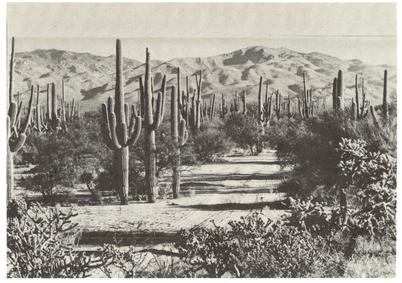
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

FOLIO OF THE
TUCSON AREA, ARIZONA
MAP I-844-H

Creosotebush community. Altitude, about 1,600 feet above mean sea level



Paloverde-saguaro community. Saguaro National Monument. Altitude, 3,000 feet above mean sea level. Photograph by U.S. National Park Service, about 1935

Border between grassland (left background) and oak woodland (right). Foreground trees are Mexican blue oaks. Lyle Canyon, Huachuca Mountains. Altitude, 5,100 feet above mean sea level. Photograph by H. L. Shantz, 1933

Interior of Douglas fir-white fir forest. Santa Catalina Mountains. Altitude, 8,700 feet above mean sea level. Photograph by Forrest Shreve, about 1910

Grassland in 1909 (A) and 1968 (B) near the Santa Rita Mountains. The photographs illustrate the kind of changes that have occurred in the grassland as the result of grazing and climatic change. Altitude, 4,500 feet above mean sea level. Photograph (A) by F. C. Schrader; photograph (B) by J. R. Hastings

EVERGREEN CONIFER FOREST

Includes ponderosa pine forest, Douglas fir-white fir forest, and corkbark fir forest

EVERGREEN WOODLAND

Includes open parklike woodland of oak and dense woodland of oak, juniper, and pinyon pine or oak and chaparral species, such as Wright silktassel and pointleaf manzanita

GRASSLAND

Woody phase

Grassy phase

CHIHUAHUAN DESERT

Includes tarbush, sandpaper bush, whitethorn, and creosotebush. Barrel, prickly pear, and pincushion cacti are common

SONORAN DESERT

Paloverde-saguaro

Creosotebush
Stippled where inferred

Desert saltbush
Stippled where inferred

DECIDUOUS RIPARIAN FOREST

Includes saltcedar, mesquite, cottonwood, willow, and other riparian species growing along perennial and ephemeral streams and where ground water is at shallow depth

1 Botanically unique area
1. *Desert Botanical Laboratory*
2. *Knipe Cienega*
3. *Goodding Research Natural Area*

Base from U.S. Geological Survey
Ajo 1953-69, Tucson and
Nogales 1956-62

SCALE 1:250 000

5 0 5 10 MILES

5 0 5 10 KILOMETERS

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100-FOOT INTERVALS
DATUM IS MEAN SEA LEVEL
1974 MAGNETIC DECLINATION VARIES FROM 13°30' TO 12°30' EAST

Interior—Geological Survey, Reston, Va.—1974

MAP SHOWING VEGETATION IN THE TUCSON AREA, ARIZONA

By
R. M. Turner

1974

SCIENTIFIC EQUIVALENTS FOR COMMON NAMES OF PLANTS AND ANIMALS USED

Plants

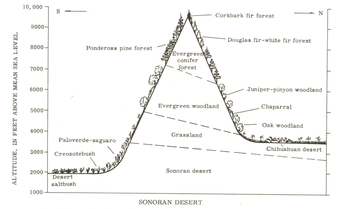
alligator juniper	=	*Juniperus deppeanna* Steud.
Apache pine	=	*Pinus latifolia* Sarg.
Arizona alder	=	*Alnus oblongifolia* Torr.
Arizona ash	=	*Fraxinus velutina* Torr.
Arizona white oak	=	*Quercus arizonica* Sarg.
barrel cactus	=	*Ferocactus* spp.
black grama	=	*Bouteloua eriopoda* Torr.
blue grama	=	*Bouteloua gracilis* (H. B. K.) Lag.
blue paloverde	=	*Cercidium floridum* Benth.
burroweed	=	*Haplopappus tenuisectus* (Greene) Blake
bursage	=	*Franseria deltoidea* Torr.
canyon hackberry	=	*Celtis reticulata* Torr.
catclaw	=	*Acacia greggii* Gray
chamizo	=	*Atriplex canescens* (Pursh) Nutt.
Chihuahua pine	=	*Pinus chihuahuana* Engelm.
corkbark fir	=	*Abies lasiocarpa* var. *arizonica* (Merriam) Lemmon
cottonwood	=	*Populus fremontii* Wats.
creosotebush	=	*Larrea tridentata* (DC.) Coville
desertbroom	=	*Baccharis sarothroides* Gray
desert hackberry	=	*Celtis pallida* Torr.
desert saltbush	=	*Atriplex polycarpa* (Torr.) Wats.
Douglas fir	=	*Pseudotsuga menziesii* (Mirbel) Franco
Emory oak	=	*Quercus emoryi* Torr.
foothill paloverde	=	*Cercidium microphyllum* (Torr.) Rose & Johnston
Gambel oak	=	*Quercus gambelii* Nutt.
Goodding willow	=	*Salix gooddingii* Ball
green sprangletop	=	*Leptochloa dubia* (H. B. K.) Nees.
hollyleaf buckthorn	=	*Rhamnus crocea* Nutt. *ilicifolia* (Kellogg) Greene
ironwood	=	*Olneya tesota* Gray
mesquite	=	*Prosopis juliflora* (Swartz) DC.
Mexican blue oak	=	*Quercus oblongifolia* Torr.
Mexican pinyon pine	=	*Pinus cembroides* Zucc.
Mexican white pine	=	*Pinus reflexa* Engelm.
mustard	=	[various species of the Cruciferae]
netleaf oak	=	*Quercus reticulata* Humb. & Bonpl.
ninebark	=	*Physocarpus monogynus* (Torr.) Coult.
oak	=	*Quercus* spp.
one-seed juniper	=	*Juniperus monosperma* (Engelm.) Sarg.
pincushion cactus	=	*Mammillaria microcarpa* Engelm.
pointleaf manzanita	=	*Arctostaphylos pungens* H. B. K.
ponderosa pine	=	*Pinus ponderosa* Laws.
prickly pear cactus	=	*Opuntia* spp. (Platyopuntias).
Rocky Mountain maple	=	*Acer glabrum* Torr.
Rothrock grama	=	*Bouteloua rothrockii* Vasey
sacaton	=	*Sporobolus airoides* Torr.
saguaro	=	*Carnegiea gigantea* (Engelm.) Britt. & Rose
saltcedar	=	*Tamarix pentandra* Pall.
sand dropseed	=	*Sporobolus cryptandrus* (Torr.) Gray
sandpaper bush	=	*Mortonia scabrella* Gray
scrub oak	=	*Quercus dumosa* Nutt. var. *turbinella* (Greene) Jepson
seepwillow	=	*Baccharis glutinosa* Pers.
sideoats grama	=	*Bouteloua curtipendula* (Michx.) Torr.
silverleaf oak	=	*Quercus hypoleucoides* Cumus
snakeweed	=	*Gutierrezia lucida* Greene
snowberry	=	*Symphoricarpos oreophilus* Gray
squawbush	=	*Rhus trilobata* Nutt.
sycamore	=	*Platanus wrightii* Wats.
tarbush	=	*Flourensia cernua* DC.
tobosa	=	*Hilaria mutica* (Buckl.) Benth.
wait-a-minute bush	=	*Mimosa biuncifera* Benth.
walnut	=	*Juglans major* (Torr.) Heller
white bursage	=	*Franseria dumosa* Gray
white fir	=	*Abies concolor* (Gord. & Glend.) Lindl.
whitethorn	=	*Acacia constricta* Benth.
willow	=	*Salix* sp.
Wright silktassel	=	*Garrya wrightii* Torr.

Animals

Gambel quail	=	*Lophortyx gambelli* Gambel
javelina	=	*Pecari tajacu* (Linnaeus)
mourning dove	=	*Zenaidura macroura* (Linnaeus)
mule deer	=	*Odocoileus hemionus* (Rafinesque)
white-tailed deer	=	*Odocoileus virginianus* (Zimmermann)
whitewing dove	=	*Zenaidura asiatica* (Linnaeus)

Vegetation data obtained from maps by the Arizona Game and Fish Department, U.S. National Park Service, and U.S. Forest Service and from National Aeronautics and Space Administration high-altitude aerial photographs (Ames Research Center)

The vegetation of the Tucson area is remarkably varied—that of the semiarid plains and valleys is short and sparse, and that of the mountains is tall and dense. The diversity and areal change of plant communities and climate in the Tucson area duplicate changes normally found only over many hundreds of miles. The marked plant and climatic diversity is caused by great altitude change in short horizontal distance, from the desert to the mountain top. For example, forests comparable to those near the mountain summits are to be found at the altitude of the Sonoran desert only 700 miles or more to the north. Because of the sharp gradations in temperature and moisture with changes in altitude and because plants respond to these climatic gradations, mountain vegetation occurs in more or less easily recognizable zones. Although differences in topography, geology, and soil may produce irregularities in the zonal boundaries, the sequence and altitudinal range of the vegetation zones generally are predictable. Vegetation changes with increasing altitude are shown in the following hypothetical profile (Marshall, 1957; Lowe, 1964).



SONORAN DESERT

The vegetation of the Sonoran desert occupies the lowest most arid areas and extends to altitudes of about 3, 000 to 3, 600 feet where the terrain is gentle but extends to altitudes of about 4, 500 feet on steep southerly slopes. The following Sonoran desert plant communities are recognized in the map area: paloverde-saguaro, creosotebush, and desert saltbush.

Paloverde-saguaro community.--The paloverde-saguaro community is a complex assemblage of plants composed of small trees, such as foothill paloverde and ironwood; shrubs, such as creosotebush and bursage; and the giant saguaro and several other species of cacti. The paloverde-saguaro community occupies bajadas and mountain slopes above the creosotebush community. Because of the diversity and density of the plant life, this community is regarded as the most scenic in Arizona's deserts and, therefore, provides the most desirable home-building sites. The coarse soil in which most of the community grows probably is not an important source of dust, although once the surface of the soil is disturbed, the community is likely to be invaded by desertbroom, species of mustard, and annual grasses.

Creosotebush community.--The creosotebush community occupies lower and more arid areas than the paloverde-saguaro community. Creosotebush is the dominant shrub; white bursage is common in areas northwest of Tucson. The even stature and spacing of the plants and the floristic simplicity of the community produce a monotonously uniform landscape. The community occupies flat terrain on the slightly tilted plains and lower bajadas surrounding the mountains, which contributes further to the impression of uniformity. The height and spacing of the creosotebush are good indicators of the aridity of the habitat. As shown by one study, in gently sloping areas that have few or no drainage channels, 6 inches of precipitation will support about 150 plants per acre, and 12 inches of precipitation will support about 300 plants per acre. Caliche is common in this plant community particularly where the soils are derived from basalt. The soil is readily airborne, especially where the plant cover is removed or where the natural algal-fungal crust is destroyed.

Desert saltbush community.--Desert saltbush grows in the fine-grained alluvium that fills the valleys. The desert saltbush is a gray 2- to 5-foot shrub that grows in the same altitudinal range as the creosotebush community. Desert saltbush formerly was the most widespread plant community in the bottom lands along the lower Santa Cruz River. Other saltbush species were common, especially chamizo, which occurred in sandy soils. Because of agricultural development, this vegetation now is rare in the bottom lands. Mesquite is a common subordinate plant and the saguaro is a rare member of the community. The areas that support desert saltbush are monotonous in appearance because of the simple uniform composition of the vegetation. The soil may contain excessive salt accumulations; however, the soil is highly productive when it is irrigated and the salt is flushed out. The fine-textured soil is readily airborne.

CHIHUAHUAN DESERT

The Chihuahuan desert is one of the four major deserts in North America; however, it covers only about 10 square miles in the Tucson area, where it is at altitudes of about 3, 500 to 5, 000 feet above mean sea level. The characteristic shrubs are from 3 to 6 feet tall and include tarbush, sandpaper bush, whitethorn, and creosotebush. Barrel, prickly pear, and pincushion cacti are common. Trees are absent except along washes, where small mesquite and other trees grow. The soil of the Chihuahuan desert generally is calcareous and is derived from limestone.

GRASSLAND

The altitude of the grassland ranges from about 1, 500 to about 5, 000 feet above mean sea level. At altitudes below about 3, 000 feet, it occurs mainly in low flat areas subject to seasonal flooding (swales). Typically, there is a sparse to dense grass cover and a scattering of shrubs. Shrub-free grassland occurs at altitudes of from 4, 500 to 5, 000 feet, where the soil is deep and the terrain is smooth to gently rolling. About 35 species of grass occur in the grassland, the most common of which are black grama, blue grama, sideoats grama, and Rothrock grama; other common grass species are sand dropseed, sacaton, and green sprangletop. Many grassland shrubs are the same shrubs that occur in moist Sonoran desert situations and include mesquite, catclaw, whitethorn, blue paloverde, and desert hackberry. The Sonoran desert "indicator" species, such as saguaro, foothill paloverde, ironwood, and bursage, are absent.

The most productive grassland may support as many as 30 head of cattle per square mile; however, shrubs are conspicuous in most of the grassland, and, where erosion and grazing have been extreme, grass is rare and the grassland has become dominated by shrubs. Shrub domination of the grassland is a recent occurrence. The invasion of the grassland by shrubs probably began one or two decades before the end of the 19th century. Today, newly established shrubs are found in some of the most favorable grassland habitats, which indicates that grassland devoid of shrubs is a shrinking resource. The time when shrub establishment began coincides with two prominent events in the region: (1) the advent of widespread livestock grazing and (2) increasing aridity caused by a decrease in rainfall and an increase in temperature.

At its upper altitudinal margin, which may be 4, 000 feet or higher, the grassland interfingers with the oak woodland. In places the grassland infringes upon the Sonoran desert, extending to altitudes as low as 1, 500 feet; where surrounded by the Sonoran desert, the grassland may be dominated by tobosa. The tobosa swales, however, have usually been invaded by woody species, such as mesquite, burroweed, and snakeweed.

EVERGREEN WOODLAND

The evergreen woodland is a forest composed of short evergreen trees. Several evergreen woodland communities occur in the Tucson region. Small evergreen oaks are common in all the woodland types. The trees generally are from 15 to 20 feet tall and are widely spaced; grass or shrubs occupy the space between the trees. Grass is absent or inconspicuous only where chaparral species grow densely. The altitude of the evergreen woodland ranges from about 4, 000 to 7, 000 feet above mean sea level.

The least dense evergreen woodland community is the oak woodland which ranges throughout the 4, 000 to 7, 000 feet altitude of the evergreen woodland. At altitudes of between 4, 000 and 5, 500 feet, the oak woodland is open and orchardlike and has a grass matrix; the typical tree species are Mexican blue oak, Emory oak, and Arizona white oak. The best examples of the vegetation are found in the gentle terrain above the grassland. As the upper limit of the oak woodland is approached, the vegetation becomes more dense and two additional tree species, silverleaf and netleaf oak, replace the Mexican blue oak of low altitude. In moist habitats, such as in valleys, the oaks may be more than 20 feet tall. Changes paralleling those of the grassland have occurred in the oak woodland during the past century, along the lower altitudinal limits especially, the oaks have died and shrubs, such as mesquite, have become established.

The most dense evergreen woodland community is present mainly at the higher altitudes in hilly or mountainous terrain. It is dominated by a group of species that elsewhere forms a community, called chaparral, with rank equivalent to evergreen woodland, grassland, etc. In the Tucson area, the community is a mixture of chaparral, evergreen oaks, and other low trees from adjacent oak woodland communities. In most of the area pointleaf manzanita and Wright silktassel are the dominant plants, northward from the north slopes of the Santa Catalina Mountains, scrub oak also is a dominant species. A few deciduous shrubs—mainly squawbush—and a few spiny shrubs—mainly wait-a-minute bush—are present in the community. The shrubs in the chaparral community recover quickly after fires; some sprout from root crowns, and seeds of others germinate best following fires. During dry seasons, these shrubs burn readily, and the longer the elapsed time since the last fire, the greater the flammability of the vegetation. Urban areas that invade this community face the risk of fire and the attendant loss of property and lives.

Another phase of the evergreen woodland is dominated by three species of small conifers—alligator juniper, one-seed juniper, and Mexican pinyon pine—and contains scattered oak trees. The vegetation is most common in the upper half of the evergreen woodland community and generally is confined to steep slopes that have shallow soil. The trees are more closely spaced than the trees in the oak woodland, and shrubby chaparral species—such as Wright silktassel, pointleaf manzanita, and hollyleaf buckthorn—grow in the small openings between the trees.

The evergreen woodland is used for cattle grazing and is an important habitat for mule deer, white-tailed deer, and javelina; therefore, the woodland is a recreational hunting area.

EVERGREEN CONIFER FOREST

The evergreen conifer forest is present in the high mountains and comprises several distinct plant communities. All the communities are dominated by needle-leaved evergreen trees that produce seeds in cones. The coniferous trees grow at altitudes of as low as about 6, 500 feet on northern slopes of the mountains and extend to the tops of the highest peaks, which are about 9, 500 feet above mean sea level. The evergreen conifer forest is present only in the Santa Catalina, Rincon, and Santa Rita Mountains. Because the areal extent of the forest is small and because the mosaic of the forest communities is complex, no attempt has been made to differentiate the communities on the map.

The largest community is the ponderosa pine community, which extends to the summits of the mountains on the south slopes. Although ponderosa pine is dominant, Mexican white pine and Chihuahua pine also are present. Apache pine occurs at the lower margin of the zone in the Santa Rita Mountains. Silverleaf oak, Arizona white oak, and netleaf oak are typical constituents, although they generally occur as shrubs rather than trees; Gambel oak, a winter deciduous tree, grows only in the evergreen conifer forest in the Tucson area. Several shrubs, such as snowberry and ninebark, are common at higher altitudes in the forest.

Forests of Douglas fir and white fir occur only on the cool moist north slopes or in canyons of the high mountains. Gambel oak, snowberry, and ninebark are present, but the evergreen is absent. A forest of corkbark fir is present on the north slope of Mount Lemmon in the Santa Catalina Mountains. The forest covers only a few acres and represents an outpost of the spruce-fir forest that forms the timberline in subarctic areas. The evergreen conifer forest is mostly on Federal land, where the number of private dwellings is restricted. The evergreen conifer forest is used extensively for recreation by people from nearby urban areas.

DECIDUOUS RIPARIAN FOREST

Riparian vegetation is present along stream channels, their associated terraces, and in areas where ground water is at shallow depth. This community is present in some form at all altitudes in the Tucson area. The plants may be tall and grow in dense stands—the maximum height and density are attained in habitats of abundant moisture. As the altitude changes along a stream channel, a progressive change takes place in the species composition. Near an altitude of 5, 000 feet, Arizona alder and Rocky Mountain maple are common. With decreasing altitude these strictly montane species give way to walnut, Goodding willow, sycamore, Arizona ash, canyon hackberry, and cottonwood; these last species commonly occur beyond the mountains near the mouths of canyons. In general, streamflow decreases rapidly when the streams enter the basal plains, and species composition, responding to the altered moisture regime, changes in short distances to mesquite, catclaw, and blue paloverde. At any given altitude, the deciduous riparian forest includes some plants that are characteristic of the vegetation of the adjacent uplands. Saltcedar, a species introduced by man, has become prominent along major stream channels since the 1930's; saltcedar grows especially densely in the large silt deposits at the head of reservoirs, replacing the native seepwillow that formerly grew at such sites.

Included in the deciduous riparian forest community are forests of mesquite, which grow in such artificially created habitats as irrigation overflow areas or areas behind runoff retention dams. This is probably the most rapidly changing community as highway construction, flood-control projects, and other activities of man alter the runoff pattern of the landscape. Where ground-water levels have dropped markedly, the mesquite forest is dying.

This community is an important habitat for wildlife and is a favored nesting site for game birds, such as whitewing and mourning doves and Gambel quail.

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