

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Geologic Map of the Southwest quarter of the  
Mountain City quadrangle, Elko county, Nevada

by

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This map is preliminary and has not been reviewed for conformity with U. S. Geological Survey editorial standards and stratigraphic nomenclature.

Menlo Park, California

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## DESCRIPTION OF MAP UNITS

- Qf ARTIFICIAL FILL (QUATERNARY)--Includes tailings ponds and mine dumps of the Rio Tinto mine, and the garbage dump of Rio Tinto village (Since the map was made, the tailings have been reworked and moved down stream)
- Qc COLLUVIUM, TALUS AND LANDSLIDE DEPOSITS (QUATERNARY)--Unsorted surficial material ranging from boulders through sand and gravel to silt and clay. Development of colluvium is strongly controlled by direction of exposure as the greater amount of vegetation on north-facing slopes favors accumulation. Coarse material at the upper end of mapped bodies forms talus and finer material is washed downslope and becomes colluvium. Poorly resistant formations such as airfall tuffs and non-welded ignimbrites commonly blanketed by colluvium over much of their extent. Landslides common on steeper slopes
- Qa ALLUVIUM (QUATERNARY)--Consists of sand, silt, and gravel along present stream courses. Generally quite shallow in valley of Owyhee River, as indicated by outcrops in central part of valley. Maybe 2 m thick above normal stream in summer time, thicker alluvium may be present in some small valleys where rate of supply exceeds the transporting power of the stream.
- Qtg TERRACE GRAVEL AND DISSECTED ALLUVIAL FANS (QUATERNARY)--Gravel accumulated on stream terraces higher than the present flood level. In the valley of the Owyhee River, as much as 30 m above the river, and of boulders as much as .7 m in diameter, subangular to well-rounded. Thickness as much as 3 m
- Qgm GLACIAL MORAINES (QUATERNARY)--Boulders large to very large, angular. Material unsorted. Typical cross-valley ridge of terminal moraine. Present on east side of Bald Mountain. No striated boulders observed
- QTls LANDSLIDES, ROCKSLIDES, AND EARTHFLAWS (QUATERNARY AND TERTIARY)--Unsorted boulders and finer material. Younger bodies have characteristic hummocky topography
- QTs\* UNCONSOLIDATED SEDIMENTARY ROCKS (QUATERNARY AND TERTIARY)--Includes material as alluvium, colluvium, talus, glacial moraine, glacial outwash
- Tcp COUGAR POINT WELDED TUFF (MIOCENE)--Upper part of formation is phenorhyolitic to phenodacitic ignimbrite, purplish gray to dark brown, or black where glassy, and ranging from compact vitrophyres to firable devitrified welded tuff. The tuff contains abundant phenocrysts of sanidine or anorthoclase, plagioclase and, in most quartz. Apatite, zircon and magnetite are common accessories. In some of the compact vitrophyres, fayalite, and ferroaugite are present, the latter may be accompanied or proxied by ferropigeonite, very rarely by hypersthene and hornblende. In less compact welded tuff,

fayalite is iddingsitized and pyroxene argillized. The groundmass ranges from wholly glassy to cryptocrystalline. Locally includes, beneath the ignimbrite, rhyolitic air-fall tuff and lapilli tuff, cream to buff in color, and dark carbonaceous tuffs, locally containing fossil leaves. A potassium-argon age determined (DKA-1068) on a sample of sanidine from near the base of the welded tuff section at Yellow Rock in the Owyhee 15' quadrangle, by John Obradovich (oral commun., 1965) gave a date of  $12.2 \pm 0.8$  m.y.

- Tcb TUFFS AND SEDIMENTS OF CALIFORNIA CREEK BASIN (MIOCENE)--White to creamy tuff and gravelly tuff, locally contains petrified wood, including logs up to 1 m in diameter
- Tcs PHENORHYOLITE OF COLD SPRINGS MOUNTAIN (MIOCENE)--Largely a light gray, massive, phenocryst poor phenorhyolite. Named for Cold Springs Mountain, which is in the southeastern quarter of the Mountain City quadrangle. Present at Haystack Peak in the southeast part of the map area.
- Tjr JARBIDGE RHYOLITE (MIOCENE)--Porphyritic rhyolite, with cryptocrystalline or glassy groundmass, locally spherulitic. Phenocrysts very abundant, include quartz up to 5 mm in diameter, sanidine phenocrysts somewhat smaller and less numerous, oligoclase similar in size but scarcer. Clinopyroxene recognizable in glassy phases only, and is generally pigeonite. Accessories include zircon, apatite, ilmenite, magnetite; very rarely topaz (which may be secondary) or pale pink garnet. Two K-Ar dates, one from Meadow Creek, in the Rowland quadrangle, of  $16.8 \pm 0.5$  m.y. (Coats, 1964, p. M11), the other from a basal vitrophyre in the Wildhorse quadrangle, of 15.4 m.y. (Evernden and others, 1964, p. 194). Total thickness may be 600 m
- Twt WELDED LAPILLI TUFF OF WALL CREEK (MIOCENE)--Medium- to dark-gray welded tuff and welded lapilli tuffs, phenorhyodacite to phenorhyolite. Phenocrysts include plagioclase and sanidine, commonly with quartz, ferroaugite, and rarely ferropigeonite. Contains coarse glassy lapilli, flow structure common. Many small bodies in southwest part of map area. K-Ar age determinations on plagioclase-sanidine composite grains from five different localities, four by John Obradovich (oral commun., 1966) and one by Richard Marvin (oral commun., 1967) gave ages ranging from  $15 \pm 0.8$  to  $16 \pm 0.8$  m.y.
- Trt AIR FALL TUFF (MIOCENE)--White to cream colored poorly stratified, fine-grained, unconsolidated; locally underlies welded lapilli tuff of Wall Creek
- Tmf MUDFLOW OF MCCALL CREEK (MIOCENE)--Present in west-central part of map area, near Rio Tinto mine. Poorly sorted tuffaceous boulder gravel. Smaller boulders well rounded, larger ones (to 8 m max.) quite angular. Most boulders consist of Valmy quartzite

- Tdp DANGER POINT TUFF (MIOCENE)--Ranging from andesitic to rhyolitic in composition, largely montmorillonitized, with substantial admixture of boulders picked up by surface flow. Locally, most boulders are Prospect Mountain quartzite. Elsewhere, sedimentary admixture is finer, and most is granitic material of local derivation. Locally interbedded with tuff unit of Seventy Six Basalt
- Tsb SEVENTY SIX BASALT (MIOCENE)--Present in east-central part of map area. Flows of porphyritic olivine basalt, with conspicuous clear phenocrysts of labradorite, commonly to 5 cm and locally to 15 cm in size, in a subophitic groundmass with plates of purplish augite including grains of olivine, labradorite, magnetite, ilmenite, and apatite. Local patches of mesostasis made up of biotite and sanidine. Locally interbedded with tuff, TsbT
- Tsbt SEVENTY SIX BASALT, TUFF UNIT (MIOCENE)--Dull-greenish-gray, now nontronitic, with plagioclase crystals like those in flows. More fully developed in southeast quarter of Mountain City quadrangle
- Ts\* SEVENTY SIX BASALT, WITH TUFF UNIT, UNDIVIDED--Shown in cross sections
- Trg ANDESITE OF ROCKY GULCH (MIOCENE?)--Holocrystalline, pyroxene andesite containing phenocrysts of plagioclase (andesine to labradorite, with oscillatory zoning), augite, hypersthene, and magnetite. The groundmass contains plagioclase, alkali feldspar, hypersthene, and magnetite
- Tac TUFF AND SEDIMENTARY ROCKS OF ALLEGHENY CREEK (MIOCENE)--Light cream-colored to pale-green tuff, locally biotitic with small lenses of fine gravel and tuffaceous gravel, containing fossils (the Rizzi Ranch local fauna) of early Miocene age (C. A. Repenning, written commun., 1966). As the Allegheny Creek beds are overlain by Seventy Six Basalt, the early Miocene date on the faunas is consistent with the potassium-argon date for the Seventy Six basalt
- Thh BIOTITE PHENORHYODACITE OF HUBER HILL (OLIGOCENE?)--Occurs as the volcanic dome of Huber Hill. Pale-grayish-red to pale-pinkish-gray biotite phenorhyodacite, with sparse phenocrysts, mostly under 0.5 mm in size, of black biotite and partially resorbed oligoclase. Groundmass generally cryptocrystalline. As mapped may include some ignimbrite of similar lithology
- Thg TUFF OF HARRIS GULCH (OLIGOCENE)--Biotite phenorhyolite tuff, with quartz, plagioclase, biotite, and sanidine. Apparently accumulated in a complex graben extending from Harris Gulch, east of Mountain City, to near Bieroth Ranch. Biotite locally bleached and altered to vermicular kaolinite; secondary barite present locally. This alteration is believed related to the gold-silver mineralization at Mountain City. Sanidine from the

tuff was dated by J. C. von Essen (written commun., 1969) at 30.1+ m.y. This is believed to reflect the date of eruption alteration and mineralization may be only slightly younger.

- Tbr PHENORHYOLITE VITROPHYRE OF BUTLER RANCH (OLIGOCENE)--Massive pale-gray vitrophyre, locally perlitic, contain small amounts sphenocrysts of sanidine, quartz, and oligoclase. Forms a dome near Butler Ranch (Bieroth Ranch on map), may have associated ignimbrites, possibly interbedded with tuff of Harris Gulch
- Tba BIEROTH ANDESITE OF BUSHNELL (1967) (OLIGOCENE<sup>?</sup>)--Biotite-hypersthene phenodacite welded tuff, with plentiful phenocrysts of plagioclase, sanidine, brown biotite, nontronite after (?)hypersthene. Shard structure clear, but pectinate recrystallization common. Glassier phases may have olive-green hornblende and may lack sanidine and quartz. Type locality is at Bieroth Spring, near the western edge of the Rowland quadrangle
- Tar ANDESITE OF RUSSEL GULCH (EOCENE)--Black, mostly vitrophyric, andesitic welded tuff, with phenocrysts of andesine, augite, hypersthene, apatite, magnetite, and rare zircon, biotite, and green hornblende. Where devitrified, black to brown felsophyre. At base, locally small amounts of rhyolitic airfall tuff
- Trd PHENORHYOLITE TUFF OF RABBIT DRAW (EOCENE)--White air-fal and welded tuff, with phenocrysts of dark smoky quartz, abundant black biotite, sanidine, and oligoclase. Rests on Ordovician volcanic or Mesozoic plutonic rocks; underlies andesite of Russel Gulch
- Trc PHENORHYODACITE IGNIMBRITE OF REED CREEK (EOCENE)--Welded tuff with abundant phenocrysts, principally quartz, plagioclase, and biotite. Present near southeast corner of map area, an outlier of a unit more extensively developed in the north half of the Mountain city quadrangle
- Tjc VOLCANIC AND SEDIMENTARY ROCKS OF JONES CREEK (EOCENE)--Flows and tuff breccias of pyroxene andesite, hornblende-pyroxene andesite, hornblende-augite andesite and hornblende andesite, dark gray to medium gray and commonly porphyritic. Gray air-fall tuffs are locally present. Total thickness may be several thousand feet. Locally includes phenodacite Ignimbrite of Jones Creek
- Tjd PHENODACITE IGNIMBRITE OF JONES CREEK (EOCENE)--Compact to moderately compact, with conspicuous phenocrysts of plagioclase, augite, hypersthene, hornblende, and biotite, grading by increase of quartz and sanidine into a phenorhydacite
- Trs ANDESITE NEAR THE RANGER STATION (EOCENE)--Dark-gray, porphyritic dopatic hornblende phenoandesite, containing phenocrysts of plagioclase (An<sub>70-75</sub>), hornblende, apatite, and magnetite. Cryptocrystalline groundmass consists of plagioclase,

clinopyroxene(?) and sanidine(?)

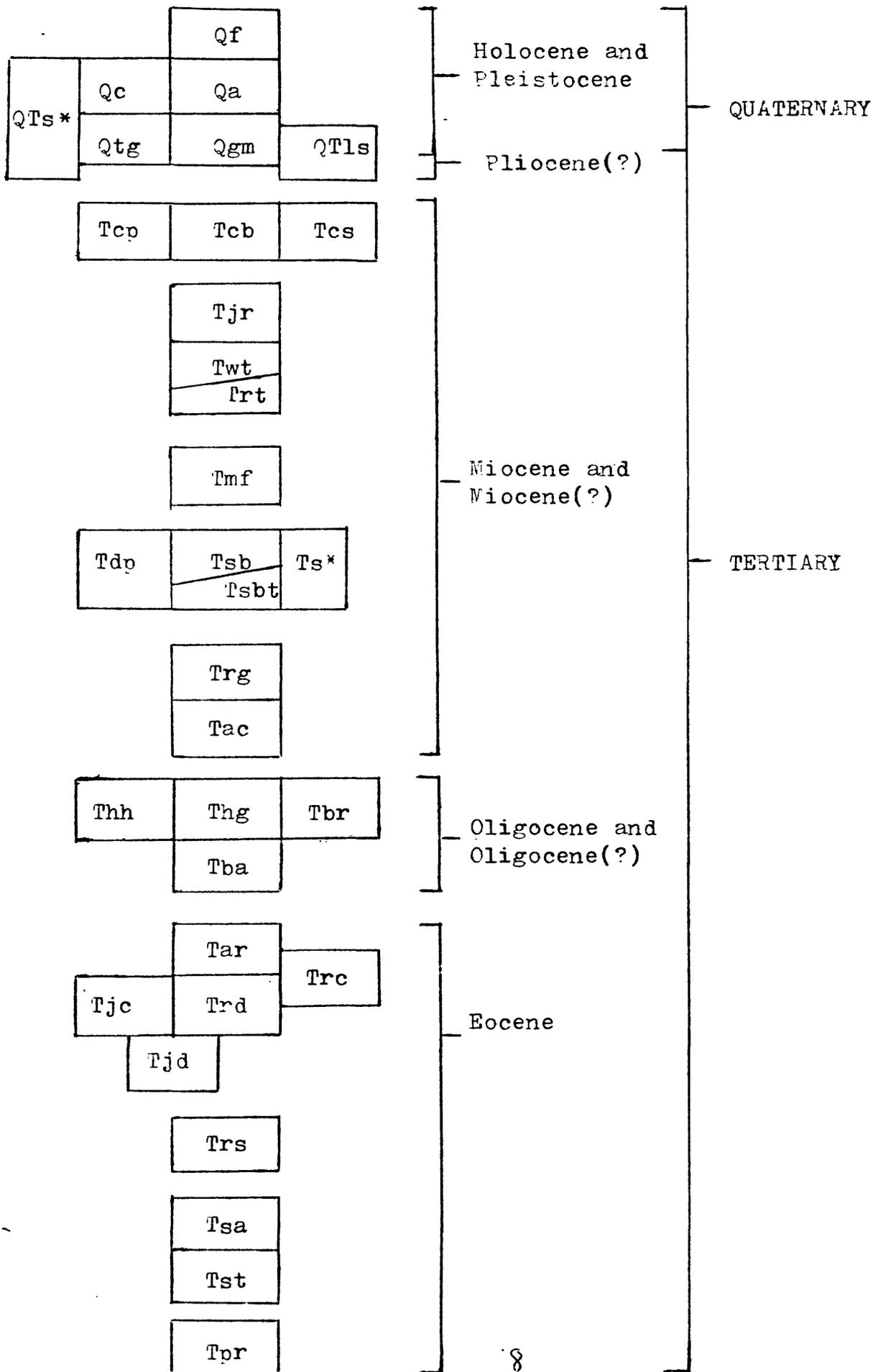
- Tsa ANDESITE OF SUMMIT CREEK (EOCENE)--Mostly pyroxene andesite and pyroxene-hornblende-biotite andesite; also contains biotite pyroxene dacite vitrophyre
- Tst AIR-FALL TUFF (EOCENE)--Phenocrhyolite tuff, underlies andesite of Summit Creek
- Tpr GRAVEL OF PECK RANCH (EOCENE)--Cobble gravel, mostly made up of tan-weathering jasperoid apparently derived from the part of Van Duzer Limestone of Decker which has been silicified near the Lime Creek Thrust. Overlain by tuff and sedimentary rocks of Allegheny Creek
- Kg GRANITE (IN THE BROAD SENSE ACCORDING TO STRECKEISEN, 1967) (CRETACEOUS)--Includes granodiorite and quartz monzonite of previous usage; includes marginal microcline microperthite aplite, pegmatite, and migmatitic zones adjacent to country rock. Generally contains both biotite and hornblende, locally contains perthitic orthoclase megacrysts
- Ka APLITE (CRETACEOUS)--Marginal to granite.
- P Prh RESERVATION HILL FORMATION (PERMIAN? AND PENNSYLVANIAN?)--Mostly fine grained dolomitic metasandstone and siltstone; pale gray, weathering white or pale reddish brown, in beds 2 cm to 5 cm thick, interbedded regularly with thinner beds of graphitic phyllite. The dolomitic metasandstone is composed of various combinations of quartz, calcite, tremolite, diopside, and wolastonite, the last locally coarsely prismatic. Also present are metagraywacke, micaceous and tremolitic quartzite, rare metachert, actinolite-epidote-plagioclase schist derived from andesite and hornblende plagioclase schist. A few lenses of gray, siliceous dolomitic limestone, locally with coarse calcitic "eyes" suggesting former presence of crinoids
- Mc CHAIMAN FORMATION (MISSISSIPPIAN)--Forms the top of a sequence including, in descending order, the Nelson Banner, and Grossman formations, all of Mississippian or Mississippian(?) age. Includes the Mountain City Formation (Coats, 1971). Largely quartz-muscovite biotite schist, locally with orthoclase, garnet, or graphite, rarely with andalusite, where thermally metamorphosed. Includes beds, of calc-silicate granulite up to 2 ft thick composed of quartz, calcite, diopside, tremolite, clinozoisite, and orthoclase. Contains a bed of quartz-plagioclase-orthoclase hornfels derived from rhyolite tuff
- Mn NELSON FORMATION (MISSISSIPPIAN)--Greenschist composed of tremolite-actinolite, chlorite, epidote, calcite, ilmenite, and relict andesine, in part altered to albite. Derived from flows, tuff breccias, and minor sills of andesitic and basaltic composition. Includes one lens of rhyolitic tuff. At the base,

locally an extrusive breccia, possibly a peperite, with limy matrix, locally fossiliferous

- Mb BANNER FORMATION (MISSISSIPPIAN)--Soft massive bluish-gray limestone, containing solitary and colonial corals, brachiopods, and bryozoans. Grades downward through medium- to fine-grained brownish quartz arenite and gray tan-weathering siliceous siltstone through arenaceous limestone into conglomerate with rounded white quartzite boulders as much as 15 cm in diameter. Maximum thickness 200 m. Age: Osagian or Meramecian (Middle Mississippian)
- Mg GROSSMAN FORMATION (MISSISSIPPIAN?)--Coarse conglomerate with clasts of gray quartzite, black chert, phyllite, and magnetiferous siltstone. Sandstone, siltstone, and phyllite. Formerly regarded as Devonian or Mississippian, but presence of numerous clasts derived from the Valmy Formation suggests that it is younger than the Antler Orogeny. It unconformably underlies the Banner formation and rests on Valmy Formation
- Ov VALMY FORMATION, UNDIVIDED (ORDOVICIAN)--Micaceous quartz-calcarenite and calcareous sandstone, locally containing phyllocarid shells and small lenticular masses of thin-bedded chert with slaty partings, and ranging in color from light to dark gray, rarely black or grayish green; locally phosphatic or baritic. Also contains hard, well-bedded micaceous siltstone and black quartzose phyllite, and micaceous phyllitic limestone, locally phosphatic. Numerous irregular masses of quartz-albite-chlorite schist derived from andesite. Gray to black, locally tan, fine-grained with interlocking textures; rare detrital tourmaline and zircon and, in the black quartzite, carbonaceous material interstitially and disseminated through the quartz grains
- Ovq VALMY FORMATION, QUARTZITE (ORDOVICIAN)--Gray to black, locally tan, fine-grained with interlocking textures; rare detrital tourmaline and zircon and, in the black quartzite, carbonaceous material interstitially and disseminated through the quartz grains
- Ovg VALMY FORMATION, GABBRO (ORDOVICIAN)--Greenstone derived from gabbro with original texture and some pyroxene and calcic plagioclase preserved
- Ovd VALMY FORMATION, DIABASE (ORDOVICIAN)--Greenstone derived from diabase with original texture and some pyroxene and calcic plagioclase preserved
- Pvd VAN DUZER LIMESTONE (PENNSYLVANIAN)--Outcrops near southwest corner of map but apparently underlies much of south part of map area south of Valmy outcrops. Dominantly thin bedded to very thin bedded medium- to dark-gray calcarenite and quartzose calcarenite, locally grading to quartzite. Chertification of calcareous beds is common. Minor flows of meta-andesite, now

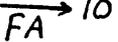
chlorite-muscovite-albite calcite schist. Thin films of micaceous and graphitic material form laminae within the thicker calcareous beds. Van Duzer Limestone was defined by Decker (1962, p. 29-21, p. 1) for rocks in Van Duzer Creek (Wild Horse quadrangle, near northwest corner), the type locality. The type section is designated the ridge top in secs. 6 and 7, T. 44 N., R. 53 E. (Bull Run quadrangle, near northeast corner). The total thickness is about 7,000 ft. A single fossil locality from Trail Creek (Wild Horse quadrangle, just south of the Mountain City quadrangle), furnished brachiopods and conodonts, both of Desmoinesian age

### CORRELATION OF MAP UNITS





## SYMBOLS

	<b>CONTACT</b>
	<b>FAULTS</b> --Dashed where inferred; dotted where concealed
	Thrust fault
	High angle fault--Bar and ball on downthrown side
<b>STRIKE AND DIP OF BEDS</b>	
	Inclined
	Vertical
	Overturned
<b>STRIKE AND DIP OF FOLIATION</b>	
	Inclined
<b>STRIKE AND DIP OF CLEAVAGE</b>	
	Inclined
<b>BEARING AND PLUNGE OF LINEATION</b>	
	
<b>MINOR FOLD AXES</b>	
	Anticline--showing plunge
	Fold axis--showing plunge