

Memo to: Bill Paleck and Bob Hall
Saguaro National Monument

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Subject: MAPPING INFORMATION, SOURCES, AND METHODS

The base maps for the study are composed of topographic maps (1:24,000). All other maps were reduced to conform to this scale.

Land Ownership.

Information came from parcel maps and computerized parcel information records from the Pima County Assessor's Office and is current to June 1987. Some of the information on federal land holdings was obtained from the Bureau of Reclamation, Central Arizona Project maps which were current to September 1987. There was also some information obtained from the State Land Department. User's of this map should recognize that ownership information changes frequently. In particular, land surrounding the Tucson Mountain Unit has been "rebooked" since June 1987. Consequently all parcel codes have been renumbered. This is due to rapid growth and ownership changes in the area. Xerographic reduction of the parcel maps to fit the base map has caused some distortion of parcel size and shape. This information was collected and mapped by Jennifer Wellington-Miller, Carol Whittaker, and Bobi Lyon of the Landscape Architecture Division of the School of Renewable Natural Resources, University of Arizona.

Zoning

Zoning information was obtained from Pima County Planning and Zoning maps. Users of this map should note that certain parcels are exempt from the zoning shown on this map because of

conditional zoning granted prior to 1975. Conditional zoning is "conditional" on the owner meeting requirements set out by the Board of Supervisors. As of 1975, conditional zoning is valid for 3 years. If the requirements are not met the land reverts to the original zoning. Prior to 1975 there was no time limit on conditional zoning and the zoning on these parcels has been "grandfathered" to the present. Conditional zoning cannot be determined simply by consulting Pima County zoning maps. The only way to determine whether a parcel has conditional zoning status is to ask specifically about conditional zoning for the parcel of interest. This information was collected and mapped by Jennifer Wellington-Miller and Carol Whittaker.

Vegetation Mapping Methods

Vegetation types inside and within 2 miles of the boundary of Saguaro National Monument were delineated using the classification system proposed by Brown et al. (1979). Vegetation types are classified from the most general plant community down to more specific series and associations. Vegetation types were recognized based on the dominant plants in each type, including both overstory and understory species. In many areas the same plant species occur in several vegetation types, however, because their relative dominance varies different types can be distinguished. Vegetation types are not homogeneous, they are generalizations of complex and diverse associations between plant species. Boundaries between vegetation associations are often indistinct and may occur as a broad transition zone rather than

the abrupt change indicated by a line on a map.

Vegetation of the Tucson Mountain Unit was mapped using black and white aerial photos at 1 inch = 1000 feet (Cooper Aerial Survey 1984), black and white orthophoto quadrangles at a scale of 1:24,000 (U.S.G.S. 1972) and 7.5 minute topographic maps (U.S.G.S. various dates). A previous vegetation map, (prepared for Bureau of Reclamation by Arizona Game and Fish as part of the Biological Resources Inventory for the Tucson portion of the Central Arizona Project) was consulted, verified by examining each type in the field, and incorporated into the present vegetation map.

Vegetation of the Rincon Mountain Unit was mapped using color aerial photos (U.S.D.A. 1977) and field checks. Previous vegetation maps were consulted, field checked, and incorporated into the present map (Kurzius 1983, SWCA, Inc. 1987). Vegetation maps were prepared by Audrey E. Goldsmith, Division of Wildlife, School of Renewable Natural Resources, University of Arizona.

Riparian Area Methods

Riparian areas include washes and drainages and were recognized typically by the presence of stream bed channels and/or increased vegetative cover. Riparian areas were mapped from black and white aerial photos (1 inch =1000 feet), orthophoto quadrangles (1:24,000) and color aerial photos (1:24,000). Because of distortion on aerial photos and xerographic reductions, riparian area maps were adjusted to match the base map which was a U.S.G.S. 7.5 minute topographic quadrangle. Because of these distortions and adjustments the

locations of some drainages, particularly small ones, may not be exact. Exact location of washes and riparian corridors can be located using aerial photos and field checks. Riparian maps were prepared by Audrey E. Goldsmith and Jennifer Wellington-Miller.

VEGETATION TYPES-SAGUARO NATIONAL MONUMENT

- 143.15 Mixed grass-scrub series
 - 143.155 Mixed grass-mixed scrub association
 - 143.155a Three awn-burroweed-mesquite-acacia-palo verde-yucca association
 - 143.161 Burroweed association
 - 143.162 Burroweed-acacia association
- 144.16 Shrub-scrub disclimax series
 - 144.163 Snakeweed-mesquite association
- 154.11 Creosote series
 - 154.111 Creosote association
 - 154.112 Creosote-mesquite association
 - 154.113 Creosote-triangle leaf bursage-mixed scrub association
 - 154.115 Creosote-ironwood-mixed scrub association
 - 154.116 Creosote-acacia-paloverde-ocotillo-zinnia association
- 154.12 Palo verde-cacti series
 - 154.121a Palo verde-triangle leaf bursage association
 - 154.121b Palo verde-mixed shrub-mixed cacti-zinnia
 - 154.121c Palo verde-mixed shrub-mixed cacti-burroweed
 - 154.122 Palo verde-saguaro-mixed cacti-mixed scrub association
 - 154.123 Jojoba-mixed scrub association
 - 154.124a Palo verde-creosote-mixed scrub association
 - 154.124b Palo verde-creosote- baccharis-brittlebush-ocotillo association
 - 154.125 Paloverde-saguaro-creosote association
 - 154.126 Palo verde-saguaro- brittlebush association
 - 154.128a Palo verde-acacia-mixed cacti-mixed scrub-grass association
 - 154.128b Palo verde-acacia-saguaro-mixed cacti-mixed scrub-grass association
 - 154.129a Mesquite-acacia-paloverde-mixed cacti-mixed scrub association
 - 154.129b Mesquite-acacia- saguaro-mixed cacti-mixed scrub-grass association
- 154.15 Buckwheat-agave community
 - 154.155 Buckwheat-mixed scrub association
- 224.52 Mesquite Series-Riparian Communities
 - 224.521 Mesquite bosque association
 - 224.522 Mesquite-mixed short tree association
 - 224.523 Mesquite-Lycium-mixed scrub
 - 224.524 Mesquite-ironwood association
 - 224.525 Mesquite- mixed broadleaf association
 - (154.112 Creosote-mesquite association)

Rincon Mountain Unit Vegetation Types-Saguaro National Monument

143.15 Mixed grass-scrub series

- 143.155 Mixed grass-mixed scrub association
- 143.155a Three awn-burroweed-mesquite-acacia-palo verde-yucca association
- 143.161 Burroweed association
- 143.162 Burroweed-acacia association

154.11 Creosote series

- 154.111 Creosote association
- 154.112 Creosote-mesquite association
- 154.113 Creosote-triangle leaf bursage-mixed scrub association
- 154.116 Creosote-acacia-paloverde-ocotillo-zinnia association

154.12 Palo verde-cacti series

- 154.121a Palo verde-triangle leaf bursage association
- 154.121b Palo verde-mixed shrub-mixed cacti-zinnia association
- 154.121c Palo verde-mixed shrub-mixed cacti-burroweed
- 154.122 Palo verde-saguaro-mixed cacti-mixed scrub association
- 154.123 Jojoba-mixed scrub association
- 154.124a Palo verde-creosote-mixed scrub association
- 154.124b Palo verde-creosote- baccharis-brittlebush-ocotillo association
- 154.125 Paloverde-saguaro-creosote association
- 154.126 Palo verde-saguaro- brittlebush association
- 154.128a Palo verde-acacia-mixed cacti-mixed scrub-grass association
- 154.128b Palo verde-acacia-saguaro-mixed cacti-mixed scrub-grass association
- 154.129a Mesquite-acacia-paloverde-mixed cacti-mixed scrub association
- 154.129b Mesquite-acacia- saguaro-mixed cacti-mixed scrub-grass association

224.52 Mesquite Series-Riparian Communities

- 224.521 Mesquite bosque association
- 224.522 Mesquite-mixed short tree association
- 224.523 Mesquite-Lycium-mixed scrub association
- 224.524 Mesquite-ironwood association
- 224.525 Mesquite- mixed broadleaf association

Tucson Mountain Unit Vegetation Types-Saguaro National Monument

- 143.15 Mixed grass-scrub series
- 143.155 Mixed grass-mixed scrub association
- 144.16 Shrub-scrub disclimax series
- 144.163 Snakeweed-mesquite association
- 154.11 Creosote series
- 154.111 Creosote association
- 154.112 Creosote-mesquite association
- 154.113 Creosote-triangle leaf bursage-mixed scrub association
- 154.115 Creosote-ironwood-mixed scrub association
- 154.12 Palo verde-cacti series
- 154.121a Palo verde-triangle leaf bursage association
- 154.122 Palo verde-saguaro-mixed cacti-mixed scrub association
- 154.123 Jojoba-mixed scrub association
- 154.124a Palo verde-creosote-mixed scrub association
- 154.15 Buckwheat-agave community
- 154.155 Buckwheat-mixed scrub association
- 224.52 Mesquite Series-Riparian Communities
- 224.522 Mesquite-mixed short tree association
- 224.523 Mesquite-Lycium-mixed scrub
- 224.524 Mesquite-ironwood-mixed shrub association

VEGETATION TYPE DESCRIPTIONS

Vegetation type descriptions were obtained from sources listed at the end of this section and from field observations by A. Goldsmith.

143.15 Mixed grass-scrub series

Warm temperate grasslands, called semidesert grasslands composed of a variety of grasses, especially perennial bunch grasses and shrubs.

143.155 Mixed grass-mixed scrub association

This association is dominated by perennial grasses such as three-awn, grama and a variety of others. Shrubs are also important especially mesquite, burroweed, desert zinnia, acacia, creosote, ephedra and characteristically yucca species. A variety of cacti are also present in various densities. In the Tucson Mountain Unit, jojoba association occurs with grasses. South of the Rincon Mountain Unit the influence of upland Sonoran desert on semidesert grasslands decreases from west to east and north to south. Ocotillo, fourwing saltbush, palo verde, and desert hackberry also occur. Lehmann lovegrass is an exotic perennial grass that is invading the desert grassland.

143.155a Three awn-burroweed-mesquite-acacia-palo verde-yucca association

This association occurs mainly south of Rincon Creek and is dominated by the named species. The relative cover of grasses vs shrubs and trees varies within the area. Other shrubs that occur in this type are hackberry, and fourwing saltbush. Cacti include Opuntia, cholla, barrel and saguaro.

143.161 Burroweed association

This occurred in a small area west of Old Spanish Trail and Thunderhead Ranch. This area is dominated by burroweed with a few grasses (an annual Bouteloua) and occasional mesquite and acacia. This is a disclimax association possibly resulting from local overgrazing. It lies at the confluence of several large drainages where natural riparian vegetation occurs.

143.162 Burroweed-acacia association

This is another disclimax association. Burroweed and whitethorn acacia are co-dominant. Cholla cacti and fluffgrass occur with occasional hackberry, ephedra, desert zinnia and mesquite.

144.16 Shrub-scrub disclimax series

144.163 Snakeweed-mesquite association

This association is located near Brawley Wash west of the Tucson Mountain Unit. It is a disturbed community probably from agriculture or grazing and perhaps periodic flooding.

154.11 Creosote series

This community is one of the major vegetation types in the Sonoran desert scrub. The associations are composed mainly of shrubs with sparse understory. The associations differ in the relative dominance of creosote and other trees or shrubs, and in the composition of the understory. Species occurring in the creosote associations include palo verde, mesquite, acacia, burroweed, desert zinnia, bursage, saltbush, paperflower, cacti and grasses. Creosote tends to occur on limestone substrates (Brown 1982).

154.111 Creosote association

Creosote completely dominates this association although other species occur occasionally. Most commonly occurring species are palo verde, desert zinnia, and acacia. Near the Tucson Mountain Unit, triangle-leaf bursage also occurs.

154.112 Creosote-mesquite association

This association tends to occur on or near flood plains. The understory includes perennial grasses and burroweed. Catclaw acacia, desert broom and seep willow also occur locally.

154.113 Creosote-triangle leaf bursage-mixed scrub association

This association, which occurs mainly near the west unit of Saguaro National Monument, includes creosote and triangle-leaf bursage as co-dominants. Palo verde, whitethorn acacia, burroweed, saltbush, paperflower, cacti and grass also occur.

154.115 Creosote-ironwood-mixed scrub association

This association is distinguished by the presence of ironwood, a species found in areas of greater soil moisture and lack of frosts. Usually palo verde and mixed cacti are also present. In the study area, this association was observed only near the Tucson Mountain Unit.

154.116 Creosote-acacia-paloverde-ocotillo-zinnia association

This association was found in areas of limestone influenced soils south of the riparian vegetation of Tanque

Verde wash. Relative dominance of the named species varied within the area.

154.12 Palo verde-cacti series

The palo verde-mixed cacti community is the most extensive vegetation in and around Saguaro National Monument. This community typically occurs in the rocky upland of the Sonoran desert. Saguaro cacti occur to varying degrees in all of the following associations. Littleleaf palo verde, also called foothill palo verde, is the most characteristic species along with Opuntia cacti species. The differences among the associations are in the importance of other shrub or tree species and the composition of shrubs in the understory.

154.121a Palo verde-triangle leaf bursage association

This association occurs in and around the Tucson Mountain Unit. Palo verde dominates the overstory and triangle-leaf bursage dominates the understory. Other shrubs include acacia, creosote, desert zinnia, ratany, mesquite, buckwheat and paperflower. Grasses include fluffgrass, bush muhly, and three-awn. Cacti include cholla, barrel, Mammalaria, and saguaros. Limberbush, false mesquite, graythorn may also occur.

154.121b Palo verde-mixed shrub-mixed cacti-zinnia

This association contains species similar to 154.121a but the understory shrub is usually desert zinnia, although burroweed and brittlebush also occur. This association occurs in and near the Rincon Mountain Unit.

154.121c Palo verde-mixed shrub-mixed cacti-burroweed

This association is similar to 154.121a and b, but with burroweed as the predominant understory shrub. Burroweed tends to occur on slightly better soils than desert zinnia and indicates potential for greater plant production.

154.122 Palo verde-saguaro-mixed cacti-mixed scrub association

This association occurs most often on rocky uplands and is dominated visually by palo verde and saguaro cacti. A variety of other shrubs, grasses and cacti also occur.

154.123 Jojoba-mixed scrub association

Jojoba may occur as the sole overstory shrub, as on the hills by Camino del Cerro Road east of the Tucson Mountains, or as part of the shrub community, as in the Rincon Mountain Unit near Javelina Rocks along the loop drive. It is a valuable plant for wildlife (Brown 1982).

154.124a Palo verde-creosote-mixed scrub association

Palo verde and creosote are co-dominants in this upland association. A mixture of species from the palo verde-cacti series and the creosote series may occur.

154.124b Palo verde-creosote- baccharis-brittlebush-ocotillo association

This association occurs in a hilly pediment area west Freeman Rd and north east of Monument Headquarters in the Rincon Mountain Unit. The relative dominance of the shrub species varies with soil, aspect and slope. Soils are a mixture of shallow gravelly loam over bedrock and shallow limey soils. Grasses in the understory include bush muhly, three awn, fluff grass. Saguaro cacti also occur in this type.

154.125 Palo verde-saguaro-creosote association

This association was found mainly within the boundary of the Rincon Mountain Unit east of the end of Speedway Road. It is dominated by all three species and includes a variety of other cacti, desert zinnia, a little burroweed and very few grasses.

154.126 Palo verde-saguaro- brittlebush association

This association was adopted from the vegetation map by Kurzius (1983) and includes palo verde and saguaro overstory with an understory of brittlebush and burroweed; other cacti, grasses, ocotillo, some creosote and snakeweed are also present.

154.128a Palo verde-acacia-mixed cacti-mixed scrub-grass association

This association occurs primarily south of the Rincon Mountains and grades into several other palo verde associations. Usually it is dominated by a mixture of palo verde, acacia, creosote and cacti with an understory of grasses (three awn, fluffgrass and bush muhly) and shrubs (burroweed, desert zinnia, brittlebush). Other shrubs occur locally including mesquite, false mesquite, mariola, wolfberry, limberbush, Condalia spp., paperflower, and Lippia. Saguaro cacti occur in this type but a separate category, 154.128b, is presented to distinguish areas where saguaros are more prevalent.

154.128b Palo verde-acacia-saguaro-mixed cacti-mixed scrub-grass association

Similar to the above type 154.128a, but with saguaro cacti more prevalent.

154.129a Mesquite-acacia-paloverde-mixed cacti-mixed scrub association

This association occurs mainly on the southern boundary and foothills of the Rincon Mountains. Mesquite, acacia and littleleaf palo verde dominate the overstory. The vegetation in this type is very diverse and the relative volume of vegetation is greater than in type 154.128 (S.W.C.A., Inc. 1986). Both whitethorn and catclaw acacia occur and the understory tends to be burroweed and perennial grasses. Other shrubs such as desert hackberry, ephedra, graythorn, wolfberry, and mariola also occur locally, especially near drainages. Saguaro occur in this type but are found more frequently in 154.129b.

154.129b Mesquite-acacia- saguaro-mixed cacti-mixed scrub-grass association

Same as above but with denser stands of saguaro.

154.15 Buckwheat-agave community

154.155 Buckwheat-mixed scrub association

This association was identified on a north facing slope west of Wasson Peak in the Tucson Mountain Unit. The dominant species are "bush" or "flattop" buckwheat and Agave spp. (See Central Arizona Project Resource Inventory).

224.52 Mesquite Series-Riparian Communities

These riparian areas vary from narrow, sandy channels bordered by a slightly denser stand of shrubs and trees to extensive floodplains with mixed deciduous woodland along the main channels and extensive, dense stands of mesquite or mesquite and mixed short trees and shrubs. They are characterized by greater soil moisture and deeper soils which result in greater vegetative productivity.

224.521 Mesquite bosque association

Formerly extensive along watercourses in Pima County, now reduced to a few locations near major washes such as Tanque Verde wash north of the Rincon Mountain Unit, a few areas along Brawley Wash west of the Tucson Mountain Unit. These bosques are interspersed with other riparian vegetation types. Dense stands of native annual and perennial grasses characterize the undisturbed bosque. Introduced forbs and grasses are common (Brown 1982).

224.522 Mesquite-mixed short tree association

This association includes many species of trees and shrubs and often a denser understory of grasses and sub-shrubs than the surrounding uplands. Typically, mesquite is accompanied by desert hackberry, wolfberry and/or Condalia spp., graythorn and blue palo verde, burroweed and some cacti. Other species which may be present are seep willow, white burro

brush, saltbush, desert willow and cacti including saguaros.

224.523 Mesquite-Lycium-mixed scrub

This is a riparian scrub vegetation lacking the taller trees of the mesquite short tree association. Creosote and other shrubs predominate with the mesquite and wolfberry (Lycium).

224.524 Mesquite-ironwood association

This association was identified in and around the Tucson Mountain Unit in areas of sheet flooding on the bajada west of the Tucson Mountains and riparian areas to the east and south. Many other shrubs and trees of both riparian and palo verde upland associations may occur in this type.

224.525 Mesquite- mixed broadleaf association

This association is restricted to channels where permanent or at least intermittantly flowing streams occur. Willow, cottonwood, velvet ash, sycamore, Arizona black walnut, Mexican elderberry and mesquite are trees occurring in this type. This association occurred in particular to the north and south of the Rincon Mountain Unit within 2 mile of the border of Saguaro National Monument.

SPECIES LIST

Agave
Arizona black walnut
Barrel cactus
Blue Palo verde
Brittlebush
Bush or flattop buckwheat
Burroweed
Bush muhly
Catclaw acacia
Cholla cactus
Condalia
Cottonwood
Creosote
Desert hackberry
Desert zinnia
Desert willow
Ephedra
False mesquite, fairy duster
Fourwing saltbush
Fluff grass
Graythorn
Jojoba
Ironwood
Limberbush

Agave spp.
Juglans microcarpa
Ferocactus spp.
Cercidium floridum
Encelia farinosa
Eriogonum fasciculatum
Haplopappus tenuisectus
Muhlenbergia porteri
Acacia greggii
Opuntia spp.
Condalia spp.
Populus fremontii
Larrea tridentata
Celtis pallida
Zinnia acerosa
Chilopsis linearis
Ephedra spp.
Calliandra eriophylla
Atriplex canescens
Tridens pulchellus
Ziziphus obtusifolia
Simmondsia chinensis
Olneya tesota
Jatropha cardiophylla

Lippia
Little leaf palo verde
Mammalaria cacti
Mariola
Mesquite
Mexican elderberry
Ocotillo
Opuntia cactus
Ratany
Paperflower
Saguaro
Snakeweed
Sycamore
Three awn
Triangle-leaf bursage
Velvet ash
Whitethorn acacia
White burro brush
Wolfberry
Yucca

Lippia wrightii
Cercidium microphyllum
Mammalaria spp.
Parthenium incanum
Prosopis juliflora
Sambucus mexicana
Fouquieria splendens
Opuntia spp.
Krameria spp.
Psilostrophe cooperi
Carnegiea gigantea
Gutierrezia spp.
Platanus racemosa
Aristida spp.
Ambrosia deltoidea
Fraxinus pennsylvanica
Acacia constricta
Hymenoclea salsola
Lycium spp.
Yucca spp.

Other species occurring in Sonoran desert plant communities are discussed in Brown (ed.) Biotic Communities of the American Southwest-United States and Mexico. 1982. Special Issue of Desert Plants, vol. 4, no. 1-4.

See also:

Biological Resource Inventory, Tucson Division--Phase B, Central Arizona Project. Arizona Game and Fish Dept. prepared for the Bureau of Reclamation, Feb. 1983).

A Preliminary Classification of the Vegetation of the Rincon Mountain Unit of Saguaro National Monument Based on Spectral Analysis of Landsat Imagery and Ground Data by Margaret Kurzius, Spring 1983.

Trees and Shrubs of the Southwestern Deserts by Lyman Benson and Robert Darrow. The University of Arizona Press, 1981.

Preliminary Ecological Assessment of the Rocking K Ranch, S.W.C.A., Inc., Review Draft Feb. 5, 1986.