10.6 ± 1.1 m.y.

PLUTONIC ROCKS

Monzogranite of McGinty. *Coarse-grained, white to gray, porphyritic monzogranite to granodiorite. Euhedral zoned phenocrysts of alkali feldspar, as large as 5 cm. in maximum diameter, set in coarse-grained matrix of subhedral plagioclase and alkali feldspar (5 mm.), subhedral quartz (8 mm.), and biotite. Accessory hornblende, zircon, sphene, apatite, and xenotime(?). Biotite, generally 6 to 9 percent, is partially altered to chlorite. About 37 m.y. old.*

A pluton ranging from monzogranite to granodiorite crops out in the southern part of the Tecoma quadrangle. In adjacent quadrangles the roof of the pluton gently dips on average, but locally it is irregular and has several tens of meters of relief. The outcrops of this body near Six-Shooter Canyon appear to have steep walls.

STRUCTURAL GEOLOGY

Folds and faults in the pre-Quaternary rocks of the Tecoma quadrangle are continuous with those described by

Miller and others (1982) and Miller and Schneyer (1983) in the adjacent Patterson Pass, Crater Island NW, and Lucin quadrangles. These structures are divided into a pre-Oligocene group and an Oligocene and younger group.

PRE-OLIGOCENE FAULTS

Paleozoic strata in the Tecoma quadrangle are cut by numerous low- and high-angle pre-Oligocene faults. Low-angle faults are generally bedding-plane faults, and have produced both younger-over-older and older-over-younger juxtapositions of strata. Three major structural blocks separated by low-angle faults, but also internally broken by low-angle faults, occur: (1) the lower block is composed of Ordovician strata and parts of the thick-bedded dolomite unit; (2) the middle block is composed of Silurian and Devonian strata; and (3) the upper block is composed of siliceous breccia and Mississippian and Permian strata.

Strata in the lower structural block are broadly folded. Open to tight folds deform Ordovician and Silurian strata east of Copper Mountain near Governors Spring. There, the folded strata are cut by a low-angle fault containing Guilmette Formation of the middle structural block in the hanging wall. The fault is locally marked by thin tectonic slices of siltstone and silty limestone, probably derived from the Chainman Shale and Diamond Peak Formation, undivided, and the Tripon Pass Limestone. This fault apparently dips gently southwestward, passing under Copper Mountain at shallow depths and cropping out on the west side of the mountain where the thick-bedded dolomite unit lies in the hanging wall and the Garden City Formation in the footwall. Bedding-plane faults are common within, and often bound, Ordovician strata west of Copper Mountain and northward along the foothills of the range to Quartzite Canyon. In particular, the Eureka Quartzite is duplicated in several places by bedding-plane faults.

The middle structural block consists of part of the thick-bedded dolomite unit and the Simonson and Guilmette Formations. Although bedding in this structural block is typically concordant with bedding in underlying and overlying blocks, as indicated by map relations along the western flank of the Pilot Range, bedding and structures are locally discordant in the Copper Mountain area. Here, the middle block is broadly folded and probably also faulted by high-angle, north-striking faults.

The upper structural block is underlain by a major fault zone occurring on the Guilmette Formation. Tectonic slices of siliceous breccia and Tripon Pass Limestone occur in this fault zone. Bedding-plane faults within the upper structural block are localized at the tops of the Tripon Pass Limestone, Chainman Shale and Diamond Peak Formation, undivided, and the Pequop(?) Formation (section AA'). The faults bounding the Permian units are poorly exposed, but the units vary greatly in thickness, indicating significant structural modification. Distinctive stratigraphic intervals within these units are structurally thinned at several locations. Stratigraphic intervals near the base and top of the Pequop(?) Formation typically are truncated, and bedding-plane faults are inferred at those locations. Small bedding-plane faults are probably pervasive throughout the Permian units.

Pre-Oligocene high-angle faults in the northern Pilot Range occur in generally east- and north-striking sets, but individual faults may have east, northwest, and north strikes. The high-angle faults in general cut the low-angle faults, although south and east of Bald Eagle Mountain low-angle faults at the base of the Permian Pequop(?) Formation and the chert and dolomite unit apparently ramp over and cut both faults and strata in underlying units.These high- and low-angle faults are Eocene or older because they are intruded by the monzogranite of McGinty. The east-striking high-angle faults produce moderate stratigraphic separations with the north side down; in some cases different thicknesses of a given subunit are juxtaposed (section CC'). These data indicate that the faults may be lateral ramps to bedding-plane faults at depth. North-striking faults have moderate strike separations and drop strata down on the west. In some cases, such as faults near the mouth of Six Shooter Canyon, the north-striking faults probably are Oligocene and younger or have experienced reactivation along with Oligocene and younger faulting. This relation is suggested by the apparent continuity of faults within the range and range-bounding faults cutting Miocene strata.

OLIGOCENE AND YOUNGER FAULTS

Paleogene and Neogene strata and Paleogene plutons are cut by moderately dipping Oligocene and younger faults that may have formed during two stages of movement: an early period of listric(?) faulting and a later period of high-angle(?) faulting and doming that blocked out the present range. The Oligocene and younger faults are distinguished from the pre-Oligocene faults by age, structural style, and spatial distribution. These faults outline major topographic breaks because they juxtapose units of different resistance and because, in part, they are youthful features responsible for the blocking-out of the ranges.

Oligocene and younger faults occur along the west side of the Pilot Range where the faults dip moderately westward and hanging-wall rocks in general dip gently eastward and northeastward. East of Rhyolite Butte a fault dips gently to moderately northeastward and Tertiary hanging-wall strata are moderately inclined northeastward. These Tertiary strata are juxtaposed with gently dipping strata on the west, under Rhyolite Butte, along an inferred north-striking fault east of the butte.

Along the western range front the gently east-dipping Miocene strata are juxtaposed with moderately east-dipping Paleozoic strata by faults generally concealed by alluvium. This fault system is delineated by aligned springs and by sparse exposures of faults in bedrock in the southern Tecoma quadrangle, but it is not traceable north of Quartzite Canyon. Displaced rocks from the siliceous breccia and the chert and dolomite unit form spurs along the northwestern side of the Pilot Range and are interpreted as gravity-slide blocks on the map. Alternatively, these may be fault-bounded blocks. Rocks of the Pequop(?) Formation beneath these displaced blocks have well-developed cleavage and are strongly folded by minor northwest-trending, tight folds. These relations suggest that movement of the overlying displaced blocks of the chert and dolomite unit might have involved deeper-seated (ductile) processes than one might expect for gravity-slide blocks. Because the displaced blocks are internally disrupted and are morphologically similar to gravity slides, they are interpreted as such on the map.

All of the normal faults along the west side of the Pilot Range postdate Miocene stratified volcanic rocks. The range-front faults cut the 8.8-m.y.-old rhyolite of Rhyolite Butte and are in part contemporaneous with undated diabase which intrudes these fault zones but is typically broken in the zones. Movement on some range-front faults in the Tecoma quadrangle may have been as young as Pleistocene, as established for the southward continuations of these fault zones (Miller and Lush, 1981; Miller and others, 1982).

ECONOMIC DEPOSITS

Considerable mining activity took place in the Copper Mountain area of the Lucin District near the southeastern corner of the Tecoma quadrangle (Blue, 1960; Doelling, 1980); copper, gold, silver and lead were shipped in quantity. The district is presently being actively explored. No other major commodities have been produced in significant quantities in the Tecoma quadrangle, although small mines and prospects occur in a few places.

Other features with potential economic interest in the Tecoma quadrangle are: (1) outcrops of the Eureka Quartzite, a potential source for pure silica; (2) jasperoid in the siliceous breccia that structurally overlies the Guilmette Formation, which is similar to mineralized jasperoid occurring 15 km. (9 mi.) to the north in the Tecoma mining district, has recently attracted much attention as a gold play; (3) small deposits of well-sorted, rounded gravel along the shores of Pleistocene Lake Bonneville; (4) barite occurring as small replacement and solution fillings in the upper part of the Guilmette Formation, and possibly related to barium-rich granite in the monzogranite of McGinty reported by Lee (1984, sample no. GR-23); (5) north-striking siliceous dikes and veins common in the northern Pilot Range which may have served as conduits for mineralizing fluids; and (6) siliceous Tertiary volcanic rocks which may have potential for gold resources.

Recently, companies have explored for oil and gas in Tecoma Valley. Extrapolating structures and stratigraphic units mapped in the Pilot Range to bedrock beneath Tecoma Valley is presently difficult because of the structural complexity and the lack of drill-hole and other subsurface data.

GEOLOGIC HAZARDS

Pleistocene or Holocene faulting 8 km. (5 mi.) south of the Tecoma quadrangle in the Pilot Range (Miller and others, 1982) raises the possibility of moderate to large earthquakes in the vicinity of the Pilot Range. In addition, gravity slide blocks along the steep western face of the range have a youthful morphology in some places. At Rhyolite Butte, landslide deposits rest on late Pleistocene lake deposits. Future slides, perhaps triggered by earthquakes, are a possibility.

Alluvial fans bordering the Pilot Range and alluvial deposits in canyons within the range were emplaced primarily by debris flow and sheet wash mechanisms. These destructive processes potentially could affect land in much of the Tecoma quadrangle.

Eolian sand deposits in the quadrangle are largely stabilized, but where they are disturbed the dunes are active and create road maintenance problems, as at the townsite of Tecoma. Fine-grained lake deposits provide an unstable substrate for roads; such roads require fill for stability.

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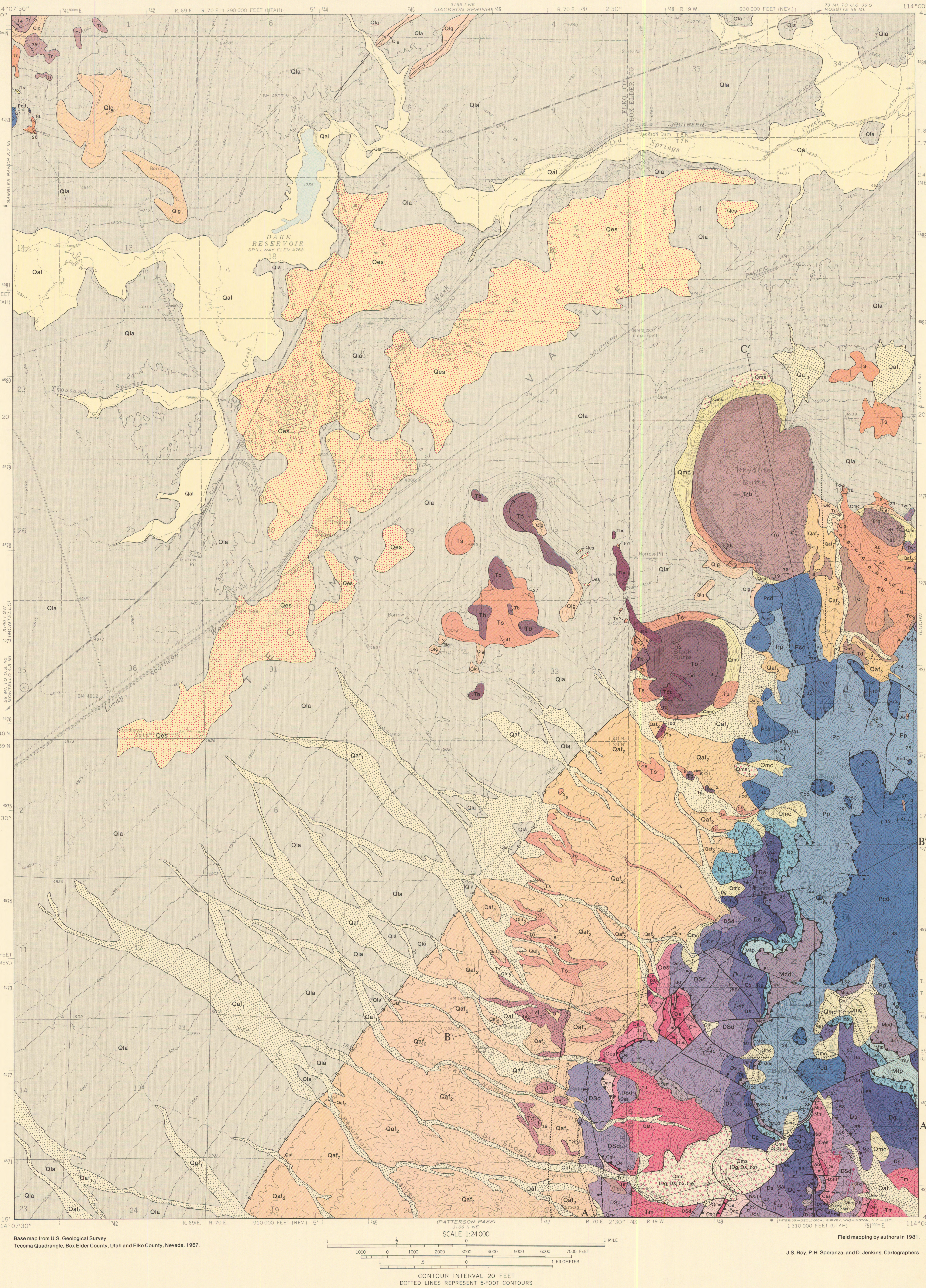
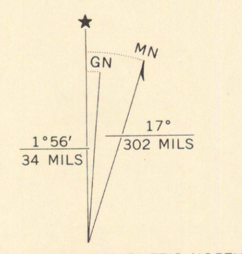


Base map from U.S. Geological Survey
Tecoma Quadrangle, Box Elder County, Utah and Elko County, Nevada, 1967.

Field mapping by authors in 1981.

J.S. Roy, P.H. Speranza, and D. Jenkins, Cartographers

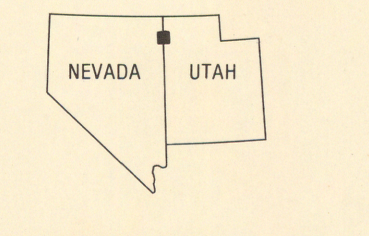


UTM GRID AND 1967 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

GEOLOGIC MAP OF THE TECOMA QUADRANGLE, BOX ELDER COUNTY, UTAH AND ELKO COUNTY, NEVADA

by
David M. Miller and Joel D. Schneyer
U.S. Geological Survey

1985



QUADRANGLE LOCATION

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Plate 2
To Accompany
Utah Geological and Mineral Survey Map 77
Geologic Map of Tecoma Quadrangle

Contact
Dotted where covered.

HIGH-ANGLE FAULTS
Dashed where location inferred; dotted where covered.

15

Normal fault; *bar and ball on downthrown side; dip indicated.*

Strike-slip fault; *arrows show sense of separation.*

LOW-ANGLE AND BEDDING-PLANE FAULTS
Dashed where location inferred; dotted where covered; barbs on upper plate.

Bedding-plane fault; *known or presumed to be pre-Oligocene in age.*

Bedding-plane or low-angle normal fault; *cutting Oligocene and (or) younger rocks.*

25

Trend and plunge of striae in fault surface

Gravity slide block
Tertiary or Quaternary age; dashed where location inferred, dotted where covered.

STRIKE AND DIP OF BEDDING

51

Inclined   Vertical

56 31

Plunge of lineation

STRIKE AND DIP OF IGNEOUS FOLIATION

14

Inclined   Vertical

TRACE OF AXIAL SURFACE OF FOLD

Anticline   Syncline

Location of Paleontological sample

B   B

Trace of Bonneville shoreline

P   P

Trace of Provo shoreline

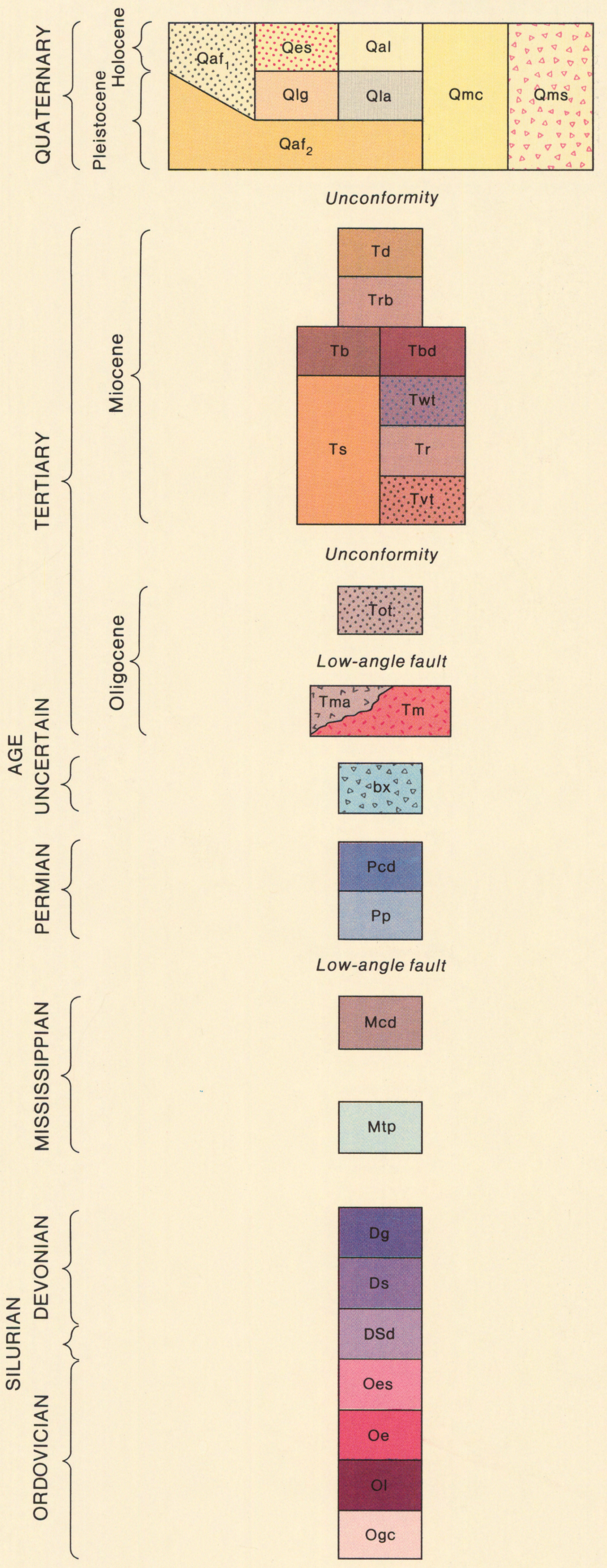
Prospect   Shaft   Adit

TABLE 1. *Paleontological data for the Tecoma quadrangle*

Map location	Field number	USGS collection number	Unit and faunal description	Fossil age	Date of report	Paleontologist	Location: Latitude	Location: Longitude
1	M79PR-86	27624-PC	Pequop(?) Formation Fenestelloids, indet.—3 spec. Fistuliporoids, indet.—2 spec. Probably specimens of an unnamed *Cystodictya?* sp. *Polypora?* sp.—1 spec. *Rhombopora* sp., indet.—3 spec. *Rhombotrypella* sp.—3 spec. *Tabulipora* sp.—3 spec. *Timanodictya* sp—3 spec. The bryozoan assemblage of this sample is typical of Pennsylvanian and Permian strata. The presence of *Timanodictya* suggests a Permian age for these strata.	Permian	6/2/80	O.L. Karklins	41°18′16″	114°0′46″
2	M80PR-10	f14332	Pequop(?) Formation This sample contains fusulinids in the *Schwagerina* sp. and an early *Parafusulina* sp. This would place it stratigraphically equivalent to the lower part of the Pequop Formation of early Leodardian age.	Early Permian	12/8/80	R.C. Douglass	41°15′36″	114°1′15″
3	M81PR-40	f14483	Pequop(?) Formation The Schwagerinid fusulinids of this sample suggest an age very close to the Wolfcamp/Pequop boundary. If they are Pequop age, they are early Pequop age.	Early Permian	8/3/82	R.C. Douglass	41°16′18″	114°0′12″
4	M81PR-41	f14484	Pequop(?) Formation This sample contains several species of fusulinids. In addition to the schwagerinids resembling some from collection f14483, it includes *Parafusulina* sp. indicitive of Pequop age.	Early Permian	8/3/82	R.C. Douglass	41°16′19″	114°0′11″
5	M81PR-47	28109	Pequop(?) Formation Acanthocladiids, indet.—2 spec. *Cystodictya* sp.—1 spec. *Rhomboptrypella* sp.—3 spec. *Streblotrypa* sp.—3 spec. *Timanodictya(?)* sp.—1 spec. 2 trepostome genera—3 spec. The bryozoan assemblage in this collection is typical of Pennsylvanian and Permian strata. Possible presence of *Timanodictya(?)* sp. in this assemblage is suggestive of a Permian age for these strata.	Permian(?)	10/19/81	O.L. Karklins	41°15′40″	114°0′58″
6	M81PR-46	9447-CO	Ely Springs Dolomite None of the megafossils in this collection can be positively identified although some are probably *Deiracorallium* sp. The corals are all small, solitary non-dissepimented rugosans. Some are apparently angulate (*Deiracorallium?* and *Bighornia??*) with distinct fossulae and axial structure. Individually, these corals might range through much of the Paleozoic, but of the 15 or more specimens, 5 have characters that are most common in the Late Ordovician. Collectively, this is the most probable age.	Late Ordovician(?)	10/8/81	W.A. Oliver, Jr.	41°15′42″	114°0′51″

FORMATION	SYMBOL	LITHOLOGY	THICKNESS feet (meters)
Chert and dolomite	Pcd		980 (300)
Pequop(?) Formation	Pp		920 (280)
Chainman Shale and Diamond Peak Formation, undivided	Mcd		600 (185)
Tripon Pass Limestone	Mtp		350 (105)
Guilmette Formation	Dg		965 (295)
Simonson Dolomite	Ds		905 (275)
Thick-bedded dolomite	DSd		1010 (310)
Ely Springs Dolomite	Oes		110 (35)
Eureka Quartzite	Oe		260 (80)
Lehman Formation	Ol		50 (15)
Garden City Formation	Ogc		400 (120)

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qes — Eolian sand—*Brown and brownish-gray fine sand and silt.*

Qal — Alluvium—*Silt and sand in active streams and washes.*

Qmc — Colluvium and talus—*Talus and colluvium of sand and gravel.*

Qaf1 — Younger alluvial fan deposits—*Fan deposits of cobble, gravel, sand, and silt.*

Qms — Slump and landslide deposits—*Disaggregated rock and surficial deposits displaced downslope by gravity.*

Qla — Undifferentiated lacustrine and alluvial deposits—*Soft, white, calcareous clay and lacustrine silt forming thin veneers over older alluvium and pediment surfaces.*

Qlg — Lacustrine gravel—*Well-rounded and sorted cobble, gravel, and sand that form shoreline deposits of Lake Bonneville.*

Qaf2 — Older alluvial fan deposits—*Poorly sorted boulder- to silt-sized alluvial deposits forming high terraces.*

Td — Diabase—*Dikes and sills of diabase and mafic rocks.*

Trb — Rhyolite of Rhyolite Butte—*Dark-brown weathering, glassy sanidine-quartz-plagioclase-pyroxene rhyolite flow.*

Tb — Basalt flows—*Black, aphanitic olivine-pyroxene basalt.*

Tbd — Basalt feeder dikes—*Resistant feeder dikes of aphanitic basalt.*

Ts — Sedimentary rocks—*Lithified non-resistant lake deposits of conglomerate, sandstone, siltstone, and limestone. Dot-dash indicates marker units of pebble conglomerate containing clasts of lineated metaquartzite. Triangle-dot symbol indicates rhyolitic tuff bed.*

Twt — Welded tuff—*Welded sanidine rhyolitic tuff and underlying black vitrophyre.*

Tr — Rhyolitic flow—*Strongly flow-banded, siliceous rocks.*

Tvt — Vitric tuff—*White to light-gray, thin- to thick-bedded vitric tuff without phenocrysts.*

Tot — Older tuff—*Interlayered vitrophyre, tuff breccia, and white, altered tuff.*

Tm — Monzogranite of McGinty—*Coarse-grained, white to gray, porphyritic monzogranite to granodiorite.*

Tma — Altered igneous and sedimentary rocks.

bx — Silicified breccia—*Dense, resistant, dark-brown, brecciated jasperoid, silicified sandstone, altered carbonate rocks, and siliceous fracture and vug fillings.*

Pcd — Chert and dolomite—*Siliceous, light- and medium-gray, thin- to medium-bedded dolomite and quartz sandstone.*

Pp — Pequop(?) Formation—*Mostly laminated to thin-bedded, platy, charcoal-gray, silty limestone that commonly forms tan grassy slopes.*

Mcd — Chainman Shale and Diamond Peak Formation, undivided—*Dark-gray to black siliceous, slope-forming sandstone and brown, weathering, ledge-forming conglomerate.*

Mtp — Tripon Pass Limestone—*Dark-gray to black, regularly bedded, silty limestone with interbedded calcareous siltstone.*

Dg — Guilmette Formation—*Dark-gray to black, well-bedded, cliff-forming limestone; light gray to white-weathering, fossiliferous. Dot-dash line indicates quartz sandstone beds and sandy limestone near top.*

Ds — Simonson Dolomite—*Interlayered dark- to light-gray calcareous dolomite forming banded steep slopes.*

DSd — Thick-bedded dolomite—*Light- to medium-gray, poorly bedded to structureless dolomite.*

Oes — Ely Springs Dolomite—*Dark calcareous, cherty dolomite.*

Oe — Eureka Quartzite—*White and light-gray, vitreous, medium-grained orthoquartzite, well bedded.*

Ol — Lehman Formation—*Gray, thin-bedded, fossiliferous, coarse, silty limestone with orange, silty partings.*

Ogc — Garden City Formation—*Thin-bedded and laminated blue-gray limestone, gray and brown silty limestone, and brown calcareous siltstone.*