## Ecoregions of Arizona

EPA/600/3-89/060, 152 p.

quantity of environmental resources; they are designed to serve as a spatial framework for the Service (NRCS), The Nature Conservancy, and several Arizona state agencies. The project is Hill, R., and Moran, B.C., 2006, Ecoregions of New Mexico (color poster with map, descriptive text, research, assessment, management, and monitoring of ecosystems and ecosystem components. associated with an interagency effort to develop a common national framework of ecological By recognizing the spatial differences in the capacities and potentials of ecosystems, ecoregions regions (McMahon and others, 2001). Reaching that objective requires recognition of the Griffith, G.E., Omernik, J.M., Smith, D.W., Cook, T.D., Tallyn, E., Moseley, K., and Johnson, C.B., 2014 stratify the environment by its probable response to disturbance (Bryce and others, 1999). differences in the conceptual approaches and mapping methodologies applied to develop the (in review), Ecoregions of California (poster): U.S. Geological Survey Open-File Report 2014–XXXX, These general purpose regions are critical for structuring and implementing ecosystem most common ecoregion-type frameworks, including those developed by the USDA-Forest management strategies across federal agencies, state agencies, and nongovernment Service (Bailey and others, 1994; Cleland and others, 2007), the USEPA (Omernik, 1987) organizations that are responsible for different types of resources within the same geographical 1995), and the NRCS (U.S. Department of Agriculture–Soil Conservation Service, 1981; U.S. areas (Omernik and others, 2000). The Arizona 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 (United States Environmental Protection Agency [USEPA] 2013; Omernik, 1987). The approach used to compile this map is based on the premise that ecological regions can be identified through the Literature Cited 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

II divides the continent into 50 regions (Commission for Environmental Cooperation, 1997, map revised 2006). At level III, the continental United States contains 105 ecoregions and the conterminous United States has 85 ecoregions (USEPA, 2013). Level IV is a further ecoregions are given in Omernik (1995, 2004), Omernik and others (2000), and Gallant and woodland- and shrubland-covered hills, lava fields and volcanic plateaus, forested mountains, glaciated peaks, and river alluvial floodplains. Ecological diversity is remarkably high. There

Vational Health and Environmental Effects Research Laboratory (Corvallis, Oregon),

2006; Griffith and others, 2006, 2014; and Woods and others, 2001).

Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and USEPA Region IX, U.S. Department of Agriculture (USDA)—Natural Resources Conservation Griffith, G.E., Omernik, J.M., McGraw, M.M., Jacobi, G.Z., Canavan, C.M., Schrader, T.S., Mercer, D., Department of Agriculture–Natural Resources Conservation Service, 2006). As each of these frameworks is further refined, their differences are becoming less discernible. Collaborative consistency in ecoregion frameworks for the entire nation.

Bailey, R.G., Avers, P.E., King, T., and McNab, W.H., eds., 1994, Ecoregions and subregions of the United States (map) (supplementary table of map unit descriptions compiled and edited by McNab, W.H. and Bailey, R.G.): Washington, D.C., USDA–Forest Service, scale 1:7,500,000. Bryce, S.A., Omernik, J.M., and Larsen, D.P., 1999, Ecoregions - a geographic framework to guide risk characterization and ecosystem management: Environmental Practice, v. 1, no. 3, p. 141-155. regions. Level I is the coarsest level, dividing North America into 15 ecological regions. Level Bryce, S.A., Woods, A.J., Morefield, J.D., Omernik, J.M., McKay, T.R., Brackley, G.K., Hall, R.K. Higgins, D.K., McMorran, D.C., Vargas, K.E., Petersen, E.B., Zamudio, D.C., and Comstock, J.A. , Ecoregions of Nevada (color poster with map, descriptive text, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,350,000) subdivision of level III ecoregions. Explanations of the methods used to define the USEPA's Chapman, S.S., Griffith, G.E., Omernik, J.M., Price, A.B., Freeouf, J., and Schrupp, D.L., 2006, Ecoregions of Colorado (color poster with map, descriptive text, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,200,000). Arizona contains arid deserts and canyonlands, semiarid shrub- and grass-covered plains, Cleland, D.T., Freeouf, J.A., Keys, J.E., Jr., Nowacki, G.J., Carpenter, C., and McNab, W.H., 2007, Ecological subregions – sections and subsections of the conterminous United States: Washington, D.C., U.S. Department of Agriculture–Forest Service, General Technical Report WO-76, scale 1:3,500,000. are 7 level III ecoregions and 52 level IV ecoregions in Arizona and many continue into Commission for Environmental Cooperation, 1997, Ecological regions of North America – toward a ecologically similar parts of adjacent states (Bryce and others, 2003; Chapman and others, common perspective: Montreal, Commission for Environmental Cooperation, 71 p., (map revised 2006). Gallant, A.L., Whittier, T.R., Larsen, D.P., Omernik, J.M., and Hughes, R.M., 1989, Regionalization as a This poster is a collaborative project between the U.S. Geological Survey (USGS), USEPA tool for managing environmental resources: Corvallis, Oregon, U.S. Environmental Protection Agency,

and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,400,000) McMahon, G., Gregonis, S.M., Waltman, S.W., Omernik, J.M., Thorson, T.D., Freeouf, J.A., Rorick, A.H., and Keys, J.E., 2001, Developing a spatial framework of common ecological regions for the conterminous United States: Environmental Management, v. 28, no. 3, p. 293-316. ecoregion projects, such as this one in Arizona, are a step toward attaining consensus and Omernik, J.M., 1987, Ecoregions of the conterminous United States (map supplement): Annals of the Association of American Geographers, v. 77, no. 1, p. 118-125, scale 1:7,500,000. Omernik, J.M., 1995, Ecoregions – a framework for environmental management, in Davis, W.S. and Simon, T.P., eds., Biological assessment and criteria-tools for water resource planning and decision making: Boca Raton, Florida, Lewis Publishers, p. 49-62. Omernik, J.M., 2004, Perspectives on the nature and definition of ecological regions: Environmental Management, v. 34, Supplement 1, p. s27-s38. Omernik, J.M., Chapman, S.S., Lillie, R.A., and Dumke, R.T., 2000, Ecoregions of Wisconsin: Transactions of the Wisconsin Academy of Sciences, Arts, and Letters, v. 88, p. 77-103 Department of Agriculture-Natural Resources Conservation Service, 2006, Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin: Washington, C., U.S. Government Printing Office, Agriculture Handbook 296, 669 p. + map. U.S. Department of Agriculture-Soil Conservation Service, 1981, Land resource regions and major land resource areas of the United States: Agriculture Handbook 296, 156 p. U.S. Environmental Protection Agency, 2013, Level III ecoregions of the continental United States (revision of Omernik, 1987): Corvallis, Oregon, USEPA – National Health and Environmental Effects Research Laboratory, Map M-1, various scales. Wiken, E., 1986, Terrestrial ecozones of Canada: Ottawa, Environment Canada, Ecological Land Classification Series no. 19, 26 p.

Woods, A.J., Lammers, D.A., Bryce, S.A., Omernik, J.M., Denton, R.L., Domeier, M., and Comstock,

Virginia, U.S. Geological Survey (map scale 1:1,175,000).

J.A., 2001, Ecoregions of Utah (color poster with map, descriptive text, and photographs): Reston,

oshua trees, Mojave yucca, and the controlled Colorado River of Lake Mead are emblematic of Arizona's Mojave Basin and Range. Joshua trees have their highest densities on well-drained sandy to gravelly alluvial fans adjacent to desert mountain ranges. Recent studies indicate that as the climate warms, Joshua tree populations will be

greatly reduced, especially in the southern parts of the plant's range. Photo: Phil Stoffer, USGS

Monument Valley, located north of Kayenta and straddling the Arizona-Utah border,

occurs mostly in ecoregions 20d Arid Canyonlands and 20h Sand Deserts. The iconic

sandstone buttes rise 500 to 1000 feet above the valley floor. Photo: E.D. McKee, USGS

14. Mojave Basin and Range Stretching across southeastern California, southern Nevada, southwestern Utah, and northwestern Arizona, Ecoregion 14 is composed of broad basins and scattered mountains that are generally lower, warmer, and drier than those of the Central Basin and Range (13). Its creosotebush-dominated shrub community is distinct from the saltbush-greasewood and sagebrush-grass communities that occur to the north in the Central Basin and Range (80); it also differs from the paloverde-cactus shrub and saguaro cactus that occur in the Sonoran Basin and Range (81) to the south. In the Mojave, creosotebush, white bursage, Joshua tree and other yuccas, and blackbrush are typical. On alkali flats, saltbush, saltgrass, alkali sacaton, and iodinebush are found. On mountains, sagebrush, juniper, and singleleaf pinyon occur. At high elevations, some ponderosa pine, white fir, limber pine, and bristlecone pine can be found. The basin soils are mostly Entisols and Aridisols that typically have a thermic temperature regime; they are warmer than those of Ecoregion 13 to the north. Heavy use of off-road vehicles and motorcycles in some areas has made the soils susceptible to wind- and water-erosion. Most of Ecoregion 14 is federally owned and grazing is constrained by the lack of water and forage for livestock. The creosotebush-dominated **Eastern Mojave Basins** ecoregion includes the valleys lying between the scattered mountain ranges of riparian zones along the few perennial streams have willow, mountain brush, black cottonwood, and Gambel oak that provide rare habitat for

igher than in the Central Basin and Range (13) to the north. Limestone- and gypsum-influenced soils occur, but precipitation amount has a guminous species, such as mesquite, acacia, and smoke tree, become more common. Creosotebush, white bursage, and galleta grass are benches. Vegetation is a sparse, but diverse, shrub cover that includes creosotebush, white brittlebush, white vpical in Ecoregion 14a. Pocket mice, kangaroo rats, and desert tortoise are faunal indicators of the desert environment. Desert willow, coyote desert elements, such as ocotillo. Along the rivers, exotic tamarisk is replacing native riparian vegetation such as Fremont cottonwood and fillow, and mesquite grow in riparian areas, although the exotic tamarisk is rapidly replacing native desert riparian vegetation. mountains that rise above the basin floors of the Mojave Desert to elevations of nearly 5500 feet in Arizona. Areas of sparsely ted soils can be susceptible to erosion during storm events. described and Ecology of this ecoregion.

The Mojave Playas are generally smaller than the Lahontan and Tonopah Playas (13h), and are not part of the broad Pleistocene pluvial basins found in the Central Basin and Basins fo The Eastern Mojave Low Ranges and Arid Footslopes ecoregion is composed of alluvial fans, basalt flows, hills, and low

ards. Desert bighorn sheep may also be present on some remote rocky outcrops. from about 5000 to over 7000 feet, where mean annual precipitation increases to between 10 and 16 inches per year. Vegetation includes precipitation is 8 to 12 inches. Similar to Ecoregion 22w, extreme relief, rough topography, and a variety of exposed rock layers characterize pinyon, Utah juniper, Rocky Mountain juniper, curl-leaf mountain-mahogany, and cliffrose. In many areas, a denser and more diverse mixture the region. The soil temperature regime is Desert tortoises in Arizona occur in ecoregions Off-road vehicle use in lowlands and bajadas of large interior chaparral shrubs occurs, including oaks, ceanothus, silktassel, and Apache plume. A sagebrush zone is largely absent, although typic aridic. Although large areas are bare rock, the desert scrub contains creosotebush and white bursage, as well as some more frost-sensitive typic aridic. Although large areas are bare rock, the desert scrub contains creosotebush and white bursage, as well as some more frost-sensitive. to the north in Nevada, some Wyoming big sagebrush may be found, along with blackbrush, in the understory of the woodland. The species such as brittlebush and ocotillo. Mesquite, willows, exotic tamarisk, catclaw acacia, and arrowweed are typical in riparian zones.

the Mojave Desert at elevations ranging from 1800 to 4500 feet. Elevations are lower, soils are warmer, and evapotranspiration is bird life in the desert. In Arizona, the ecoregion includes the Cerbat Mountains, which contain some ponderosa pine at higher elevations. higher than in the Central Basin and Range (13) to the north. Limestone- and gypsum-influenced soils occur, but precipitation amount nas a greater ecological significance than geology. Toward the south and east, as summer rainfall increases, the Sonoran influence grows, and woody

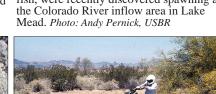
The Arid Valleys and Canyonlands ecoregion includes steep canyons and benchlands below 2000 reet elevation near the Colorado
River. It is one of the hotter and drier parts of the Mojave. Rocky colluvial soils cover eroded slopes and deeper soils occur on fish, were recently discovered. willow. The presence of the Colorado River, Lake Mead, and Lake Mohave greatly influences the management and ecology of this ecoregion.

pluvial basins found in the Central Basin and Range (13) to the north in Nevada. The high salt- and clay-content of playa surface getated soils can be susceptible to erosion during storm events, depending on slope, soil type, and grazing history. In areas transitional to the mud, and the hot, dry conditions inhibit plant growth. Ecoregion 14f is largely barren and only sparse saltbush vegetation is typically found on reat Basin in the north, blackbrush dominates slopes just above the upper elevational limit for creosotebush. Elsewhere, a mixture of typical the margins. Where moisture is sufficient, cold-intolerant trees and woody legumes such as velvet ash and mesquite occur, particularly in the ojave Desert forbs, shrubs, and succulent species occurs, including Joshua tree, other yucca species, and cacti on rocky, well-drained sites. southern Mojave. Playas are dynamic environments with surface channels, playa margins, alluvial materials, and biota changing with each oregion 14b has a diverse array of reptiles including iguanas, chuckwallas, and desert tortoise, as well as leopard, collared, horned, and spiny flooding event. In Arizona, Ecoregion 14f covers Red Lake in the Hualapai Valley. The Lower Grand Canyon ecoregion is lower and warmer than the upstream Grand Canyon (22w) with larger areas having Mojave The Eastern Mojave Mountain Woodland and Shrubland ecoregion occurs in California, Nevada, Utah, and Arizona at elevations

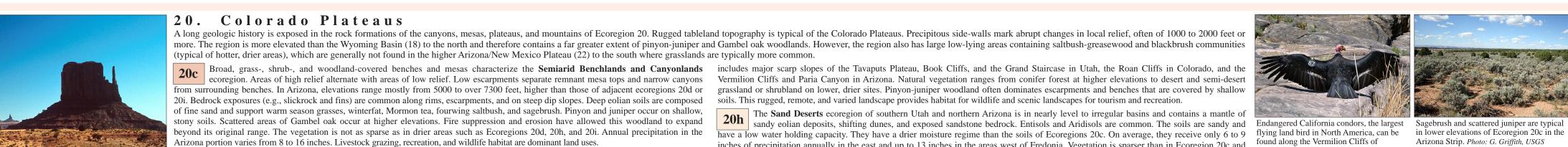
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The Eastern Mojave Mountain Woodland and Shrubland ecoregion occurs in California, Nevada, Utah, and Arizona at elevations







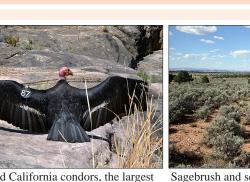


egime than those of Ecoregions 20c. Exposed bedrock is common. Blackbrush, shadscale, some sand sagebrush, and drought-tolerant grasses including galleta grass and Indian ricegrass occur. Blackbrush is more common here than in Ecoregion 20c where pinyon-juniper woodland and about 200 to 400 feet of relief, in contrast to the higher relief and more wooded adjacent ecoregions (20c, 20e). Elevations range from 3800 to agebrush dominate. Annual precipitation in the Arizona portion is 5 to 8 inches. Land use is mostly related to tourism and recreation, wildlife 5200 feet and precipitation averages 9 to 13 inches. The soil temperature regime is mesic and the soil moisture regime is typic aridic. Eolian 20d forms Lake Powell, the second largest abitat, and some livestock grazing. The **Escarpments** ecoregion is characterized by extensive, deeply-dissected, cliff-bench complexes that descend dramatically from needlegrass, bottlebrush squirreltail, Indian ricegrass, black grama, blue grama, sideoats grama, gyp dropseed, and galleta.

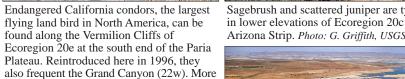
Ecoregion 20c or in Utah from the Wasatch Mountains of Ecoregion 19. Local relief can be as great as 3000 feet. Ecoregion 20e

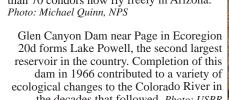
inches of precipitation annually in the east and up to 13 inches in the areas west of Fredonia. Vegetation is sparser than in Ecoregion 20c and found along the Vermilion Cliffs of Economic 20 Occurring primarily in Utah, the Arid Canyonlands ecoregion includes the inner gorge of the Colorado River and its major stock carrying capacity is limited. Shifting sand is mostly devoid of vegetation while soils on stable sand-blankets support drought-tolerant tributaries, such as the San Juan River. Much of this ecoregion is bounded by nearly vertical canyon walls that separate it from the plants including Indian ricegrass, sand dropseed, yucca, and blackbrush. jacent, higher benchlands of Ecoregion 20c. The Arizona portion lacks the relief of most of the region in Utah. Soils have a drier moisture

The Cold Desert Sagebrush-Grasslands ecoregion occurs in northwest Arizona on relatively flat to rolling plateau and valley than 70 condors now fly freely in Arizona. surfaces. Sandstones and mudstones of Triassic and Jurassic age are the dominant geology. The mostly shrub-covered region has only deposits occur and some soils are gypsiferous. Vegetation includes winterfat, fourwing saltbush, sand sagebrush, buckwheat species,



mostly in valleys and on bajadas. *Photo: NPS* amphibian, and mammal species. *Photo: BLM* 









of the Little Colorado, seen here in a dry period, is caused by dissolved travertine and

temperatures, causing downstream ecological effects. Photo: Mark Lellouch, NPS



Grass and shrublands of Ecoregion 22o south of Holbrook have been influenced by the historical residence of the Navajo and Hopi, the arrival of Mormon pioneers in the 1870's, large-scale cattle ranching beginning in the 1880's, and continued livestock

grazing throughout the past century. Photo: G. Griffith, USGS

22. Arizona/New Mexico Plateau he 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, the semiarid grassland

easels, badgers, and a variety of snakes. well as the upper elevations of the Shivwits Plateau to the southeast. Elevations range from 4000 to just over 8000 feet. The elements are part of the different geochemistry in this area, affecting springs and wells. Many water wells contain elevated levels of arsenic. podland of the Virgin Mountains has interior chaparral species interspersed with singleleaf pinyon and Utah juniper. On the lower slopes of the Virgin Mountains, juniper mixes with Joshua tree and Mojave yucca; here, woodland starts at a lower elevation than in the Mojave Basin and Range (14). Mountain brush grows on upland slopes above the woodland. Isolated pockets of Rocky Mountain white fir and Douglas-fir north. Elevations range from 5000 to 6400 feet, and annual precipitation is 7 to 10 inches. Typical vegetation includes Indian ricegrass, sand so occur, small outliers of a higher montane zone not mapped at this scale. On the Shivwits Plateau, pinyon, juniper, big sagebrush, cliffrose, dropseed, galleta, needleandthread, fourwing saltbush, broom snakeweed, and Mormon tea. ormon tea, and various grasses occur. A few cool upper drainages have some ponderosa pine, but there is less pine than in Ecoregion 22y. 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 range from 4800 to 6300 feet and annual precipitation is 7 to 10 inches. Galleta grass, Indian ricegrass, spike dropseed, winterfat, and sand transmitted from domestic sheep have ramas are typical. It is more arid, has lower elevations, and less pinyon-juniper than Ecoregion 22j to the south. Gently dipping Tertiary and dropseed occur. Many areas that once supported grasslands are now dominated by snakeweed, soapweed yucca, and Mormon tea. etaceous sedimentary rocks are typical, although Jurassic and Triassic sandstones occur in the Arizona portion that includes Redrock Valley nd some small mesas and valleys that drain to the San Juan River in New Mexico. The region is mostly Navajo tribal land. Land uses include 22v ome low-density livestock grazing of cattle, sheep, goats, and horses. In New Mexico, some irrigated agriculture occurs near the San Juan

iver, and oil and gas production is active in the northern part of the region. The Semiarid Tablelands ecoregion consists of mesas, plateaus, valleys, and canyons formed mostly from flat to gently dip sedimentary rocks, along with some areas of Tertiary and Quaternary volcanic fields. Bedrock exposures are common. Grass, shrubs, limestone in the water. After rains, it is often brown with sediments. On the Colorado River, and woodlands cover the tablelands. Elevations in the Arizona portion range from about 5000 to just over 7500 feet. The vegetation is not as upstream dams, especially the Glen Canyon Dam, have altered sediment transport and river sparse as in Ecoregion 22i to the north or 22m to the east in New Mexico. It has more grassland and less sagebrush than Ecoregion 22q to the north and northwest. The ecoregion lacks the denser woodlands and forests of the higher-elevation, more mountainous Ecoregion 23. Scattered junipers occur on shallow, stony soils, and are dense in some areas. Pinyon-juniper woodland is also common, especially in New Mexico. Alkali sacaton, shadscale, fourwing saltbush, with inclusions of mixed gramas, Indian ricegrass, and galleta also occur.

> the lower elevation Ecoregion 22p. Vegetation here typically includes shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, tea, Utah agave, yuccas, winterfat, Indian ricegrass, dropseed, and needlegrass. Seeps and springs often contain rare plants. galleta, and blue and black gramas. The Little Colorado Valley/Painted Desert ecoregion is lower, drier, and warmer than surrounding regions and has more desert scrub. Elevations are typically below 5000 feet, ranging from 4200 to 5700 feet. Precipitation is only 5 to 9 inches annually. Some annually. This is less precipitation than in many parts of Ecoregion 22aa to the south, and there is less summer moisture. Vegetation is sodic and saline soils occur or have gypsic horizons. A mix of shale badlands, greasewood flats, sand shrubland, and semi-desert grassland predominantly Utah and one-seed junipers, big sagebrush, Indian ricegrass, needleandthread, galleta, and snakeweed. Land uses include occurs in the region. Vegetation includes mound saltbush, fourwing saltbush, shadscale, Mormon tea, yucca, alkali sacaton, galleta, black livestock grazing, wildlife habitat, and woodland for fuelwood, hunting, and recreation. ama, Indian ricegrass, and gyp dropseed. A long history of overgrazing has resulted in extensive rangeland deterioration.

composed of volcanic basalt, while the Aubrey Cliffs areas to the south are composed of sandstone, limestone, and conglomerate. In addition to ackbrush, Indian ricegrass, needleandthread, western wheatgrass, galleta, black grama, and sand dropseed. Land uses include ponderosa pine, vegetation includes pinyon pine, Utah juniper, Gambel oak, big sagebrush, galleta, Mormon tea, blue grama, and Indian ricegrass. restock grazing, firewood and woodlot uses, subsistence hunting and gathering, and wildlife habitat. Coal mining occurs on Black Mesa. The Mesa Highlands ecoregion includes the highest elevations of Balakai, Black, Skeleton, and Zinez mesas, ranging from 6800 to

rose, Mormon tea, muttongrass, prairie junegrass, squirreltail, western wheatgrass, and blue grama also occur. The **Hopi Buttes** ecoregion is an area of volcanic geology in contrast to the surrounding sedimentary layers of adjacent ecoregions. The area of erosion-resistant remnants of volcanoes has elevations ranging from 5800 to 6828 feet. It is one of few volcanic fields in Although there are similarities to Ecoregion 22x to the north, this region has less sagebrush except in the more northern portions. Vegetation the world where a suite of maar crater deposits, tephra aprons, and underlying breccia-filled volcanic pipes are exposed. Vegetation includes the world where a suite of maar crater deposits, tephra aprons, and underlying breccia-filled volcanic pipes are exposed. Vegetation includes the world where a suite of maar crater deposits, tephra aprons, and underlying breccia-filled volcanic pipes are exposed. Vegetation includes the world where a suite of maar crater deposits, tephra aprons, and underlying breccia-filled volcanic pipes are exposed. Vegetation includes the world where a suite of maar crater deposits, tephra aprons, and underlying breccia-filled volcanic pipes are exposed. Vegetation includes the world where a suite of maar crater deposits, tephra aprons, and underlying breccia-filled volcanic pipes are exposed. Vegetation includes the world where a suite of maar crater deposits, tephra aprons, and underlying breccia-filled volcanic pipes are exposed. Vegetation includes the world where a suite of maar crater deposits, tephra aprons, and underlying breccia-filled volcanic pipes are exposed. Vegetation includes the world where a suite of maar crater deposits, tephra aprons, and underlying breccia-filled volcanic pipes are exposed. Vegetation includes the world where a suite of maar crater deposits, tephra aprons, and underlying breccia-filled volcanic pipes are exposed.

f the Southwestern Tablelands (26) to the east, and the 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 egion extends across northern Arizona, northwestern New Mexico, and into the San Luis Valley of Colorado. Gunnison prairie dogs are a keystone species in many of the sagebrush ecosystems and their burrows provide habitat for other wildlife including burrowing owls, The Virgin/Shivwits Woodland ecoregion covers the mid- to upper-elevations of the Virgin Mountains in Nevada and Arizona, as contained within Navajo and Hopi tribal land, with livestock grazing and wildlife habitat as principal land uses. Uranium and other trace The Chinle Valley and Mesas ecoregion is lower in elevation, warmer, with less precipitation and less woodland than adjacent

Ecoregion 22q. It is higher in elevation, slightly cooler, with more grassland than the desert scrub of ecoregions 20d and 20h to the The Kaibito/Moenkopi Sandy Plateaus are distinguished by their abundance of eolian materials and sand shrubland vegetation communities. Sand and silt blown out of the Little Colorado River Valley is deposited on these plateau surfaces to the east. Elevations development, agriculture, and diseases The Marble Platform ecoregion includes the limestone-capped plateau surface surrounding Marble Canyon as well as House Rock Valley to the west. Elevations range from about 3200 feet near Navajo Bridge in the north to just over 6500 feet on the summit of Shinumo Altar. Desert scrub is typical in the lower northern portions, with some desert grasslands in the higher elevations to the south and

west. Livestock grazing has decreased from historical high levels, although cattle and bison herds still occur. Seeps and springs emerge from

The scenic Grand Canyon is distinguished by its extreme relief, rough topography, and range of vegetation types. The exposed rocks from the canyon bottom to the top rims represent nearly 2 billion years of geologic history. Shales tend to erode to slopes, while der sandstones and limestones form cliffs. At the canyon bottom, the older and harder metamorphic basement rocks produce a steep-walled, narrow, inner gorge. Elevations of the spectacular erosional landscape range from 2000 feet along the river in the west to 8000 feet at the North Rim. Strong aspect and elevation differences contribute to vegetation ranging from riparian to desert scrub to woodland. Along the river, willows, mesquite, catclaw acacia, and exotic tamarisk occur. Various desert scrub communities occur with species typical of Mojave, Sonoran, Lower in elevation and warmer than Ecoregion 22j, the Northeast Arizona Shrub-Grasslands occur in the Little Colorado Basin at all levations mostly 4800 to 6200 feet. It has eligibly more precipitation (7 to 12 inches), colorado River, species more characteristic of Great Basin deserts predominate, such as big elevations mostly 4800 to 6200 feet. It has slightly more precipitation (7 to 12 inches), cooler temperatures, and more grassland than sagebrush, blackbrush, and rubber rabbitbrush. At higher elevations, pinyon-juniper woodland occurs with big sagebrush, snakeweed, Mormon The Arizona Strip Plateaus contain woodland and shrubland to the north of the Grand Canyon (Ecoregions 14p, 22w). Elevations resource characteristics in Arizona. range mostly from 4000 to 6500 feet, with a high point over 7100 feet on Craigs Knoll. Precipitation averages 11 to 14 inches Photo: Gary Stolz, USFWS

The Uinkaret/Aubrey Montane Conifer Forest ecoregion consists of three areas north and south of the Grand Canyon that have The **Dinétah Tablelands** ecoregion consists of plateaus, valleys, and deep canyons on Navajo and Hopi tribal land. The region is 22y higher elevations than surrounding ecoregions and an abundance of ponderosa pine woodland. Elevations are mostly over 6500 feet lower and warmer than the Mesa Highlands (22r). Cretaceous, Jurassic, and Triassic sedimentary rocks occur. Annual precipitation with Mt. Trumbull the high point at 8028 feet. Annual precipitation is 13 to 18 inches. The Uinkaret Mountains in the north have bedrock geology

The Chino/Coconino Grasslands and Shrub-Steppe ecoregion has relatively low relief compared to adjacent ecoregions, occurring in valleys, flats, and the lower portions of plateaus. It has lower precipitation, somewhat warmer temperatures, and mostly lacks the 8210 feet. The temperatures are cooler and the annual precipitation is greater than in the lower-elevation Dinétah Tablelands (22q). woodland of the adjacent higher plateaus and mountains. Various mixtures of semi-desert grasslands, semi-desert shrub-steppe, and sagebrush the ponderosa pine occurs here but is mostly lacking from the surrounding tablelands of Ecoregion 22q. Pinyon, juniper, big sagebrush, shrublands occur here. Elevations range from 4200 to 6300 feet. Ranching and livestock grazing are predominant land uses. The **Hualapai/Coconino Woodlands** ecoregion occurs south of the Grand Canyon on the higher relief portions of Crater Volcanics (23k). The 3-story structure Ecoregion 22. They are a crucial part of the Hualapai and Coconino plateaus. Elevations are mostly 4200 to 6700 feet, with annual precipitation ranging from 11 to 23 inches. contained 100 rooms, and a large population sagebrush ecosystems, and their burrowing

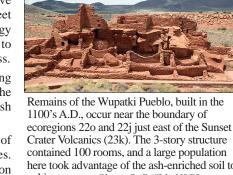


ledges, and side canyons in the Grand pipes scattered across the Grand Canyon Canyon (22w). Bighorn sheep once ranged area. The Kanab North mine and other proposed mines have raised concerns that mining would increase uranium and other trace elements in local and regional aquifer reatly reduced their population. and the Colorado River, as well as have

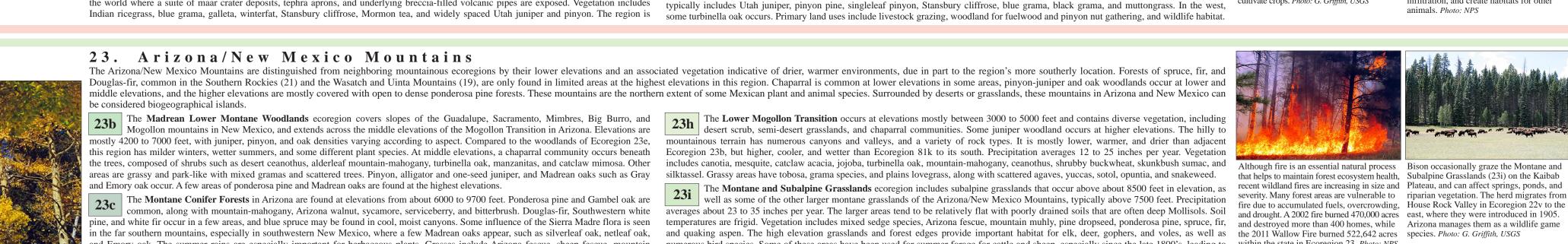


Havasu Creek area in Ecoregion 22w





Remains of the Wupatki Pueblo, built in the Gunnison's prairie dogs are found in the grass- and shrublands of the Four Corners ecoregions 220 and 22j just east of the Sunset area of the U.S., especially in parts of infiltration, and create habitats for other animals. *Photo: NPS* 



nuhly, muttongrass, junegrass, and pine dropseed. Precipitation can range from 14 inches in the drier areas to as high as 39 inches on the erosion and changes in grass and forb communities. Exotic grasses such as Kentucky bluegrass have become more common. The Northern Woodlands and Sagebrush ecoregion occurs at the lower elevations of the Kaibab Plateau and, to the east, surrounds egion's plateaus, valleys, and deep canyons are geologically diverse with volcanic, sedimentary, and some intrusive and crystalline rocks. The Arizona/New Mexico Subalpine Forests occur west of the Rio Grande at higher elevations, generally above 9000 feet. The region includes parts of the Mogollon Mountains, Black Range, San Mateo Mountains, Magdalena Mountains, and Mount Taylor in community. The climate also differs from Ecoregion 23e in that the majority of precipitation here occurs in the low-sun, cold season. elevation in Arizona at 12,633 feet. The large volcanic mountain complex also includes
Agassiz Peak and Fremont Peak, together often called the San Francisco Peaks. Several

The Sunset Crater Volcanics ecoregion includes volcanic cones, lava flows, and cinder and ash deposits, and is distinguished from 12,600 feet in the Humphreys Peak alpine zone. Although there are some vegetation differences from mountain range within Native American tribes, including the Navajo, Hopi, Havasupai, and Zuni, have given

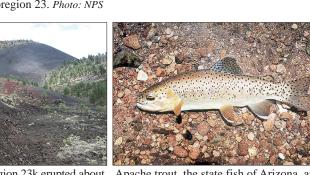
Ecoregion 23d, the major forest trees include Engelmann spruce, corkbark fir, blue spruce, white fir, and aspen. Some Douglas-fir occurs at volcanic features extend to the east and north into Ecoregion 22, this region encompasses only the forested or wooded portions of an area that lower elevations. Cryic soil temperatures occur here, and are colder than the soils in adjacent 23c. occur here, from the pinyon-juniper woodlands at the base to higher elevation zones with higher elevations. It often intermingles with grasslands and shrublands. Although elevations are higher than adjacent Ecoregion 22 higher elevations. It often intermingles with grasslands and shrublands. Although elevations are higher than adjacent Ecoregion 22 higher elevations. It often intermingles with grasslands and shrublands. Although elevations are higher than adjacent Ecoregion 22 higher elevations. It often intermingles with grasslands and shrublands. Although elevations are higher than adjacent Ecoregion 22 higher elevations. It often intermingles with grasslands and shrublands. Although elevations are higher than adjacent Ecoregion 22 higher elevations are higher than adjacent Ecoregion 23 higher elevations are higher than adjacent Ecoregion 25 higher elevations are higher have been declining over the past two decades for several reasons, including drought and have been declining over the past two decades for several reasons, including drought and to Ecoregion 23b. It lacks the milder winters, wetter summers, chaparral, Madrean oaks, and other species of Ecoregion 23b. It lacks the milder winters, wetter summers, chaparral, Madrean oaks, and other species of Ecoregion 23b. It lacks the milder winters wetter summers, chaparral, Madrean oaks, and other species of Ecoregion 23b. It lacks the milder winters wetter summers, chaparral, Madrean oaks, and other species of Ecoregion 23b. It lacks the milder winters wetter summers, chaparral, Madrean oaks, and other species of Ecoregion 23b. It lacks the milder winters wetter summers, chaparral, Madrean oaks, and other species of Ecoregion 23b. It lacks the milder winters wetter summers, chaparral, Madrean oaks, and other species of Ecoregion 23b. It lacks the milder winters wetter summers with the species of Ecoregion 23b. It lacks the milder winters wetter summers with the species of Ecoregion 23b. It lacks the milder winters wetter summers with the species of Ecoregion 23b. It lacks the milder winters wetter summers with the species of Ecoregion 23b. It lacks the milder winters with the species of Ecoregion 23b. It lacks the milder winters with the species of Ecoregion 23b. It lacks the milder winters with the species of Ecoregion 23b. It lacks the milder winters with the species of Ecoregion 23b. It lacks the milder winters with the species of Ecoregion 23b. It lacks the milder winters with the species of Ecoregion 23b. It lacks the milder winters with the species of Ecoregion 23b. It lacks the milder winters with the species of Ecoregion 23b. It lacks the milder winters with the species of Ecoregion 23b. It lacks the milder winters with the species of Ecoregion 23b. It lacks the milder winters with the species of Ecoregion 23b. It lacks the milder winters with the species of Ecoregion 23b. It lacks the milder winters with the species warmer temperatures, chronic browsing by deer and elk, insect and pathogen damage, mostly 5000 to 8400 feet and precipitation averages 13 to 25 inches per year. Sedimentary substrates predominate with a few areas of volcanic southern mountains have a Sierra Madre flora influence, with evergreen oaks such as silverleaf oak, netleaf oak, netle

sideoats grama, blue grama, black grama, galleta, bottlebrush squirreltail, and muttongrass. It lacks the sagebrush of Ecoregion 23j to the north.

The Montane and Subalpine Grasslands ecoregion includes subalpine grasslands that occur above about 8500 feet in elevation, as recent wildland fires are increasing in size and Plateau, and can affect springs, ponds, and and Emory oak. The summer rains are especially important for herbaceous plants. Grasses include Arizona fescue, sheep fescue, mountain numerous bird species. Some of these areas have been used for summer forage for cattle and sheep, especially since the late 1800's, leading to within the state in Ecoregion 23. Photo: NPS

the Defiance Plateau and the Chuska and Carrizo mountains. Juniper and pinyon pine dominate the woodland similar to Ecoregion was affected by the most recent eruptions about 900 to 1000 years ago. This is the youngest part of the San Francisco Volcanic Field, a field with The Conifer Woodlands and Savannas ecoregion is an area of mostly pinyon-juniper woodlands, with some ponderosa pine at a 6 million year history and an area that extends west to near Williams. The San Francisco Volcanic Field contains more than 600 volcanic vents.

Although fire is an essential natural process Bison occasionally graze the Montane and severity. Many forest areas are vulnerable to riparian vegetation. The herd migrates from fire due to accumulated fuels, overcrowding. House Rock Valley in Ecoregion 22v to the



rocks. Vegetation includes one-seed juniper, pinyon pine, Stansbury cliffrose, Apache plume, fourwing saltbush, Mormon tea, needleandthread, are generally less productive for commercial timber than the forests of Ecoregion 23c because of competition with dense understory brush and special endemic species such as the Sunset the range of this threatened species.



the mountain peaks different names. They consider these peaks sacred and object to

certain developments on the mountain. Several distinct life-zones or biotic communitie

24. Chihuahuan Deserts

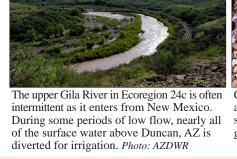
his desert ecoregion extends from the Madrean Archipelago (79) in southeast Arizona to the Edwards Plateau (30) in south-central Texas. It is the northern portion of the southernmost desert in North America that extends more than 500 miles south into Mexico. It is generally a ntinuation of basin and range terrain that is typical of the Mojave Basin and Range (14) and Sonoran Basin and Range (81) ecoregions to the west, although the pattern of alternating mountains and valleys is not as pronounced. The mountain ranges are a geologic mix of Tertiary olcanic and granitic rocks; Paleozoic sedimentary rocks such as sandstone, siltstone, and limestone; and some Precambrian granitic rocks. Outside of the major river drainages, such as the Rio Grande and Pecos River in New Mexico and Texas, the landscape is largely internally rained. 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

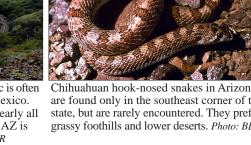
In contrast to the woodlands of Ecoregion 79b at lower elevations, above about 6500 feet are the **Madrean Pine-Oak and Mixed** diminished ability to move between the nearby mountain ranges. Ranching and livestock grazing remain a dominant land use.

Sonoran basins further west in Ecoregion 811. Desert shrubs and grasses here include the dominant creosotebush, along with tarbush, fourwing zones. The varied habitats provide cover for mule deer, bobcat, collared peccary, and Montezuma quail. shrublands to desert grasslands, and at higher elevations, some woodland. *Photo: BLM* saltbush, acacias, black grama, alkali sacaton, and a few low cacti such as pricklypear.

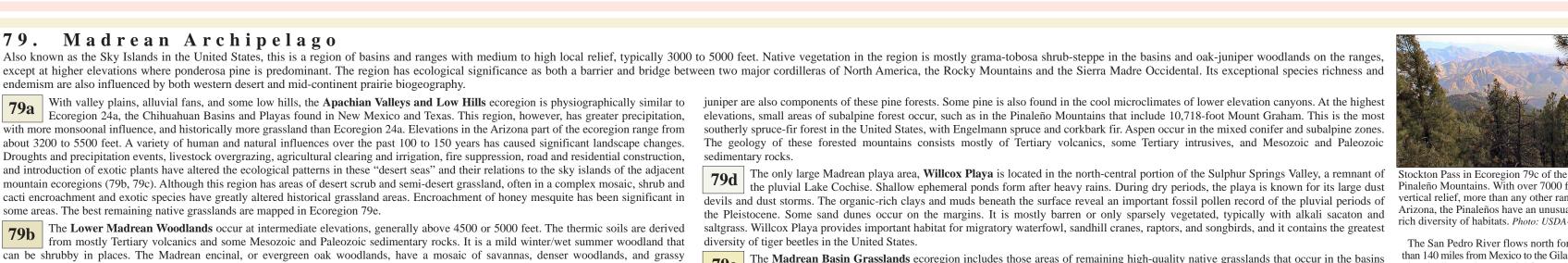
from mostly Tertiary volcanics and some Mesozoic and Paleozoic sedimentary rocks. It is a mild winter/wet summer woodland that diversity of tiger beetles in the United States.

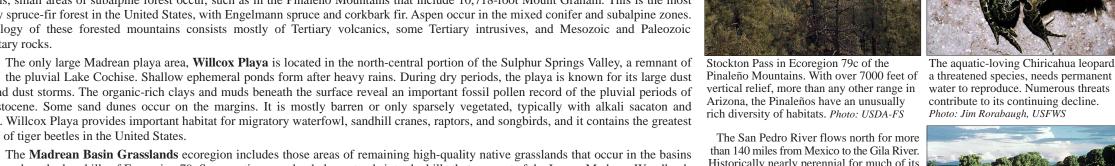
Found mostly in New Mexico and Texas, the Chihuahuan Basins and Playas include alluvial fans, internally drained basins, and river valleys that are mostly below 4500 feet. The major Chihuahuan basins formed during the Tertiary Basin and Range tectonism, when the Earth's crust stretched and fault collapse resulted in sediment-filled basins. These low elevation areas are hot and often have rocky substrates. Alluvial fans of rubble, sand, and gravel build at the base of the mountains and often coalesce to form bajadas. Vegetation lkaline soils. The region's only occurrence in Arizona is in the lower areas of the Safford Basin along the Gila River, at about 2600 to 3500 includes mostly desert shrubs, such as sotol, lechuguilla, yucca, ocotillo, lotebush, tarbush, and pricklypear, with a sparse intervening cover of eet in elevation. This area lacks the playas that are found in parts of Ecoregion 24a to the east in New Mexico and Texas. This part of the black grama and other grasses. At higher elevations, there may be scattered one-seeded juniper and pinyon pine. Strips of gray oak, velvet ash, intermittent as it enters from New Mexico. frord Basin is sometimes included with the Sonoran Desert, but it is generally too cold for the indicative plant species that are typical of and little walnut outline the patterns of intermittent and ephemeral drainages, and oaks may spread up north-facing slopes from the riparian

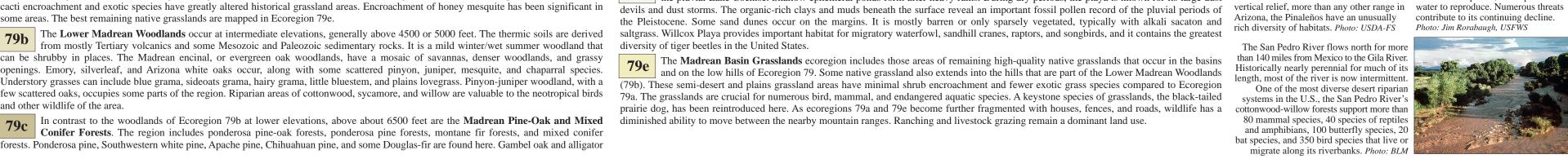


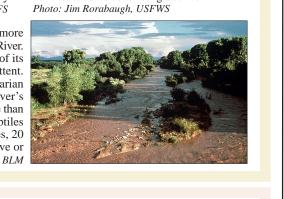


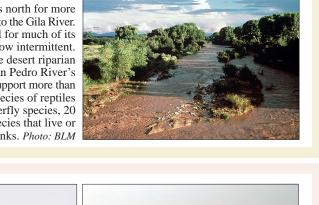
During some periods of low flow, nearly all state, but are rarely encountered. They pref of the surface water above Duncan, AZ is grassy foothills and lower deserts. *Photo: BLM* 





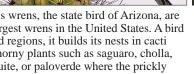








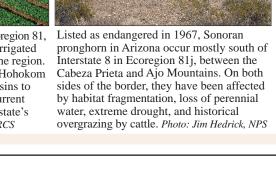


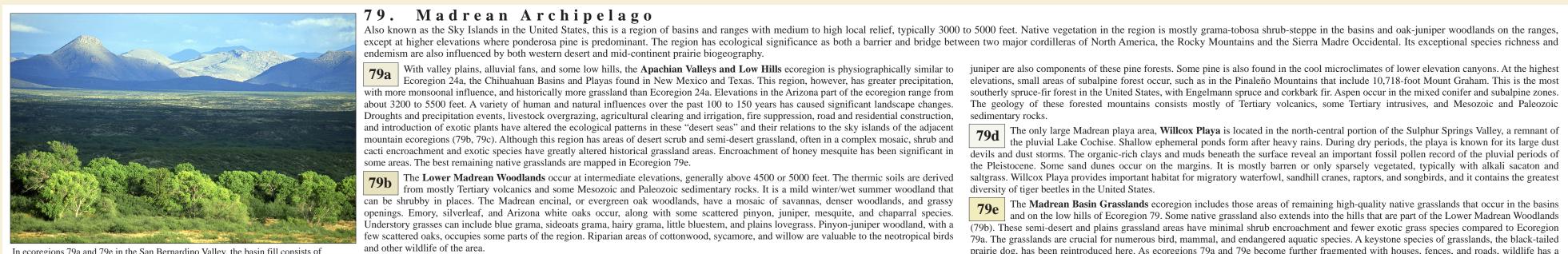


Cactus wrens, the state bird of Arizona, are With over 4 million people and an automobile



water supply. Photo: Jeff Vanuga, NRCS





alluvium interlayered with basalt flows. At the border with Mexico, the remnants of the San Bernardino Ciénega support a unique and endemic biota, including special vertebrates,

The region includes ponderosa pine-oak forests, ponderosa pine forests, montane fir forests, and mixed conifer conifer forests. alluvium interlayered with basalt flows. At the border with Mexico, the remnants of the invertebrates, and plants. Many rare species listed as endangered or threatened occur in

the San Bernardino National Wildlife Refuge. Photo: Steve Hillebrand, USFWS

sammophytic ("sand loving") scrub occurs in the active dunes and partially stabilized areas. The Lower Colorado/Lower Gila River Valleys ecoregion includes the low elevation corridors along the Colorado and lower Gila

ew oxbows remain with some freshwater marshes and remnants of riparian vegetation. Creosotebush and white bursage occupy upland areas. Ecoregion 81k, with more saguaro, foothills paloverde, ironwood, triangle-leaf bursage, ocotillo, mesquite, acacias, a variety of opuntias, and spines offer support and protection. Photo: NPS he climate is almost frost-free and crops include wheat, barley, hay and alfalfa, cotton, lettuce, citrus, broccoli, and melons. The Central Sonoran/Colorado Desert Mountains are the erosional highlands of exposed bedrock that rise above the more gently sloping sediment-filled basins (81j). Unlike the Western Sonoran Mountains (81a) in California west of the Imperial Valley, these

and the December to February periods. The vegetation of this mostly rocky terrain is typically Sonoran creosotebush scrub transitioning into signature Sonoran Desert species, and the largest cactus in the United States. It is found succulent scrub with ocotillo and numerous cacti. Species include creosotebush, white bursage, brittlebush, ocotillo, teddy bear and staghorn succulent scrub with ocotillo and numerous cacti. Species include creosotebush, white bursage, brittlebush, ocotillo, teddy bear and staghorn on the slopes of Ecoregion 81k and the upper bajadas of Ecoregion 81l, above the valley cholla, range ratany, barrel cactus, beavertail cactus, and littleleaf paloverde. Shrub and cacti density is typically sparser compared to Ecoregion 81k. mountain ranges of Ecoregion 81i. Large areas are dominated by creosotebush and white bursage. Ocotillo, brittlebush, and cholla occur on alluvial fans and coarser soils. Shrub density is low to moderate, with shrub spacing from several feet to tens of feet. The Colorado saltbush scrub occurs, often on finer-textured, poorly drained soils with high alkalinity and salinity. Allscale is the dominant shrub, along with habitats have been extensively altered. Invasive plants such as tamarisk now cover riverbanks that were once shaded by cottonwoods, willows, also a focal point in the culture of the Tohono O'odham people. Photo: Carol M. Highsmith, some fourwing saltbush, mesquite and exotic tamarisk are mixed with and mesquite. Agricultural return flows and municipal sewage discharges feed the rivers. The Gila River, from its confluence with the Salt creosotebush. Microphyll woodland habitat is found along some dry-wash channels, with blue paloverde, ironwood, smoke tree, or desert willow.

River to Painted Rock Reservoir, has low dissolved oxygen and elevated levels of pesticides, metals, inorganics, and nutrients.

he Mojave and contains large areas of paloverde-cactus shrub and giant saguaro cactus, whereas the potential natural vegetation in the Mojave is largely creosotebush. Other typical Sonoran plants include white bursage, ocotillo, brittlebush, creosotebush, catclaw acacia, cholla, desert saltbush, pricklypear, ironwood, and mesquite. In the region, winter rainfall decreases from west to east, while summer rainfall decreases from the summer The Sand Hills/Sand Dunes ecoregion occurs in California, Arizona, and Baja California, and is one of the largest dune complexes

Nonoran Desert Mohawk Valley. Pinta Sands, and Cactus Plains. The wind-blown sand

81k

The Arizona Upland/Eastern Sonoran Mountains are highland areas that have more raintail (/ to 20 incnes annually) usail use
Sonoran Desert mountains further west (ecoregions 81a, 81i) and with greater amounts in summer. It is one of the highest and coldest

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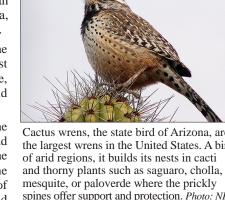
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Sonoran Desert mountains further west (ecoregions 81a, 81i) and with greater amounts in summer. It is one of the highest and coldest iginated mostly from the shores and delta of the Colorado River. This is one of the driest and hottest areas of the United States, with annual parts of the Sonoran Desert, with elevations ranging from about 1500 to over 4500 feet. Vegetation includes saguaro, foothill paloverde, precipitation only about 2 to 6 inches. The well-drained aridic soils have hyperthermic temperature regimes. Although vegetation is often creosotebush, triangle bursage, limberbush, wolfberry, bush muhly, threeawns, pricklypear, cholla, ocotillo, organippe cactus, ironwood, and parse, the ecoregion contains the largest number of dune-endemic plants in North America, as well as several specialized animal species. globe mallow. It supports a rich birdlife. The soil temperature regime here is thermic, compared to the hyperthermic soils of Ecoregion 81i. The Arizona Upland/Eastern Sonoran Basins ecoregion includes the broad alluvial plains, fans, and bajadas that occur between the higher relief mountain ranges of Ecoregion 81k. Elevations are mostly 1500 to 3000 feet, but are as low as 900 feet in the north and the largest wrens in the United States. A bird oriented form of urbanization, the Phoenix rivers. An area of riverine alluvium and river- and fan-terraces, large parts of the ecoregion are in agriculture. Elevations range from as high as 3600 feet on some upper slopes. Sediments filling the basins represent combinations of fluvial, colluvial, and alluvial deposits. In the of arid regions, it builds its nests in cacti metropolitan area has been known for its bout 70 feet where the Colorado River leaves Arizona, to over 1000 feet on slopes in the north. Riparian and wetland habitats have been plains and lower bajadas, creosotebush and bursage are still common, similar to Ecoregion 81j, although here more thornscrub elements of the and thorny plants such as saguaro, cholla, "brown cloud." Air quality here is impaired, extensively altered. Exotic plants such as tamarisk now cover riverbanks that were once shaded by cottonwoods, willows, and mesquite. Only a Sonoran Arizona Upland begin to occur. The upper bajadas have some similarities with the vegetation communities of the mountain slopes of mesquite, or paloverde where the prickly especially by ozone and coarse particulates.

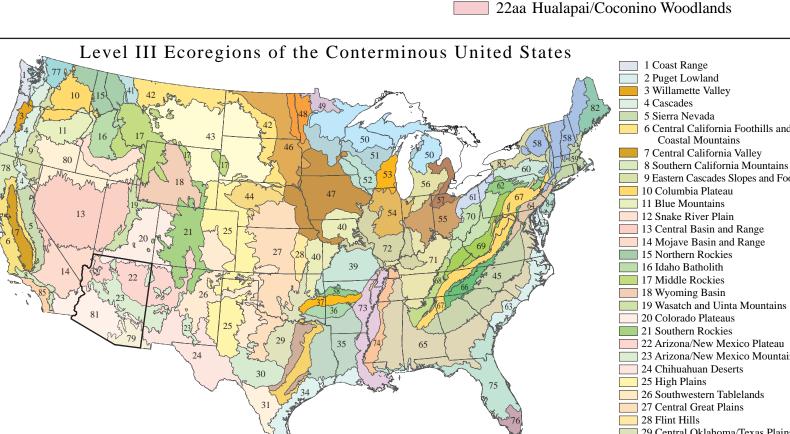
and on the low hills of Ecoregion 79. Some native grassland also extends into the hills that are part of the Lower Madrean Woodlands

in elevation, contain the majority of the state's human population and have permanently altered ecological features and processes. The region is the The Central Sonoran/Colorado Desert Basins include the broad alluvial plains, fans, and bajadas that occur between the higher relief urban/agricultural core of south-central Arizona, dominated by urban, suburban, and cropland land covers and highly engineered hydrologic networks The Middle Gila/Salt River Floodplains ecoregion includes the middle reaches of these rivers, consisting of basin-floor deposits and hydrologic modifications for irrigated pronghorn in Arizona occur mostly south of with riverine alluvium and river terraces. Elevations range from about 600 feet in the typically dry Painted Rock Reservoir, to about agriculture have a long history in the region. Interstate 8 in Ecoregion 81j, between the Desert is more open and sparsely vegetated compared to the eastern Sonoran regions (81k, 81l), leading to a less diverse avifauna. Desert is more open and sparsely vegetated compared to the eastern Sonoran regions (81k, 81l), leading to a less diverse avifauna. Desert in the Avra Valley. Parts of the ecoregion are in agriculture with crops of barley, hay and alfalfa, and cotton. The riparian and wetland is a less diverse avifauna. Desert in the Avra Valley. Parts of the ecoregion are in agriculture with crops of barley, hay and alfalfa, and cotton. The riparian and wetland is a less diverse avifauna. Desert in the Avra Valley. Parts of the ecoregion are in agriculture with crops of barley, hay and alfalfa, and cotton. The riparian and wetland is a less diverse avifauna. Desert in the Avra Valley. Parts of the ecoregion are in agriculture with crops of barley, hay and alfalfa, and cotton. The riparian and wetland is a less diverse avifauna. Desert in the Avra Valley. Parts of the ecoregion are in agriculture with crops of barley, hay and alfalfa, and cotton. The riparian and wetland is a less diverse avifauna. Desert in the Avra Valley. Parts of the ecoregion are in agriculture with crops of barley, hay and alfalfa, and cotton. The riparian and wetland is a less diverse avifauna.





Most of Arizona's cropland is in Ecoregion 81, Listed as endangered in 1967, Sonoran built canals in the Salt and Gila basins to sides of the border, they have been affected move water to their crop fields. Current by habitat fragmentation, loss of perennial agriculture uses about 70% of the state's water, extreme drought, and historical



Level III ecoregion

**————** International boundary

----- County boundary

14 Mojave Basin and Range

14e Arid Valleys and Canyonlands

20c Semiarid Benchlands and Canyonlands

20i Cold Desert Sagebrush-Grasslands

14a Eastern Mojave Basins

14p Lower Grand Canyon

20 Colorado Plateaus

20d Arid Canyonlands

14f Mojave Playas

20e Escarpments

20h Sand Deserts

**————** State boundary

Gulf of California

30 20 10 0

Level IV ecoregion

Intermittent stream

14b Eastern Mojave Low Ranges and Arid Footslopes

14c Eastern Mojave Mountain Woodland and Shrubland

SCALE 1:1 325 000

Albers equal area projection

Standard parallels 33° N and 36° N

7 Central California Valley 8 Southern California Mountains Eastern Cascades Slopes and Foothills 10 Columbia Plateau 11 Blue Mountains 2 Snake River Plain 3 Central Basin and Range 14 Mojave Basin and Range 15 Northern Rockies 16 Idaho Batholith 17 Middle Rockies 18 Wyoming Basin 19 Wasatch and Uinta Mountains 20 Colorado Plateaus 21 Southern Rockies 22 Arizona/New Mexico Plateau 23 Arizona/New Mexico Mountains 24 Chihuahuan Deserts 25 High Plains 26 Southwestern Tablelands 27 Central Great Plains 28 Flint Hills 29 Central Oklahoma/Texas Plains 58 Northeastern Highlands

22 Arizona/New Mexico Plateau

22i San Juan/Chaco Tablelands and Mesas

220 Northeast Arizona Shrub-Grasslands

22p Little Colorado Valley/Painted Desert

22u Kaibito/Moenkopi Sandy Plateaus

22y Uinkaret/Aubrey Montane Conifer Forest

22z Chino/Coconino Grasslands and Shrub-Steppe

22d Virgin/Shivwits Woodland

22i Semiarid Tablelands

22q Dinétah Tablelands

22t Chinle Valley and Mesas

22r Mesa Highlands

22v Marble Platform

22x Arizona Strip Plateaus

22s Hopi Buttes

22w Grand Canyon

30 Edwards Plateau 59 Northeastern Coastal Zone 60 Northern Allegheny Platea 31 Southern Texas Plains 32 Texas Blackland Prairies 61 Erie Drift Plain 2 North Central Appalachia 33 East Central Texas Plains 63 Middle Atlantic Coastal Pla 34 Western Gulf Coastal Plain 64 Northern Piedmont 35 South Central Plains 65 Southeastern Plains 36 Ouachita Mountain 66 Blue Ridge 37 Arkansas Valley 67 Ridge and Valley 38 Boston Mountains 68 Southwestern Appalach 39 Ozark Highlands 69 Central Appalachians 40 Central Irregular Plains 41 Canadian Rockies 70 Western Allegheny Plateau 42 Northwestern Glaciated Plains 71 Interior Plateau 43 Northwestern Great Plains 2 Interior River Valleys and Hi 3 Mississippi Alluvial Plain 44 Nebraska Sand Hills 74 Mississippi Valley Loess Plains 45 Piedmont 75 Southern Coastal Plain 46 Northern Glaciated Plains 47 Western Corn Belt Plains 76 Southern Florida Coastal Pla 7 North Cascades 48 Lake Agassiz Plain 78 Klamath Mountains/Califor 49 Northern Minnesota Wetlands High North Coast Rang 50 Northern Lakes and Forests 79 Madrean Archipelago 51 North Central Hardwood Forest 80 Northern Basin and Range 52 Driftless Area 81 Sonoran Basin and Range 53 Southeastern Wisconsin Till Plai 82 Acadian Plains and Hills 54 Central Corn Belt Plains 83 Eastern Great Lakes Lowlands 55 Eastern Corn Belt Plains

56 Southern Michigan/Northern

57 Huron/Erie Lake Plains

Indiana Drift Plains

84 Atlantic Coastal Pine Barrens

85 Southern California/Northern

23 Arizona/New Mexico Mountains

23d Arizona/New Mexico Subalpine Forests

23b Madrean Lower Montane Woodlands

23e Conifer Woodlands and Savannas

23i Montane and Subalpine Grasslands

231 Mogollon Transition Conifer Forests

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81n Gila/Salt Intermediate Basins

810 Middle Gila/Salt River Floodplains

79 Madrean Archipelago

79e Madrean Basin Grasslands

81d Sand Hills/Sand Dunes

81m Sonoran Lava Fields

81 Sonoran Basin and Range

79d Willcox Playa

79a Apachian Valleys and Low Hills

79c Madrean Pine-Oak and Mixed Conifer Forests

81g Lower Colorado/Lower Gila River Valleys

81j Central Sonoran/Colorado Desert Basins

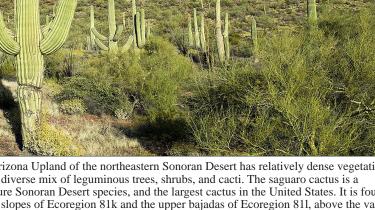
811 Arizona Upland/Eastern Sonoran Basins

81i Central Sonoran/Colorado Desert Mountains

81k Arizona Upland/Eastern Sonoran Mountains

79b Lower Madrean Woodlands





The Arizona Upland of the northeastern Sonoran Desert has relatively dense vegetation with a diverse mix of leguminous trees, shrubs, and cacti. The saguaro cactus is a floors. Saguaros start out extremely small in the first several years, and can take 50 to 75 years to develop a side arm. Some saguaros live more than 150 years, Saguaro depend on summer rains, and they establish more successfully under nurse plants, such as foothill paloverde, ironwood, acacia, or mesquite, that provide some shade from sweltering temperatures and protection from frost. Numerous species of vertebrates and nvertebrates use this plant for food, shelter, and perching sites. The saguaro cactus is

forests. Ponderosa pine, Southwestern white pine, Apache pine, Chihuahuan pine, and some Douglas-fir are found here. Gambel oak and alligator 81. Sonoran Basin and Range Similar in topography to the Mojave Basin and Range to the north, this ecoregion contains scattered low mountains and has large tracts of federally owned lands, a large portion of which are used for military training. However, the Sonoran Basin and Range is slightly hotter than

some bush muhly. An area of Joshua trees occurs northwest of Wickenburg, a relict population of this Mojavean species The Sonoran Lava Fields are composed of mostly Quaternary basait nows and plants, radict than the order ecoregions 81k or 81i. It includes the Pinacate lava field, part of a much larger volcanic area in Sonora, Mexico, and, to the north, the nges receive more summer precipitation, but less than the Arizona Upland (81k, 81l) to the east. The rugged terrain is dissected by dry

Sentinel Plain, which has some older Pliocene lava and a mosaic of eolian sand cover. The exposed black rock creates dramatic landforms and ashes that can flood during the infrequent rainfall events. The climate is hot, arid, and continental. The soil temperature regime is an extreme growing environment with few perennial plants. Pockets of windblown sand support more life, especially spring annual plants. hyperthermic with a typic aridic soil moisture regime. Soil moisture regime. Soil moisture is driest from May to June and intermittently moist during the July to September

Eroded drainageways can hold surprisingly rich xeroriparian communities. Historically, these lava fields formed significant barriers to travel. The Gila/Salt Intermediate Basins ecoregion is intermediate in elevation, climate, and natural vegetation between the Central Sonoran/Colorado Desert Basins (81j) and the higher Arizona Upland/Eastern Sonoran Basins (81l). These basins, mostly 900 to 1800 feet