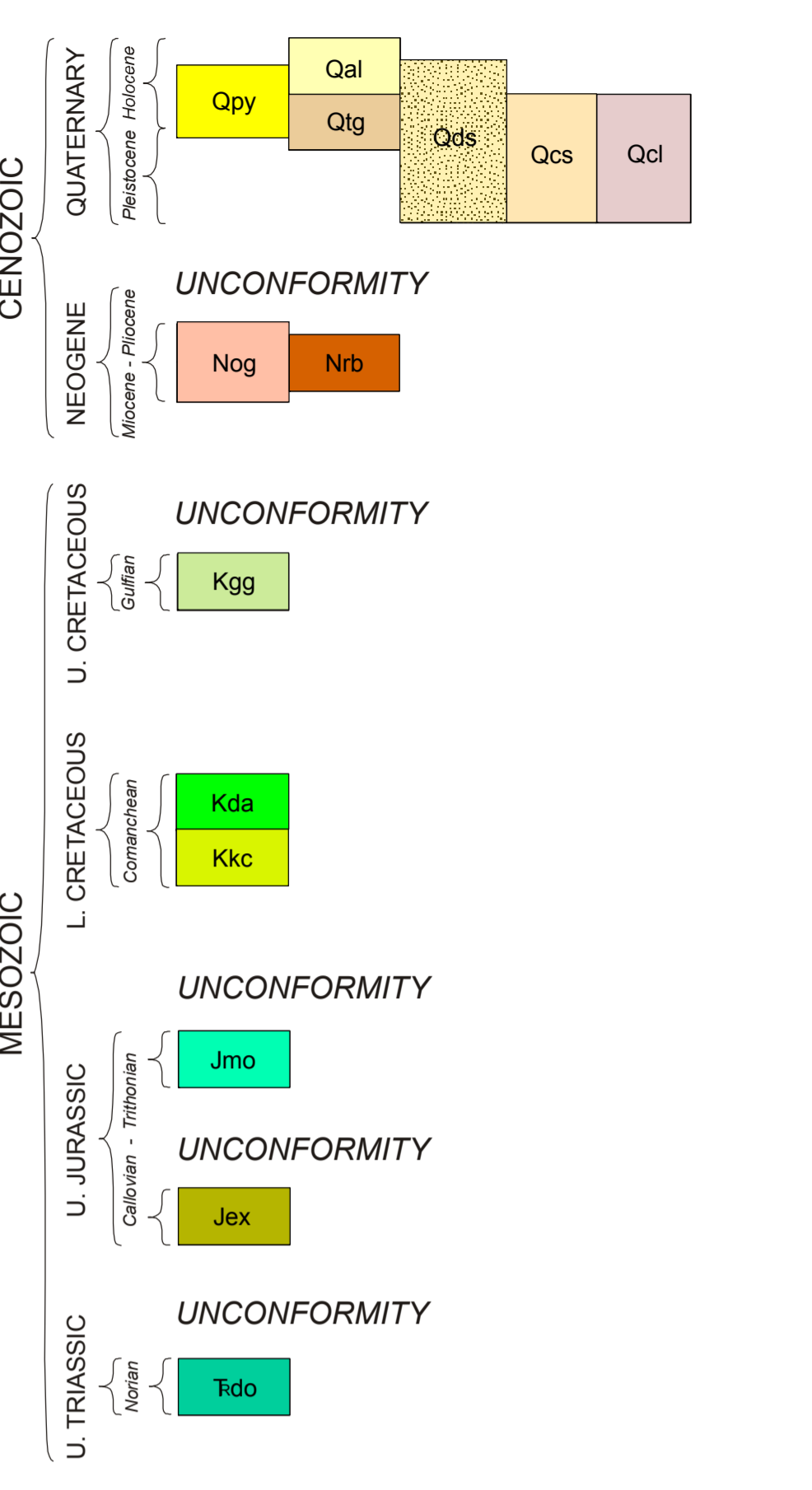
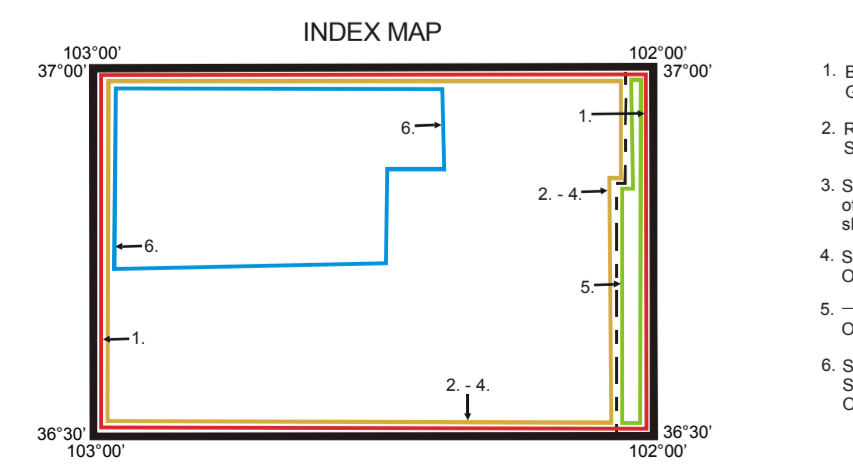


CORRELATION OF UNITS

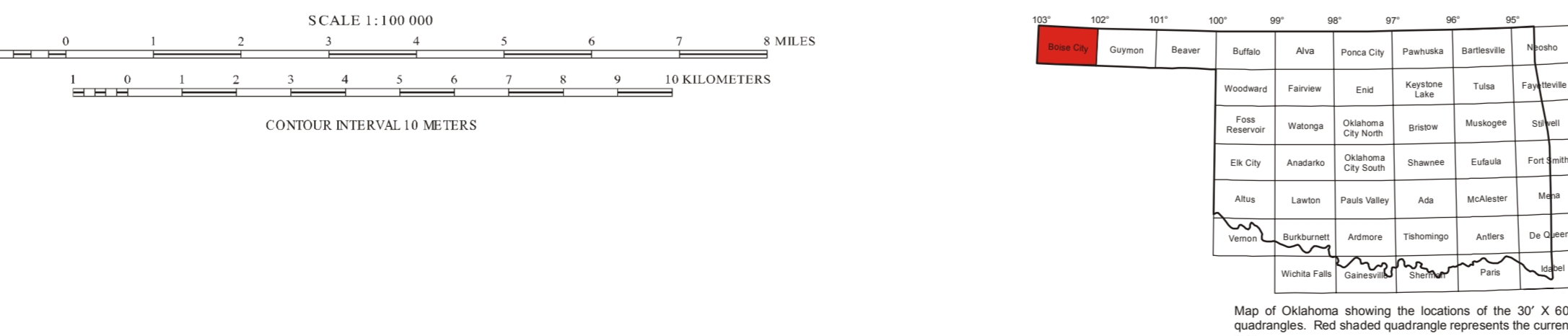


DESCRIPTION OF UNITS

- Qal** ALLUVIUM—Sand and silt; sand deposits are fine- to coarse-grained quartz, cross-bedded to massive, lenticular, reddish brown, pink, gray; silt deposits are poorly-sorted, lenticular, clay, and calcareous; thickness 3 to 15 meters (10 to 50 feet)
- Qtg** TERRACE GRAVEL—Gravel, sand, and silt; gravel is sandy, composed of pebbles and cobbles of quartz, quartzite, and calcite; sand and silt are composed of Holocene alluvium
- Qpy** PLAYA DEPOSIT—Clay and silt; sandy, gray, in shallow depressions; weathers light gray (Wisconsinian to Holocene). Includes Randall clay soil (Murphy and others, 1960)
- Qds** DUNE SAND—Sand and silt; locally occurs in dunes and dune ridges
- Qcs** COVER SAND—Sand and silt; occurs in sheets, locally modified by surface wash; thickness up to 30 meters (100 feet) or more, average thickness 12 meters (40 feet)
- Qcl** COVER LOESS—Windblown silt, similar to Qcs except for finer grain size; thickness less than 1.5 meters (5 feet)
- UNCONFORMITY**
- Nrb** RATON(?) BASALT—Fine-grained, small olivine phenocrysts comprise about 10 percent of rock; groundmass is nearly equal amounts of augite, magnetite, and slightly more labradorite; compact to vesicular dark- to light-olivine gray
- Nog** OGALLALA FORMATION—Mostly unconsolidated to weakly cemented, light gray to light brown stream-laid deposits of sand, silt, clay, and gravel capped by light-colored caliche. Some fossiliferous, freshwater limestone and volcanic ash locally. Where exposed, base may consist of a well-indurated bed of conglomerate with basalt, limestone, and dolomite clasts; thickness up to 91 meters (300 feet); may include Pleistocene deposits along major streams
- UNCONFORMITY**
- Kgg** GREENHORN LIMESTONE AND GRANEROS SHALE, UNDIVIDED—Greenhorn Limestone of Colorado Group; fine-grained, thin-bedded, gray to bluish-white; some brownish-yellow shale; *Inoceramus* common as fragments and complete shells; thickness 21 meters (70 feet) Graneros Shale of Colorado Group; gray to brownish-yellow, interbedded of limestone; gray to white bentonite at top; thickness 20 meters (65 feet)
- Kda** DAKOTA FORMATION—Composed of three divisions: upper division is sandstone, brownish-yellow; thickness about 15 to 46 meters (50 to 150 feet); middle division is gray shale with thin coal beds; thickness about 15 meters (50 feet); lower division is sandstone, quartzitic, ferruginous, pink, gray, white, black, brownish-yellow, 35 to 46 meters (115 to 150 feet) thick
- Kkc** KIOWA SHALE AND CHEYENNE SANDSTONE, UNDIVIDED (Equivalent to Purgatorio Formation of eastern Colorado and New Mexico)—Kiowa Shale, upper part, consists of dark gray marine shale with abundant *Gryphaea*; thickness 4 to 19 meters (12 to 63 feet) Cheyenne Sandstone, lower part, consists of white, cross-bedded sandstone and local conglomerate; conglomerate consists of quartzite and schist pebbles, silicified tree trunks and wood common; thickness up to 21 meters (70 feet), thinner to the east
- UNCONFORMITY**
- Jmo** MORRISON FORMATION—Silty sandstone, limestone, and shale; sandstone is yellowish brown with variegated speckles; limestone is gray; shale is gray to maroon to orange-brown; fossil dinosaur bones common; thickness 23 to 152 meters (75 to 100 feet), thin diastor
- UNCONFORMITY**
- Jex** EXETER FORMATION—Quartz-rich sandstone, crossbedded, white; thickness 12 meters (38 feet)
- UNCONFORMITY**
- Tdo** DOCKUM GROUP, UNDIVIDED—Sheep Pen Sandstone, Sloan Canyon Formation, and Trujillo Formations, undivided Sheep Pen Sandstone: even bedded, brown to yellowish-brown; thickness 5 meters (15 feet) Sloan Canyon Formation: shale, maroon to greenish-gray; thickness 21 to 38 meters (70 to 125 feet) Trujillo Formation: sandstone and conglomerate, brownish-yellow to reddish-brown; some shale, variegated; thickness 15 to 30 meters (50 to 100 feet); formation crops out in Cimarron Valley north-northeast of Boise City



- MAP REFERENCES
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The base map was compiled by the U.S. Geological Survey from 1:250,000-scale topographic maps dated 1950-1971. Planimetry revised from aerial photographs taken 1970 and other source data. Map dated 1982. Universal Transverse Mercator (UTM) projection. 1927 North American Datum. 25,000-foot grid ticks based on Oklahoma coordinate system, with 1000-foot and 500-foot coordinate system ticks every 10,000-foot UTM grid zone. The west and east sides of the map correspond to the Cimarron Mountain 30' X 60' quadrangle of eastern New Mexico to the Oklahoma border.

Geologic Map Details

Geology compiled and field checked by Kenneth V. Luza, 1999-2003. The northern part of the quadrangle includes the southern part of Basal County, Colorado and Morton County, Kansas. Research reported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program, under Assistance Award Number 1434-HC-07-AR-0174. The work and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, views, or opinions of the U.S. Government. Originally published as Open-File Report OFR-2003, this report is being revised and published as OGG-43. Cartography and layout prepared by G. Russell Standridge, 2003.

TEXT REFERENCES

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SYMBOLS

Unit contact; approximately located