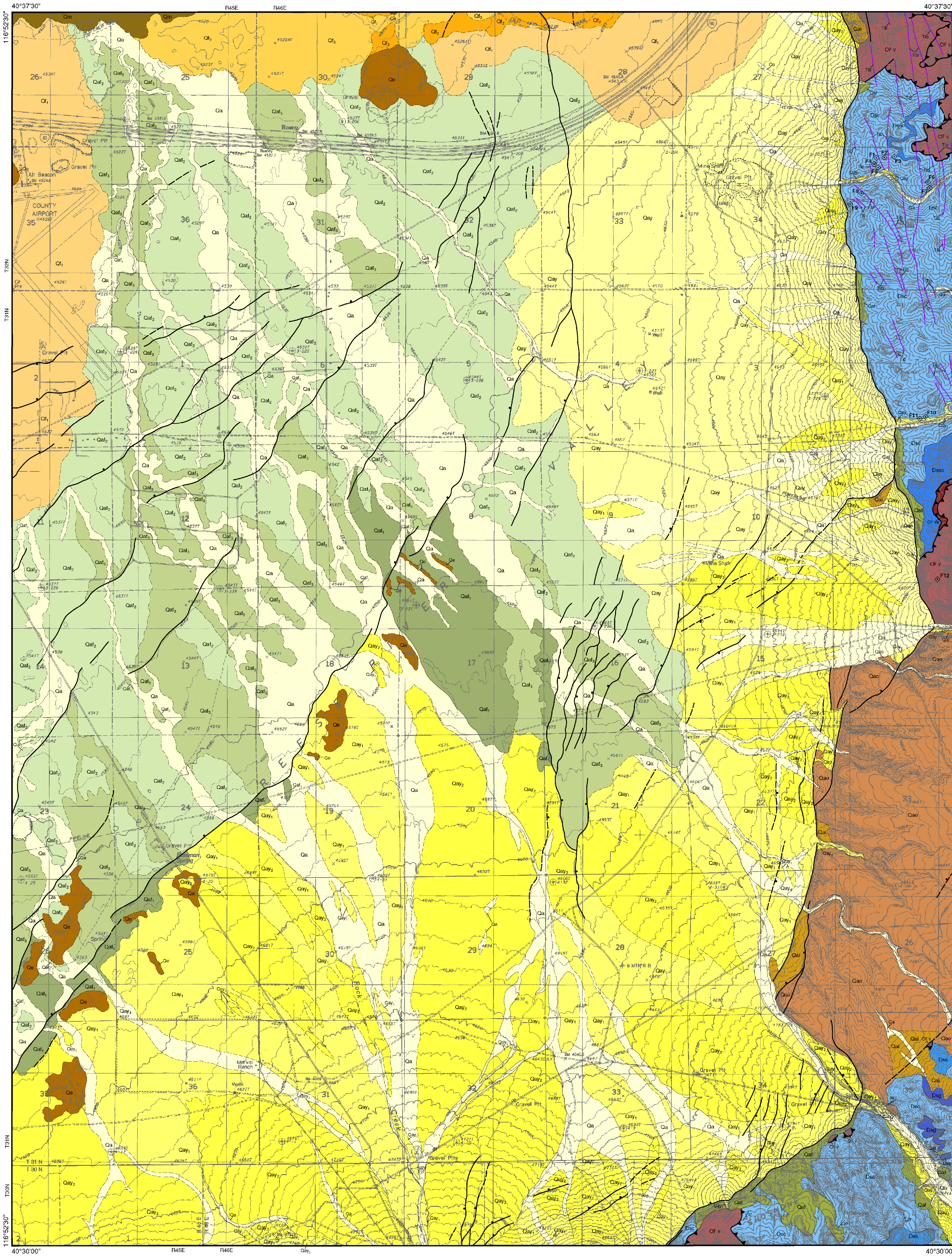

Alluvial Fan Deposits

Medium- to coarse-grained alluvial fan deposits originating from the Shoshone Range in the east and south parts of the quadrangle. Dominantly composed of pebble gravel and sand, with lesser percentages of cobbles and boulders. Gravel deposits are typically angular to subrounded, poorly to moderately sorted, and poorly to moderately stratified. Clast lithologies are predominantly Paleozoic carbonate rocks.

Qa **(Modern)** Gravel and sand deposits within and adjacent to active washes. Surfaces characterized by mostly unmodified bar-and-swale topography, and sparse to no vegetation. No significant soil development. Subject to frequent flooding.

Qay_1 **(Late Holocene)** Gravel and sand deposits forming fan-terrace remnants characterized by slightly subdued bar-and-swale surface morphology. Inset below adjacent older surfaces at fan heads along major drainages, but have minimal topographic separation along minor drainages and distal locations. Little to no rock varnish, and minimal soil development. Subject to intermittent flooding.

Qay_2 **(Mid to late Holocene)** Gravel and sand deposits forming fan-terrace remnants characterized by subdued to fully smoothed bar-and-swale surface morphology. Inset below adjacent older surfaces at fan heads along major drainages, but have minimal topographic separation along minor drainages and distal locations. Surface clasts have weak to incipient rock varnish. Soils are typically A-C profiles with 0- to 5-cm-thick Av horizon (vesicular A) and 30- to 50-cm-thick Bk horizon (Stage I $CaCO_3$); may have a weak Bw horizon.

Qay_2 **(Late Pleistocene to early Holocene)** Gravel and sand deposits forming fully smoothed fan-terrace remnants generally preserved only near fan heads. Surface clasts have moderate to dark rock varnish. Soils typically consist of 5- to 10-cm-thick Av (vesicular A) horizon, 10- to 20-cm-thick Bw (cambic) horizon, and 50- to 100-cm-thick Bk horizon (Stage I to II $CaCO_3$ with continuous coatings up to 1 mm thick).

Qai **(Late Pleistocene)** Gravel and sand deposits forming fully smoothed and generally small fan-terrace remnants preserved only along the piedmont/mountain range interface. Surface dominated by fine-grained eolian material. Surface clasts have dark rock varnish. Soils typically consist of 10- to 20-cm-thick Av (vesicular A) horizon, 15- to 30-cm-thick unstructured A horizon (eolian cap), 20- to 40-cm-thick Bt (argillic) horizon which is typically overprinted with Stage I $CaCO_3$ (Btk), and 30 to 60 cm thick Stage II+ to Stage III $CaCO_3$ horizon (Bk or Bkm); upper soil horizons are locally stripped.

Qao **(Pleistocene)** Gravel and sand deposits forming fully smoothed, deeply dissected, and broadly rounded fan-terrace remnants preserved only where uplifted by faulting. Surface expression similar to Qai, with dominant fine-grained eolian cover, and small, localized areas of desert pavement (pavettes). Surface clasts have dark rock varnish. Soils typically consist of 10- to 20-cm-thick vesicular A horizon (Av), 15- to 30-cm-thick unstructured eolian silt cap (A), 20- to 40-cm-thick argillic horizon overprinted with Stage I $CaCO_3$ (Btk), and 50- to 100-cm-thick Stage III-IV $CaCO_3$ horizon (Bkm); upper soil horizons are typically stripped.

Alluvial Flat Deposits

Medium- to fine-grained alluvial deposits adjacent to the distal end of the Shoshone Range piedmont. Deposits are mostly moderately to well-sorted fine sand and silt, and some pebble gravel. Clast lithologies are predominantly Paleozoic carbonate rocks.

Qa **(Modern)** Deposits within and adjacent to active washes. Dominantly fine sand and silt, but includes coarse sand and pebble gravel within channels. Surfaces characterized by sparse to no vegetation. No soil development. Subject to frequent flooding.

Qaf_3 **(Late Holocene)** Dominantly fine-grained deposits forming terraces set slightly above active washes. Surfaces are partially to fully smoothed. Minimal soil development. Subject to intermittent flooding.

Qaf_2 **(Mid to Late Holocene)** Dominantly fine-grained deposits forming terraces with minimal separation from Qaf_3 surfaces. Surfaces are generally fully smoothed. Soil horizons include a thin (up to 5 cm) eolian silt cap and variable Bk horizon (Stage I $CaCO_3$).

Qaf_1 **(Late Pleistocene to early Holocene)** Dominantly fine sand and silt deposits exhumed due to uplift along fault trace trending through Bateman Spring. Surfaces are generally fully smoothed. Upper soil horizons typically stripped, with variable Bk horizon preserved.

Riverine Deposits

Qm **(Late Holocene)** Deposits of recently abandoned meander belt of the Humboldt River. Composed mainly of lateral accretion deposits of predominantly pebble gravel and sand. Surface has highly irregular topography associated with complex assemblage of meander scrolls, abandoned channels, oxbow lakes, and isolated floodplain remnants.

Qf_3 **(Late Holocene)** Deposits of frequently inundated, active floodplain and overflow channels of the Humboldt River. Dominantly composed of vertical accretion deposits consisting of fine sand and organic-rich silt and clay. Located adjacent to recently abandoned meander belt (Qm). Includes minor networks of distributary channels in overflow areas between more extensive floodplains separated by older or higher units.

Qf_2 **(Late Holocene)** Deposits of infrequently inundated active floodplain surfaces. Composed dominantly of silt to silty clay overlain locally by a variably thin mantle (10 to at least 25 cm) of eolian silt.

Qf_1 **(Middle Holocene)** High, inactive floodplain deposits of the Humboldt and Reese Rivers. Dominantly composed of fine sand, silt, and clay. Locally mantled by as much as 1 m of eolian silt. Slight topographic separation from Qf_2 surfaces.

Eolian Deposits

Qe **(Holocene)** Fine-grained eolian deposits (predominantly fine sand) burying underlying piedmont or floodplain deposits. Up to 2 m or more thick at distal parts of alluvial fans.

Contact Dashed where approximately located.

Fault Dashed where approximately located or inferred; dotted where concealed; ball on downthrown side.

Thrust fault Dashed where approximately located or inferred;
saw teeth on upper plate.

Strike and dip of beds

20 Inclined

Stipple pattern indicates areas of significant disturbance due to agricultural, residential, commercial, or industrial development.

Fossil locality Showing collection number.

F1

Bedrock Units

Tib **Intrusive basaltic andesite (Miocene)** Basaltic andesite dikes 2 to about 10 m wide in northeastern part of quadrangle. May be feeders to flows exposed to east in adjacent Mule Canyon quadrangle (John and others, in press) and elsewhere on east flank of Shoshone Range. Specimens from basaltic andesite dikes in Argenta and Mule Canyon quadrangles yielded, respectively, whole rock $^{40}Ar/^{39}AR$ ages of 16.13±0.9 Ma and 16.4±0.4 Ma (R.J. Fleck, oral commun., 2001).

Slaven Chert

Dsc **Chert (Early, Middle and Late? Devonian)** Dominantly medium-gray to black chert in two thrust sheets, one in northeast part of quadrangle and a structurally higher one in southeast part. Thrust sheet of Valmy Formation separates Devonian sheets. Slaven in northeast thrust sheet contains numerous conspicuous bold sequences of black to medium-gray sandstone and quartzite, commonly 3 to 7 m thick, separated by sequences of chert commonly 10 m or more thick. Sandstone and quartzite consist of fine- and medium-size quartz grains and sparse grains of black chert; bedding commonly not evident. Interlayered chert contains subordinate amounts of dark-gray to dark-greenish-gray argillite. Slaven in southeast thrust sheet consists mainly of chert and argillite as in northeast thrust sheet. Chert in both thrust sheets commonly in beds 1 to 15 cm thick, forming ribbon chert. Chert and much of argillite altered medium-light-gray to light grayish-green and locally stained brown and yellow-brown from iron oxides. Locally contains black, medium-gray weathering, laminated limestone in lenses 1 to 5 m long. Sequences of thin-bedded, brown-weathering sandstone a few meters to possibly 10 m thick present locally. Barite in beds 1 to 30 cm thick in sections as thick as about 5 m containing interlayered chert exposed at barite mines and prospects near southeast corner of quadrangle. Upper and lower contacts thrust faults. Thickness in northeast thrust sheet about 500 m, and about 150 m in southeast sheet. Age in lower thrust sheet Early, Middle, and Late Devonian based on fossils at fossil localities F1-F11 (Table 1). Age in upper thrust sheet probably Early to Late Devonian based on lithologic correlation with Slaven Chert widely exposed elsewhere in Shoshone Range (Gilluly and Gates, 1965).

Dsg **Greenstone (Middle or Late? Devonian)** Dark-greenish-gray to brownish-gray in subhorizontal body exposed on opposite sides of hill east of Slaven Canyon, near southeast corner of quadrangle. Poorly exposed. Maximum thickness 18 m. Internal structure of original flow or flows not evident. Locally silicified in dull dark-greenish-black masses as large as 0.5 m wide. Similar greenstone in Slaven Chert to south in Tenabo quadrangle originated as submarine basalt flows (C.T. Wrucke, unpublished information). Devonian age based on interlayering with black chert of Slaven Chert.

Dssc **Sandstone and chert breccia (Early or Middle Devonian)** Medium-gray, medium-grained sandstone commonly containing a few percent of sand and grit-size fragments of black chert. Sandstone locally dominant but commonly interlayered with and locally dominated by chert breccia consisting of pebble-size black to medium-gray fragments of chert, angular to subangular clasts also commonly present. Abundance of chert clasts highly variable from a few percent to about 80 percent; clast supported where clasts abundant. Locally contains thin limestone lenses. Thickness as much as 50 m. Age Early or Middle Devonian based on fossils in Mule Canyon quadrangle to east (John and others, in press).

Dss **Sandstone (Early? Devonian)** Black fine-grained sandstone and siltstone that commonly weathers light- to medium-gray and red-brown. Commonly laminated. Exposed in southeast corner of quadrangle. Consist mostly of very fine- to medium-grained feldspathic sandstone composed of angular quartz, 20 to 30 percent angular plagioclase, <1 percent potassium feldspar, and accessory white mica. Sandstone typically bimodal from 5 to 40 percent well-rounded, medium-grained quartz. Weathers mostly red-brown. Thickness about 30 m. Early Devonian age based on presence of fine-grained sandstone interbedded with chert of that age in northeast part of quadrangle and from similarities with dated sandstone and siltstone in Tenabo quadrangle (C.T. Wrucke, unpublished information) and Battle Mountain quadrangle (House and others, 2001).

Valmy Formation

OF v **Valmy Formation, undivided (Ordovician and Cambrian)** Interbedded quartzite and argillite and minor amounts of limestone. Quartzite dominant near southeast corner of quadrangle. In northeast part of quadrangle, quartzite occurs locally as large high-standing conspicuous outcrops 5 m or more thick, but abundant quartzite also present in thinner, less conspicuous bodies interlayered with argillite. Base of lowest conspicuous quartzite shown as thrust fault within areas mapped as Valmy Formation, undivided. Ratio of quartzite to argillite highly variable throughout unit. Quartzite commonly bimodal., consisting mostly of a tight mozaic of very fine to fine, angular to subrounded grains and 5 to 10 percent randomly distributed well-rounded, fine- to medium-size grains, but grain size from smallest to largest is seriate. Argillite dark-gray to black and fissile, locally abundant in sections 10 m or more thick. Maximum thickness of unit about 350 m. Graptolites from fossil locality F12 and localities in coextensive rocks in adjacent Mule Canyon quadrangle (John and others, in press) yielded Late Ordovician age, but wide range in Ordovician possible from correlation with similar rocks widely exposed in the Shoshone Range (Gilluly and Gates, 1965). Cambrian age based on determination by Anita G. Harris of very late Late Cambrian conodont elements from limestone in Valmy Formation in Stony Point quadrangle 1 km north-northwest of northwest corner of quadrangle (Ramelli and others, 2001). Probably some argillite in unit of same age as argillite unit (Ova).

OF va **Argillite (Early? or Middle? Ordovician)** Black to medium-gray argillite in thrust sheet at base of Ordovician rocks in east-central part of quadrangle. Thickness 5 to 40 m. Uncertain Early? or Middle? Ordovician age based on a single poorly preserved graptolite fragment collected in adjacent Mule Canyon quadrangle (John and others, in press).

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DRAFT

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Has not undergone office or field review.
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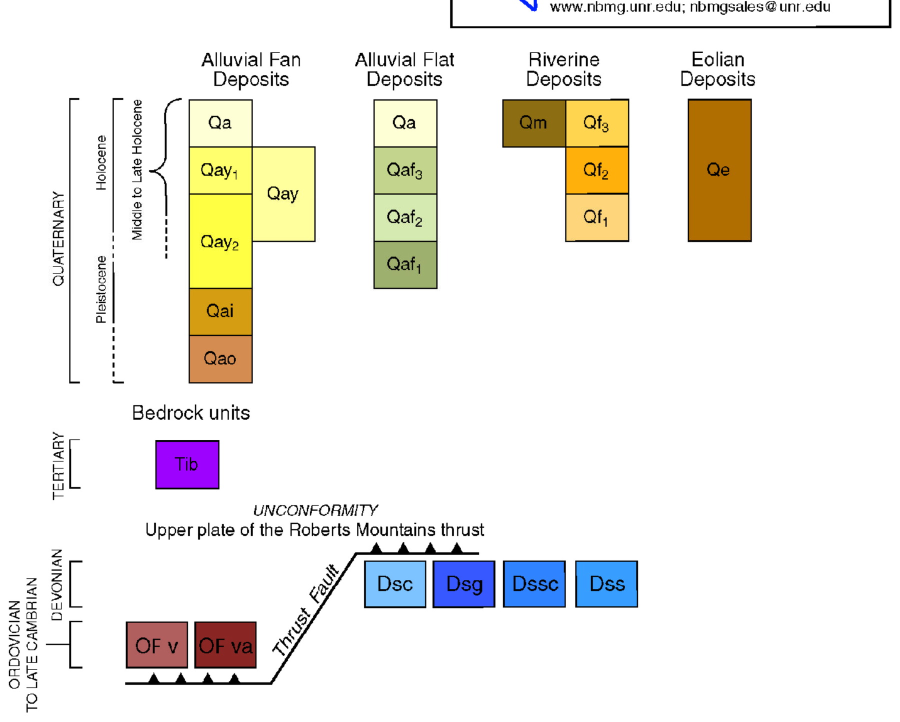

PRELIMINARY GEOLOGIC MAP OF THE BATEMAN SPRING QUADRANGLE, LANDER COUNTY, NEVADA

Alan R. Ramelli, Chester T. Wrucke, and P. Kyle House

2000

Scale 1:24,000

0 0.5 1 kilometer

0 0.5 1 mile

0 1000 2000 3000 4000 5000 feet

CONTOUR INTERVAL 10 FEET
SUPPLEMENTARY CONTOUR INTERVAL 5 FEET

Base map: U.S. Geological Survey Bateman Spring 7.5' Quadrangle, 1986 Digital Raster Graphic (DRG)