Ecoregions of New Mexico

Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources; they are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. By recognizing the spatial differences in the capacities and potentials of ecosystems, ecoregions stratify the environment by its probable response to disturbance (Bryce and others, 1999). These general purpose regions are critical for structuring and implementing ecosystem management strategies across federal agencies, state agencies, and nongovernment organizations that are responsible for different types of resources within the same geographical areas (Omernik and others, 2000).

The New Mexico ecoregion map was compiled at a scale of 1:250,000. It revises and subdivides an earlier national ecoregion map that was originally compiled at a smaller scale (USEPA, 2006; Omernik, 1987). The approach used to compile this map is based on the premise that ecological regions can be identified through the analysis of the spatial patterns and the composition of biotic and abiotic phenomena that affect or reflect differences in ecosystem quality and integrity (Wiken, 1986; Omernik, 1987, 1995). These phenomena include geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The relative importance of each characteristic varies from one ecological region to another regardless of the hierarchical level.

A Roman numeral hierarchical scheme has been adopted for different levels of ecological regions. Level I is the coarsest level, dividing North America into 15 ecological regions. Level II divides the continent into 52 regions (Commission for Environmental Cooperation Working Group, 1997). At level III, the continental United States contains 104 ecoregions and the conterminous United States has 84 ecoregions (United States Environmental Protection Agency [USEPA], 2006). Level IV is a further subdivision of level III ecoregions. Explanations of the methods used to define the USEPA's ecoregions are given in Omernik (1995, 2004), Omernik and others (2000), and Gallant and others (1989).

New Mexico contains semiarid shrub- and grass-covered plains, forested mountains, glaciated peaks, woodland- and shrubland-covered hills, lava fields and volcanic plateaus, river floodplains, and arid deserts. Ecological diversity is enormous. There are 8 level III ecoregions and 55 level IV ecoregions in New Mexico and many continue into ecologically similar parts of adjacent states (Griffith and others, 2004; Woods and others, 2005; Chapman and others, 2006).

This poster is part of a collaborative project primarily between USEPA Region VI, USEPA National Health and Environmental Effects Research Laboratory (Corvallis, Oregon), New Mexico Environment Department (NMED), U.S. Department of Agriculture (USDA)–Natural Resources Conservation Service (NRCS), and U.S. Geological Survey (USGS)–National Center for Earth Resources Observation and Science (EROS). The project is associated with an interagency effort to develop a common framework of ecological regions (McMahon and others, 2001). Reaching that objective requires recognition of the differences in the conceptual approaches and mapping methodologies applied to develop the most common ecoregion-type frameworks, including those developed by the USDA–Forest Service (Bailey and others, 1994), the USEPA (Omernik, 1987, 1995), and the NRCS (U.S. Department of Agriculture–Soil Conservation Service, 1981). As each of these frameworks is further refined, their differences are becoming less discernible. Collaborative ecoregion projects, such as this one in New Mexico, are a step toward attaining consensus and consistency in ecoregion frameworks for the entire nation.

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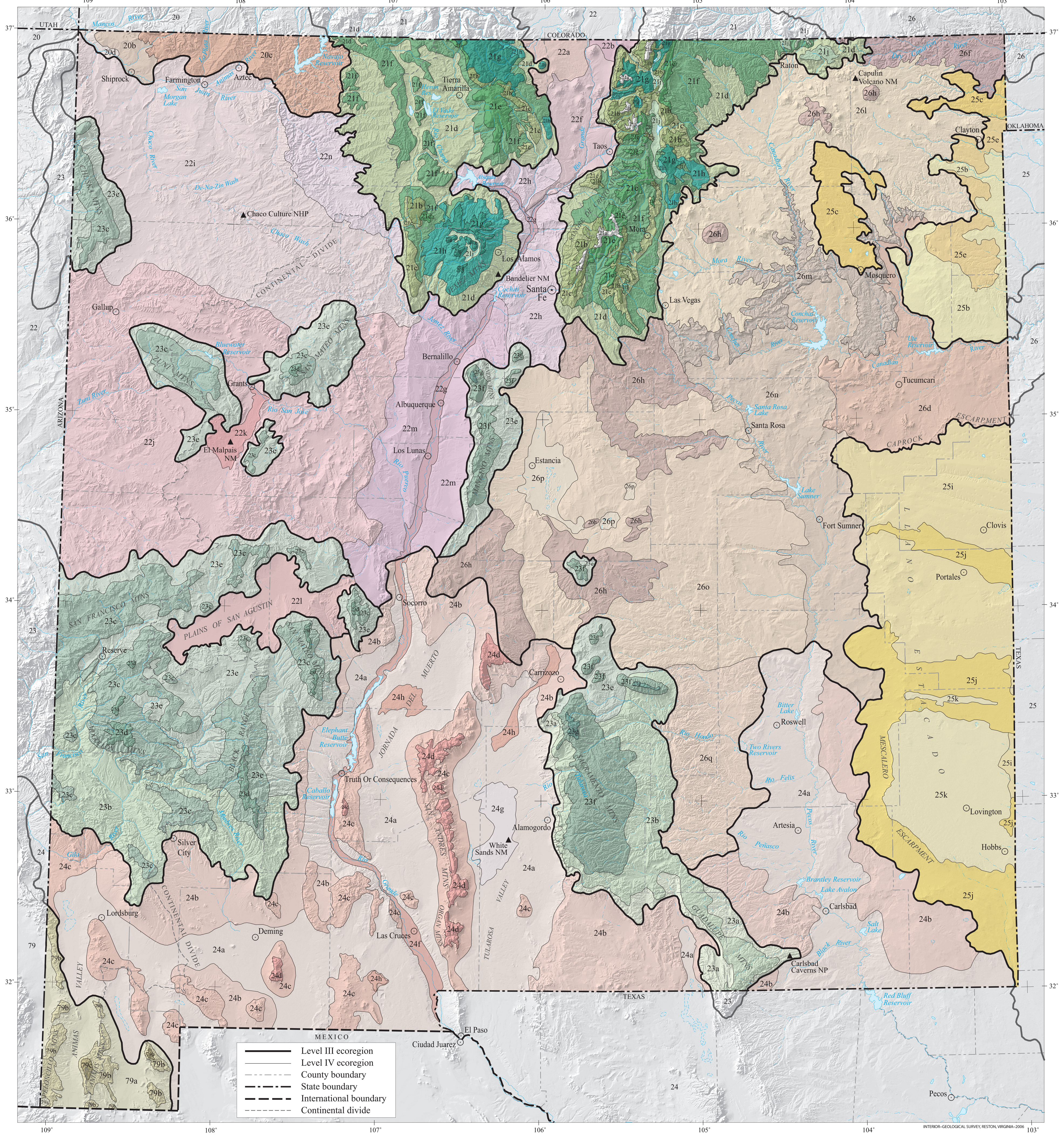

20 Colorado Plateaus
- 20b Shale Deserts and Sedimentary Basins
- 20c Semiarid Benchlands and Canyonlands
- 20d Arid Canyonlands

21 Southern Rockies
- 21a Alpine Zone
- 21b Crystalline Subalpine Forests
- 21c Crystalline Mid-Elevation Forests
- 21d Foothill Woodlands and Shrublands
- 21e Sedimentary Subalpine Forests
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- 21g Volcanic Subalpine Forests
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- 21j Grassland Parks

22 Arizona/New Mexico Plateau
- 22a San Luis Shrublands and Hills
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- 22f Taos Plateau
- 22g Rio Grande Floodplain
- 22h North Central New Mexico Valleys and Mesas
- 22i San Juan/Chaco Tablelands and Mesas
- 22j Semiarid Tablelands
- 22k Lava Malpais
- 22l Plains of San Agustin
- 22m Albuquerque Basin
- 22n Near-Rockies Valleys and Mesas

23 Arizona/New Mexico Mountains
- 23a Chihuahuan Desert Slopes
- 23b Madrean Lower Montane Woodlands
- 23c Montane Conifer Forests
- 23d Arizona/New Mexico Subalpine Forests
- 23e Conifer Woodlands and Savannas
- 23f Rocky Mountain Conifer Forests
- 23g Rocky Mountain Subalpine Forests

24 Chihuahuan Deserts
- 24a Chihuahuan Basins and Playas
- 24b Chihuahuan Desert Grasslands
- 24c Low Mountains and Bajadas
- 24d Chihuahuan Montane Woodlands
- 24f Rio Grande Floodplain
- 24g Gypsiferous Dunes
- 24h Lava Malpais

25 High Plains
- 25b Rolling Sand Plains
- 25c Moderate Relief Plains
- 25e Canadian/Cimarron High Plains
- 25i Llano Estacado
- 25j Shinnery Sands
- 25k Arid Llano Estacado

26 Southwestern Tablelands
- 26d Semiarid Canadian Breaks
- 26f Mesa de Maya/Black Mesa
- 26h Pinyon-Juniper Woodlands and Savannas
- 26l Upper Canadian Plateau
- 26m Canadian Canyons
- 26n Conchas/Pecos Plains
- 26o Central New Mexico Plains
- 26p Pluvial Lake Basins
- 26q Southern New Mexico Dissected Plains

79 Madrean Archipelago
- 79a Apachian Valleys and Low Hills
- 79b Lower Madrean Woodlands
- 79c Madrean Pine-Oak and Mixed Conifer Forests

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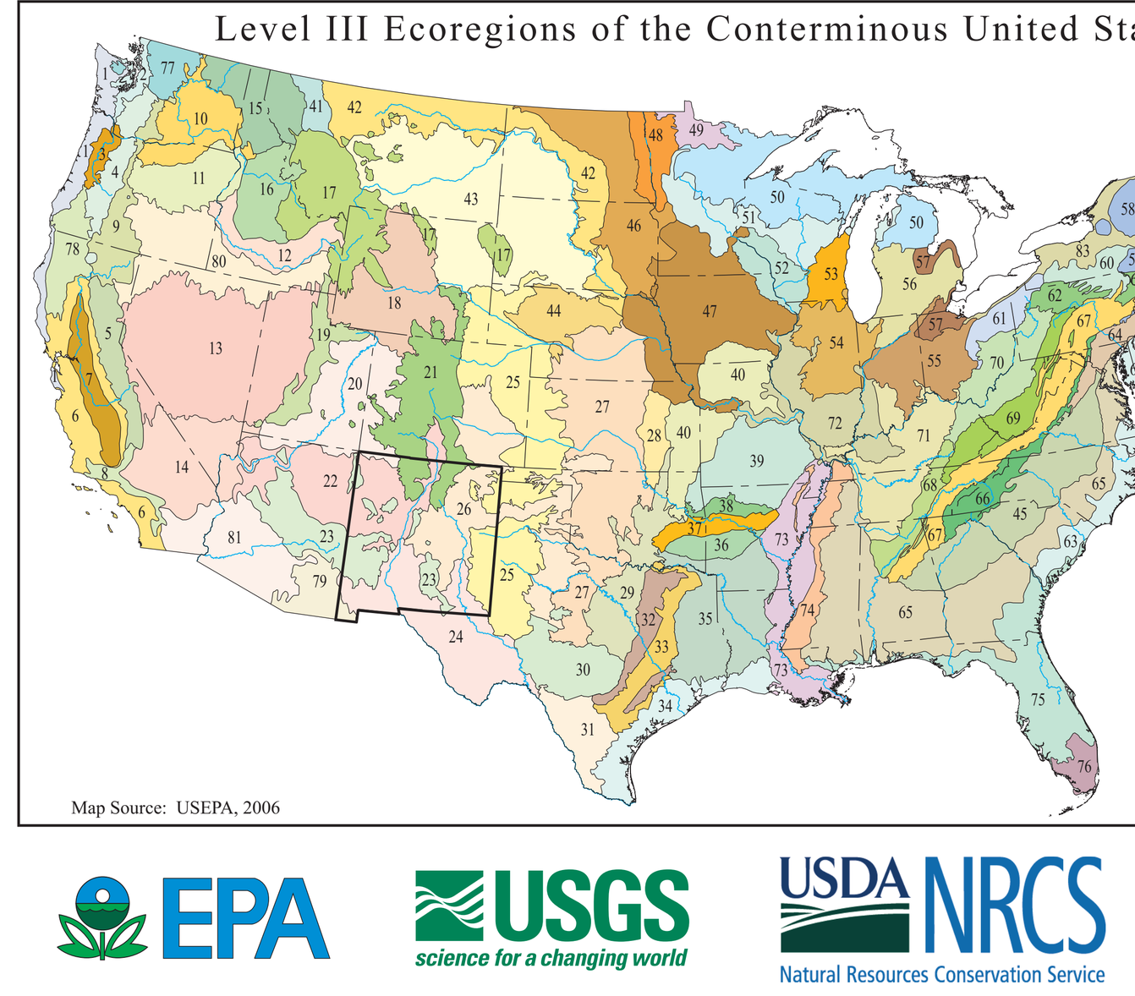
Albers equal area projection
Standard parallels 33˚ N and 36˚ N

Level III Ecoregions of the Conterminous United States



Map Source: USEPA, 2006

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20. Colorado Plateaus


Horizontal sedimentary rocks carved into relief of broad mesas, valleys, and canyons typify Ecoregion 20. Most of the flow of the San Juan River originates in Colorado.

Rugged tableland topography is typical of the Colorado Plateaus ecoregion. Canyons, mesas, plateaus, and mountains expose a long geologic history of rock formations. Precipitous side-walls mark abrupt changes in local relief, often of 1000 to 2000 feet or more. The region contains more pinyon-juniper and Gambel oak woodlands than the Wyoming Basin (18) to the north. However, the region also has large low-lying areas containing saltbush-greasewood communities, and in Utah, blackbrush communities typical of hotter, drier areas. These communities are generally not found in the higher Arizona/New Mexico Plateau (22) to the south where grasslands were typically more common.

20b The arid **Shale Deserts and Sedimentary Basins** ecoregion consists of nearly level basins and valleys, benches, low rounded hills, and badlands. Rock outcrops occur; it is sparsely vegetated with mat saltbush, fourwing saltbush, greasewood, and shadscale. Native grasses included alkali sacaton, galleta grass, poverty threeawn, sand dropseed, and Indian ricegrass. It is lower in elevation with less pinyon-juniper woodland than the adjacent Semiarid Benchlands and Canyonlands (20c).

20c Broad, grass-, shrub-, and woodland-covered benches and mesas characterize the **Semiarid Benchlands and Canyonlands** ecoregion. Areas of high relief alternate with areas of low relief. Bedrock exposures are common along rims, escarpments, and on steep dip slopes. Pinyon and juniper occur on shallow, stony soils with scattered areas of Gambel oak at higher elevations. On deeper soils, warm season grasses, sagebrush, fourwing saltbush, winterfat, and Mormon tea occur. The vegetation is not as sparse as in drier areas such as Ecoregions 20b and 20d.

20d Occurring primarily in Utah, the **Arid Canyonlands** ecoregion includes the inner gorge of the Colorado River and its major tributaries, such as the San Juan River. Much of this ecoregion is bounded by nearly vertical canyon walls that separate it from the adjacent, higher benchlands of Ecoregion 20c. Exposed bedrock is common. The New Mexico portion lacks the relief of most of the region in Utah. Soils are shallower with a drier moisture regime than those of Ecoregion 20c. Shadscale, saltbush, some sand sagebrush, and drought tolerant grasses including galleta grass and Indian ricegrass occur. This is the driest area of New Mexico, receiving less than 8 inches of annual rainfall.

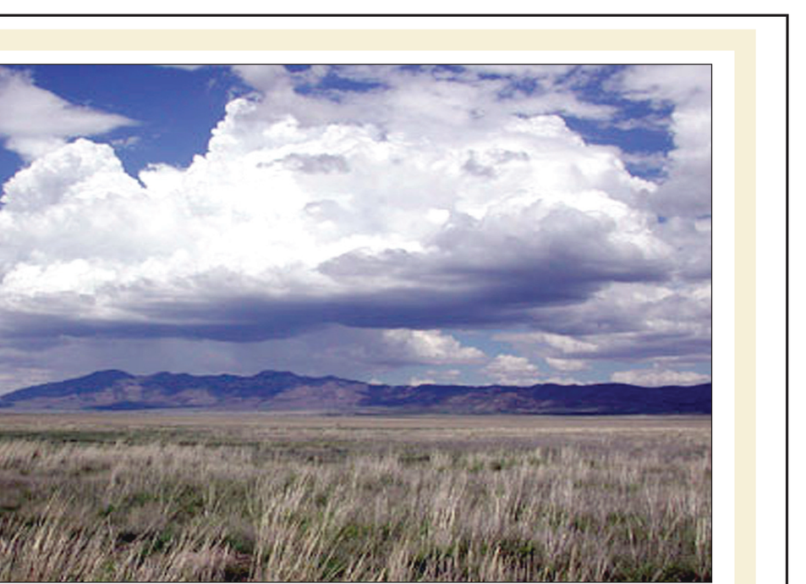
79. Madrean Archipelago

Also known as the Sky Islands in the United States, this is a region of basins and ranges with medium to high local relief, typically 3000 to 5000 feet. Native vegetation in the region is mostly grama-tobosa shrubsteppe in the basins and oak-juniper woodlands on the ranges, except at higher elevations where ponderosa pine is predominant. The region has ecological significance as both a barrier and bridge between two major cordilleras of North America: the Rocky Mountains and the Sierra Madre Occidental.

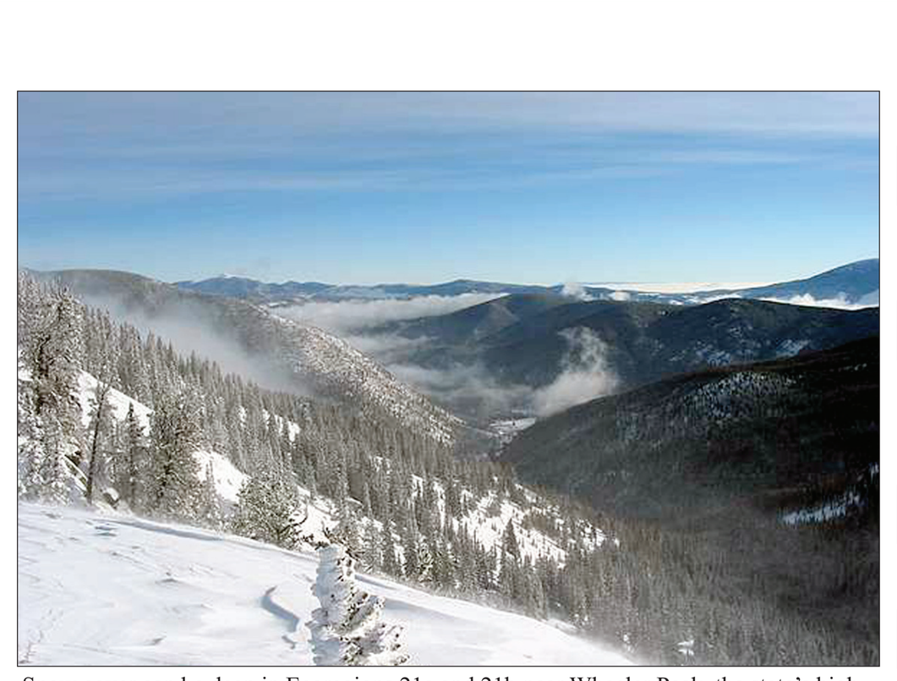
79a With valley plains, alluvial fans, and some low hills, the **Apachian Valleys and Low Hills** ecoregion is generally similar physiographically to the Chihuahuan Basins and Playas (24a). This region, however, has greater precipitation with more monsoonal influence, and has more grassland than Ecoregion 24a. The present vegetation is mostly sideoats grama, black grama, cane beardgrass, plains lovegrass, blue grama, hairy grama, sand dropseed, vine mesquite, curly mesquite, false mesquite, Mormon-tea, mimosa, yucca, ocotillo, cacti, and agave. Encroachment of honey mesquite has been significant in some areas.

79b The **Lower Madrean Woodlands** occur at intermediate elevations, generally above 5000 feet. It is a mild winter-wet summer woodland, shrubby in places. The Madrean encinal, or evergreen oak woodlands, have a mosaic of savannas, denser woodlands, and grassy openings. Emory, silverleaf, Tourney, and Arizona white oaks occur, along with scattered pinyon, juniper, mesquite, and chaparral species. Riparian areas of cottonwood, sycamore, and willow are valuable to neotropical birds and other wildlife of the area.

79c In contrast to the lower elevation woodlands of Ecoregion 79b, at elevations above about 7000 feet are the **Madrean Pine-Oak and Mixed Conifer Forests**. These include ponderosa pine-oak forests, ponderosa pine forests, montane fir forests, and mixed conifer forests. Some very small areas of subalpine forest occur in Arizona. Ponderosa pine, southwestern white pine, Apache pine, and Chihuahuan pine are found here, along with some Douglas-fir. Gambel oak and alligator juniper are also components of these pine forests.


Complex dynamics among climate change, seasonal precipitation, fire, grazing, desert shrub expansion, and grasslands occurs in the Animas Valley of Ecoregion 79a. *Photo: Dan Imhoff*

21. Southern Rockies


Snow cover can be deep in Ecoregions 21a and 21b near Wheeler Peak, the state's high point at 13,161 feet. The alpine and subalpine regions are important snow collection areas, providing water supplies to lower, more arid ecoregions. Average annual snowfall at the higher elevations is often over 100 inches and can exceed 300 inches in a few areas of New Mexico's Southern Rockies.

The Southern Rockies are composed of high elevation, steep, rugged mountains. Although coniferous forests cover much of the region, as in most of the mountainous regions in the western United States, vegetation, as well as soil and land use, follows a pattern of elevational banding. The lowest elevations are generally grass or shrub covered and heavily grazed. Low to middle elevations are also grazed and covered by a variety of vegetation types including juniper-oak woodlands, ponderosa pine, aspen, and Douglas-fir. Middle to high elevations are largely covered by coniferous forests and have little grazing activity. The highest elevations have alpine characteristics. Numerous perennial mountain streams with decidous riparian vegetation support coldwater fisheries and serve as wildlife corridors.

21a The **Alpine Zone** occurs on mountain tops above treeline, beginning at about 11,000 to 11,500 feet in New Mexico. It includes alpine meadows as well as steep, exposed rock, talus, and glaciated peaks. Annual precipitation ranges from 25 to greater than 50 inches, falling mostly as snow. Vegetation includes low shrubs, cushion plants, and wildflowers and sedges in wet meadows. The forest-tundra interface is sparsely colonized by stunted, deformed Englemann spruce, subalpine fir, and sometimes bristlecone pine and snow willow (krummholz vegetation). Ecoregion 21a is snow-free only 8 to 10 weeks annually. Snow cover is a major source of water for lower, more arid ecoregions.

21b The **Crystalline Subalpine Forests** ecoregion occupies a narrow elevational band on the steep, forested slopes of the mountains, becoming more extensive on the north slopes. The elevation range in New Mexico is generally 9000 to 11,500 feet, just below the Alpine Zone (21a). Dense forests are dominated by Englemann spruce and subalpine fir; aspen locally dominates some areas. Subalpine meadows also occur. Forest blowdown, insect outbreaks, fire, and avalanches affect the vegetation mosaic. Soils are weathered from a variety of crystalline and metamorphic materials, such as gneiss, schist, and granite, as well as some areas of igneous intrusive rocks. Recreation, logging, mining, and wildlife habitat are the major land uses.

21c The **Crystalline Mid-Elevation Forests** are found mostly in the 8000 to 10,000 feet elevation range on crystalline and metamorphic substrates. Natural vegetation includes ponderosa pine, aspen, Douglas-fir, and areas of limber pine. A diverse understory of shrubs, grasses, and wildflowers occurs. The variety of food sources supports a diversity of bird and mammal species. Forest stands have become denser in many areas due to decades of fire suppression. Land use includes wildlife habitat, livestock grazing, logging, mining, and recreation.

21d The **Foothill Woodlands and Shrublands** ecoregion is the low elevation portion of the Southern Rockies, and extends from southern Wyoming through Colorado and into New Mexico. In New Mexico, it is a transition area from the higher elevation forests to drier and lower plains (Ecoregion 26) and plateaus (Ecoregions 20, 22). Within the region, some flora and fauna species on the east side (Great Plains) may differ from those found to the west (Great Basin influence). This semiarid region has rolling to irregular terrain of hills, ridges, and footslopes, with elevations mostly 6000 to 8500 feet, and a variety of rock and soil types. In New Mexico, pinyon-juniper and oak woodlands are dominant.

21e The **Sedimentary Subalpine Forests** ecoregion occupies much of the western half of the Southern Rockies in Colorado, areas of the Sangre de Cristo Range in Colorado and New Mexico, and the western part of the Tusas Mountains in New Mexico. The region occurs on sandstone, siltstone, shale, and limestone substrates. Stream water quality, water availability, and aquatic biota are affected in places by carbonate substrates that are soluble and nutrient rich. Some streams support the endemic Rio Grande cutthroat trout. Soils are generally finer-textured than those found on crystalline or metamorphic substrates of Ecoregion 21b. Subalpine forests dominated by Englemann spruce and subalpine fir are typical, often interspersed with aspen groves or mountain meadows. Some Douglas-fir forests are at lower elevations.

21f The **Sedimentary Mid-Elevation Forests** ecoregion occurs in the western and southern portions of the Southern Rockies in Colorado and in several areas of the Rockies in New Mexico at elevations generally below Ecoregion 21e. The elevation limits and vegetation of this region are similar to the crystalline (21c) and volcanic (21h) mid-elevation forests; however a larger area of Gambel oak woodlands and forest is found in this region. Carbonate substrates in some areas affect water quality, hydrology, and biota. Abundant aquatic insects support a reproducing trout fishery. Soils are generally finer-textured than those found on crystalline and metamorphic substrates typical of Ecoregion 21c.

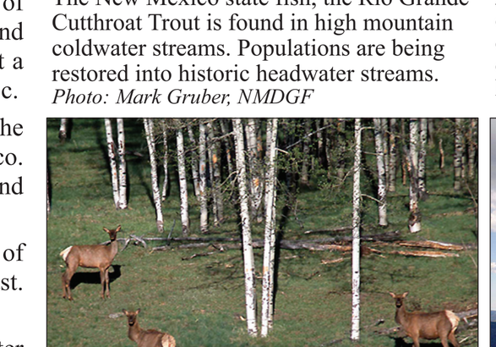
21g The steep, mountainous **Volcanic Subalpine Forests** ecoregion is composed of Tertiary or Quaternary volcanic rocks, primarily in the southern extension of the San Juan Mountains from Colorado and in parts of the Brazos, Jemez, and Taos mountains of New Mexico. Relatively young geologically, the high, rugged mountains still contain some large areas of intact habitat. Englemann spruce, subalpine fir, and aspen forests support a variety of wildlife.

21h The **Volcanic Mid-Elevation Forests** ecoregion occurs at elevations of about 7500 to 10,000 feet and is composed of igneous rocks of andesite and basalt. The majority of the region is found in the Jemez Mountains with smaller, scattered areas to the north and east. Forests of ponderosa pine, Douglas-fir, and aspen occur. Land use includes wildlife habitat, livestock grazing, logging, and recreation.

21j The **Grassland Parks** ecoregion, occurring primarily in Colorado, consists of high intermontane valleys with sufficient water availability to support grasslands and wet meadows. In New Mexico, the ecoregion is found in the Valle Grande/Valle San Antonio area in the Jemez Mountains, in the Moreno Valley and Costilla-Comanche-Valle Vidal areas in the Sangre de Cristo Mountains, and on top of Johnson Mesa near Raton. Grasslands with bunchgrasses are dominant, and include Parry's oatgrass, Arizona fescue, Idaho fescue, Thurber fescue, mountain muhly, bluebunch wheatgrass, needle-and-thread grass, Junegrass, and slender wheatgrass. There are only a few trees or shrubs, and if present, they are widely scattered and mature. Some springs and wetlands occur. Large elk herds are found in the valley parklands.

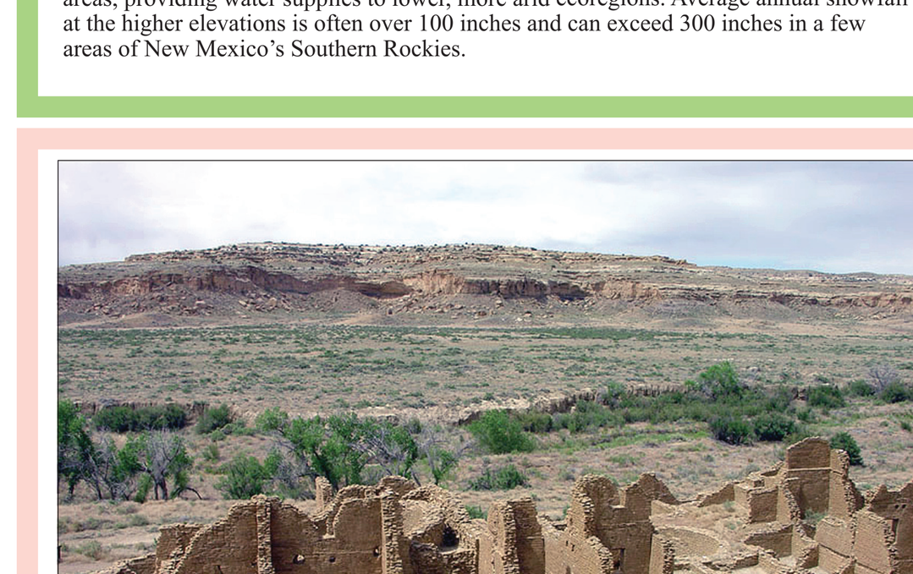

The New Mexico state fish, the Rio Grande Cutthroat Trout is found in high mountain coldwater streams. Populations are being restored into historic headwater streams. *Photo: Mark Gruber, NMDGF*

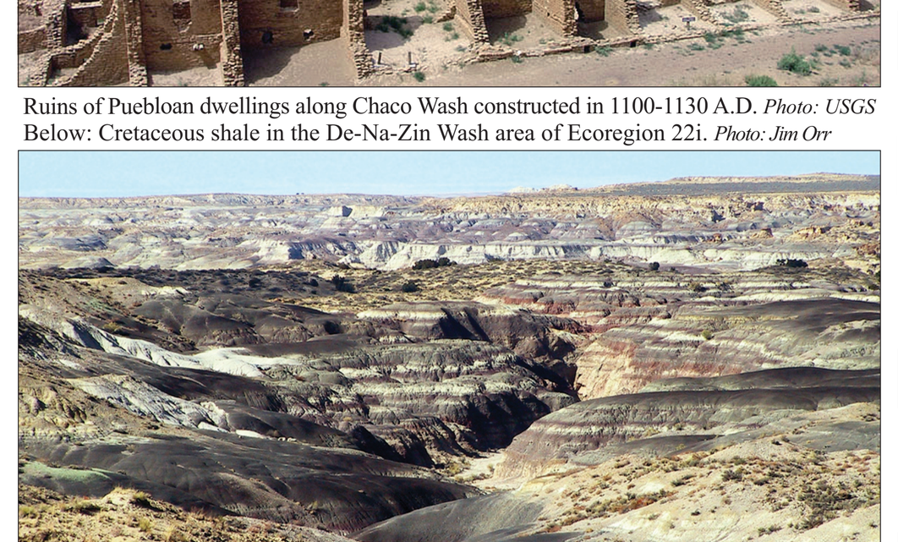

Aquatic insects, such as this recently emerged stonefly (*Pteronarcys californica*) comprise the fish food base in high quality coldwater streams such as the upper Pecos River. *Photo: Steve Cary, NM State Parks*


North American elk, or wapiti, are found in many parts of Ecoregion 21. They move to lower elevations in winter for better forage. *Photo: Jeff Vanuga, NRCS*


Balancing demands for cattle, elk, fish, recreation, and stream water quality is a land management challenge in the Valles Caldera in Ecoregion 21j. *Photo: Mouser Williams*

22. Arizona/New Mexico Plateau


Ruins of Puebloan dwellings along Chaco Wash constructed in 1100-1130 A.D. *Photo: USGS*
Below: Cretaceous shale in the De-Na-Zin Wash area of Ecoregion 22i. *Photo: Jim Orr*



The Arizona/New Mexico Plateau represents a large transitional region between the drier shrublands and wooded higher relief tablelands of the Colorado Plateaus (20) in the north, the lower, hotter, less vegetated Mojave Basin and Range (14) in the west, and forested mountain ecoregions that border the region on the northeast (21) and south (23). Local relief in the region varies from a few feet on plains and mesa tops to well over 1000 feet along tableland side slopes. The Continental Divide splits the region, but is not a prominent topographic feature. The region extends across northern Arizona, northwestern New Mexico, and into Colorado in the San Luis Valley. Gunnison prairie dogs are a keystone species in many of the sagebrush ecosystems and their burrows provide habitat for other wildlife including burrowing owls, weasels, badgers, and a variety of snakes.

22a The **San Luis Shrublands and Hills** ecoregion, occurring mostly in Colorado, includes the higher relief foothill edges and low mountain areas within the San Luis basin. It includes the San Luis Hills in Colorado, a series of low mountains, hills, and tilted mesas. The New Mexico portion includes the area northwest of the Taos Plateau Ecoregion (22f). Big sagebrush, rabbitbrush, and winterfat occur as well as grasslands of western wheatgrass, green needlegrass, blue grama, and needle-and-thread.

22b This region occurs primarily in Colorado, barely extending across the state line into New Mexico. Although precipitation in the **San Luis Alluvial Flats and Wetlands** ecoregion is low, water availability from mountain runoff, a high water table, and associated springs and wetlands have made cropland irrigation possible. The ecoregion was once dominated by shadscale, saltbush and greasewood, but most of the native vegetation has been removed for agriculture. Irrigated cropland is common in the Colorado portion, with barley malt, potatoes, alfalfa, small grains, and hay, and smaller areas of vegetables such as spinach, head lettuce, and carrots. In the New Mexico portion, sagebrush is more common, with some irrigated areas for hay.

22f The **Taos Plateau** is a region of mostly Pliocene basaltic lavas with distinct cones of Pliocene composite volcanoes. This region has higher elevation volcanic cones than the San Luis Hills of 22a in Colorado; several cones are over 9000 feet and Ute Mountain is higher than 10,000 feet. The plateau surface has more sagebrush than Ecoregion 22a in Colorado. The plateau surface has only minor dissection, but the Rio Grande is confined to a deep canyon or gorge, 800 to 1000 feet deep in places. The ecoregion extends south to include the basalt-capped Black Mesa.

22g Once containing a perennially flowing, meandering, braided river, the **Rio Grande Floodplain** ecoregion has undergone many human alterations to its landscape and hydrology over the past 400 years. The once-shifting Rio Grande had mosaics of riparian woodlands and shrublands along with a variety of wetland meadows, ponds, and marshes. The gallery forest, or bosque, of cottonwood and willow with understories of coyote willow, New Mexico olive, false indigo, and seepwillow depended on this dynamic system. A long history of irrigation and drainage canals, levees and jetty jacks, and upstream dams have altered river flows and narrowed and straightened the stream channel. Conversion to cropland, orchards, small rural farms and ranchos, and urban and suburban uses have also altered the region. Cottonwood and willow, dependent on spring flooding, have been widely replaced by invasive saltcedar and Russian olive.

22h The **North Central New Mexico Valleys and Mesas** is an area of mostly pinyon pine and juniper savanna, and mesa and valley topography similar to some other parts of Ecoregion 22. Situated between portions of the Southern Rockies (21) to the east and west, and dominated by young geologic features of the Espanola rift basin and ancestral Rio Grande floodplain, ecological differences are apparent. It has a cooler climate with slightly greater precipitation, streams tend to have more water flow, and there is a different species mix of flora and fauna compared to 22i, 22j, or 22m. It differs from 22f in geology, topography, and vegetation; from 22i and 22m in elevation, climate, and vegetation. It has a mix of geology, mostly Tertiary sedimentary or Tertiary and Quaternary volcanic rocks.

22i The **San Juan/Chaco Tablelands and Mesas** ecoregion of plateaus, valleys, and canyons contains a mix of desert scrub, semi-desert shrub-steppe, and semi-desert grasslands. Shadscale, fourwing saltbush, mormon tea, Indian ricegrass, galleta, and blue and black gramas are typical. It is more arid, has generally lower elevations, and less pinyon-juniper than the Semiarid Tablelands (22j) to the south or Ecoregion 22n to the east. It is mostly composed of gently dipping Tertiary and Cretaceous sedimentary rocks. Oil and gas production occurs mostly in the northern part of the region. It contains the upper reaches of the Rio Puerco, an area of severe erosion due to geology, topography, and human influences.

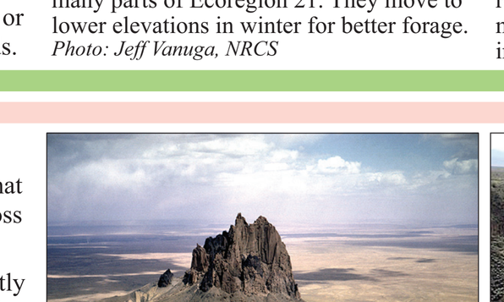
22j With some similarities to Ecoregion 20c, the **Semiarid Tablelands** consists of mesas, plateaus, valleys, and canyons formed mostly from flat to gently dipping sedimentary rocks, along with some areas of Tertiary and Quaternary volcanic fields. The region contains areas of high relief and some low relief plains. Bedrock exposures are common. Grass, shrubs, and woodland cover the tablelands. The vegetation is not as sparse as in Ecoregion 22i to the north or 22m to the east. It lacks the denser pine forests of the higher and more mountainous Ecoregion 23. Scattered junipers occur on shallow, stony soils, and are dense in some areas. Pinyon-juniper woodland is also common in some areas. Saltbush species, alkali sacaton, sand dropseed, and mixed grama grasses occur.

22k Part of the much larger Zuni-Bandera volcanic field, the **Lava Malpais** covers some of the younger Holocene volcanic flows with the least soil development. The youngest flow, called the McCartys flow, dates from about 3000 years ago. Different types of lava flows are found here, as well as lava tubes and ice caves. Some unique flora and fauna not found in surrounding areas occur here, and some species that are more widespread have made adaptations to survive in the specialized habitats here. The lava substrate has the ability in places to trap and retain moisture, allowing for a more mesophytic vegetation, such as stunted Douglas-fir and ponderosa pine, to occur in some areas. The region is an important area for understanding recent ecological successions, as well as longer term climatic changes.

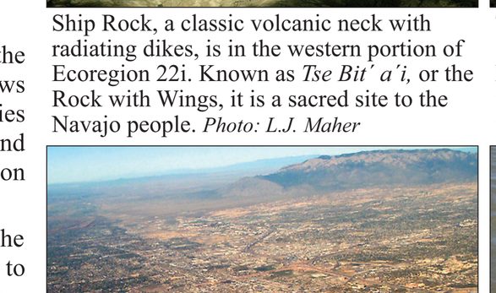
22l The **Plains of San Agustin** are mostly a topographically closed basin, with some alluvial fans and piedmont slopes near the surrounding mountains of Ecoregion 23. Beach and lacustrine deposits mark various stages of Pleistocene Lake San Agustin. Clay to fine-grained sand lake bed sediments, linear beach-ridge sand deposits, and some sand sheets and dune sand deposits occur. The sandy areas are mostly stabilized by grasses and low shrubs. Vegetation of alkali sacaton, fourwing saltbush, and greasewood is found in the low areas. Some western wheatgrass, vine-mesquite, areas of blue grama and sand dropseed occur. Higher elevation slopes have some pinyon-juniper savanna with an understory of blue grama, dropseeds, Indian ricegrass, and bottlebrush squirreltail grasses. Livestock grazing is the predominant land use.

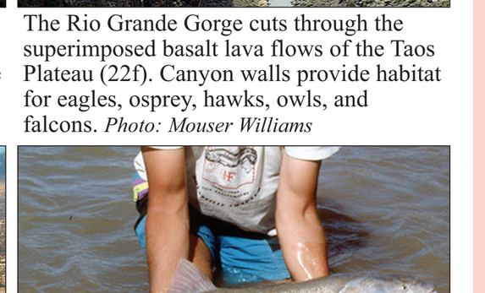
22m Part of one of the deeper physiographic basins of the Rio Grande rift, the **Albuquerque Basin** ecoregion is lower in elevation, drier, and warmer than surrounding ecoregions to the north, east, and west. The basin is filled with thick sediments of mostly Quaternary and some Tertiary age, with a few areas of volcanic rocks and lava-capped mesas. Extending from the La Bajada Escarpment on the north to near Socorro in the south, the region contains some diverse features and transitional characteristics. Unlike most of Ecoregion 22 which has mesic soils, 22m has a largely thermic soil temperature regime. There is a mix of sand scrub and desert grassland vegetation. Native vegetation includes black grama, sand dropseed, mesa dropseed, blue grama, galleta, sand sage, alkali sacaton, threeawns, and scattered yucca. Juniper occurs primarily in the north. Urban and suburban land uses are spreading. The Santa Fe Group aquifer, the drinking water source for Albuquerque and most of the Middle Rio Grande Valley, has seen some groundwater declines in recent years, along with increases in contaminants.

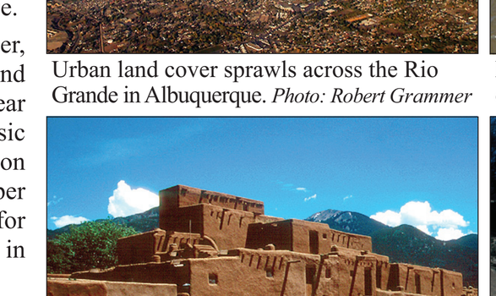
22n Similar to Ecoregion 22h, the **Near-Rockies Valleys and Mesas** ecoregion is an area of mostly pinyon-juniper woodland, juniper savanna, and mesa and valley topography, with influences of higher elevation vegetation in drainages from the adjacent Southern Rockies (21). Its geology differs from Ecoregion 22h, with older Tertiary and Cretaceous sedimentary rocks. It has generally higher elevations, greater precipitation, and more juniper than Ecoregion 22i to the west. Canyon streams flow intermittently out of the Rockies into the Canon Largo watershed, a tributary to the San Juan River.

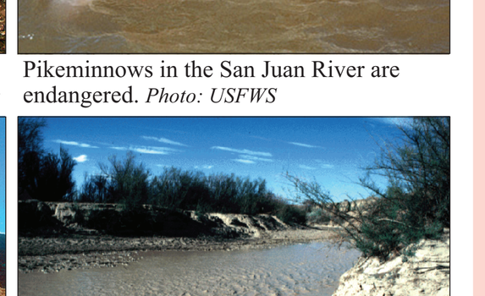

Ship Rock, a classic volcanic neck with radiating dikes, is in the western portion of Ecoregion 22i. Known as *Tse Bit' a'i*, or the Rock with Wings, it is a sacred site to the Navajo people. *Photo: L.J. Maher*


The Rio Grande Gorge cuts through the superimposed basalt lava flows of the Taos Plateau (22f). Canyon walls provide habitat for eagles, osprey, hawks, owls, and falcons. *Photo: Mouser Williams*

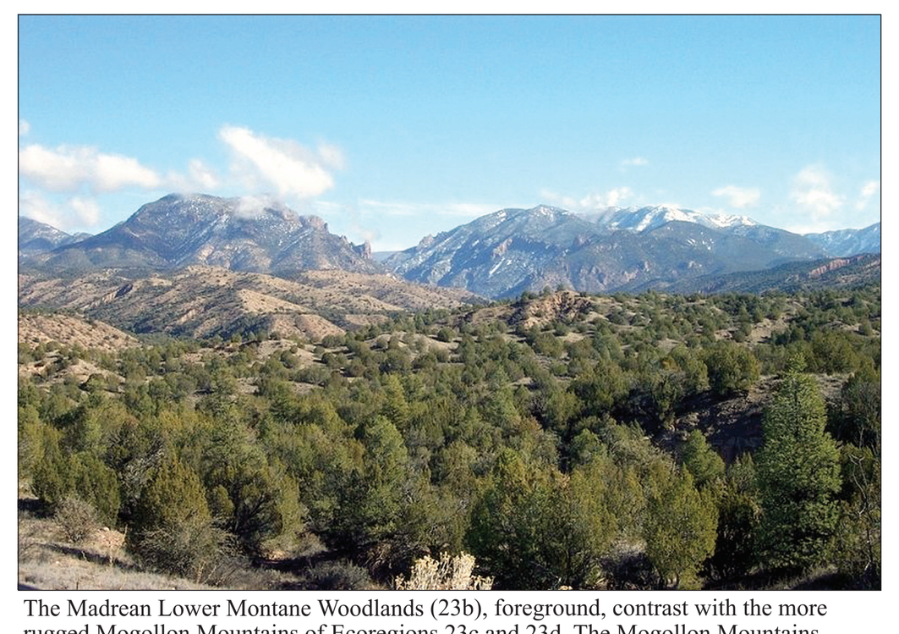

Urban land cover sprawls across the Rio Grande in Albuquerque. *Photo: Robert Grammer*


Pikeminnows in the San Juan River are endangered. *Photo: USFWS*


Adobe structures of the Taos Pueblo were built between 1000 and 1450 A.D. *Photo: Mark Nohl*


Soil erosion and high sediment loads are typical in the Rio Puerco basin. *Photo: USGS*

23. Arizona/New Mexico Mountains


The Madrean Lower Montane Woodlands (23b), foreground, contrast with the more rugged Mogollon Mountains of Ecoregions 23c and 23d. The Mogollon Mountains include peaks over 10,000 feet in elevation and form the core of the Gila Wilderness. Created in 1924 at the urging of conservationist Aldo Leopold, the Gila Wilderness was the world's first designated wilderness area. *Photo: April Sterling*

The Arizona/New Mexico Mountains are distinguished from neighboring mountainous ecoregions by their lower elevations and associated vegetation indicative of drier, warmer environments, due in part to the region's more southerly location. Forests of spruce, fir, and Douglas-fir, common in the Southern Rockies (21) and the Wasatch and Uinta Mountains (19), are only found in limited areas at the highest elevations in this region. Chaparral is common at lower elevations in some areas, pinyon-juniper and oak woodlands are found at lower and middle elevations, and the higher elevations are mostly covered with open to dense ponderosa pine forests. These mountains are the northern extent of some Mexican plant and animal species. Surrounded by deserts or grasslands, these mountains in New Mexico can be considered biogeographical islands.

23a The **Chihuahuan Desert Slopes** are found on the Guadalupe and Sacramento mountains. The lower slopes of these mountains represent a continuation of the Chihuahuan Desert ecosystem; soils and vegetation in much of Ecoregion 23a are similar to those in the Low Mountains and Bajadas (24c) of the Chihuahuan Deserts (24). The lower slopes were once mostly grasslands overgrazed in the late 19th century and subsequently invaded by desert shrubs. Yucca, sotol, lechuguilla, ocotillo, and cacti now dominate the rocky slopes below 5500 feet. Grasslands persist near alluvial fans and on gentle slopes with deeper, sandstone-derived soils. Water is scarce; the few streams that originate from springs at higher elevations do not persist beyond the mouths of major canyons.

23b The **Madrean Lower Montane Woodlands** ecoregion covers the slopes of the Guadalupe, Sacramento, Mimbres, Big Burro, and Mogollon mountains, generally between 5500 to 7200 feet, with densities of juniper, pinyon pine, and oak varying according to aspect. There are some similarities to Ecoregion 23e; however, Ecoregion 23b has milder winters, wetter summers, and inclusions of alligator juniper and Madrean evergreen oak species. At middle elevations, dense thickets of shrubs such as desert ceanothus, alderleaf mountain mahogany, and catclaw mimosa form chaparral communities. Other areas are grassy and park-like with scattered trees. A few small areas of ponderosa pine, Douglas-fir, or southwestern white pine occur at the highest elevations, outliers of Ecoregions 23c or 23f. In the west, the Gila River and tributaries have many endemic aquatic organisms including fish, amphibians, and insects.

23c The **Montane Conifer Forests** are found west of the Rio Grande at elevations from about 7000 to 9500 feet. Ponderosa pine and Gambel oak are common, along with mountain mahogany and serviceberry. Some Douglas-fir, southwestern white pine, and white fir occur in a few areas. Blue spruce may occasionally be found in cool, moist canyons. The influence of the Sierra Madre flora is seen mostly in the southern mountains and diminishes to the north. In the far south, other oaks appear, such as silverleaf oak, netleaf oak, Arizona white oak, and Emory oak. The summer rains are especially important for herbaceous plants. The region is geologically diverse with volcanic, sedimentary, and some intrusive and crystalline rocks. Endemic Gila trout occur in some of the region's streams. Livestock grazing, logging, and recreation are the primary land uses. Wildfire is an important feature influencing the forested ecosystems in this region.

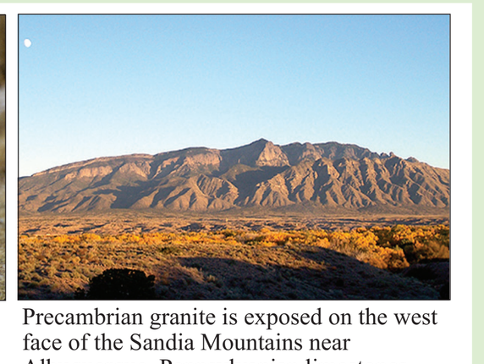
23d The **Arizona/New Mexico Subalpine Forests** occur west of the Rio Grande at the higher elevations, generally above 9500 feet. The region includes parts of the Mogollon Mountains, Black Range, San Mateo Mountains, Magdalena Mountains, and Mount Taylor. The peak elevations are mostly above 10,000 feet. Although there are some vegetational differences from mountain range to mountain range within Ecoregion 23d, the major forest trees include Engelmann spruce, corkbark fir, blue spruce, white fir, and aspen. Some Douglas-fir occurs at lower elevations. Cryic soils developed on the mixed geology of mostly Tertiary volcanics and Tertiary intrusives, with only minor areas of Precambrian rocks in the Black Range.

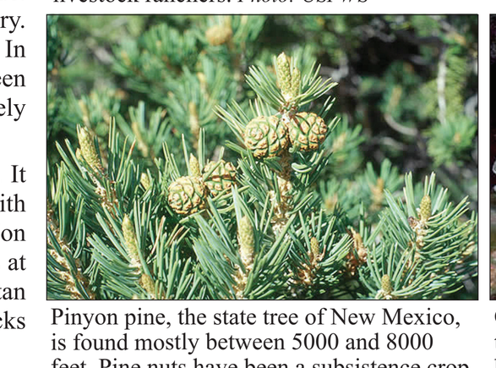
23e The **Conifer Woodlands and Savannas** ecoregion is an area of mostly pinyon-juniper woodlands, with some ponderosa pine at higher elevations. It often intermingles with grasslands and shrublands. Although elevations are higher than surrounding Ecoregion 22 areas, the boundaries tend to be transitional. The region is generally cooler, with more uniform winter and summer seasonal moisture compared to Ecoregion 23b. It lacks the milder winters, wetter summers, chaparral, Madrean oaks, and other species of Ecoregion 23b.

23f The **Rocky Mountain Conifer Forests** are found at elevations from about 7000 to 9600 feet in the mountains east of the Rio Grande. With similarities to Ecoregion 23c, ponderosa pine and Gambel oak are common, with mountain mahogany and a dense understory. Some Douglas-fir, southwestern white pine, and white fir occur in a few areas. Blue spruce may occasionally be found in cool, moist canyons. In the Sandia and Manzano mountains, white fir and Douglas-fir are more extensive than in other parts of the region. Current forests have been shaped by fire and fire suppression. It differs from Ecoregion 23c by some of the flora, fauna, and water quality characteristics that more closely resemble the Southern Rockies (21). The region is geologically diverse with volcanic, sedimentary, and some intrusive and crystalline rocks.

23g The **Rocky Mountain Subalpine Forests** ecoregion occurs east of the Rio Grande at high elevations, generally above 9500 feet. It includes parts of the Sandia Mountains, Capitan Mountains, and Sierra Blanca. The peak elevations are mostly above 10,000 feet, with Sierra Blanca Peak nearing 12,000 feet. There are some differences in flora, fauna, geology, and water quality from the subalpine ecoregion (23d) to the west. The major forest trees include Engelmann spruce, corkbark fir, blue spruce, white fir, and aspen. Some Douglas-fir occurs at lower elevations. There are a few small inclusions of montane grassland. A mix of geology occurs in the region. Sierra Blanca and the Capitan Mountains are composed of Tertiary volcanics and Tertiary intrusives, while the Sandia Mountains to the north have a core of Precambrian rocks capped by Pennsylvanian sedimentary rocks.

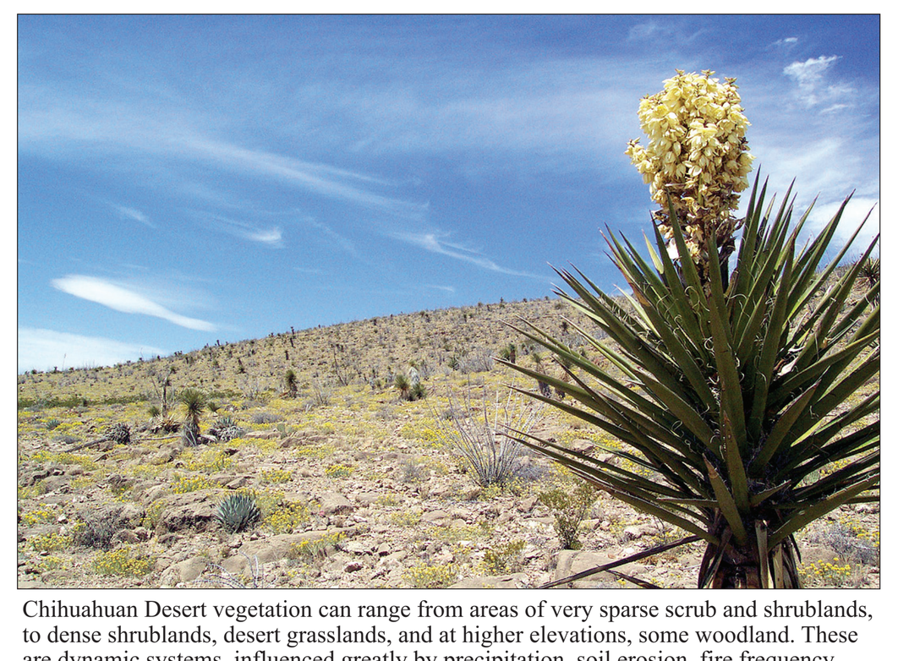

The endangered Mexican gray wolf has been reintroduced in parts of the Gila National Forest. The often controversial recovery effort has been opposed by some livestock ranchers. *Photo: USFWS*


Precambrian granite is exposed on the west face of the Sandia Mountains near Albuquerque. Pennsylvanian limestones cap the 10,678-foot crest and the gentler eastern slope. *Photo: Ken Scheffe, NRCS*


Pinyon pine, the state tree of New Mexico, is found mostly between 5000 and 8000 feet. Pine nuts have been a subsistence crop in the Southwest for more than 7000 years.


Once abundant, Gila trout are now listed as threatened. They are found in a few small headwater streams in Ecoregion 23, mostly in the Gila River basin. *Photo: USFWS*

24. Chihuahuan Deserts


Chihuahuan Desert vegetation can range from areas of very sparse scrub and shrublands, to dense shrublands, desert grasslands, and at higher elevations, some woodland. These are dynamic systems, influenced greatly by precipitation, soil erosion, fire frequency, and human land use. *Photo: Nathan Newcomer*

This desert ecoregion extends from the Madrean Archipelago (79) in southeast Arizona to the Edwards Plateau (30) in south-central Texas. It is the northern portion of the southernmost desert in North America that extends more than 500 miles south into Mexico. The physiography is generally a continuation of basin and range terrain that is typical of the Mojave Basin and Range (14) and the Central Basin and Range (13) ecoregions to the west and north, although the pattern of alternating mountains and valleys is not as pronounced as it is in Ecoregions 13 and 14. The mountain ranges (sky islands) are a geologic mix of Tertiary volcanic and intrusive granitic rocks, Paleozoic sedimentary layers, and some Precambrian granitic plutonic rocks. Outside the major river drainages, such as the Rio Grande and Pecos River, the landscape is largely internally drained. Vegetative cover is predominantly desert grassland and arid shrubland, except for high elevation islands of oak, juniper, and pinyon pine woodland. The extent of desert shrubland is increasing across lowlands and mountain foothills due to gradual desertification caused in part by historical grazing pressure.

24a The **Chihuahuan Basins and Playas** include alluvial fans, internally drained basins, and river valleys mostly below 4500 feet. The major Chihuahuan basins formed during Tertiary Basin and Range tectonism when the Earth's crust stretched and fault collapse resulted in sediment-filled basins. These low elevation areas are some of the hottest and most arid habitats in the state. The playas and basin floors have saline or alkaline soils and areas of salt flats, dunes, and windblown sand. The typical desert shrubs and grasses, the dominant creosotebush, along with tarbush, fourwing saltbush, acacias, gyp grama, and alkali sacaton, must withstand large seasonal and diurnal ranges in temperature, low available moisture, and a high evapotranspiration rate. Horse crippler and other cacti are common. Bitter Lake near Roswell is a biologically significant wetland area. It has a high diversity of dragonflies and damselflies, including the continent's largest and smallest dragonfly species.

24b The **Chihuahuan Desert Grasslands** occur in areas of fine-textured soils, such as silts and clays, that have a higher water retention capacity than coarse-textured, rocky soil. The grasslands occur in areas of somewhat higher annual precipitation (10 to 15 inches) than the Chihuahuan Basins and Playas (24a), such as elevated basins between mountain ranges, low mountain benches and plateau tops, and north-facing mountain slopes. Grasslands were once more widespread, but heavy grazing in the late 19th and early 20th centuries was unsustainable, and desert shrubs invaded where the grass cover became fragmented. In grassland areas with lower rainfall, areal coverage of grasses may be sparse, 10% or less. Some areas are now mostly shrubs as grasslands continue to decline due to erosion, drought, and climatic change. Typical grasses are black, blue, and sideoats grama, dropseeds, bush muhly, and tobosa, with scattered creosotebush, and prickly pear and cholla cacti.

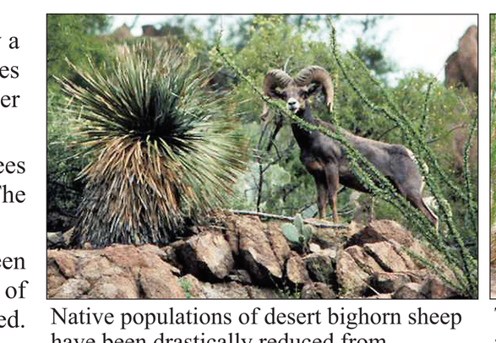
24c The **Low Mountains and Bajadas** include several disjunct hilly areas that have a mixed geology. The mountainous terrain has shallow soil, exposed bedrock, and coarse rocky substrates. Alluvial fans of rubble, sand, and gravel build at the base of the mountains and often coalesce to form bajadas. Vegetation includes mostly desert shrubs, such as sotol, lechuguilla, yucca, ocotillo, lotebush, tarbush, and pricklypear, with a sparse intervening cover of black grama and other grasses. At higher elevations, there may be scattered one-seeded juniper and pinyon pine. Strips of gray oak, velvet ash, and little walnut etch the patterns of intermittent and ephemeral drainages, and oaks may spread up north-facing slopes from the riparian zones. The varied habitats provide cover for mule deer, bobcat, javelina, and Montezuma quail.

24d The **Chihuahuan Montane Woodlands** ecoregion comprises the higher elevation mountainous areas, generally above 5000 or 6000 feet. These include the Chisos, Davis, Glass, and Apache mountains of Texas and the Organ, Florida, San Andres, and Oscura mountains of New Mexico. Increased precipitation in the mountains supports woodland areas except on sunny, exposed slopes that may have grass and chaparral only. Oaks, junipers, and pinyon pines predominate on all these mountain ranges. At lower elevations they occur in canyons and shaded hollows, and with increasing elevation and moisture levels, form more dense woodlands. Coniferous forests are limited in extent; some ponderosa pine, southwestern white pine, and relict Douglas-fir grow at the highest elevations in a few areas. In these higher ranges, trees sometimes grow with a grassy understory, or with a brush cover of bigtooth maple, madrone, little walnut, oak chaparral, and grapevines. The higher mountainous areas are a major refuge for larger ungulates, such as mule deer and desert bighorn sheep.

24f The Chihuahuan Desert portion of the **Rio Grande Floodplain** has some similarities to Ecoregion 22g upstream. Hydrology has been altered by upstream impoundments, by Elephant Butte and Caballo reservoirs, and by channelization in this region. Annual flooding of terraces and benches has been eliminated. Riparian woodlands and shrublands have been greatly reduced and invasive salt cedar has expanded. Narrow bands of cropland, orchards, vineyards, and small farms occur in portions of Ecoregion 24f. The southern Rio Grande valley in New Mexico is still an important wintering area for sandhill cranes, snow geese, and other migratory waterfowl. Urban land uses are spreading in the Las Cruces and El Paso areas. Drought, aquifer depletion, and agricultural irrigation create water supply concerns in Texas and Mexico.

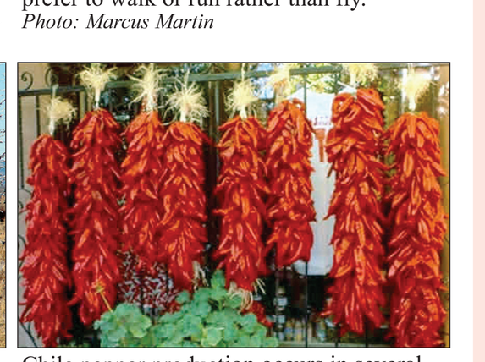
24g The **Gypsiferous Dunes** ecoregion is one of the largest dune fields in the United States, and is the world's largest expanse of gypsum sand dunes. The gypsum was dissolved in runoff mostly from the San Andres Mountains, carried into the Tularosa Basin, and then crystallized in playa lake deposits. Fine white grains of gypsum are blown by the winds to form a variety of dune types: dome-shaped, barchan, transverse, and parabolic. Several types of small animals have evolved a white coloration to help camouflage them in the dunes. In many areas, the dunes are mostly barren; interdune flats tend to be more vegetated. Soaptree yucca, sand verbena, mormon tea, skunkbush sumac, fourwing saltbush, gyp moonpod, gyp grama, alkali sacaton, sandhill muhly, hoary rosemary mint, and a few Rio Grande cottonwoods occur.

24h The **Lava Malpais** region includes three separate areas: the impressively long Carrizozo Lava flow in the northern part of the Tularosa Basin, an area of Quaternary lava in the Jornada del Muerto, and, in the south, the Aden-Afton basalt flow. The Carrizozo lava, one of the younger volcanic features in New Mexico, flowed from a small cinder cone or vent called Little Black Peak, located at the northern end. Pahoehoe lava texture, collapse pits, lava tubes, and other volcanic features are found here. Mixed shrubs and grasses occur on the lava, taking advantage of available moisture and warmer ground temperatures created by solar absorption. Similar to Ecoregion 22k, some species of rodents and reptiles found here have developed abnormally dark coloration, called melanism, for camouflage against the dark lava. Several species of bats occupy some of the intact lava tubes. The Jornada del Muerto field formed where a small central volcano produced multiple lava flows. The topography of the combined vent and surrounding lava flows forms a shield-type volcano profile. Large lava tubes occur south of the central vent. These tubes were mined for bat guano early in the century. Aden Crater on the Aden-Afton field is also a well-preserved small shield volcano.

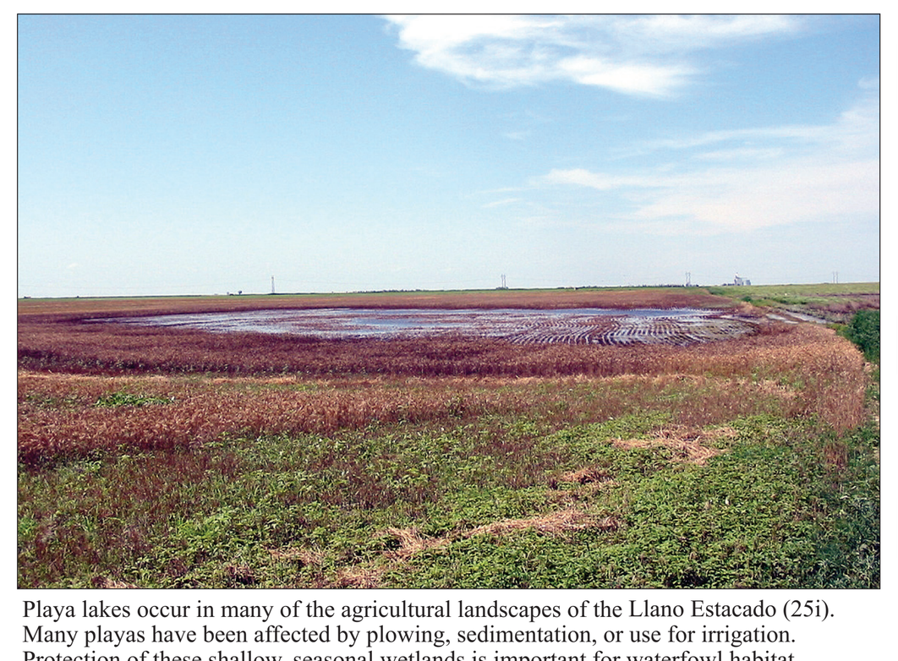

Native populations of desert bighorn sheep have been drastically reduced from historical levels. Captive breeding and reintroduction programs for the subspecies have established some individuals in southwest New Mexico. *Photo: Robert Shantz*


The state bird of New Mexico, roadrunners are well-adapted to desert environments. Their varied diet includes insects, spiders, lizards, snakes, fruits, and seeds. They often prefer to walk or run rather than fly. *Photo: Marcus Martin*


Bosque del Apache National Wildlife Refuge, south of Socorro, attracts one of the world's largest winter concentrations of sandhill cranes. *Photo: Dan Monaghan*


Chile pepper production occurs in several parts of the Chihuahuan Deserts ecoregion. New Mexico is the leading state in pungent chile production. *Photo: National Park Service*

25. High Plains


Playa lakes occur in many of the agricultural landscapes of the Llano Estacado (25i). Many playas have been affected by plowing, sedimentation, or use for irrigation. Protection of these shallow, seasonal wetlands is important for waterfowl habitat, recharge of the Ogallala Aquifer and, ultimately, the health of the High Plains economy. In some areas, about 85-90% of the aquifer's recharge is focused through the playa lakes. *Photo: NRCS*

Higher and drier than the Central Great Plains (27) to the east, and in contrast to the irregular, mostly grassland or grazing land of the Northwestern Great Plains (43) to the north, much of the High Plains is characterized by smooth to slightly irregular plains with a high percentage of cropland. Grama-buffalo grass is the potential natural vegetation in this region as compared to mostly wheatgrass-needlegrass to the north, Trans-Pecos shrub savanna to the south, and taller grasses to the east. The ecoregion includes the plains area of the Llano Estacado. Thousands of playa lakes (seasonal depressional wetlands) occur in this area, many serving as recharge areas for the important Ogallala Aquifer. These playa lakes are also essential for waterfowl during their yearly migration along the Central Flyway of North America. Oil and gas production occurs in parts of the region.

25b The **Rolling Sand Plains** expand northward from the lip of the Canadian River trough, and are composed of flat sandy plains, sand hills, depressions, and mostly stabilized dunes. Soils developed from mostly eolian sand and silt deposits. In northern Texas and New Mexico, the vegetative cover of the Rolling Sand Plains is transitional between the Shinnery Sands (25j) to the south and the sandsage prairies of Oklahoma, Colorado, and Kansas. Havard shin oak, the characteristic shrub cover of the Shinnery Sands, still grows in parts of Ecoregion 25b in Texas, but it is at the northern limit of its distribution. However, both Havard shin oak and sand sagebrush perform the same important function of stabilizing sandy areas subject to wind erosion. The sandsage association includes grasses such as big sandreed, little bluestem, sand dropseed, and sand bluestem. Other native range plants include sideoats grama, blue grama, buffalograss, switchgrass, yellow Indiangrass, and yucca. Lesser prairie-chickens use shin oak and sandsage prairie habitats, but are presently imperiled due to agricultural practices as well as intensive grazing. Land use in the New Mexico portion is primarily rangeland, although some areas have irrigated cropland using deep wells.

25c The **Moderate Relief Plains** ecoregion is composed of irregular, rolling to broken plains, transitional to Ecoregion 26. Slopes are greater than in the adjacent cropland-dominated flat and rolling plains of Ecoregion 25d in Colorado or Ecoregion 25e in Oklahoma and Texas. Land use is predominantly rangeland, in contrast to the cropland or mosaic of cropland and rangeland of surrounding High Plains (25) ecoregions. Soils formed primarily from loamy eolian sediments. In New Mexico, Ecoregion 25c occurs mostly on the Tertiary Ogallala Formation. Blue grama-buffalograss or blue grama-western wheatgrass was the natural prairie type, different from the sand sagebrush-mixed bluestem prairie of Ecoregion 25b. Soils have a mesic temperature regime, in contrast to the thermic soils to the south in Ecoregion 25.

25e The **Canadian/Cimarron High Plains** ecoregion includes the portion of the High Plains north of the Canadian River, primarily in the Texas and Oklahoma panhandles and in southeast Kansas, that has similarities to the Llano Estacado. Only a small portion of the region occurs in New Mexico. Winters are more severe than on the Llano Estacado (25i) to the south; the increased snow accumulation delays summer drought conditions because snowmelt saturates the ground in spring. Although the topography of Ecoregion 25e is just as flat as the Llano Estacado, this northern region has fewer playas and is more deeply dissected by stream channels. There is also more grazing land in Ecoregion 25e compared to 25i; the rougher terrain near the stream incisions tends to be grazed rather than tilled. In cultivated areas, corn, winter wheat, and grain sorghum are the principal crops. Many areas in the New Mexico portion that had cropland decades ago have now reverted to rangeland.

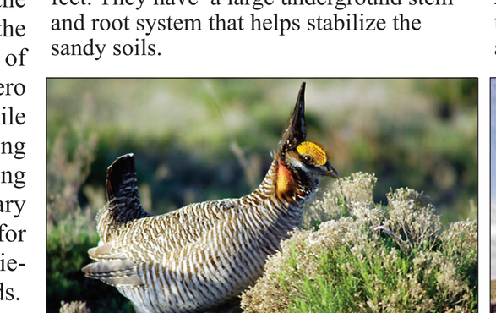
25i The **Llano Estacado** ecoregion, translated as the "Staked Plain", is a level, treeless, elevated plain surrounded by escarpments on three sides. Geologically, the Llano Estacado began as an apron of Miocene-Pliocene sediments (Ogallala Formation) eroded from the eastern Rocky Mountains. Several caliche horizons developed in the Ogallala sediments, including a hardened caprock caliche in the uppermost layer. The caprock was eventually covered by Pleistocene wind-borne sand and silt, the Blackwater Draw Formation. The smooth surface of the plain holds seasonal rainfall in numerous playas. The Llano Estacado was once covered with shortgrass prairie, composed of buffalograss, blue and sideoats grama, and little and silver bluestem. Bison were once prominent elements of a prairie ecosystem that no longer functions as an interdependent web of bison, black-tailed prairie dog, black-footed ferret, snake, ferruginous hawk, coyote, swift fox, deer, pronghorn, mountain lion, and gray wolf. About 80-90% of the Llano Estacado in Texas and New Mexico is presently tilled for agriculture, with more rangeland to the west. Farmers produce cotton, corn, and wheat under dryland agriculture or irrigated with water pumped from the Ogallala Aquifer. The capacity of the Ogallala Aquifer is limited, particularly under drought conditions. Withdrawals from the aquifer usually exceed recharge.

25j The **Shinnery Sands** ecoregion includes sand hills and dunes as well as flat sandy recharge areas. These sand beds lie at the western edge of the High Plains where rising winds drop heavier sand grains and carry finer material further east onto the flat expanse of the Llano Estacado (25i). The ecoregion is named for the Havard (shin) oak brush that stablizes sandy areas subject to wind erosion. Although the shin oak rarely grows higher than 4 feet, its extensive root system can reach over 50 feet through dune sand to reach water. The largest area of sand dunes, at the southwestern edge of the Llano Estacado (25i), is composed of sands blown out of the Pecos River Basin against the Mescalero Escarpment of the Llano Estacado by prevailing southwesterly winds. These dunes serve as a major recharge area for the Pecos River. While sandsage and prairie grasses may create a continuous plant cover in portions of Ecoregion 25j, the vegetative cover is vulnerable to overgrazing and subsequent wind blowouts which may begin a cycle of dune formation. In dune areas, anchoring shrubs such as Havard shin oak, fourwing saltbush, and yucca stabilize the dune sand for herbaceous grasses and forbs such as sand verbenas, sunflowers, fringed sagewort, and hoary rosemary-mint. Ephemeral ponds and swales between the dunes support rushes, sedges, and sandbar willow. The shinnery sands are habitat for the lesser prairie-chicken and sanddune lizard, two species that are in serious decline. The shrubs offer cover and shade for nesting prairie-chickens, and shin oak acorns are a staple food source. Parts of the sand plains and dune fields of Ecoregion 25j contain dense arrays of oil fields.

25k The **Arid Llano Estacado** ecoregion is drier than the main portion of the Llano Estacado (25i) to the north. Its climate is transitional to the arid Chihuahuan Desert region (24) to the southwest. Across the region in New Mexico and Texas, yearly precipitation is less than that of the Llano Estacado (25i); there is also less winter precipitation and an absence of snow cover to provide soil moisture. This can cause the caliche layer to be closer to the surface in Ecoregion 25k, increasing the general droughty condition of the soil and making tilled agriculture more difficult than in the Llano Estacado (25i). The arid conditions are reflected in the land use, which is dominated by livestock grazing. The shortgrass prairie of grama and buffalo grasses is susceptible to overgrazing, and a broken grass cover allows the invasion of shrubs such as mesquite and lotebush. Oil and gas production activities are widespread.


Shin oaks in the Shinnery Sands ecoregion (25j) are seldom taller than two or three feet. They have a large underground stem and root system that helps stabilize the sandy soils.


Sanddune lizards, a threatened species, are found in the Mescalero Sands of Ecoregion 25j. The decline of the lizard is a signal that the sand/shinnery oak ecosystem is being altered. *Photo: Don Sias*


Lesser prairie-chickens, a unique grouse of the High Plains, inhabit shinnery oak and sand sagebrush habitats. Their population has been greatly reduced due to rangeland alteration, drought, livestock grazing, and other land use practices. *Photo: Marcus Miller, NRCS*


Oil and gas production is common in the southern portion of Ecoregion 25 in New Mexico's Permian Basin. The state ranks 6th in in oil production and 2nd in gas production in the U.S. Increasing energy development can affect air, water, and habitat resources.

26. Southwestern Tablelands


The southwestern part of the Great Plains of the U.S. contains a diversity of landscapes and vegetation patterns. Dissected tablelands, canyons, and flat to rolling plains are found here. A few volcanic cones occur in the New Mexico portion. Shortgrass prairie covers the majority of the region in New Mexico, particularly in the flatter portions, with juniper and shrubs common on steeper terrain. Livestock grazing is a primary land use. *Photo: New Mexico State Parks*

The Southwestern Tablelands flank the High Plains (25) with red hued canyons, mesas, badlands, and dissected river breaks. Unlike most adjacent Great Plains ecological regions, little of the Southwestern Tablelands is in cropland. Much of this region is in sub-humid grassland and semiarid rangeland. The eastern boundary represents a transition from the more extensive cropland within the High Plains (25) to the generally more rugged and less arable land within the Southwestern Tablelands (26) ecoregion. The natural vegetation in this region is mostly grama-buffalograss, with some juniper-scrub oak-grass savanna on escarpment bluffs. Prairie fires were likely important in maintaining the grasslands and suppressing encroachment of shrub and woody species. Pronghorn antelope is the most common large native mammal of the region.

26d The **Semiarid Canadian Breaks** ecoregion is similar to the Canadian Breaks (26a) to the east in Texas with its deep valley trough and moderate-relief tablelands, but it is drier. This ecoregion also has large areas of Triassic mudstones and shales exposed, whereas Ecoregion 26a in Texas has a more homogeneous substrate of the Tertiary Ogallala Formation. The mudstones and shales create badlands that are not productive, and plant growth is sparse, increasing the look of aridity to the landscape. Some of the taller grasses and eastern riparian species found in the Canadian Breaks (26a) also tend to disappear towards the west in Ecoregion 26d as conditions become drier and the soils become less productive. The shrub and midgrass prairie vegetation includes one-seed juniper, sand sagebrush, skunkbush sumac, and yucca, along with sideoats grama, little bluestem, western wheatgrass, blue grama, buffalograss, galleta, and alkali sacaton.

26f The **Mesa de Maya/Black Mesa** ecoregion covers a small portion of southeast Colorado, northeast New Mexico, and northwest Oklahoma. It includes basalt-capped mesas as well as deep canyons, knobs, dissected plains, and breaks that have been cut into sandstone, shale, and limestone. In New Mexico, the valley of the Dry Cimarron River is a canyon of these exposed Triassic, Jurassic, and Cretaceous strata. As Black Mesa extends east into Oklahoma, it supports many end-of-range flora and fauna species. Great Plains vegetation intergrades with foothill flora of the Rocky Mountains. Mesa tops are covered with shortgrass prairie. Shrubs and small trees, mainly pinyon and oneseed juniper, occur in canyons and on north-facing slopes. The vegetation mosaic contrasts with the grassland of adjacent, less rugged plains.

26h Scattered, dissected areas with pinyon and juniper woodlands on the uplands characterize the **Pinyon-Juniper Woodlands and Savannas** ecoregion. Occurring in Colorado and New Mexico, the region is a continuation or an outlier of the pinyon-juniper woodlands found in Ecoregion 21d in the Southern Rockies (21). Soils tend to be thin, and for most of the region are formed in materials weathered from limestone, sandstone, and shale. Rock outcrops are common. In central New Mexico, much of the region is often associated with the Paleozoic Glorieta Sandstone and other limestone and shale rocks. In the north, the region includes a few hills and peaks of volcanic or mixed geology that have some small areas of montane coniferous forest. Annual precipitation in the New Mexico portion ranges from 12 to 16 inches, with the highest precipitation found in areas closest to the mountains. Land use is primarily wildlife habitat and rangeland.

26l The **Upper Canadian Plateau** is heterogeneous relative to relief, geologic substrates, and vegetation patterns. Parts of the region are influenced by proximity to mountainous regions, and there are other east to west differences within the region. The ecoregion contains mesic soils, higher elevations, and areas of greater relief compared to the thermic soils and lower elevations to the south in Ecoregion 26n. It is underlain mostly by Cretaceous sandstone and shale, with some Tertiary and Quaternary volcanic rocks. It includes parts of the Raton-Clayton and Ocate volcanic fields. Cover types include shortgrass prairie, some midgrass prairie, scattered juniper savanna, and juniper woodland on hills.

26m The **Canadian Canyons** ecoregion includes parts of the Canadian Escarpment, Canadian River Gorge, and associated canyons where coniferous and mixed woodland occurs and Jurassic rocks have been exposed by water and wind erosion. Its higher relief and different vegetation distinguishes it from surrounding ecoregions 26l, 26n, and 26d. Vegetation is dominated by pinyon pine, one-seed juniper, and some ponderosa pine at higher elevations. The Canadian River Gorge is one of the biggest and deepest canyons on the American Great Plains.

26n Broad, rolling plains, tablelands, and piedmonts characterize the **Conchas/Pecos Plains**, broken by drainages to the Pecos, Conchas, and a small portion of the Canadian rivers. The region has lower elevations and thermic soils compared to the higher elevations and mix of mesic and thermic soils of Ecoregion 26o to the west. Livestock grazing is the dominant land use. Soils formed in material primarily from Quaternary, Triassic, and Permian sediments. The natural vegetation of these plains included blue grama, galleta, sand dropseed, threeawns, ring muhly, broom snakeweed, cacti, yucca, and cholla. Some areas of sideoats grama and little bluestem, with blue grama, western wheatgrass, galleta, and buffalograss also occurred.

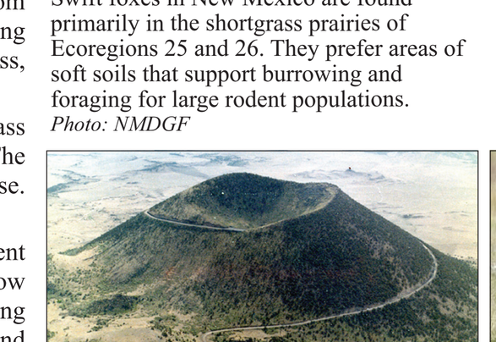
26o The **Central New Mexico Plains** are slightly drier than Ecoregion 26n to the east, with more shortgrass steppe and less midgrass prairie. It has generally higher elevations and more mesic soils than the somewhat lower elevations and thermic soils of 26n. The region is composed of mostly Permian rocks compared to the Triassic materials of Ecoregion 26n. Livestock grazing is the dominant land use. Pronghorn antelope are common as well as coyote and a variety of raptors.

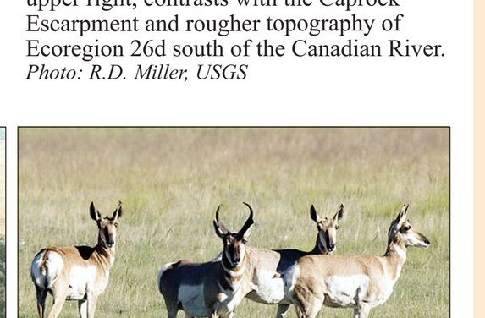
26p The **Pluvial Lake Basins** ecoregion includes the Estancia, Pinos Wells, and Encino lake basins near the center of the state. Permanent lakes occupied several large closed basins in New Mexico during the last ice age. Today, annual evaporation is greater than the inflow to the basins from rainfall, runoff, and groundwater discharge. Annual precipitation is only 12 to 13 inches. Natural vegetation includes fourwing saltbush and alkali sacaton. The region was an historical trade route for salt between Rio Grande pueblos and Plains tribes. Some agriculture and cropland occurs today in the Estancia basin, irrigated by groundwater.

26q The **Southern New Mexico Dissected Plains** is a transitional area between the shortgrass prairies of Ecoregion 26 and the Chihuahuan Desert grasslands of Ecoregion 24. It is also influenced by the proximity to the Sacramento Mountains of Ecoregion 23. Geology is mostly Paleozoic limestone, dolomite, shale, and sandstone. Rock outcrops are common. It is characterized by well-dissected topography with numerous draws and shallow canyons, and a rather sparse vegetative cover. Annual precipitation averages only 12 to 13 inches, lower than most of Ecoregion 26 to the north. The eastern portion has more Chihuahuan scrub, while to the west at higher elevations, some juniper savanna occurs. Native vegetation is short and mid grasses with some low desert shrubs. Grasses are mainly blue grama, black grama, hairy grama, sideoats grama, triden, or threeawn. Shrubs include juniper, lotebush, yucca, dalea, and a variety of acacias.


Swift foxes in New Mexico are found primarily in the shortgrass prairies of Ecoregions 25 and 26. They prefer areas of soft soils that support burrowing and foraging for large rodent populations. *Photo: NMDGF*


The flat terrain of the High Plains (25), upper right, contrasts with the Caprock Escarpment and rougher topography of Ecoregion 26d south of the Canadian River. *Photo: R.D. Miller, USGS*


The classic cinder cone of Capulin Mountain, along with several other low volcanic peaks and lava flows, add to the geological and physical diversity of Ecoregion 26l. *Photo: R.D. Miller, USGS*


Once nearly extinct, pronghorn now occur in several parts of New Mexico. They are most abundant on the rolling, wide-open terrain of shortgrass or midgrass prairies, typical of many parts of Ecoregion 26. *Photo: Robert Shantz*