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U.S. Geological Survey

Scientific Investigations Map 3142
Prepared in cooperation with the **National Park Service**
(Pamphlet accompanies map)

2011

Geologic Map of Big Bend National Park, Texas

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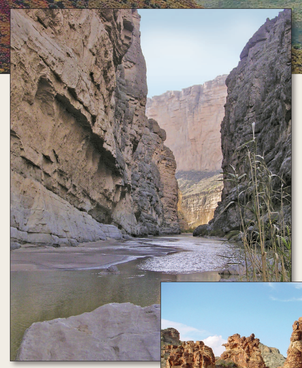
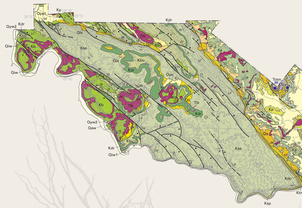
(Above) Mule Ear Peaks. Mule Ear Peaks are one of the most distinctive geologic landforms in the park, and are composed of the Chisos Formation and overlying Burro Mesa Formation.



Casa Grande. Casa Grande is one of the highest peaks (7,325 ft elevation) in the Chisos Mountains, and in Texas. The peak's name, meaning "Big House" in Spanish, comes from its massive, steep-sided profile, which towers above the Basin. Casa Grande is an extra-caldera vent, or volcanic dome, of the Pine Canyon caldera, which erupted rocks of the South Rim Formation.

(Above) The Rio Grande near the mouth of Santa Elena Canyon. As the international boundary between the U.S. and Mexico (Mexico is on the left side of the river and the U.S. is on the right), the Rio Grande is the lifeblood of the region and is a fragile, riparian ecosystem with unique plant and animal communities, and a critical shared water resource of bi-national communities along this desolate course.

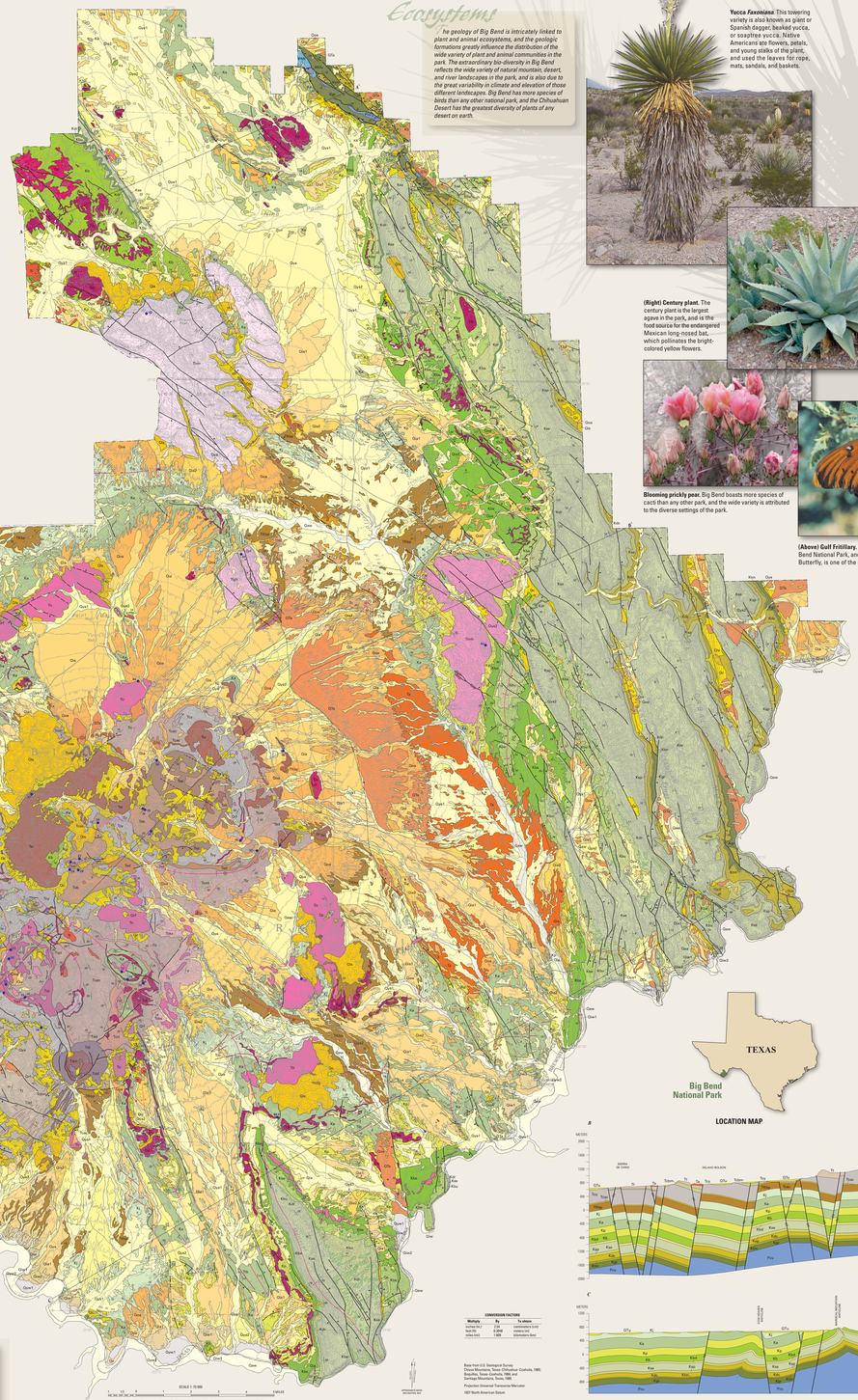


(Right) Chisos Formation. Spires of orange-weathering tuffaceous sandstone of the Chisos Formation, near Blue Creek Ranch.

View of El Pico in the Sierra del Carmen. Although El Pico is located across the Rio Grande from Big Bend, in Coahuila, Mexico, the Sierra del Carmen extends northward into Big Bend National Park, where the range forms towering limestone cliffs, originally deposited in ancient seas during Cretaceous time. The high mountain range is a series of uplifted, east-tilted fault blocks, which mark the easternmost range of the western North American cordillera.

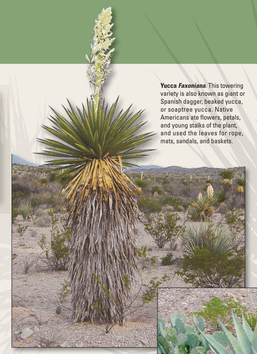
Scenic Landscapes

Big Bend National Park offers some of the most diverse and scenic landscapes of all national parks, and is renowned for its spectacular geology. The Chisos Mountains are the centerpiece of the park with its rugged volcanic peaks in an evergreen and oak woodland setting. The lowlands surrounding the Chisos Mountains are part of the Chihuahuan Desert; where each Spring the desert floor blooms with bursts of brightly colored wildflowers, cacti, and other plants. The Rio Grande contrasts sharply with the desert; and forms a green ribbon of life winding through the rocky landscape. Mesa de Anguila and Sierra del Carmen are uplifted mesas and mountains bounding the west and east sides of the park, respectively, where they form steep, majestic cliffs and deep, intervening canyons.



Ecosystems

The geology of Big Bend is intricately linked to plant and animal ecosystems, and the geologic formations greatly influence the distribution of the wide variety of plant and animal communities in the park. The extraordinary bio-diversity in Big Bend reflects the wide variety of natural mountain, desert, and river landscapes in the park, and is also due to the great variability in climate and elevation of those different landscapes. Big Bend has more species of birds than any other national park, and the Chihuahuan Desert has the greatest diversity of plants of any desert on earth.



Yucca *Faxoniana*. This towering variety is also known as giant or Spanish dagger, beaked yucca, or soaptree yucca. Native Americans ate flowers, petals, and young stalks of the plant, and used the leaves for rope, mats, sandals, and baskets.

(Right) Century plant. The century plant is the largest agave in the park, and is the food source for the endangered Mexican long-nosed bat, which pollinates the bright-colored yellow flowers.

Blooming prickly pear. Big Bend boasts more species of cacti than any other park, and the wide variety is attributed to the diverse settings of the park.

(Above) Gulf Fritillary. Over 160 species of butterflies occur in Big Bend National Park, and the Gulf Fritillary, also known as Passion Butterfly, is one of the more common varieties in the park.

(Right) Mexican Jay. Big Bend National Park is one of the best localities in the U.S. for bird watching, and more species have been recorded there than any other National Park. Some of the more rare species include the Mexican Jay, Mexican mallard, Lucifer hummingbird, and Colima warbler.

(Right) Collared lizards. Collared lizards are some of the largest lizards in the park, and are a critical part of the Big Bend ecosystem because they are the food source for many birds in the park, and they help control the population of insects.

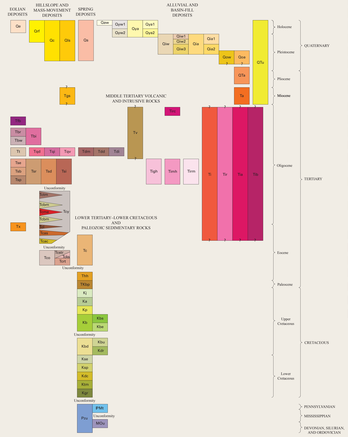
(Left) Black bears. Black bears were common in the park in the early 1900s, but none were observed after Big Bend became a park in 1944. They returned to the park from Mexico in the 1980s, and remain there today mostly in the Chisos Mountains; their recolonization is rare and enigmatic. They are well adapted to the Chisos Mountains, mainly because of their food source of acorns, juniper berries, pinon nuts, all available in this woodland environment.

Face off. A coyote **(left)** and a black-tailed jackrabbit **(above)** face off. Coyotes are well adapted in Big Bend, and are found in almost all environments in the park. The black-tailed jackrabbit is actually a hare, and is prey for mountain lions, coyotes, fox, bobcats, and hawks and eagles.

Texas Brown tarantula. The Texas Brown tarantula is a common variety of spider found in Big Bend National Park. Texas Browns can grow in excess of a four-inch leg span, and weigh more than 3 ounces as adults.

Geology

CORRELATION OF MAP UNITS



LIST OF MAP UNITS

SURFICIAL DEPOSITS

Eolian deposits

Qe — Eolian sand (Holocene)

Hillslope and mass-movement deposits

Qrf — Rock fall deposits (Holocene and late Pleistocene)

Qc — Colluvium and colluvial-fan deposits (Holocene and Pleistocene)

Qls — Landslide deposits (Holocene and Pleistocene)

Spring deposits

Qs — Spring deposits (Holocene and Pleistocene)

Alluvial and basin-fill deposits

Qaw — Active tributary wash and river deposits (latest Holocene)

Qyat1 — Younger of the young axial river deposits (Holocene)

Qyat2 — Older of the young axial river deposits (Holocene to late Pleistocene)

Qya — Young alluvial deposits, undivided (Holocene to late Pleistocene)

Qat1 — Younger of the young alluvial deposits (Holocene)

Qat2 — Older of the young alluvial deposits (Holocene to late Pleistocene)

Qiat — Intermediate axial river deposits, undivided (late and middle Pleistocene)

Qmat1 — Younger intermediate axial river deposits (late Pleistocene)

Qmat2 — Older intermediate axial river deposits (late to middle Pleistocene)

Qima — Intermediate alluvial deposits, undivided (late and middle Pleistocene)

Qmat1 — Younger of the intermediate alluvial deposits (late to middle Pleistocene)

Qmat2 — Older of the intermediate alluvial deposits (middle Pleistocene)

Qoat — Old axial river deposits (middle to early? Pleistocene)

Qoa — Old alluvial deposits, undivided (middle to early? Pleistocene)

QTu — Very old alluvium (early Pleistocene and Pliocene)

Ts — Basin-fill deposits (Miocene)

Surface mass-movement deposits

Tgr — Gravity slide blocks (Miocene?)

Undivided surficial deposits

QTu — Quaternary to Tertiary deposits, undivided (Holocene to Miocene) (cross-section only)

MIDDLE TERTIARY VOLCANIC AND INTRUSIVE ROCKS

Tv — Volcanic rocks, undivided (Oligocene)

Ti — Intrusive complex at Rattlesnake Mountain (Oligocene)

Ti — Intrusive rocks, undivided (Oligocene to Eocene)

Tri — Rhyolite and other felsic composition intrusive rocks, undivided (Oligocene to Eocene)

Tai — Andesite and other intermediate composition intrusive rocks, undivided (Oligocene to Eocene)

Tbi — Basalte and other mafic composition intrusive rocks, undivided (Oligocene to Eocene)

Tbf — Basalte flow (Oligocene)

Tbm — Burro Mesa Formation (Oligocene)

Tbm — Effusive member

Tbm — Wasp Spring member

Tbi — Intrusive rocks, undivided

Tt — Trachytic lava, undivided (Oligocene)

Sierra Quemada related rocks (Oligocene)

Tsqf — Sierra Quemada ring dike

Tsqi — Sierra Quemada intrusive rocks, undivided

Tsqv — Sierra Quemada vent breccia

Dominguez Mountain related rocks (Oligocene)

Tdmv — Dominguez Mountain mafic lava flows

Tdm — Dominguez Mountain dike swarm

Tdi — Dominguez Mountain intrusive rocks, undivided

South Rim Formation (Oligocene)

Tsr — Emory Peak rhyolite member

Tsb — Boot Rock member

Tsc — Pine Canyon rhyolite member

Tsr — Outflow deposits, undivided

Tsr — Ring dike

Tsi — Intrusive rocks, undivided

Tgh — Fayalite syenite of Grapevine Hills (Oligocene)

Tmh — Fayalite syenite of McKinney Hills (Oligocene)

Tcrm — Syenite of Rosillos Mountains (Oligocene)

Chisos Formation (Oligocene and Eocene)

Tcy — Younger part, undivided (Oligocene and Eocene)

Tcmt — Tule Mountain Trachyandesite Member (Oligocene)

Tcbm — Boo Mountain Basalt Member (Oligocene)

Tcme — Male Ear Spring Tuff Member (Oligocene)

Tcu — Undifferentiated lava flow (Eocene)

Tcas — Ash Spring Basalt Member (Eocene)

Tcbc — Blume Creek Basalt Member (Eocene)

Tcu — Older part, undivided (Eocene) (cross-section only)

Tcsst — Sandstone, tuff, and rhyolite unit

Tcks — Siltstone unit

Tcrt — Rhyolite tuff unit

Tc — Christmas Mountains related volcanic rocks (Eocene)

LOWER TERTIARY TO LOWER CRETACEOUS SEDIMENTARY ROCKS

Tc — Camos Formation (Eocene)

Tbh — Hannold Hill Formation (Eocene)

Tbbp — Black Peaks Formation (Paleocene to Upper Cretaceous)

Kj — Javelina Formation (Upper Cretaceous)

Ka — Aguja Formation (Upper Cretaceous)

Kp — Pen Formation (Upper Cretaceous)

Kb — Boquillas Formation, undivided (Upper Cretaceous)

Kbs — San Vicente Member

Kbe — Ernst Member

Kbd — Buda Limestone and Del Rio Clay, undivided (Upper Cretaceous) (cross-section only)

Kbu — Buda Limestone (Upper Cretaceous)

Kdr — Del Rio Clay (Upper Cretaceous)

Ksm — Santa Elena Limestone (Lower Cretaceous)

Ksp — Sue Peaks Formation (Lower Cretaceous)

Kdc — Del Carmen Limestone (Lower Cretaceous)

Kbbs — Telephone Canyon Formation and Meson Sandstone, undivided (Lower Cretaceous)

Kcr — Cito Rosa Limestone (Lower Cretaceous)

PALEOZOIC ROCKS

PzC — Paleozoic rocks, undivided (Lower Pennsylvanian through Ordovician)

PMt — Tesnus Formation (Lower Pennsylvanian and Upper Mississippian)

MDu — Mississippian to Ordovician rocks, undivided

MAP EXPLANATION

Contact

Faults

Normal—Dashed where approximately located, dotted where concealed. Bar and ball on downthrown side

Buried—Inferred from geophysical data

Reverse—Dotted where concealed. Showing relative motion; U on upthrown side, D on downthrown side. Rosillos Mountains only

Oblique-slip, right-lateral offset—Dotted where concealed. Showing relative motion; U on upthrown side, arrows indicate relative right-lateral strike-slip movement

Oblique-slip, left-lateral offset—Dotted where concealed. Bar and ball on downthrown side, paired arrows indicate relative left-lateral strike-slip movement

Thrust—Dashed where approximately located, dotted where concealed. Sawtooth on upper plate

Other

Anticline—Dashed where approximately located, dotted where concealed

Syncline—Dashed where approximately located, dotted where concealed

Strike and dip of bedding

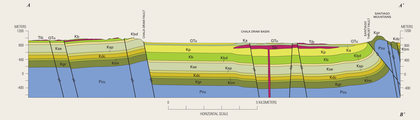
Inclined

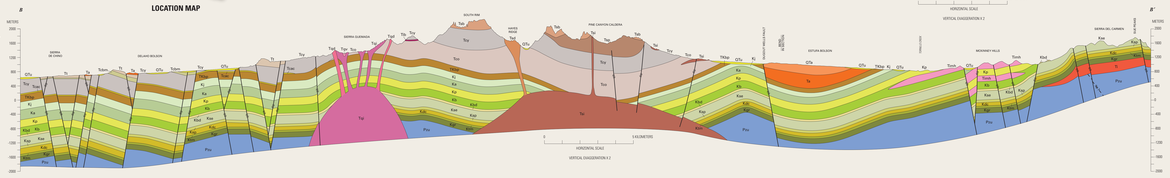
Horizontal

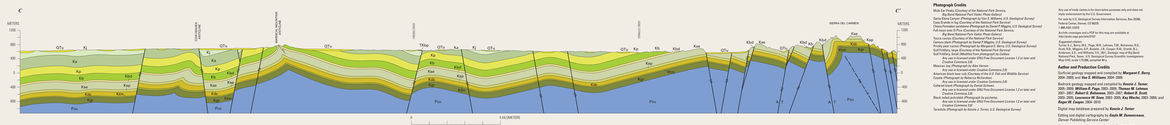
Vertical

Overturned

Geochronology sample location and map sample number (Appendix)







CONVERSION FACTORS

Multiply	By	To obtain
inches (in.)	2.54	centimeters (cm)
feet (ft)	0.3048	meters (m)
miles (mi)	1.609	kilometers (km)

Base from U.S. Geological Survey
Digital Chart of the World, Mexico, Coahuila, 1992; Baseline, Texas–Coahuila, 1998; and Geologic Mountains, Texas, 1995

Projection Universal Transverse Mercator
1927 North American Datum

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Mule Ear Peaks (Courtesy of the National Park Service, Big Bend National Park Visitor Photo Gallery)
Casa Grande (Courtesy of the U.S. Geological Survey)
Casa Grande in Fog (Courtesy of the National Park Service)
Rio Grande (Courtesy of the U.S. Geological Survey)
Full moon over El Pico (Courtesy of the National Park Service)
Chisos Formation (Courtesy of Robert Scott, Flickr)
Texas Indian Blanket (Courtesy of the National Park Service)
Century plant (Photograph by Gerard Villegas, U.S. Geological Survey)
Blooming prickly pear (Photograph by Gerard Villegas, U.S. Geological Survey)
Gulf Fritillary, large (Courtesy of the National Park Service)
Gulf Fritillary, small (Courtesy of the National Park Service)
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Mexican Jay (Photograph by Alan Vernon)
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Collared lizard (Courtesy of the U.S. Fish and Wildlife Service Country Photographs by Rebecca Richardson)
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Collared lizard (Photograph by Daniel Schwen)
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Black-tailed jackrabbit (Photograph by jackrary)
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Texas Brown Tarantula (Photograph by Mario J. Scrivo, U.S. Geological Survey)

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