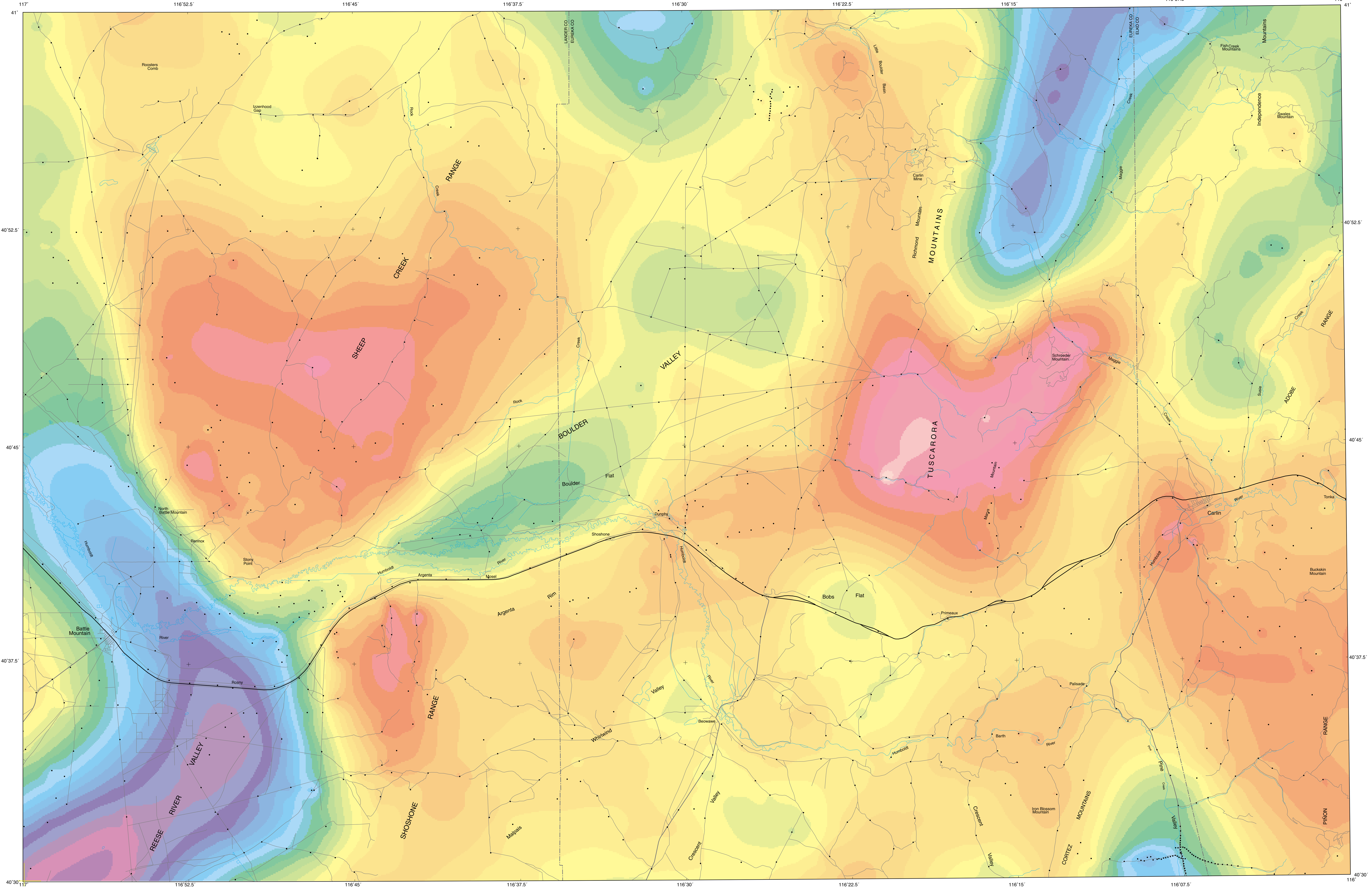
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY



Base from U.S. Geological Survey, 1988
UTM Projection, zone 11
Central Meridian 117°
1927 North American Datum

Data compiled in 1999
Edited by Jane S. Ciener
Cartographic preparation by David Lanford
Manuscript approved for publication on June 25, 1999

SCALE 1:100 000

CONVERSION FACTORS

Multiply	By	To obtain
centimeters (cm)	0.3937	inches (in)
meters (m)	3.281	feet (ft)
kilometers (km)	0.6214	miles (mi)

ISOSTATIC GRAVITY MAP OF THE BATTLE MOUNTAIN 30 X 60 MINUTE QUADRANGLE, NORTH-CENTRAL NEVADA

By
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2000

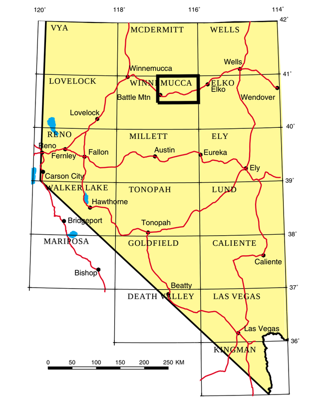

Figure 1. Index map of Nevada showing 1 by 2 degree quadrangles and location of study area.

[[COLUMN1]]

Valley, and the Humboldt River Valley suggest that ENE-trending Basin and Range faulting controls the location of the Humboldt River. In other areas, the Humboldt River transects Basin and Range structure. The Humboldt River parallels the northern edge of Argenta Rim, but near Dunphy, the Humboldt bends nearly 90° to the south, cutting across a gravity high related to Paleozoic rocks exposed in the Dunphy area. Southwest of Carlin, the Humboldt River cuts across a gravity high that reflects exposed Paleozoic rocks over the Piñon Range.

BOULDER VALLEY

Boulder Valley, a northeast-trending, fault-bounded graben, is characterized by a gravity low that extends the entire length of the valley approximately along its topographic axis. The gravity low reaches an amplitude of about -12 mGal, which indicates a depth to basement of about 1 km (3,000 ft). Several local gravity highs cut across the valley: north of Dunphy, a prominent gravity high extends some 8 km northward to the center of Boulder Valley and probably reflects Paleozoic rocks at shallow depth. In the northern part of Boulder Valley, another gravity high extends across the valley and suggests that buried Paleozoic rocks form a structural ridge across the valley at shallow depth. These features indicate that Boulder Valley is composed of at least three sub-basins that may play an important role in the hydrology of the Rock Creek--Reese River--Humboldt River triple confluence within the Humboldt River basin.

MAGGIE CREEK AND SUSIE CREEK BASIN

Steep gravity gradients along the eastern margin of the Tuscarora Mountains and the western margin of the Independence Mountains define a well-developed Tertiary basin that underlies Maggie Creek in the northeast part of the Battle Mountain quadrangle. A gravity low of about -22 mGal indicates a depth to basement of about 1.7 km (5,200 ft) in the deepest part of the basin.

Another gravity low is located east of the Independence Mountains, west of the Adobe Range, and north of Carlin. Gravity data indicate that this basin is relatively shallow and has about 0.6 km (1,900 ft) of basin-fill material and that the margins of the basin are diffuse and not well defined.

CRESCENT AND PINE VALLEYS

In the south-central part of the quadrangle, gravity lows in the northern part of Crescent Valley indicate that the area is underlain by volcanic rocks. Just northeast of Beowawe, a gravity high indicates that Paleozoic rocks, exposed in some places, extend at shallow depth beneath adjacent areas of alluvial cover.

The northernmost part of Pine Valley extends into the Battle Mountain quadrangle in the southeast part of the study area. A gravity low of about -18 mGal indicates that basin fill material is about 1.4 km thick (4,300 ft).

SHEEP CREEK RANGE

Greatly improved gravity data coverage over the Sheep Creek Range reveal several geophysical features. Along the western edge of the range, a steep isostatic gravity gradient of about 6 mGal/km indicates the presence of a prominent Basin and Range fault striking about N. 10° W. along the northern part to about N. 30° W. along the southern part. The vertical displacement of this fault is about 2.5 km (7,500 ft). The displacement was determined from a depth-to-basement map of the Winnemucca quadrangle (Ponce, 1998) and the relief on exposed Paleozoic rocks. A gravity high along the western margin of the range is associated with exposed Paleozoic rocks, and a gravity high in the central part of the range probably indicates the presence of similar rocks at shallow depths. A part of these gravity highs may be related to an increase in density of the rock units due to the occurrence, locally, of barite in the Slaven Chert. A local 2-4 mGal gravity low extends across the southern third of the Sheep Creek Range and may reflect the presence of a thick section of lower density volcanic rocks or the presence of a buried intrusion. This gravity low is south of and not related to a dacitic intrusion mapped in the central part of the Sheep Creek Range by John and Wrucke (1999). The location of this feature is also distinct from a possible intrusion interpreted by Gott and Zablocki (1968) on the basis of geochemical and geophysical anomalies below a pediment at the southwestern end of the range near Rennox. The western margin of the Sheep Creek Range also correlates to one of the most prominent aeromagnetic anomalies in the state of Nevada: the northern Nevada rift (fig. 2), a linear feature about 500-km long that extends almost the entire length of Nevada (Blakely and Jachens, 1991) and is related to mid-Miocene mafic igneous rocks. Gravity data indicate that a left step occurs between the northern end of the Shoshone Range and the Sheep Creek Range and reflects a left-lateral fault that offsets the northern Nevada rift by about 3 km, similar to and coincident with an offset aeromagnetic anomaly described by Zoback and others (1994).

SHOSHONE RANGE

The western margin of the Shoshone Range is characterized by a gravity high that is related to exposed Paleozoic rocks. Gravity values are highest south of Argenta and may reflect an increase in density caused by massive sedimentary barite deposits. Some barite beds are up to 12-m (40-ft) thick, 305-m (1,000 ft) long, and 305-m (1,000 ft) wide (Stewart and McKee, 1977). Gravity data do not indicate the presence of pediments along the western margin of the Shoshone Range, whereas a steep gravity gradient of 7.2 mGal/km does indicate a prominent Basin and Range fault with possible vertical offset of about 4.3 km (13,000 ft).

The gravity high over the Shoshone Range continues, in a subdued fashion, to the east along Argenta Rim, where Miocene basaltic rocks crop out, and suggests that Paleozoic rocks are present at moderate depth. This may indicate that a thick section of lower density volcanic rocks or possibly plutonic rocks is present. At the eastern margin of the Argenta Rim and east of Dunphy, a broad, but low amplitude gravity high correlates to scattered Paleozoic outcrops, and indicates that the entire area is underlain by Paleozoic rocks at shallow depth. Although no gravity stations are on a small exposed granitic body in this area, surrounding gravity data suggest its areal extent is limited.

TUSCARORA MOUNTAINS

One of the most prominent gravity anomalies in the Battle Mountain quadrangle is a gravity high in the central part of the quadrangle over the Tuscarora Mountains. The anomaly bifurcates to the north along Richmond Mountain and to the northeast along Schroeder Mountain. Maximum isostatic gravity values of about 22-24 mGal are similar to the maximum values over exposed Paleozoic rocks along the western margin of the Shoshone and Sheep Creek Ranges. The western edge of the Tuscarora Mountains gravity high correlates with the north-northeast-trending Crescent Valley--Independence lineament (fig. 2), a crustal fault zone described by Peters (1998). The northern extension of the high along Richmond Mountain follows the western margin of a wide belt of Paleozoic sedimentary rocks, and is coincident with the Carlin trend (Roberts, 1960; 1985). Aeromagnetic data (Kirchoff-Stein, 1988) indicate that the gravity high correlates to a broad, circular magnetic high typical of intrusions. Several small exposed granitic bodies (Evans, 1980) occur along the flank of the gravity high and coincide with local aeromagnetic highs. Gravity and magnetic data indicate that this entire area is probably underlain by large intrusions.

Gravity data along the northeastern extension of the high indicates that intermittently exposed Paleozoic rocks are part of a continuous northeast-trending ridge that extends from Schroeder Mountain to Swales Mountain in the Independence Mountains. A gravity high overlies Swales Mountain and is coincident with a magnetic high associated with mapped Tertiary granitic rocks (fig. 2) (Stewart and Carlson, 1976).

CORTEZ MOUNTAINS AND PIÑON RANGE

The northern end of the Cortez Mountains correlates with a broad gravity high centered just north of Iron Blossom Mountain along the Humboldt River. Although the gravity high is underlain by Jurassic volcanic rhyolite and rhyodacite flows, the source of the anomaly is unknown. Along the northern margin of the high, exposed granitic rocks have do not appear to be related to the gravity anomaly.

The Piñon Range is characterized by a gravity high associated with exposed Paleozoic rocks. The northern extension of the high, near Carlin, indicates that Paleozoic rocks occur at shallow depth below the Humboldt River basin. The trend of the gravity high is coincident with the Carlin trend (Roberts, 1960; 1985) and may reflect doming of basement rocks or could be in part related to slightly higher density (Mabey, 1964) rock units of the lower plate of the Roberts Mountain thrust.

SUMMARY

Gravity anomalies in the Battle Mountain quadrangle reflect a suite of geologic features that include the structure and topography of pre-Cenozoic rocks, thick sequences of Tertiary volcanic rocks, buried intrusions, Basin and Range faults, other faults, and moderately deep late Cenozoic basins. These features play an important role in the geologic, mineral, and hydrologic setting and evolution of north-central Nevada.

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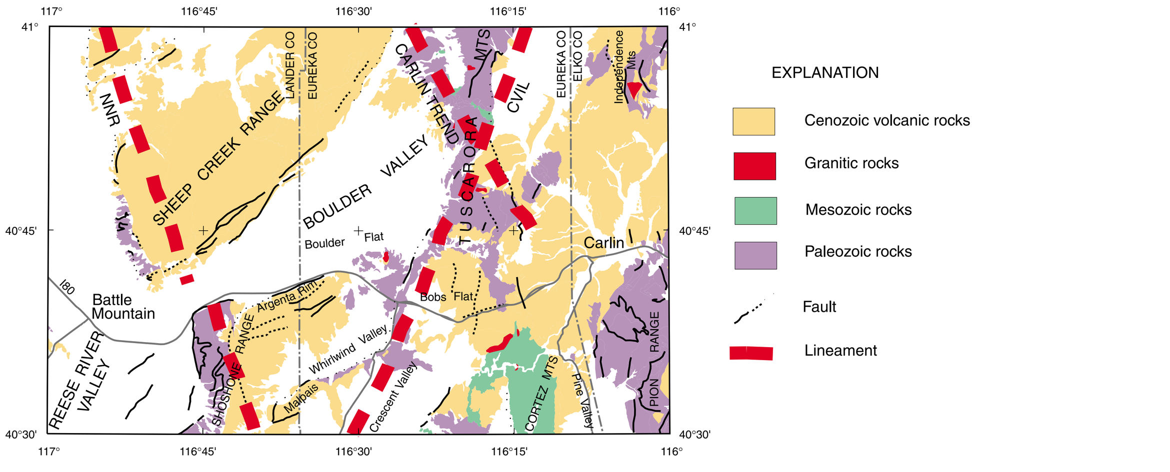

Figure 2. Index map of the Battle Mountain quadrangle showing generalized geology faults, and features described in text (modified from Stewart and Carlson, 1976; Peters, 1999). CVIL, Crescent Valley-Independence lineament; NNR, northern Nevada rift.

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