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Vegetation Inventory, Mapping, and Characterization Report, Saguaro National Park

Volume III, Type Descriptions

Natural Resource Report NPS/SODN/NRR—2021/2238



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ON THE COVER

Representative photos of vegetation associations found in Saguaro National Park. NPS photos.

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Executive Summary

The Sonoran Desert Network (SODN) conducted a vegetation mapping and characterization effort at the two districts of Saguaro National Park from 2010 to 2018. This project was completed under the National Park Service (NPS) Vegetation Mapping Inventory, which aims to complete baseline mapping and classification inventories at more than 270 NPS units. The vegetation map data were collected to provide park managers with a digital map product that meets national standards of spatial and thematic accuracy, while also placing the vegetation into a regional and national context.

A total of 97 distinct vegetation communities were described: 83 exclusively at the Rincon Mountain District, 9 exclusively at the Tucson Mountain District, and 5 occurring in both districts. These communities ranged from low-elevation creosote (*Larrea tridentata*) shrublands spanning broad alluvial fans to mountaintop Douglas fir (*Pseudotsuga menziesii*) forests on the slopes of Rincon Peak. All 97 communities were described at the association level, each with detailed narratives including lists of species found in each association, their abundance, landscape features, and overall community structural characteristics. Only 15 of the 97 vegetation types were existing "accepted" types within the NVC. The others are newly described and specific to Saguaro National Park (and will be proposed for formal status within the NVC).

This document is Volume III of three volumes comprising the Saguaro National Park Vegetation Mapping Inventory. This volume provides full type descriptions of the 97 associations identified and mapped during the project, and detailed in Volume I. Volume II provides abridged versions of these full descriptions, briefly describing the floristic and structural characteristics of the vegetation and showing representative photos of associations, their distribution, and an example of the satellite imagery for one polygon.

Introduction

The Sonoran Desert Network (SODN) conducted a vegetation mapping and characterization effort at Saguaro National Park from 2010 to 2018. This project was completed under the National Park Service (NPS) Vegetation Mapping Inventory, which aims to complete baseline mapping and classification inventories at more than 270 NPS units. The vegetation map data were collected to provide park managers with a digital map product that meets national standards of spatial and thematic accuracy, while also placing the vegetation into a regional and national context.

Saguaro National Park consists of two units located at opposite ends of Tucson, Arizona. The Rincon Mountain District (RMD) spans the Rincon and Tanque Verde Mountains to the east of Tucson, while the Tucson Mountain District (TMD) spans the Tucson Mountains to the west of Tucson. These units were completed as separate projects due to their large size and considerable differences in vegetation communities, elevational range, and geology. This report combines the projects from both units into one cohesive document.

Vegetation mapping and characterization comprised four major phases: (1) field-based data collection, (2) development of vegetation community types at the National Vegetation Classification (NVC) association level, (3) development of the vegetation map, and (4) accuracy assessment of the vegetation map. These phases began at the TMD in spring 2010 and at the RMD in spring 2013. The final phase, accuracy assessment, was completed at the TMD in fall 2016 and at the RMD in summer/fall 2018.

A total of 97 distinct vegetation communities were described: 83 exclusively at the RMD, 9 exclusively at the TMD, and 5 occurring in both districts. These communities ranged from low-elevation creosote (*Larrea tridentata*) shrublands spanning broad alluvial fans to mountaintop Douglas fir (*Pseudotsuga menziesii*) forests on the slopes of Rincon Peak. All 97 communities were described at the association level, each with detailed narratives including lists of species found in each association, their abundance, landscape features, and overall community structural characteristics. Only 15 of the 97 vegetation types were existing "accepted" types within the NVC. The others are newly described and specific to Saguaro National Park (and will be proposed for formal status within the NVC).

This document is Volume III of three volumes comprising the Saguaro National Park Vegetation Mapping Inventory. This volume provides full type descriptions of the 97 associations identified and mapped during the project, and detailed in Volume I. Volume II provides abridged versions of these full descriptions, briefly describing the floristic and structural characteristics of the vegetation and showing representative photos of associations, their distribution, and an example of the satellite imagery for one polygon.

Type Descriptions, Tucson Mountain District

1. *Parkinsonia microphylla* / *Opuntia* spp. - *Ambrosia salsola* / *Muhlenbergia porteri* Shrubland Association (P)

Translated name: Yellow paloverde / Pricklypear species - Burrobush / Bush muhly Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN111

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Mojave-Sonoran Bajada and Valley Desert Scrub [G295]
Alliance	–
Association	*Parkinsonia microphylla* / *Opuntia* spp. - *Ambrosia salsola* / *Muhlenbergia porteri* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Tucson Mountain District

This community is found in the Tucson Mountain District (TMD) along a major drainage/alluvial fan system that runs northwest from the Wasson Peak area.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Tucson Mountain District

This association occurs on low-angle (<10%) and north-trending alluvial fans from 700 to 9,638 meters (2,300–3,175 ft). The surface cover is characterized by fine gravel and fine, silty soils typically composed of old and new alluvium.

VEGETATION DESCRIPTION

Saguaro National Park, Tucson Mountain District

This xeroriparian association is characterized by an open (<10%) canopy (>2 m) of yellow paloverde (*Parkinsonia microphylla*), a subcanopy (0.5–2 m) dominated by sandy, wash-loving burrobush (*Ambrosia salsola*) and pricklypear (*Opuntia* ssp.), and a field stratum (<0.5 m) by bush muhly (*Muhlenbergia porteri*).

Yellow paloverde (*Parkinsonia microphylla*) is present as relatively large (3–4 m), mature trees with cover ranging from 3% to 6 %. Occasionally, desert ironwood (*Olneya tesota*) can appear with cover equal to, and rarely surpassing, yellow paloverde (*Parkinsonia microphylla*). Saguaro (*Carnegiea gigantea*) is present in all examples, but in relatively low densities.

In the subcanopy, burrobush (*Ambrosia salsola*) is a consistent (1.0) dominant that provides cover ranging from 3 to 10%. The consistency and dominance of this species is diagnostic of this community. Combined, cactus apple (*Opuntia engelmannii*) and tulip pricklypear (*Opuntia phaeacantha*) provide cover similar to burrobush (*Ambrosia salsola*). These species form large, round individual clumps spaced widely apart. A variety of other associate species were documented in the subcanopy layer; these include spiny hackberry (*Celtis ehrenbergiana*), buckhorn cholla (*Cylindropuntia acanthocarpa*), chain-fruit cholla (*Cylindropuntia fulgida*), whitethorn acacia (*Vachellia constricta*), Berlandier's wolfberry (*Lycium berlandieri*), sangre de cristo (*Jatropha cardiophylla*), creosote bush (*Larrea tridentata*), four-wing saltbush (*Atriplex canescens*), lotebush (*Ziziphus obtusifolia*), and candy barrelcactus (*Ferocactus wislizeni*).

The field layer is quite sparse in this association, with bushy muhly (*Muhlenbergia porteri*) as the sole dominant with consistent (1.0) cover around 2%. Other noteworthy field components include pinkflower hedgehog cactus (*Echinocereus fasciculatus*), spidergrass (*Aristida ternipes*), purple threeawn (*Aristida purpurea*), and slender janusia (*Cottsia gracilis*).

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This desert scrub vegetation group forms the vegetation matrix in broad valleys, lower bajadas, plains, and low hills in the Mojave, western Sonoran, and Lower Colorado deserts where winter (cool-season) precipitation prevails. This desert scrub is characterized by a sparse to moderately dense layer (2–50% cover) of xeromorphic, microphyllous and broad-leaved shrubs. *Larrea tridentata* and *Ambrosia dumosa* typically dominate and are diagnostic of this group, but many different shrubs, dwarf shrubs, and cacti may co-dominate or form typically sparse understory layers. Associated species may Include *Encelia farinosa*, *Ephedra aspera*, *Ephedra nevadensis*, *Fouquieria splendens*, *Lycium andersonii*, *Opuntia basilaris*, and *Cylindropuntia bigelovii*. The herbaceous layer is typically sparse, but it may be seasonally abundant with ephemerals. Herbaceous species, such as *Aristida* spp., *Chamaesyce* spp., *Cryptantha* spp., *Dasyochloa pulchella*, *Eriogonum inflatum*, *Nama* spp., and *Phacelia* spp., are common. On sandy sites, the perennial grass *Pleuraphis rigida* may be abundant with *Ambrosia dumosa*. Stands can often appear as very open sparse vegetation, with the mostly barren ground surface being the predominant feature.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 1. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Carnegiea gigantea* (1.0)
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0)
Subcanopy (0.5–2 m)	*Ambrosia salsola* (1.0), *Opuntia engelmannii* (0.75), *Opuntia phaeacantha* (0.5)
Field (0–0.5 m)	*Muhlenbergia porteri* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 2. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Olneya tesota*
Subcanopy (0.5–2 m)	*Cylindropuntia acanthocarpa, Cylindropuntia fulgida, Lycium berlandieri, Ziziphus obtusifolia, Phoradendron californicum, Vachellia constricta, Larrea tridentata, Jatropha cardiophylla, Ferocactus wislizeni, Atriplex canescens, Baccharis brachyphylla*
Field (0–0.5 m)	*Echinocereus fasciculatus, Aristida ternipes, Aristida purpurea, Cottsia gracilis, Krameria bicolor*

CLASSIFICATION COMMENTS

Saguaro National Park, Tucson Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from three classification plots and one mapped polygon sampled during the 2010 mapping and classification effort.

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons:

ELEMENT SOURCES

Saguaro National Park

Inventory Notes: Data not available

Plots: IP102, IP114, IP188

Polygons: S305

Local Description Authors: S. Studd, J. Galvin

Citations

Brown, D. E., C. H. Lowe, and C. P. Pase. 1979. Mojave-Sonoran Bajada and Valley Desert Scrub, version date 16Apr2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed November 1, 2019.

6. (*Carnegiea gigantea*) / *Parkinsonia microphylla* / *Larrea tridentata - Opuntia engelmannii* (*Vachellia constricta*) / *Krameria bicolor* Wooded Shrubland Association (P)

Translated name: (Saguaro) / Yellow paloverde / Creosote bush - Cactus apple (Whitethorn acacia) / White ratany Wooded Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN115

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	(*Carnegiea gigantea*) / *Parkinsonia microphylla* / *Vachellia constricta - Larrea tridentata* / *Krameria bicolor* Wooded Shrubland (P)

DISTRIBUTION

Saguaro National Park, Tucson Mountain District

This community is restricted to a few small areas in the northern part of the Tucson Mountain District (TMD). One area is south of Picture Rocks Road and roughly bounded by Ironwood and Ringtail trails on the west and east sides. The other area is along the eastern boundary section that spurs outward, close to Veteran's Trail.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Tucson Mountain District

This wooded shrubland community spans a low-angle (<15%) and broad semi-alluvial section of rolling hills from 700 to 945 meters (2,300–3,100 ft). These hills are often bisected by shallow drainages and low-height interfluves. The surface cover is dominated by a layer of fine gravel with scattered rocks throughout.

VEGETATION DESCRIPTION

Saguaro National Park, Tucson Mountain District

This community is characterized by a very open (<5%) canopy of yellow paloverde (*Parkinsonia microphylla*), a subcanopy co-dominated by whitethorn acacia (*Vachellia* constricta) and creosote (*Larrea tridentata*), and a field stratum (<0.5 m) dominated by white ratany (*Krameria bicolor*). The type is notable due to the almost complete absence of triangle bur ragweed (*Ambrosia deltoidea*) and brittlebush (*Encelia farinosa*), two species that tend to dominate communities sharing similar habitat.

In the canopy, yellow paloverde (*Parkinsonia microphylla*) averages 3% cover, growing mostly as small trees up to 4 meters in height. Saguaro (*Carnegiea gigantea*) is a consistent (1.0) associate with average cover around 1%. Ocotillo (*Fouquieria splendens*) is a patchy (0.67) and low-cover (<1%) associate. Velvet mesquite (*Prosopis velutina*) is an uncommon (0.33) associate that, when present, provides minimal cover (<1%).

Whitethorn acacia (*Vachellia* constricta) and creosote (*Larrea tridentata*) are very consistent (1.0) subcanopy dominants with average cover around 5% and 2%, respectively. Buckhorn cholla (*Cylindropuntia acanthocarpa*) is a consistent (1.0) and low-cover (1%) associate. Other noteworthy subcanopy species include Warnock's snakewood (*Condalia warnockii*), catclaw acacia (*Senegalia greggii*), and Berlandier's wolfberry (*Lycium berlandieri*).

In the field stratum, white ratany (*Krameria bicolor*) is a consistent (1.0) dominant with cover ranging from 1% to 3%. Other noteworthy field species include Christmas cholla (*Cylindropuntia leptocaulis*), pencil cholla (*Cyl-*

indropuntia arbuscula), pinkflower hedgehog cactus (*Echinocereus fasciculatus*), candy barrelcactus (*Ferocactus wislizeni*), American threefold (*Trixis californica*), rough menodora (*Menodora scabra*), whitestem paperflower (*Psilostrophe cooperi*), and desert senna (*Senna covesii*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*, and many cacti, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, *and Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 3. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Carnegiea gigantea* (1.0)
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0)
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0), *Vachellia constricta* (1.0)
Field (0–0.5 m)	*Krameria bicolor* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 4. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina, Fouquieria splendens*
Subcanopy (0.5–2 m)	*Condalia warnockii, Cylindropuntia acanthocarpa, Senegalia greggii, Cylindropuntia arbuscula, Trixis californica, Ferocactus wislizeni, Jatropha cardiophylla, Lycium berlandieri, Opuntia engelmannii*
Field (0–0.5 m)	*Echinocereus fasciculata, Senna covesii, Menodora scabra, Psilostrophe cooperi, Ambrosia deltoidea*

CLASSIFICATION COMMENTS

Saguaro National Park, Tucson Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from three classification plots sampled during the 2010 mapping and classification effort.

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons:

ELEMENT SOURCES

Saguaro National Park

Inventory Notes: Data not available

Plots: IP046, IP087, IP100

Polygons: Data not available

Local Description Authors: S. Studd, N. Gonzalez, J. Galvin

Citations

Schulz, K. A. 2013. *Carnegiea gigantea - Parkinsonia microphylla - Prosopis velutina* Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

10. (*Parkinsonia microphylla - Fouquieria splendens*) / *Encelia farinosa* (*Cottsia gracilis*) Shrubland Association (P)

Translated name: (Yellow paloverde - Ocotillo) / Brittlebush (Slender janusia) Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN129

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	(*Parkinsonia microphylla - Fouquieria splendens*) / *Encelia farinosa* (*Cottsia gracilis*) Shrubland (P)

DISTRIBUTION

Saguaro National Park

In the Rincon Mountain District (RMD), this widespread community is present throughout the low slopes of Tanque Verde Ridge and above the Madrona Ranger Station. In the Tucson Mountain District (TMD), it covers large portions in the southern areas of the park, especially on the slopes of Wasson Peak.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park

This community is predominantly present on steep (40%) and exposed, south-facing slopes from 730 to 1,470 meters (2,400–4,820 ft). The surface cover is characterized by very shallow and well-drained, loamy soils interspersed/covered with very coarse gravel and rock with vast expanses of bedrock outcrops/shelves. The bedrock outcrops/shelves are primarily composed of gneissic granodiorite (RMD), quartz monzonite (RMD), and granite (TMD).

VEGETATION DESCRIPTION

Saguaro National Park

This shrubland association is characterized by a sparse (<10%) canopy (>2 m) of yellow paloverde (*Parkinsonia microphylla*) and ocotillo (*Fouquieria splendens*) with a variable (8–35%) field layer (<0.5 m) dominated by brittlebush (*Encelia farinosa*) and slender janusia (*Cottsia gracilis*). Ocotillo (*Fouquieria splendens*) is a very consistent (>0.9), common associate with 3 to 4 meter tall individuals that provide around 1% to 3% [8] cover throughout. Yellow paloverde (*Parkinsonia microphylla*) is also a consistent (1.0) associate that rarely surpasses 5% cover, but it has rare inclusions with cover approaching 20%. This species ranges from small (<2 m), shrubby individuals to sizeable (4+ m), single-stem trees. At RMD, velvet mesquite (*Prosopis velutina*) provides inconsistent (0.33) cover ranging from absent to 3%. Saguaros (*Carnegiea gigantea*) are present throughout this community (1.0), but they contribute little (1%) to overall vegetation cover.

The subcanopy stratum is primarily characterized by a mix of low-cover associate shrubs and succulents. At RMD, cactus apple (*Opuntia engelmannii*) is a patchy (0.66) associate that, when present, provides cover ranging up to 5%. This species is less common (0.42) and provides less cover (<1%) at TMD. Other noteworthy shrubs include staghorn cholla (*Cylindropuntia versicolor*; RMD only), buckhorn cholla (*Cylindropuntia acanthocarpa*; TMD only), catclaw acacia (*Senegalia greggii*), Berlandier's wolfberry (*Lycium berlandieri*), teddybear cholla (*Cylindropuntia bigelovii*), spiny hackberry (*Celtis ehrenbergiana*), whitethorn acacia (*Vachellia* constricta), and Wright's beebrush (*Aloysia wrightii*). When present, these species rarely contribute more than 4% cover. Within this community, teddybear cholla (*Cylindropuntia bigelovii*) should only provide small and patchy inclusions; it should not become a consistent dominant.

The field stratum is characterized by the dominance of brittlebush (*Encelia farinosa*), which is the most consistent (1.0) and highest-cover (5–10% [20]) species in this community. In areas invaded by buffelgrass (*Cenchrus ciliaris*), cover of brittlebush (*Encelia farinosa*) can be considerably reduced (1–2%). The remaining cover is split amongst a diverse mix of small shrubs, subshrubs, and grasses. Slender janusia (*Cottsia gracilis*) is the most dominant of these species, providing consistent (>0.8) cover averaging around 3% across the community. Fairyduster (*Calliandra eriophylla*) and sangre de cristo (*Jatropha cardiophylla*) are the next most common low-cover associates, providing 1% to 2% cover each (with occasional inclusions up to 8%). The grass component is quite diverse with at least five noteworthy bunch grasses, including bush muhly (*Muhlenbergia porteri*), tanglehead (*Heteropogon contortus*), sideoats grama (*Bouteloua curtipendula*), slender grama (*Bouteloua repens*), and Arizona cottontop (*Digitaria californica*). Overall, these species provide little cover (<1%). Other documented species include cloakfern (*Astrolepis* sp.), paleface (*Hibiscus denudatus*), candy barrelcactus (*Ferocactus wislizeni*), yellow Indian mallow (*Abutilon malacum*), pinkflower hedgehog cactus (*Echinocereus fasciculatus*), and cockroach plant (*Haplophyton crooksii*). While not consistent across the community, both buffelgrass (*Cenchrus ciliaris*) and Lehmann lovegrass (*Eragrostis lehmanniana*) were documented with local cover values ranging up to 18% in one instance.

At the slightly higher elevations (i.e., 1,100 to 1,470 meters [3,600–4,820 ft]), on less-exposed aspects, this community also supports species, such as Arizona spikemoss (*Selaginella arizonica*) and Schott's century plant (*Agave schottii*), that are normally restricted to cooler, northern slopes. Arizona spikemoss (*Selaginella arizonica*) was seen with cover ranging from 6% to 20%, occurring in somewhat patchy distribution. Schott's century plant (*Agave schottii*) only grew in occasional small patches, mostly in the most sheltered spots.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa (in drier sites)*, *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*. Many cacti are also present, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 5. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Carnegiea gigantea* (1.0, 1.0)
Canopy (2–5 m)	*Fouquieria splendens* (1.0, 0.95), *Parkinsonia microphylla* (1.0, 1.0)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Encelia farinosa* (1.0, 1.0), *Janusia gracilis* (0.92, 0.81)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association with RMD listed first, then TMD).

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 6. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina*
Subcanopy (0.5–2 m)	*Opuntia engelmannii, Cylindropuntia versicolor, Cylindropuntia acanthocarpa, Senegalia greggii, Lycium berlandieri, Cylindropuntia bigelovii, Celtis ehrenbergiana, Aloysia wrightii, Vachellia constricta*
Field (0–0.5 m)	*Calliandra eriophylla, Jatropha cardiophylla, Muhlenbergia porteri, Astrolepis* sp., *Heteropogon contortus, Bouteloua curtipendula, Bouteloua repens, Digitaria californica, Cenchrus ciliaris, Eragrostis lehmanniana, Hibiscus denudatus, Ferocactus wislizeni, Abutilon malacum, Echinocereus fasciculatus, Haplophyton crooksii*

CLASSIFICATION COMMENTS

Saguaro National Park

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from eight classification plots sampled at RMD during the 2013–2017 mapping and classification effort, and 23 classification plots and three mapped polygons sampled at TMD during the 2010 mapping and classification effort.

At RMD, polygons attributed as NPSSODN129 overlapped with two groups classified by Roseberry and Dole (1937), a broad group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*), and a semi-desert chaparral group defined by an open area dominated by "shrub species common to the Sonoran life zone."

Global

This provisional association fits well within the Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, A3282. At this time, there is no association that is a match for our described community, NPSSODN129.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory Notes: Data not available

Plots: IPS024U, IPS036U, IPS072U, IPS091U, IPS106U, IP225U, IP341U, IP347U, V202_002, V202_003, 202_007

Saguaro National Park, Tucson Mountain District

Plots: IP002, IP005, IP006, IP026, IP055, IP068, IP071, IP090, IP091, IP092, IP093, IP109, IP112, IP120, IP138, IP147, IP151, IP155, IP156, IP165, IP182, IP189, IP192

Polygons: S235, S236, S310

Local Description Authors: J. Galvin, S. Studd, N. Gonzalez

Citations

Roseberry, R. D., and N. E. Dole. 1937. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Carnegiea gigantea - Parkinsonia microphylla - Prosopis velutina* Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. http://usnvc.org, accessed October 28, 2019.

13. (*Parkinsonia microphylla*) / *Larrea tridentata* - Mixed Cacti / *Ambrosia deltoidea* Shrubland Association (P)

Translated name: (Yellow paloverde) / Creosote bush - Mixed Cacti / Triangle bur ragweed Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN093

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	(*Parkinsonia microphylla*) / *Larrea tridentata* - Mixed Cacti / *Ambrosia deltoidea* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Tucson Mountain District

This community occurs at the Tucson Mountain District (TMD), mainly in the westernmost outskirts and in the northwest corner of the park.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Tucson Mountain District

This association spans low-angle (<5%) alluvial fans of variable aspect from 670 to 878 meters (2,200–2,880 ft). A few examples exist on low hillslopes above the alluvial fan. The surface cover is characterized by a dominant layer of gravel and bare soil, typically composed of old and new alluvium. Biological soil crusts are usually present and sometimes locally abundant.

VEGETATION DESCRIPTION

Saguaro National Park, Tucson Mountain District

This community is characterized by an open (<10%) canopy (>2 m) of yellow paloverde (*Parkinsonia* microphylla), a variable (5–20%) subcanopy (0.5–2 m) dominated by creosote and a diverse suite of succulents, and a sparse (<5%) field stratum (<0.5 m) dominated by triangle bur ragweed (*Ambrosia deltoidea*).

In the canopy, yellow paloverde *(Parkinsonia microphylla*) grows as a short (3 m) tree contributing cover that typically ranges from 2 to 5% with occasional dense inclusions up to 10%. Ocotillo *(Fouquieria splendens)* is a common (0.60), low-cover (1%) associate. Saguaro (*Carnegiea gigantea*) is present as a low-density associate in all examples of this community with a median of 7 individuals per classification plot. In rare expressions of this type, desert ironwood (*Olneya tesota*) may appear and become co-dominant with, or more dominant than, yellow paloverde (*Parkinsonia microphylla*).

Creosote bush (*Larrea tridentata*) is the most dominant species in this community, providing consistent (1.0) cover that typically ranges from 3 to 10%, with some dense inclusion up to 20%. When combined, cactus species are the next most common group of subcanopy species with average cover approaching 5%. In order from most to least frequent, these species include chain-fruit cholla (*Cylindropuntia fulgida*), buckhorn cholla (*Cylindropuntia acanthocarpa*), and cactus apple (*Opuntia engelmannii*). Whitethorn acacia (*Vachellia constricta*) is a patchy (0.5), low-cover (<1%) associate.

Triangle bur ragweed (*Ambrosia deltoidea*) is a consistent (1.0) dominant in the field stratum, contributing with cover that ranges from 3% to 6%. Pencil cholla (*Cylindropuntia arbuscula*) and Christmas cholla (*Cylindropuntia*

leptocaulis) are occasional (0.2, 0.5) associates that are tied to lower areas of water flow or accumulation. These species may not be found in examples spanning large interfluves. The low-shrubs, slender janusia (*Cottsia gracilis*), sangre de cristo *(Jatropha cardiophylla)*, and white ratany (*Krameria bicolor*), are occasional associates, especially on sites approaching upper alluvial fans. Other noteworthy field species include pinkflower hedgehog cactus (*Echinocereus fasciculatus*) and candy barrelcactus (*Ferocactus wislizeni*).

Extremely homogenous variants of this type are seen occasionally, where the diversity is reduced and creosote bush (*Larrea tridentata*) more or less becomes the sole dominant. These instances occur in the lower reaches of the bajada where the landscape is usually low angled to flat, with fine soil. The same associated species occur in these situations, just infrequently. In other instances, pricklypear (*Opuntia ssp.*) can become the major dominant and creosote bush (*Larrea tridentata*) will be reduced to occasional. In some areas, this type can also be reduced to a creosote (*Larrea tridentata*)-buckhorn cholla (*Cylindropuntia acanthocarpa*) shrubland with occasional desert ironwood (*Olneya tesota*) or yellow paloverde *(Parkinsonia microphylla)* trees and a highly reduced to absent field layer (basically lacking the triangle bur ragweed [*Ambrosia deltoidea*] altogether). These areas can be relatively small and are considered patchy inclusions.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa (in drier sites)*, *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*, and many cacti, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 7. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Carnegiea gigantea* (1.0)
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0)
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0), *Cylindropuntia fulgida* (0.91), *Opuntia engelmannii* (1.0)
Field (0–0.5 m)	*Ambrosia deltoidea* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 8. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Olneya tesota, Fouquieria splendens*
Subcanopy (0.5–2 m)	*Cylindropuntia acanthocarpa, Jatropha cardiophylla, Lycium berlandieri, Ferocactus wislizeni, Opuntia phaeacantha, Cylindropuntia leptocaulis, Cylindropuntia arbuscula*
Field (0–0.5 m)	*Cottsia gracilis, Krameria bicolor, Echinocereus fasciculatus*

CLASSIFICATION COMMENTS

Saguaro National Park, Tucson Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 30 classification plots and 11 mapped polygons sampled during the 2010 mapping and classification effort.

This association fits well within the accepted USNVC alliance, A3282, Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance. The association likely occurs in this alliance, but is not classified.

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons:

ELEMENT SOURCES

Saguaro National Park

Inventory Notes: Data not available

Plots: IP013, IP014, IP024, IP028, IP029, IP031, IP034, IP039, IP041, IP045, IP052, IP056, IP057, IP070, IP076, IP077, IP080, IP095, IP101, IP107, IP113, IP122, IP125, IP130, IP136, IP141, IP180, IP187, IP191, IP198

Polygons: S229, S258, S278, S281, S282, S283, S288, S290, S293, S304, WS004

Local Description Authors: S. Studd, J. Galvin

Citations

Schulz, K. A. 2013. Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 31, 2019.

18. [*Ephedra* sp. - *Parthenium incanum - Larrea tridentata*] Shrubland Association (P)

Translated name: [Jointfir - Mariola - Creosote bush] Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN175

NVC CLASSIFICATION

Division	–
Macrogroup	–
Group	–
Alliance	–
Association	*Larrea tridentata* [*Ephedra aspera - Parthenium incanum*] Shrubland (P)

DISTRIBUTION

Saguaro National Park, Tucson Mountain District

This shrubland occurs in the Tucson Mountain District (TMD), exclusively in the vicinity of Safford Peak in the northern portion of the district.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Tucson Mountain District

This shrubland occurs on the generally northeast-facing, rocky backslopes from approximately 884 to 975 meters (2,900–3,200 ft). These slopes are moderate to steep (20–50+%). The surface is dominated by rock and gravel with a parent material that is predominantly on extrusive igneous bedrock.

VEGETATION DESCRIPTION

Saguaro National Park, Tucson Mountain District

This shrubland association is characterized by a very open (<5%) canopy (>2 m), a subcanopy (0.5–2 m) dominated by creosote (*Larrea tridentata*), and a field stratum (<0.5 m) dominated by rough jointfir (*Ephedra aspera*) and mariola (*Parthenium incanum*). The vegetation is very open and sparse, and it forms a relatively stunted shrubland with the majority of shrubs growing at, or less than, 1 meter tall. Yellow paloverde (*Parkinsonia microphylla*) is present as a short tree (2–3 m) that, when present, provides cover from 1% to 3%. Saguaro (*Carnegiea gigantea*) and ocotillo (*Fouquieria* splendens) are patchy (0.5), low-cover (<1%) associates.

In the subcanopy, creosote bush (*Larrea tridentata*) provides consistent (1.0) cover that ranges from 5% to 15%. It was often recorded as a medium-sized shrub with heights ranging from 1 to 1.5 meters. Other documented subcanopy species include Wright's beebrush (*Aloysia wrightii*), wolfberry (*Lycium* spp.), and buckhorn cholla (*Cylindropuntia acanthocarpa*).

In the field stratum, rough jointfir (*Ephedra aspera*) and mariola (*Parthenium incanum*) present as co-dominants or with one becoming the sole dominant and the other a subdominant. Both species provide consistent (1.0) and low cover (1–3%) throughout this community. Districtwide, these species are uncommon, and their combined appearance in this community, albeit with low cover, is indicative of this association. Other documented field species include large-petal onion (*Allium macropetalum*), Arizona spikemoss (*Selaginella arizonica*), spiny cliffbrake fern (*Pellaea truncata*), slender janusia (*Cottsia gracilis*), shrubby thoroughwort (*Koanophyllon solidaginifolium)*, brownfoot (*Acourtia* wrightii), rough menodora (*Menodora scabra*), white ratany (*Krameria grayi*), slender poreleaf (*Porophyllum gracile*), American threefold (*Trixis californica*), and fairyduster (*Calliandra eriophylla*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 9. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0), *Ephedra aspera* (1.0)
Field (0–0.5 m)	*Parthenium incanum* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 10. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Carnegiea gigantea, Parkinsonia microphylla, Fouquieria splendens*
Subcanopy (0.5–2 m)	*Lycium* spp., *Aloysia wrightii, Vachellia constricta, Cylindropuntia acanthocarpa, Simmondsia chinensis*
Field (0–0.5 m)	*Cottsia gracilis, Selaginella arizonica, Pellaea truncata, Koanophyllon solidaginifolium, Acourtia wrightii, Menodora scabra, Krameria bicolor, Porophyllum gracile, Trixis californica, Calliandra eriophylla, Muhlenbergia porteri, Allium macropetalum, Echinocereus fasciculatus, Tridens muticus*

CLASSIFICATION COMMENTS

Saguaro National Park, Tucson Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from two classification plots sampled during the 2010 mapping and classification effort.

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons:

ELEMENT SOURCES

Saguaro National Park

Inventory Notes: Data not available

Plots: IP003, IP035

Polygons: Data not available

Local Description Authors: S. Studd, J. Galvin

19. *Carnegiea gigantea* / *Parkinsonia microphylla* (*Olneya tesota*) / *Ambrosia deltoidea* Shrubland Association (P)

Translated name: Saguaro / Yellow paloverde (Desert ironwood) / Triangle bur ragweed Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN094

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	*Carnegiea gigantea* / *Parkinsonia microphylla* (*Olneya tesota*) / *Ambrosia deltoidea* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Tucson Mountain District

This association is widely distributed across all sections of the Tucson Mountain District (TMD).

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Tucson Mountain District

This community is found on low-angle (<10%), lower to upper alluvial fans of variable aspect from 683 to 1,042 meters (2,240–3,420 ft). The surface cover is dominated by a layer of gravel with scattered rocks. Parent materials are most commonly a mix of new and old alluvium. This community is often bisected by minor xeroriparian washes, many small enough to not affect the overall vegetation community.

VEGETATION DESCRIPTION

Saguaro National Park, Tucson Mountain District

This shrubland is characterized by an open (<10%) canopy (>2 m) of yellow paloverde (*Parkinsonia* microphylla) and desert ironwood (*Olneya tesota*) with an understory dominated by a suite of succulents and triangle bur ragweed (*Ambrosia deltoidea*). There are trends in landform and aspect within this association. In general, species diversity is greater and vegetation cover is higher on slopes, while examples on bajadas show decreased diversity and cover.

Yellow paloverde (*Parkinsonia microphylla*) is a consistent (1.0), small (2–3 m) tree with average cover around 3% and some dense inclusions up to 10%. Desert ironwood (*Olneya tesota*) is a patchy (0.66) associate that, when present, contributes cover ranging from 1% to 2%, with occasional dense inclusions where it outcompetes yellow paloverde (*Parkinsonia microphylla*). Saguaro (*Carnegiea gigantea*) was documented in all examples of this community, typically providing cover around 1%. A median of 12 saguaros (*Carnegiea gigantea*) were documented in each classification plot. Ocotillo (*Fouquieria splendens*) is a patchy (0.66) associate that, when present, provides cover ranging from 1% to 3%.

The subcanopy (0.5–2 m) is characterized by a variable mix of succulents that, in order from most to least frequent, include buckhorn cholla (*Cylindropuntia acanthocarpa*), chain-fruit cholla (*Cylindropuntia fulgida*), and cactus apple (*Opuntia engelmannii*). Combined, these species contribute around 10% cover to the community. Other documented subcanopy species include creosote (*Larrea tridentata*), whitethorn acacia (*Vachellia constricta*), and Berlandier's wolfberry (*Lycium berlandieri*). On average, each of these species contributes around 1% cover.

The field stratum is dominated by triangle bur ragweed *(Ambrosia deltoidea)* with cover typically ranging from 3 to 8%, including some dense inclusions up to 12%. This species often has the greatest cover of all the species present and accounts for roughly 20% of the total cover. It is common to see relatively small inclusions where triangle bur ragweed (*Ambrosia deltoidea*) decreases and succulents are the sole understory dominants. Other documented species include candy barrelcactus (*Ferocactus wislizeni*), Christmas cholla (*Cylindropuntia leptocaulis*), slender janusia (*Cottsia gracilis*), pinkflower hedgehog cactus (*Echinocereus fasciculatus*), sangre de cristo (*Jatropha cardiophylla*), white ratany (*Krameria bicolor*), and desert mistletoe (*Phoradendron californicum*).

Occasionally this type will occur on the interfluvial ridges surrounded by deeply incised drainages, usually in more narrow basins, between opposing mountain slopes. The relatively constricted nature of these areas means increased intermixing of types, and each shifting slope or aspect can change composition. In these areas, desert ironwood (*Olneya tesota*) remains common to occasional, while yellow paloverde (*Parkinsonia microphylla*) and triangle bur ragweed (*Ambrosia deltoidea*) remain dominant. Other common associates in these areas vary greatly.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*, and many cacti, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 11. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Carnegiea gigantea* (1.0)
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0), *Olneya tesota* (0.66)
Subcanopy (0.5–2 m)	*Cylindropuntia acanthocarpa* (0.98), *Opuntia engelmannii* (0.60)
Field (0–0.5 m)	*Ambrosia deltoidea* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 12. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens*
Subcanopy (0.5–2 m)	*Larrea tridentata, Cylindropuntia fulgida, Vachellia constricta, Cylindropuntia arbuscula, Opuntia phaeacantha, Jatropha cardiophylla, Lycium berlandieri, Ferocactus wislizeni, Phoradendron californicum, Ambrosia salsola*
Field (0–0.5 m)	*Krameria bicolor, Echinocereus fasciculatum, Mammillaria grahamii, Calliandra eriophylla, Encelia farinosa, Cottsia gracilis, Encelia farinosa, Cylindropuntia leptocaulis*

CLASSIFICATION COMMENTS

Saguaro National Park, Tucson Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 40 classification plots sampled during the 2010 mapping and classification effort and 14 mapped polygons.

This association fits well within the accepted USNVC alliance, A3282, Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance. The association likely occurs in this alliance, but it is not classified.

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons:

ELEMENT SOURCES

Saguaro National Park

Inventory Notes: Data not available

Plots: IP001, IP010, IP011, IP017, IP018, IP022, IP027, IP038, IP043, IP044, IP054, IP058, IP059, IP069, IP081, IP083, IP085, IP088, IP097, IP104, IP106, IP108, IP110, IP124, IP127, IP144, IP149, IP154, IP158, IP159, IP160, IP162, IP169, IP170, IP172, IP174, IP175, IP177, IP184, IP186

Polygons: S234, S237, S238, S239, S241, S246, S251, S260, S272, S276, S279, S287, S298, S316

Local Description Authors: B. Fallon, S. Studd, J. Galvin

Citations

Schulz, K. A. 2013. Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 31, 2019.

20. *Cylindropuntia acanthocarpa - Vachellia constricta / Calliandra eriophylla - Cottsia gracilis* Shrubland Association (P)

Translated name: Buckhorn cholla - Whitethorn acacia / Fairyduster - Slender janusia Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN116

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	*Cylindropuntia acanthocarpa - Vachellia constricta / Calliandra eriophylla - Cottsia gracilis* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Tucson Mountain District

This shrubland is widely distributed across the Tucson Mountain District (TMD). It is common along the north side of the Hugh Norris Trail ridgeline, surrounding Golden Gate Road, on both the higher backslopes and lower hillslopes.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Tucson Mountain District

This widespread association occurs on generally north-trending backslopes of hills and mountain slopes from 792 to 1,127 meters (2,600–3,700 ft). The surface cover is characterized by a dominant layer of gravel with some scattered rock and exposed bedrock.

VEGETATION DESCRIPTION

Saguaro National Park, Tucson Mountain District

This shrubland association is characterized by an open (<10%) canopy (>2 m) of yellow paloverde (*Parkinsonia microphylla*) and a variable (5–20%) understory defined by a unique suite of microphyllus shrubs most commonly dominated by whitethorn acacia (*Vachellia constricta*) and buckhorn cholla (*Cylindropuntia acanthocarpa*). Yellow paloverde *(Parkinsonia microphylla)* is present in all examples of this association, typically growing as 2 to 3 meter tall trees with cover ranging from 1% to 3%. Saguaro (*Carnegiea gigantea*) and ocotillo (*Fouquieria splendens*) are consistent (>0.9), low-cover (<1%) associates.

In the subcanopy stratum, buckhorn cholla (*Cylindropuntia acanthocarpa*) and whitethorn acacia (*Vachellia constricta*) are consistent (>0.95) dominants that, when present, provide average cover around 3% each, with some dense inclusions up to 10%. Berlandier's wolfberry (*Lycium berlandieri*), catclaw acacia (*Senegalia greggii*), creosote bush (*Larrea tridentata*), and prickly pear (*Opuntia* spp.) are low-cover associates (1%) that may appear locally dominant over small or topographically complex areas. Other noteworthy subcanopy species include Wright's beebrush (*Aloysia wrightii*) and teddybear cholla (*Cylindropuntia bigelovii*).

In the field stratum (<0.5 m), fairyduster (*Calliandra eriophylla*) and slender janusia (*Cottsia gracilis*) are the two most abundant and consistent species, with average cover of 2% and 1%, respectively. Arizona spikemoss (*Selaginella arizonica*) is a patchy (0.60) associate that, when present, can provide dense inclusions of dominance with extreme examples reaching up to 60% cover. At the margins of this community, especially in areas of increased exposure, brittlebush (*Encelia farinosa*) may begin to appear. Other common species include pinkflower hedgehog cactus (*Echinocereus fasciculatus*), candy barrelcactus (*Ferocactus wislizeni*), American threefold (*Trixis californica*), white ratany (*Krameria bicolor*), bush muhly (*Muhlenbergia porteri*), Arizona cottontop (*Digitaria*

californica), sangre de cristo (*Jatropha cardiophylla*), San Felipe dogweed (*Adenophyllum porophylloides*), globemallow (*Sphaeralcea* spp.), and rough menodora (*Menodora scabra*).

Where this type covers sheltered bedrock crevices or in shallow drainages, desert lavender *(Hyptis emoryi*) and spiny hackberry (*Celtis ehrenbergiana*) may appear. In very rare instances, often around boulder outcroppings, several uncommon species may appear but will not be consistent throughout the larger community; these species include yellow trumpetbush (*Tecoma stans*), Coulter's brickellbush (*Brickellia coulteri*), longflower tube tongue (*Justicia longii*), Schott's yellowhood (*Nissolia schottii*), and shrubby thoroughwort (*Koanophyllon solidaginifolium*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*, and many cacti, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 13. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Carnegiea gigantea* (1.0)
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0), *Fouquieria splendens* (0.93)
Subcanopy (0.5–2 m)	*Vachellia constricta* (0.89), *Cylindropuntia acanthocarpa* (0.96)
Field (0–0.5 m)	*Calliandra eriophylla* (0.89), *Cottsia gracilis* (0.93), *Selaginella arizonica* (0.61)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 14. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Lycium berlandieri, Aloysia wrightii, Larrea tridentata, Opuntia engelmannii, Opuntia* spp., *Cylindropuntia bigelovii, Trixis californica, Ferocactus wislizeni, Senegalia greggii, Jatropha cardiophylla, Adenophyllum porophylloides, Sphaeralcea* spp., *Hyptis emoryi, Celtis ehrenbergiana*
Field (0–0.5 m)	*Krameria bicolor, Echinocereus fasciculatus, Encelia farinosa, Muhlenbergia porteri, Digitaria californica, Menodora scabra*

CLASSIFICATION COMMENTS

Saguaro National Park, Tucson Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 17 classification plots and 11 mapped polygons sampled during the 2010 mapping and classification effort.

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons:

ELEMENT SOURCES

Saguaro National Park

Inventory Notes: Data not available

Plots: IP008, IP036, IP040, IP072, IP075, IP086, IP098, IP105, IP117, IP131, IP135, IP140, IP142, IP167, IP171, IP181, IP197

Polygons: S233, S264, S277, S312, S314, S318, S323, S324, S326, S329, S334

Local Description Authors: S. Studd, B. Fallon, N. Gonzalez, J. Galvin

Citations

Schulz, K. A. 2013. *Carnegiea gigantea - Parkinsonia microphylla - Prosopis velutina* Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

26. *Parkinsonia microphylla* / *Ambrosia deltoidea* Shrubland Association (P)

Translated name: Yellow paloverde / Triangle bur ragweed Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN100

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub and Grassland [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	*Parkinsonia microphylla* / *Ambrosia deltoidea* Shrubland (P)

DISTRIBUTION

Saguaro National Park

In the Rincon Mountain District (RMD), this community is limited to one hill toward the northern end of the Cactus Forest Loop Road. In the Tucson Mountain District (TMD), this community is found wherever alluvial fans meet with hills or mountain slopes.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park

This association is at the transitional zone between alluvial fan associations and mid-elevation slopes. It is found predominantly on low sections of backslopes and footslopes of hills and mountains from 700 to 1,000 meters (2,300–3,300 ft). At its highest elevation, it is seen on open flats on top of mountains. It is generally restricted to slopes of 25 to 45 degrees. Ground surface cover is a mixture of coarse gravel and rock occurring on a number of different geology types, without driving any notable difference in vegetation.

VEGETATION DESCRIPTION

Saguaro National Park

This shrubland community is characterized by a very sparse (<5%) canopy (2–5 m) of yellow paloverde (*Parkinsonia microphylla*) and a moderately dense (20–40%) field layer (<0.5 m) solely dominated by triangle bur-ragweed (*Ambrosia deltoidea*).

In the canopy, yellow paloverde (*Parkinsonia microphylla*) is consistently (1.0) present as scattered and small (3–4 m), tree-like individuals with average cover around 3%. At RMD, velvet mesquite (*Prosopis velutina*) can co-occur with yellow paloverde (*Parkinsonia microphylla*) with cover around 1%. Saguaro (*Carnegiea gigantea*) is a consistent (1.0), low-cover (<1%) associate. At TMD, ocotillo (*Fouquieria splendens*) is an occasional (0.50) associate.

The subcanopy composition is conspicuously different between the two districts. At RMD, the subcanopy is characterized by the presence and typical dominance of creosote (*Larrea tridentata*) with no other noteworthy associates. This consistently (1.0) present species provides cover around 5 [10]%. At TMD, the subcanopy is a sparse (2–4%) mix of whitethorn acacia (*Vachellia constricta*), Berlandier's wolfberry (*Lycium berlandieri*), and buckhorn cholla (*Cylindropuntia acanthocarpa*). Due to low cover and species diversity, this stratum is noticeably different from the adjacent alluvial fan types that support a diverse suite of shrubs and succulents. Certain distinctive species of the adjacent alluvial communities tend to be rare (desert ironwood [*Olneya tesota*] and cactus apple [*Opuntia engelmannii*]) or absent (pencil cholla [*Cylindropuntia arbuscula*] and chain-fruit cholla [*Cylindropuntia fulgida*]) from this community. Other noteworthy species, Sangre de cristo (*Jatropha cardiophylla)*, catclaw acacia (*Senegalia greggii*), and Berlandier's wolfberry (*Lycium berlandieri*), are low-cover associates.

The field layer (<0.5 m) is consistently dominated (1.0) by the low subshrub, triangle bur-ragweed (*Ambrosia deltoidea*). Throughout this association, this species provides cover that is typically less than 10%, excluding an example at RMD with notably high cover (20%). The consistent dominance of this species, and low cover of associate species, is a defining characteristic of this association. Less common associates may include fairyduster (*Calliandra eriophylla*), slender janusia (*Cottsia gracilis*), American threefold (*Trixis californica*), tulip pricklypear (*Opuntia phaeacantha*), pelotazo (*Abutilon incanum*), white ratany (*Krameria bicolor*), and buffelgrass (*Cenchrus ciliaris*).

In general, species diversity tends to increase as one moves upslope. On these slopes, a number of species start to appear more frequently and merge in from the neighboring communities; these species include fairyduster (*Calliandra eriophylla*), slender janusia (*Cottsia gracilis*), sangre de cristo (*Jatropha cardiophylla*), white ratany (*Krameria bicolor*), Berlandier's wolfberry (*Lycium berlandieri*), buckhorn cholla (*Cylindropuntia acanthocarpa*), and whitethorn acacia (*Vachellia constricta*). While these adjacent communities may share a number of associate shrubs, they should not contain more than scant cover of triangle bur-ragweed (*Ambrosia deltoidea*). Brittlebush (*Encelia farinosa*) is a transitional component of this community and may be present on the upper slopes of this community.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*. Many cacti are also present, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 15. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0, 1.0)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Ambrosia deltoidea* (1.0, 1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association with RMD listed first, then TMD).

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 16. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Prosopis velutina, Fouquieria splendens, Vachellia constricta, Cylindropuntia acanthocarpa, Jatropha cardiophylla, Senegalia greggii, Lycium berlandieri, Larrea tridentata*
Subcanopy (0.5–2 m)	*Larrea tridentata*
Field (0–0.5 m)	*Calliandra eriophylla, Menodora scabra, Cottsia gracilis, Echinocereus fasciculata, Krameria bicolor, Cenchrus ciliaris, Encelia farinosa, Trixis californica, Opuntia phaeacantha*

CLASSIFICATION COMMENTS

Saguaro National Park

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from one plot sampled at RMD during the 2013–2017 mapping and classification effort, and 13 classification plots sampled at TMD during the 2010 mapping and classification effort.

At RMD, Roseberry and Dole (1937) classified this community and many of the similar, adjacent communities into a broad group defined solely by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

This described community fits well within the Sonoran Paloverde - Mixed Cacti Desert Scrub Group (G293). Its type concept includes all diagnostic species present within, and landforms covered by, NPSSODN100. Three associations are nested under this group, but none currently include a detailed type concept. Because of this, we are unable to confirm membership of NPSSODN100 in any of these associations.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park

Inventory Notes: Data not available

Saguaro National Park, Rincon Mountain District

Plots: IPS148

Saguaro National Park, Tucson Mountain District

Plots: IP020, IP021, IP030, IP037, IP060, IP062, IP063, IP078, IP079, IP123, IP137, IP148, IP193

Local Description Authors: J. Galvin, S. Studd, N. Gonzalez

Citations

Roseberry, R. D., and N. E. Dole. 1937. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2015. Sonoran Paloverde - Mixed Cacti Desert Scrub Group, version date 05Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed August 28, 2019.

Schulz, K. A. 2013. Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 31, 2019.

29. *Parkinsonia microphylla* / *Lycium berlandieri* (Mixed Shrub) Rocky Shrubland Association (P)

Translated name: Yellow paloverde / Berlandier's wolfberry (Mixed Shrub) Rocky Shrubland Association

NVC name: N/A

Identifier: NPSSODN117

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	*Parkinsonia microphylla /Lycium berlandieri* (Mixed Shrub) Rocky Shrubland (P)

DISTRIBUTION

Saguaro National Park, Tucson Mountain District

This association is found only in the northernmost section of the Tucson Mountain District (TMD), north of Picture Rocks Road.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Tucson Mountain District

This type occurs on very rocky, north- and northeast-facing crests, shoulders, and backslopes of steep mountain slopes. Gradients range from 35% slopes up to vertical cliff bands dotted with vegetation. Rock and bedrock outcroppings are very common to dominant (35–65%) and can provide the majority of ground cover; this results in little space for plants to take hold. This community seems to occur quite consistently along the upper portions of steep slopes. With even slight changes to aspect or a reduction in slope severity, it quickly shifts to other communities.

VEGETATION DESCRIPTION

Saguaro National Park, Tucson Mountain District

This shrubland community is characterized by an open (5–20%) canopy (>2 m) of yellow paloverde (*Parkinsonia* microphylla) with a diverse understory of mixed shrubs and succulents most commonly dominated by Berlandier's wolfberry (*Lycium berlandieri*). The high rock cover, in the form of large, rounded boulders, creates microclimates of cooler temperatures and protected germination sites where much of the vegetation is located. The total cover can appear quite dense when all apparent between-rock openings are filled with large and rounded shrubs.

Yellow paloverde (*Parkinsonia microphylla*) is present as a short (2 m) tree or tall shrub with cover ranging from 5% to 12 [20]%. Ironwood (*Olneya tesota*) is a consistent (0.83) associate that, when present, provides average cover around 2%. Saguaro (*Carnegiea gigantea*) is a consistent (1.0), low-cover (<1%) associate.

In general, the most dominant and consistent species in the subcanopy (0.5–2 m) are wolfberry (*Lycium* spp.), mostly Berlandier's wolfberry (*Lycium berlandieri*), but Arizona desert-thorn (*Lycium exsertum*) and water jacket (*Lycium andersonii*) were documented as well. Berlandier's wolfberry (*Lycium berlandieri*) is a consistent and characteristic component of this community, generally with 2% to 3% cover. Other noteworthy subcanopy species include catclaw acacia (*Senegalia greggii*), spiny hackberry (*Celtis ehrenbergiana*), whitethorn acacia (*Vachellia constricta*), rough jointfir (*Ephedra aspera*), creosote (*Larrea tridentata*), and staghorn cholla (*Cylindropuntia acanthocarpa*).

The field stratum (<0.5 m) is defined by diverse suite of subshrubs, perennial forbs, and perennial grasses with no consistent dominants or common associates. Arizona spikemoss (*Selaginella arizonica*) is a consistent associate that can provide occasional inclusions of dominance with cover up to 5%. Other noteworthy species include pelotazo (*Abutilon incanum*), Schott's yellowhood (*Nissolia schottii*), shrubby thoroughwort (*Koanophyllon solidaginifolium*), longflower tube-tongue (*Justicia longii*), Coulter's brickellbush (*Brickellia coulteri*), globemallow (*Sphaeralcea* spp.), slender janusia (*Cottsia gracilis*), bush muhly (*Muhlenbergia porteri*), rough menodora (*Menodora scabra*), and ragged rockflower (*Crossosoma bigelovii*).

Where this community is ecotonal with lower slopes, drainages, or different aspects, species from those communities will start to become more common or even locally co-dominant. This is especially true where this community occupies a small area, thereby closely surrounded by different communities. Occasional succulents, like candy barrelcactus (*Ferocactus wislizeni*) and saguaro (*Carnegiea gigantea*), or ironwood (*Olneya tesota*) trees are to be expected.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*, and many cacti, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 17. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0), *Carnegiea gigantea* (1.0)
Subcanopy (0.5–2 m)	*Lycium berlandieri* (1.0), *Celtis ehrenbergiana* (1.0), *Vachellia constricta* (0.83)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 18. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Olneya tesota, Prosopis velutina*
Subcanopy (0.5–2 m)	*Ephedra aspera, Lycium andersonii, Lycium exsertum, Senegalia greggii, Crossosoma bigelovii, Cylindropuntia acanthocarpa, Larrea tridentata*
Field (0–0.5 m)	*Abutilon incanum, Muhlenbergia porteri, Brickellia coulteri, Menodora scabra, Nissolia schottii, Koanophyllon solidaginifolium, Justicia longii, Notholaena standleyi, Encelia farinosa, Galium stellatum, Bouteloua curtipendula, Digitaria californica, Bouteloua repens, Tridens muticus, Anemone tuberosa, Boerhavia scandens, Hibiscus denudata, Echinocereus fasciculata, Hilaria mutica, Ambrosia deltoidea, Eriogonum wrightii, Selaginella arizonica, Cottsia gracilis*

CLASSIFICATION COMMENTS

Saguaro National Park, Tucson Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from six mapped polygons sampled during the 2010 mapping and classification effort.

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons:

ELEMENT SOURCES

Saguaro National Park

Inventory Notes: Data not available

Plots: Data not available

Polygons: S242, S252, S262, S268, S270, S296

Local Description Authors: S. Studd, J. Galvin

Citations

Schulz, K. A. 2013. *Carnegiea gigantea - Parkinsonia microphylla - Prosopis velutina* Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

34. *Simmondsia chinensis* - Mixed Cacti / *Ambrosia deltoidea* Shrubland Association (P)

Translated name: Jojoba - Mixed Cacti / Triangle bur ragweed Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN112

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Jojoba - Crucifixion-thorn - Eastern Mojave Buckwheat Desert Scrub [A3283]
Association	*Simmondsia chinensis* - Mixed Cacti / *Ambrosia deltoidea* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Tucson Mountain District

This shrubland association is located at the Tucson Mountain District (TMD), mainly to the northeast of Wasson Peak, as well as in the southwest and southeast areas of the park.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Tucson Mountain District

This community is found on low-angle (<15%), mid to upper alluvial fans and the adjacent footslopes and toeslopes from 792 to 975 meters (2,500–3200 ft). On fan systems, this type usually occurs as the slope transitions into rockier and steeper sites, where the drainages deepen nearing their origins. This type is frequently found where the foothills are convoluted, creating complex landscape patterns and transitions. Gravel is often the primary ground cover in this community, and it is most commonly composed of rhyolite tuff and megabreccia, with some areas composed of alluvium.

VEGETATION DESCRIPTION

Saguaro National Park, Tucson Mountain District

This community is characterized by a very open (<5%) canopy (>2 m) of yellow paloverde (*Parkinsonia microphylla*), a subcanopy (0.5–2 m) dominated by jojoba (*Simmondsia chinensis*) and a mix of succulents, and a field stratum (<0.5 m) dominated by triangle bur ragweed (*Ambrosia deltoidea*). Vegetation differs slightly between landscape positions, with a more prolific mixed cacti component on the upper alluvial fans compared to the low, mountain slopes.

Yellow paloverde (*Parkinsonia microphylla*) is a consistent (1.0) canopy component with cover ranging from scant inclusions (<1%) to areas of dominance (>5%). It can have much lower cover when in the foothills compared to the upper alluvial slopes. On foothill sites, yellow paloverde *(Parkinsonia microphylla)* has the greatest cover along shallow wash edges. Saguaro (*Carnegiea gigantea*) and ocotillo (*Fouquieria splendens*) are consistent (1.0) components of this community with average cover around 1%.

Jojoba (*Simmondsia chinensis*) is a diagnostic component of this community that presents as consistent and evenly spaced, medium-sized shrubs with cover ranging from 1 to 3%. Interspersed with this species is a variable mixture of pricklypear (*Opuntia* spp.) and cholla (*Cylindropuntia* spp.) that includes cactus apple (*Opuntia engelmannii*), tulip pricklypear (*Opuntia phaeacantha*), buckhorn cholla (*Cylindropuntia acanthocarpa*), chain-fruit cholla (*Opuntia fulgida*), and teddybear cholla (*Opuntia bigelovii*). Combined, these species contribute an average of 5% cover with some dense inclusions up to 15%. Of these species, buckhorn cholla (*Cylindropuntia acanthocarpa*) and cactus apple (*Opuntia engelmannii*) are the most prolific. Other noteworthy subcanopy species include

creosote bush (*Larrea tridentata*), whitethorn acacia (*Vachellia constricta*), and Berlandier's wolfberry (*Lycium berlandieri*).

Triangle bur ragweed (*Ambrosia deltoidea*) is the most abundant and consistent (1.0) shrub in the field layer with cover ranging from 2% to 5%. In combination with jojoba (*Simmondsia chinensis*), this species is a diagnostic component of this community. Other common associates in the field stratum include candy barrelcactus (*Ferocactus wislizeni*), white ratany (*Krameria bicolor*), littleleaf ratany (*Krameria erecta*), fairyduster *(Calliandra eriophylla)*, desert zinnia *(Zinnia acerosa)*, brittlebush *(Encelia farinosa)*, sangre de cristo (*Jatropha cardiophylla*), slender janusia (*Cottsia gracilis*), and American threefold (*Trixis californica*). At the margins of this community and in areas with increased exposure, brittlebush (*Encelia farinosa*) may appear and occasionally become co-dominant with triangle bur ragweed (*Ambrosia deltoidea*). Other less common species found here, that are not common on the lower alluvial fan sites, include paleface (*Hibiscus denudatus*), slim tridens (*Tridens muticus*), and rough menodora (*Menodora scabra*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub alliance is reported along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region and in the Perris Valley and Cahuilla Mountains in southern California. This desert scrub alliance is dominated by taller *Canotia holacantha* or *Simmondsia chinensis*, with *Ambrosia deltoidea*, *Larrea tridentata*, *Ericameria linearifolia*, or *Eriogonum fasciculatum* present to co-dominant. In Arizona, frost-sensitive species, such as *Carnegiea gigantea*, *Ferocactus* sp., *Olneya tesota*, *Cylindropuntia bigelovii*, and *Prosopis* spp., are absent or have low cover. In California, this alliance is generally characterized by *Simmondsia chinensis* as dominant or co-dominant in the shrub canopy, with *Artemisia californica*, *Echinocereus engelmannii*, *Encelia actonii*, *Encelia farinosa*, *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, *Lotus scoparius*, *Opuntia basilaris*, *Cylindropuntia californica*, *Rhus ovata*, *Salvia mellifera*, and *Yucca schidigera* as subdominants. The herbaceous layer is generally sparse. Stands occur on well-drained upland slopes and alluvial fans. Elevations range from 600 to 1,300 meters in Arizona to 580 to 880 meters in southern California. Soils range from cobbly loams to loamy sand.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 19. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Carnegiea gigantea* (1.0), *Parkinsonia microphylla* (1.0), *Fouquieria splendens* (1.0)
Subcanopy (0.5–2 m)	*Simmondsia chinensis* (1.0)
Field (0–0.5 m)	*Ambrosia deltoidea* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 20. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Opuntia engelmannii, Larrea tridentata, Cylindropuntia fulgida, Cylindropuntia acanthocarpa, Opuntia phaeacantha, Vachellia constricta, Cylindropuntia bigelovii, Lycium berlandieri, Jatropha cardiophylla, Ferocactus wislizeni, Trixis californica*
Field (0–0.5 m)	*Calliandra eriophylla, Krameria bicolor, Krameria erecta, Zinnia acerosa, Encelia farinosa, Echinocereus fasciculatus, Cottsia gracilis*

CLASSIFICATION COMMENTS

Saguaro National Park, Tucson Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 10 classification plots and three mapped polygons sampled during the 2010 mapping and classification effort.

This *Simmondsia chinensis* - Mixed Cacti / *Ambrosia deltoidea* Shrubland Association is very similar in name to the USNVC-accepted vegetation type, CEGL000953, *Ambrosia deltoidea* / *Simmondsia chinensis* Shrubland. However, there is no description accompanying this accepted type. For this reason, our association remains separate. Lack of information on whether or not mixed cacti are a diagnostic component of the USNVC type contributes to this sustained separation.

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons:

ELEMENT SOURCES

Saguaro National Park

Inventory Notes: Data not available

Plots: IP025, IP065, IP094, IP116, IP168, IP176, IP185, IP190, IP195, IP199

Polygons: S249, S275, S302

Local Description Authors: S. Studd, N. Gonzalez, J. Galvin

Citations

Western Ecology Group. *Ambrosia deltoidea* / *Simmondsia chinensis* Association, version date 30Dec1899. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed February 19, 2019.

Schulz, K. A. 2013. Jojoba - Crucifixion-thorn - Eastern Mojave Buckwheat Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 31, 2019.

35. *Simmondsia chinensis* (Mixed Cacti) Shrubland Association (P)

Translated name: Jojoba (Mixed Cacti) Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN134

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Jojoba - Crucifixion-thorn - Eastern Mojave Buckwheat Desert Scrub [A3283]
Association	*Simmondsia chinensis* (Mixed Cacti) Shrubland (P)

DISTRIBUTION

Saguaro National Park

In the Rincon Mountain District (RMD), this community is found in two locations, along the north western boundary of the park, near the Douglas Springs Trail as it climbs out of the cactus forest, and near the western end of the Tanque Verde Ridge Trail. In the Tucson Mountain District (TMD), this community is generally found in the eastern half of the district, from the southern boundary north to Picture Rocks Road area. It is not found in contiguous patches; instead, it repeats across the landscape in a regular pattern occurring on north-trending aspects of the undulating foothills.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park

This shrubland community is typically found on moderate to steep (20–40+%), north-trending backslopes from 731 to 1,426 meters (2,400–4,680 ft). In general, the surface cover is characterized by shallow and well-drained soils under a dominant layer of coarse gravel. Parent material is typically comprised of extrusive igneous bedrock with some non-calcareous sedimentary rock occurring as well.

VEGETATION DESCRIPTION

Saguaro National Park

This shrubland association is characterized by an open (<5%) canopy (>2 m) with a subcanopy (0.5–2 m) dominated by jojoba (*Simmondsia chinensis*) and a variable mix of cacti that include buckhorn cholla (Cylindropuntia acanthocarpa), cactus apple (Opuntia engelmannii), and tulip pricklypear (Opuntia phaeacantha).

The canopy stratum is characterized by a low-cover (<5%) mix of short trees and large shrubs. Ocotillo (*Fouquieria splendens*) is a consistent (0.80–0.95) associate that, when present, provides less than 5% cover. In general, this species is more prolific at RMD with an average of 3% cover, compared to only 1% at TMD. Velvet mesquite (*Prosopis velutina*) and yellow paloverde (*Parkinsonia microphylla*) are present in examples at both districts. At RMD, velvet mesquite (*Prosopis velutina*) tends to be more common (0.80) than the patchy (0.20) yellow paloverde (*Parkinsonia microphylla*). At TMD, the opposite is true, with yellow paloverde (*Parkinsonia microphylla*) providing more consistent cover (0.70) compared to the uncommon (0.3) velvet mesquite (*Prosopis velutina*). These species are present as short (2 m) and shrubby, multi-trunk individuals or as single-trunk individuals growing to 3 to 4 meters in height. Saguaros (*Carnegiea gigantea*) range from patchy (0.6) to consistent (0.8), low-cover associates.

The moderately dense (15–30%) subcanopy is characterized by the consistent (1.0) dominance of jojoba (*Simmondsia chinensis*) with cover ranging from 3 to 10 [20]%. This species is a diagnostic component of this community and commonly provides at least half of the total shrub cover in the stratum. Other shrub and succulent species are varied across examples of this type, each varying in dominance and cover across the range, responding to subtle shifts in environmental constraints. However, taken together, the succulent cacti, buckhorn cholla

(*Cylindropuntia acanthocarpa*), cactus apple (*Opuntia engelmannii*), and tulip pricklypear (*Opuntia phaeacantha*), are the second most distinct and characteristic part of this community, providing about half of the shrub cover. In general, cactus apple (*Opuntia engelmannii*) is more common at RMD, while the other two cacti are more common or only present at TMD. At RMD, cactus apple (*Opuntia engelmannii*) is a consistent (0.80) associate with average cover around 5%, occasionally becoming co-dominant with jojoba (*Simmondsia chinensis*). This species is far less common (0.50) at TMD, with cover rarely surpassing 1%. Tucson Mountain District tends to have an even mix of the three species, each providing around 1% cover. Wright's beebrush (*Aloysia wrightii*) is another species that is more prolific in the RMD than the TMD, providing average cover around 4% and 1%, respectively. Other noteworthy subcanopy species include catclaw acacia (*Senegalia greggii*), Berlandier's wolfberry (Lycium berlandieri), common sotol (*Dasylirion wheeleri*), staghorn cholla (*Cylindropuntia versicolor*; RMD only), whitethorn acacia (Vachellia constricta), and spiny hackberry (*Celtis ehrenbergiana*).

The moderately sparse (10%) field layer is characterized by a diverse mix of small shrubs, subshrubs, perennial grasses, and spikemoss. Across both districts, fairyduster (*Calliandra eriophylla*) and slender janusia (*Cottsia gracilis*) are the most consistent (>0.75) associates with each providing an average of 1% to 2% cover. At TMD, the mat-forming Arizona spikemoss (*Selaginella arizonica*) may become a field dominant, especially on steeper, shadier slopes. Cover ranged from 3% to 42% with an average of 7.5%, with the higher elevations having the densest populations. Other noteworthy species include sangre de cristo (*Jatropha cardiophylla*), shrubby thoroughwort (*Koanophyllon solidaginifolium*), pelotazo (*Abutilon incanum*), curly-mesquite (*Hilaria belangeri*), candy barrelcactus (*Ferocactus wislizeni*), sideoats grama (*Bouteloua curtipendula*), desert rosemallow (*Hibiscus coulteri*), slender grama (*Bouteloua repens*), and Arizona cottontop (*Digitaria californica*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub alliance is reported along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region and in Perris Valley and the Cahuilla Mountains in southern California. This desert scrub alliance is dominated by taller *Canotia holacantha* or *Simmondsia chinensis*; *Ambrosia deltoidea*, *Larrea tridentata*, *Ericameria linearifolia*, or *Eriogonum fasciculatum* are present to co-dominant. In Arizona, frost-sensitive species, such as *Carnegiea gigantea*, *Ferocactus* sp., *Olneya tesota*, *Cylindropuntia bigelovii*, and *Prosopis* spp., are absent or have low cover. In California, this alliance is generally characterized by *Simmondsia chinensis* as dominant or co-dominant in the shrub canopy, with *Artemisia californica*, *Echinocereus engelmannii*, *Encelia actonii*, *Encelia farinosa*, *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, *Lotus scoparius*, *Opuntia basilaris*, *Cylindropuntia californica*, *Rhus ovata*, *Salvia mellifera*, and *Yucca schidigera* as subdominants. The herbaceous layer is generally sparse. Stands occur on well-drained, upland slopes and alluvial fans. Elevations range from 600 to 1,300 meters in Arizona, and from 580 to 880 meters in southern California. Soils range from cobbly loams to loamy sand.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 21. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens* (0.8, 0.95)
Subcanopy (0.5–2 m)	*Simmondsia chinensis* (1.0, 1.0), *Opuntia engelmannii* (0.80, 0.47), *Aloysia wrightii* (0.80, 0.58), *Opuntia phaeacantha* (0.0, 0.47), *Cylindropuntia acanthocarpa* (0.0, 0.81)
Field (0–0.5 m)	*Cottsia gracilis* (1.0, 0.95)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association with RMD listed first, then TMD).

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 22. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Prosopis velutina, Parkinsonia microphylla*
Subcanopy (0.5–2 m)	*Celtis ehrenbergiana, Cylindropuntia versicolor, Senegalia greggii, Dasylirion wheeleri, Vachellia constricta, Lycium berlandieri,*
Field (0–0.5 m)	*Jatropha cardiophylla, Calliandra eriophylla, Ferocactus wislizeni, Abutilon incanum, Hibiscus coulteri, Digitaria californica, Koanophyllon solidaginifolium, Bouteloua curtipendula, Digitaria californica*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from five classification plots sampled at RMD during the 2013–2017 mapping and classification effort, and 16 classification plots and six mapped polygons sampled at TMD during the 2010 mapping and classification effort.

At RMD, polygons attributed as NPSSODN134 overlapped with two groups classified by Roseberry and Dole (1937), a saguaro group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*), and a semi-desert chaparral group defined by an open area dominated by "shrub species common to the Sonoran life zone."

Global

This provisional association fits well within the Jojoba - Crucifixion-thorn - Eastern Mojave Buckwheat Desert Scrub Alliance, A3283. At this time, there is no association that is a match for our described community, NPSSODN134.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory Notes: Data not available

Plots: IPS042U, IPS044U, IPS162, IPS174, IPS750

Saguaro National Park, Tucson Mountain District

Plots: IP004, IP012, IP047, IP049, IP051, IP053, IP066, IP129, IP152, IP161, IP163, IP164, IP179, IP067, IP119, IP146

Plots: S253, S263, S267, S271, S297, S303

Local Description Authors: J. Galvin, S. Studd

Citations

Roseberry, R. D., and N. E. Dole. 1937. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Brown, D. E., and T. Keeler-Wolf. 2013. *Simmondsia chinensis - Canotia holacantha - Eriogonum fasciculatum* Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

36. *Simmondsia chinensis* / *Encelia farinosa* Shrubland Association (P)

Translated name: Jojoba / Brittlebush Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN132

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Jojoba - Crucifixion-thorn - Eastern Mojave Buckwheat Desert Scrub [A3283]
Association	*Simmondsia chinensis* / *Encelia farinosa* Shrubland (P)

DISTRIBUTION

Saguaro National Park

In the Rincon Mountain District (RMD), this community was documented in two locations; the first was near the southeast corner of the Cactus Forest Loop Road, and the second was along the Douglas Springs Trail as it switchbacks out of the Cactus Forest trail system. In the Tucson Mountain District (TMD), this community was documented across the southern- and eastern-trending slopes of Wasson Peak.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park

This community is exclusively present on exposed, south-trending slopes and upper alluvial fans of varying grade (5–40%) from 870 to 1,402 meters (2,854–4,600 ft). The surface cover is characterized by very shallow and well-drained soils of sandy loam, and sometimes clay, interspersed/covered with coarse gravel, exposed rock, and occasional to frequent bedrock outcrops. At RMD, these outcrops are primarily composed of gneissic granodiorite and quartz monzonite. At TMD, they are primarily composed of sandstone shale and conglomerate.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland association is characterized by a very open (<5%) canopy (>2 m), a variable (5–25%) subcanopy layer (0.5–2 m) dominated by jojoba (*Simmondsia chinensis*), and a variable (5–30%) field layer (<0.5 m) dominated by brittlebush (*Encelia farinosa*). This association is distinguished from similar *Parkinsonia microphylla* / *Encelia farinosa* shrublands by having much higher and more consistent jojoba (*Simmondsia chinensis*).

In the canopy, ocotillo (*Fouquieria splendens*) is a very consistent (~ 0.9) associate, providing cover from 1% to 2% across both districts. The cover and consistency of yellow paloverde (*Parkinsonia microphylla*) and velvet mesquite (*Prosopis velutina*) is dependent on the district. At RMD, velvet mesquite (*Prosopis velutina*) and yellow paloverde (*Parkinsonia microphylla*) are patchy (0.6) trees that, when present, contribute 1% to 3% cover. At TMD, yellow paloverde (*Parkinsonia microphylla*) is a consistent (0.88) associate that, when present, provides average cover around 3%. Velvet mesquite (*Prosopis velutina*) is typically absent from examples of this community within TMD. These tree species range from small, multi-stemmed individuals that may reside in the subcanopy stratum (0.5–2m) to moderately tall (4 m), single-stem trees. In general, saguaro *(Carnegiea gigantea)* is less abundant in this association than other adjacent communities, but saguaros are still found in all height/age classes. They tend to be more consistent at TMD (0.96) than RMD (0.60).

The subcanopy stratum is defined by the dominance of jojoba (*Simmondsia chinensis*). This species is a diagnostic component of this community, typically providing cover less than 10%. Across districts, RMD tends to have higher cover with an average of 6%, compared to 3% at TMD. The distribution of cactus apple (*Opuntia engelmannii*) creates another noteworthy difference between examples at the two districts. At TMD, this species is very uncom-

mon (0.2) and is typically outcompeted by the similar tulip pricklypear (*Opuntia phaeacantha*). At RMD, cactus apple (*Opuntia engelmannii*) is a consistent (0.90) succulent that, on the low-angle and less-rocky examples, may outcompete jojoba (*Simmondsia chinensis*) with cover above 10%. Where slopes increase and surface rock and exposed bedrock are more common, cover of cactus apple (*Opuntia engelmannii*) decreases (1–2%) and jojoba (*Simmondsia chinensis*) provides sole dominance. The remaining cover in the subcanopy is composed of a mix of low-cover shrubs and succulents, including catclaw acacia (*Senegalia greggii*), staghorn cholla (*Cylindropuntia versicolor*; RMD only), buckhorn cholla (*Cylindropuntia acanthocarpa*; TMD only), creosote (*Larrea tridentata*), whitethorn acacia (*Vachellia constricta*), teddybear cholla (*Cylindropuntia bigelovii*), Berlandier's wolfberry (*Lycium berlandieri*), jumping cholla (*Cylindropuntia fulgida*), and spiny hackberry (*Celtis ehrenbergiana*). When present, these species rarely contribute more than 2% cover.

The field stratum is characterized by the dominance of brittlebush (*Encelia farinosa*), which is the most consistent (1.0) and highest-cover species in this community. Examples at RMD contain conspicuously higher cover of this species, providing an average 14% cover, compared to only 4% at TMD. The remaining cover in this stratum is split amongst a diverse suite of small shrubs, subshrubs, and grasses. These species include slender janusia (*Cottsia gracilis*), fairyduster (*Calliandra eriophylla*), sangre de cristo (*Jatropha cardiophylla*), spidergrass (*Aristida ternipes*), and rough menodora (*Menodora scabra*). When present, these species may contribute 1% to 3% cover. In addition, a number of very sparse (<<1%) and/or inconsistent species were also present, including slender poreleaf (*Porophyllum gracile*), Arizona cottontop (*Digitaria californica*), candy barrelcactus (*Ferocactus wislizeni*), bush muhly (*Muhlenbergia porteri*), Arizona spikemoss (*Selaginella arizonica*), tobosagrass (*Hilaria mutica*), slim tridens (*Tridens muticus*; TMD only), purple threeawn (*Aristida purpurea*), and slender Bouteloua (*Bouteloua repens*). In one example of this community at RMD, mariola (*Parthenium incanum*) was present as co-dominant with brittlebush (*Encelia farinosa*), providing cover around 10%.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub alliance is reported along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region and in Perris Valley and the Cahuilla Mountains in southern California. This desert scrub alliance is dominated by taller *Canotia holacantha* or *Simmondsia chinensis*; *Ambrosia deltoidea*, *Larrea tridentata*, *Ericameria linearifolia*, or *Eriogonum fasciculatum* are present to co-dominant. In Arizona, frost-sensitive species, such as *Carnegiea gigantea*, *Ferocactus* sp., *Olneya tesota*, *Cylindropuntia bigelovii*, and *Prosopis* spp., are absent or have low cover. In California, this alliance is generally characterized by *Simmondsia chinensis as dominant or co-dominant in the shrub canopy*, *with Artemisia californica*, *Echinocereus engelmannii*, *Encelia actonii*, *Encelia farinosa*, *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, *Lotus scoparius*, *Opuntia basilaris*, *Cylindropuntia californica*, *Rhus ovata*, *Salvia mellifera*, and *Yucca schidigera* as subdominants. The herbaceous layer is generally sparse. Stands occur on well-drained, upland slopes and alluvial fans. Elevations range from 600 to 1,300 meters in Arizona, and from 580 to 880 meters in southern California. Soils range from cobbly loams to loamy sand.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 23. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Simmondsia chinensis* (1.0, 0.96), *Opuntia engelmannii* (0.9, 0.2)
Field (0–0.5 m)	*Encelia farinosa* (0.9, 1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association with RMD listed first, then TMD).

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 24. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Carnegiea gigantea, Prosopis velutina, Parkinsonia microphylla*
Subcanopy (0.5–2 m)	*Cottsia gracilis, Cylindropuntia versicolor, Senegalia greggii, Lycium berlandieri, Larrea tridentata, Celtis ehrenbergiana, Cylindropuntia bigelovii, Cylindropuntia acanthocarpa, Opuntia phaeacantha*
Field (0–0.5 m)	*Calliandra eriophylla, Jatropha cardiophylla, Aristida ternipes, Menodora scabra, Porophyllum gracile, Muhlenbergia porteri, Ferocactus wislizeni, Digitaria californica, Bouteloua repens, Parthenium incanum*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 10 classification plots at RMD sampled during the 2013–2017 mapping and classification effort and 25 classification plots at TMD sampled during the 2010 mapping and classification effort.

At RMD, polygons attributed as NPSSODN132 overlapped with two group classified by Roseberry and Dole (1937), a saguaro group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*), and a semi-desert chaparral group defined by an open area dominated by "shrub species common to the Sonoran life zone."

Global

This provisional association fits well within the Jojoba - Crucifixion-thorn - Eastern Mojave Buckwheat Desert Scrub Alliance, A3283. At this time, there is no association that is a match for our described community, NPSSODN132.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory Notes: Data not available

Plots: IPS040U, IPS046U, IPS050U, IPS095, IPS099, IPS161, IP229U, IPS736, IPS738, IPS749

Saguaro National Park, Tucson Mountain District

Plots: IP009, IP019, IP032, IP042, IP048, IP050, IP061, IP074, IP084, IP089, IP096, IP099, IP103, IP111, IP121, IP134, IP143, IP150, IP166, IP173, IP178, IP183, IP194, IP196

Local Description Authors: J. Galvin, S. Studd

Citations

Roseberry, R. D., and N. E. Dole. 1937. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Brown, D. E., and T. Keeler-Wolf. 2013. *Simmondsia chinensis - Canotia holacantha - Eriogonum fasciculatum* Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

38. *Yucca baccata - Dasylirion wheeleri* (*Quercus turbinella*) / *Muhlenbergia porteri* Shrubland Association (P)

Translated name: Banana yucca - Common sotol - (Sonoran scrub oak) / Bush muhly Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN120

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Chihuahuan Semi-Desert Grassland [M087]
Group	Chihuahuan Desert Foothill-Piedmont and Lower Montane Grassland [G490]
Alliance	–
Association	*Yucca baccata - Dasylirion wheeleri* / *Muhlenbergia porteri* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Tucson Mountain District

This shrubland association occurs near Wasson and Amole peaks in the Tucson Mountain District (TMD).

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Tucson Mountain District

This community occurs on steep slopes (35–50%) and north-trending mountain shoulders and backslopes from 1,100 to 1,310 meters (3,600–4,300 ft). The surface cover is characterized by loose and coarse gravel with large, embedded boulders composed of extrusive igneous rock.

VEGETATION DESCRIPTION

Saguaro National Park, Tucson Mountain District

This shrubland community is characterized by a sparse (<5%) to absent canopy (>2 m), a subcanopy (0.5–2 m) of mixed shrubs and succulents, most commonly dominated by banana yucca (*Yucca baccata*) and common sotol (*Dasylirion wheeleri*), and a field stratum dominated by bush muhly (*Muhlenbergia porteri*). Overall vegetative cover is estimated at 20% to 30%, with more or less equal contributions from shrubs, succulents, subshrubs, and perennial grasses. Velvet mesquite (*Prosopis velutina*) and ocotillo (*Fouquieria splendens*) were the only species recorded in the canopy stratum, and they had patchy (0.5) and low cover (1%).

In the subcanopy, banana yucca (*Yucca baccata*) and common sotol (*Dasylirion wheeleri*) are consistent (1.0) dominants with cover of each rarely exceeding 5%. In one example of this community, Sonoran scrub oak (*Quercus turbinella*) co-dominated as a short, shrubby tree. This occurrence was on the northwest slope of Amole Peak. Wright's beebrush (*Aloysia wrightii*) is a consistent (1.0) associate that, at times, can present as a co-dominant with banana yucca (*Yucca baccata*) and common sotol (*Dasylirion wheeleri*). Other common shrubs and succulents in the subcanopy include buckhorn cholla (*Cylindropuntia acanthocarpa*), cactus apple (*Opuntia engelmannii*), and catclaw acacia (*Senegalia greggii*).

In the field stratum, bush muhly (*Muhlenbergia porteri*) is a consistent (1.0) dominant with cover ranging from 2% to 5%. Combined, sideoats grama (*Bouteloua curtipendula*) and Arizona cottontop (*Digitaria californica*) contribute an additional 3% to 5% cover. Other noteworthy species include bastardsage (*Eriogonum wrightii*), white sagebrush (*Artemisia ludoviciana*), slender janusia *(Cottsia gracilis)*, starry bedstraw (*Galium stellatum*), brown-plume wirelettuce (*Stephanomeria pauciflora*), and Arizona spikemoss (*Selaginella arizonica*).

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This group is a broadly defined desert grassland (shrub-steppe) that is typical of the Borderlands of Arizona, New Mexico, and northern Mexico, and extends throughout much of the Chihuahuan Desert, west to the Sonoran Desert, and north to the Mogollon Rim. The vegetation is characterized by an open to dense herbaceous layer dominated by a diverse mixture of perennial desert grasses. Scattered shrubs and succulents are usually present, but they usually have lower total cover than the herbaceous layer. Common species include desert grasses, such as *Bouteloua eriopoda*, *Bouteloua ramosa*, *Bouteloua rothrockii*, and *Muhlenbergia porteri*, as well as widespread species, including *Bouteloua curtipendula*, *Bouteloua gracilis*, *Bouteloua hirsuta*, and *Eragrostis intermedia*. Also typical are succulents, such as *Agave lechuguilla*, rosetophyllous shrubs, such as species of *Nolina*, *Dasylirion*, and *Yucca*, and short (dwarf) shrubs including species of *Calliandra*, *Mimosa*, and *Parthenium*. Scattered tall shrubs and short trees, such as species of *Acacia*, *Prosopis*, and various oaks, may be present but with low cover. In upper foothills and lower montane zones, *Muhlenbergia emersleyi* and *Muhlenbergia setifolia* are characteristic species. Sites occur on gently sloping alluvial erosional fans and piedmonts (bajadas) that lie along mountain fronts of the isolated basin ranges (e.g., sky-island mountain archipelago) extending onto foothill slopes up to 1,670 meters in the Chihuahuan Desert.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 25. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens* (1.0)
Subcanopy (0.5–2 m)	*Yucca baccata* (1.0), *Dasylirion wheeleri* (1.0), *Aloysia wrightii* (1.0), *Senegalia greggii* (1.0), *Opuntia engelmannii* (0.75), *Cylindropuntia acanthocarpa* (1.0)
Field (0–0.5 m)	*Muhlenbergia porteri* (1.0), *Bouteloua curtipendula* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 26. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina*
Subcanopy (0.5–2 m)	*Quercus turbinella, Ericameria laricifolia, Simmondsia chinensis, Lycium berlandieri, Lycium* spp., *Opuntia* spp., *Adenophyllum porophylloides, Opuntia engelmannii, Cylindropuntia acanthocarpa*
Field (0–0.5 m)	*Digitaria californica, Eriogonum wrightii, Selaginella arizonica, Artemisia ludoviciana, Stephanomeria pauciflora, Bromus rubens, Cheilanthes lindheimeri, Agave schottii, Cottsia gracilis, Galium stellatum, Calliandra eriophylla*

CLASSIFICATION COMMENTS

Saguaro National Park, Tucson Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from four classification plots sampled during the 2010 mapping and classification effort.

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons:

ELEMENT SOURCES

Saguaro National Park

Inventory Notes: Data not available

Plots: IP033, IP115, IP126, IP128

Polygons: Data not available

Local Description Authors: S. Studd, D. Winkler, J. Galvin

Schulz, K. A., and E. Muldavin. 2015. Chihuahuan Desert Foothill-Piedmont and Lower Montane Grassland, version date 05Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed April 22, 2020.

39. (*Prosopis velutina*) / *Vachellia constricta* (*Larrea tridentata - Senegalia greggii*) Intermittently Flooded Shrubland Association (P)

Translated name: (Velvet mesquite) / Whitethorn acacia (Creosote - Catclaw acacia) Intermittently Flooded Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN089

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	North American Warm Desert Xeric-Riparian Scrub [M092]
Group	Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope [G541]
Alliance	–
Association	*(Prosopis velutina) / Vachellia constricta (Larrea tridentata - Senegalia greggii)* Intermittently Flooded Shrubland (P)

DISTRIBUTION

Saguaro National Park

In both districts, this intermittently flooded shrubland community is present along minor washes and adjacent slopes originating from high slopes and cutting through lower-gradient, out-flowing alluvial fan systems in all directions. In the Rincon Mountain District (RMD), it is found primarily throughout the Cactus Forest Loop Road and associated trail system. This community is found throughout all sections of the Tucson Mountain District (TMD).

ENVIRONMENTAL DESCRIPTION

Saguaro National Park

This community is restricted to low-angle (<5%) washes that bisect the broad alluvial fans and low hills from 682–1,140 meters (2,240–3,740 ft). The surface cover is characterized by deep and well-drained soils that, within the watercourse, are dominated by fine gravel and sand; the adjacent slopes are more commonly bare soil. Exposed bedrock and large boulders are often present on the banks and occasionally in the wash bottoms. Aspect varies and is determined by location within the park. The majority of these areas have low slope gradients, but a few areas higher up in elevation are steep (anywhere from 0 to 39%, with average of 5%).

VEGETATION DESCRIPTION

Saguaro National Park

This xeroriparian shrubland community is characterized by a sparse (<10%) canopy (>2 m) of velvet mesquite (*Prosopis velutina*) and a dense (20–40 [60]%) shrub layer (0.5–2 m) dominated by whitethorn acacia (*Vachellia constricta*) with common associates creosote (*Larrea tridentata*) and catclaw acacia (*Senegalia greggii*).

Velvet mesquite (*Prosopis velutina*) is a consistent (1.0) component, typically present as large (4 m) trees along the margins of the watercourse; cover is around 6%. Yellow paloverde (*Parkinsonia microphylla*) and blue paloverde (*Parkinsonia florida*) are sparse (1–2%) and inconsistent (0.5 and 0.4) associates that can co-occur or occasionally replace velvet mesquite (*Prosopis velutina*) in the canopy. In general, the cover and dominance of yellow paloverde (*Parkinsonia microphylla*) is related to how much this community intergrades with the adjacent, upland communities. At TMD, desert ironwood (*Olneya tesota*) is an occasional (0.57) associate tree that, when present, provides cover up to 5%. All species are typically present as small, single-trunk trees with heights from 3 to 5 meters. When present, blue paloverde (*Parkinsonia florida*) tends to be emergent from the tree canopy.

The shrub layer is consistently (1.0) dominated by large (up to 3 m) whitethorn acacia (*Vachellia constricta*) that can form dense thickets along and within the watercourse. Overall, this species provides consistent cover throughout with an average around 20%. The remainder of the shrub layer is composed of a consistent (>0.75) mix of creosote (*Larrea tridentata*) and catclaw acacia (*Senegalia greggii*) with an average cover of 6% for each species. Creosote (*Larrea tridentata*) can provide dense inclusions where it can become co-dominant with, or more dominant than, whitethorn acacia (*Vachellia constricta*). This typically occurs within the ecotone with the similar creosote (*Larrea tridentata*) floodplain communities. Other noteworthy shrubs and succulents include Warnock's snakewood (*Condalia warnockii*), cactus apple (*Opuntia engelmannii*), staghorn cholla (*Cylindropuntia versicolor*; RMD only), rosary babybonnets (*Coursetia glandulosa*; TMD only), Berlandier's wolfberry (*Lycium berlandieri*), sweetbush (*Bebbia juncea*; TMD only), spiny hackberry (*Celtis ehrenbergiana*), and lotebush (*Ziziphus obtusifolia*).

The field layer (<0.5) is extremely sparse (<5%) without any consistent dominants or common associates. Ambrosia-leaf bur-ragweed (*Ambrosia ambrosioides*) provides conspicuous inclusions of dominance, typically at the margins of the watercourse. In order from most to least frequent, other noteworthy field components include Christmas cactus (*Cylindropuntia leptocaulis*), bush muhly (*Muhlenbergia porteri*), desert zinnia (*Zinnia acerosa*), desert tobacco (*Nicotiana obtusifolia*), candy barrelcactus (*Ferocactus wislizeni*), Mediterranean grass (*Schismus* sp.), redstem storksbill (*Erodium cicutarium*), fiddleneck (*Amsinckia* sp.), Arizona cottontop (*Digitaria californica*), and spidergrass (*Aristida ternipes*).

Due to the frequently abrupt transition from "upland" landforms to wash or drainage systems, upland species are not uncommon and can, in some instances, provide considerable cover and diversity. For example, within alluvial washes, cacti can be common in and along the channel. The communities intergrade strongly, but upland species are considered accidental rather than characteristic of this wash/drainage type. Where the system presents as a deeper canyon with steep-walled edges, these species are commonly relegated to the upper banks rather than found within the wash. In general, these communities are recognizable by their presence in sandy-bottomed and rocky-sided washes, by their increased overall vegetative cover, and by the increased abundance of the acacias and other key species listed.

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This group is restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains, and basin floors throughout the warm deserts of the western U.S. and northwestern Mexico. A woody layer is usually present and is typically scattered clumps to very open. It may be dominated by shrubs and small trees, such as *Acacia greggii*, *Brickellia laciniata*, *Baccharis sarothroides*, *Chilopsis linearis*, *Ephedra californica*, *Ericameria paniculata*, *Fallugia paradoxa*, *Forestiera pubescens*, *Hymenoclea salsola*, *Hymenoclea monogyra*, *Hyptis emoryi*, *Juglans microcarpa*, *Lepidospartum squamatum*, *Olneya tesota*, *Parkinsonia florida*, *Prosopis* spp., *Psorothamnus spinosus*, *Prunus fasciculata*, *Rhus microphylla*, *Salazaria mexicana*, *Sarcobatus vermiculatus*, or *Viguiera reticulata*. A few known herbaceous communities dominate intermittent drainages and washes, with woody vegetation either absent or as scattered individuals only. Dominant species include *Panicum bulbosum*, *Alopecurus aequalis*, or *Lycurus phleoides*. Although this group is often dry, it is characterized by intermittent fluvial processes, such as rapid sheet- and gully flow. This group is restricted to drainages in upland areas or ramaderos that are intermittently flooded and occur as linear or sometimes broader, braided strips within desert scrub- or desert grassland-dominated landscapes. The vegetation of desert washes is quite variable in species composition and structure, ranging from sparse and patchy to moderately dense. It typically occurs along the banks but may occur within the channel.

MOST ABUNDANT SPECIES

Table 27. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (1.0, 0.71)
Subcanopy (0.5–2 m)	*Vachellia constricta* (1.0, 1.0), *Larrea tridentata* (0.9, 0.75), *Senegalia greggii* (0.9, 0.86)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association with RMD listed first, then TMD).

OTHER NOTEWORTHY SPECIES

Table 28. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla, Parkinsonia florida, Olneya tesota*
Subcanopy (0.5–2 m)	*Condalia warnockii, Celtis ehrenbergiana, Opuntia engelmannii, Cylindropuntia versicolor, Ziziphus obtusifolia, Coursetia glandulosa, Bebbia juncea, Lycium berlandieri*
Field (0–0.5 m)	*Ambrosia ambrosioides, Cylindropuntia leptocaulis, Nicotiana obtusifolia, Muhlenbergia porteri, Digitaria californica, Zinnia acerosa, Schismus* sp., *Erodium cicutarium, Amsinckia* sp., *Ferocactus wislizeni, Aristida ternipes*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 10 plots, nine classification plots sampled at RMD during the 2013–2017 mapping and classification effort, and three plots and four mapped polygons sampled at TMD during the 2010 mapping and classification effort.

Roseberry and Dole (1937) classified this community and many of the similar, adjacent communities into a broad group defined solely by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory Notes: Data not available

Plots: IPS019H, IPS134H, IP201H, IP205H, IP212H, IP224H, IP226H, IP232H, IP233H, V201_003

Saguaro National Park, Tucson Mountain District

Plots: IP073, IP133, IP145

Polygons: S274, S294, S320, S322

Local Description Authors: J. Galvin, S. Studd, D. Winkler, N. Gonzalez

Citations

Roseberry, R. D., and N. E. Dole. 1937. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2011. Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope Group, version date 06Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 31, 2019.

Type Descriptions, Rincon Mountain District

2. (*Quercus emoryi - Quercus oblongifolia*) / *Eragrostis lehmanniana* Herbaceous Association (P)

Translated name: (Emory oak - Mexican blue oak) / Lehmann lovegrass Herbaceous Association (P)

NVC name: N/A

Identifier: NPSSODN177

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	North American Warm Desert Ruderal Scrub and Grassland [M512]
Group	North American Warm Desert Ruderal Grassland [G677]
Alliance	Ruderal Lovegrass Desert Grassland [A2687]
Association	(*Quercus emoryi - Quercus oblongifolia*) / *Eragrostis lehmanniana* Herbaceous (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This herbaceous community is present on the low slopes along the eastern boundary of the park, mainly between the Miller and Turkey Creek trailheads.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is restricted to south-trending hills of varying grade (10–30%) from 1,350 to 1,600 meters (4,429–5,250 ft). The surface cover is characterized by shallow and well-drained, gravelly to skeletal loamy soils underlying a dominant layer of gravel and small rocks.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This herbaceous community is characterized by a very sparse (<<5%) tree canopy (>2 m) of Emory oak (*Quercus emoryi*) and/or Mexican blue oak (*Quercus oblongifolia*) with a dense (40+%) matrix of perennial grasses solely dominated by Lehmann lovegrass (*Eragrostis lehmanniana*). The canopy oaks are present as small (3–4 m) trees that provide minimal cover (1–2%). Alligator juniper (*Juniperus deppeana*) and velvet mesquite (*Prosopis velutina*) were the only other documented tree species.

The subcanopy stratum (0.5–2 m) is characterized by a diverse, but sparse (5%), mix of shrubs and succulent with no consistent dominants or common associates. Documented subcanopy components include common sotol (*Dasylirion wheeleri*), catclaw acacia (*Mimosa aculeaticarpa*), pointleaf manzanita (*Arctostaphylos pungens*), Palmer's century plant (*Agave palmeri*), desertbroom (*Baccharis sarothroides*), cactus apple (*Opuntia engelmannii*), and beargrass (*Nolina microcarpa*).

The field stratum (<0.5 m) is characterized by a dense (40+%) matrix of Lehmann lovegrass (*Eragrostis lehmanniana*). This species accounts for virtually all cover in this stratum and only had one documented associate, Schott's century plant (*Agave schottii*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This semi-natural grassland is characterized by dominance or co-dominance of *Eragrostis lehmanniana*, an introduced perennial forage grass seeded and now naturalized throughout much of southern Arizona. This alliance is

also variable in composition and cover. It is defined by having 25% or more cover of *Eragrostis lehmanniana* or over one-third cover of perennial graminoids for stands with a sparser herbaceous layer. *Eragrostis lehmanniana* also strongly dominates many stands with few native species remaining. Scattered shrubs and dwarf shrubs may be present, typically totaling less than 10% cover, but this alliance includes stands with up to 15% cover of the tall shrub *Prosopis velutina*. Other woody species may include *Calliandra eriophylla*, *Gutierrezia sarothrae*, or *Isocoma tenuisecta*. *Gutierrezia microcephala* is abundant in some stands. Remnant desert grasses include *Aristida ternipes*, *Bouteloua chondrosioides*, *Bouteloua curtipendula*, *Bouteloua eriopoda*, *Bouteloua rothrockii*, *Digitaria californica*, and *Eragrostis intermedia*. Other common herbaceous species include *Allionia incarnata*, *Ambrosia confertiflora*, *Boerhavia erecta*, *Mollugo verticillata*, *Cylindropuntia versicolo*r, *Panicum hirticaule*, *Polygala barbeyana*, *Proboscidea parviflora*, and *Phemeranthus aurantiacus*. This desert grassland/steppe alliance occurs in southeastern Arizona on alluvial fans, ridges, hills, and valley floors. The elevation range is 960 to 1,100 meters (3,150–3,600 ft). Sites occur on gentle to moderate slopes. Substrates are variable, but they are often well-drained, sandy loam.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 29. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus oblongifolia* (1.0), *Quercus emoryi* (1.0)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Eragrostis lehmanniana* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 30. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Mimosa aculeaticarpa*, *Arctostaphylos pungens, Agave palmeri, Baccharis sarothroides, Opuntia engelmannii, Nolina microcarpa*
Field (0–0.5 m)	*Agave schottii*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from one classification plot sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN177 overlapped with one group classified by Roseberry and Dole (1939), a pinyon, juniper, and cypress group defined as "areas that contain 20% or more of pinyon, juniper, or cypress, to the exclusion of commercial types of trees."

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park

Inventory notes: Data not available

Plots: IPS614

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Eragrostis lehmanniana - Eragrostis curvula* Ruderal Desert Grassland Alliance, version date 26Sep2014. U.S. National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 29, 2019.

3. *Prosopis velutina* Woodland Association (P)

Translated name: Velvet mesquite Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN136

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	North American Warm Desert Ruderal Scrub and Grassland [M512]
Group	North American Warm Desert Ruderal Scrub [G819]
Alliance	Ruderal Velvet Mesquite Desert Scrub [A3163]
Association	*Prosopis velutina* Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community was documented within the Cactus Forest trail system.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland is restricted to low-angle (<10%) alluvial fans/floodplains around 861 meters (2,825 ft). The surface cover is characterized by deep and well-drained, fine to coarse, loamy soil with fine gravel and scattered, small rocks. Numerous very shallow and small washes bisect this community, with no changes in vegetation where they occur.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is characterized by a moderately dense (10–20 [30]%) canopy (>2 m) solely dominated by velvet mesquite (*Prosopis velutina*) with a variable understory (10–20%) most consistently dominated by bush muhly (*Muhlenbergia porteri*). Velvet mesquite (*Prosopis velutina*) is present as large ([2] 4–5 m), single-stemmed trees that provide almost all the cover in the canopy. The only additional species documented in the canopy were saguaros (*Carnegiea gigantea*), which provide scant (<1%) cover throughout.

The subcanopy (0.5–2 m) is a very sparse (<5%) and variable mix of associate shrubs and succulents with no clear dominants. These species include cactus apple (*Opuntia engelmannii*), longleaf jointfir (*Ephedra trifurca*), whitethorn acacia (*Vachellia constricta*), jumping cholla (*Cylindropuntia fulgida*), staghorn cholla (*Cylindropuntia versicolor*), catclaw acacia (*Senegalia greggii*), and spiny hackberry (*Celtis ehrenbergiana*). While any of these can provide small inclusions of dominance, none of them are consistent across the community.

The field stratum is also quite variable (5–8%), with bush muhly (*Muhlenbergia porteri*) and burroweed (*Isocoma tenuisecta*) providing noteworthy cover. bush muhly (*Muhlenbergia porteri*) is the more consistent (0.75) of the two, providing cover around 3% to 5% in most examples of this community. Burroweed is patchier (0.5), but, when present, can provide considerable cover up to 18%. Other noteworthy associates include Arizona cottontop (*Digitaria californica*), tulip pricklypear (*Opuntia phaeacantha*), desert zinnia (*Zinnia acerosa*), and purple three-awn (*Aristida purpurea*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This ruderal alliance occurs as the common invasive upland shrublands found in former semi-desert grasslands in foothills and piedmonts in the sky-island region of southern Arizona and adjacent Mexico, and north into the lower Mogollon Rim foothills. The open to dense, tall (2–5 m) to short (<2 m) shrub layer is dominated by *Proso-*

pis velutina. Associated species that may co-dominate or form a short-shrub layer include *Acacia greggii*, *Atriplex canescens*, *Calliandra eriophylla*, *Fouquieria splendens*, and *Mimosa dysocarpa*. Grass cover is generally low and composed of desert grasses, such as *Dasyochloa pulchella*, *Muhlenbergia porteri*, and *Pleuraphis mutica*. Scattered juniper trees may be present. *Larrea tridentata* is absent or has low cover. Substrates are typically derived from alluvium. During the last century, the area occupied by this vegetation has increased through conversion of desert grasslands as a result of drought, overgrazing by livestock, and/or decreases in fire frequency.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 31. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (1.0)
Subcanopy (0.5–2 m)	*Opuntia engelmannii* (0.92)
Field (0–0.5 m)	*Muhlenbergia porteri* (0.75), *Isocoma tenuisecta* (0.61)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 32. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Vachellia constricta, Cylindropuntia versicolor, Ephedra trifurca, Cylindropuntia fulgida, Senegalia greggii, Celtis ehrenbergiana*
Field (0–0.5 m)	*Digitaria californica, Opuntia phaeacantha, Zinnia acerosa, Aristida purpurea*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 11 classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN136 overlapped with one group classified by Roseberry and Dole (1939), a saguaro group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

This provisional association fits well within the Ruderal Velvet Mesquite Desert Scrub alliance, A3163. At this time, there are numerous associations that are potential matches for our described community, NPSSODN136.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS081U, IPS146U, IPS150, IPS151, IPS152, IPS746, IPS753, IPS755, IPS757, IPS768, IPS769

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Prosopis velutina* Ruderal Desert Scrub Alliance, version date 21Dec2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

4. *Prosopis velutina* / *Opuntia engelmannii - Ericameria laricifolia* / *Muhlenbergia porteri* Wooded Shrubland Association (P)

Translated name: Velvet mesquite / Cactus apple - Turpentine bush / bush muhly Wooded Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN137

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	North American Warm Desert Ruderal Scrub and Grassland [M512]
Group	North American Warm Desert Ruderal Scrub [G819]
Alliance	Ruderal Velvet Mesquite Desert Scrub [A3163]
Association	*Prosopis velutina* / *Opuntia engelmannii - Ericameria laricifolia* / *Muhlenbergia porteri* Wooded Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is primarily found along the lower portion of the Manning Camp Trail, near the junction with the Quilter Trail.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded shrubland is typically present on low-angle (<20%) benches within broader mountain backslopes from 1,220 to 1,450 meters (4,000–4,700 ft). Aspects tend to trend toward the south, but this community can be present on slopes of any aspect. The surface cover is characterized by shallow and well-drained soil ranging from cobbles to skeletal loam covered with a dense layer of gravel. Scattered rocks and occasional outcrops of exposed bedrock are present, derived from a diverse mix of parent materials including quartz monzonite and gneissic monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is characterized by a variable (15–30%) canopy (>2 m) dominated by velvet mesquite (*Prosopis velutina*), a subcanopy dominated by cactus apple (*Opuntia engelmannii*) and turpentine bush (*Ericameria laricifolia*), and a field stratum dominated by bush muhly (*Muhlenbergia porteri*). Velvet mesquite (*Prosopis velutina*) is consistently (1.0) present as 4 meter tall, single-stem trees with an average cover around 15%; some dense inclusions range up to 30%. Ocotillo (*Fouquieria splendens*), the only other species documented within the canopy, provides low cover (<1%) throughout the community. At times, honey mesquite (*Prosopis glandulosa*) may appear and rarely become more dominant than velvet mesquite (*Prosopis velutina*). This is most common along included drainages.

The variably dense (10–25%) subcanopy (0.5–2 m) is characterized by the consistent dominance (1.0) of cactus apple (*Opuntia engelmannii*) and turpentine bush (*Ericameria laricifolia*) with a number of associate shrubs and succulents. These species provide average cover around 7% and 5%, respectively, with some dense inclusions ranging up to 18%. Catclaw acacia (*Senegalia greggii*) provides a very consistent (1.0), low cover (1%) throughout the community. In order of most to least frequent, other noteworthy species include staghorn cholla (*Cylindropuntia versicolor*), Wright's beebrush (*Aloysia wrightii*), spiny hackberry (*Celtis ehrenbergiana*), common sotol (*Dasylirion wheeleri*), and Arizona rosewood (*Vauquelinia californica*).

The field stratum (<0.5 m) is characterized by a variable (10–30+%) layer of perennial grasses most commonly dominated by bush muhly (*Muhlenbergia porteri*). bush muhly (*Muhlenbergia porteri*) provides consistent (1.0) dominance with average cover around 10%; the species has occasional dense inclusions up to 18%. The remaining native grasses, in order from most to least frequent, include sideoats grama (*Bouteloua curtipendula*), Arizona cottontop (*Digitaria californica*), and spidergrass (*Aristida ternipes*). When present, these species typically provide less than 5% cover. Sideoats grama (*Bouteloua curtipendula*) is a very consistent (1.0) but low-cover (1%) component of the native grasses. Noteworthy associate subshrubs include fairyduster (*Calliandra eriophylla*), bastard-sage (*Eriogonum wrightii*), burroweed (*Isocoma tenuisecta*), Santa Catalina prairie clover (*Dalea pulchra*), desert zinnia (*Zinnia acerosa*), and candy barrelcactus (*Ferocactus wislizeni*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This ruderal alliance occurs as the common invasive upland shrublands found in former semi-desert grasslands in foothills and piedmonts in the sky-island region of southern Arizona and adjacent Mexico, and north into the lower Mogollon Rim foothills. The open to dense, tall (2–5 m) to short (<2 m) shrub layer is dominated by *Prosopis velutina*. Associated species that may co-dominate or form a short-shrub layer include *Acacia greggii*, *Atriplex canescens*, *Calliandra eriophylla*, *Fouquieria splendens*, and *Mimosa dysocarpa*. Grass cover is generally low and composed of desert grasses, such as *Dasyochloa pulchella*, *Muhlenbergia porteri*, and *Pleuraphis mutica*. Scattered juniper trees may be present. *Larrea tridentata* is absent or has low cover. Substrates are typically derived from alluvium. During the last century, the area occupied by this vegetation has increased through conversion of desert grasslands as a result of drought, overgrazing by livestock, and/or decreases in fire frequency.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 33. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (1.0)
Subcanopy (0.5–2 m)	*Opuntia engelmannii* (1.0), *Ericameria laricifolia* (1.0)
Field (0–0.5 m)	*Muhlenbergia porteri* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 34. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens, Prosopis glandulosa*
Subcanopy (0.5–2 m)	*Senegalia greggii, Ericameria laricifolia, Dasylirion wheeleri, Aloysia wrightii, Cylindropuntia versicolor, Celtis ehrenbergiana, Vauquelinia californica*
Field (0–0.5 m)	*Bouteloua curtipendula, Digitaria californica, Aristida ternipes, Eragrostis lehmanniana, Eragrostis curvula, Calliandra eriophylla, Dalea pulchra, Ferocactus wislizeni, Zinnia acerosa, Isocoma tenuisecta, Eriogonum wrightii*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from nine plots, eight classification plots sampled during the 2013–2017 mapping and classification effort, and one upland soil and vegetation monitoring plot.

Polygons attributed as NPSSODN136 overlapped with one group classified by Roseberry and Dole (1939), a semi-desert chaparral group defined by an open area dominated by "shrub species common to the Sonoran life zone."

Global

This provisional association fits well within the Ruderal Velvet Mesquite Desert Scrub alliance, A3163. At this time, there are numerous associations that are potential matches for our described community, NPSSODN136. Of these, CEGL001391, *Prosopis velutina* / *Muhlenbergia porteri* Ruderal Shrubland, is the best; however, at this time this association lacks a detailed type concept.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: V302_014, IPS096U, IP301U, IP303U, IP306U, IP309U, IP333U, IPS817, IPS818

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Prosopis velutina* Ruderal Desert Scrub Alliance, version date 21Dec2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

Western Ecology Group. *Prosopis velutina* / *Muhlenbergia porteri* Ruderal Shrubland Association. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

5. *Prosopis velutina* / *Opuntia engelmannii* (*Senegalia greggii - Celtis ehrenbergiana*) Wooded Shrubland Association (P)

Translated name: Velvet mesquite / Cactus apple (Catclaw acacia - Spiny hackberry) Wooded Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN135

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	North American Warm Desert Ruderal Scrub and Grassland [M512]
Group	North American Warm Desert Ruderal Scrub [G819]
Alliance	Ruderal Velvet Mesquite Desert Scrub [A3163]
Association	*Prosopis velutina* / *Opuntia engelmannii* (*Senegalia greggii - Celtis ehrenbergiana*) Wooded Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread throughout the low-elevation portions of the park, especially east of X9 Ranch, around Hope Camp Trail, and along the upslope margin of the Cactus Forest trail system.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland is typically present on low-angle (<15%), upper alluvial fans and toeslopes from 880 to 1,087 meters (2,887–3,566 ft). The surface cover is characterized by shallow and well-drained soil ranging from gravelly loam to skeletal loam and, sometimes, clay. Scattered rocks and occasional outcrops of exposed bedrock are present, derived from a diverse mix of parent materials including Mica Schist, gneissic quartz monzonite, and granodiorite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is characterized by an open (5–15 [25]%) low-canopy stratum (2–5 m) solely dominated by velvet mesquite (*Prosopis velutina*), and a variable ([5] 10–25%) subcanopy (0.5–2 m) dominated by cactus apple (*Opuntia engelmannii*) with catclaw acacia (*Senegalia greggii*) and spiny hackberry (*Celtis ehrenbergiana*). Velvet mesquite contributes consistent (1.0) dominance as 3 [5] meter tall trees; it provides an average cover of 10% with some areas up to 20%. Sparse (<1%) ocotillo (*Fouquieria splendens*) was documented in half of the examples of this community, mainly in those with increased slopes and rock cover. Despite falling into an appropriate elevational range, saguaros (*Carnegiea gigantea*) are quite uncommon (0.23) in this community.

The subcanopy (0.5–2 m) is characterized by the consistent presence (1.0) and dominance (0.85) of cactus apple (*Opuntia engelmannii*) with a number of associate shrubs and succulents. Cactus apple (*Opuntia engelmannii*) provides variable cover throughout, ranging from a scant 1% up to a very conspicuous 15%. Rarely, tulip prickly pear (*Opuntia phaeacantha*) can replace cactus apple (*Opuntia engelmannii*) as a subcanopy dominant, but it typically provides trivial cover or none at all. Spiny hackberry (*Celtis ehrenbergiana*) and catclaw acacia (*Senegalia greggii*) are consistent (0.70 and 0.88), associate shrubs with cover rarely surpassing 5% each. These species are usually present as 1 to 2 meter tall shrubs, but in close proximity to the numerous drainages that bisect this community, they may present as small, single-stem trees reaching into the canopy. In order of most to least frequent, other noteworthy shrubs and succulents include staghorn cholla (*Cylindropuntia versicolor*), Berlandier's wolfberry (*Lycium berlandieri*), whitethorn acacia (*Vachellia constricta*), Wright's beebrush (*Aloysia wrightii*), Warnock's snakewood (*Condalia warnockii*), jumping cholla (*Cylindropuntia fulgida*), and Arizona desert-thorn (*Lycium exsertum*).

The field stratum (<0.5 m) is characterized by highly variable (5–40%) cover of perennial grasses, native and non-native, and subshrubs. On average, the native and non-native grasses provide similar cover, around 6% to 7%, but dominance can vary greatly across the community. The high end (>25%) of the cover range is always associated with areas of non-native dominance, usually in the upper reaches of the Rincon Valley. The native grass component is usually composed of four species, bush muhly (*Muhlenbergia porteri*), spidergrass (*Aristida ternipes*), Arizona cottontop (*Digitaria californica*), and streambed bristlegrass (*Setaria leucopila*). When present, these species typically provide less than 5% cover. The non-native component is solely composed of Lehmann lovegrass (*Eragrostis lehmanniana*), which provides extremely variable cover, from absent to a dense matrix of 40%. Other noteworthy associates include sangre de cristo (*Jatropha cardiophylla*), fairyduster (*Calliandra eriophylla*), slender janusia (*Cottsia gracilis*), sixweeks grama (*Bouteloua barbata*), candy barrel cactus (*Ferocactus wislizeni*), and red brome (*Bromus rubens*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This ruderal alliance occurs as the common invasive upland shrublands found in former semi-desert grasslands in the foothills and piedmonts in the sky-island region of southern Arizona and adjacent Mexico, and north into the lower Mogollon Rim foothills. The open to dense, tall (2–5 m) to short (<2 m) shrub layer is dominated by *Prosopis velutina*. Associated species that may co-dominate or form a short-shrub layer include *Acacia greggii*, *Atriplex canescens*, *Calliandra eriophylla*, *Fouquieria splendens*, and *Mimosa dysocarpa*. Grass cover is generally low and composed of desert grasses, such as *Dasyochloa pulchella*, *Muhlenbergia porteri*, and *Pleuraphis mutica*. Scattered juniper trees may be present. *Larrea tridentata* is absent or has low cover. Substrates are typically derived from alluvium. During the last century, the area occupied by this vegetation has increased through conversion of desert grasslands as a result of drought, overgrazing by livestock, and/or decreases in fire frequency.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 35. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (1.0)
Subcanopy (0.5–2 m)	*Opuntia engelmannii* (1.0), *Celtis ehrenbergiana* (0.70), *Senegalia greggii* (0.88)
Field (0–0.5 m)	*Muhlenbergia porteri* (0.70), *Eragrostis lehmanniana* (0.82), *Aristida ternipes* (0.70), *Digitaria californica* (0.70)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 36. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Carnegiea gigantea, Fouquieria splendens*
Subcanopy (0.5–2 m)	*Cylindropuntia versicolor, Opuntia phaeacantha, Lycium berlandieri, Vachellia constricta, Aloysia wrightii, Lycium exsertum, Condalia warnockii, Cylindropuntia fulgida*
Field (0–0.5 m)	*Setaria leucopila, Jatropha cardiophylla, Calliandra eriophylla, Cottsia gracilis, Ferocactus wislizeni, Bromus rubens, Bouteloua barbata*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 17 plots, 13 classification plots sampled during the 2013–2017 mapping and classification effort, and four upland soil and vegetation monitoring plots.

Polygons attributed as NPSSODN135 overlapped with one group classified by Roseberry and Dole (1939), a semi-desert chaparral group solely defined as an open area dominated by "shrub species common to the Sonoran life zone."

Global

This provisional association fits well within the Ruderal Velvet Mesquite Desert Scrub alliance, A3163. At this time, there are numerous associations that are potential matches for our described community, NPSSODN135.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS098U, IPS100U, IPS102U, IPS141, IPS164, IPS173, IP204H, IP206H, IP218H, IP227H, IP234U, IP269U, IP332U, V202_005, V202_006, V202_009, V202_011

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Prosopis velutina* Ruderal Desert Scrub Alliance, version date 21Dec2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

7. (*Carnegiea gigantea*) / *Parkinsonia microphylla* / *Opuntia engelmannii* (*Vachellia constricta - Larrea tridentata*) / *Ambrosia deltoidea* Wooded Shrubland Association (P)

Translated name: (Saguaro) / Yellow paloverde / Cactus apple (Whitethorn acacia - Creosote) / Triangle bur ragweed Wooded Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN099

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub and Grassland [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	(*Carnegiea gigantea*) / *Parkinsonia microphylla* / *Opuntia engelmannii* (*Vachellia constricta - Larrea tridentata*) / *Ambrosia deltoidea* Wooded Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This limited community is scattered throughout the Cactus Forest Loop Road and associated trail system.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded shrubland community is found exclusively on low-angle (1–6%) alluvial fans at around 850 meters (2,788 ft), usually near the transition with low hills and/or pediment formations. Within the park, it can be present on any aspect, but tends to trend north to northwest. In general, the surface cover is defined by very deep and well-drained, fine-loamy soil underlying a layer of coarse (5–10 cm) gravel. Sometimes, the soil can be quite shallow and characterized as a skeletal loam. In both cases, there is likely a layer of caliche at a variable depth below the soil surface.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded shrubland community is characterized by a sparse (<10%) canopy stratum (2–5 m) of yellow paloverde (*Parkinsonia microphylla*), a variable (10–25%) subcanopy stratum (0.5–2 m) of cactus apple (*Opuntia engelmannii*), whitethorn acacia (*Vachellia constricta*), and creosote (*Larrea tridentata*) with a 15–25% field stratum (<0.5 m) dominated by triangle bur ragweed (*Ambrosia deltoidea*). Yellow paloverde (*Parkinsonia microphylla*) is a consistent (1.0) dominant, typically present as scattered and medium-sized (3–4 m), tree-like individuals with average cover around 4%. Velvet mesquite (*Prosopis velutina*) is also a consistent (1.0) associate that can occasionally co-dominate with yellow paloverde (*Parkinsonia microphylla*) with average cover around 2% to 3%. Saguaros (*Carnegiea gigantea*) are a conspicuous and diagnostic component but provide very low (<1%) cover throughout.

The subcanopy is characterized by a diverse mix of shrubs and succulents with cactus apple (*Opuntia engelmannii*), creosote (*Larrea tridentata*), and whitethorn acacia (*Vachellia constricta*) providing the most consistent presence (1.0) and dominance throughout. On average, cactus apple (*Opuntia engelmannii*) provides the highest cover with an average 8% across the community including some areas up to 15%. Creosote (*Larrea tridentata*) and whitethorn acacia (*Vachellia constricta*) provide variable cover that ranges from a scant 1% up to a dominant 5%. In order from most to least frequent, other noteworthy shrubs and succulents include staghorn cholla (*Cylindro-*

puntia versicolor), Warnock's snakewood (*Condalia warnockii*), chain-fruit cholla (*Cylindropuntia fulgida*), and catclaw acacia (*Senegalia greggii*).

The field layer is characterized by the overwhelming dominance of triangle bur ragweed (*Ambrosia deltoidea*). Across the community, this species provides cover ranging from 10% to 20% with an average around 15%. Desert zinnia (*Zinnia acerosa*) is the most consistent (1.0) associate with occasional cover up to 5% where it can become a common associate or subdominant field component. In order from most to least frequent, other noteworthy species include bush muhly (*Muhlenbergia porteri*), Christmas cactus (*Cylindropuntia leptocaulis*), and candy barrelcactus (*Ferocactus wislizeni*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., M*enodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, *Zinnia grandiflora*, and many cacti, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 37. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0), *Prosopis velutina* (1.0)
Subcanopy (0.5–2 m)	*Opuntia engelmannii* (1.0), *Larrea tridentata* (1.0), *Vachellia constricta* (1.0)
Field (0–0.5 m)	*Ambrosia deltoidea* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 38. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Condalia warnockii, Cylindropuntia versicolor, Cylindropuntia fulgida, Senegalia greggii*
Field (0–0.5 m)	*Zinnia acerosa*, *Muhlenbergia porteri, Cylindropuntia leptocaulis, Ferocactus wislizeni*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from three plots sampled during the 2013–2017 mapping and classification effort. All of these are distributed throughout the lower elevation (850 m) alluvial fans along the western boundary of the Rincon District, in an area referred to as the Cactus Forest.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a broad group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

This described community fits well within the Sonoran Paloverde - Mixed Cacti Desert Scrub group (G293). Its type concept includes all diagnostic species present within, and landforms covered by, NPSSODN099. Three associations are nested under this group, but none currently includes a detailed type concept. Because of this, we're unable to confirm membership of NPSSODN099 in any of these associations. CEGL001375 yellow paloverde - creosote is superficially the best fit, solely based on the species listed in the association name.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park

Inventory notes: Data not available

Plots: IPS149, IPS741, IPS752

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

K. A. Schulz. 2013. Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Washington, D.C. http://usnvc.org, accessed August 28, 2019.

8. (*Carnegiea gigantea*) / *Parkinsonia microphylla* / *Opuntia engelmannii* (*Vachellia constricta - Larrea tridentata*) Wooded Shrubland Association (P)

Translated name: (Saguaro) / Yellow paloverde / Cactus apple (Whitethorn acacia - Creosote) Wooded Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN095

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub and Grassland [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	(*Carnegiea gigantea*) / *Parkinsonia microphylla* / *Opuntia engelmannii* (*Vachellia constricta - Larrea tridentata*) Wooded Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread throughout the Cactus Forest Loop Road and associated trail system.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded shrubland community is found exclusively on low-angle (1–6% [20]) alluvial fans from 820 to 945 meters (2,609–3,100 ft), usually on the interfluve between the numerous washes that crisscross this association. Within the park, it can be present on any aspect but tends to trend north to northwest. In general, the surface cover is defined by very deep and well-drained, fine-loamy soil underlying a layer of coarse (5–10 cm) gravel. Sometimes, the soil can be quite shallow and characterized as a skeletal loam. In both cases, there is likely a layer of caliche at a variable depth below the soil surface. Biological soil crusts are a noteworthy component of this community's surface cover.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded shrubland community is characterized by a sparse (<12%) canopy stratum (2–5 m) of yellow paloverde (*Parkinsonia microphylla*) and a variable (10–30%) subcanopy stratum (0.5–2 m) of cactus apple (*Opuntia engelmannii*), whitethorn acacia (*Vachellia constricta*), and creosote (*Larrea tridentata*). Yellow paloverde (*Parkinsonia microphylla*) is a consistent (0.92) dominant, typically present as scattered and large (4–5 m), tree-like individuals with average cover around 6% and some denser areas approaching 20%. Velvet mesquite (*Prosopis velutina*) is a less consistent (0.75) associate that can occasionally co-dominate with yellow paloverde (*Parkinsonia microphylla*) or present as the sole canopy tree with cover ranging up to 8%. Saguaros (*Carnegiea gigantea*) are a very conspicuous and diagnostic component but provide very low (<1%) cover throughout.

The subcanopy is characterized by a diverse mix of shrubs and succulents, with cactus apple (*Opuntia engelmannii*), creosote (*Larrea tridentata*), and whitethorn acacia (*Vachellia constricta*) providing the most consistent dominance throughout. On average, cactus apple (*Opuntia engelmannii*) provides the highest cover with 7% across the community including some areas up to 15%. Whitethorn acacia (*Vachellia constricta*) and creosote (*Larrea tridentata*) both provide variable cover that ranges from a scant 1% up to a dominant 7% in some examples. Areas of high cover are often in close proximity to, or in the ecotone with, the similar whitethorn acacia (*Vachellia constricta*) intermittently flooded shrubland association and/or creosote (*Larrea tridentata*) shrubland. In order from most to least frequent, other noteworthy shrubs and succulents include staghorn cholla (*Cylindropuntia versi-*

color), Warnock's snakewood (*Condalia warnockii*), chainfruit cholla (*Cylindropuntia fulgida*), lotebush (*Ziziphus obtusifolia*), spiny hackberry (*Celtis ehrenbergiana*), Arizona pencil cholla (*Cylindropuntia arbuscula*), catclaw acacia (*Senegalia greggii*), and longleaf jointfir (*Ephedra trifurca*). All three species of cholla (*Cylindropuntia* sp.) can provide sporadic and dense inclusions of dominance.

The sparse field layer (<10%) is characterized by a variable mix of subshrubs, succulents, and perennial grasses, most commonly dominated by desert zinnia (*Zinnia acerosa*). This very consistent (1.0) associate provides average cover around 2% that can range from <1% to areas of dominance with cover around 10%. Rough menodora (*Menodora scabra*) is a very inconsistent (0.36) associate that can occasionally provide dominance with cover up to 10%. Brittlebush (*Encelia farinosa*) is a sparse (1%) and inconsistent (0.61) associate that is typically present in scattered, dense patches that are often located at the base of trees or in the ecotone with adjacent brittlebush-dominated communities. Arizona cottontop (*Digitaria californica*) and bush muhly (*Muhlenbergia porteri*) are the most common grasses with sparse (<2% [5]) and patchy cover throughout. In order from most to least frequent, other noteworthy species include candy barrelcactus (*Ferocactus wislizeni*), Christmas cactus (*Cylindropuntia leptocaulis*), purple threeawn (*Aristida purpurea*), tulip pricklypear (*Opuntia phaeacantha*), woody crinklemat (*Tiquilia canescens*), slender poreleaf (*Porophyllum gracile*), burroweed (*Isocoma tenuisecta*), and white-stem paperflower (*Psilostrophe cooperi*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*, and many cacti, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters (4,003 ft). Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 39. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0), *Prosopis velutina* (0.85)
Subcanopy (0.5–2 m)	*Opuntia engelmannii* (0.85), *Larrea tridentata* (0.92), *Vachellia constricta* (1.0)
Field (0–0.5 m)	*Zinnia acerosa* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 40. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Celtis ehrenbergiana, Condalia warnockii, Cylindropuntia versicolor, Cylindropuntia fulgida, Ziziphus obtusifolia, Cylindropuntia arbuscula, Senegalia greggii, Ephedra trifurca*
Field (0–0.5 m)	*Muhlenbergia porteri, Digitaria californica, Menodora scabra, Cylindropuntia leptocaulis, Tiquilia canescens, Porophyllum gracile, Opuntia phaeacantha, Isocoma tenuisecta, Psilostrophe cooperi, Aristida purpurea*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from 15 plots, 12 classification plots sampled during the 2013–2017 mapping and classification effort, and three upland soil and vegetation monitoring plots. All of these are distributed throughout the lower-elevation (850 m) alluvial fans along the western boundary of the Rincon District, in an area referred to as the Cactus Forest.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a broad group defined solely by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

This association fits well within the accepted USNVC alliance A3282, Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance. Three associations are nested under this alliance, but none currently include a detailed type concept. Because if this, we are unable to confirm membership of NPSSODN095 in any of these associations. CEGL001375, Yellow Paloverde - Creosote, is superficially the best fit, based solely on the species listed in the association name.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded Global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS047, IPS077, IPS082, IPS140U, IPS142U, IP202U, IP204U, IP228U, IP232U, IP249U, IP263U, IPS758, V201_002, V201_006, V202_010

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2015. Sonoran Paloverde - Mixed Cacti Desert Scrub Group, version date 05Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed August 28, 2019.

Schulz, K. A. 2013. Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 31, 2019.

9. (*Fouquieria splendens*) / *Prosopis velutina* / *Opuntia engelmannii* / *Cottsia gracilis* Shrubland Association (P)

Translated name: (Ocotillo) / Velvet mesquite / Cactus apple / Slender janusia Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN133

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	(*Fouquieria splendens*) / *Prosopis velutina* / *Opuntia engelmannii* / *Cottsia gracilis* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread throughout the low slopes of Tanque Verde Ridge and northeast of the Madrona Ranger Station.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is typically found on low and moderately steep (20–40%), north-trending backslopes from 950 to 1,200 meters (3,120–3,940 ft). In general, the surface cover is characterized by shallow and well-drained soils under a dominant layer of gravel. Surface rock and exposed bedrock, primarily composed of gneissic quartz, is common throughout this community.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland association is characterized by a sparse (<10%) canopy (>2 m) of ocotillo (*Fouquieria splendens*) and velvet mesquite (*Prosopis velutina*), an open (10–15%) subcanopy layer (0.5–2 m) dominated by cactus apple (*Opuntia engelmannii*), and a variable (1–25%) field layer (<0.5 m) most commonly dominated by slender janusia (*Cottsia gracilis*). In the canopy, both velvet mesquite (*Prosopis velutina*) and ocotillo (*Fouquieria splendens*) provide a consistent 2% to 5% each with occasional inclusion up to 10%. The size and growth form of the velvet mesquite (*Prosopis velutina*) trends toward the small and multi-stemmed; the average height is less than 3 meters. Saguaros (*Carnegiea gigantea*) are conspicuous components of this community, but they provide a scant 1% cover throughout.

The moderately sparse (10–15%) subcanopy is consistently (0.96) dominated by the sprawling succulent, cactus apple (*Opuntia engelmannii*), which, at an average of 7% [18], provides the most cover of any species in this community. Catclaw acacia (*Senegalia greggii*) is a consistent (0.88), but sparse (2%), associate with a generally low (<1 m) stature. Other noteworthy associates include yellow paloverde (*Parkinsonia microphylla*), Wright's beebrush (*Aloysia wrightii*), spiny hackberry (*Celtis ehrenbergiana*), staghorn cholla (*Cylindropuntia versicolor*), and Berlandier's wolfberry (*Lycium berlandieri*).

The sparse (<10%) field layer is characterized by a diverse mix of small shrubs, subshrubs, and perennial grasses most commonly dominated by slender janusia (*Cottsia gracilis*). Overall, this species provides a consistent (0.85) cover around 3% with occasional inclusions reaching 8%. Sangre de cristo (*Jatropha cardiophylla*) and fairyduster (*Calliandra eriophylla*) are consistent (0.90) associates with conspicuous, but very sparse, cover around 1% to 2% each. Brittlebush (*Encelia farinosa*) may be present with cover less than 1%, typically on minor aspect changes or

along the margins of the community, but it should never become a dominant. The invasive bunchgrass, Lehmann lovegrass (*Eragrostis lehmanniana*), was documented in more than half (0.65) of the classification plots with cover values ranging up to 10%. Buffelgrass (*Cenchrus ciliaris*) was also observed, but it was far less common throughout this community, appearing in only three plots (0.15). In areas of high exposed rock and/or on sheltered slopes, Arizona spikemoss (*Selaginella arizonica*) may dominate, occasionally with cover up to 8%. Other noteworthy species include sideoats grama (*Bouteloua curtipendula*), bush muhly (*Muhlenbergia porteri*), candy barrelcactus (*Ferocactus wislizeni*), turpentine bush (*Ericameria laricifolia*), tanglehead (*Heteropogon contortus*), black grama (*Bouteloua eriopoda*), slender grama (*Bouteloua repens*), and pelotazo (*Abutilon incanum*). While average cover values are low (<1%), each of these species could potentially become a local dominant or common associate.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*. Many cacti are also present, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 41. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens* (0.96), *Prosopis velutina* (0.92)
Subcanopy (0.5–2 m)	*Opuntia engelmannii* (0.96), *Senegalia greggii* (0.88)
Field (0–0.5 m)	*Cottsia gracilis* (0.85), *Jatropha cardiophylla* (0.88), *Calliandra eriophylla* (0.96)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 42. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Carnegiea gigantea*
Subcanopy (0.5–2 m)	*Parkinsonia microphylla, Aloysia wrightii, Celtis ehrenbergiana, Cylindropuntia versicolor, Lycium berlandieri*
Field (0–0.5 m)	*Bouteloua curtipendula, Encelia farinosa, Eragrostis lehmanniana, Cenchrus ciliaris, Selaginella* arizonica, *Muhlenbergia porteri, Ferocactus wislizeni, Ericameria laricifolia, Heteropogon contortus, Bouteloua eriopoda, Bouteloua repens, Abutilon incanum*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 25 plots, 24 classification plots sampled during the 2013–2017 mapping and classification effort, and one upland soil and vegetation monitoring plot.

Polygons attributed as NPSSODN133 overlapped with two groups classified by Roseberry and Dole (1939), a saguaro group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*), and a semi-desert chaparral group defined by an open area dominated by "shrub species common to the Sonoran life zone."

Global

This provisional association fits well within the Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, A3282. At this time, there is no association that is a match for our described community, NPSSODN133.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: 202_004, IPS022U, IPS023U, IPS025U, IPS029U, IPS037U, IPS048U, IPS065, IPS090U, IPS154, IP208U, IP216U, IP220U, IP221H, IP233U, IP238U, IP251U, IP260U, IP268U, IP270U, IP271U, IP308U, IP327U, IP337U, IP345U

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Carnegiea gigantea - Parkinsonia microphylla - Prosopis velutina* Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

10. (*Parkinsonia microphylla - Fouquieria splendens*) / *Encelia farinosa* (*Cottsia gracilis*) Shrubland Association (P)

Translated name: (Yellow paloverde - Ocotillo) / Brittlebush (Slender janusia) Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN129

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	(*Parkinsonia microphylla - Fouquieria splendens*) / *Encelia farinosa* (*Cottsia gracilis*) Shrubland (P)

DISTRIBUTION

Saguaro National Park

In the Rincon Mountain District (RMD), this widespread community is present throughout the low slopes of Tanque Verde Ridge and above the Madrona Ranger Station. In the Tucson Mountain District (TMD), it covers large portions in the southern areas of the park, especially on the slopes of Wasson Peak.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park

This community is predominantly present on steep (40%) and exposed, south-facing slopes from 730 to 1,470 meters (2,400–4,820 ft). The surface cover is characterized by very shallow and well-drained, loamy soils interspersed/covered with very coarse gravel and rock with vast expanses of bedrock outcrops/shelves. The bedrock outcrops/shelves are primarily composed of gneissic granodiorite (RMD), quartz monzonite (RMD), and granite (TMD).

VEGETATION DESCRIPTION

Saguaro National Park

This shrubland association is characterized by a sparse (<10%) canopy (>2 m) of yellow paloverde (*Parkinsonia microphylla*) and ocotillo (*Fouquieria splendens*) with a variable (8–35%) field layer (<0.5 m) dominated by brittlebush (*Encelia farinosa*) and slender janusia (*Cottsia gracilis*). Ocotillo (*Fouquieria splendens*) is a very consistent (>0.9), common associate with 3 to 4 meter tall individuals that provide around 1% to 3% [8] cover throughout. Yellow paloverde (*Parkinsonia microphylla*) is also a consistent (1.0) associate that rarely surpasses 5% cover, but it has rare inclusions with cover approaching 20%. This species ranges from small (<2 m), shrubby individuals to sizeable (4+ m), single-stem trees. At RMD, velvet mesquite (*Prosopis velutina*) provides inconsistent (0.33) cover ranging from absent to 3%. Saguaros (*Carnegiea gigantea*) are present throughout this community (1.0), but they contribute little (1%) to overall vegetation cover.

The subcanopy stratum is primarily characterized by a mix of low-cover associate shrubs and succulents. At RMD, cactus apple (*Opuntia engelmannii*) is a patchy (0.66) associate that, when present, provides cover ranging up to 5%. This species is less common (0.42) and provides less cover (<1%) at TMD. Other noteworthy shrubs include staghorn cholla (*Cylindropuntia versicolor*; RMD only), buckhorn cholla (*Cylindropuntia acanthocarpa*; TMD only), catclaw acacia (*Senegalia greggii*), Berlandier's wolfberry (*Lycium berlandieri*), teddybear cholla (*Cylindropuntia bigelovii*), spiny hackberry (*Celtis ehrenbergiana*), whitethorn acacia (*Vachellia* constricta), and Wright's beebrush (*Aloysia wrightii*). When present, these species rarely contribute more than 4% cover. Within this community, teddybear cholla (*Cylindropuntia bigelovii*) should only provide small and patchy inclusions; it should not become a consistent dominant.

The field stratum is characterized by the dominance of brittlebush (*Encelia farinosa*), which is the most consistent (1.0) and highest-cover (5–10% [20]) species in this community. In areas invaded by buffelgrass (*Cenchrus ciliaris*), cover of brittlebush (*Encelia farinosa*) can be considerably reduced (1–2%). The remaining cover is split amongst a diverse mix of small shrubs, subshrubs, and grasses. Slender janusia (*Cottsia gracilis*) is the most dominant of these species, providing consistent (>0.8) cover averaging around 3% across the community. Fairyduster (*Calliandra eriophylla*) and sangre de cristo (*Jatropha cardiophylla*) are the next most common low-cover associates, providing 1% to 2% cover each (with occasional inclusions up to 8%). The grass component is quite diverse with at least five noteworthy bunch grasses, including bush muhly (*Muhlenbergia porteri*), tanglehead (*Heteropogon contortus*), sideoats grama (*Bouteloua curtipendula*), slender grama (*Bouteloua repens*), and Arizona cottontop (*Digitaria californica*). Overall, these species provide little cover (<1%). Other documented species include cloak-fern (*Astrolepis* sp.), paleface (*Hibiscus denudatus*), candy barrelcactus (*Ferocactus wislizeni*), yellow Indian mallow (*Abutilon malacum*), pinkflower hedgehog cactus (*Echinocereus fasciculatus*), and cockroach plant (*Haplophyton crooksii*). While not consistent across the community, both buffelgrass (*Cenchrus ciliaris*) and Lehmann lovegrass (*Eragrostis lehmanniana*) were documented with local cover values ranging up to 18% in one instance.

At the slightly higher elevations (i.e., 1,100 to 1,470 meters [3,600–4,820 ft]), on less-exposed aspects, this community also supports species, such as Arizona spikemoss (*Selaginella arizonica*) and Schott's century plant (*Agave schottii*), that are normally restricted to cooler, northern slopes. Arizona spikemoss (*Selaginella arizonica*) was seen with cover ranging from 6% to 20%, occurring in somewhat patchy distribution. Schott's century plant (*Agave schottii*) only grew in occasional small patches, mostly in the most sheltered spots.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*. Many cacti are also present, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 43. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Carnegiea gigantea* (1.0, 1.0)
Canopy (2–5 m)	*Fouquieria splendens* (1.0, 0.95), *Parkinsonia microphylla* (1.0, 1.0)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Encelia farinosa* (1.0, 1.0), *Janusia gracilis* (0.92, 0.81)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association with RMD listed first, then TMD).

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 44. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina*
Subcanopy (0.5–2 m)	*Opuntia engelmannii, Cylindropuntia versicolor, Cylindropuntia acanthocarpa, Senegalia greggii, Lycium berlandieri, Cylindropuntia bigelovii, Celtis ehrenbergiana, Aloysia wrightii, Vachellia constricta*
Field (0–0.5 m)	*Calliandra eriophylla, Jatropha cardiophylla, Muhlenbergia porteri, Astrolepis* sp., *Heteropogon contortus, Bouteloua curtipendula, Bouteloua repens, Digitaria californica, Cenchrus ciliaris, Eragrostis lehmanniana, Hibiscus denudatus, Ferocactus wislizeni, Abutilon malacum, Echinocereus fasciculatus, Haplophyton crooksii*

CLASSIFICATION COMMENTS

Saguaro National Park

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from eight classification plots sampled at RMD during the 2013–2017 mapping and classification effort, and 23 classification plots and three mapped polygons sampled at TMD during the 2010 mapping and classification effort.

At RMD, polygons attributed as NPSSODN129 overlapped with two groups classified by Roseberry and Dole (1939), a broad group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*), and a semi-desert chaparral group defined by an open area dominated by "shrub species common to the Sonoran life zone."

Global

This provisional association fits well within the Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, A3282. At this time, there is no association that is a match for our described community, NPSSODN129.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS024U, IPS036U, IPS072U, IPS091U, IPS106U, IP225U, IP341U, IP347U, V202_002, V202_003, 202_007

Saguaro National Park, Tucson Mountain District

Plots: IP002, IP005, IP006, IP026, IP055, IP068, IP071, IP090, IP091, IP092, IP093, IP109, IP112, IP120, IP138, IP147, IP151, IP155, IP156, IP165, IP182, IP189, IP192

Polygons: S235, S236, S310

Local description authors: J. Galvin, S. Studd, N. Gonzalez

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Carnegiea gigantea - Parkinsonia microphylla - Prosopis velutina* Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. http://usnvc.org, accessed October 28, 2019.

11. (*Parkinsonia microphylla*) / *Aloysia wrightii* Shrubland Association (P)

Translated name: (Yellow paloverde) / Wright's beebrush Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN092

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	–
Alliance	–
Association	(*Parkinsonia microphylla*) / *Aloysia wrightii* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present on the hills east of the Camino Loma Alta trailhead.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is found exclusively on steep (30–50%), north-facing backslopes from 925 to 1,045 meters (3,030–3,428 ft). The surface cover is defined by shallow and well-drained soils underlying a layer of coarse (5–10 cm) gravel and small rocks that are part of the Bisbee geologic group, which includes sandstone, shale, and limestone. Within the park, this community is restricted to this geologic group.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is characterized by a sparse (<10%) canopy (>2 m) of yellow paloverde (*Parkinsonia microphylla*) and a moderately dense (15–25%) subcanopy (0.5–2 m) dominated by Wright's beebrush (*Aloysia wrightii*). Yellow paloverde (*Parkinsonia microphylla*) is typically present as small (3 m), tree-like individuals or small, shrubby individuals (<2 m) with consistent cover around 3%. Ocotillos (*Fouquieria splendens*) are a sparse associate with a consistent (1.0) cover at 1% to 2% throughout.

The subcanopy is characterized by the sole dominance of Wright's beebrush (*Aloysia wrightii*, 1–1.5 m tall) with consistent (1.0) cover ranging from 10% to 20%. Cactus apple (*Opuntia engelmannii*), whitethorn acacia (*Vachellia constricta*), and catclaw acacia (*Senegalia greggii*) are the most common associates with an average of 1% to 3% each. Other noteworthy shrubs include Warnock's snakewood (*Condalia warnockii*), Berlandier's wolfberry (*Lycium berlandieri*), and staghorn cholla (*Cylindropuntia versicolor*).

The relatively sparse (<10%) field layer is characterized by the consistent presence (1.0) of mariola (*Parthenium incanum*) with cover ranging from 4% to 8% throughout. At times, in areas of high Wright's beebrush cover (*Aloysia wrightii*), mariola (*Parthenium incanum*) may not be present. Brittlebush (*Encelia farinosa*) is an incidental component with sparse cover that occurs predominately at the margins of the community or on minor aspect shifts where the exposure trends more south. Hairy-seed bahia (*Bahia absinthifolia*), slim tridens (*Tridens muticus*), and rough menodora (*Menodora scabra*) are the most consistent associates, appearing in all examples of this community with cover typically less than 1%. Other noteworthy associates include black grama (*Bouteloua eriopoda*), bush muhly (*Muhlenbergia porteri*), fairyduster (*Calliandra eriophylla*), desert zinnia (*Zinnia acerosa*), candy barrelcactus (*Ferocactus wislizeni*), and caliche globemallow (*Sphaeralcea laxa*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 45. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0)
Subcanopy (0.5–2 m)	*Aloysia wrightii* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 46. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens*
Subcanopy (0.5–2 m)	*Vachellia constricta, Opuntia engelmannii, Condalia warnockii, Lycium berlandieri, Senegalia greggii*
Field (0–0.5 m)	*Parthenium incanum, Encelia farinosa, Muhlenbergia porteri, Menodora scabra, Bouteloua eriopoda, Tridens muticus, Bahia absinthifolia, Zinnia acerosa, Calliandra eriophylla, Sphaeralcea laxa, Ferocactus wislizeni*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from five classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN092 overlap with one group classified by Roseberry and Dole (1939), a Saguaro group defined solely by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS068U, IPS078U, IPS084U, IPS119, IPS767

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

12. (*Parkinsonia microphylla*) / *Cylindropuntia bigelovii* / *Encelia farinosa* Shrubland Association (P)

Translated name: (Yellow paloverde) / Teddybear cholla / Brittlebush Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN128

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	(*Parkinsonia microphylla*) / *Cylindropuntia bigelovii* / *Encelia farinosa* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present throughout the low slopes of Tanque Verde Ridge, especially around Box Canyon.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is exclusively present on exposed, south-facing slopes of varying grade (15–50%) from 934 to 1,144 meters (3,064–3,753 ft). The surface cover is characterized by very shallow and well-drained, loamy soils interspersed/covered with coarse gravel, exposed rock, and vast expanses of bedrock outcrops/shelves composed primarily of gneissic granodiorite and quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland association is characterized by a moderately sparse (<15%) subcanopy layer (0.5–2 m) dominated by teddybear cholla (*Cylindropuntia bigelovii*) and a moderately dense (20–35%) field layer (<0.5 m) dominated by brittlebush (*Encelia farinosa*). In the canopy, ocotillo (*Fouquieria splendens*) and yellow paloverde (*Parkinsonia microphylla*) are very consistent (1.0) associates, providing average cover of 2% and 4%, respectively. Yellow paloverde (*Parkinsonia microphylla*) is generally present as small, shrubby individuals, rarely growing above three meters in height. Velvet mesquite (*Prosopis velutina*) provides inconsistent (0.60) cover ranging from absent to 3%. Saguaros (*Carnegiea gigantea*) are present throughout this community (0.90), but they contribute little (<1%) to overall vegetation cover.

The subcanopy stratum is solely defined by the consistent (1.0) dominance of teddybear cholla (*Cylindropuntia bigelovii*), which provides variable cover ranging from 5% to 15%. Locally, this species can appear rather patchy, preferring areas of exposed bedrock and/or high, surface rock cover; however, it should have a rather uniform distribution across the broader landscape. The remaining cover is composed of a mix of low-cover shrubs and succulents, including staghorn cholla (*Cylindropuntia versicolor*), catclaw acacia (*Senegalia greggii*), Berlandier's wolfberry (*Lycium berlandieri*), whitethorn acacia (*Vachellia constricta*), creosote (*Larrea tridentata*), and cactus apple (*Opuntia engelmannii*). When present, these species rarely contribute more than 4% cover.

The field stratum is characterized by the dominance of brittlebush (*Encelia farinosa*), which is the most consistent (1.0) and highest-cover (15% [30]) species in this community. The remaining cover is split amongst a diverse mix of small shrubs, subshrubs, and grasses. Slender janusia (*Janusia gracilis*) is the most dominant of these species, providing consistent (1.0) cover averaging to around 2% across the community. Other noteworthy species include bush muhly (*Muhlenbergia porteri*), fairy duster (*Calliandra eriophylla*), sangre de cristo (*Jatropha cardiophylla*),

American threefold (*Trixis californica*), and candy barrel cactus (*Ferocactus wislizeni*). While not consistent (0.6) across the community, buffelgrass (*Cenchrus ciliaris*) was documented with local cover values ranging up to 18% in one instance. Arizona spikemoss (*Selaginella arizonica*) can be present in areas with dominant bedrock with cover ranging up to 20%.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*. Many cacti are also present, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 47. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens* (1.0), *Parkinsonia microphylla* (1.0)
Subcanopy (0.5–2 m)	*Cylindropuntia bigelovii* (1.0)
Field (0–0.5 m)	*Encelia farinosa* (1.0), *Cottsia gracilis* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 48. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Carnegiea gigantea, Prosopis velutina*
Subcanopy (0.5–2 m)	*Cylindropuntia versicolor, Senegalia greggii, Lycium berlandieri, Vachellia constricta, Opuntia engelmannii, Larrea tridentata*
Field (0–0.5 m)	*Calliandra eriophylla, Jatropha cardiophylla, Muhlenbergia porteri, Trixis californica, Ferocactus wislizeni, Cenchrus ciliaris, Selaginella arizonica*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from seven plots sampled during the 2013–2017 mapping and classification effort.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a broad group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

This association has similarities to the described USNVC type, CEGL003065, *Opuntia bigelovii* Shrubland (referenced in Global Description citation). The locale for the described type does not match; the NVC type is described to occur in northern Arizona, southeastern California, and southern Nevada. The described suite of species reflects these Mojave Desert localities and does not accurately describe the unique variety found in Saguaro National Park.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park

Inventory notes: Data not available

Plots: IPS026U, IPS032U, IPS087, IPS097, IP207U, IP241U, IP259U

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Reid, M. S. *Opuntia bigelovii* Shrubland, version date 06Jan2017. U.S. National Vegetation Classification Database, V2.01 (2017). Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. http://usnvc.org, accessed December 10, 2018.

14. (*Parkinsonia microphylla*) / *Larrea tridentata* Shrubland Association (P)

Translated name: (Yellow paloverde) / Creosote Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN101

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	(*Parkinsonia microphylla*) / *Larrea tridentata* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This shrubland community is mainly distributed throughout the northwest corner of the park, north of Cactus Forest Loop Road, between the Broadway and Douglas Springs trailheads. Some examples were also documented near the outflow of Box Canyon.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is restricted to low-angle (<5%), lower alluvial fans from 860 to 905 meters (2,820–2,970 ft). In general, the surface cover is defined by very deep and well-drained, fine-loamy soil underlying a layer of coarse (5–10 cm) gravel. Sometimes, the soil can be quite shallow and characterized as a skeletal loam. In both cases, there is likely a layer of caliche at a variable depth below the soil surface.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is characterized by a sparse (<5%) canopy (>2 m) of yellow paloverde (*Parkinsonia microphylla*) and a variably dense (10–30%) shrub layer (0.5–2 m) solely dominated by creosote (*Larrea tridentata*). Yellow paloverde (*Parkinsonia microphylla*) is consistently present (1.0) as large (4 m), scattered trees with average cover around 3%, but reaching toward 15% in some examples. Velvet mesquite (*Prosopis velutina*) is an inconsistent (0.33) and sparse associate, occasionally providing cover similar to that of yellow paloverde (*Parkinsonia microphylla*). Saguaros (*Carnegiea gigantea*) are a rare associate within this community.

Creosote (*Larrea tridentata*) provides consistent (1.0) dominance throughout the subcanopy stratum, with average cover around 20% and up to 30% in some areas. Whitethorn acacia (*Vachellia constricta*) is the most consistent (0.67) associate shrub, often providing 1% to 2% cover. This is most often the case in close proximity to minor drainages where this species can define the adjacent community. Cactus apple (*Opuntia engelmannii*) and tulip pricklypear (*Opuntia phaeacantha*) are occasional associates with scant cover throughout, but they sometimes provide inclusions of noteworthy cover up to 8%. In one example, chainfruit cholla (*Cylindropuntia fulgida*) presented as a co-dominant with creosote (*Larrea tridentata*) with cover around 15%.

The field layer (<0.5 m) within the community is extremely sparse (<5%) with associates that include desert zinnia (*Zinnia acerosa*), rough menodora (*Menodora scabra*), Christmas cactus (*Cylindropuntia leptocaulis*), and brittlebush (*Encelia farinosa*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*. Many cacti are also present, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 49. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0)
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 50. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina*
Subcanopy (0.5–2 m)	*Vachellia constricta, Opuntia engelmannii, Opuntia phaeacantha, Cylindropuntia fulgida*
Field (0–0.5 m)	*Zinnia acerosa, Menodora scabra, Schismus* sp.*, Erodium cicutarium, Amsinckia* sp.*, Cylindropuntia leptocaulis, Encelia farinosa*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from three classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN101 overlapped with one group classified by Roseberry and Dole (1939), a saguaro group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

This association shares a title with USNVC CEGL001375, *Parkinsonia microphylla - Larrea tridentata* Shrubland Association; however, the USNVC type is lacking a description.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS034U, IP242U, IPS745

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed November 1, 2019.

15. (*Prosopis velutina*) / *Aloysia wrightii* Shrubland Association (P)

Translated name: (Velvet mesquite) / Wright's beebrush Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN138

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	(*Prosopis velutina*) / *Aloysia wrightii* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread throughout the low slopes of Tanque Verde Ridge and northeast of the Madrona Ranger Station.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is typically found on very steep (50+%), exclusively north-facing backslopes from 900 to 1,200 meters (2,950–3,900 ft). In general, the surface cover is dominated by coarse gravel and rock with considerable outcrops of exposed bedrock.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland association is characterized by a sparse (<10%) canopy (>2 m) of velvet mesquite (*Prosopis velutina*) and a subcanopy layer (0.5–2 m) dominated by Wright's beebrush (*Aloysia wrightii*) with a diverse mix of associate species. Velvet mesquite (*Prosopis velutina*) is typically present as a short (2–3 m) tree that provides consistent (1.0) cover around 4%. Larger individuals (up to 5 m) may be present at the base of large bedrock outcrops/cliff bands or in the ecotone with adjacent drainage communities. Ocotillo (*Fouquieria splendens*) is a sparse (<1–2%) but very consistent (1.0) associate. Both blue paloverde (*Parkinsonia florida*) and yellow paloverde (*Parkinsonia microphylla*) provide uncommon occurrences of low cover (1%).

The variably dense (15–30%) subcanopy is consistently (1.0) and often solely dominated by Wright's beebrush (*Aloysia wrightii*). This species accounts for the majority of cover within the stratum, ranging from 15% to 30%. As this species is strongly associated with sheltered northern slopes, cover tends to decrease as aspects become more exposed. A number of low-cover, and often transitional, associates provide the remaining cover; these are, most notably, staghorn cholla (*Cylindropuntia versicolor*), spiny hackberry (*Celtis ehrenbergiana*), Berlandier's wolfberry (*Lycium berlandieri*), climbing wartclub (*Boerhavia scandens*), pelotazo (*Abutilon incanum*), and common sotol (*Dasylirion wheeleri*). Of these, common sotol (*Dasylirion wheeleri*) is the most transitional, its cover noticeably increasing with elevation, to the point where it can become a subdominant.

The variable (5–20%) field layer is characterized by a diverse mix of small shrubs, subshrubs, and perennial grasses, without any clear dominants or common associates. Perennial grasses provide variable cover (2–10%) and are usually composed of black grama (*Bouteloua eriopoda*), sideoats grama (*Bouteloua curtipendula*), bush muhly (*Muhlenbergia porteri*), and spidergrass (*Aristida ternipes*). At times, the invasive bunch grass, Lehmann lovegrass (*Eragrostis lehmanniana*), may appear and dominate the perennial grasses. Shrubby thoroughwort (*Koanophyllon solidaginifolium*) is a consistent, low-cover (<5%) associate that tends to increase in areas heavily dominated by large rocks and boulders. Brittlebush (*Encelia farinosa*) is a patchy associate that may appear in areas with

increased exposure or within the ecotone with adjacent communities. Other noteworthy, low-cover associates include slender janusia (*Cottsia gracilis*), bastard sage (*Eriogonum wrightii*), white sage (*Artemisia ludoviciana*), fairyduster (*Calliandra eriophylla*), and longflower tube tongue (*Justicia longii*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*. Many cacti are also present, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 51. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (1.0)
Subcanopy (0.5–2 m)	*Aloysia wrightii* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 52. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens*
Subcanopy (0.5–2 m)	*Celtis ehrenbergiana, Cylindropuntia versicolor, Lycium berlandieri, Boerhavia scandens, Abutilon incanum, Dasylirion wheeleri*
Field (0–0.5 m)	*Koanophyllon solidaginifolium, Cottsia gracilis, Encelia farinosa, Eragrostis lehmanniana, Muhlenbergia porteri, Ferocactus wislizeni, Bouteloua eriopoda, Aristida ternipes, Eriogonum wrightii, Artemisia ludoviciana, Calliandra eriophylla, Justicia longii*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from seven plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN138 overlapped with two groups classified by Roseberry and Dole (1939), a Sonoran chaparral group defined by “areas that contain 80% or more shrub species common to the Sonoran life zone,” and a semi-desert chaparral group defined by an open area dominated by ”shrub species common to the Sonoran life zone.”

Global

This provisional association fits well within the Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, A3282. At this time, there is no association that is a match for our described community, NPSSODN138.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS027U, IPS061, IPS094U, IPS127, IPS143, IPS160, IPS183

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Carnegiea gigantea - Parkinsonia microphylla - Prosopis velutina* Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

16. (*Prosopis velutina*) / *Larrea tridentata* Shrubland Association (P)

Translated name: (Velvet mesquite) / Creosote Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN088

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub and Grassland [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	(*Prosopis velutina*) / *Larrea tridentata* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This shrubland community is mainly distributed throughout the northwest corner of the park, north of the Cactus Forest Loop Road, between the Broadway and Douglas Springs trailheads. Some examples were also documented near the outflow of Box Canyon.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is restricted to low-angle (<5%), lower alluvial fans and the nearly-flat floodplains along some of the larger wash systems from 860 to 905 meters (2,820–2,970 ft). The surface cover is defined by very deep and well-drained soils commonly composed of fine silt and sand with sparse to non-existent gravel and rock.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is characterized by a sparse (<5%) canopy (>2 m) of velvet mesquite (*Prosopis velutina*) and a variably dense (10–30%) shrub layer (0.5–2 m) dominated solely by creosote (*Larrea tridentata*). Velvet mesquite (*Prosopis velutina*) is consistently present (0.80) as large (4 m), scattered trees with average cover around 3% but reaching toward 15% in some examples. Areas of high cover are typically associated with adjacent wash communities and may present as wooded shrublands. Saguaros (*Carnegiea gigantea*) are a rare associate within this community.

Creosote (*Larrea tridentata*) provides consistent (1.0) dominance throughout the subcanopy stratum, with average cover around 20% and up to 30% in some areas. Whitethorn acacia (*Vachellia constricta*) is the most consistent (0.75) associate shrub, often providing 1% to 2% cover. This is most often the case in close proximity to minor drainages where this species can define the adjacent community. Cactus apple (*Opuntia engelmannii*) and tulip pricklypear (*Opuntia phaeacantha*) are occasional associates with scant cover throughout, but they sometimes provide inclusions of noteworthy cover up to 8%. In one example, chainfruit cholla (*Cylindropuntia fulgida*) presented as a co-dominant with creosote (*Larrea tridentata*) with cover around 15%.

The field layer (<0.5 m) within the community is extremely sparse (<5%) and is often composed of a suite of native and non-native annual grasses and forbs, including Mediterranean grass (*Schismus* sp.), redstem storksbill (*Erodium cicutarium*), and fiddleneck (*Amsinckia* sp.). Christmas cactus (*Cylindropuntia leptocaulis*) is a sparse associate that can occasionally provide small inclusions of dominance.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*, and many cacti, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 53. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (0.88)
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 54. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Vachellia constricta, Opuntia engelmannii, Opuntia phaeacantha, Cylindropuntia fulgida*
Field (0–0.5 m)	*Schismus* sp.*, Erodium cicutarium, Amsinckia* sp.*, Cylindropuntia leptocaulis*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from eight plots, six classification plots sampled during the 2013–2017 mapping and classification effort, and two upland soil and vegetation monitoring plots.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a broad group defined solely by the consistent presence of saguaro (*Carnegiea gigantea*). While this community is typically devoid of saguaro (*Carnegiea gigantea*), it is always in close proximity to communities that contain this species.

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IP210U, IP217U, IP223U, IP252U, IPS136H, IPS756, V201_004, V201_005

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 31, 2019.

17. (*Prosopis velutina*) / *Vachellia constricta - Opuntia engelmannii* Shrubland Association (P)

Translated name: (Velvet mesquite) / Whitethorn acacia - Cactus apple Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN098

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub and Grassland [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	(*Prosopis velutina*) / *Vachellia constricta - Opuntia engelmannii* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This shrubland community is exclusively present in the Rincon Valley on the alluvial fans east of Hope Camp. This community continues and is widespread south of the park, throughout the Rincon Valley.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is restricted to very low-angle (<5%), typically south-trending, alluvial fans and minor washes at elevations around 960 meters (3,150 ft). The surface cover is characterized by very shallow and well-drained soils that underlie a mix of fine gravel and sandy loam. Biological soil crusts are widespread throughout this community.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is characterized by a sparse (<10%) canopy (>2 m) of velvet mesquite (*Prosopis velutina*) and a dense (20–30%) shrub layer (0.5–2 m) dominated by whitethorn acacia (*Vachellia constricta*) and cactus apple (*Opuntia engelmannii*). Velvet mesquite (*Prosopis velutina*) is a consistent (1.0) component, typically present as small (2 m), shrubby trees with low cover around 5%. Yellow paloverde (*Parkinsonia microphylla*) and blue paloverde (*Parkinsonia florida*) are sparse associates that provide little cover (<1%) across the community.

The shrub layer is consistently (1.0) dominated by small (1.5 m) whitethorn acacia (*Vachellia constricta*) that provide an evenly distributed 10% to 15% cover throughout. Areas of high cover typically occur within and along the numerous minor drainages that cross this community. Overall, cactus apple (*Opuntia engelmannii*) is slightly less common with a far patchier distribution. Cover for this species ranges from sparse areas with less than 5% to dense patches with up to 20%. At times, chainfruit cholla (*Cylindropuntia fulgida*) can provide small, patchy inclusions of subdominance with cover usually not reaching above 5%. Other low-cover associates include staghorn cholla (*Cylindropuntia versicolor*), spiny hackberry (*Celtis ehrenbergiana*), and candy barrelcactus (*Ferocactus wislizeni*).

The field layer (<0.5 m) is characterized by variable cover ranging from 1% to 10%, most commonly dominated by desert zinnia (*Zinnia acerosa*). When present, this species provides cover less than 5%, but it may occasionally reach toward 10%. Other noteworthy, low-cover associates include spidergrass (*Aristida ternipes*), bush muhly (*Muhlenbergia porteri*), Mediterranean grass (*Schismus* sp.), and tulip pricklypear (*Opuntia phaeacantha*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*, and many cacti, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 55. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (1.0)
Subcanopy (0.5–2 m)	*Vachellia constricta* (1.0), *Opuntia engelmannii* (1.0)
Field (0–0.5 m)	*Zinnia acerosa* (0.66)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 56. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla, Parkinsonia florida*
Subcanopy (0.5–2 m)	*Celtis ehrenbergiana, Cylindropuntia fulgida, Cylindropuntia versicolor, Ferocactus wislizenii*
Field (0–0.5 m)	*Muhlenbergia porteri, Schismus* sp., *Aristida ternipes, Opuntia phaeacantha*

CLASSIFICATION COMMENTS

Saguaro National Park

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from seven plots sampled during the 2013–2017 mapping and classification effort.

The majority of this community falls within the expansion lands added to the park in 1991, which are located along the western half of the south boundary. This area was not included in Saguaro National Park when Roseberry and Dole (1939) created their map. This community likely would have been placed within the broad group defined by the consistent presence of saguaro (*Carnegiea gigantea*) or the semi-desert chaparral group.

Global

This described community is a fair fit for the Sonoran Paloverde - Mixed Cacti Desert Scrub Group (G293). Its type concept includes most diagnostic species present within, and landforms covered by, NPSSODN098. Three associations are nested under this group, but none currently include a detailed type concept. Because of this, we are unable to confirm membership of NPSSODN098 in any of these associations. This association appears to occupy a position between Sonoran Paloverde - Mixed Cacti Desert Scrub and the more velvet mesquite- and invasive grass-dominated ruderal communities. Due to the relatively low cover of velvet mesquite and the minimal to

absent invasive grass component, we ultimately decided to provisionally place NPSSODN098 under the Sonoran Paloverde - Mixed Cacti Desert Scrub Group (G293).

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park

Inventory notes: Data not available

Plots: IPS079, IPS139, IPS159, IPS770, IPS771, IPS772, IPS773

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2015. Sonoran Paloverde - Mixed Cacti Desert Scrub Group, version date 05Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed August 28, 2019.

Schulz, K. A. 2013. Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October, 31, 2019.

21. *Dalea pulchra* / Mixed Perennial Grass Shrub Savanna Association (P)

Translated name: Santa Catalina prairie clover / Mixed Perennial Grass Shrub Savanna Association (P)

NVC name: N/A

Identifier: NPSSODN127

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Chihuahuan Semi-Desert Grassland [M087]
Group	Chihuahuan Desert Foothill-Piedmont and Lower Montane Grassland [G490]
Alliance	–
Association	*Dalea pulchra* / Mixed Perennial Grass Shrub Savanna (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is primarily located on the slopes above the Bridal Wreath Falls area, but it was also documented in other scattered locations throughout Tanque Verde Ridge.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrub savanna is commonly found on slopes of moderate grade (24%), often with a western-trending aspect, from 1,100 to 1,350 meters (3,608–4,429 ft). The surface cover is characterized by shallow and well-drained, gravelly to skeletal loamy soils. Covering or interspersed with the soil is a dominant layer of gravel and cobble with occasional exposed bedrock. Parent material is typically composed of metagranodiorite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is characterized by a moderately dense (>20%) subcanopy stratum (0.5–2 m) dominated by Santa Catalina prairie clover (*Dalea pulchra*), and a variably dense (15–40%) field stratum (<0.5 m) of mixed perennial grasses. Most of the classification plots fall within the boundary of the 1989 Chiva Fire or 1999 Box Canyon Fire, and evidence of historic fire disturbance was noted on many datasheets.

The canopy strata (>2 m) are very sparse (<5%) with ocotillo (*Fouquieria splendens*) providing the most consistent (0.57), albeit low (1%), cover. Patches of Mexican blue oak (*Quercus oblongifolia*), Arizona white oak (*Quercus arizonica*), velvet mesquite (*Prosopis velutina*), and California rosewood (*Vauquelinia californica*) were also documented within this community, typically associated with minor drainages and/or bedrock outcrops.

The subcanopy stratum (0.5–2 m) is characterized by a variable mix of shrubs and succulents, most commonly dominated by Santa Catalina prairie clover (*Dalea pulchra*), with variable cactus apple (*Opuntia engelmannii*), Thurber's cotton (*Gossypium thurberi*), catclaw mimosa (*Mimosa aculeaticarpa*), and common sotol (*Dasylirion wheeleri*). Overall, Santa Catalina prairie clover (*Dalea pulchra*) is the most dominant (0.88) and consistent (1.0) of the four species; average cover is around 10%, and cover ranges locally from a scant 1% to dense expanses above 20%. Common sotol (*Dasylirion wheeleri*) and cactus apple (*Opuntia engelmannii*) are consistent (1.0, 0.88) associates with average cover ranging from 2% to 3%. At times, either species may become dominant with cover reaching up to 10%. Catclaw mimosa (*Mimosa aculeaticarpa*) and Thurber's cotton (*Gossypium thurberi*) are patchy (0.44, 0.55) shrubs; when present, they can occur as either scattered, low-cover (<1%) individuals or very dense inclusions of sole dominance with cover above 20%. At the upper elevational range of this community, beargrass (*Nolina microcarpa*) may become a noteworthy succulent and start to fill the role of common sotol (*Dasylirion wheeleri*). In order from most to least frequent, other noteworthy subcanopy components include staghorn cholla (*Cylindropuntia versicolor*), turpentine bush (*Ericameria laricifolia*), catclaw acacia (*Senegalia*

greggii), Wright's beebrush (*Aloysia wrightii*), and desertbroom (*Baccharis sarothroides*).

The field stratum (0–0.5 m) is characterized by a diverse mix of perennial grasses, native and non-native, as well as small succulents and subshrubs. On average, the native and non-native grasses each contribute similar cover, 10% and 8%, respectively; however, cover of non-native grass is mainly associated with dense areas of Lehmann lovegrass (*Eragrostis lehmanniana*) dominance that are not representative of the community as a whole. When present (0.55), cover of Lehmann lovegrass (*Eragrostis lehmanniana*) ranges from areas of scattered, low cover (<5%) to dense patches of dominance up to 40%. In order from most to least frequent, the native grasses include spidergrass (*Aristida ternipes*), sideoats grama (*Bouteloua curtipendula*), slender grama (*Bouteloua repens*), tanglehead (*Heteropogon contortus*), bullgrass (*Muhlenbergia emersleyi*), Arizona cottontop (*Digitaria californica*), and bush muhly (*Muhlenbergia porteri*). Schott's century plant (*Agave schottii*) is a very noteworthy associate that provides patchy (0.57) cover around 3%, occasionally becoming dominant with cover up to 10%. Prairie acacia (*Acacia angustissima*), bastardsage (*Eriogonum wrightii*), fairyduster (*Calliandra eriophylla*), and white sagebrush (*Artemisia ludoviciana*) are noteworthy associates that occasionally provide local dominance.

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This group is a broadly defined desert grassland (shrub-steppe) that is typical of the Borderlands of Arizona, New Mexico, and northern Mexico. It extends throughout much of the Chihuahuan Desert, west to the Sonoran Desert, and north to the Mogollon Rim. The vegetation is characterized by an open to dense herbaceous layer dominated by a diverse mixture of perennial desert grasses. Scattered shrubs and succulents are usually present, but they typically have lower total cover than the herbaceous layer. Common species include desert grasses, such as *Bouteloua eriopoda*, *Bouteloua ramosa*, *Bouteloua rothrockii*, and *Muhlenbergia porteri*, as well as widespread species, such as *Bouteloua curtipendula*, *Bouteloua gracilis*, *Bouteloua hirsuta*, and *Eragrostis intermedia*. Also typical are succulents, such as *Agave lechuguilla*, rosetophyllous shrubs, such as species of *Nolina*, *Dasylirion*, and *Yucca*, and short (dwarf) shrubs including species of *Calliandra*, *Mimosa*, and *Parthenium*. Scattered tall shrubs and short trees, such as species of *Acacia*, *Prosopis*, and various oaks, may be present but with low cover. In upper foothills and lower montane zones, *Muhlenbergia emersleyi* and *Muhlenbergia setifolia* are characteristic species. Sites occur on gently sloping, alluvial erosional fans and piedmonts (bajadas) that lie along mountain fronts of the isolated basin ranges (e.g., sky-island mountain archipelago), extending onto foothill slopes up to 1,670 meters elevation in the Chihuahuan Desert.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 57. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Dalea pulchra* (1.0), *Dasylirion wheeleri* (0.88), *Mimosa aculeaticarpa* (0.57), *Gossypium thurberi* (0.55), *Opuntia engelmannii* (1.0)
Field (0–0.5 m)	*Eragrostis lehmanniana* (0.71), *Agave schottii* (0.57)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 58. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens, Quercus Arizonica, Prosopis velutina, Quercus oblongifolia, Vauquelinia californica*
Subcanopy (0.5–2 m)	*Cylindropuntia versicolor, Ericameria laricifolia, Senegalia greggii, Aloysia wrightii, Nolina microcarpa*
Field (0–0.5 m)	*Fouquieria splendens, Quercus Arizonica, Prosopis velutina, Quercus oblongifolia, Vauquelinia californica*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 15 plots, 14 classification plots sampled during the 2013–2017 mapping and classification effort, and one upland soil and vegetation monitoring plot.

Polygons attributed as NPSSODN127 overlap with two groups classified by Roseberry and Dole (1939), a semi-desert chaparral group defined as "open areas of shrub species common to the Sonoran life zone," and a sagebrush group defined as "area on which sage-like species are dominant, to the exclusion of tree species."

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park

Inventory notes: Data not available

Plots: IP056U, IPS058U, IPS060U, IPS083, IPS109, IPS145, IPS163, IPS165, IPS166, IPS809, IP324U, IP353U, IP359U, IP416U, V302_007

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A., and E. Muldavin. 2015. Chihuahuan Desert Foothill-Piedmont and Lower Montane Grassland, version date 05Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed April 22, 2020.

22. *Fouquieria splendens - Prosopis velutina* / *Dodonaea viscosa* Shrubland Association (P)

Translated name: Ocotillo - Velvet mesquite / Florida hopbush Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN139

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	*Fouquieria splendens - Prosopis velutina* / *Dodonaea viscosa* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is restricted to the low, western slopes of Rincon Peak, just above the upper Rincon Valley.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is typically found on low, moderately steep (15–35%) backslopes from 1,036 to 1,280 meters (3,400–4,200 ft). In general, the surface cover is characterized by dominant expanses of bedrock, boulders, and coarse gravel with shallow to very shallow, well-drained soils throughout. The bedrock is typically composed of muscovite gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland association is characterized by a 10% to 20% canopy stratum (>2 m) of ocotillo (*Fouquieria splendens*) and velvet mesquite (*Prosopis velutina*), a 15% to 25% subcanopy layer (0.5–2 m) dominated by Florida hopbush (*Dodonaea viscosa*), and a variable (15–30%) field layer (<0.5 m) most commonly dominated by fairy-duster (*Calliandra eriophylla*) and/or rockloving spikemoss (*Selaginella rupincola*). Composition and dominance of species can be very dependent on the percentage of exposed bedrock, which can often be quite high. Areas with lower bedrock tend to favor the canopy dominants and grasses, while the higher-bedrock areas tend to favor rockloving spikemoss (*Selaginella rupincola*).

In the canopy, ocotillo (*Fouquieria splendens*) provides a very consistent 5 to 10% cover with occasional inclusion up to 15%. This species typically ranges from small, 3 meter tall, individuals to large examples up to 5 meters. Velvet mesquite (*Prosopis* velutina) is a less-consistent dominant with cover ranging from a scant 1% up to a very dominant 12%. This species ranged in size from small (<2 m), shrubby individuals in the subcanopy to larger trees with heights up to 5 meters. This species tends to provide lower cover and/or a shrubbier growth form where exposed bedrock dominates. Saguaros (*Carnegiea gigantea*) were documented within this community but provided very low cover (<<1%).

The subcanopy is consistently (1.0) dominated by Florida hopbush (*Dodonaea viscosa*) with cover ranging from 5 to 15 [20]%. The dominance of this species is a diagnostic component of this community. Cactus apple (*Opuntia engelmannii*) is a consistent (1.0), low-cover (2%) associate that can occasionally provide dominance with cover up to 5%. In order from most to least frequent, other noteworthy shrubs and succulents include staghorn cholla (*Cylindropuntia versicolor*), catclaw acacia (*Senegalia greggii*), turpentine bush (*Ericameria laricifolia*), common sotol (*Dasylirion wheeleri*), Thurber's desert honeysuckle (*Anisacanthus thurberi*), littleleaf false tamarind (*Ly-*

siloma watsonii), showy goldeneye (*Heliomeris multiflora*), and Thurber's cotton (*Gossypium thurberi*). At high elevations, yellow trumpetbush (*Tecoma stans*) and coralbean (*Erythrina flabelliformis*) may begin to appear.

The variable field layer is characterized by a diverse mix of subshrubs, perennial grasses, and spikemoss. Rocklov-ing spikemoss (*Selaginella rupincola*) ranges from absent to dense areas of dominance with cover up to 25%. This species is most common in areas dominated by low-angle bedrock slabs, typically with extremely shallow soil. Fairyduster (*Calliandra eriophylla*) is another variable associate that ranges from absent to dominant with cover approaching 10%. In areas with lower bedrock dominance and/or at the upper elevational range of this community, native perennial grasses may provide noteworthy (5–10%) cover. These species include sideoats grama (*Boutel-oua curtipendula*), alkali sacaton (*Sporobolus airoides*), slender grama (*Bouteloua repens*), tanglehead (*Heteropogon contortus*), Arizona cottontop (*Digitaria californica*), bullgrass (*Muhlenbergia emersleyi*), and spidergrass (*Aristida ternipes*). Other noteworthy field species include slender janusia (*Cottsia gracilis*), white sagebrush (*Artemisia ludoviciana*), bastardsage (*Eriogonum wrightii*), and Wright's milkpea (*Galactia wrightii*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krame-ria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*. Many cacti are also present, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands oc-cur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 59. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens* (1.0), *Prosopis velutina* (1.0)
Subcanopy (0.5–2 m)	*Dodonaea viscosa* (1.0)
Field (0–0.5 m)	*Calliandra eriophylla* (0.66), *Selaginella rupincola* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 60. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Cylindropuntia versicolor, Opuntia engelmannii, Senegalia greggii, Ericameria laricifolia, Dasylirion wheeleri, Anisacanthus thurberi, Lysiloma watsonii, Heliomeris multiflora, Gossypium thurberi, Tecoma stans, Erythrina flabelliformis*
Field (0–0.5 m)	*Bouteloua curtipendula, Sporobolus airoides, Heteropogon contortus, Bouteloua repens, Digitaria californica, Muhlenbergia emersleyi, Aristida ternipes, Cottsia gracilis, Artemisia ludoviciana, Eriogonum wrightii, Galactia wrightii*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from five plots, four classification plots sampled during the 2013–2017 mapping and classification effort, and one upland soil and vegetation monitoring plot.

Polygons attributed as NPSSODN139 overlapped with one group classified by Roseberry and Dole (1939), a semi-desert chaparral group defined by an open area dominated by "shrub species common to the Sonoran life zone."

Global

This provisional association fits well within the Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, A3282. At this time, there is no association that is a match for our described community, NPSSODN139.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS169, IPS600, IPS601, IPS602, V302_004

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Carnegiea gigantea - Parkinsonia microphylla - Prosopis velutina* Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

23. *Fouquieria splendens* (*Prosopis velutina*) / *Opuntia engelmannii* / Mixed Perennial Grass - *Agave schottii* Shrub Savanna Association (P)

Translated name: Ocotillo (Velvet mesquite) / Cactus apple / Mixed Perennial Grass - Schott's century plant Shrub Savanna Association (P)

NVC name: N/A

Identifier: NPSSODN124

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Chihuahuan Semi-Desert Grassland [M087]
Group	Chihuahuan Desert Foothill-Piedmont and Lower Montane Grassland [G490]
Alliance	–
Association	*Fouquieria splendens* (*Prosopis velutina*) / *Opuntia engelmannii* / Mixed Perennial Grass - *Agave schottii* Shrub Savanna (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread throughout the low slopes of Tanque Verde Ridge, Mica Mountain, and Rincon Peak.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrub savanna is restricted to generally south- to southwest-facing backslopes of varying grade from 1,196 to 1,340 meters (3,923–4,396 ft). The surface cover is characterized by shallow and well-drained, gravelly to skeletal loamy soils with scattered small rocks and occasional exposed bedrock. Some slopes, especially the steeper ones, may be dominated by loose rocks. Parent material is very diverse with areas including mica schist, quartz monzonite, and gneissic granodiorite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is characterized by an open (5–15%) canopy stratum (>2 m) dominated by ocotillo (*Fouquieria splendens*) with velvet mesquite (*Prosopis velutina*), a variable (5–20%) subcanopy (0.5–2 m) dominated by cactus apple (*Opuntia engelmannii*), and a highly variable ([10] 20–50%) field stratum (<0.5 m) dominated by perennial grasses and Schott's century plant (*Agave schottii*). Ocotillo (*Fouquieria splendens*) is consistently (1.0) present with cover ranging from 2 to 10 [20]% with an average around 6%. This species is typically present in the canopy with heights ranging from 3 to 5 meters, but it can occasionally present as shorter (<2 m) individuals in the subcanopy. Velvet mesquite (*Prosopis velutina*) is a patchy (0.60) common associate that, when present, can provide cover up to 10%. Mexican blue oak (*Quercus oblongifolia*) and California rosewood (*Vauquelinia californica*) are very uncommon associates that can be found in sheltered locations. This is especially the case as the aspect trends more to the north, where exposed bedrock is prevalent, and/or at the upper elevational limit of this community. These species should never appear as dominants. Saguaros (*Carnegiea gigantea*) are the only other canopy species documented within this community (0.23); they have scant (< 1%) cover throughout.

The subcanopy is characterized by the consistent presence (0.85) and dominance (0.75) of cactus apple (*Opuntia engelmannii*) with a diverse mix of associate shrubs and succulents. Across this community, cactus apple (*Opuntia engelmannii*) ranges from a sparse (1%) associate to, more commonly, a dominant with an average cover around 5% and dense inclusions approaching 20%. Turpentine bush (*Ericameria laricifolia*) is the next most common (0.85) associate with an average cover of 2%, including occasional inclusions of dominance where cover reaches

up to 6%. Common sotol (*Dasylirion wheeleri*) is an inconsistent (0.50) subcanopy component that, when present, can provide cover similar to that of cactus apple (*Opuntia* engelmannii). From most to least frequent, other noteworthy shrubs and succulents include Thurber's cotton (*Gossypium thurberi*), staghorn cholla (*Cylindropuntia versicolor*), catclaw acacia (*Senegalia greggii*), littleleaf false tamarind (*Lysiloma watsonii*), sangre de cristo (*Jatropha cardiophylla*), Tahitian kidneywood (*Eysenhardtia orthocarpa*), and yellow trumpetbush (*Tecoma stans*). When present, cover of these species should be no more than 3%; they rarely provide dominance.

The field stratum is characterized by a variable mix of perennial bunch grasses, native and non-native, interspersed with the low-growing succulent, Schott's century plant (*Agave schottii*). Local grass dominance is typically composed of either native or non-native species with occasional areas that are an even mix of the two. Also of note, grass cover is typically highest on the lower-angle, less rocky slopes; it tends to drop off considerably on the steep, rocky ones. In order of most to least frequent, the dominant native grasses include sideoats grama (*Bouteloua curtipendula*), tanglehead (*Heteropogon contortus*), spidergrass (*Aristida ternipes*), bush muhly (*Muhlenbergia porteri*), cane bluestem (*Bothriochloa barbinodis*), and bullgrass (*Muhlenbergia emersleyi*). Overall, these species provide an average of 15% cover across the community with dense inclusions with up to 30%. The non-native grasses are composed entirely of Lehmann lovegrass (*Eragrostis lehmanniana*), which provides similar cover to that of the native species. The low-growing subshrub fairyduster (*Calliandra eriophylla*) is a consistent (0.73) associate with inconspicuous cover of 1% to 3 [6]%. Schott's century plant (*Agave* schottii) is a consistent (0.81) dominant with average cover around 6%. Other noteworthy field components include Arizona spikemoss (*Selaginella arizonica*), rockloving spikemoss (*Selaginella rupincola*), ambrosia leaf bur ragweed (*Ambrosia ambrosioides*), bastardsage (*Eriogonum wrightii*), oakwoods prairie clover (*Dalea versicolor*), slender janusia (*Cottsia gracilis*), prairie acacia (*Acacia angustissima*), red brome (*Bromus rubens*), and pineneedle milkweed (*Asclepias linaria*).

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This group is a broadly defined desert grassland (shrub-steppe) that is typical of the Borderlands of Arizona, New Mexico, and northern Mexico. It extends throughout much of the Chihuahuan Desert, west to the Sonoran Desert, and north to the Mogollon Rim. The vegetation is characterized by an open to dense herbaceous layer dominated by a diverse mixture of perennial desert grasses. Scattered shrubs and succulents are usually present, but they typically have lower total cover than the herbaceous layer. Common species include desert grasses, such as *Bouteloua eriopoda*, *Bouteloua ramosa*, *Bouteloua rothrockii*, and *Muhlenbergia porteri*, as well as widespread species, such as *Bouteloua curtipendula*, *Bouteloua gracilis*, *Bouteloua hirsuta*, and *Eragrostis intermedia*. Also typical are succulents, such as *Agave lechuguilla*, rosetophyllous shrubs, such as species of *Nolina*, *Dasylirion*, and *Yucca*, and short (dwarf) shrubs including species of *Calliandra*, *Mimosa*, and *Parthenium*. Scattered tall shrubs and short trees, such as species of *Acacia*, *Prosopis*, and various oaks, may be present but with low cover. In upper foothills and lower montane zones, *Muhlenbergia emersleyi* and *Muhlenbergia setifolia* are characteristic species. Sites occur on gently sloping, alluvial erosional fans and piedmonts (bajadas) that lie along mountain fronts of the isolated basin ranges (e.g., sky-island mountain archipelago), extending onto foothill slopes up to 1,670 meters elevation in the Chihuahuan Desert.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 61. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens* (0.90), *Prosopis velutina* (0.50)
Subcanopy (0.5–2 m)	*Opuntia engelmannii* (0.79), *Ericameria laricifolia* (0.79)
Field (0–0.5 m)	*Agave schottii* (0.81)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 62. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Carnegiea gigantea, Prosopis velutina, Quercus oblongifolia, Vauquelinia californica*
Subcanopy (0.5–2 m)	*Cylindropuntia versicolor, Gossypium thurberi, Senegalia greggii, Dasylirion wheeleri, Lysiloma watsonii, Eysenhardtia orthocarpa, Jatropha cardiophylla*
Field (0–0.5 m)	*Calliandra eriophylla, Bouteloua curtipendula, Heteropogon contortus, Aristida ternipes, Muhlenbergia porteri, Bothriochloa barbinodis, Muhlenbergia emersleyi, Eragrostis lehmanniana, Selaginella arizonica, Selaginella rupincola, Eriogonum wrightii, Dalea versicolor, Cottsia gracilis, Acacia angustissima, Asclepias linaria, Bromus rubens, Ambrosia ambrosioides*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 21 plots, 19 classification plots sampled during the 2013–2017 mapping and classification effort, and two upland soil and vegetation monitoring plots.

Polygons attributed as NPSODN124 overlapped with three groups classified by Roseberry and Dole (1939), a semi-desert chaparral group defined by an open area dominated by "shrub species common to the Sonoran life zone," a woodland chaparral group defined as "areas that contain 20% or more of both broadleaf tree and shrub species," and a Sonoran chaparral group defined as "areas that contain 80% or more shrub species common to the Sonoran life zone."

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park

Inventory notes: Data not available

Plots: V302_005, V302_012, IP310U, IP330U, IP350U, IP462U, IPS017, IPS031, IPS035, IPS039, IPS041, IPS043, IPS085, IPS091, IPS093, IPS122, IPS124, IPS128, IPS603, IPS804, IPS805

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A., and E. Muldavin. 2015. Chihuahuan Desert Foothill-Piedmont and Lower Montane Grassland, version date 05Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed April 22, 2020.

24. *Fouquieria splendens* / (*Opuntia engelmannii*) / *Selaginella rupincola* Sparse Rock Outcrop Association (P)

Translated name: Ocotillo / (Cactus apple) / Rockloving spikemoss Sparse Rock Outcrop Association (P)

NVC name: N/A

Identifier: NPSSODN125

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	*Fouquieria splendens* / (*Opuntia engelmannii*) / *Selaginella rupincola* Sparse Rock Outcrop (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is distributed throughout the low-elevation regions of the park, especially on the southern slopes of Tanque Verde Ridge.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This sparse rock outcrop community is restricted to generally south-trending expanses of exposed bedrock from 984 to 1,400 meters (3,228–4,593 ft). The surface cover is dominated (50+%) by vast expanses of exposed bedrock composed of gneissic quartz monzonite with scattered pockets of soil and gravel. Areas with noteworthy vegetation typically have moderate grades (<25%), but there are often vertical cliff bands within this community, usually when transitioning into a large drainage.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is characterized by a very sparse (<6%) canopy stratum (>2 m) dominated by ocotillo (*Fouquieria splendens*), a sparse (<8%) subcanopy (0.5–2 m) of cactus apple (*Opuntia engelmannii*), and a variable (14–35%) field stratum (<0.5 m) dominated by rockloving spikemoss (*Selaginella rupincola*). Ocotillo (*Fouquieria splendens*) is consistently (1.0) present with variable cover ranging from 3% to 8% and averaging around 6%. This species is typically present in the canopy at heights ranging from 4 to 5 meters. Its distribution is dictated by the presence of soil and/or fractures in the bedrock. Saguaro (*Carnegiea gigantea*) is the only other canopy species documented, typically along the margins of the community; it has scant (<1% cover).

The subcanopy is characterized by the consistent (1.0), but low-cover, presence of the succulent, cactus apple (*Opuntia engelmannii*). This species is typically present as small, stunted individuals that are more or less limited to the vegetated islands scattered throughout the bedrock. Across this community, cactus apple (*Opuntia engelmannii*) ranges from 1% to 5% cover. Both velvet mesquite (*Prosopis velutina*) and yellow paloverde (*Parkinsonia microphylla*) can be present as small, shrubby individuals with scant cover (<1%) throughout. Other documented, but very sparse, species include jumping cholla (*Cylindropuntia fulgida*), staghorn cholla (*Cylindropuntia versicolor*), turpentine bush (*Ericameria laricifolia*), common sotol (*Dasylirion wheeleri*), catclaw acacia (*Senegalia greggii*), and littleleaf false tamarind (*Lysiloma watsonii*). The composition of low-cover associates is typically dictated by what is present in the adjacent communities.

The field stratum is characterized by the sole dominance of spikemoss (*Selaginella* sp.), predominately rockloving spikemoss (*Selaginella rupincola*). Arizona spikemoss (*Selaginella arizonica*) may become co-dominant at times. These two species account for about one-half of the total relative cover documented in this community (i.e.,

about 10–30%). Distribution of these species within this community is typically quite consistent, except in extremely steep sections. Schott's century plant (*Agave schottii*) and slender bouteloua (*Bouteloua repens*) are patchy (0.67) associates that, when present, can provide cover up to 3% each. A diverse mix of sparse associates was also documented, including rose natal grass (*Melinis repens*), spiked crinkleawn (*Trachypogon spicatus*), Arizona muhly (*Muhlenbergia arizonica*), sangre de cristo (*Jatropha cardiophylla*), and red hoarypea (*Tephrosia vicioides*). These species are all restricted to areas where surface soil is present.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3 to 16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic, deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*, and many cacti, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs, with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 63. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens* (1.0)
Subcanopy (0.5–2 m)	*Opuntia engelmannii* (1.0)
Field (0–0.5 m)	*Selaginella rupincola* (1.0), *Selaginella arizonica* (0.25)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 64. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Carnegiea gigantea*
Subcanopy (0.5–2 m)	*Parkinsonia microphylla, Prosopis velutina, Cylindropuntia versicolor, Senegalia greggii, Dasylirion wheeleri, Lysiloma watsonii, Cylindropuntia fulgida*
Field (0–0.5 m)	*Agave schottii, Bouteloua repens, Melinis repens, Trachypogon spicatus, Muhlenbergia arizonica, Jatropha cardiophylla, Tephrosia vicioides*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from four classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSODN125 overlapped with two groups classified by Roseberry and Dole (1939), a broad group defined solely by the consistent presence of saguaro (*Carnegiea gigantea*), and a Sonoran chaparral

group defined as “areas that contain 80% or more shrub species common to the Sonoran life zone.”

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park

Inventory notes: Data not available

Plots: IPS086U, IPS089, IPS126U, IP360U

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 31, 2019.

25. *Nolina microcarpa* / Mixed Perennial Grass - *Agave schottii* Shrub Savanna Association (P)

Translated name: Beargrass / Mixed Perennial Grass - Schott's century plant Shrub Savanna Association (P)

NVC name: N/A

Identifier: NPSSODN126

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Chihuahuan Semi-Desert Grassland [M087]
Group	Chihuahuan Desert Foothill-Piedmont and Lower Montane Grassland [G490]
Alliance	–
Association	*Nolina microcarpa* / Mixed Perennial Grass - *Agave schottii* Shrub Savanna (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread across Tanque Verde Ridge and on the western slopes of Rincon Peak, especially within the boundaries of the Box Canyon Fire of 1999.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrub savanna is restricted to low-angle (5–20%) ridges and benches from 1,200 to 1,700 meters (4,100–5,577 ft). Depending on a combination of elevation and slope, this community can occur on any aspect. The surface cover spans a number of soil series that are all shallow and well-drained, gravelly to skeletal loamy soils with occasional areas of clay. Covering / interspersed with the soil is a dominant layer of gravel with scattered rocks and occasional exposed bedrock. Parent material is very diverse with areas including mica schist, quartz monzonite, and gneissic granodiorite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is characterized by a moderately sparse (<15%) subcanopy (0.5–2 m) dominated by beargrass (*Nolina microcarpa*), and a highly variable (10–40%) field stratum (<0.5 m) dominated by perennial grasses and Schott's century plant (*Agave schottii*). All examples of this community occur within the boundaries of the 1999 Box Canyon Fire, and historic fire disturbance was noted in all classification plots. This community is likely a post-fire version of the similar association, [*Quercus oblongifolia - Prosopis velutina - Vauquelinia californica*] / *Nolina microcarpa* / Mixed Perennial Grass - *Agave schottii* Wooded Shrub Savanna Association.

The canopy strata (>2 m) are extremely sparse (<5 %) and typically characterized by scattered pockets of trees. Border pinyon (*Pinus discolor*) and California rosewood (*Vauquelinia californica*) are the most common of these trees; when present, they can provide 1% to 2% cover. Velvet mesquite (*Prosopis velutina*), Emory oak (*Quercus emoryi*), and Mexican blue oak (*Quercus oblongifolia*) were also documented within this community.

The subcanopy is characterized by the consistent (1.0), but low-cover (5%), dominance of beargrass (*Nolina microcarpa*). Distribution of this species is variable; it ranges from scattered, small individuals to large, dense clumps. Locally, cover can be as low as 1% or as high as 10%. Other noteworthy subcanopy species include common sotol (*Dasylirion wheeleri*), pointleaf manzanita (*Arctostaphylos pungens*), dollarjoint prickly pear (*Opuntia chlorotica*), catclaw mimosa (*Mimosa aculeaticarpa*), and desertbroom (*Baccharis sarothroides*).

The field stratum is characterized by a mix of perennial grasses, native and non-native, and the small succulent, Schott's century plant (*Agave schottii*). Overall, the grasses are mainly dominated by a single non-native, Lehmann

lovegrass (*Eragrostis lehmanniana*). While it contributes the highest average cover (10%) across the community, its distribution is extremely patchy, with many areas having little to no cover and others a dense matrix up to 30%. Buffelgrass (*Cenchrus ciliaris*) was documented in one classification plot. When Lehmann lovegrass (*Eragrostis lehmanniana*) is sparse, a number of native grasses can provide conspicuous but low cover; these include sideoats grama (*Bouteloua curtipendula*), bullgrass (*Muhlenbergia emersleyi*), and tanglehead (*Heteropogon contortus*). Schott's agave (*Agave schottii*) is the most consistent (1.0) field component, providing cover that ranges from 2% to 10%. Locally, distribution of this species can appear patchy; however, when viewed across the community as a whole, it is quite consistent. Prairie acacia (*Acacia angustissima*) is a consistent (1.0), low-cover (<1%) species. In areas where exposed sheets of bedrock are prevalent and/or on sheltered, north-facing slopes, rockloving spikemoss (*Selaginella rupincola*) can become the sole field dominant.

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This group is a broadly defined desert grassland (shrub-steppe) that is typical of the Borderlands of Arizona, New Mexico, and northern Mexico. It extends throughout much of the Chihuahuan Desert, west to the Sonoran Desert, and north to the Mogollon Rim. The vegetation is characterized by an open to dense herbaceous layer dominated by a diverse mixture of perennial desert grasses. Scattered shrubs and succulents are usually present, but they typically have lower total cover than the herbaceous layer. Common species include desert grasses, such as *Bouteloua eriopoda*, *Bouteloua ramosa*, *Bouteloua rothrockii*, and *Muhlenbergia porteri*, as well as widespread species, such as *Bouteloua curtipendula*, *Bouteloua gracilis*, *Bouteloua hirsuta*, and *Eragrostis intermedia*. Also typical are succulents, such as *Agave lechuguilla*, rosetophyllous shrubs, such as species of *Nolina*, *Dasylirion*, and *Yucca*, and short (dwarf) shrubs including species of *Calliandra*, *Mimosa*, and *Parthenium*. Scattered tall shrubs and short trees, such as species of *Acacia*, *Prosopis*, and various oaks, may be present but with low cover. In upper foothills and lower montane zones, *Muhlenbergia emersleyi* and *Muhlenbergia setifolia* are characteristic species. Sites occur on gently sloping, alluvial erosional fans and piedmonts (bajadas) that lie along mountain fronts of the isolated basin ranges (e.g., sky-island mountain archipelago), extending onto foothill slopes up to 1,670 meters elevation in the Chihuahuan Desert.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 65. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Nolina microcarpa* (1.0)
Field (0–0.5 m)	*Agave schottii* (1.0), *Eragrostis lehmanniana* (0.33)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 66. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus emoryi, Quercus oblongifolia, Pinus discolor, Vauquelinia californica*
Subcanopy (0.5–2 m)	*Dasylirion wheeleri, Arctostaphylos pungens, Opuntia chlorotica, Mimosa aculeaticarpa, Baccharis sarothroides*
Field (0–0.5 m)	*Selaginella rupincola, Cenchrus ciliaris, Bouteloua curtipendula, Muhlenbergia emersleyi, Heteropogon contortus, Acacia angustissima*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from four plots, three classification plots sampled during the 2013–2017 mapping and classification effort, and one upland soil and vegetation monitoring plot.

Polygons attributed as NPSODN126 overlap with one group classified by Roseberry and Dole (1939), a woodland chaparral group defined as "areas that contain 20% or more of both broadleaf tree and shrub species."

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS103U, IPS112U, IP402H, V302_009

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A., and E. Muldavin. 2015. Chihuahuan Desert Foothill-Piedmont and Lower Montane Grassland, version date 05Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed April 22, 2020.

26. *Parkinsonia microphylla* / *Ambrosia deltoidea* Shrubland Association (P)

Translated name: Yellow paloverde / Triangle bur ragweed Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN100

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub and Grassland [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	*Parkinsonia microphylla* / *Ambrosia deltoidea* Shrubland (P)

DISTRIBUTION

Saguaro National Park

In the Rincon Mountain District (RMD), this community is limited to one hill toward the northern end of the Cactus Forest Loop Road. In the Tucson Mountain District (TMD), this community is found wherever alluvial fans meet with hills or mountain slopes.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park

This association is at the transitional zone between alluvial fan associations and mid-elevation slopes. It is found predominantly on low sections of backslopes and footslopes of hills and mountains from 700 to 1,000 meters (2,300–3,300 ft). At its highest elevation, it is seen on open flats on top of mountains. It is generally restricted to slopes of 25 to 45 degrees. Ground surface cover is a mixture of coarse gravel and rock occurring on a number of different geology types, without driving any notable difference in vegetation.

VEGETATION DESCRIPTION

Saguaro National Park

This shrubland community is characterized by a very sparse (<5%) canopy (2–5 m) of yellow paloverde (*Parkinsonia microphylla*) and a moderately dense (20–40%) field layer (<0.5 m) solely dominated by triangle bur ragweed (*Ambrosia deltoidea*).

In the canopy, yellow paloverde (*Parkinsonia microphylla*) is consistently (1.0) present as scattered and small (3–4 m), tree-like individuals with average cover around 3%. At RMD, velvet mesquite (*Prosopis velutina*) can co-occur with yellow paloverde (*Parkinsonia microphylla*) with cover around 1%. Saguaro (*Carnegiea gigantea*) is a consistent (1.0), low-cover (<1%) associate. At TMD, ocotillo (*Fouquieria splendens*) is an occasional (0.50) associate.

The subcanopy composition is conspicuously different between the two districts. At RMD, the subcanopy is characterized by the presence and typical dominance of creosote (*Larrea tridentata*) with no other noteworthy associates. This consistently (1.0) present species provides cover around 5 [10]%. At TMD, the subcanopy is a sparse (2–4%) mix of whitethorn acacia (*Vachellia constricta*), Berlandier's wolfberry (*Lycium berlandieri*), and buckhorn cholla (*Cylindropuntia acanthocarpa*). Due to low cover and species diversity, this stratum is noticeably different from the adjacent alluvial fan types that support a diverse suite of shrubs and succulents. Certain distinctive species of the adjacent alluvial communities tend to be rare (desert ironwood [*Olneya tesota*] and cactus apple [*Opuntia engelmannii*]) or absent (pencil cholla [*Cylindropuntia arbuscula*] and chain-fruit cholla [*Cylindropuntia fulgida*]) from this community. Other noteworthy species, Sangre de cristo (*Jatropha cardiophylla*), catclaw acacia (*Senegalia greggii*), and Berlandier's wolfberry (*Lycium berlandieri*), are low-cover associates.

The field layer (<0.5 m) is consistently dominated (1.0) by the low subshrub, triangle bur ragweed (*Ambrosia*

deltoidea). Throughout this association, this species provides cover that is typically less than 10%, excluding an example at RMD with notably high cover (20%). The consistent dominance of this species, and low cover of associate species, is a defining characteristic of this association. Less common associates may include fairyduster (*Calliandra eriophylla*), slender janusia (*Cottsia gracilis*), American threefold (*Trixis californica*), tulip pricklypear (*Opuntia phaeacantha*), pelotazo (*Abutilon incanum*), white ratany (*Krameria bicolor*), and buffelgrass (*Cenchrus ciliaris*).

In general, species diversity tends to increase as one moves upslope. On these slopes, a number of species start to appear more frequently and merge in from the neighboring communities; these species include fairyduster (*Calliandra eriophylla*), slender janusia (*Cottsia gracilis*), sangre de cristo (*Jatropha cardiophylla*), white ratany (*Krameria bicolor*), Berlandier's wolfberry (*Lycium berlandieri*), buckhorn cholla (*Cylindropuntia acanthocarpa*), and whitethorn acacia (*Vachellia constricta*). While these adjacent communities may share a number of associate shrubs, they should not contain more than scant cover of triangle bur ragweed (*Ambrosia deltoidea*). Brittlebush (*Encelia farinosa*) is a transitional component of this community and may be present on the upper slopes of this community.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*. Many cacti are also present, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 67. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0, 1.0)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Ambrosia deltoidea* (1.0, 1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association with RMD listed first, then TMD).

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 68. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Prosopis velutina, Fouquieria splendens, Vachellia constricta, Cylindropuntia acanthocarpa, Jatropha cardiophylla, Senegalia greggii, Lycium berlandieri, Larrea tridentata*
Subcanopy (0.5–2 m)	*Larrea tridentata*
Field (0–0.5 m)	*Calliandra eriophylla, Menodora scabra, Cottsia gracilis, Echinocereus fasciculata, Krameria bicolor, Cenchrus ciliaris, Encelia farinosa, Trixis californica, Opuntia phaeacantha*

CLASSIFICATION COMMENTS

Saguaro National Park

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from one plot sampled at RMD during the 2013–2017 mapping and classification effort, and 13 classification plots sampled at TMD during the 2010 mapping and classification effort.

At RMD, Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a broad group defined solely by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

This described community fits well within the Sonoran Paloverde - Mixed Cacti Desert Scrub Group (G293). Its type concept includes all diagnostic species present within, and landforms covered by, NPSSODN100. Three associations are nested under this group, but none currently includes a detailed type concept. Because of this, we are unable to confirm membership of NPSSODN100 in any of these associations.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park

Inventory notes: Data not available

Plots: IPS148

Saguaro National Park, Tucson Mountain District

Plots: IP020, IP021, IP030, IP037, IP060, IP062, IP063, IP078, IP079, IP123, IP137, IP148, IP193

Local description authors: J. Galvin, S. Studd, N. Gonzalez

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2015. Sonoran Paloverde - Mixed Cacti Desert Scrub Group, version date 05Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed August 28, 2019.

Schulz, K. A. 2013. Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 31, 2019.

27. *Parkinsonia microphylla* / *Encelia farinosa - Hibiscus denudatus* Shrubland Association (P)

Translated name: Yellow paloverde / Brittlebush - Paleface Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN090

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub and Grassland [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	*Carnegiea gigantea - Parkinsonia microphylla - Prosopis velutina* Desert Scrub Alliance [A3282]
Association	*Parkinsonia microphylla / Encelia farinosa - Hibiscus denudatus* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread on the hills east of the Camino Loma Alta trailhead.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is often found on low-angle (<25%), rolling hills, typically with a southern aspect, from 970–1,070 meters (3,182–3,510 ft). In general, the surface cover is defined by shallow, well-drained soils that underlie a layer of coarse (5–10 cm) gravel and small rocks that are part of the Bisbee geologic group; this group includes sandstone, shale, and limestone. Within the park, this community is restricted to this geologic group.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is characterized by a moderately sparse (<15%) canopy (>2 m) dominated by yellow paloverde (*Parkinsonia microphylla*) and a moderately dense (20%) field layer (<0.5 m) co-dominated by brittlebush (*Encelia farinosa*) and paleface (*Hibiscus denudatus*). Yellow paloverde (*Parkinsonia microphylla*) is typically present as small (3 m), tree-like individuals or small, shrubby individuals (<2 m); cover averages around 10% and ranges from a sparse 3% to 15%. Ocotillo (*Fouquieria splendens*) is a fairly consistent (0.71), low-cover associate with cover mainly less than 5%. Saguaro (*Carnegiea gigantea*) is a sparse associate with trivial cover throughout.

The subcanopy is characterized by a diverse mix of shrubs and succulents, with cactus apple (*Opuntia engelmannii*) often providing the highest cover. However, this species is an inconsistent associate; in some areas it provides cover up to 6%, and in many areas it is absent. Where exposed bedrock is high and/or slopes are steep (40+%) and south-trending, teddybear cholla (*Cylindropuntia bigelovii*) can become a subcanopy dominant. This species is not consistent throughout the community. Other noteworthy subcanopy species include whitethorn acacia (*Vachellia constricta*), Berlandier's wolfberry (*Lycium berlandieri*), creosote bush (*Larrea tridentata*), and staghorn cholla (*Cylindropuntia versicolor*).

The field layer is consistently dominated by the low subshrubs, brittlebush (*Encelia farinosa*) and paleface (*Hibiscus denudatus*). Brittlebush (*Encelia farinosa*) is the more consistent of the two, with an average of 10% and some areas up to 20%. Paleface (*Hibiscus denudatus*) ranges from a co-dominant or sole dominant with cover ranging from 5 % to 10% to a common associate with <5% cover. Other noteworthy associates include desert zinnia (*Zinnia* acerosa), slender janusia (*Cottsia gracilis*), Cochise scaly cloakfern (*Astrolepis cochisensis*), rough menodora (*Menodora scabra*), hairy-seed bahia (*Bahia absinthifolia*), woody crinklemat (*Tiquilia canescens*), black grama (*Bouteloua eriopoda*), slim tridens (*Tridens muticus*), dense ayenia (*Ayenia microphylla*), mariola (*Parthenium incanum*), bush muhly (*Muhlenbergia porteri*), and cockroach plant (*Haplophyton crooksii*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*, and many cacti, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 69. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0)
Subcanopy (0.5–2 m)	*Opuntia engelmannii* (0.87)
Field (0–0.5 m)	*Encelia farinosa* (1.0), *Hibiscus denudatus* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 70. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Fouquieria splendens, Carnegiea gigantea*
Subcanopy (0.5–2 m)	*Vachellia constricta, Lycium berlandieri, Larrea tridentata, Cylindropuntia versicolor*
Field (0–0.5 m)	*Zinnia acerosa, Muhlenbergia porteri, Menodora scabra, Tiquilia canescens, Senna covesii, Parthenium incanum, Bouteloua eriopoda, Cottsia gracilis, Tridens muticus, Ayenia microphylla, Haplophyton crooksii*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from eight plots sampled during the 2013–2017 mapping and classification effort.

The majority of this community falls within the expansion lands added to the park in 1991, which are located along the western half of the south boundary. This area was not included in Saguaro National Park when Roseberry and Dole (1939) created their map. This community likely would have been placed within the broad group defined by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

This described community fits well within the Sonoran paloverde – mixed cacti desert scrub group (G293). Its type concept includes most diagnostic species present within, and landforms covered by, NPSSODN090. Paleface (*Hibiscus denudatus*) is notably absent from the group description. Three associations are nested under this group; however, none currently include a detailed type concept, and the USNVC names are a poor fit for NPSSODN090.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS066U, IPS070U, IPS121, IPS123, IPS748, IPS760, IPS764, IPS766

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2015. Sonoran Paloverde - Mixed Cacti Desert Scrub Group, version date 05Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed August 28, 2019.

Schulz, K. A. 2013. Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 31, 2019.

28. *Parkinsonia microphylla* / *Encelia farinosa - Zinnia acerosa* Shrubland Association (P)

Translated name: Yellow paloverde / Brittlebush - Desert zinnia Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN102

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub and Grassland [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Allaiance	*Carnegiea gigantea - Parkinsonia microphylla - Prosopis velutina* Desert Scrub [A3282]
Association	*Parkinsonia microphylla / Encelia farinosa - Zinnia acerosa* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread on the hills east of the Camino Loma Alta Trailhead.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is often found on low-angle (<25%) rolling hills, typically with a southern aspect, from 970 to 1,070 meters (3,182–3,510 ft). In general, the surface cover is defined by shallow, well-drained soils that underlie a layer of coarse (5–10 cm) gravel and small rocks that are part of the Bisbee geologic group; this group includes sandstone, shale, and limestone. Within the park, this community is restricted to this geologic group.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is characterized by a moderately sparse (<15%) canopy (>2 m) dominated by yellow paloverde (*Parkinsonia microphylla*) and a 10% to 20% field layer (<0.5 m) co-dominated by brittlebush (*Encelia farinosa*) and desert zinnia (*Zinnia acerosa*). Yellow paloverde (*Parkinsonia microphylla*) is typically present as small (3 m), tree-like individuals or small, shrubby individuals (<2 m); cover averages around 10% and ranges from a sparse 3% to 15%. Ocotillo (*Fouquieria splendens*) is a fairly consistent low-cover associate with cover mainly less than 5%. Saguaro (*Carnegiea gigantea*) is a sparse associate with trivial cover throughout.

The subcanopy is characterized by a diverse mix of shrubs and succulents with cactus apple (*Opuntia engelmannii*) often providing the highest cover. However, this species is an inconsistent associate; in some areas it provides cover up to 6%, and in many areas it is absent. Where exposed bedrock is high and/or slopes are steep (40+%) and south-trending, teddybear cholla (*Cylindropuntia bigelovii*) can provide small inclusions of dominance but should not be consistent across the landscape. Other noteworthy subcanopy species include whitethorn acacia (*Vachellia constricta*), Berlandier's wolfberry (*Lycium berlandieri*), creosote bush (*Larrea tridentata*), and staghorn cholla (*Cylindropuntia versicolor*).

The field layer is consistently dominated by the low subshrubs, brittlebush (*Encelia farinosa*) and desert zinnia (*Zinnia acerosa*). Brittlebush (*Encelia farinosa*) is the more consistent of the two, providing cover that typically ranges from 5% to 10% with some areas up to 20%. Desert zinnia (*Zinnia acerosa*) can be co-dominant with, or more dominant than, brittlebush (*E. farinosa*), providing cover that ranges from 5% to 10%. When this community spans areas with extremely shallow soils, these species may exhibit decreased cover (<5%), but they should still be the most prominent field components. Mariola (*Parthenium incanum*) and woody crinklemat (*Tiquilia canescens*) may provide small inclusions of dominance, but they should never overtake brittlebush (*Encelia farinosa*) and desert zinnia (*Zinnia acerosa*) across the broader community. Other noteworthy associates include paleface

(*Hibiscus denudatus*), slender janusia (*Cottsia gracilis*), Cochise scaly cloakfern (*Astrolepis cochisensis*), rough menodora (*Menodora scabra*), hairy-seed bahia (*Bahia absinthifolia*), Arizona wrightwort (*Carlowrightia arizonica*), black grama (*Bouteloua eriopoda*), slim tridens (*Tridens muticus*), dense ayenia (*Ayenia microphylla*), bush muhly (*Muhlenbergia porteri*), and cockroach plant (*Haplophyton crooksii*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*, and many cacti, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 71. Most abundant species for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla*
Subcanopy (0.5–2 m)	*Opuntia engelmannii*
Field (0–0.5 m)	*Encelia farinosa, Zinnia acerosa*

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 72. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Fouquieria splendens, Carnegiea gigantea*
Subcanopy (0.5–2 m)	*Vachellia constricta, Lycium berlandieri, Larrea tridentata, Cylindropuntia versicolor*
Field (0–0.5 m)	*Carlowrightia arizonica, Hibiscus denudatus, Muhlenbergia porteri, Menodora scabra, Tiquilia canescens, Senna covesii, Parthenium incanum, Bouteloua eriopoda, Cottsia gracilis, Tridens muticus, Ayenia microphylla, Haplophyton crooksii*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on observations from the 2013–2017 mapping and classification effort.

The majority of this community falls within the expansion lands added to the park in 1991, which are located along the western half of the south boundary. This area was not included in Saguaro National Park when Roseberry and Dole (1939) created their map. This community likely would have been placed within the broad group defined by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: N/A

Polygons: N/A

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 31, 2019.

30. *Parkinsonia microphylla* / *Opuntia engelmannii* / *Encelia farinosa* Shrubland Association (P)

Translated name: Yellow paloverde / Cactus apple / Brittlebush Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN096

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub and Grassland [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	*Carnegiea gigantea - Parkinsonia microphylla - Prosopis velutina* Desert Scrub [A3282]
Association	*Parkinsonia microphylla / Opuntia engelmannii / Encelia farinosa* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread across the rolling hills within the Cactus Forest Loop Road area of the park, especially along the western boundary.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is often found on small and low-angle (<25%) rolling hills of variable aspects from 820–945 meters (2,609–3,100 ft). In general, the surface cover is characterized by shallow, well-drained skeletal loam and clay underlying a layer of coarse (5–10 cm) gravel with scattered rocks. Typically, the rock and gravel is composed of a fine-grained metaquartzite with occasional areas of rhyolitic tuff.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is characterized by a sparse (<10%) canopy (2–5 m) of yellow paloverde (*Parkinsonia microphylla*), a variable (5–25%) subcanopy (0.5–2 m) of cactus apple (*Opuntia engelmannii*), and a moderately dense (15–30%) field layer (<0.5 m) dominated solely by brittlebush (*Encelia farinosa*). Yellow paloverde (*Parkinsonia microphylla*) is consistently (1.0) present as scattered and large (4 m), tree-like individuals with average cover around 5%, including some areas up to 15%. Occasionally (0.60), velvet mesquite (*Prosopis velutina*) can co-occur with yellow paloverde (*Parkinsonia microphylla*) with cover around 1%, or be present as the sole canopy tree with cover up to 5%. Saguaros (*Carnegiea gigantea*) and ocotillos (*Fouquieria splendens*) are consistent (0.80), but sparse, associates with trivial (<1%) cover throughout.

The subcanopy is characterized by a diverse mix of shrubs and succulents, with creosote (*Larrea tridentata*) and cactus apple (*Opuntia engelmannii*) providing the most cover throughout. Cactus apple (*Opuntia engelmannii*) is a fairly consistent (0.80) dominant, averaging 7% cover across the community including areas up to 16%. Creosote (*Larrea tridentata*) is a less consistent (0.70) associate that typically provides sparse (<1%) cover. It occasionally occurs in pockets of co-dominance with cactus apple (*Opuntia engelmannii*). Sometimes it provides sole dominance within the stratum, often with cover between 10% and 20%. Staghorn cholla (*Cylindropuntia versicolor*) is a consistent (0.70), low-cover associate with average cover typically from 1% to 2%. Teddybear cholla (*Cylindropuntia bigelovii*) is an uncommon species within this community, but, when present, may provide local dominance. From most to least frequent, other noteworthy associate shrubs and succulents include Berlandier's wolfberry (*Lycium berlandieri*), whitethorn acacia (*Vachellia constricta*), Warnock's snakewood (*Condalia warnockii*), spiny hackberry (*Celtis ehrenbergiana*), chain-fruit cholla (*Cylindropuntia fulgida*), and Arizona pencil cholla (*Cylindropuntia arbuscula*). Typically, whitethorn acacia (*Vachellia constricta*) and spiny hackberry (*Celtis*

ehrenbergiana) are most common on steep, northern aspects and/or when in close proximity to the numerous small drainages that bisect this association.

The field layer (<0.5 m) is consistently dominated (1.0) by the low subshrub, brittlebush (*Encelia farinosa*). Throughout this association, brittlebush (*Encelia farinosa*) provides an average cover of 20% with areas ranging from 12% to 30%. The consistent dominance of this species and low cover of associate species are defining characteristics of this association. In order from most to least frequent, other associates include bush muhly (*Muhlenbergia porteri*), desert zinnia (*Zinnia acerosa*), candy barrelcactus (*Ferocactus wislizeni*), rough menodora (*Menodora scabra*), and Christmas cactus (*Cylindropuntia leptocaulis*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*, and many cacti, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 73. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0)
Subcanopy (0.5–2 m)	*Larrea tridentata* (0.7), *Opuntia engelmannii* (0.8)
Field (0–0.5 m)	*Encelia farinosa* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY SPECIES

Table 74. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Prosopis velutina, Fouquieria splendens, Carnegiea gigantea*
Subcanopy (0.5–2 m)	*Vachellia constricta, Lycium berlandieri, Celtis ehrenbergiana, Condalia warnockii, Cylindropuntia versicolor, Cylindropuntia fulgida, Cylindropuntia bigelovii, Cylindropuntia arbuscula*
Field (0–0.5 m)	*Muhlenbergia porteri, Menodora scabra, Zinnia acerosa, Cylindropuntia leptocaulis, Ferocactus wislizeni*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from 10 plots sampled during the 2013–2017 mapping and classification effort.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a broad group defined solely by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

This described community fits well within the Sonoran paloverde - mixed cacti desert scrub group (G293). Its type concept includes all diagnostic species present within, and landforms covered by, NPSSODN096. Three associations are nested under this group; however, none currently include a detailed type concept, and the USNVC names are a poor fit for NPSSODN0096.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS080U, IPS130U, IPS132U, IPS138U, IP212U, IP230H, IP256U, IP261U, IP265, IP276U

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 31, 2019.

31. *Parkinsonia microphylla* / *Parthenium incanum* Shrubland Association (P)

Translated name: Yellow paloverde / Mariola Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN091

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	–
Alliance	–
Association	*Parkinsonia microphylla* / *Parthenium incanum* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread on the hills east of the Camino Loma Alta trailhead.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is found exclusively on steep (30–50%), north-facing backslopes from 925 to 1,045 meters (3,030–3,428 ft). The surface cover is defined by shallow and well-drained soils underlying a layer of coarse (5–10 cm) gravel and small rocks that are part of the Bisbee geologic group, which includes sandstone, shale, and limestone. Within the park, this community is restricted to this geologic group.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is characterized by a sparse (<10%) canopy (>2 m) dominated by yellow paloverde (*Parkinsonia microphylla*) and a moderately dense (20–30%) field layer (<0.5 m) dominated solely by mariola (*Parthenium incanum*). Yellow paloverde (*Parkinsonia microphylla*) is a consistent (1.0) dominant that is typically present as small (3 m tall), tree-like individuals or large, shrubby individuals (<2 m); cover is variable and ranges from 5 to 20%. Saguaros (*Carnegiea gigantea*) and ocotillos (*Fouquieria splendens*) are sparse associates with trivial cover throughout.

The subcanopy is characterized by a low-cover mix of shrubs and succulents without any consistent dominants or common associates. Cactus apple (*Opuntia engelmannii*) is an inconsistent (0.60) and variable associate that provides occasional inclusions of dominance with cover around 5%; it can also be absent. Other noteworthy shrubs include whitethorn acacia (*Vachellia constricta*), Warnock's snakewood (*Condalia warnockii*), spiny hackberry (*Celtis ehrenbergiana*), Berlandier's wolfberry (*Lycium berlandieri*), Wright's beebrush (*Aloysia wrightii*), creosote (*Larrea tridentata*), catclaw acacia (*Senegalia greggii*), and sangre de cristo (*Jatropha cardiophylla*).

The field layer is consistently (1.0) dominated by a moderately dense (15–25%) layer of mariola (*Parthenium incanum*). Brittlebush (*Encelia farinosa*), woody crinklemat (*Tiquilia canescens*), paleface (*Hibiscus denudatus*), and rough menodora (*Menodora scabra*) are all low-cover but conspicuous associates. Brittlebush (*Encelia farinosa*) is most common where the aspect begins to shift and become more exposed and/or as the backslopes start to level off near the summits of hills. Woody crinklemat (*Tiquilia canescens*) is most common on the lower-angle backslopes where they begin to transition to footslopes. Other noteworthy associates include black grama (*Bouteloua eriopoda*), bush muhly (*Muhlenbergia porteri*), whitestem paperflower (*Psilostrophe cooperi*), fairyduster (*Calliandra eriophylla*), desert zinnia (*Zinnia acerosa*), slim tridens (*Tridens muticus*), and hairy-seed bahia (*Bahia absinthifolia*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 75. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (0.85)
Subcanopy (0.5–2 m)	*Opuntia engelmannii* (0.57)
Field (0–0.5 m)	*Parthenium incanum* (0.85)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 76. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens, Carnegiea gigantea*
Subcanopy (0.5–2 m)	*Vachellia constricta, Condalia warnockii, Celtis ehrenbergiana, Lycium berlandieri, Larrea tridentata, Aloysia wrightii, Senegalia greggii, Jatropha cardiophylla*
Field (0–0.5 m)	*Encelia farinosa, Muhlenbergia porteri, Menodora scabra, Tiquilia canescens, Bouteloua eriopoda, Tridens muticus, Hibiscus denudatus, Bahia absinthifolia, Zinnia acerosa, Calliandra eriophylla, Psilostrophe cooperi*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 10 plots, nine classification plots sampled during the 2013–2017 mapping and classification effort, and one upland soil and vegetation monitoring plot.

The majority of this community falls within the expansion lands added to the park in 1991, which are located along the western half of the south boundary. This area was not included in Saguaro National Park when Roseberry and Dole (1939) created their map. This community likely would have been placed within the broad group defined by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS014U, IPS064, IPS076U, IPS125, IP215U, IPS761, IPS762, IPS763, IPS765, V202_001

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

32. *Parkinsonia microphylla* / *Tiquilia canescens* (*Zinnia acerosa*) Shrubland Association (P)

Translated name: Yellow paloverde / Woody crinklemat (Desert zinnia) Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN097

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	–
Alliance	–
Association	*Parkinsonia microphylla* / *Tiquilia canescens* (*Zinnia acerosa*) Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This uncommon community is found near the Loma Alta Trailhead, southwest of the Javelina Picnic Area, and in the northwest corner of the park just west of the Shantz Trail.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is found on low-angle (1–10% [20]) slopes of varying aspect at elevations around 950 meters (3,030–3,428 ft). The surface cover is defined by shallow and well-drained soils underlying a layer of coarse (5–10 cm) gravel and small rocks that are part of the Bisbee geologic group, which includes sandstone, shale, and limestone. Within the park, this community is restricted to this geologic group.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is characterized by a sparse (<10%) canopy (>2 m) dominated by yellow paloverde (*Parkinsonia microphylla*) and a moderately dense (15–30%) field layer (<0.5 m) dominated by woody crinklemat (*Tiquilia canescens*) with a diverse mix of associate shrubs. Yellow paloverde (*Parkinsonia microphylla*) is typically present as small (3–5 m), tree-like individuals or low (<2 m) shrubs with consistent (1.0) cover around 5%. Velvet mesquite (*Prosopis velutina*) is an uncommon (0.33) component of this community, generally with low cover (<3%). Saguaros (*Carnegiea gigantea*) and ocotillos (*Fouquieria splendens*) are sparse associates with trivial cover throughout.

The subcanopy is characterized by a low-cover (5 [20]%) mix of shrubs and succulents without any consistent dominants or common associates. Creosote (*Larrea tridentata*) is the most consistent (1.0) subcanopy species with an average cover of 3% across the community with occasional dense (15–20%) areas of dominance. In order from most to least frequent, other noteworthy shrubs include cactus apple (*Opuntia engelmannii*), whitethorn acacia (*Vachellia constricta*), Warnock's snakewood (*Condalia warnockii*), Wright's beebrush (*Aloysia wrightii*), Berlandier's wolfberry (*Lycium berlandieri*), spiny hackberry (*Celtis ehrenbergiana*), staghorn cholla (*Cylindropuntia versicolor*), chainfruit cholla (*Cylindropuntia fulgida*), and longleaf jointfir (*Ephedra trifurca*).

The field layer is characterized by the consistent (0.92) dominance of woody crinklemat (*Tiquilia canescens*) with one common associate, desert zinnia (*Zinnia acerosa*). Across the community, woody crinklemat (*Tiquilia canescens*) provides cover that ranges from 10% to 20%, with occasional areas of low cover (<5%) that are often associated with the summits of small hills. Desert zinnia (*Zinnia acerosa*) is a less consistent (0.81) species that, when present, provides cover around 5%. Mariola (*Parthenium incanum*) is an inconsistent (0.58) associate with

low (1%) cover, but it can occasionally provide inclusions of subdominance with cover approaching 10%. Areas of high cover are most common where aspects begin to trend north. Brittlebush (*Encelia farinosa*) is an occasional associate with scattered patches, usually under the canopy trees or creeping in from neighboring communities. Other noteworthy associates include black grama (*Bouteloua eriopoda*), bush muhly (*Muhlenbergia porteri*), paleface (*Hibiscus denudatus*), rough menodora (*Menodora scabra*), slim tridens (*Tridens muticus*), dense ayenia (*Ayenia microphylla*), and hairy-seed bahia (*Bahia absinthifolia*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 77. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0)
Subcanopy (0.5–2 m)	*Larrea tridentata* (0.83)
Field (0–0.5 m)	*Tiquilia canescens* (0.92), *Zinnia acerosa* (0.83)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 78. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens, Carnegiea gigantea, Prosopis velutina*
Subcanopy (0.5–2 m)	*Opuntia engelmannii, Vachellia constricta, Condalia warnockii, Celtis ehrenbergiana, Lycium berlandieri, Ephedra trifurca, Cylindropuntia versicolor, Cylindropuntia fulgida*
Field (0–0.5 m)	*Parthenium incanum, Encelia farinosa, Muhlenbergia porteri, Menodora scabra, Bouteloua eriopoda, Tridens muticus, Hibiscus denudatus, Bahia absinthifolia*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on 12 plots sampled during the 2013–2017 mapping and classification effort.

The majority of this community falls within the expansion lands added to the park in 1991, which are located along the western half of the south boundary. This area was not included in Saguaro National Park when Roseberry and Dole (1939) created their map. The portions that are included in that map are classified as semi-desert chaparral, which they list as an open version of chaparral. This designation is a poor fit for NPSSODN097, as this community is defined by the dominance of a diminutive subshrub.

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park

Inventory notes: Data not available

Plots: IPS020U, IPS021U, IPS062U, IPS074U, IPS075, IPS157, IPS742, IPS743, IPS744, IPS746, IPS747, IPS759

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

33. *Prosopis velutina* / *Opuntia engelmannii* / *Encelia farinosa* (*Cottsia gracilis*) Wooded Shrubland Association (P)

Translated name: Velvet mesquite / Cactus apple / Brittlebush (Slender janusia) Wooded Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN130

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub [A3282]
Association	*Prosopis velutina* / *Opuntia engelmannii* / *Encelia farinosa* (*Cottsia gracilis*) Wooded Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This widespread community is present throughout the low slopes of Tanque Verde Ridge and above the Madrona Ranger Station.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is predominantly present on low-angle (<20%), mountain pediments of varying aspect from 840 to 1,350 meters (2,755–4,429 ft). The surface cover is characterized by very shallow and well-drained, loamy soils interspersed/covered with coarse gravel, exposed rock, and occasional expanses of bedrock outcrops/shelves that are primarily composed of gneissic granodiorite and quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded shrubland association is characterized by a sparse (<10%) canopy (>2 m) of velvet mesquite (*Prosopis velutina*), a variable (10–20%) subcanopy layer (0.5–2 m) of cactus apple (*Opuntia engelmannii*) with a mix of associated shrubs, and a variably dense ([8] 20–40%) field layer (<0.5 m) dominated by brittlebush (*Encelia farinosa*) with slender janusia (*Cottsia gracilis*). Velvet mesquite (*Prosopis velutina*) provides consistent (1.0), low cover around 5%, occasionally reaching above 10%. This species ranges from small (<2 m), shrubby individuals to sizeable (4+ m), single-stem trees. Yellow paloverde (*Parkinsonia microphylla*) provides consistent (0.90) cover around 1%, with uncommon inclusions where it competes for dominance with velvet mesquite (*Prosopis velutina*). Saguaros (*Carnegiea gigantea*) are present throughout this community (1.0) but contribute little (<1%) to overall vegetation cover.

The subcanopy stratum is primarily characterized by the presence of cactus apple (*Opuntia engelmannii*) with a diverse mix of low-cover associate shrubs and succulents. Cactus apple (*Opuntia engelmannii*) provides a relatively constant 5% to 10% [20] cover throughout, excluding areas of high invasive grass cover, where it is all but absent. In order of most to least frequent, other noteworthy shrubs include staghorn cholla (*Cylindropuntia versicolor*), catclaw acacia (*Senegalia greggii*), Berlandier's wolfberry (*Lycium berlandieri*), teddybear cholla (*Cylindropuntia bigelovii*), spiny hackberry (*Celtis ehrenbergiana*), and Wright's beebrush (*Aloysia wrightii*). When present, these species rarely contribute more than 4% cover. Within this community, teddybear cholla (*Cylindropuntia bigelovii*) should only provide small, patchy inclusions; it should not become a consistent dominant.

The field stratum is characterized by the dominance of brittlebush (*Encelia farinosa*), which is the most consistent (1.0) and highest-cover (10% [20]) species in this community. The remaining cover is split amongst a diverse mix of small shrubs, subshrubs, and grasses. Slender janusia (*Cottsia gracilis*) is the most dominant of these species,

providing consistent (1.0) cover averaging to around 4% across the community. Fairyduster (*Calliandra eriophylla*) and sangre de cristo (*Jatropha cardiophylla*) are the next most common, low-cover associates, providing 1% to 2% each with occasional inclusions up to 8%. The grass component is quite diverse with at least five noteworthy bunch grasses, including bush muhly (*Muhlenbergia porteri*), tanglehead (*Heteropogon contortus*), sideoats grama (*Bouteloua curtipendula*), slender bouteloua (*Bouteloua repens*), and Arizona cottontop (*Digitaria californica*). While not consistent across the community, Lehmann lovegrass (*Eragrostis lehmanniana*) can provide inclusion of dominance.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by the xeromorphic deciduous and evergreen tall shrubs, *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, and *Zinnia grandiflora*. Many cacti are also present, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*, *Opuntia engelmannii*, and *Cylindropuntia fulgida* (both cholla and pricklypear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 meters. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 79. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (1.0)
Subcanopy (0.5–2 m)	*Opuntia engelmannii* (1.0)
Field (0–0.5 m)	*Encelia farinosa* (1.0), *Janusia gracilis* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 80. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Carnegiea gigantea, Parkinsonia microphylla*
Subcanopy (0.5–2 m)	*Cylindropuntia versicolor, Senegalia greggii, Lycium berlandieri, Cylindropuntia bigelovii, Celtis ehrenbergiana, Aloysia wrightii*
Field (0–0.5 m)	*Calliandra eriophylla, Jatropha cardiophylla, Muhlenbergia porteri, Heteropogon contortus, Bouteloua curtipendula, Bouteloua repens, Digitaria californica, Cenchrus ciliaris, Eragrostis lehmanniana*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from 11 classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN130 overlapped with one group classified by Roseberry and Dole (1939), a broad group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

This provisional association fits well within the Saguaro - Yellow Paloverde - Velvet Mesquite Desert Scrub Alliance, A3282. At this time, there is no association that is a match for our described community, NPSSODN130.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS052U, IPS059, IPS063, IPS171, IP221U, IP222U, IP235U, IP240U, IT057, IPS774, IPS775

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Carnegiea gigantea - Parkinsonia microphylla - Prosopis velutina* Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

35. *Simmondsia chinensis* (Mixed Cacti) Shrubland Association (P)

Translated name: Jojoba (Mixed Cacti) Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN134

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Jojoba - Crucifixion-thorn - Eastern Mojave Buckwheat Desert Scrub [A3283]
Association	*Simmondsia chinensis* (Mixed Cacti) Shrubland (P)

DISTRIBUTION

Saguaro National Park

In the Rincon Mountain District (RMD), this community is found in two locations, along the north western boundary of the park, near the Douglas Springs Trail as it climbs out of the cactus forest, and near the western end of the Tanque Verde Ridge Trail. In the Tucson Mountain District (TMD), this community is generally found in the eastern half of the district, from the southern boundary north to Picture Rocks Road area. It is not found in contiguous patches; instead, it repeats across the landscape in a regular pattern occurring on north-trending aspects of the undulating foothills.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park

This shrubland community is typically found on moderate to steep (20–40+%), north-trending backslopes from 731 to 1,426 meters (2,400–4,680 ft). In general, the surface cover is characterized by shallow and well-drained soils under a dominant layer of coarse gravel. Parent material is typically comprised of extrusive igneous bedrock with some non-calcareous sedimentary rock occurring as well.

VEGETATION DESCRIPTION

Saguaro National Park

This shrubland association is characterized by an open (<5%) canopy (>2 m) with a subcanopy (0.5–2 m) dominated by jojoba (*Simmondsia chinensis*) and a variable mix of cacti that include buckhorn cholla (Cylindropuntia acanthocarpa), cactus apple (Opuntia engelmannii), and tulip pricklypear (Opuntia phaeacantha).

The canopy stratum is characterized by a low-cover (<5%) mix of short trees and large shrubs. Ocotillo (*Fouquieria splendens*) is a consistent (0.80–0.95) associate that, when present, provides less than 5% cover. In general, this species is more prolific at RMD with an average of 3% cover, compared to only 1% at TMD. Velvet mesquite (*Prosopis velutina*) and yellow paloverde (*Parkinsonia microphylla*) are present in examples at both districts. At RMD, velvet mesquite (*Prosopis velutina*) tends to be more common (0.80) than the patchy (0.20) yellow paloverde (*Parkinsonia microphylla*). At TMD, the opposite is true, with yellow paloverde (*Parkinsonia microphylla*) providing more consistent cover (0.70) compared to the uncommon (0.3) velvet mesquite (*Prosopis velutina*). These species are present as short (2 m) and shrubby, multi-trunk individuals or as single-trunk individuals growing to 3 to 4 meters in height. Saguaros (*Carnegiea gigantea*) range from patchy (0.6) to consistent (0.8), low-cover associates.

The moderately dense (15–30%) subcanopy is characterized by the consistent (1.0) dominance of jojoba (*Simmondsia chinensis*) with cover ranging from 3 to 10 [20]%. This species is a diagnostic component of this community and commonly provides at least half of the total shrub cover in the stratum. Other shrub and succulent species are varied across examples of this type, each varying in dominance and cover across the range, responding to subtle shifts in environmental constraints. However, taken together, the succulent cacti, buckhorn cholla

(*Cylindropuntia acanthocarpa*), cactus apple (*Opuntia engelmannii*), and tulip pricklypear (*Opuntia phaeacantha*), are the second most distinct and characteristic part of this community, providing about half of the shrub cover. In general, cactus apple (*Opuntia engelmannii*) is more common at RMD, while the other two cacti are more common or only present at TMD. At RMD, cactus apple (*Opuntia engelmannii*) is a consistent (0.80) associate with average cover around 5%, occasionally becoming co-dominant with jojoba (*Simmondsia chinensis*). This species is far less common (0.50) at TMD, with cover rarely surpassing 1%. Tucson Mountain District tends to have an even mix of the three species, each providing around 1% cover. Wright's beebrush (*Aloysia wrightii*) is another species that is more prolific in the RMD than the TMD, providing average cover around 4% and 1%, respectively. Other noteworthy subcanopy species include catclaw acacia (*Senegalia greggii*), Berlandier's wolfberry (Lycium berlandieri), common sotol (*Dasylirion wheeleri*), staghorn cholla (*Cylindropuntia versicolor*; RMD only), whitethorn acacia (*Vachellia constricta*), and spiny hackberry (*Celtis ehrenbergiana*).

The moderately sparse (10%) field layer is characterized by a diverse mix of small shrubs, subshrubs, perennial grasses, and spikemoss. Across both districts, fairyduster (*Calliandra eriophylla*) and slender janusia (*Cottsia gracilis*) are the most consistent (>0.75) associates with each providing an average of 1% to 2% cover. At TMD, the mat-forming Arizona spikemoss (*Selaginella arizonica*) may become a field dominant, especially on steeper, shadier slopes. Cover ranged from 3% to 42% with an average of 7.5%, with the higher elevations having the densest populations. Other noteworthy species include sangre de cristo (*Jatropha cardiophylla*), shrubby thoroughwort (*Koanophyllon solidaginifolium*), pelotazo (*Abutilon incanum*), curly-mesquite (*Hilaria belangeri*), candy barrelcactus (*Ferocactus wislizeni*), sideoats grama (*Bouteloua curtipendula*), desert rosemallow (*Hibiscus coulteri*), slender grama (Bouteloua repens), and Arizona cottontop (*Digitaria californica*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub alliance is reported along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region and in Perris Valley and the Cahuilla Mountains in southern California. This desert scrub alliance is dominated by taller *Canotia holacantha* or *Simmondsia chinensis*; *Ambrosia deltoidea*, *Larrea tridentata*, *Ericameria linearifolia*, or *Eriogonum fasciculatum* are present to co-dominant. In Arizona, frost-sensitive species, such as *Carnegiea gigantea*, *Ferocactus* sp., *Olneya tesota*, *Cylindropuntia bigelovii*, and *Prosopis* spp., are absent or have low cover. In California, this alliance is generally characterized by *Simmondsia chinensis* as dominant or co-dominant in the shrub canopy, with *Artemisia californica*, *Echinocereus engelmannii*, *Encelia actonii*, *Encelia farinosa*, *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, *Lotus scoparius*, *Opuntia basilaris*, *Cylindropuntia californica*, *Rhus ovata*, *Salvia mellifera*, and *Yucca schidigera* as subdominants. The herbaceous layer is generally sparse. Stands occur on well-drained, upland slopes and alluvial fans. Elevations range from 600 to 1,300 meters in Arizona, and from 580 to 880 meters in southern California. Soils range from cobbly loams to loamy sand.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 81. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens* (0.8, 0.95)
Subcanopy (0.5–2 m)	*Simmondsia chinensis* (1.0, 1.0), *Opuntia engelmannii* (0.80, 0.47), *Aloysia wrightii* (0.80, 0.58), *Opuntia phaeacantha* (0.0, 0.47), *Cylindropuntia acanthocarpa* (0.0, 0.81)
Field (0–0.5 m)	*Cottsia gracilis* (1.0, 0.95)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association with RMD listed first, then TMD).

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 82. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Prosopis velutina, Parkinsonia microphylla*
Subcanopy (0.5–2 m)	*Celtis ehrenbergiana, Cylindropuntia versicolor, Senegalia greggii, Dasylirion wheeleri, Vachellia constricta, Lycium berlandieri,*
Field (0–0.5 m)	*Jatropha cardiophylla, Calliandra eriophylla, Ferocactus wislizeni, Abutilon incanum, Hibiscus coulteri, Digitaria californica, Koanophyllon solidaginifolium, Bouteloua curtipendula, Digitaria californica*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from five classification plots sampled at RMD during the 2013–2017 mapping and classification effort, and 16 classification plots and six mapped polygons sampled at TMD during the 2010 mapping and classification effort.

At RMD, polygons attributed as NPSSODN134 overlapped with two groups classified by Roseberry and Dole (1939), a saguaro group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*), and a semi-desert chaparral group defined by an open area dominated by "shrub species common to the Sonoran life zone."

Global

This provisional association fits well within the Jojoba - Crucifixion-thorn - Eastern Mojave Buckwheat Desert Scrub Alliance, A3283. At this time, there is no association that is a match for our described community, NPSSODN134.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS042U, IPS044U, IPS162, IPS174, IPS750

Saguaro National Park, Tucson Mountain District

Plots: IP004, IP012, IP047, IP049, IP051, IP053, IP066, IP129, IP152, IP161, IP163, IP164, IP179, IP067, IP119, IP146

Polygons: S253, S263, S267, S271, S297, S303

Local description authors: J. Galvin, S. Studd

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Brown, D. E., and T. Keeler-Wolf. 2013. *Simmondsia chinensis - Canotia holacantha - Eriogonum fasciculatum* Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

36. *Simmondsia chinensis* / *Encelia farinosa* Shrubland Association (P)

Translated name: Jojoba / Brittlebush Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN132

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Jojoba - Crucifixion-thorn - Eastern Mojave Buckwheat Desert Scrub [A3283]
Association	*Simmondsia chinensis* / *Encelia farinosa* Shrubland (P)

DISTRIBUTION

Saguaro National Park

In the Rincon Mountain District (RMD), this community was documented in two locations; the first was near the southeast corner of the Cactus Forest Loop Road, and the second was along the Douglas Springs Trail as it switchbacks out of the Cactus Forest trail system. In the Tucson Mountain District (TMD), this community was documented across the southern- and eastern-trending slopes of Wasson Peak.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park

This community is exclusively present on exposed, south-trending slopes and upper alluvial fans of varying grade (5–40%) from 870 to 1,402 meters (2,854–4,600 ft). The surface cover is characterized by very shallow and well-drained soils of sandy loam, and sometimes clay, interspersed/covered with coarse gravel, exposed rock, and occasional to frequent bedrock outcrops. At RMD, these outcrops are primarily composed of gneissic granodiorite and quartz monzonite. At TMD, they are primarily composed of sandstone shale and conglomerate.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland association is characterized by a very open (<5%) canopy (>2 m), a variable (5–25%) subcanopy layer (0.5–2 m) dominated by jojoba (*Simmondsia chinensis*), and a variable (5–30%) field layer (<0.5 m) dominated by brittlebush (*Encelia farinosa*). This association is distinguished from similar *Parkinsonia microphylla* / *Encelia farinosa* shrublands by having much higher and more consistent jojoba (*Simmondsia chinensis*).

In the canopy, ocotillo (*Fouquieria splendens*) is a very consistent (~ 0.9) associate, providing cover from 1% to 2% across both districts. The cover and consistency of yellow paloverde (*Parkinsonia microphylla*) and velvet mesquite (*Prosopis velutina*) is dependent on the district. At RMD, velvet mesquite (*Prosopis velutina*) and yellow paloverde (*Parkinsonia microphylla*) are patchy (0.6) trees that, when present, contribute 1% to 3% cover. At TMD, yellow paloverde (*Parkinsonia microphylla*) is a consistent (0.88) associate that, when present, provides average cover around 3%. Velvet mesquite (*Prosopis velutina*) is typically absent from examples of this community within TMD. These tree species range from small, multi-stemmed individuals that may reside in the subcanopy stratum (0.5–2 m) to moderately tall (4 m), single-stem trees. In general, saguaro (*Carnegiea gigantea*) is less abundant in this association than other adjacent communities, but saguaros are still found in all height/age classes. They tend to be more consistent at TMD (0.96) than RMD (0.60).

The subcanopy stratum is defined by the dominance of jojoba (*Simmondsia chinensis*). This species is a diagnostic component of this community, typically providing cover less than 10%. Across districts, RMD tends to have higher cover with an average of 6%, compared to 3% at TMD. The distribution of cactus apple (*Opuntia engelmannii*) creates another noteworthy difference between examples at the two districts. At TMD, this species is very uncom-

mon (0.2) and is typically outcompeted by the similar tulip pricklypear (*Opuntia phaeacantha*). At RMD, cactus apple (*Opuntia engelmannii*) is a consistent (0.90) succulent that, on the low-angle and less-rocky examples, may outcompete jojoba (*Simmondsia chinensis*) with cover above 10%. Where slopes increase and surface rock and exposed bedrock are more common, cover of cactus apple (*Opuntia engelmannii*) decreases (1–2%) and jojoba (*Simmondsia chinensis*) provides sole dominance. The remaining cover in the subcanopy is composed of a mix of low-cover shrubs and succulents, including catclaw acacia (*Senegalia greggii*), staghorn cholla (*Cylindropuntia versicolor*; RMD only), buckhorn cholla (*Cylindropuntia acanthocarpa*; TMD only), creosote (*Larrea tridentata*), whitethorn acacia (*Vachellia constricta*), teddybear cholla (*Cylindropuntia bigelovii*), Berlandier's wolfberry (*Lycium berlandieri*), jumping cholla (*Cylindropuntia fulgida*), and spiny hackberry (*Celtis ehrenbergiana*). When present, these species rarely contribute more than 2% cover.

The field stratum is characterized by the dominance of brittlebush (*Encelia farinosa*), which is the most consistent (1.0) and highest-cover species in this community. Examples at RMD contain conspicuously higher cover of this species, providing an average 14% cover, compared to only 4% at TMD. The remaining cover in this stratum is split amongst a diverse suite of small shrubs, subshrubs, and grasses. These species include slender janusia (*Cottsia gracilis*), fairyduster (*Calliandra eriophylla*), sangre de cristo (*Jatropha cardiophylla*), spidergrass (*Aristida ternipes*), and rough menodora (*Menodora scabra*). When present, these species may contribute 1% to 3% cover. In addition, a number of very sparse (<<1%) and/or inconsistent species were also present, including slender poreleaf (*Porophyllum gracile*), Arizona cottontop (*Digitaria californica*), candy barrelcactus (*Ferocactus wislizeni*), bush muhly (*Muhlenbergia porteri*), Arizona spikemoss (*Selaginella arizonica*), tobosagrass (*Hilaria mutica*), slim tridens (*Tridens muticus*; TMD only), purple threeawn (*Aristida purpurea*), and slender Bouteloua (*Bouteloua repens*). In one example of this community at RMD, mariola (*Parthenium incanum*) was present as co-dominant with brittlebush (*Encelia farinosa*), providing cover around 10%.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub alliance is reported along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region and in Perris Valley and the Cahuilla Mountains in southern California. This desert scrub alliance is dominated by taller *Canotia holacantha* or *Simmondsia chinensis*; *Ambrosia deltoidea*, *Larrea tridentata*, *Ericameria linearifolia*, or *Eriogonum fasciculatum* are present to co-dominant. In Arizona, frost-sensitive species, such as *Carnegiea gigantea*, *Ferocactus* sp., *Olneya tesota*, *Cylindropuntia bigelovii*, and *Prosopis* spp., are absent or have low cover. In California, this alliance is generally characterized by *Simmondsia chinensis* as dominant or co-dominant in the shrub canopy, with *Artemisia californica*, *Echinocereus engelmannii*, *Encelia actonii*, *Encelia farinosa*, *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, *Lotus scoparius*, *Opuntia basilaris*, *Cylindropuntia californica*, *Rhus ovata*, *Salvia mellifera*, and *Yucca schidigera* as subdominants. The herbaceous layer is generally sparse. Stands occur on well-drained, upland slopes and alluvial fans. Elevations range from 600 to 1,300 meters in Arizona, and from 580 to 880 meters in southern California. Soils range from cobbly loams to loamy sand.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 83. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Simmondsia chinensis* (1.0, 0.96), *Opuntia engelmannii* (0.9, 0.2)
Field (0–0.5 m)	*Encelia farinosa* (0.9, 1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association with RMD listed first, then TMD).

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 84. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Carnegiea gigantea, Prosopis velutina, Parkinsonia microphylla*
Subcanopy (0.5–2 m)	*Cottsia gracilis, Cylindropuntia versicolor, Senegalia greggii, Lycium berlandieri, Larrea tridentata, Celtis ehrenbergiana, Cylindropuntia bigelovii, Cylindropuntia acanthocarpa, Opuntia phaeacantha*
Field (0–0.5 m)	*Calliandra eriophylla, Jatropha cardiophylla, Aristida ternipes, Menodora scabra, Porophyllum gracile, Muhlenbergia porteri, Ferocactus wislizeni, Digitaria californica, Bouteloua repens, Parthenium incanum*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 10 classification plots at RMD sampled during the 2013–2017 mapping and classification effort and 25 classification plots at TMD sampled during the 2010 mapping and classification effort.

At RMD, polygons attributed as NPSSODN132 overlapped with two group classified by Roseberry and Dole (1939), a saguaro group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*), and a semi-desert chaparral group defined by an open area dominated by "shrub species common to the Sonoran life zone."

Global

This provisional association fits well within the Jojoba - Crucifixion-thorn - Eastern Mojave Buckwheat Desert Scrub Alliance, A3283. At this time, there is no association that is a match for our described community, NPSSODN132.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS040U, IPS046U, IPS050U, IPS095, IPS099, IPS161, IP229U, IPS736, IPS738, IPS749

Saguaro National Park, Tucson Mountain District

Plots: IP009, IP019, IP032, IP042, IP048, IP050, IP061, IP074, IP084, IP089, IP096, IP099, IP103, IP111, IP121, IP134, IP143, IP150, IP166, IP173, IP178, IP183, IP194, IP196

Local description authors: J. Galvin, S. Studd

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Brown, D. E., and T. Keeler-Wolf. 2013. *Simmondsia chinensis - Canotia holacantha - Eriogonum fasciculatum* Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

37. *Simmondsia chinensis* / *Hilaria belangeri* Shrub Savanna Association (P)

Translated name: Jojoba / Curly mesquite Shrub Savanna Association (P)

NVC name: N/A

Identifier: NPSSODN131

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde - Mixed Cacti Desert Scrub [G293]
Alliance	Jojoba - Crucifixion-thorn - Eastern Mojave Buckwheat Desert Scrub [A3283]
Association	*Simmondsia chinensis* / *Hilaria belangeri* Shrub Savanna (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is limited to a few small patches spread across the low hills northwest of Javelina Rocks.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is exclusively present on low-angle (<10%) slopes around 950 meters (3,116 ft). The surface cover is characterized by very shallow and well-drained soils of gravelly loam.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland association is characterized by a moderately sparse (10–15%) subcanopy layer (0.5–2 m) dominated by jojoba (*Simmondsia chinensis*) and a moderately dense (20–30+%) field layer (<0.5 m) dominated by curly mesquite (*Hilaria belangeri*). In the low canopy (2–5 m), ocotillo (*Fouquieria splendens*), yellow paloverde (*Parkinsonia microphylla*), and velvet mesquite (*Prosopis velutina*) are low-cover associates, with each providing 1% to 2% cover.

The subcanopy stratum is defined by the consistent (1.0) dominance of jojoba (*Simmondsia chinensis*) with a suite of low-cover (1%) associates. Jojoba (*Simmondsia chinensis*) typically provides cover that ranges from 5% to 15%. In order from most to least frequent, the suite of associates includes cactus apple (*Opuntia engelmannii*), catclaw acacia (*Senegalia greggii*), Berlandier's wolfberry (*Lycium berlandieri*), and staghorn cholla (*Cylindropuntia versicolor*).

The field stratum is characterized by the overwhelming dominance of curly mesquite (*Hilaria belangeri*), which is the most consistent (1.0) and highest-cover (20–30%) species in this community. A number of low shrubs may present as common associates, including brittlebush (*Encelia farinosa*), mariola (*Parthenium incanum*), and Wright's beebrush (*Aloysia wrightii*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Sonoran Desert scrub alliance is reported along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region and in Perris Valley and the Cahuilla Mountains in southern California. This desert scrub alliance is dominated by taller *Canotia holacantha* or *Simmondsia chinensis*; *Ambrosia deltoidea*, *Larrea tridentata*, *Ericameria linearifolia*, or *Eriogonum fasciculatum* are present to co-dominant. In Arizona, frost-sensitive species, such as *Carnegiea gigantea*, *Ferocactus* sp., *Olneya tesota*, *Cylindropuntia bigelovii*, and *Prosopis* spp., are absent or have low cover. In California, this alliance is generally characterized by *Simmondsia chinensis* as dominant or co-dominant in the shrub canopy, with *Artemisia califor-*

nica, *Echinocereus engelmannii*, *Encelia actonii*, *Encelia farinosa*, *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, Lotus scoparius, *Opuntia basilaris*, *Cylindropuntia californica*, *Rhus ovata*, *Salvia mellifera*, and *Yucca schidigera* as subdominants. The herbaceous layer is generally sparse. Stands occur on well-drained, upland slopes and alluvial fans. Elevations range from 600 to 1,300 meters in Arizona, and from 580 to 880 meters in southern California. Soils range from cobbly loams to loamy sand.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 85. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Simmondsia chinensis* (1.0)
Field (0–0.5 m)	*Hilaria belangeri* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 86. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Carnegiea gigantea, Prosopis velutina, Parkinsonia microphylla*
Subcanopy (0.5–2 m)	*Opuntia engelmannii, Senegalia greggii, Lycium berlandieri, Cylindropuntia versicolor*
Field (0–0.5 m)	*Encelia farinosa, Parthenium incanum, Aloysia wrightii*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from one classification plot sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN131 overlapped with two groups classified by Roseberry and Dole (1939), a saguaro group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*), and a semi-desert chaparral group defined by an open area dominated by "shrub species common to the Sonoran life zone."

Global

This provisional association fits well within the Jojoba - Crucifixion-thorn - Eastern Mojave Buckwheat Desert Scrub Alliance, A3283. At this time, there is no association that is a match for our described community, NPSSODN131.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS739

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Brown, D. E., and T. Keeler-Wolf. 2013. *Simmondsia chinensis - Canotia holacantha - Eriogonum fasciculatum* Desert Scrub Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

39. (*Prosopis velutina*) / *Vachellia constricta* (*Larrea tridentata - Senegalia greggii*) Intermittently Flooded Shrubland Association (P)

Translated name: (Velvet mesquite) / Whitethorn acacia (Creosote - Catclaw acacia) Intermittently Flooded Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN089

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	North American Warm-Desert Xeric-Riparian Scrub [M092]
Group	Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope [G541]
Alliance	–
Association	(*Prosopis velutina*) / *Vachellia constricta* (*Larrea tridentata - Senegalia greggii*) Intermittently Flooded Shrubland (P)

DISTRIBUTION

Saguaro National Park

In both districts, this intermittently flooded shrubland community is present along minor washes and adjacent slopes originating from high slopes and cutting through lower-gradient, out-flowing alluvial fan systems in all directions. In the Rincon Mountain District (RMD), it is found primarily throughout the Cactus Forest Loop Road and associated trail system. This community is found throughout all sections of the Tucson Mountain District (TMD).

ENVIRONMENTAL DESCRIPTION

Saguaro National Park

This community is restricted to low-angle (<5%) washes that bisect the broad alluvial fans and low hills from 682–1,140 meters (2,240–3,740 ft). The surface cover is characterized by deep and well-drained soils that, within the watercourse, are dominated by fine gravel and sand; the adjacent slopes are more commonly bare soil. Exposed bedrock and large boulders are often present on the banks and occasionally in the wash bottoms. Aspect varies and is determined by location within the park. The majority of these areas have low slope gradients, but a few areas higher up in elevation are steep (anywhere from 0 to 39%, with average of 5%).

VEGETATION DESCRIPTION

Saguaro National Park

This xeroriparian shrubland community is characterized by a sparse (<10%) canopy (>2 m) of velvet mesquite (*Prosopis velutina*) and a dense (20–40 [60]%) shrub layer (0.5–2 m) dominated by whitethorn acacia (*Vachellia constricta*) with common associates creosote (*Larrea tridentata*) and catclaw acacia (*Senegalia greggii*).

Velvet mesquite (*Prosopis velutina*) is a consistent (1.0) component, typically present as large (4 m) trees along the margins of the watercourse; cover is around 6%. Yellow paloverde (*Parkinsonia microphylla*) and blue paloverde (*Parkinsonia florida*) are sparse (1–2%) and inconsistent (0.5 and 0.4) associates that can co-occur or occasionally replace velvet mesquite (*Prosopis velutina*) in the canopy. In general, the cover and dominance of yellow paloverde (*Parkinsonia microphylla*) is related to how much this community intergrades with the adjacent, upland communities. At TMD, desert ironwood (*Olneya tesota*) is an occasional (0.57) associate tree that, when present, provides cover up to 5%. All species are typically present as small, single-trunk trees with heights from 3 to 5 meters. When present, blue paloverde (*Parkinsonia florida*) tends to be emergent from the tree canopy.

The shrub layer is consistently (1.0) dominated by large (up to 3 m) whitethorn acacia (*Vachellia constricta*) that can form dense thickets along and within the watercourse. Overall, this species provides consistent cover through-

out with an average around 20%. The remainder of the shrub layer is composed of a consistent (>0.75) mix of creosote (*Larrea tridentata*) and catclaw acacia (*Senegalia greggii*) with an average cover of 6% for each species. Creosote (*Larrea tridentata*) can provide dense inclusions where it can become co-dominant with, or more dominant than, whitethorn acacia (*Vachellia constricta*). This typically occurs within the ecotone with the similar creosote (*Larrea tridentata*) floodplain communities. Other noteworthy shrubs and succulents include Warnock's snakewood (*Condalia warnockii*), cactus apple (*Opuntia engelmannii*), staghorn cholla (*Cylindropuntia versicolor*; RMD only), rosary babybonnets (*Coursetia glandulosa*; TMD only), Berlandier's wolfberry (*Lycium berlandieri*), sweetbush (*Bebbia juncea*; TMD only), spiny hackberry (*Celtis ehrenbergiana*), and lotebush (*Ziziphus obtusifolia*).

The field layer (<0.5 m) is extremely sparse (<5%) without any consistent dominants or common associates. Ambrosia-leaf bur-ragweed (*Ambrosia ambrosioides*) provides conspicuous inclusions of dominance, typically at the margins of the watercourse. In order from most to least frequent, other noteworthy field components include Christmas cactus (*Cylindropuntia leptocaulis*), bush muhly (*Muhlenbergia porteri*), desert zinnia (*Zinnia acerosa*), desert tobacco (*Nicotiana obtusifolia*), candy barrelcactus (*Ferocactus wislizeni*), Mediterranean grass (*Schismus* sp.), redstem storksbill (*Erodium cicutarium*), fiddleneck (*Amsinckia* sp.), Arizona cottontop (*Digitaria californica*), and spidergrass (*Aristida ternipes*).

Due to the frequently abrupt transition from "upland" landforms to wash or drainage systems, upland species are not uncommon and can, in some instances, provide considerable cover and diversity. For example, within alluvial washes, cacti can be common in and along the channel. The communities intergrade strongly, but upland species are considered accidental rather than characteristic of this wash/drainage type. Where the system presents as a deeper canyon with steep-walled edges, these species are commonly relegated to the upper banks rather than found within the wash. In general, these communities are recognizable by their presence in sandy-bottomed and rocky-sided washes, by their increased overall vegetative cover, and by the increased abundance of the acacias and other key species listed.

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This group is restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains, and basin floors throughout the warm deserts of the western U.S. and northwestern Mexico. A woody layer is usually present and is typically scattered clumps to very open. It may be dominated by shrubs and small trees, such as *Acacia greggii*, *Brickellia laciniata*, *Baccharis sarothroides*, *Chilopsis linearis*, *Ephedra californica*, *Ericameria paniculata*, *Fallugia paradoxa*, *Forestiera pubescens*, *Hymenoclea salsola*, *Hymenoclea monogyra*, *Hyptis emoryi*, *Juglans microcarpa*, *Lepidospartum squamatum*, *Olneya tesota*, *Parkinsonia florida*, *Prosopis* spp., *Psorothamnus spinosus*, *Prunus fasciculata*, *Rhus microphylla*, *Salazaria mexicana*, *Sarcobatus vermiculatus*, or *Viguiera reticulata*. A few known herbaceous communities dominate intermittent drainages and washes, with woody vegetation either absent or as scattered individuals only. Dominant species include *Panicum bulbosum*, *Alopecurus aequalis*, or *Lycurus phleoides*. Although this group is often dry, it is characterized by intermittent fluvial processes, such as rapid sheet- and gully flow. This group is restricted to drainages in upland areas or ramaderos that are intermittently flooded and occur as linear or sometimes broader, braided strips within desert scrub- or desert grassland-dominated landscapes. The vegetation of desert washes is quite variable in species composition and structure, ranging from sparse and patchy to moderately dense. It typically occurs along the banks but may occur within the channel.

MOST ABUNDANT SPECIES

Table 87. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (1.0, 0.71)
Subcanopy (0.5–2 m)	*Vachellia constricta* (1.0, 1.0), *Larrea tridentata* (0.9, 0.75), *Senegalia greggii* (0.9, 0.86)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association with RMD listed first, then TMD).

OTHER NOTEWORTHY SPECIES

Table 88. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla, Parkinsonia florida, Olneya tesota*
Subcanopy (0.5–2 m)	*Condalia warnockii, Celtis ehrenbergiana, Opuntia engelmannii, Cylindropuntia versicolor, Ziziphus obtusifolia, Coursetia glandulosa, Bebbia juncea, Lycium berlandieri*
Field (0–0.5 m)	*Ambrosia ambrosioides, Cylindropuntia leptocaulis, Nicotiana obtusifolia, Muhlenbergia porteri, Digitaria californica, Zinnia acerosa, Schismus* sp., *Erodium cicutarium, Amsinckia* sp., *Ferocactus wislizeni, Aristida ternipes*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 10 plots, nine classification plots sampled at RMD during the 2013–2017 mapping and classification effort, and three plots and four mapped polygons sampled at TMD during the 2010 mapping and classification effort.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a broad group defined solely by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded Global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS019H, IPS134H, IP201H, IP205H, IP212H, IP224H, IP226H, IP232H, IP233H, V201_003

Saguaro National Park, Tucson Mountain District

Plots: IP073, IP133, IP145

Polygons: S274, S294, S320, S322

Local description authors: J. Galvin, S. Studd, D. Winkler, N. Gonzalez

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2011. Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope Group, version date 06Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 31, 2019.

40. *Prosopis velutina - Chilopsis linearis* / *Ambrosia monogyra* Intermittently Flooded Woodland Association (P)

Translated name: Velvet mesquite - Desert willow / Singlewhorl burrobush Intermittently Flooded Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN172

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	North American Warm-Desert Xeric-Riparian Scrub [M092]
Group	Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope [G541]
Alliance	Desert-willow - Smoketree Desert Wash Scrub [A1044]
Association	*Prosopis velutina - Chilopsis linearis* / *Ambrosia monogyra* Intermittently Flooded Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community was documented in and adjacent to the major washes and adjacent floodplains in the northern portion of the Cactus Forest. The northern end of Monument Wash is the primary example of this community.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This intermittently flooded woodland is restricted to very low-angle (<5%) washes and adjacent floodplains around an elevation of 800 meters (2,624 ft). The surface cover is characterized by very deep and well-drained soils. The watercourse tends to be characterized by very fine, gravelly sand, while the adjacent floodplains are more commonly sandy loam or silt.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community presents as two distinct variations based on the landform—floodplain or wash. The floodplain variation is characterized by a variably dense (20–40%) canopy (2–5 m) co-dominated by velvet mesquite (*Prosopis velutina*) and desert willow (*Chilopsis linearis*) with noteworthy cover of catclaw acacia (*Senegalia greggii*) and a potentially dense understory of mixed annual forbs and grasses. The wash variation is characterized by a similar overstory of velvet mesquite (*Prosopis velutina*) and desert willow (*Chilopsis linearis*), but the subcanopy is dominated by a patchy distribution of singlewhorl burrobush (*Ambrosia monogyra*).

The canopy dominants are consistently present (1.0) and provide similar cover across the community, with each contributing between 10% and 20%. They can present as co-dominants or, more commonly, one will provide sole dominance while the other becomes a subdominant or common associate. Overall, velvet mesquite (*Prosopis velutina*) is the taller of the two dominants, with heights typically ranging from 3 to 7 meters; this is in comparison to desert willow (*Chilopsis linearis*), with heights of 2 to 5 meters. When present (0.66), catclaw acacia (*Senegalia greggii*) provides cover ranging from 5% to 10% as either shrubs with heights below 2 meters or trees with heights similar to velvet mesquite (*Prosopis velutina*). For all these species, heights and canopy sizes are typically greatest when growing along the margins of the watercourse.

Within the floodplain version of this community, the subcanopy stratum (0.5–2 m) is characterized by a low-cover mix of associate shrubs including fourwing saltbush (*Atriplex canescens*), desert-thorn (*Lycium* sp.), lotebush (*Ziziphus obtusifolia*), desertbroom (*Baccharis sarothroides*), and Warnock's snakewood (*Condalia warnockii*).

While each of these species may provide small inclusions of local dominance, they are not consistent across the community. Excluding fourwing saltbush (*Atriplex canescens*), which is often out in the open, these species are found growing under the canopies of the dominant trees. Within the wash version of this community, the subcanopy is solely dominated by singlewhorl burrobush (*Ambrosia monogyra*). This species provides a variable distribution throughout the community ranging from sparse (<1%), scattered individuals to dense (25–50%) monocultures. Most often, this species is found growing within the watercourse, and, as such, is highly susceptible to alteration from flooding events.

Within the floodplain version of this community, the field (<0.5 m) stratum is characterized by a variable and sometimes dense mix of annual grasses and forbs. The most frequently encountered species include sixweeks grama (*Bouteloua barbata*), carelessweed (*Amaranthus palmeri*), spiderling (*Boerhavia* sp.), and morning-glory (*Ipomoea* sp.). Abundance and cover of species will vary considerably depending on the season and associated rainfall. Within the wash version, only ambrosia leaf bur ragweed (*Ambrosia ambrosioides*) provided noteworthy cover.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This palustrine shrubland occurs along desert washes in the southwestern U.S. and northwestern Mexico. Sites are intermittently flooded drainages on alluvial fans and basins from 960 to 1,080 meters (3,135–3,550 ft) at Buenos Aires National Wildlife Refuge. Stands in the Verde Valley at Tuzigoot National Monument occur on floodplains at around 1,500 meters (4,921 ft). Substrates are generally sandy. The vegetation is characterized by a tall-shrub layer dominated by *Chilopsis linearis*. *Senegalia greggii* may co-dominate in the tall-shrub layer, but *Prosopis velutina* generally has low cover (<10%). *Baccharis sarothroides* forms an open short-shrub layer in some stands. A sparse to moderately dense herbaceous layer is present and composed of a mixture of annual and perennial forbs and grasses. Common species include *Acalypha neomexicana*, *Amaranthus palmeri*, *Boerhavia coccinea*, *Bouteloua aristidoides*, *Urochloa arizonica*, *Eriogonum polycladon*, *Gutierrezia microcephala*, and *Setaria* spp. The exotic grass, *Eragrostis lehmanniana*, is present in some stands but at relatively low cover.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 89. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (1.0), *Chilopsis linearis* (1.0)
Subcanopy (0.5–2 m)	*Ambrosia monogyra* (0.33)
Field (0–0.5 m)	*Amaranthus palmeri* (0.33), *Bouteloua barbata* (0.33)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 90. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Atriplex canescens, Condalia warnockii, Lycium* sp., *Baccharis sarothroides, Ziziphus obtusifolia*
Field (0–0.5 m)	*Ambrosia ambrosioides, Ipomoea* sp., *Boerhavia* sp.

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from three plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN172 overlapped with one group classified by Roseberry and Dole (1939), a woodland-grass group defined as "areas that contain 20% or more of both broadleaf tree and herbaceous species."

Global

This provisional association fits well within the Desert-willow - Smoketree Desert Wash Scrub Alliance, A1044. At this time, there is no association that is a match for our described community, NPSSODN172.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

GLOBAL RANGE: DATA NOT AVAILABLE

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS049, ITS051, IPS071

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Evens, J., and M. S. Reid. 2015. *Chilopsis linearis - Psorothamnus spinosus* Desert Wash Scrub Alliance, version date 14Mar2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

41. *Alnus oblongifolia* / *Acer negundo* / *Rosa woodsii* Intermittently Flooded Woodland Association (P)

Translated name: Arizona alder / Boxelder / Woods' rose Intermittently Flooded Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN122

NVC CLASSIFICATION

Division	Western North American Interior Flooded Forest [1.b.C.Nd]
Macrogroup	Interior Warm and Cool Desert Riparian Forest [M036]
Group	Western Interior Riparian Forest and Woodland [G797]
Alliance	Arizona Alder Riparian Forest [A0953]
Association	*Alnus oblongifolia* / *Acer negundo* / *Rosa woodsii* Intermittently Flooded Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is restricted to two locations—in Turkey Creek near the eastern boundary, and in an unnamed drainage east of Spud Rock Campground.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is restricted to low-angle drainages with intermittent water flow. The surface cover is characterized by deep, well-drained soils, often covered with a dense layer of leaf litter.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is characterized by a moderately dense (30–50%) upper canopy (>5 m) dominated by Arizona alder (*Alnus oblongifolia*) and boxelder (*Acer negundo*) with a variable understory of shorter boxelder and Woods' rose (*Rosa woodsii*). Arizona alder (*Alnus oblongifolia*) is present as tall (10–20 m), wide-canopied trees with cover ranging from 10% to 40%. Boxelder (*Acer negundo*) is a shorter (5–10 m) tree that is typically co-dominant with or subdominant to Arizona alder (*Alnus oblongifolia*); cover ranges from 10% to 30%. Other documented canopy trees include Arizona sycamore (*Platanus wrightii*), Fremont cottonwood (*Populus fremontii*), Goodding's willow (*Salix gooddingii*), Arizona madrone (*Arbutus arizonica*), and various oak (*Quercus* sp.) species.

The abundance and dominance of subcanopy (0.5–2 m) species is tied to the density of the overstory canopy. In closed-canopy examples, cover is quite low (<5%). In comparison, open-canopied examples often contain a dominant understory of shrubs with cover ranging from 10% to 30%. The composition of this layer is typically a mix of short boxelder (*Acer negundo*), smooth sumac (*Rhus glabra*), California buckthorn (*Frangula californica*), New Mexico locust (*Robinia neomexicana*), canyon grape (*Vitis arizonica*), and black cherry (*Prunus serotina*).

The field stratum (<0.5 m) is a variable mix of low shrubs and ferns most commonly dominated by Wood's rose (*Rosa woodsii*). This species ranges from absent to dense inclusions (with cover surpassing 20%). The only other documented species was western brackenfern (*Pteridium aquilinum*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This alliance is characterized by the abundance of *Alnus oblongifolia* in a tall-shrub/small-tree canopy layer. Companion upper-canopy species may include *Acer grandidentatum*, *Acer negundo*, *Hesperocyparis arizonica*, *Fraxinus velutina*, *Juglans major*, *Platanus wrightii*, and/or *Populus angustifolia*. Shrubs that may occur include *Salix exigua*, *Prunus serotina*, or *Symphoricarpos oreophilus*. Common forb species can include *Aquilegia chrysantha*,

Galium triflorum, *Geranium* spp., *Maianthemum racemosum*, *Pteridium aquilinum*, and *Thalictrum fendleri*. Common graminoids include *Glyceria striata* and species of *Carex* or *Bromus*. Examples of this alliance are found in montane riparian zones of the dry, southern mountains of New Mexico and Arizona. Elevations range from 1,050 meters (3,445 ft) to just over 2,400 meters (7,874 ft). Flowing or standing water is always present in the streambed, and stream gradients appear to range from nearly flat to moderately steep.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 91. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Acer negundo* (1.0), *Alnus oblongifolia* (0.66)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Rosa woodsii* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 92. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Populus fremontii, Platanus wrightii*
Canopy (2–5 m)	*Salix gooddingii, Quercus arizonica, Quercus hypoleucoides, Arbutus arizonica*
Subcanopy (0.5–2 m)	*Rhus glabra, Frangula californica, Robinia neomexicana, Vitis arizonica, Prunus serotina*
Field (0–0.5 m)	*Pteridium aquilinum*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from three classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN122 bisected numerous upland groups classified by Roseberry and Dole (1939).

Global

This provisional association fits well within the Arizona Alder Riparian Forest, A0953. At this time, there is no association that is a match for our described community, NPSSODN122.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS178, IPS610, IPS611

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Reid, M. S. 2013. *Alnus oblongifolia* Riparian Forest Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

42. *Platanus wrightii - Fraxinus velutina* Intermittently Flooded Woodland Association (P)

Translated name: Arizona sycamore - Velvet ash Riparian Intermittently Flooded Association (P)

NVC name: N/A

Identifier: NPSSODN120

NVC CLASSIFICATION

Division	Western North American Interior Flooded Forest [1.B.3.Nd]
Macrogroup	Interior Warm and Cool Desert Riparian Forest [M036]
Group	Western Interior Riparian Forest and Woodland [G797]
Alliance	Arizona Sycamore Riparian Forest [A3801]
Association	*Platanus wrightii - Fraxinus velutina* Intermittently Flooded Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is restricted to the major ephemeral drainages throughout the park, specifically, the lower reaches of Rincon Creek and Deer Creek. Typically, this community does not provide continuous presence along the watercourse, but instead is found in scattered patches.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This riparian woodland community is restricted to low-angle drainages with intermittent water flow where geologic and hydrologic features such as tinajas, springs, and seeps allow for high water retention and/or availability throughout the drier seasons. The surface cover is typically dominated by slabs of exposed bedrock underlying pockets of sand and gravel of variable depth that shift with each flood event. Throughout much of the year, standing water may be found in shallow depressions in the rock and/or large tinajas clustered throughout the watercourse. Where bedrock is less common, the soil is typically quite deep and well drained, usually consisting of coarse sandy loam.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This riparian woodland community is characterized by a moderately dense (20–30%) upper canopy (>5 m) dominated by Arizona sycamore (*Platanus wrightii*) and velvet ash (*Fraxinus velutina*) with a variable understory of obligate and facultative wetland species. Arizona sycamore (*Platanus wrightii*) is a consistent (1.0) dominant with cover ranging from 5% to 15%. This cover is often supplied by a few tall (7–9 m) individuals with broad canopies, but shorter (<5 m) individuals may also be present. The smaller individuals are typically present in narrow drainages where they mix with the surrounding, more upland, species. Velvet ash (*Fraxinus velutina*) is a less consistent (0.80) dominant that, when present, provides highly variable cover ranging from 5% to 30%. In some examples of this community, velvet ash (*Fraxinus velutina*) was the clear dominant with Arizona sycamore (*Platanus wrightii*) as an associate. This species is present within two distinct height strata; it sometimes occurs as upper-canopy trees with heights ranging from 7 to 11 meters, and also occurs as understory trees only reaching to 4 meters. Goodding's willow (*Salix gooddingii*) is a consistent (0.80) but low-cover (1–2%) associate with heights ranging from 5 to 6 meters. Fremont cottonwood (*Populus fremontii*) is an uncommon associate that can occasionally contribute noteworthy cover (<10%).

The variably sparse (5–15%) subcanopy stratum (0.5–2 m) is characterized by a diverse mix of low-cover shrubs with no clear dominants or associates. The most noteworthy of these include common buttonbush (*Cephalanthus occidentalis*), Thurber's cotton (*Gossypium thurberi*), mule-fat (*Baccharis salicifolia*), Thurber's desert honeysuck-

le (*Anisacanthus thurberi*), Florida hopbush (*Dodonaea viscosa*), netleaf hackberry (*Celtis reticulata*), and catclaw mimosa (*Mimosa aculeaticarpa*). If consistent standing water is present, southern cattail (*Typha domingensis*) may be present.

The variably sparse (5–15%) field stratum (<0.5 m) is characterized by a diverse mix of perennial grasses and forbs, most commonly dominated by the facultative wetland species, deergrass (*Muhlenbergia rigens*). Present in all examples of this type, deergrass (*Muhlenbergia rigens*) provides an average cover around 4% with some areas ranging up toward 10%. While far less consistent (0.40), crimson fountaingrass (*Cenchrus setaceus*) is a noteworthy, non-native associate. There are numerous additional upland grasses and forbs that can be present throughout but are not diagnostic of this community. When standing water is present and/or persists, a number of species, including some facultative and obligate wetland species, can be present, including seep monkeyflower (*Mimulus guttatus*), rushes (*Juncus* sp.), annual rabbitsfoot grass (*Polypogon monspeliensis*), hummingbird trumpet (*Epilobium canum*), spotted ladysthumb (*Persicaria maculosa*), and sedges (*Carex* sp.).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE)

This alliance consists of riparian woodlands dominated by the broad-leaved and cold-deciduous tree, *Platanus wrightii*. *Fraxinus velutina* and *Juglans major* are common associates in the upper canopy. *Populus fremontii* can be an emergent tree, but sites are not dominated by this species. Other trees present include *Celtis laevigata* var. *reticulata*, *Juglans major*, *Juniperus monosperma*, *Prosopis velutina*, *Quercus arizonica*, *Quercus emoryi*, *Robinia neomexicana*, and *Salix gooddingii*. The vine stratum is dominated by *Vitis arizonica*. The shrub layer is often present and contains several of the following: *Alnus oblongifolia*, *Amorpha fruticosa*, *Baccharis salicifolia*, *Rhus trilobata*, *Salix bonplandiana*, and *Toxicodendron radicans*. The herbaceous layer commonly includes *Aristida* spp., *Bouteloua curtipendula*, *Carex* spp., *Choisya dumosa* var. *arizonica*, *Datura inoxia*, *Elymus elymoides*, *Eriogonum* spp., *Gutierrezia sarothrae*, *Marrubium vulgare*, *Muhlenbergia emersleyi*, *Muhlenbergia* spp., *Oenothera elata* ssp. *hookeri*, and *Sporobolus cryptandrus*. This alliance is found in Arizona, southwestern New Mexico, and northern Mexico. It occurs along perennial or seasonally intermittent streams, in narrow stream valleys, and on gently sloping alluvial terraces. These vegetation types require reliable surface flow during the winter–spring months, they are periodically inundated during spring runoff, and they are generally found along small, perennial streams. The soils are depositional and silty-loam in texture.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 93. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Platanus wrightii* (1.0), *Fraxinus velutina* (0.80), *Salix gooddingii* (0.80)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Muhlenbergia rigens* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 94. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Populus fremontii*
Canopy (2–5 m)	*Quercus oblongifolia*
Subcanopy (0.5–2 m)	*Cephalanthus occidentalis, Gossypium thurberi, Baccharis salicifolia, Anisacanthus thurberi, Dodonaea viscosa, Celtis reticulata, Mimosa aculeaticarpa, Typha domingensis*
Field (0–0.5 m)	*Cenchrus setaceus, Mimulus guttatus, Juncus* sp., *Polypogon monspeliensis, Epilobium canum, Persicaria maculosa, Carex* sp.

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from five classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN120 overlapped with two groups classified by Roseberry and Dole (1939), a woodland grass group defined as "areas that contain 20% or more of both broadleaf tree and herbaceous species," and a pinyon, juniper, or cypress group defined as "areas that contain 20% or more of [pinyon, juniper, or cypress], to the exclusion of commercial types of trees."

Global

This provisional association fits well within the *Platanus wrightii* Riparian Forest Alliance, A3801. USNVC Association, CEGL000644, Arizona Sycamore - Velvet Ash Riparian Forest matches this type nominally, but lacks a description with structural, floristic, and environmental details.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: N/A

ELEMENT SOURCES

***Saguaro National Park* Inventory notes:** Data not available

***Saguaro National Park* Plots:** IPS001H, IPS013H, IPS088H, IPS156, IP413H

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Kittel, G. 2013. *Platanus wrightii* Riparian Forest Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

Western Ecology Group. *Platanus wrightii - Fraxinus velutina* Riparian Forest Association. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

43. *Platanus wrightii* / *Quercus oblongifolia* Riparian Woodland Association

Translated name: Arizona sycamore / Mexican blue oak Riparian Woodland Association

NVC name: CEGL005338

NVC CLASSIFICATION

Division	Western North American Interior Flooded Forest [1.B.C.Nd]
Macrogroup	Interior Warm and Cool Desert Riparian Forest [M036]
Group	Western Interior Riparian Forest and Woodland [G797]
Alliance	Arizona Sycamore Riparian Forest [A3801]
Association	*Platanus wrightii* / *Quercus oblongifolia* Riparian Woodland [CEGL005338]

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is restricted to the major ephemeral drainages throughout the park, specifically, lower Chiminea Canyon, lower Madrona Canyon, and numerous tributaries of Rincon Creek.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This intermittently flooded woodland community is restricted to low-angle, typically south- to west-flowing drainages with intermittent water flow. The surface cover is dominated by a mix of features, including slabs of exposed bedrock, sections of deep gravel/sand, and large boulders. Throughout much of the year, standing water may be found in shallow depressions in the rock and/or large tinajas clustered throughout the watercourse.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This intermittently flooded woodland community is characterized by a variable (30–40%) canopy (>2 m) dominated by Mexican blue oak (*Quercus oblongifolia*) with common associates, Arizona sycamore (*Platanus wrightii*) and velvet ash (*Fraxinus velutina*), and a variable understory of obligate and facultative wetland species. Mexican blue oak (*Quercus oblongifolia*) is a consistent (1.0) dominant that provides average cover around 15% and a range in cover from 10% to 25%. This species is present as wide-canopied trees with heights from 4 to 8 meters, typically lining the margins of the watercourse. Arizona sycamore (*Platanus wrightii*) and velvet ash (*Fraxinus velutina*) are patchy (0.57), common associates that, when present, provide cover ranging from 5% to 20%. Arizona sycamore (*Platanus wrightii*) occurs as emergent, broad-canopied trees with heights from 8 to more than 10 meters. Velvet ash (*Fraxinus velutina*) are shorter statured (4–6 m) trees that range from broad, single-trunk individuals to sprawling, multi-stemmed ones. These species co-occurred in only one example of this community. Netleaf hackberry (*Celtis reticulata*) is a common (0.71), but sparse, associate tree with cover that is usually less than 5%. Other noteworthy, but sparse, trees include Goodding's willow (*Salix gooddingii*), alligator juniper (*Juniperus deppeana*), Arizona walnut (*Juglans major*), Arizona white oak (*Quercus arizonica*), and velvet mesquite (*Prosopis velutina*).

The sparse (<10%) subcanopy stratum (0.5–2 m) is characterized by a diverse mix of low-cover shrubs without clear dominants or associates. Distribution of these species ranges from scattered individuals to dense, shrub-dominated inclusions. Dense areas are typically on low-angle shelves, just outside of the watercourse, and are composed of Thurber's cotton (*Gossypium thurberi*), catclaw mimosa (*Mimosa aculeaticarpa*), and catclaw acacia (*Senegalia greggii*). Any of these species may also appear as scattered individuals along the watercourse. Tahitian kidneywood (*Eysenhardtia orthocarpa*) was documented throughout the community, ranging from small (<2 m), shrubby individuals to trees with heights up to 4 meters. Species that are more commonly distributed along the water course include mule-fat (*Baccharis salicifolia*), Florida hopbush (*Dodonaea viscosa*), desert honeysuckle (*Anisacanthus thurberi*), desertbroom (Baccharis sarothroides), ambrosia leaf bur-ragweed (*Ambrosia ambrosioides*), littleleaf false tamarind (*Lysiloma watsonii*), and wolf berry (*Lycium* sp.). In areas with consistent standing water, southern cattail (*Typha domingensis*) may be present.

The very sparse (<5%) field stratum (<0.5 m) is characterized by a mix of perennial grasses and forbs without any consistent dominants or common associates. Deergrass (*Muhlenbergia rigens*) was present in most (0.85) examples of this community with cover ranging from 1% to 3%. All other documented species were sparse (<1%) and present in only one or two examples of this community.

GLOBAL TYPE CONCEPT DESCRIPTION (ASSOCIATION LEVEL)

This desert riparian woodland occurs in southern Arizona at elevations of about 1,370 meters (4,490 ft). Sites occur along streams in foothills and mountain canyons where substrates are typically gravelly to sandy alluvium. The vegetation is characterized by the co-dominance of *Platanus wrightii* and *Quercus oblongifolia* in the tree canopy. *Juglans major* or *Quercus emoryi* may also be present in the tree canopy. The shrub layer is sparse to moderately dense. Associated species include *Baccharis sarothroides*, *Brickellia* spp., *Celtis laevigata* var. *reticulata*, *Dasylirion wheeleri*, *Erythrina flabelliformis*, *Gossypium thurberi*, *Lycium* spp., *Mimosa aculeaticarpa* var. *biuncifera*, and *Rhus trilobata*. The herbaceous layer is sparse to moderately dense and typically dominated by graminoids, such as *Bouteloua curtipendula* and *Muhlenbergia rigens*, but numerous forbs and other grasses may be present.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 95. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Quercus oblongifolia* (1.0), *Platanus wrightii* (0.57)
Canopy (2–5 m)	*Fraxinus velutina* (0.57)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 96. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Salix gooddingii, Prosopis velutina, Celtis reticulata, Eysenhardtia orthocarpa, Juniperus deppeana, Juglans major, Quercus arizonica*
Subcanopy (0.5–2 m)	*Gossypium thurberi, Baccharis salicifolia, Anisacanthus thurberi, Dodonaea viscosa, Celtis reticulata, Mimosa aculeaticarpa, Typha domingensis, Baccharis sarothroides, Lysiloma watsonii*
Field (0–0.5 m)	*Muhlenbergia rigens*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from seven classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as CEGL005338 bisect numerous upland groups classified by Roseberry and Dole (1939).

Global

Data not available

Classification confidence: Low - Poorly Documented

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: This desert riparian woodland occurs in southern Arizona, but it is likely more widespread within the range of *Quercus oblongifolia*.

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park

Inventory notes: Data not available

Plots: IPS092H, IPS179, IPS181, IPS618, IPS806, IPS807, IPS814

Local description authors: J. Galvin, S. Studd

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2004. *Platanus wrightii* / *Quercus oblongifolia* Riparian Woodland Association, version date 22Aug2007. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

44. *Populus fremontii* / *Muhlenbergia rigens* Riparian Woodland Association

Translated name: Fremont cottonwood / Deergrass Riparian Woodland Association

NVC name: CEGL001455

Identifier: N/A

NVC CLASSIFICATION

Division	Western North American Interior Flooded Forest [D013]
Macrogroup	Interior Warm and Cool Desert Riparian Forest [M036]
Group	Western Interior Riparian Forest and Woodland [G797]
Alliance	Fremont Cottonwood - Velvet Ash - Goodding's Willow Riparian Forest and Woodland [A3803]
Association	*Populus fremontii* / *Muhlenbergia rigens* Riparian Woodland [CEGL001455]

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is primarily found within the mid-slope drainages flowing off the north side of Tanque Verde Ridge. The most notable occurrences are above Bridal Wreath Falls and around the Douglas Springs Campground.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This intermittently flooded woodland community is restricted to low-angle drainages with intermittent water flow, often where geologic and hydrologic features, such as tinajas, springs, and seeps, allow for high water retention and/or availability throughout the drier seasons. The surface cover is typically dominated by slabs of exposed bedrock underlying pockets of variably deep sand and gravel that shift with each flood event. Throughout much of the year, standing water may be found in shallow depressions in the rock and/or large tinajas clustered throughout the watercourse. Where bedrock is less common, the soil is typically quite deep and well drained, usually consisting of coarse sandy loam.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is characterized by a moderately sparse (10–20%) canopy (>2 m) dominated by Fremont cottonwood (*Populus fremontii*) with Goodding's willow (*Salix gooddingii*) and an understory of deergrass (*Muhlenbergia rigens*). This woodland can range from expanses of exposed bedrock with very sparse and inconsistent cover to sandy stretches where these species provide a more consistent, sparse woodland.

Across the community, Fremont cottonwood (*Populus fremontii*) provides variable cover that ranges from a few scattered individuals, providing less than 5% cover, to areas of more consistent dominance with cover up to 20%. In general, areas dominated by exposed bedrock coincide with low tree cover, while portions characterized by dominant sand and rock tend to be associated with the higher-cover examples. Overall, this species is present as canopy trees with heights typically ranging from 6 to 10 meters. Goodding's willow (*Salix gooddingii*) provides consistent cover ranging from 5% to 10% across the community. This species presents as either a small tree with heights ranging from 3 to 5 meters or small, shrubby individuals that are in the subcanopy stratum (0.5–2 m). Velvet ash (*Fraxinus velutina*) is an inconsistent (0.50) associate tree that, when present, only provides 1% to 2% cover. Numerous oak species were documented but did not provide consistent cover across the community; these include Mexican blue oak (*Quercus oblongifolia*), Emory oak (*Quercus emoryi*), and Arizona white oak (*Quercus arizonica*). In most cases, these species were associated with the adjacent upland community. Netleaf hackberry (*Celtis reticulata*) and alligator juniper (*Juniperus deppeana*) are the only additional species documented in the canopy strata.

Excluding the shrubby Goodding's willow (*Salix gooddingii*), the subcanopy stratum is characterized by a low-cover mix of shrubs, vines, and succulents with no clear dominants or common associates. Of these species, some are associated solely with the drainage community, while the majority are present in the adjacent upland communities. The most prominent species associated with the drainage are mule-fat (*Baccharis salicifolia*), canyon grape (*Vitis arizonica*), and desert false indigo (*Amorpha fruticosa*). The upland associated species include beargrass (*Nolina microcarpa*), common sotol (*Dasylirion wheeleri*), desertbroom (*Baccharis sarothroides*), gumhead (*Gymnosperma glutinosum*), and catclaw mimosa (*Mimosa aculeaticarpa*).

The highly variable (5–40%) field stratum (<0.5 m) is characterized by a variable mix of grasses, forbs, and subshrubs most commonly dominated by deergrass (*Muhlenbergia rigens*). This species is a consistent (1.0) component of the community, but it provides highly variable dominance (0.5) with cover ranging from less than 1% to up to 30% in dense areas. Areas of low cover are typically associated with stretches of dominant, exposed bedrock. Other noteworthy grasses include Lehmann lovegrass (*Eragrostis lehmanniana*), bullgrass (*Muhlenbergia emersleyi*), rough bentgrass (*Agrostis scabra*), Texas bluestem (*Schizachyrium cirratum*), pinyon ricegrass (*Piptochaetium fimbriatum*), and plains lovegrass (*Eragrostis intermedia*). Other sparse associates include Chihuahuan brickelbush (*Brickellia floribunda*), coralbells (*Heuchera sanguinea*), seep monkeyflower (*Mimulus guttatus*), rushes (*Juncus* sp.), and hummingbird trumpet (*Epilobium canum*).

GLOBAL TYPE CONCEPT DESCRIPTION (ASSOCIATION LEVEL)

This open riparian woodland is found generally along small, perennial and seasonally intermittent streams in the foothills zone of isolated desert mountain ranges in extreme southwestern New Mexico and, possibly, southeastern Arizona. These woodlands occur in narrow stream valleys on gently sloping alluvial terraces, and they are periodically inundated during spring runoff. The stand from Gray Ranch in the Animas Mountains was described from an east-facing alluvial terrace at approximately 1,700 meters elevation. The parent material is gravelly rhyolite alluvium, deposited among boulders. This woodland has an open tree canopy with a grassy understory. The broad-leaved deciduous trees, *Populus fremontii* and *Salix gooddingii*, dominate the canopy layer with 10% to 20% cover. Scattered *Baccharis salicifolia* and *Dalea* spp. may be present in the poorly developed shrub layer. The perennial bunchgrass, *Muhlenbergia rigens*, is the only abundant species in the herbaceous layer, with 20% cover. Total herbaceous cover is 25%.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 97. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Populus fremontii* (1.0)
Canopy (2–5 m)	*Salix gooddingii* (1.0)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Muhlenbergia rigens* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 98. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus oblongifolia, Quercus emoryi, Quercus arizonica, Fraxinus velutina, Celtis reticulata, Juniperus deppeana*
Subcanopy (0.5–2 m)	*Baccharis salicifolia, Amorpha fruticosa, Nolina microcarpa, Vitis arizonica, Dasylirion wheeleri, Baccharis sarothroides, Gymnosperma glutinosum, Mimosa aculeaticarpa*
Field (0–0.5 m)	*Mimulus guttatus, Juncus* sp., *Epilobium canum, Eragrostis lehmanniana, Muhlenbergia emersleyi, Agrostis scabra, Schizachyrium cirratum, Piptochaetium fimbriatum, Eragrostis intermedia, Brickellia floribunda, Heuchera sanguinea*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from five plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as CEGL001455 bisect numerous upland groups classified by Roseberry and Dole (1939).

Global

Data not available

Classification confidence: Low - Poorly Documented

NatureServe conservation status: data not available

Global status: G2 (07Nov1997)

Rounded global status: G2 - Imperiled

Global range: MX (Potentially occurs), U.S.

Reasons: Few intact examples of this association remain in the southwestern U.S. It has been documented on the Gray Ranch of the Animas Mountains in New Mexico, but has been observed elsewhere in the Southwest, particularly along intermittent and more ephemeral stream channels. Stands are often small and naturally restricted by alluvial terrace size. The association continues to be in decline, primarily as a function of grazing, and, to a lesser degree, hydrological alterations (dams and diversions) and agricultural conversion. The remaining functional stands are restricted to unregulated perennial streams and rivers, as well as ephemeral washes. It is a significant association with respect to biodiversity, particularly for birds in the Southwest. Even protected examples are threatened by continued declines in upland watershed conditions.

ELEMENT SOURCES

***Saguaro National Park*, Inventory notes:** Data not available

***Saguaro National Park*, Plots:** IP300H, IPS652, IPS679, IPS715, IPS721

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Reid, M. S., modified by K. A. Schulz. 2011. *Populus fremontii* / *Muhlenbergia rigens* Riparian Woodland, version date 11May1993. U.S. National Vegetation Classification Database, V2.01 (2017). Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. http://usnvc.org, accessed December 6, 2018.

45. *Prosopis velutina - Senegalia greggii* Intermittently Flooded Shrubland Association (P)

Translated name: Velvet mesquite - Catclaw acacia Intermittently Flooded Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN0177

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	North American Warm-Desert Xeric-Riparian Scrub [M092]
Group	Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope [G541]
Alliance	–
Association	*Prosopis velutina - Senegalia greggii* Intermittently Flooded Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community was documented throughout the lower elevational range of the park.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This intermittently flooded shrubland is restricted to mixed-gradient (3–50+%) drainages/arroyos and adjacent slopes from 920 to 1,240 meters (3,018–4,068 ft). The channel is typically low angle (<20%), excluding the occasional dry-fall, while the adjacent slopes are typically much steeper, occasionally occurring as vertical cliff bands. Within the watercourse, the surface cover is characterized by deep, well-drained soils of fine, gravelly sand with scattered rock ranging from small cobbles to large boulders. At times, usually in the higher elevational reaches of this community, vast expanses of exposed bedrock may come to dominate the surface cover. Rock composition is quite variable, depending on where the community occurs within the park.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is characterized by a variable low canopy (2 –5 m) and subcanopy (0.5–2 m) dominated by velvet mesquite (*Prosopis velutina*) with one common associate, catclaw acacia (*Senegalia greggii*), and a variable mix of associate shrubs and succulents. Velvet mesquite (*Prosopis velutina*) is by far the most consistent (1.0) and dominant species in this community; it has an average cover around 7%, with some examples up to 20%. In general, it is present as shrubby individuals with heights less than 2 meters, but larger, tree-like examples were also documented. Catclaw acacia (*Senegalia greggii*) is exclusively present in the subcanopy stratum as a small (<2 m) shrub with variable cover ranging from absent to 10% and averaging 3%. This species was documented in all but one example of this community. Both of these species are most common along the margins of the watercourse and/or on the adjacent slopes, but in wide drainages, they can occur on vegetated islands that occur when the drainage becomes braided. Wright's beebrush (*Aloysia wrightii*) is a sporadic (0.58) associate that, when present, provides cover around 5%, with rare inclusions up to 12%. This species is most common on the sheltered, north-facing slopes adjacent to the watercourse. Netleaf hackberry (*Celtis ehrenbergiana*) is a patchy (0.66), low-cover (2%) associate with rare inclusions of dominance where cover can reach above 10%. Cactus apple (*Opuntia engelmannii*) was documented in most (0.92) examples of this community, but it is primarily associated with the adjacent upland communities. Other noteworthy associated shrubs and succulents include staghorn cholla (*Cylindropuntia versicolor*), whitethorn acacia (*Vachellia constricta*), Thurber's cotton (*Gossypium thurberi*), Thurber's desert honeysuckle (*Anisacanthus thurberi*), Warnock's snakewood (*Condalia warnockii*), Berlandier's wolfberry (*Lycium berlandieri*), and catclaw mimosa (*Mimosa aculeaticarpa*). In major drainages, especially Box Canyon, shrubby examples of western soapberry (*Sapindus saponaria* var. *drummondii*) may be present as an associate and occasional co-dominant.

The field is a generally sparse (< 10%), inconsistent mix of subshrubs, succulents, and grasses without any clear dominants. Ambrosia leaf bur ragweed (*Ambrosia ambrosioides*) is a common (0.83) subshrub with low-cover patches scattered along the edges of the watercourse. A diverse mix of native, perennial bunch grasses provide cover around 4% throughout the community. In order of most to least frequently observed, these species include sideoats grama (*Bouteloua curtipendula*), bush muhly (*Muhlenbergia porteri*), spidergrass (*Aristida ternipes*), Arizona cottontop (*Digitaria californica*), and tanglehead (*Heteropogon contortus*). Four invasive, perennial grasses, Lehmann lovegrass (*Eragrostis lehmanniana*), crimson fountaingrass (*Cenchrus setaceus*), rose natal grass (*Melinis repens*) and buffelgrass (*Cenchrus ciliaris*), were documented throughout this community with less than 1% cover each. Lehmann lovegrass (*Eragrostis lehmanniana*) was consistently (0.83) distributed, while the other three were relatively infrequent, occurring in less than a third of the documented examples of this community. The invasive, annual grass, red brome (*Bromus rubens*), was commonly (0.66) documented throughout this community. Numerous additional species that are associated with the adjacent upland communities may be present, most notably, slender janusia (*Cottsia gracilis*).

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This group is restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains, and basin floors throughout the warm deserts of the western U.S. and northwestern Mexico. A woody layer is usually present, and it is typically scattered clumps to very open. It may be dominated by shrubs and small trees, such as *Acacia greggii*, *Brickellia laciniata*, *Baccharis sarothroides*, *Chilopsis linearis*, *Ephedra californica*, *Ericameria paniculata*, *Fallugia paradoxa*, *Forestiera pubescens*, *Hymenoclea salsola*, *Hymenoclea monogyra*, *Hyptis emoryi*, *Juglans microcarpa*, *Lepidospartum squamatum*, *Olneya tesota*, *Parkinsonia florida*, *Prosopis* spp., *Psorothamnus spinosus*, *Prunus fasciculata*, *Rhus microphylla*, *Salazaria mexicana*, *Sarcobatus vermiculatus*, or *Viguiera reticulata*. A few known herbaceous communities dominate intermittent drainages and washes, with woody vegetation absent or as scattered individuals only. Dominant species include *Panicum bulbosum*, *Alopecurus aequalis*, or *Lycurus phleoides*. Although this group is often dry, it is characterized by intermittent fluvial processes, such as rapid sheet- and gully flow. This group is restricted to drainages in upland areas or ramaderos that are intermittently flooded and occur as linear or sometimes broader, braided strips within desert scrub- or desert grassland-dominated landscapes. The vegetation of desert washes is quite variable in species composition and structure, ranging from sparse and patchy to moderately dense; the vegetation typically occurs along the banks, but it may occur within the channel.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 99. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (1.0)
Subcanopy (0.5–2 m)	*Prosopis velutina* (1.0), *Senegalia greggii* (.92)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 100. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Mimosa aculeaticarpa, Celtis ehrenbergiana, Gossypium thurberi, Anisacanthus thurberi, Vachellia constricta, Aloysia wrightii, Cylindropuntia versicolor, Lycium berlandieri, Condalia warnockii*
Field (0–0.5 m)	*Ambrosia ambrosioides, Eragrostis lehmanniana, Cenchrus setaceus, Bromus rubens, Bouteloua curtipendula, Muhlenbergia porteri, Aristida ternipes, Digitaria californica, Heteropogon contortus, Melinis repens, Cenchrus ciliaris*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 13 plots, 12 classification plots sampled during the 2013–2017 mapping and classification effort, and one upland soil and vegetation monitoring plot.

Polygons attributed as NPSSODN0177 overlapped with two groups classified by Roseberry and Dole (1939), a saguaro group defined solely by the consistent presence of saguaro (*Carnegiea gigantea*), and a semi-desert chaparral group defined by an open area dominated by "shrub species common to the Sonoran life zone."

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS028H, IP208H, IP209H, IP211H, IP213H, IP219H, IP222H, IP223H, IP229H, IP235H, IP302H, IP313H, V202_006

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A., and E. Muldavin. Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope, version date 06Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed April 22, 2020.

46. *Prosopis velutina - Senegalia greggii* Intermittently Flooded Woodland Association (P)

Translated name: Velvet mesquite - Catclaw acacia Intermittently Flooded Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN0141

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	North American Warm-Desert Xeric-Riparian Scrub [M092]
Group	Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope [G541]
Alliance	–
Association	*Prosopis velutina - Senegalia greggii* Intermittently Flooded Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community was documented throughout the lower elevational range of the park.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This intermittently flooded woodland is restricted to low-angle (<10%) washes/arroyos and the adjacent, steep (>20%) slopes from 872 to 1,240 meters (2,860–4,068 ft). Within the watercourse, the surface cover is characterized by deep, well-drained soils of fine, gravelly sand with scattered rock ranging from small cobbles to large boulders. The adjacent slopes are more commonly characterized as fine, loamy soils with considerable cover of plant litter. Rock composition is quite variable, depending on where the community occurs within the park.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is characterized by a variably dense (15–40%) canopy (>2 m) dominated by velvet mesquite (*Prosopis velutina*) with one common associate, catclaw acacia (*Senegalia greggii*). Throughout its range, this community can vary from dense wooded areas, often with closed canopies, to sparsely wooded areas that are more dominated by shrubs. Velvet mesquite (*Prosopis velutina*) is by far the most consistent (1.0) and dominant species in this community; it has average cover around 21%, with some examples up to 30%. In general, it is present as a large tree with an average height around 5 meters. Catclaw acacia (*Senegalia greggii*) provides cover in the canopy as large (4 m), single-stemmed trees, and in the subcanopy (0.5–2 m) as small (<2 m) shrubs. Across all strata, this species provides around 8% cover with some areas up to 15%. Both of these species are most common along the margins of the watercourse and/or on the adjacent slopes; however, in wide drainages, they can occur on vegetated islands that occur when the drainage becomes braided. Netleaf hackberry (*Celtis reticulata*) is an uncommon (0.1) associate that can provide 1% to 2% cover. Western soapberry (*Sapindus saponaria* var. *drummondii*) provides patchy (.38) inclusions of small (<2 m), multi-stemmed individuals and taller (3–4 m), single-stemmed trees, especially in the Box Canyon drainage. Across both growth forms, cover of this species ranges from absent up to 10%. Velvet ash (*Fraxinus velutina*), a facultative wetland tree in the arid West, is another patchy (.25) associate. When documented, this species was present as tall (5–7 m) individuals that provided from 2% to 4% cover, often from one or two large trees. Scattered oaks, usually Emory oak (*Quercus emoryi*), can be present in this community, typically in the upper elevational reaches and/or in very sheltered sections of these drainages.

The subcanopy is highly variable with cover ranging from 3% to 35%. In general, areas of low subcanopy cover coincide with a dense, closed canopy, and vice versa. The most consistent subcanopy species is the shrubby catclaw acacia (*Senegalia greggii*). Catclaw mimosa (*Mimosa aculeaticarpa*) provides patchy (0.5) inclusions of domi-

nance, often in the sparsely wooded variation. This species can occur as sparse (<1%), scattered individuals in the wooded areas to dense (20%), impenetrable patches where the canopy is more open. Spiny hackberry (*Celtis ehrenbergiana*) is a common (0.75) associate with highly variable cover. Typically, this species is present as scattered individuals providing little (<1%) cover; however, it can occasionally form dense thickets with cover up to 30%. Thurber's cotton (*Gossypium thurberi*) is a very common (1.0), low-cover (1%) species that is typically found on vegetated islands and/or where the canopy is more open. Other low-cover, but noteworthy, associates include lotebush (*Ziziphus obtusifolia*), common buttonbush (*Cephalanthus occidentalis*), singlewhorl burrobush (*Ambrosia monogyra*), mule-fat (*Baccharis salicifolia*), Thurber's desert honeysuckle (*Anisacanthus thurberi*), white thorn acacia (*Vachellia constricta*), and Arizona desert-thorn (*Lycium exsertum*). When present, these species should not provide more than 1% to 2% cover. Often, canyon grape (*Vitis arizonica*) and Gila manroot (*Marah gilensis*) are found twining through the shrub layer and, occasionally, up into the canopy.

The field is a generally sparse (<10%), inconsistent mix of subshrubs and grasses without any clear dominants. Ambrosia leaf bur ragweed (*Ambrosia ambrosioides*) is the most common (0.88) subshrub with low-cover patches scattered along the edges of the watercourse. Two invasive perennial grasses, Lehmann lovegrass (*Eragrostis lehmanniana*) and crimson fountaingrass (*Cenchrus setaceus*), were documented throughout this community with close to 1% cover each. Lehmann lovegrass (*Eragrostis lehmanniana*) was consistently (0.88) distributed, while crimson fountaingrass (*Cenchrus setaceus*) was limited to the larger drainages, specifically Box Canyon. The invasive annual grass, red brome (*Bromus rubens*), was commonly (0.75) documented throughout this community.

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This group is restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains, and basin floors throughout the warm deserts of the western U.S. and northwestern Mexico. A woody layer is usually present, and it is typically scattered clumps to very open. It may be dominated by shrubs and small trees, such as *Acacia greggii*, *Brickellia laciniata*, *Baccharis sarothroides*, *Chilopsis linearis*, *Ephedra californica*, *Ericameria paniculata*, *Fallugia paradoxa*, *Forestiera pubescens*, *Hymenoclea salsola*, *Hymenoclea monogyra*, *Hyptis emoryi*, *Juglans microcarpa*, *Lepidospartum squamatum*, *Olneya tesota*, *Parkinsonia florida*, *Prosopis* spp., *Psorothamnus spinosus*, *Prunus fasciculata*, *Rhus microphylla*, *Salazaria mexicana*, *Sarcobatus vermiculatus*, or *Viguiera reticulata*. A few known herbaceous communities dominate intermittent drainages and washes, with woody vegetation absent or as scattered individuals only. Dominant species include *Panicum bulbosum*, *Alopecurus aequalis*, or *Lycurus phleoides*. Although this group is often dry, it is characterized by intermittent fluvial processes, such as rapid sheet- and gully flow. This group is restricted to drainages in upland areas or ramaderos that are intermittently flooded and occur as linear or sometimes broader, braided strips within desert scrub- or desert grassland-dominated landscapes. The vegetation of desert washes is quite variable in species composition and structure, ranging from sparse and patchy to moderately dense; the vegetation typically occurs along the banks, but it may occur within the channel.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 101. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (1.0)
Subcanopy (0.5–2 m)	*Senegalia greggii* (0.88), *Celtis ehrenbergiana* (0.75)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 102. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Celtis reticulata, Sapindus saponaria* var. *drummondii, Fraxinus velutina, Quercus emoryi*
Subcanopy (0.5–2 m)	*Mimosa aculeaticarpa, Celtis ehrenbergiana, Gossypium thurberi, Ziziphus obtusifolia, Cephalanthus occidentalis, Ambrosia monogyra, Baccharis salicifolia, Anisacanthus thurberi, Vachellia constricta, Lycium exsertum, Vitis arizonica, Marah gilensis*
Field (0–0.5 m)	*Ambrosia ambrosioides, Eragrostis lehmanniana, Cenchrus setaceus, Bromus rubens*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 11 plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN0141 overlapped with two groups classified by Roseberry and Dole (1939), a saguaro group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*), and a semi-desert chaparral group defined as an open area dominated by "shrub species common to the Sonoran life zone."

Global

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS030H, IPS054H, IPS144H, IPS158, IPS175, IPS177, IP203H, IP214H, IP216H, IP225H, IP309H

Local description authors: J. Galvin

CITATIONS

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A., and E. Muldavin. 2011. Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope, version date 06Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed April 22, 2020.

47. *Prosopis velutina* / Annual Forb Woodland Association (P)

Translated name: Velvet mesquite / Annual Forb Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN173

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	North American Warm-Desert Xeric-Riparian Scrub [M092]
Group	Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope [G541]
Alliance	–
Association	*Prosopis velutina* / Annual Forb Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

The community was documented in and adjacent to the major washes and adjacent floodplains in the northern portion of the Cactus Forest.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This intermittently flooded woodland is restricted to very low-angle (<5%) washes and adjacent floodplains around an elevation of 800 meters (2,624 ft). The surface cover is characterized by very deep and well-drained soils. The watercourse tends to be characterized by very fine, gravelly sand, while the adjacent floodplains are more commonly sandy loam or silt.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is characterized by a variably dense (10–40%) canopy (2–5 m) dominated solely by velvet mesquite (*Prosopis velutina*) with an understory of mixed annual forbs and grasses. Velvet mesquite (*Prosopis velutina*) is present as tall (4–6 m) trees with a generally consistent distribution throughout the community. When present (0.5), catclaw acacia (*Senegalia greggii*) provided up to 5% cover in the canopy with tree-like individuals ranging in height up to 4 meters. Blue paloverde (*Parkinsonia florida*), Arizona sycamore (*Platanus wrightii*), and velvet ash (*Fraxinus velutina*) are the only additional species documented in the canopy that, when present, contribute scattered individuals with cover less than 1%.

The subcanopy stratum (0.5–2 m) is characterized by a low-cover mix of associate shrubs, including lotebush (*Ziziphus obtusifolia*), Warnock's snakewood (*Condalia warnockii*), creosote (*Larrea tridentata*), and white thorn acacia (*Vachellia constricta*). The last two species are highly associated with adjacent communities in which they are dominant species.

The field (<0.5 m) stratum is characterized by a variable and sometimes dense mix of annual grasses and forbs. The most frequently encountered species include sixweeks grama (*Bouteloua barbata*), carelessweed (*Amaranthus palmeri*), spiderling (*Boerhavia* sp.), soft feather pappusgrass (*Enneapogon mollis*), and morning-glory (*Ipomoea* sp.). Abundance and cover of species will vary considerably depending on the season and associated rainfall. Ambrosia leaf bur ragweed (*Ambrosia ambrosioides*) is the only noteworthy perennial field component with presence that is typically associated with the margins of included watercourses.

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This group is restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains, and basin

floors throughout the warm deserts of the western U.S. and northwestern Mexico. A woody layer is usually present, and it is typically scattered clumps to very open. It may be dominated by shrubs and small trees, such as *Acacia greggii*, *Brickellia laciniata*, *Baccharis sarothroides*, *Chilopsis linearis*, *Ephedra californica*, *Ericameria paniculata*, *Fallugia paradoxa*, *Forestiera pubescens*, *Hymenoclea salsola*, *Hymenoclea monogyra*, *Hyptis emoryi*, *Juglans microcarpa*, *Lepidospartum squamatum*, *Olneya tesota*, *Parkinsonia florida*, *Prosopis* spp., *Psorothamnus spinosus*, *Prunus fasciculata*, *Rhus microphylla*, *Salazaria mexicana*, *Sarcobatus vermiculatus*, or *Viguiera reticulata*. A few known herbaceous communities dominate intermittent drainages and washes, with woody vegetation either absent or as scattered individuals only. Dominant species include *Panicum bulbosum*, *Alopecurus aequalis*, or *Lycurus phleoides*. Although this group is often dry, it is characterized by intermittent fluvial processes, such as rapid sheet- and gully flow. This group is restricted to drainages in upland areas or ramaderos that are intermittently flooded and occur as linear or sometimes broader, braided strips within desert scrub- or desert grassland-dominated landscapes. The vegetation of desert washes is quite variable in species composition and structure, ranging from sparse and patchy to moderately dense; the vegetation typically occurs along the banks, but it may occur within the channel.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 103. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (1.0)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 104. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Fraxinus velutina, Platanus wrightii*
Canopy (2–5 m)	*Senegalia greggii, Parkinsonia florida*
Subcanopy (0.5–2 m)	*Mimosa aculeaticarpa, Celtis ehrenbergiana, Gossypium thurberi, Anisacanthus thurberi, Vachellia constricta, Aloysia wrightii, Cylindropuntia versicolor, Lycium berlandieri, Condalia warnockii*
Field (0–0.5 m)	*Amaranthus palmeri, Bouteloua barbata, Boerhavia* sp., *Enneapogon mollis, Ipomoea* sp., *Ambrosia ambrosioides*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from four plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN173 overlapped with two groups classified by Roseberry and Dole (1939), a semi-desert chaparral group defined by an open area dominated by "shrub species common to the Sonoran life zone," and a woodland-grass group defined by "areas that contain 20% or more of both broadleaf tree and herbaceous species."

Global

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: GNR

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: ITS055, IPS073, IPS153, IPS155

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A., and E. Muldavin. 2011. Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope, version date 06Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed April 22, 2020.

48. *Prosopis velutina* / *Ziziphus obtusifolia - Condalia warnockii* Woodland Association (P)

Translated name: Velvet mesquite / Lotebush - Warnock's snakewood Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN174

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	North American Warm-Desert Xeric-Riparian Scrub [M092]
Group	Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope [G541]
Alliance	–
Association	*Prosopis velutina* / *Ziziphus obtusifolia* - *Condalia warnockii* Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

The only examples of this community were documented within the floodplains adjacent to Monument Wash in the northern portions of the Cactus Forest.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland is restricted to very low-angle (<5%) floodplains around 800 meters (2,624 ft). The surface cover is characterized by deep and well-drained, fine to coarse, loamy soil and silt underlying a dominant layer of litter.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is characterized by a dense (40–50+%) canopy (>2 m) solely dominated by velvet mesquite (*Prosopis velutina*) with a variable (5–20%) understory of lotebush (*Ziziphus obtusifolia*) and Warnock's snakewood (*Condalia warnockii*). Velvet mesquite (*Prosopis velutina*) is consistently (1.0) present as large (5+ m), single-stemmed trees, often with broad canopies (10 m). This species provides all documented cover in the canopy.

The subcanopy (0.5–2 m) is characterized by the consistent (1.0) co-dominance of lotebush (*Ziziphus obtusifolia*) and Warnock's snakewood (*Condalia warnockii*). In general, these species provide similar low cover throughout with an average around 4% each. Other documented associate shrubs include creosote (*Larrea tridentata*), catclaw acacia (*Senegalia greggii*), fourwing saltbush (*Atriplex canescens*), and white thorn acacia (*Vachellia constricta*). These species all provide sparse cover (<1%) that rarely competes with the subcanopy dominants.

The field stratum is quite sparse (<8%) with only a suite of annuals, especially carelessweed (*Amaranthus palmeri*), which provides noteworthy cover.

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This group is restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains, and basin floors throughout the warm deserts of the western U.S. and northwestern Mexico. A woody layer is usually present, and it is typically scattered clumps to very open. It may be dominated by shrubs and small trees such, as *Acacia greggii*, *Brickellia laciniata*, *Baccharis sarothroides*, *Chilopsis linearis*, *Ephedra californica*, *Ericameria paniculata*, *Fallugia paradoxa*, *Forestiera pubescens*, *Hymenoclea salsola*, *Hymenoclea monogyra*, *Hyptis emoryi*, *Juglans microcarpa*, *Lepidospartum squamatum*, *Olneya tesota*, *Parkinsonia florida*, *Prosopis* spp., *Psorothamnus spinosus*, *Prunus fasciculata*, *Rhus microphylla*, *Salazaria mexicana*, *Sarcobatus vermiculatus*, or *Viguiera reticulata*. A few known herbaceous communities dominate intermittent drainages and washes, with woody vegetation

either absent or as scattered individuals only. Dominant species include *Panicum bulbosum*, *Alopecurus aequalis*, or *Lycurus phleoides*. Although this group is often dry, it is characterized by intermittent fluvial processes, such as rapid sheet- and gully flow. This group is restricted to drainages in upland areas or ramaderos that are intermittently flooded and occur as linear or sometimes broader, braided strips within desert scrub- or desert grassland-dominated landscapes. The vegetation of desert washes is quite variable in species composition and structure, ranging from sparse and patchy to moderately dense; the vegetation typically occurs along the banks, but it may occur within the channel.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 105. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Prosopis velutina* (1.0)
Canopy (2–5 m)	*Prosopis velutina* (1.0)
Subcanopy (0.5–2 m)	*Ziziphus obtusifolia* (1.0), *Condalia warnockii* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 106. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Senegalia greggii, Vachellia constricta, Larrea tridentata, Atriplex canescens*
Field (0–0.5 m)	*Amaranthus palmeri*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from four plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN174 overlapped with one group classified by Roseberry and Dole (1939), a woodland-grass group defined by "area that contain 20% or more of both broadleaf tree and herbaceous species."

Global

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS053, IPS067, IPS069, IPS813

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A., and E. Muldavin. 2011. Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope, version date 06Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed April 22, 2020.

49. *Quercus rugosa - Ceanothus integerrimus* Woodland Association (P)

Translated name: Netleaf oak - Deerbrush Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN153

NVC CLASSIFICATION

Division	Western North American Interior Chaparral [2.B.2.Ng]
Macrogroup	Cool Interior Chaparral [M094]
Group	Western North American Montane Sclerophyll Scrub [G282]
Alliance	–
Association	*Quercus rugosa - Ceanothus integerrimus* Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This uncommon community was documented on the north slopes of Mica Mountain.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This association is primarily present on mountain backslopes from 2,050 to 2,300 meters (6,725–7,545 ft). All examples of this community are north trending, and most are sheltered by large bedrock outcrops. The dominant surface cover varies based on fire history. Unburned examples are dominated by deep litter, while burned versions are dominated by a mix of gravel, bare soil, and shallow litter.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is present in two distinct variations, unburned woodland and burned shrubland. The unburned version is characterized by a dense (50–75+%) lower canopy (2–5 m) co-dominated by deerbrush (*Ceanothus integerrimus*) and netleaf oak (*Quercus rugosa*) with a minimal to nonexistent understory. The burned version is characterized by a more open (<50%) subcanopy dominated by deerbrush (*Ceanothus integerrimus*) with variable netleaf oak (*Quercus rugosa*).

In the unburned variation, deerbrush (*Ceanothus integerrimus*) is present as short (3–4 m), narrow-canopied trees with average cover around 50%. Netleaf oak (*Quercus rugosa*) is a similarly statured species with lower cover closer to 25%. The only other documented low-canopy species was silverleaf oak (*Quercus hypoleucoides*). The understory is characterized by the absence of associates with only a few documented species, including New Mexico locust (*Robinia neomexicana*) and pineland figwort (*Scrophularia parviflora*).

In the burned variation, deerbrush (*Ceanothus integerrimus*) is short (<2 m) and shrubby with cover similar to the unburned version. Netleaf oak (*Quercus rugosa*) is considerably reduced in this variation, with shrubby cover providing less than 5%. There were considerably more associate species in this variation, including Gambel oak (*Quercus gambelii*), New Mexico raspberry (*Rubus neomexicana*), Pringle's manzanita (*Arctostaphylos pringlei*), mutton grass (*Poa fendleri*), and meadow rue (*Thalictrum fendleri*).

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This group consists of cool, mostly montane chaparral and sclerophyllous scrublands that occur in the western U.S. from the Sierra Nevada, Klamath-Siskiyou Mountains and southern Cascade Range of California, Oregon and Washington east on [to?] the ranges of the Great Basin and plateaus of the Colorado Plateau into the Rocky Mountains extending out to the Black Hills. There are also occurrences extending as far west as the inner Coast

Ranges in central California and the Peninsular and Transverse ranges. Stands are typically fairly open-canopied shrublands with open interspaces either bare or supporting patchy grasses and forbs. *Arctostaphylos patula* and *Ceanothus velutinus* are the most widespread dominant/diagnostic species. Other dominant/diagnostic species include *Arctostaphylos mewukka*, *Arctostaphylos nevadensis*, *Arctostaphylos viscida*, *Ceanothus cordulatus*, *Ceanothus integerrimus*, *Ceanothus martinii*, *Chrysolepis sempervirens*, *Holodiscus discolor*, *Prunus emarginata*, *Quercus garryana* var. *fruticosa* (shrub form), *Quercus sadleriana*, and *Quercus vacciniifolia*. *Cercocarpus ledifolius* is generally absent. Most of the oaks and other chaparral species occur in the western extent. Understory varies with shrub density, but it is generally sparse. Occasional emergent conifers may be present. Higher-elevation stands typically have greater species diversity. Stands in this group are typically montane shrublands found on the slopes of the Sierra Nevada and Cascades and into the western Great Basin, Colorado Plateau, and Black Hills of South Dakota, in summer-dry habitats from 800 to 3,000 meters. Stands in California are found at higher elevations than most other chaparral, ranging from 300 to 3,300 meters in elevation. They occur in the northern Coast Ranges, Klamath Mountains, Modoc Plateau, Sierra Nevada and foothills, and southern Cascades of California, Oregon, and Washington. The climate is semi-arid to cool temperate. Yearly precipitation and temperature ranges are quite large. Much of the precipitation comes as winter snow at higher elevations, and summer drought-stress is characteristic. These shrublands occur on ridges and rocky slopes often with southerly aspects. Substrates are thin, well-drained, skeletal soils with coarser-texture loamy or sandy soils. Parent materials are varied and range from limestone and sandstone to granitics, mafic, and ultramafic substrates. These shrub communities established after stand-replacing fires or clear-cut logging in *Pinus ponderosa* forests, *Pseudotsuga menziesii* forests, or pinyon-juniper woodlands. They move from seral stage to forest after several decades. Excessively rocky or droughty, fire-prone sites in the forest may support relatively persistent stands of this group. In the Rocky Mountains, stands are found within a matrix of montane conifer forest and woodland in limited, small-patch occurrences that form post-fire shrublands in areas previously dominated by woodlands. Typical fire regime in this group varies with the amount of organic accumulation. All characteristic species are fire adapted.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 107. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Ceanothus integerrimus* (1.0), *Quercus rugosa* (1.0)
Subcanopy (0.5–2 m)	*Ceanothus integerrimus* (1.0), *Quercus rugosa* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 108. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus hypoleucoides*
Subcanopy (0.5–2 m)	*Robinia neomexicana, Quercus gambelii, Rubus neomexicana*, *Arctostaphylos pringlei*
Field (0–0.5 m)	*Scrophularia parviflora, Poa fendleri, Thalictrum fendleri*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from two plots sampled during the 2013–2017 mapping and classification effort.

Polygons mapped as NPSSODN153 completely overlapped with areas Roseberry and Dole (1939) classified as "areas containing 20% or more of both commercial pine and Douglas fir."

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS799, IPS876

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Shiflet, T. N. 1994. Western North American Montane Sclerophyll Scrub Group, version date 06Aug2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 30, 2019.

50. (*Quercus arizonica - Quercus emoryi*) / *Arctostaphylos pungens* Shrubland Association (P)

Translated name: (Arizona white oak - Emory oak) / Pointleaf manzanita Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN150

NVC CLASSIFICATION

Division	Western North American Interior Chaparral [2.B.2.Ng]
Macrogroup	Warm Interior Chaparral [M091]
Group	Western Madrean Chaparral [G281]
Alliance	Manzanita - Ceanothus Chaparral [A3790]
Association	(*Quercus arizonica - Quercus emoryi*) / *Arctostaphylos pungens* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread throughout the middle slopes of Tanque Verde Ridge and the eastern slopes of the range.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This association is primarily present on moderately steep (20–40%) mountain backslopes from 1,450 to 1,650 meters (4,757–5,413 ft). Most examples of this community are north trending, but it can be found on any aspect depending on elevation. The surface cover is characterized by shallow and well-drained soils of skeletal loam underlying a layer of coarse gravel with consistent outcrops of exposed bedrock. The underlying parent material is primarily composed of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland is characterized by a sparse (<10 [20]%) canopy stratum (2–5 m) of Arizona white oak (*Quercus arizonica*) and Emory oak (*Quercus* emoryi), and a dense (20–50%) subcanopy (0.5–2 m) dominated by pointleaf manzanita (*Arctostaphylos pungens*). Most examples of this community contained evidence of historic fire disturbance, likely from the Chiva Fire (1989) and the Rincon Fire (1994).

The composition of oak species forms a distinct gradient based on elevation and/or aspect. In general, Emory oak (*Quercus emoryi*) is most common at the lower elevational range of the community, but it can be present higher up when on exposed slopes. Arizona white oak (*Quercus arizonica*) follows the reverse of that pattern with more cover at higher elevation or on lower, sheltered slopes. These species present as co-dominants or with either one becoming the sole dominant while the other is an associate. Both species are typically present as small (3–4 m) trees with cover ranging from 1% to 10% each. Scattered, low-cover (1%) alligator juniper (*Juniperus deppeana*) was documented throughout the community. In most examples of this community, snags, likely of alligator juniper (*Juniperus deppeana*) and border pinyon (*Pinus discolor*), were observed.

The subcanopy is characterized by the consistent (1.0) dominance of pointleaf manzanita (*Arctostaphylos pungens*) with few associate species. On average, this species provides around 30% cover throughout the community with some areas reaching up to 50%. At the upper elevational limit of this community, Pringle's manzanita (*Arctostaphylos pringlei*) may begin to appear, but it rarely competes for dominance with pointleaf manzanita (*Arctostaphylos pungens*). Wright's silktassel (*Garrya wrightii*) is an inconsistent (0.50) species that, when present, usually contributes only 1% to 2%. Other noteworthy subcanopy species include yucca (*Yucca madrensis*), beargrass

(*Nolina microcarpa*), California brickellbush (*Brickellia californica*), catclaw mimosa (*Mimosa aculeaticarpa*), and common sotol (*Dasylirion wheeleri*).

The very sparse (<5%) field stratum is characterized by a mix of native perennial grasses, forbs, and subshrubs. The most noteworthy of these include bullgrass (*Muhlenbergia emersleyi*), bristly wolfstail (*Muhlenbergia alopecuroides*), Palmer's century plant (*Agave palmeri*), and single threeawn (*Aristida schiedeana*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

Stands of this alliance have a moderately dense canopy dominated or co-dominated by the sclerophyllous, evergreen shrubs, *Arctostaphylos pungens*, *Arctostaphylos pringlei*, *Ceanothus greggii*, *Mortonia scabrella*, or *Mortonia utahensis*. Other characteristic shrubs include *Amelanchier utahensis*, *Cercocarpus montanus* var. *paucidentatus*, *Dasylirion wheeleri*, *Ephedra viridis*, *Garrya flavescens*, *Mahonia fremon*tii, and *Robinia neomexicana*. Scattered oaks, such as *Quercus arizonica*, *Quercus pungens*, or *Quercus turbinella*, may be present but not co-dominant. Herbaceous cover is typically low (<15% cover). Common grasses include *Bouteloua curtipendula*, *Bouteloua eriopoda*, and *Muhlenbergia emersleyi*. Frequent forbs include *Astrolepis sinuata*, *Bahia absinthifolia*, and *Macroptilium gibbosifolium*. This alliance occurs in southeastern Nevada, southwestern Utah, Arizona, and southwestern New Mexico. This chaparral occurs on dry mountain slopes ranging from 980 to 2,470 meters, depending on aspect. The climate is arid to semi-arid with temperatures rarely falling below freezing. Annual precipitation has a bimodal distribution. About one-third to two-thirds of the highly variable annual precipitation occurs in July through September during the late summer monsoon, and most of the remaining precipitation falls during the winter months. Mean annual precipitation is approximately 40 centimeters. Soils are gravelly with rocks. Parent material includes limestone, rhyolite, granite, and quartzite. Adjacent vegetation includes desert grasslands dominated by *Elionurus barbiculmis*, *Heteropogon contortus*, and *Bouteloua* spp. at lower elevations, and desert scrub stands dominated by *Acacia neovernicosa* or *Parthenium incanum*.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 109. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus emoryi* (1.0), *Quercus arizonica* (1.0)
Subcanopy (0.5–2 m)	*Arctostaphylos pungens* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 110. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Juniperus deppeana, Pinus discolor, Quercus emoryi*
Subcanopy (0.5–2 m)	*Nolina microcarpa, Dasylirion wheeleri, Garry wrightii, Arctostaphylos pringlei, Yucca madrensis, Brickellia californica, Mimosa aculeaticarpa*
Field (0–0.5 m)	*Muhlenbergia alopecuroides, Aristida schiedeana, Agave palmeri, Muhlenbergia emersleyi*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from eight plots sampled during the 2013–2017 mapping and classification effort.

Polygons mapped as NPSSODN150 overlap with one group classified by Roseberry and Dole (1939), a pinyon, juniper, or cypress group defined as "areas containing 20% or more of [Pinyon, Juniper, or Cypress], to the exclusion of commercial types of trees."

Global

CEGL000958, *Arctostaphylos pungens* shrubland, is the closest match to NPSSODN150, but due to the lack of described *Quercus arizonica* and *Quercus emoryi*, we maintained it as a provisional association.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS180, IPS613, IPS678, IPS680, IPS683, IPS688, IPS719, IPS842

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Arctostaphylos pungens - Arctostaphylos pringlei - Ceanothus greggii* Chaparral Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 16, 2019.

51. (*Quercus hypoleucoides - Quercus arizonica*) / *Arctostaphylos* (*pringlei - pungens*) Shrubland Association (P)

Translated name: (Silverleaf oak - Arizona white oak) / Manzanita (Pringle's - pointleaf) Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN148

NVC CLASSIFICATION

Division	Western North American Interior Chaparral [2.B.2.Ng]
Macrogroup	Warm Interior Chaparral [M091]
Group	Western Madrean Chaparral [G281]
Alliance	Manzanita - Ceanothus Chaparral [A3790]
Association	(*Quercus hypoleucoides - Quercus arizonica*) / *Arctostaphylos* (*pringlei - pungens*) Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread throughout the high slopes of Tanque Verde and Heartbreak ridges, often within the boundaries of historic fire events (specifically, the 1989 Chiva Fire).

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This association is primarily present on moderately steep (20–40%) mountain backslopes from 1,600 to 1,900 meters (5,249–6,233 ft). Most examples of this community are north trending, but it can be found on any aspect depending on elevation. The surface cover is characterized by a mix of shallow to deep, well-drained soils of skeletal loam underlying a layer of coarse gravel with consistent outcrops of exposed bedrock and large, detached boulders. The underlying parent material is primarily composed of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland is characterized by a sparse (<10%) canopy stratum (2–5 m) of silverleaf oak (*Quercus hypoleucoides*) and Arizona white oak (*Quercus arizonica*) with a dense (25–50%) subcanopy (0.5–2 m) dominated by Pringle's manzanita (*Arctostaphylos pringlei*) and pointleaf manzanita (*Arctostaphylos pungens*). Almost all examples of this community contained evidence of historic fire disturbance, probably from the Chiva Fire (1989) and the Rincon Fire (1994).

Within the canopy stratum, silverleaf oak (*Quercus hypoleucoides*) is the more prolific of the two oaks, providing consistent (1.0) presence with highly variable cover ranging from around 2 [15]%. This species can range from a small (<2 m), shrubby tree to single-stem individuals with heights up to 4 meters. Arizona white oak (*Quercus arizonica*) is also a consistent (1.0) component, but it has lower cover that is typically less than 5%. This species is typically present as small (3–4 m) trees, but it can appear shrubby, especially in areas of historic fire disturbance. Alligator juniper (*Juniperus deppeana*) and border pinyon (*Pinus discolor*) were documented as sparse (1%) associates. Snags of both species, which are poorly adapted to fire and very slow to recolonize, were documented across the community. It is likely that pre-fire these were more prevalent in the community. At the lower elevational limit of this community, Emory oak (*Quercus emoryi*) may be present as a sparse associate, typically on more exposed aspects; it should not outcompete silverleaf oak (*Quercus hypoleucoides*).

The subcanopy is characterized by the consistent (1.0) dominance of manzanita (*Arctostaphylos* sp.), Pringle's manzanita (*Arctostaphylos pringlei*), and pointleaf manzanita (*Arctostaphylos pungens*), with few associate species. On average, these species provide around 30% throughout the community with some areas reaching up to 50%.

Composition and dominance of these species align with a distinct elevational gradient. Local instances of increased or decreased exposure may cause a temporary change in dominance. Pointleaf manzanita (*Arctostaphylos pungens*) tends to dominate at the low end, while Pringle's manzanita (*Arctostaphylos pringlei*) is most common at the higher end. Either species may be the sole dominant throughout this gradient, or they can appear as co-dominants. Wright's silktassel (*Garrya wrightii*) is an inconsistent (0.50) species that, when present, usually contributes only 1 to 2%. Other noteworthy subcanopy species include yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), California brickellbush (*Brickellia californica*), and common sotol (*Dasylirion wheeleri*).

The very sparse (<5%) field stratum is characterized by a diverse mix of native perennial grasses, forbs, and subshrubs. The most noteworthy of these include bullgrass (*Muhlenbergia emersleyi*), bristly wolfstail (*Muhlenbergia alopecuroides*), Palmer's century plant (*Agave palmeri*), and single threeawn (*Aristida schiedeana*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

Stands of this alliance have a moderately dense canopy dominated or co-dominated by the sclerophyllous, evergreen shrubs, *Arctostaphylos pungens*, *Arctostaphylos pringlei*, *Ceanothus greggii*, *Mortonia scabrella*, or *Mortonia utahensis*. Other characteristic shrubs include *Amelanchier utahensis*, *Cercocarpus montanus* var. *paucidentatus*, *Dasylirion wheeleri*, *Ephedra viridis*, *Garrya flavescens*, *Mahonia fremontii*, and *Robinia neomexicana*. Scattered oaks, such as *Quercus arizonica*, *Quercus pungens*, or *Quercus turbinella*, may be present but not co-dominant. Herbaceous cover is typically low (<15%). Common grasses include *Bouteloua curtipendula*, *Bouteloua eriopoda*, and *Muhlenbergia emersleyi*. Frequent forbs include *Astrolepis sinuata*, *Bahia absinthifolia*, and *Macroptilium gibbosifolium*. This alliance occurs in southeastern Nevada, southwestern Utah, Arizona, and southwestern New Mexico. This chaparral occurs on dry mountain slopes ranging from 980 to 2,470 meters elevation depending on aspect. The climate is arid to semi-arid with temperatures rarely falling below freezing. Annual precipitation has a bimodal distribution. About one-third to two-thirds of the highly variable annual precipitation occurs in July through September during the late summer monsoon, and most of the rest falls during the winter months. Mean annual precipitation is approximately 40 centimeters. Soils are gravelly with rocks. Parent material includes limestone, rhyolite, granite, and quartzite. Adjacent vegetation includes desert grasslands dominated by *Elionurus barbiculmis*, *Heteropogon contortus*, and *Bouteloua* spp. at lower elevations, and desert scrub stands dominated by *Acacia neovernicosa* or *Parthenium incanum*.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 111. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus hypoleucoides* (1.0), *Quercus arizonica* (1.0)
Subcanopy (0.5–2 m)	*Arctostaphylos pungens* (1.0), *Arctostaphylos pringlei* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 112. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Juniperus deppeana, Pinus discolor, Quercus emoryi*
Subcanopy (0.5–2 m)	*Nolina microcarpa, Dasylirion wheeleri, Garry wrightii, Yucca madrensis, Brickellia californica*
Field (0–0.5 m)	*Muhlenbergia alopecuroides, Aristida schiedeana, Agave palmeri, Muhlenbergia emersleyi*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 11 plots, nine classification plots sampled during the 2013–2017 mapping and classification effort, and two upland soil and vegetation monitoring plots.

Polygons mapped as NPSSODN148 overlap with two groups classified by Roseberry and Dole (1939), a pinyon, juniper, or cypress group defined as "areas containing 20% or more of [Pinyon, Juniper, or Cypress], to the exclusion of commercial types of trees," and a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir." Areas mapped as containing commercial pines have been subjected to major fire disturbance, mainly the 1989 Chiva Fire, since the 1939 map was created.

Global

CEGL000958, Pointleaf manzanita (*Arctostaphylos pungens*) shrubland, is the closest match to NPSSODN148, but due to the lack of described Arizona white oak (*Quercus arizonica*), we maintained it as a provisional association.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS195, IP407U, IP516U, IP568U, IP574U, IPS605, IPS651, IPS657, IPS671, V402_010, V502_011

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Arctostaphylos pungens - Arctostaphylos pringlei - Ceanothus greggii* Chaparral Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 16, 2019.

52. (*Quercus hypoleucoides - Quercus arizonica*) / *Ceanothus fendleri* Wooded Shrubland Association (P)

Translated name: (Silverleaf oak - Arizona white oak) / Fendler's ceanothus Wooded Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN152

NVC CLASSIFICATION

Division	Western North American Interior Chaparral [2.B.2.Ng]
Macrogroup	Warm Interior Chaparral [M091]
Group	Western Madrean Chaparral [G281]
Alliance	Manzanita - Ceanothus Chaparral [A3790]
Association	(*Quercus hypoleucoides - Quercus arizonica*) / *Ceanothus fendleri* Wooded Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This uncommon community is found on the high slopes of Tanque Verde Ridge and around Juniper Basin, often within the boundaries of historic fire events, specifically the 1989 Chiva Fire and the 1999 Box Canyon Fire.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This association is primarily present on mountain backslopes from 1,850 to 2,050 meters (6,070–6,725 ft). Most examples of this community are north trending, but it can be found on any aspect depending on elevation.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded shrubland is characterized by a moderately sparse (10–20%) canopy stratum (2–5 m) of silverleaf oak (*Quercus hypoleucoides*) and Arizona white oak (*Quercus arizonica*) with a moderately dense (20–40%) subcanopy (0.5–2 m) dominated by Fendler's ceanothus (*Ceanothus fendleri*). All examples of this community contained evidence of historic fire disturbance, likely from the Chiva Fire (1989) and the Box Canyon Fire (1999).

Silverleaf oak (*Quercus hypoleucoides*) and Arizona white oak (*Quercus arizonica*) provide consistent (1.0) presence, with each contributing variable cover ranging from a 1% to 2% and up to 10%. These species can range from small (<2 m), shrubby trees to single-stem individuals with heights up to 4 meters. Alligator juniper (*Juniperus deppeana*) and border pinyon (*Pinus discolor*) were documented as sparse (1%) associates. These species are poorly adapted to fire and very slow to recolonize; snags of both species were documented across the community. It is likely that pre-fire these were more prevalent in the community.

The subcanopy is characterized by the consistent (1.0) dominance of Fendler's ceanothus (*Ceanothus fendleri*) with a few associate species. On average, this species provides cover ranging from 10% to 50+% throughout the community. At times, Pringle's manzanita (*Arctostaphylos pringlei*) and pointleaf manzanita (*Arctostaphylos pungens*) can become subdominants or common associates with cover approaching 5%. Other documented subcanopy components include Wright's silktassel (*Garrya wrightii*), yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), California brickellbush (*Brickellia californica*), catclaw mimosa (*Mimosa aculeaticarpa*), and common sotol (*Dasylirion wheeleri*).

The variably sparse (2–10%) field stratum is characterized by the presence and occasional dominance of native, perennial grasses. The most noteworthy of these include bullgrass (*Muhlenbergia emersleyi*), longtongue muhly (*Muhlenbergia longiligula*), bristly wolfstail (*Muhlenbergia alopecuroides*), single threeawn (*Aristida schiedeana*),

spidergrass (*Aristida ternipes*), and sideoats grama (*Bouteloua curtipendula*). Meadow rue (*Thalictrum fendleri*) and Wright's thimblehead (*Hymenothrix wrightii*) were also documented in this community.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

Stands of this alliance have a moderately dense canopy dominated or co-dominated by the sclerophyllous, evergreen shrubs, *Arctostaphylos pungens*, *Arctostaphylos pringlei*, *Ceanothus greggii*, *Mortonia scabrella*, or *Mortonia utahensis*. Other characteristic shrubs include *Amelanchier utahensis*, *Cercocarpus montanus* var. *paucidentatus*, *Dasylirion wheeleri*, *Ephedra viridis*, *Garrya flavescens*, *Mahonia fremontii*, and *Robinia neomexicana*. Scattered oaks, such as *Quercus arizonica*, *Quercus pungens*, or *Quercus turbinella*, may be present but not co-dominant. Herbaceous cover is typically low (<15% cover). Common grasses include *Bouteloua curtipendula*, *Bouteloua eriopoda*, and *Muhlenbergia emersleyi*. Frequent forbs include *Astrolepis sinuata*, *Bahia absinthifolia*, and *Macroptilium gibbosifolium*. This alliance occurs in southeastern Nevada, southwestern Utah, Arizona, and southwestern New Mexico. This chaparral occurs on dry mountain slopes ranging from 980 to 2,470 meters depending on aspect. The climate is arid to semi-arid with temperatures rarely falling below freezing. Annual precipitation has a bimodal distribution. About one-third to two-thirds of the highly variable annual precipitation occurs in July through September during the late summer monsoon; most of the remaining precipitation falls during the winter months. Mean annual precipitation is approximately 40 centimeters. Soils are gravelly with rocks. Parent material includes limestone, rhyolite, granite, and quartzite. Adjacent vegetation includes desert grasslands dominated by *Elionurus barbiculmis*, *Heteropogon contortus*, and *Bouteloua* spp. at lower elevations, and desert scrub stands dominated by *Acacia neovernicosa* or *Parthenium incanum*.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 113. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus hypoleucoides* (1.0), *Quercus arizonica* (1.0)
Subcanopy (0.5–2 m)	*Ceanothus fendleri* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 114. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Juniperus deppeana, Pinus discolor*
Subcanopy (0.5–2 m)	*Nolina microcarpa, Dasylirion wheeleri, Garry wrightii, Arctostaphylos pringlei, Yucca madrensis, Brickellia californica, Arctostaphylos pungens*
Field (0–0.5 m)	*Muhlenbergia alopecuroides, Aristida schiedeana, Agave palmeri, Muhlenbergia emersleyi, Muhlenbergia longiligula, Thalictrum fendleri, Hymenothrix wrightii*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from five classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSODN152 overlap with numerous groups classified by Roseberry and Dole (1939) that are scattered across the mountain.

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS638, IPS695, IPS702, IPS846, IPS866

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Arctostaphylos pungens - Arctostaphylos pringlei - Ceanothus greggii* Chaparral Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 16, 2019.

53. (*Quercus hypoleucoides - Quercus rugosa*) / *Arctostaphylos pringlei* Shrubland Association (P)

Translated name: (Silverleaf oak - Netleaf oak) / Pringle's manzanita Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN155

NVC CLASSIFICATION

Division	Western North American Interior Chaparral [2.B.2.Ng]
Macrogroup	Warm Interior Chaparral [M091]
Group	Western Madrean Chaparral [G281]
Alliance	Manzanita - Ceanothus Chaparral [A3790]
Association	(*Quercus hypoleucoides - Quercus rugosa*) / *Arctostaphylos pringlei* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present throughout the high slopes of Tanque Verde and Heartbreak ridges, often within the boundaries of historic fire events (specifically, the 1989 Chiva Fire).

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This association is exclusively present on moderately steep (20–40%), north-facing mountain backslopes from 1,600 to 1,900 meters (5,249–6,233 ft). The surface cover is characterized by a mix of shallow to deep, well-drained soils of skeletal loam underlying a layer of coarse gravel with consistent outcrops of exposed bedrock and large, detached boulders. The underlying parent material is primarily composed of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland is characterized by a sparse (<10 %) canopy stratum (2–5 m) of silverleaf oak (*Quercus hypoleucoides*) and netleaf oak (*Quercus rugosa*) with a dense (25–50%) subcanopy (0.5–2 m) dominated by Pringle's manzanita (*Arctostaphylos pringlei*). All examples of this community contained evidence of historic fire disturbance, likely from the Chiva Fire (1989) and the Rincon Fire (1994).

Within the canopy strata, silverleaf oak (*Quercus hypoleucoides*) and netleaf oak (*Quercus* rugosa) are both a consistent (1.0) component that, on average, provide 4% to 5 [10]% cover each. These species can range from small (<2 m), shrubby trees to single-stem individuals with heights up to 4 meters. Alligator juniper (*Juniperus deppeana*) and border pinyon (*Pinus discolor*) were documented as sparse (1%) associates. Snags of both species, which are poorly adapted to fire and very slow to recolonize, were documented across the community. It is likely that they were more prevalent in the community pre-fire. At the lower elevational limit of this community Arizona white oak (*Quercus arizonica*) may be present as a sparse associate, typically on more exposed aspects.

The subcanopy is characterized by the consistent (1.0) dominance of Pringle's manzanita (*Arctostaphylos pringlei*) with few associate species. Pringle's manzanita (*Arctostaphylos pringlei*) provides around 20% cover, on average, throughout the community, with some areas reaching up to 30%. Pointleaf manzanita (*Arctostaphylos pungens*) is a fairly consistent (0.75) associate that provides an average of 5% cover across the community with values ranging from absent to 15%. In order of most to least frequent, other noteworthy subcanopy species include Fendler's ceanothus (*Ceanothus fendleri*), Wright's silktassel (*Garrya wrightii*), beargrass (*Nolina microcarpa*), and New Mexico Locust (*Robinia neomexicana*).

The very sparse (<5%) field stratum is characterized by a mix of native perennial grasses, forbs, and subshrubs. The most noteworthy of these include longtongue muhly (*Muhlenbergia longiligula*), fragrant snakeroot (*Ageratina herbacea*), mutton grass (*Poa fendleriana*), and Fendler's lipfern (*Cheilanthes fendleri*).

GLOBAL TYPE CONCEPT DESCRIPTION

Stands of this alliance have a moderately dense canopy dominated or co-dominated by the sclerophyllous, evergreen shrubs, *Arctostaphylos pungens*, *Arctostaphylos pringlei*, *Ceanothus greggii*, *Mortonia scabrella*, or *Mortonia utahensis*. Other characteristic shrubs include *Amelanchier utahensis*, *Cercocarpus montanus* var. *paucidentatus*, *Dasylirion wheeleri*, *Ephedra viridis*, *Garrya flavescens*, *Mahonia fremontii*, and *Robinia neomexicana*. Scattered oaks, such as *Quercus arizonica*, *Quercus pungens*, or *Quercus turbinella*, may be present but not co-dominant. Herbaceous cover is typically low (<15% cover). Common grasses include *Bouteloua curtipendula*, *Bouteloua eriopoda*, and *Muhlenbergia emersleyi*. Frequent forbs include *Astrolepis sinuata*, *Bahia absinthifolia*, and *Macroptilium gibbosifolium*. This alliance occurs in southeastern Nevada, southwestern Utah, Arizona, and southwestern New Mexico. This chaparral occurs on dry mountain slopes ranging from 980 to 2,470 meters in elevation depending on aspect. The climate is arid to semi-arid with temperatures rarely falling below freezing. Annual precipitation has a bimodal distribution. About one-third to two-thirds of the highly variable annual precipitation occurs in July through September during the late summer monsoon; the remaining precipitation falls during the winter months. Mean annual precipitation is approximately 40 centimeters. Soils are gravelly with rocks. Parent material includes limestone, rhyolite, granite, and quartzite. Adjacent vegetation includes desert grasslands (dominated by *Elionurus barbiculmis*, *Heteropogon contortus*, and *Bouteloua* spp. at lower elevations) and desert scrub stands (dominated by *Acacia neovernicosa* or *Parthenium incanum*).

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 115. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus hypoleucoides* (1.0), *Quercus rugosa* (1.0)
Subcanopy (0.5–2 m)	*Arctostaphylos pringlei* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 116. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Juniperus deppeana, Pinus discolor, Quercus arizonica*
Subcanopy (0.5–2 m)	*Arctostaphylos pungens, Nolina microcarpa, Garry wrightii, Robinia neomexicana, Ceanothus fendleri*
Field (0–0.5 m)	*Muhlenbergia longiligula, Ageratina herbacea, Poa fendleriana, Cheilanthes fendleri*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from four plots, three classification plots sampled during the 2013–2017 mapping and classification effort, and one upland soil and vegetation monitoring plots.

Polygons mapped as NPSSODN155 predominately overlapped with areas Roseberry and Dole (1939) classified as "areas containing 20% or more of [Pinyon, Juniper, or Cypress], to the exclusion of commercial types of trees," and as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir." Areas mapped as containing commercial pines have been subjected to major fire disturbance, mainly from the 1989 Chiva Fire, since the 1939 map was created.

Global

CEGL000958, *Arctostaphylos pungens* shrubland, is the closest match to NPSSODN155, but due to the lack of described *Quercus arizonica*, we maintained it as a provisional association.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS625, IPS658, IPS686, V502_028

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

54. [*Quercus arizonica - Quercus emoryi*] / *Arctostaphylos pungens* Woodland Association (P)

Translated name: [Arizona white oak - Emory oak] / Pointleaf manzanita Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN151

NVC CLASSIFICATION

Division	Western North American Interior Chaparral [2.B.2.Ng]
Macrogroup	Warm Interior Chaparral [M091]
Group	Western Madrean Chaparral [G281]
Alliance	Manzanita - Ceanothus Chaparral [A3790]
Association	[*Quercus arizonica - Quercus emoryi*] / *Arctostaphylos pungens* Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community occurs throughout the high slopes of Tanque Verde and Heartbreak ridges, often within the boundaries of historic fire events (specifically, the 1989 Chiva Fire).

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This association is primarily present on moderately steep (20–40%) mountain backslopes from 1,450 to 1,650 meters (4,757–5,413 ft). Most examples of this community are north trending, but it can be found on any aspect depending on elevation. The surface cover is characterized by a mix of shallow to deep, well-drained soils of skeletal loam underlying a layer of coarse gravel with consistent outcrops of exposed bedrock and large, detached boulders. The underlying parent material is composed primarily of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland is characterized by a variably dense (20–40%) canopy stratum (2–5 m) dominated by Arizona white oak (*Quercus arizonica*) and Emory oak (*Quercus emoryi*), with a similarly dense (20–40%) subcanopy (0.5–2 m) dominated by manzanita (*Arctostaphylos* sp.), mainly pointleaf manzanita (*Arctostaphylos pungens*). Almost all examples of this community contained evidence of historic fire disturbance, likely from the Chiva Fire (1989).

Within the canopy stratum, Arizona white oak (*Quercus arizonica*) and Emory oak (*Quercus emoryi*) provide similar cover (10%) as codominants or with either one becoming the sole dominant. Both species can range from small (<2 m), shrubby trees to single-stem individuals with heights up to 5 meters. Growth form is likely dependent on historical fire severity and frequency. Alligator juniper (*Juniperus deppeana*) and border pinyon (*Pinus discolor*) were documented as sparse (1%) associates. Snags of both species, which are poorly adapted to fire and very slow to recolonize, were documented across the community. It is likely that pre-fire these were more prevalent in the community. At the upper elevational limit of this community, silverleaf oak (*Quercus hypoleucoides*) may appear but should never outcompete the other oaks.

The subcanopy is characterized by the consistent (1.0) dominance of pointleaf manzanita (*Arctostaphylos pungens*) with few associate species. On average, this species provides around 20+% throughout the community with some areas reaching up to 40%. In more sheltered locations or at higher elevations, Pringle's manzanita (*Arctostaphylos pringle*i) may become a co-dominant or subdominant species. Other noteworthy subcanopy species include Wright's silktassel (*Garrya wrightii*), yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), California brickellbush (*Brickellia californica*), and Fendler's ceanothus (*Ceanothus fendleri*).

The very sparse (<5%) field stratum is characterized by a diverse mix of native perennial grasses, forbs, and subshrubs. The most noteworthy of these include bullgrass (*Muhlenbergia emersleyi*), bristly wolfstail (*Muhlenbergia alopecuroides*), plains lovegrass (*Eragrostis intermedia*), Palmer's century plant (*Agave palmeri*), and single threeawn (*Aristida schiedeana*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

Stands of this alliance have a moderately dense canopy dominated or co-dominated by the sclerophyllous, evergreen shrubs, *Arctostaphylos pungens*, *Arctostaphylos pringlei*, *Ceanothus greggii*, *Mortonia scabrella*, or *Mortonia utahensis*. Other characteristic shrubs include *Amelanchier utahensis*, *Cercocarpus montanus* var. *paucidentatus*, *Dasylirion wheeleri*, *Ephedra viridis*, *Garrya flavescens*, *Mahonia fremontii*, and *Robinia neomexicana*. Scattered oaks, such as *Quercus arizonica*, *Quercus pungens*, or *Quercus turbinella*, may be present but not co-dominant. Herbaceous cover is typically low (<15% cover). Common grasses include *Bouteloua curtipendula*, *Bouteloua eriopoda*, and *Muhlenbergia emersleyi*. Frequent forbs include *Astrolepis sinuata*, *Bahia absinthifolia*, and *Macroptilium gibbosifolium*. This alliance occurs in southeastern Nevada, southwestern Utah, Arizona, and southwestern New Mexico. This chaparral occurs on dry mountain slopes ranging from 980 to 2,470 meters, depending on aspect. The climate is arid to semi-arid with temperatures rarely falling below freezing. Annual precipitation has a bimodal distribution. About one-third to two-thirds of the highly variable annual precipitation occurs in July through September during the late summer monsoon; most of the remaining precipitation falls during the winter months. Mean annual precipitation is approximately 40 centimeters. Soils are gravelly with rocks. Parent material includes limestone, rhyolite, granite, and quartzite. Adjacent vegetation includes desert grasslands dominated by *Elionurus barbiculmis*, *Heteropogon contortus*, and *Bouteloua* spp. at lower elevations, and desert scrub stands dominated by *Acacia neovernicosa* or *Parthenium incanum*.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 117. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus emoryi* (1.0), *Quercus arizonica* (1.0)
Subcanopy (0.5–2 m)	*Arctostaphylos pungens* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 118. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Juniperus deppeana, Pinus discolor, Pinus hypoleucoides, Arbutus arizonica*
Subcanopy (0.5–2 m)	*Arctostaphylos pringlei, Nolina microcarpa, Garrya wrightii, Yucca madrensis, Brickellia californica, Ceanothus fendleri*
Field (0–0.5 m)	*Muhlenbergia alopecuroides, Aristida schiedeana, Agave palmeri, Muhlenbergia emersleyi*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from one classification plot sampled during the 2013–2017 mapping and classification effort.

Polygons mapped as NPSSODN151 overlap with one group classified by Roseberry and Dole (1939), a pinyon, juniper, or cypress group defined as "areas containing 20% or more of [Pinyon, Juniper, or Cypress], to the exclusion of commercial types of trees."

Global

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS689

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Arctostaphylos pungens - Arctostaphylos pringlei - Ceanothus greggii* Chaparral Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 16, 2019.

55. [*Quercus chrysolepis - Quercus rugosa - Holodiscus dumosa*] Shrubland Association (P)

Translated name: [Canyon live oak - Netleaf oak - Rockspirea] Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN168

NVC CLASSIFICATION

Division	Western North American Interior Chaparral [2.B.2.Ng]
Macrogroup	Warm Interior Chaparral [M091]
Group	Western Madrean Chaparral [G281]
Alliance	–
Association	[*Quercus chrysolepis - Quercus rugosa - Holodiscus dumosa*] Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This restricted community was only documented on the high slopes surrounding Rincon Peak.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is typically found on mountain backslopes and shoulders of variable grade (10–50+%) above 2,600 meters (8,200 ft). The surface cover is characterized by the consistent presence and typical dominance of exposed bedrock and/or boulders underlying a shallow soil layer. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is characterized by a variably dense (20–40%) subcanopy (0.5–2 m) dominated by canyon live oak (*Quercus chrysolepis*), shrubby netleaf oak (*Quercus rugosa*), and rockspirea (*Holodiscus dumosa*). The shrubby nature of this community is a result of its presence in exposed areas with shallow soils and/or fire history.

The dominant subcanopy shrubs provide cover ranging from 5% to 10% each, with canyon live oak (*Quercus chrysolepis*) typically contributing the highest cover. In general, these species are present as 1- to 2-meter-tall shrubs or stunted trees, but taller examples may be scattered throughout the community. Vegetation cover within this stratum is highly dependent on available soils. Areas with high exposed bedrock tend to have the lowest vegetation cover. Other documented species include New Mexico locust (*Robinia neomexicana*), mock orange (*Philadelphus* sp.), common hoptree (*Ptelea trifoliata*), and border pinyon (*Pinus discolor*).

The very sparse (<<5%) field stratum (<0.5 m) contains no consistent dominants or common associates. Documented species include mountain snowberry (*Symphoricarpos oreophilus*), cliff muhly (*Muhlenbergia polycaulis*), New Mexico fleabane (*Erigeron neomexicana*), and kingcup cactus (*Echinocereus triglochidiatus*).

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This interior chaparral group is found across the southwestern U.S. from central New Mexico and southern Utah, west to California. The moderate to dense evergreen shrub layer is dominated by sclerophyllous shrubs, especially *Ceanothus greggii* and *Quercus turbinella*. Other common shrubs from the eastern portion of its range (Arizona and New Mexico) include *Arctostaphylos pringlei* (higher elevations), *Arctostaphylos pungens*, *Cercocarpus montanus*, *Garrya wrightii*, *Purshia stansburiana*, *Quercus toumeyi*, and *Rhus trilobata*. In desert chaparral stands in the western extent, *Arctostaphylos patula* (not dominant), *Arctostaphylos glauca*, *Cercocarpus montanus* var. *glaber*,

Garrya flavescens, *Juniperus californica*, *Nolina parryi*, *Quercus john-tuckeri*, *Quercus cornelius-mulleri*, *Quercus berberidifolia*, and *Rhus ovata* characterize this shrubland. Scattered remnant pinyon and juniper trees may be present; however, in the western Mojave, *Juniperus californica* sometimes forms an open, shrubby tree layer with the evergreen oaks and other shrubs. Stands occur prominently across central Arizona (Mogollon Rim) and western New Mexico, south into mountains in the northwestern Chihuahuan region and Madrean Occidentale in northern Mexico, and north into extreme southwestern Utah and southern Nevada. It also occurs in mountains in the Sonora and western Mojave deserts, and extends from northeast Kern County, California, and south into Baja Norte, Mexico. Stands are found on foothills, xeric mountain slopes, and canyons in hotter and drier habitats, and stands often dominate along the mid-elevation transition zone between desert scrub and montane woodlands (1,000–2,200 m). Sites are often steep and rocky. Parent materials are varied and include basalt, diabases, gneiss, schist, shales, slates, sandstones, and, more commonly, limestone and coarse-textured granitic substrates. Occasional desert scrub species may be present in drier, rockier, more open transition sites. Most chaparral species are fire adapted, sprouting vigorously after burning or producing abundant fire-resistant seeds. Stands occurring within montane woodlands are seral and a result of recent fires.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 119. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Quercus chrysolepis* (1.0), *Quercus rugosa* (1.0), *Holodiscus dumosa* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 120. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Rubus neomexicana, Philadelphus* sp., *Pinus discolor, Ptelea trifoliata*
Field (0–0.5 m)	*Echinocereus triglochidiatus, Muhlenbergia polycaulis, Symphoricarpos oreophilus, Erigeron neomexicana*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from one classification plot sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN168 overlap with one group classified by Roseberry and Dole (1939), a Douglas fir group defined as "areas that contain 80% or more Douglas fir, to the exclusion of commercial pines."

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS788

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Brown, D. E. 1982. Western Madrean Chaparral Group, version date 05Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 29, 2019.

56. [*Quercus hypoleucoides - Quercus arizonica*] / *Arctostaphylos* (*pringlei - pungens*) Woodland Association (P)

Translated name: [Silverleaf oak - Arizona white oak] / Manzanita (Pringle's - pointleaf) Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN149

NVC CLASSIFICATION

Division	Western North American Interior Chaparral [2.B.2.Ng]
Macrogroup	Warm Interior Chaparral [M091] (P)
Group	Western Madrean Chaparral [G281]
Alliance	Manzanita - Ceanothus Chaparral [A3790]
Association	[*Quercus hypoleucoides - Quercus arizonica*] / *Arctostaphylos* (*pringlei - pungens*) Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread throughout the high slopes of Tanque Verde and Heartbreak ridges, often within the boundaries of historic fire events (specifically, the 1989 Chiva Fire).

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This association is primarily present on moderately steep (20–40%) mountain backslopes from 1,600 to 1,900 meters (5,249–6,233 ft). Most examples of this community are north trending, but it can be found on any aspect depending on elevation. The surface cover is characterized by a mix of shallow to deep, well-drained, skeletal loam underlying a layer of coarse gravel with consistent outcrops of exposed bedrock and large, detached boulders. The underlying parent material is primarily composed of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland is characterized by a variably dense (20–40%) canopy stratum (2–5 m) dominated by silverleaf oak (*Quercus hypoleucoides*) and Arizona white oak (*Quercus arizonica*), with a similarly dense (20–40%) subcanopy (0.5–2 m) dominated by Pringle's manzanita (*Arctostaphylos pringlei*) and/or pointleaf manzanita (*Arctostaphylos pungens*). Almost all examples of this community contained evidence of historic fire disturbance, likely from the Chiva Fire (1989) and Rincon Fire (1994).

Within the canopy stratum, silverleaf oak (*Quercus hypoleucoides*) and Arizona white oak (*Quercus arizonica*) provide similar average cover (10%) as co-dominants or with either one becoming the sole dominant. Both species can range from small (<2 m), shrubby trees to single-stem individuals with heights up to 5 meters. Growth form is likely dependent on historical fire severity and frequency. When sheltered by large bedrock expanses/cliff bands, silverleaf oak (*Quercus hypoleucoides*) may become the sole dominant with all other species present as subdominants or common associates. Alligator juniper (*Juniperus deppeana*) and border pinyon (*Pinus discolor*) were documented as sparse (1%) associates. Snags of both species, which are poorly adapted to fire and very slow to recolonize, were documented across the community. It is likely that pre-fire these species were more prevalent in the community. At the lower elevational limit of this community, Emory oak (*Quercus emoryi*) may appear but should never outcompete the other oaks. Toward the upper elevational limit of this community, large conifers, specifically Arizona pine (*Pinus arizonica*), may start to appear. In these higher reaches, netleaf oak (*Quercus rugosa*) may appear, but it should not outcompete Arizona white oak (*Quercus arizonica*).

The subcanopy is characterized by the consistent (1.0) dominance of manzanita (*Arctostaphylos* sp.), Pringle's manzanita (*Arctostaphylos pringlei*) and pointleaf manzanita (*Arctostaphylos pungens*) with few associate species. On average, these species provide around 20% throughout the community with some areas reaching up to 40%. Composition and dominance of these species aligns with a distinct elevational gradient. At the low end, pointleaf manzanita (*Arctostaphylos pungens*) tends to dominate, while Pringle's manzanita is most common at the higher end. Throughout this gradient, either species may be the sole dominant or they can appear as co-dominants. Wright's silktassel (*Garrya wrightii*) is a consistent (0.85) species that, when present, usually contributes only 1% to 2%. Other noteworthy subcanopy species include yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), California brickelbush (*Brickellia californica*), and Fendler's ceanothus (*Ceanothus fendleri*).

The very sparse (<5%) field stratum is characterized by a diverse mix of native perennial grasses, forbs, and subshrubs. The most noteworthy of these include longtongue muhly (*Muhlenbergia longiligula*), bullgrass (*Muhlenbergia emersleyi*), bristly wolfstail (*Muhlenbergia alopecuroides*), plains lovegrass (*Eragrostis intermedia*), Palmer's century plant (*Agave palmeri*), and single threeawn (*Aristida schiedeana*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

Stands of this alliance have a moderately dense canopy dominated or co-dominated by the sclerophyllous, evergreen shrubs, *Arctostaphylos pungens*, *Arctostaphylos pringlei*, *Ceanothus greggii*, *Mortonia scabrella*, or *Mortonia utahensis*. Other characteristic shrubs include *Amelanchier utahensis*, *Cercocarpus montanus* var. *paucidentatus*, *Dasylirion wheeleri*, *Ephedra viridis*, *Garrya flavescens*, *Mahonia fremontii*, and *Robinia neomexicana*. Scattered oaks, such as *Quercus arizonica*, *Quercus pungens*, or *Quercus turbinella*, may be present but not co-dominant. Herbaceous cover is typically low (<15%). Common grasses include *Bouteloua curtipendula*, *Bouteloua eriopoda*, and *Muhlenbergia emersleyi*. Frequent forbs include *Astrolepis sinuata*, *Bahia absinthifolia*, and *Macroptilium gibbosifolium*. This alliance occurs in southeastern Nevada, southwestern Utah, Arizona, and southwestern New Mexico. This chaparral occurs on dry mountain slopes ranging from 980 to 2,470 meters elevation, depending on aspect. The climate is arid to semi-arid with temperatures rarely falling below freezing. Annual precipitation has a bimodal distribution. About one-third to two-thirds of the highly variable annual precipitation occurs in July through September during the late summer monsoon; most of the remaining precipitation falls during the winter months. Mean annual precipitation is approximately 40 centimeters. Soils are gravelly with rocks. Parent material includes limestone, rhyolite, granite, and quartzite. Adjacent vegetation includes desert grasslands dominated by *Elionurus barbiculmis*, *Heteropogon contortus*, and *Bouteloua* spp. at lower elevations, and desert scrub stands dominated by *Acacia neovernicosa* or *Parthenium incanum*.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 121. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus hypoleucoides* (1.0), *Quercus arizonica* (1.0)
Subcanopy (0.5–2 m)	*Arctostaphylos pungens* (1.0), *Arctostaphylos pringlei* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 122. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Juniperus deppeana, Pinus discolor, Pinus arizonica, Arbutus arizonica, Quercus emoryi*
Subcanopy (0.5–2 m)	*Nolina microcarpa, Garry wrightii, Arctostaphylos pringlei, Yucca madrensis, Brickellia californica, Ceanothus fendleri*
Field (0–0.5 m)	*Muhlenbergia longiligula Muhlenbergia alopecuroides, Aristida schiedeana, Agave palmeri, Muhlenbergia emersleyi*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 13 plots, 12 classification plots sampled during the 2013–2017 mapping and classification effort, and one upland soil and vegetation monitoring plot.

Polygons mapped as NPSSODN149 overlap with two groups classified by Roseberry and Dole (1939), a pinyon, juniper, or cypress group defined as "areas containing 20% or more of [Pinyon, Juniper, or Cypress], to the exclusion of commercial types of trees," and a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir." Areas mapped as containing commercial pines have been subjected to major fire disturbance, mainly the 1989 Chiva Fire, since the 1939 map was created.

Global

CEGL000958, *Arctostaphylos pungens* shrubland, is the closest match to NPSSODN149, but due to the lack of described *Quercus arizonica*, we maintained it as a provisional association.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IP432H, IP442U, IP454U, IP506H, IP527U, IP572U, IPS672, IPS675, IPS684, IPS720, IPS845, IPS865, V502_005

Local description authors: J. Galvin

Citations

Roseberry, R.D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Arctostaphylos pungens - Arctostaphylos pringlei - Ceanothus greggii* Chaparral Alliance, version date 18Dec2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 16, 2019.

57. [*Quercus hypoleucoides - Quercus arizonica*] Shrubland Association (P)

Translated name: [Silverleaf oak - Arizona white oak] Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN163

NVC CLASSIFICATION

Division	Western North American Interior Chaparral [2.B.2.Ng]
Macrogroup	Warm Interior Chaparral [M091]
Group	Western Madrean Chaparral [G281]
Alliance	–
Association	[*Quercus hypoleucoides - Quercus arizonica*] Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present throughout the upper mid-elevation areas of the park in areas of historic fire disturbance.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is typically found on mountain backslopes of variable grade (10–50+%) with an east-trending aspect from 1,860 to 2,160 meters (6,102–7,086 ft). This community may occur lower on the mountain, down to 1,640 meters (5,380 ft), exclusively on sheltered, north-facing slopes. The surface cover is characterized by moderately deep and well-drained loam underlying either a thick layer of pine/oak litter and duff or a dense layer of gravel. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is characterized by a variably dense (25–50%) low canopy (2–5 m) and subcanopy (0.5–2 m) co-dominated by shrubby silverleaf oak (*Quercus hypoleucoides*) and Arizona white oak (*Quercus arizonica*) with a sparse understory. Overall, this community has been subjected to significant fire effects in recent history. All examples of this type fall within areas that, in the absence of fire, would likely support dominant pines (*Pinus* sp.) and/or junipers (*Juniperus* sp.). Numerous large snags were documented throughout.

Across the broader community, silverleaf oak (*Quercus hypoleucoides*) provides the highest cover with an average of 24%, compared to 10% for Arizona white oak (*Quercus arizonica*). Local dominance aligns with an elevational gradient in which Arizona white oak (*Quercus arizonica*) is most dominant at the lower end and silverleaf oak (*Quercus hypoleucoides*) at the upper end. Across this gradient, either oak can range from a sparse 5% associate to a very dense 40+% dominant (depending upon the elevation and/or exposure). Individuals fall into two distinct height ranges and growth forms—a shrub-like regenerating tree with heights below 2 meters, and a short, small-crowned tree with heights from 2 to 4 meters. These two distinct growth forms can co-occur, or either one can be the sole dominant. At times, mature and often solitary individuals may appear with heights above 5 meters. Saplings of both ponderosa pine (*Pinus ponderosa*) and Arizona pine (*Pinus arizonica*) were documented in this community. Other documented species include Arizona madrone (*Arbutus arizonica*), Pringle's manzanita (*Arctostaphylos pringlei*), Fendler's ceanothus (*Ceanothus fendleri*), pointleaf manzanita (*Arctostaphylos pungens*), Wrights silktassel (*Garry wrightii*), and catclaw mimosa (*Mimosa aculeaticarpa*).

The very sparse (<<5%) field stratum (<0.5 m) is characterized by the consistent presence (0.75) of longtongue muhly (*Muhlenbergia longiligula*) with few associate species. This species was documented in most examples of

this type with cover around 1%. In one example of this community, Western brackenfern (*Pteridium aquilinum*) provided field dominance with cover above 20%. Other documented low-cover species include pinyon ricegrass (*Piptochaetium fimbriatum*), Pringle's speargrass (*Piptochaetium pringlei*), and pineywoods geranium (*Geranium caespitosum*).

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This interior chaparral group is found across the southwestern U.S. from central New Mexico and southern Utah, west to California. The moderate to dense, evergreen shrub layer is dominated by sclerophyllous shrubs, especially *Ceanothus greggii* and *Quercus turbinella*. Other common shrubs from the eastern portion of its range (Arizona and New Mexico) include *Arctostaphylos pringlei* (higher elevations), *Arctostaphylos pungens*, *Cercocarpus montanus*, *Garrya wrightii*, *Purshia stansburiana*, *Quercus toumeyi*, and *Rhus trilobata*. In desert chaparral stands in the western extent, *Arctostaphylos patula* (not dominant), *Arctostaphylos glauca*, *Cercocarpus montanus* var. *glaber*, *Garrya flavescens*, *Juniperus californica*, *Nolina parryi*, *Quercus john-tuckeri*, *Quercus cornelius-mulleri*, *Quercus berberidifolia*, and *Rhus ovata* characterize this shrubland. Scattered remnant pinyon and juniper trees may be present; however, in the western Mojave, *Juniperus californica* sometimes forms an open, shrubby tree layer with the evergreen oaks and other shrubs. Stands occur prominently across central Arizona (Mogollon Rim) and western New Mexico, south into mountains in the northwestern Chihuahuan region and Madrean Occidentale in northern Mexico, and north into extreme southwestern Utah and southern Nevada. It also occurs in mountains in the Sonora and western Mojave deserts, and extends from northeast Kern County, California, and south into Baja Norte, Mexico. Stands are found on foothills, xeric mountain slopes, and canyons in hotter and drier habitats; they often dominate along the mid-elevation transition zone between desert scrub and montane woodlands (1,000–2,200 m). Sites are often steep and rocky. Parent materials are varied and include basalt, diabases, gneiss, schist, shales, slates, sandstones, and, more commonly, limestone and coarse-textured granitic substrates. Occasional desert scrub species may be present in drier, rockier, more open transition sites. Most chaparral species are fire adapted, sprouting vigorously after burning or producing abundant fire-resistant seeds. Stands occurring within montane woodlands are seral and a result of recent fires.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 123. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus hypoleucoides* (1.0), *Quercus arizonica* (1.0)
Subcanopy (0.5–2 m)	*Quercus hypoleucoides* (1.0), *Quercus arizonica* (1.0)
Field (0–0.5 m)	*Muhlenbergia longiligula* (0.75)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 124. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Pinus arizonica, Pinus ponderosa, Arbutus arizonica, Arctostaphylos pringlei, Ceanothus fendleri, Arctostaphylos pungens, Garry wrightii, Mimosa aculeaticarpa*
Field (0–0.5 m)	*Piptochaetium fimbriatum, Piptochaetium pringlei, Geranium caespitosum, Pteridium aquilinum*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from four plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN163 are spread across six high-elevation communities classified by Roseberry and Dole (1939).

Global

Currently, this described association does not have a place within the USNVC. It likely belongs under the warm interior chaparral macrogroup (M091); however, that macrogroup does not mention *Quercus arizonica* (Arizona white oak) or *Quercus hypoleucoides* (silverleaf oak).

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS182, IPS694, IPS802, IPS863

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Brown, D. E. 1982. Western Madrean Chaparral Group, version date 05Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 29, 2019.

58. [*Quercus hypoleucoides - Quercus rugosa*] / *Arctostaphylos pringlei* Woodland Association (P)

Translated name: [Silverleaf oak - Netleaf oak] / Pringle's manzanita Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN156

NVC CLASSIFICATION

Division	Western North American Interior Chaparral [2.B.2.Ng]
Macrogroup	Warm Interior Chaparral [M091]
Group	Western Madrean Chaparral [G281]
Alliance	Manzanita - Ceanothus Chaparral [A3790]
Association	[*Quercus hypoleucoides - Quercus rugosa*] / *Arctostaphylos pringlei* Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is restricted to the high slopes of Tanque Verde and Heartbreak ridges, often within the boundaries of historic fire events (specifically, the 1989 Chiva Fire).

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This association is present primarily on moderately steep (20–40%) mountain backslopes from 1,600 to 1,900 meters (5,249–6,233 ft). Most examples of this community are north trending, but it can be found on any aspect depending on elevation. The surface cover is characterized by a mix of shallow to deep, well-drained soils of skeletal loam underlying a layer of coarse gravel with consistent outcrops of exposed bedrock and large, detached boulders. The underlying parent material is primarily composed of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland is characterized by a variably dense (20–40%) canopy stratum (2–5 m) dominated by silverleaf oak (*Quercus hypoleucoides*) and netleaf oak (*Quercus rugosa*) with a similarly dense (20–40%) subcanopy (0.5–2 m) dominated by Pringle's manzanita (*Arctostaphylos pringlei*). Almost all examples of this community contained evidence of historic fire disturbance, likely from the Chiva Fire (1989) and Rincon Fire (1994).

Within the canopy strata, silverleaf oak (*Quercus hypoleucoides*) and netleaf oak (*Quercus* rugosa) provide similar average cover (10–20%) as co-dominants or with either one becoming the sole dominant. Both species can range from small (<2 m), shrubby trees to single-stem individuals with heights up to 5 meters. Growth form is likely dependent on historical fire severity and frequency. Alligator juniper (*Juniperus deppeana*) and border pinyon (*Pinus discolor*) were documented as sparse (1%) associates. Snags of both species, which are poorly adapted to fire and very slow to recolonize, were documented across the community. It is likely that pre-fire these were more prevalent in the community. At the lower elevational limit of this community, Arizona white oak (*Quercus arizonica*) may appear but should never outcompete the other oaks. Toward the upper elevational limit of this community, large conifers, specifically Arizona pine (*Pinus arizonica*), may start to appear.

The subcanopy is characterized by the consistent (1.0) dominance of Pringle's manzanita (*Arctostaphylos pringlei*) with few associate species. On average, this species provides around 20% cover throughout the community with some areas reaching up to 40%. Wright's silktassel (*Garrya wrightii*) is a consistent species that, when present, usually contributes only 1% to 2% cover. Other noteworthy subcanopy species include yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), California brickellbush (*Brickellia californica*), and Fendler's ceanothus (*Ceanothus fendleri*).

The very sparse (<5%) field stratum is characterized by a diverse mix of native perennial grasses, forbs, and subshrubs. The most noteworthy of these include longtongue muhly (*Muhlenbergia longiligula*), bullgrass (*Muhlenbergia emersleyi*), bristly wolfstail (*Muhlenbergia alopecuroides*), plains lovegrass (*Eragrostis intermedia*), Palmer's century plant (*Agave palmeri*), and single threeawn (*Aristida schiedeana*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 125. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus hypoleucoides* (1.0), *Quercus rugosa* (1.0)
Subcanopy (0.5–2 m)	*Arctostaphylos pringlei* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 126. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Juniperus deppeana, Pinus discolor, Pinus arizonica, Arbutus arizonica, Quercus arizonica*
Subcanopy (0.5–2 m)	*Arctostaphylos pungens, Nolina microcarpa, Garry wrightii, Arctostaphylos pringlei, Yucca madrensis, Brickellia californica, Ceanothus fendleri*
Field (0–0.5 m)	*Muhlenbergia longiligula, Muhlenbergia alopecuroides, Aristida schiedeana, Agave palmeri, Muhlenbergia emersleyi*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from two plots, one classification plot sampled during the 2013–2017 mapping and classification effort, and one upland soil and vegetation monitoring plot.

Polygons mapped as NPSSODN156 overlap with two groups classified by Roseberry and Dole (1939), a pinyon, juniper, or cypress group defined as "areas containing 20% or more of [Pinyon, Juniper, or Cypress], to the exclusion of commercial types of trees," and a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir." Areas mapped as containing commercial pines have been subjected to major fire disturbance, mainly from the 1989 Chiva Fire, since the 1939 map was created.

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS871, V502_002

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

59. [*Quercus hypoleucoides - Quercus rugosa*] Shrubland Association (P)

Translated name: [Silverleaf oak - Netleaf oak] Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN161

NVC CLASSIFICATION

Division	Western North American Interior Chaparral [2.B.2.Ng]
Macrogroup	Warm Interior Chaparral [M091]
Group	Western Madrean Chaparral [G281]
Association	–
Association	[*Quercus hypoleucoides - Quercus rugosa*] Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present throughout the upper-elevation areas of the park in areas of historic fire disturbance. The largest examples of this community are found on the southern slopes of Rincon Peak and on the north slope of Mica Mountain.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is typically found on mountain backslopes of variable grade (10–50+%) with an east-trending aspect from 1,900 to 2,600 meters (6,233–8,530 ft). This community may occur lower on the mountain, down to 1,700 meters (5,577 ft), exclusively on sheltered, north-facing slopes. The surface cover is characterized by moderately deep and well-drained loam underlying either a thick layer of pine/oak litter and duff or a dense layer of gravel. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is characterized by a variably dense (25–50%) low canopy (2–5 m) and subcanopy (0.5–2 m) co-dominated by shrubby netleaf oak (*Quercus rugosa*) and silverleaf oak (*Quercus hypoleucoides*) with a sparse understory. Overall, this community has been subjected to significant fire effects in recent history. All examples of this type fall within areas that, in the absence of fire, would likely support dominant pines (*Pinus* sp.) and/or junipers (*Juniperus* sp.). Numerous large snags, and occasional mature conifers, were documented throughout.

Local dominance aligns with an elevational gradient where silverleaf oak (*Quercus hypoleucoides*) is most dominant at the lower end, and netleaf oak (*Quercus rugosa*) is most dominant at the upper end. Across this gradient, either oak can range from a sparse 5% associate up to a very dense 40+% dominant, depending upon the elevation and/or exposure. Individuals fall into two distinct height ranges and growth forms, a shrub-like regenerating tree with heights below 2 meters, and a short, small-crowned tree with heights from 2 to 4 meters. These two distinct growth forms can co-occur or either one can be the sole dominant. At times, mature and often solitary individuals may appear with heights above 5 meters. Saplings of ponderosa pine (*Pinus ponderosa*), Arizona pine (*Pinus arizonica*), and Douglas fir (*Pseudotsuga menziesii*) were documented in this community. Other recorded species include Arizona madrone (*Arbutus arizonica*), Pringle's manzanita (*Arctostaphylos pringlei*), Fendler's ceanothus (*Ceanothus fendleri*), rock spirea (*Holodiscus dumosa*), canyon live oak (*Quercus chrysolepis*), Wrights silktassel (*Garry wrightii*), and catclaw mimosa (*Mimosa aculeaticarpa*).

The very sparse (<<5%) field stratum (<0.5 m) is characterized by the consistent presence (0.75) of longtongue muhly (*Muhlenbergia longiligula*) with few associate species. This species was documented in most examples of this type with cover around 1%.

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This interior chaparral group is found across the southwestern U.S. from central New Mexico and southern Utah, west to California. The moderate to dense evergreen shrub layer is dominated by sclerophyllous shrubs, especially *Ceanothus greggii* and *Quercus turbinella*. Other common shrubs from the eastern portion of its range (i.e., Arizona and New Mexico) include *Arctostaphylos pringlei* (higher elevations), *Arctostaphylos pungens*, *Cercocarpus montanus*, *Garrya wrightii*, *Purshia stansburiana*, *Quercus toumeyi*, and *Rhus trilobata*. In desert chaparral stands in the western extent, *Arctostaphylos patula* (not dominant), *Arctostaphylos glauca*, *Cercocarpus montanus* var. *glaber*, *Garrya flavescens*, *Juniperus californica*, *Nolina parryi*, *Quercus john-tuckeri*, *Quercus cornelius-mulleri*, *Quercus berberidifolia*, and *Rhus ovata* characterize this shrubland. Scattered remnant pinyon and juniper trees may be present; however, in the western Mojave, *Juniperus californica* sometimes forms an open, shrubby tree layer with the evergreen oaks and other shrubs. Stands occur prominently across central Arizona (Mogollon Rim) and western New Mexico, south into mountains in the northwestern Chihuahuan region and Madrean Occidentale in northern Mexico, and north into extreme southwestern Utah and southern Nevada. It also occurs in mountains in the Sonora and western Mojave deserts, and extends from northeast Kern County, California, and south into Baja Norte, Mexico. Stands are found on foothills, xeric mountain slopes, and canyons in hotter and drier habitats; they often dominate along the mid-elevation transition zone between desert scrub and montane woodlands (1,000–2,200 m). Sites are often steep and rocky. Parent materials are varied and include basalt, diabases, gneiss, schist, shales, slates, sandstones, and, more commonly, limestone and coarse-textured granitic substrates. Occasional desert scrub species may be present in drier, rockier, more open transition sites. Most chaparral species are fire adapted, sprouting vigorously after burning or producing abundant fire-resistant seeds. Stands occurring within montane woodlands are seral and a result of recent fires.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 127. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus hypoleucoides* (1.0), *Quercus rugosa* (1.0)
Subcanopy (0.5–2 m)	*Quercus hypoleucoides* (1.0), *Quercus rugosa* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 128. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Pinus arizonica, Pinus ponderosa, Pseudotsuga menziesii, Arbutus arizonica, Arctostaphylos pringlei, Ceanothus fendleri, Garry wrightii, Mimosa aculeaticarpa, Holodiscus dumosa, Quercus chrysolepis*
Field (0–0.5 m)	*Muhlenbergia longiligula*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from six plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN161 are spread across six high-elevation communities classified by Roseberry and Dole (1939).

Global

Currently, this described association does not have a place within the USNVC. It likely belongs under the warm interior chaparral macrogroup (M091); however, that macrogroup does not mention *Quercus rugosa* (netleaf oak) or *Quercus hypoleucoides* (silverleaf oak).

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS699, IPS717, IPS822, IPS824, IPS825, IPS827

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Brown, D. E. 1982. Western Madrean Chaparral Group, version date 05Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 29, 2019.

60. *Mimosa aculeaticarpa* Shrubland Association (P)

Translated name: Catclaw mimosa Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN154

NVC CLASSIFICATION

Division	Western North American Interior Chaparral [2.B.2.Ng]
Macrogroup	Warm Interior Chaparral [M091]
Group	–
Alliance	–
Association	*Mimosa aculeaticarpa* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This shrubland community is primarily present as small inclusions within numerous oak savannas and pinyon juniper woodlands, but it also covers broad swaths on the slopes above Grass Shack Campground.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is typically found on south-trending, mountain shoulders, summits, and backslopes of a generally low grade (<30%) from 1,767 to 1,859 meters (5,800–6,100 ft). The surface cover is characterized by shallow and well-drained skeletal loam underlying a variable mix of gravel, bare soil, and litter, with patches of low-angle exposed bedrock slabs. The bedrock and rock is typically composed of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is characterized by a dense (30–50%) subcanopy stratum (0.5–2 m) dominated solely by an impenetrable thicket of catclaw mimosa (*Mimosa aculeaticarpa*). In all examples of this community, historic fire disturbance was noted with numerous snags dotting the landscape. Based on snag composition, this community was likely dominated by border pinyon (*Pinus discolor*), Arizona white oak (*Quercus arizonica*), and alligator juniper (*Juniperus deppeana*) prior to the fire disturbance. While these areas were clearly influenced by a fire event, they are outside the boundaries of major fires from the last 30+ years.

The canopy stratum (>2 m) is extremely sparse (<5%) with remnant trees from the pre-fire woodland community. Only Arizona white oak (*Quercus arizona*) and border pinyon (*Pinus discolor*) were documented as living individuals in the canopy stratum.

In the subcanopy, catclaw mimosa (*Mimosa aculeaticarpa*) provides the vast majority of the cover with areas having up to 40% cover. Individual plants generally range from 1 to 2 meters tall, but they can reach into the canopy stratum with heights up to 3 meters. Other documented subcanopy components include pointleaf manzanita (*Arctostaphylos pungens*), yucca (*Yucca madrensis*), cactus apple (*Opuntia engelmannii*), and beargrass (*Nolina microcarpa*).

The field stratum (<0.5 m) is characterized by a sparse (<10%) mix of perennial forbs, grasses, and succulents, including tarragon (*Artemisia dracunculus*), single threeawn (*Aristida schiedeana*), Schott's century plant (*Agave schottii*), and Lehmann lovegrass (*Eragrostis lehmanniana*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 129. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Mimosa aculeaticarpa* (1.0)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 130. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus arizonica*, *Pinus discolor*
Subcanopy (0.5–2 m)	*Yucca madrensis, Nolina microcarpa, Arctostaphylos pungens, Opuntia engelmannii*
Field (0–0.5 m)	*Aristida schiedeana, Yucca schottii, Artemisia dracunculus, Eragrostis lehmanniana*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from three plots sampled during the 2013–2017 mapping and classification effort.

Polygons mapped as NPSSODN154 predominately overlapped with areas Roseberry and Dole (1939) classified as "areas containing 20% or more of [Pinyon, Juniper, or Cypress], to the exclusion of commercial types of trees."

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS002U, IPS663, IPS730

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

61. [*Quercus oblongifolia - Prosopis velutina - Vauquelinia californica*] / Mixed Perennial Grass - *Agave schottii* Wooded Shrub Savanna Association (P)

Translated name: [Mexican blue oak - Velvet mesquite - California rosewood] / Mixed Perennial Grass - Schott's century plant Wooded Shrub Savanna Association (P)

NVC name: N/A

Identifier: NPSSODN123

NVC CLASSIFICATION

Division	North American Warm Desert Scrub and Grassland [3.A.2.Na]
Macrogroup	Chihuahuan Semi-Desert Grassland [M087]
Group	Chihuahuan Desert Foothill-Piedmont and Lower Montane Grassland [G490]
Alliance	–
Association	[*Quercus oblongifolia - Prosopis velutina - Vauquelinia californica*] / Mixed Perennial Grass - *Agave schottii* Wooded Shrub Savanna (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread throughout mid-elevation regions of the park, mainly on the southern side of the range. The primary examples are below Grass Shack Campground, the southern slopes of Tanque Verde Ridge, and the low slopes on the western flank of Rincon Peak.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded shrub savanna is restricted to backslopes of varying grade (15–60%) from 1,320 to 1,635 meters (4,330–5,364 ft). Slopes are typically south-trending, but examples of this community were documented in all of the cardinal directions. The surface cover is characterized by shallow and well-drained, gravelly to skeletal loamy soils with occasional areas of clay. Covering/interspersed with the soil is a dominant layer of gravel with scattered rocks and occasional exposed bedrock. Parent material is very diverse with areas including mica schist, quartz monzonite, and gneissic granodiorite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is characterized by a sparse (5–10 [15]%) lower-canopy stratum (2–5 m) dominated by California rosewood (*Vauquelinia californica*), Mexican blue oak (*Quercus oblongifolia*), and velvet mesquite (*Prosopis velutina*), a 5–20% subcanopy (0.5–2 m) of mixed shrubs and succulents, and a variable (5–40%) field stratum (<0.5 m) by perennial grasses and Schott's century plant (*Agave schottii*). With around 132 recorded perennial species, this is one of the most species-rich communities in the Rincon Mountains.

Mexican blue oak (*Quercus oblongifolia*), velvet mesquite (*Prosopis velutina*), and Arizona rosewood (*Vauquelinia californica*) are consistently present (0.70, 0.85, 0.75) as co-dominants or with any of them becoming the sole dominant. Overall, each species contributes an average of 3 to 4% with some areas up to 8%. Total canopy cover is typically less than 10%, but some examples have cover approaching 20%. In general, the lower elevational range of the community tends to favor velvet mesquite (*Prosopis velutina*) and Arizonica rosewood (*Vauquelinia californica*), while the upper elevational tends to favor Mexican blue oak (*Quercus oblongifolia*). Velvet mesquite (*Prosopis velutina*) and Arizona rosewood (*Vauquelinia californica*) are generally present as large shrubs or small trees with heights ranging from 2 to 4 meters. Mexican blue oak is present as a relatively large tree with heights up to 5 meters. Emory oak (*Quercus emoryi*) and alligator juniper (*Juniperus deppeana*) are transitional associates that provide cover in the ecotone with adjacent oak savanna communities. At times, honey mesquite (*Prosopis glandu-*

losa) may appear and rarely become more dominant that velvet mesquite (*Prosopis velutina*). This is most common along included drainages.

The subcanopy is characterized by the consistent presence (1.0) and occasional dominance of bear grass (*Nolina microcarpa*) and turpentine bush (*Ericameria laricifolia*) with a diverse mix of associate shrubs and succulents. Across the community, these species provide average cover around 4% cover with denser areas ranging up to 8%. Locally, distribution tends to be extremely patchy. From most to least frequent, other noteworthy shrubs and succulents include cactus apple (*Opuntia engelmannii*), staghorn cholla (*Cylindropuntia versicolor*), common sotol (*Dasylirion wheeleri*), Thurber's cotton (*Gossypium thurberi*), and pointleaf manzanita (*Arctostaphylos pungens*).

The field is characterized by a diverse mix of native and non-native perennial grasses, and the small succulent, Schott's century plant (*Agave schottii*). The native and non-native grasses each contribute an average of 10% and 6% cover, respectively, with areas up to 20%. Typically, one group is the sole dominant while the other is an associate. Sideoats grama (*Bouteloua curtipendula*) and bullgrass (*Muhlenbergia emersleyi*) are by far the most consistent (1.0) native grasses with variable cover less than 5% each. In order from most to least frequent, other noteworthy native grasses include plains lovegrass (*Eragrostis intermedia*), cane bluestem (*Bothriochloa barbinodis*), bristly wolfstail (*Muhlenbergia alopecuroides*), and spider grass (*Aristida ternipes*). The non-native grasses are entirely composed of Lehmann lovegrass (*Eragrostis lehmanniana*) that, when present, provides highly variable cover ranging from 1% to 20%. Schott's agave (*Agave schottii*) is a very consistent (1.0) dominant that provides average cover around 5 [10]%. Other noteworthy field components include bastard sage (*Eriogonum wrightii*), rockloving spikemoss (*Selaginella rupincola*), and red brome (*Bromus rubens*).

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

This group is a broadly defined desert grassland (shrub-steppe) that is typical of the Borderlands of Arizona, New Mexico, and northern Mexico. It extends throughout much of the Chihuahuan Desert, west to the Sonoran Desert, and north to the Mogollon Rim. The vegetation is characterized by an open to dense herbaceous layer dominated by a diverse mixture of perennial desert grasses. Scattered shrubs and succulents are usually present, but they typically have lower total cover than the herbaceous layer. Common species include desert grasses, such as *Bouteloua eriopoda*, *Bouteloua ramosa*, *Bouteloua rothrockii*, and *Muhlenbergia porteri*, as well as widespread species, such as *Bouteloua curtipendula*, *Bouteloua gracilis*, *Bouteloua hirsuta*, and *Eragrostis intermedia*. Also typical are succulents, such as *Agave lechuguilla*, rosetophyllous shrubs, such as species of *Nolina*, *Dasylirion*, and *Yucca*, and short (dwarf) shrubs including species of *Calliandra*, *Mimosa*, and *Parthenium*. Scattered tall shrubs and short trees, such as species of *Acacia*, *Prosopis*, and various oaks, may be present but with low cover. In upper foothills and lower montane zones, *Muhlenbergia emersleyi* and *Muhlenbergia setifolia* are characteristic species. Sites occur on gently sloping, alluvial erosional fans and piedmonts (bajadas) that lie along mountain fronts of the isolated basin ranges (e.g., sky-island mountain archipelago), extending onto foothill slopes up to 1,670 meters elevation in the Chihuahuan Desert.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 131. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus oblongifolia* (0.70), *Prosopis velutina* (0.85), *Vauquelinia californica* (0.75)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Agave schottii* (0.85), *Bouteloua curtipendula* (0.90), *Muhlenbergia emersleyi* (0.80), *Eragrostis lehmanniana* (0.55)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 132. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus emoryi, Juniperus deppeana, Prosopis glandulosa*
Subcanopy (0.5–2 m)	*Nolina microcarpa, Ericameria laricifolia, Opuntia engelmannii, Cylindropuntia versicolor, Dasylirion wheeleri, Gossypium thurberi, Arctostaphylos pungens*
Field (0–0.5 m)	*Eragrostis intermedia, Bothriochloa barbinodis, Muhlenbergia alopecuroides, Aristida ternipes, Eriogonum wrightii, Selaginella rupincola, Bromus rubens*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from eight plots, six classification plots sampled during the 2013–2017 mapping and classification effort, and two upland soil and vegetation monitoring plots.

Polygons attributed as NPSSODN123 overlapped with three groups classified by Roseberry and Dole (1939), a semi-desert chaparral group defined by an open area dominated by "shrub species common to the Sonoran life zone," a woodland chaparral group defined as "areas that contain 20% or more of both broadleaf tree and shrub species," and a Sonoran chaparral group defined as "areas that contain 80% or more shrub species common to the Sonoran life zone."

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data are available

Plots: IPS016U, IPS045U, IPS120U, IP328U, IP412H, IP467U, V302_009, V402_013

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A., and E. Muldavin. 2015. Chihuahuan Desert Foothill-Piedmont and Lower Montane Grassland, version date 05Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed April 22, 2020.

62. *Quercus emoryi* / *Arctostaphylos pungens* / *Muhlenbergia emersleyi* Wooded Shrub Savanna Association (P)

Translated name: Emory oak / Pointleaf manzanita / Bullgrass Semi-Desert Wooded Shrub Savanna Association (P)

NVC name: N/A

Identifier: NPSSODN157

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [1.B.1.Nd]
Macrogroup	Madrean Lowland Evergreen Woodland [M010]
Group	Madrean Encinal [G201]
Alliance	*Quercus arizonica - Quercus emoryi - Quercus grisea* Scrub Woodland [A3101]
Association	*Quercus emoryi / Arctostaphylos pungens / Muhlenbergia emersleyi* Wooded Shrub Savanna (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread throughout the rolling hills between Bridal Wreath Falls and Douglas Springs Campground.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This association is present primarily on low-gradient (20%), rolling hills within broader, north-trending backslopes from an elevation of 1,350 to 1,700 meters (4,429–5,577 ft). The primary example of this community lies in the shadow of a substantial ridgeline (Tanque Verde Ridge). The surface cover is characterized by shallow and well-drained soils of skeletal loam underlying a layer of coarse gravel with consistent outcrops of exposed bedrock and large, detached boulders. The underlying parent material is primarily composed of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This semi-desert shrubland is characterized by a sparse (<10%) canopy stratum (2–5 m) dominated by Emory oak (*Quercus emoryi*), a variable (5–20%) subcanopy stratum (0.5–2 m) dominated by pointleaf manzanita (*Arctostaphylos pungens*), and a highly variable (5–30%) field stratum (<0.5 m) dominated by bullgrass (*Muhlenbergia emersleyi*). All examples of this community exhibited signs of historic fire disturbance, likely from the Chiva (1989) and Box Canyon (1999) fires.

Emory oak (*Quercus emoryi*) is present as short (3 m), shrub-like trees to tall (5 m), single-stem trees with consistent (1.0) cover typically less than 10%. In one instance cover of this species was closer to 20%, but values that high are not typical of the broader community. At the upper elevational range of this community, Arizona white oak (*Quercus arizonica*) may become a co-dominant or, rarely, the sole canopy dominant. A couple of associate trees, border pinyon (*Pinus discolor*) and alligator juniper (*Juniperus deppeana*), may be present, but they should never be dominant. These species are typically most common in more sheltered locations, along drainages, and/or at the upper elevational limit of this community. Snags, mainly of these two species, were observed throughout the community.

The subcanopy is characterized by the consistent presence (1.0) and typical dominance of pointleaf manzanita (*Arctostaphylos pungens*) with a number of occasionally dominant and/or co-dominant associate shrubs and succulents. On average, this species provides around 10% cover throughout the community. Distribution of this species is quite variable, ranging from scattered individuals providing low cover (<5%) to dense patches ranging up to

20%. Within areas that have not been subjected to recent or historic fire disturbance, cover may be conspicuously higher with values reaching above 30%. Beargrass (*Nolina microcarpa*) is a consistent (0.93) but low-cover (3%) associate that can, on occasion, become co-dominant with, but never more dominant than, pointleaf manzanita (*Arctostaphylos pungens*). Sole dominance of this species is typically associated with the lower-elevation semi-desert grassland associations. Catclaw mimosa (*Mimosa aculeaticarpa*) is an inconsistent (0.39) associate that provides occasional dense inclusions of dominance with cover up to 10%. Common sotol (*Dasylirion wheeleri*) and desertbroom (*Baccharis sarothroides*) are inconsistent, low-cover associates.

The field stratum is characterized by a diverse mix of native perennial grasses most commonly dominated by bullgrass (*Muhlenbergia emersleyi*) with the low succulent, Schott's century plant (*Agave schottii*). On average, perennial grasses provide around 20% cover with some dense areas ranging up to 50%. Of that total cover, bullgrass (*Muhlenbergia emersleyi*) accounts for an average of 10% (with denser areas above 30%). In order from most to least dominant, the other noteworthy native perennial grasses include sideoats grama (*Bouteloua curtipendula*), bristly wolfstail (*Muhlenbergia alopecuroides*), Texas bluestem (*Schizachyrium cirratum*), tanglehead (*Heteropogon contortus*), single threeawn (*Aristida schiedeana*), plains lovegrass (*Eragrostis intermedia*), and spidergrass (*Aristida ternipes*). Annual grasses, mainly sixweeks threeawn (*Aristida adscensionis*), can be a conspicuous component of this community with occasional dense inclusions of annual dominance. Non-native Lehmann lovegrass (*Eragrostis lehmanniana*) is an inconsistent (0.56) associate that, when present, can overtake the field stratum with cover up to 30%. Schott's agave (*Agave schottii*) is a consistent (0.83) associate, usually with cover less than 5%; occasionally it provides dominance with cover up to 10%. Other noteworthy field components include rocklove spikemoss (*Selaginella rupincola*), fairysword (*Cheilanthes lindheimeri*), purple grama (*Bouteloua radicosa*), slender grama (*Bouteloua repens*), Palmer's century plant (*Agave palmeri*), Fendler's lipfern (*Cheilanthes fendleri*), and Lumholtz's prairie clover (*Dalea lumholtzii*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

Woodlands included in this alliance are characterized by a typically open, broad-leaved and evergreen tree canopy (3–15 m tall) that is dominated or co-dominated by the diagnostic species, *Quercus arizonica*, *Quercus emoryi*, *Quercus grisea*, or *Quercus toumeyi*. Other non-diagnostic tree species may be present with less cover than evergreen oak trees, including *Juniperus deppeana*, *Juniperus monosperma*, *Pinus discolor*, *Pinus edulis*, and *Quercus hypoleucoides*. Shrubs are frequently present and may form an open to moderately dense shrub layer less than 3 meters tall. Dominant shrubs include chaparral species, such as *Arctostaphylos pungens*, *Cercocarpus montanus*, *Garrya wrightii*, *Quercus turbinella*, or *Rhus* spp., and some wide-ranging shrubs, such as *Brickellia* spp., *Gutierrezia sarothrae*, *Cylindropuntia imbricata*, *Opuntia phaeacantha*, and *Yucca baccata*. The most diagnostic species are restricted to the Madrean region and include *Agave* spp., *Dasylirion wheeleri*, *Ericameria laricifolia*, *Nolina microcarpa*, *Yucca madrensis*, and juvenile tree species. The sparse to frequently dense graminoid layer is dominated by bunchgrasses. Dominant and character species include desert grasses, such as *Muhlenbergia emersleyi*, *Piptochaetium fimbriatum*, or *Schizachyrium cirratum*, but stands can be very diverse. The usually sparse, but often diverse, forb layer may include species of *Artemisia*, *Croton*, *Dichondra*, *Geranium*, *Macroptilium*, *Viguiera*, and many others. Diagnostic of this woodland alliance is the tree layer dominated by *Quercus arizonica*, *Quercus emoryi*, and/or *Quercus grisea*. This alliance is found on rocky slopes in canyons and mountains in western Texas, southern New Mexico, southeastern Arizona, and northern Mexico. Sites include moderate to steep slopes on all aspects in canyons and on piedmont and mountains slopes. Soils are often gravelly loams derived from a variety of parent materials. Soil and parent material are highly variable, but soils are often silty, sandy, gravelly, or cobbly loam.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 133. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus emoryi* (1.0)
Subcanopy (0.5–2 m)	*Arctostaphylos pungens* (0.94), *Nolina microcarpa* (0.89)
Field (0–0.5 m)	*Muhlenbergia emersleyi* (0.94), *Agave schottii* (0.83)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 134. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus toumeyi*, *Juniperus deppeana, Pinus discolor, Quercus arizonica*
Subcanopy (0.5–2 m)	*Mimosa aculeaticarpa, Baccharis sarothroides, Dasylirion wheeleri*
Field (0–0.5 m)	*Bouteloua curtipendula, Muhlenbergia alopecuroides, Schizachyrium cirratum, Heteropogon contortus, Aristida schiedeana, Eragrostis intermedia, Aristida ternipes, Aristida adscensionis, Eragrostis lehmanniana, Selaginella rupincola, Cheilanthes lindheimeri, Bouteloua radicosa, Bouteloua repens, Agave palmeri, Cheilanthes fendleri, Dalea lumholtzii*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 31 plots, 23 classification plots sampled during the 2013–2017 mapping and classification effort, and eight upland soil and vegetation monitoring plots.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a pinyon, juniper, or cypress type defined by containing "20% or more of any of the above species, to the exclusion of commercial types of trees."

Global

This described community fits well within the *Quercus arizonica - Quercus emoryi - Quercus grisea* Scrub Woodland Alliance (A3101); however, no community is a match at the association level.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS196, IP401U, IP412U, IP413U, IP416H, IP418U, IP420U, IP423H, IP424U, IP428U, IP431U, IP440U, IP448U, IP450U, IP457U, IP460U, IP463U, IP471U, IP480U, IPS626, IPS650, IPS665, IPS708, V402_002, V402_005, V402_006, V402_012, V402_017, V402_020, V402_021, V402_023

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Brown, D. E., C. H. Lowe, and C. P. Pase. 1979. *Quercus arizonica - Quercus emoryi - Quercus grisea* Scrub Woodland Alliance, version date 08Jan2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed September 25, 2019.

63. *Quercus emoryi* / *Nolina microcarpa* / *Muhlenbergia emersleyi* Wooded Shrub Savanna Association (P)

Translated name: Emory oak / Beargrass / Bullgrass Wooded Shrub Savanna Association (P)

NVC name: N/A

Identifier: NPSSODN158

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [1.B.1.Nd]
Macrogroup	Madrean Lowland Evergreen Woodland [M010]
Group	Madrean Encinal [G201]
Alliance	*Quercus arizonica - Quercus emoryi - Quercus grisea* Scrub Woodland [A3101]
Association	*Quercus emoryi / Nolina microcarpa / Muhlenbergia emersleyi* Wooded Shrub Savanna (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community occupies a narrow band around the Tanque Verde Ridge.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This association is present on backslopes of varying grade (10–50+%) and aspect from an elevation of 1,320 to 1,640 meters (4,330–5,370 ft). The surface cover is characterized by shallow and well-drained soils of skeletal loam underlying a layer of coarse gravel with consistent outcrops of exposed bedrock and large, detached boulders. The underlying parent material is primarily composed of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded shrub savanna is characterized by a moderately sparse (<15%) canopy stratum (2–5 m) dominated by Emory oak (*Quercus emoryi*), a variable (10–20%) subcanopy stratum (0.5–2 m) dominated by beargrass (*Nolina microcarpa*), and a highly variable (5–40%) field stratum (<0.5 m) dominated by bullgrass (*Muhlenbergia emersleyi*).

Emory oak (*Quercus emoryi*) is present as short (3 m), shrub-like trees to tall (5 m), single-stem trees with consistent (1.0) cover typically ranging from 5% to 10%. Mexican blue oak (*Quercus oblongifolia*) is a patchy (0.66) and transitional component of this community that is most commonly present at the lower elevational reaches of this community. This species is typically present as scattered, single-stem trees with cover that never surpasses 5% or outcompetes Emory oak (*Quercus emoryi*). Alligator juniper (*Juniperus deppeana*) is an occasional (0.66), low-cover associate (1%) that is distributed throughout the community. In areas of historic fire disturbance, this species may be absent or present only as remnant snags. Arizona white oak (*Quercus arizonica*) is an uncommon (0.17) associate that is usually found at the upper elevational limits of this community and/or in extremely sheltered locations.

The subcanopy is characterized by the consistent dominance (1.0) of beargrass (*Nolina microcarpa*) with a diverse mix of occasionally dominant and/or co-dominant associate shrubs and succulents. Local distribution of beargrass (*Nolina microcarpa*) is quite variable, ranging from scattered individuals providing low cover (5%) to dense patches up to 20%. On average, this species provides around 10% cover across the community. In order from most to least frequent, other noteworthy subcanopy shrubs and succulents include common sotol (*Dasylirion wheeleri*), turpentine bush (*Ericameria laricifolia*), Wright's silktassel (*Garry wrightii*), fragrant sumac (*Rhus aromatica*), gumhead (*Gymnosperma glutinosum*), and redberry buckthorn (*Rhamnus crocea*). When present,

these species typically provide low cover (1–2%) that rarely reaches above 5%. At the lower elevational range of this community, Arizona rosewood (*Vauquelinia californica*) and Sonoran scrub oak (*Quercus turbinella*) may be consistent, low-cover associates; however, frequency generally decreases with increased elevation. At the upper elevational range of this community, pointleaf manzanita (*Arctostaphylos pungens*) begins to provide lower cover, but it should not become a consistent associate or provide more cover than beargrass (*Nolina microcarpa*). Catclaw mimosa (*Mimosa aculeaticarpa*) is an inconsistent (0.33) component that presents as either scattered, single individuals or occasional, dense inclusions of sole dominance with cover up to 20%.

The field stratum is characterized by a diverse mix of perennial grasses, succulents, and subshrubs most commonly dominated by very consistent (1.0) bullgrass (*Muhlenbergia emersleyi*). Overall, native perennial grasses account for 5% to 15% cover, while the non-natives range from absent to dense patches above 20%. Of the native total, bullgrass (*Muhlenbergia emersleyi*) accounts for an average of 5% with some areas above 10%. In order from most to least frequent, other noteworthy grasses include sideoats grama (*Bouteloua curtipendula*), plains lovegrass (*Eragrostis intermedia*), Texas bluestem (*Schizachyrium cirratum*), and black grama (*Bouteloua eriopoda*). The non-native grasses are solely composed of Lehmann lovegrass (*Eragrostis lehmanniana*) with inconsistent (0.5) inclusions of cover ranging up to 25%. Schott's agave (*Agave schottii*) is a patchy (0.67), low-cover (2%) associate with occasional inclusions of dominance. Other noteworthy, but low-cover, associates include Palmer's century plant (*Agave palmeri*), white sage (*Artemisia ludoviciana*), bastard sage (*Eriogonum wrightii*), and showy goldeneye (*Heliomeris multiflora*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

Woodlands included in this alliance are characterized by a typically open, broad-leaved evergreen tree canopy (3–15 m tall) that is dominated or co-dominated by the diagnostic species, *Quercus arizonica*, *Quercus emoryi*, *Quercus gris*ea, or *Quercus toumeyi*. Other non-diagnostic tree species may be present with less cover than the evergreen oak trees, including *Juniperus deppeana*, *Juniperus monosperma*, *Pinus discolor*, *Pinus edulis*, and *Quercus hypoleucoides*. Shrubs are frequently present and may form an open to moderately dense shrub layer less than 3 meters tall. Dominant shrubs include chaparral species, such as *Arctostaphylos pungens*, *Cercocarpus montanus*, *Garrya wrightii*, *Quercus turbinella*, or *Rhus* spp., and some wide-ranging shrubs, such as *Brickellia* spp., *Gutierrezia sarothrae*, *Cylindropuntia imbricata*, *Opuntia phaeacantha*, and *Yucca baccata*. The most diagnostic species are restricted to the Madrean region and they include *Agave* spp., *Dasylirion wheeleri*, *Ericameria laricifolia*, *Nolina microcarpa*, *Yucca madrensis*, and juvenile tree species. The sparse to frequently dense graminoid layer is dominated by bunchgrasses. Dominant and character species include desert grasses, such as *Muhlenbergia emersleyi*, *Piptochaetium fimbriatum*, or *Schizachyrium cirratum*, but stands can be very diverse. The usually sparse, but often diverse, forb layer may include species of *Artemisia*, *Croton*, *Dichondra*, *Geranium*, *Macroptilium*, *Viguiera*, and many others. Diagnostic of this woodland alliance is the tree layer dominated by *Quercus arizonica*, *Quercus emoryi*, and/or *Quercus grisea*. This alliance is found on rocky slopes in canyons and mountains in western Texas, southern New Mexico, southeastern Arizona, and northern Mexico. Sites include moderate to steep slopes on all aspects in canyons and on piedmont and mountains slopes. Soils are often gravelly loams derived from a variety of parent materials. Soil and parent material are highly variable, but soils are often silty, sandy, gravelly or cobbly loam.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 135. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus emoryi* (1.0), *Quercus oblongifolia* (0.67)
Subcanopy (0.5–2 m)	*Nolina microcarpa* (1.0)
Field (0–0.5 m)	*Muhlenbergia emersleyi* (1.0), *Agave schottii* (0.67), *Eragrostis lehmanniana* (0.5)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 136. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Juniperus deppeana, Quercus arizonica*
Subcanopy (0.5–2 m)	*Mimosa aculeaticarpa, Dasylirion wheeleri, Arctostaphylos pungens, Rhus aromatic, Rhamnus crocea, Garry wrightii, Vauquelinia californica, Quercus turbinella, Gymnosperma glutinosum, Ericameria laricifolia, Mimosa aculeaticarpa*
Field (0–0.5 m)	*Bouteloua curtipendula, Schizachyrium cirratum, Eragrostis intermedia, Agave palmeri, Bouteloua eriopoda, Artemisia ludoviciana, Eriogonum wrightii, Heliomeris multiflora, Agave schottii*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from 18 plots sampled during the 2013–2017 mapping and classification effort.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a pinyon, juniper, or cypress type defined by containing "20% or more of any of the above species, to the exclusion of commercial types of trees."

Global

This described community fits well within the *Quercus arizonica - Quercus emoryi - Quercus grisea* Scrub Woodland Alliance [A3101]; however, no community is a match at the association level.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS114U, IPS115, IPS147, IPS189, IPS198, IPS199, IPS604, IP311U, IP349U, IP401H, IP408U, IP435U, IP449U, IPS619, IPS642, IPS643, IPS710, IPS712

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Brown, D. E., C. H. Lowe, and C. P. Pase. 1979. *Quercus arizonica - Quercus emoryi - Quercus grisea* Scrub Woodland Alliance, version date 08Jan2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed September 25, 2019.

64. *Quercus oblongifolia* / *Bouteloua curtipendula* Scrub Association

Translated name: Mexican blue oak / Sideoats grama Scrub Association

NVC name: CEGL000973

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [1.B.1.Nd]
Macrogroup	Madrean Lowland Evergreen Woodland [M010]
Group	Madrean Encinal [G201]
Alliance	Mexican Blue Oak Scrub Woodland [A0791]
Association	*Quercus oblongifolia* / *Bouteloua curtipendula* Scrub [CEGL000973]

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is widespread throughout the park, especially below Grass Shack and on the western slopes of Rincon Peak. While present around the park, this community forms a rather narrow elevational band between the sparse, often velvet mesquite (*Prosopis velutina*)-dominated savannas and the pinyon/oak tree savannas and woodlands.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded shrub savanna is typically found on south- to southwest-trending slopes of a generally steep grade (40%) from 1,400 to 1,800 meters (4,593–5,905 ft), but it may be found on northern aspects at lower elevations. The surface cover is characterized by shallow and well-drained, skeletal loam. Covering/interspersed with the soil is a dominant layer of rock with frequent outcrops of exposed bedrock. The dominant rock layer can range from small cobble to scattered large boulders, and the bedrock can be present as low-angle slabs, vertical outcrops, and/or distinct cliff bands. Parent material is very diverse, but it is most commonly characterized by the presence of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is characterized by moderately sparse (10–20%) canopy stratum (>2 m) dominated by Mexican blue oak (*Quercus oblongifolia*), a similarly open (5–20%) subcanopy (0.5–2 m) stratum dominated by beargrass (*Nolina microcarpa*) with a diverse mix of associates, and a variable (10–40%) field stratum (<0.5 m) dominated by a mix of perennial grasses. Mexican blue oak (*Quercus oblongifolia*) is a consistent (1.0) dominant that typically presents as large (4–5 m), single-stem trees with cover ranging from 10% to 20%. Emory oak (*Quercus emoryi*) is a patchy (0.66) associate that is most common at the higher elevational range of this community and/or where the aspect trends more to the north. Average cover for this species is low (2%), but it can occasionally provide co-dominance with Mexican blue oak (*Quercus oblongifolia*). Alligator juniper (*Juniperus deppeana*) is an occasional (0.50) associate that, when present, can provide cover up to 5%. Velvet mesquite (*Prosopis velutina*) and Arizona rosewood (*Vauquelinia californica*) are incidental associates that are only present at the lower elevational range and in the ecotone with the similar *Quercus oblongifolia - Prosopis velutina – Vauquelinia californica* / *Nolina microcarpa* / mixed perennial grass - *Agave schottii* shrubland association.

The subcanopy is characterized by the consistent (1.0) presence, but variable dominance (0.67), of beargrass (*Nolina microcarpa*) with a diverse mix of associate shrubs and succulents. On average, beargrass (*Nolina microcarpa*) provides around 5% cover across the community, but local values can be highly variable, ranging from 1% up to 20%. A number of less-consistent shrubs and succulents can become subcanopy dominants or co-dominants when cover of beargrass (*Nolina microcarpa*) is low; this typically occurs at lower elevations or where canopy cover is high. Pointleaf manzanita (*Arctostaphylos pungens*) is a patchy (0.50) associate; it can present as scattered

individuals that provide minimal cover (<1%) or as dense patches where it becomes dominant (sometimes providing cover approaching 10%). Wright's silktassel (*Garrya wrightii*) is a consistent (0.85) associate that typically provides scant cover (<1%) but can create occasional inclusions of dominance with more substantial cover (5%). At the lower end of the community, these species tend to be clustered around the base of the tree canopy and/or boulders that provide shelter. Common sotol (*Dasylirion wheeleri*) is a transitional species that is most common at lower elevations, sometimes outcompeting beargrass (*Nolina microcarpa*), and gradually decreases at higher elevations. Other noteworthy subcanopy associates include turpentine bush (*Ericameria laricifolia*), Thurber's cotton (*Gossypium thurberi*), California brickellbush (*Brickellia californica*), oakwoods prairie clover (*Dalea versicolor*), yucca (*Yucca madrensis*), and cactus apple (*Opuntia engelmannii*).

The field stratum is characterized by a diverse mix of native perennial grasses, often with the small succulent, Schott's century plant (*Agave schottii*). Overall, the native perennial grasses provide an average of 20% cover throughout with some areas reaching up to 40%. Across the community, bullgrass (*Muhlenbergia emersleyi*) and sideoats grama (*Bouteloua curtipendula*) are the most consistent (0.86 and 0.93) and dominant species. In order of most to least frequent, other noteworthy grasses include tanglehead (*Heteropogon contortus*), cane bluestem (*Bothriochloa barbinodis*), single threeawn (*Aristida schiedeana*), plains lovegrass (*Eragrostis intermedia*), and wolfstail (*Muhlenbergia alopecuroides*). In general, these species only provide small amounts of cover (i.e., a few percent each). Lehmann lovegrass (*Eragrostis lehmanniana*) was documented in half of the classification plots, typically with low cover (<5%). This species was a dominant in one example of this community with cover around 25%. Overall, distribution of Schott's agave (*Agave schottii*) can be quite inconsistent (0.57) with areas of absence and dense patches near 20%; average cover is around 3%. In order of most to least frequent, other noteworthy field components include white sagebrush (*Artemisia ludoviciana*), bastard sage (*Eriogonum wrightii*), prairie acacia (*Acacia angustissima*), and Palmer's agave (*Agave palmeri*).

GLOBAL TYPE CONCEPT DESCRIPTION

This encinal association occurs in southeastern Arizona on gently to moderately sloping alluvial plains and bajadas to steep and rocky slopes in canyons, foothills, and mountains. Elevation ranges from 1,370 to 1,610 meters (4,500–5,300 ft). Aspects are variable, but it appears more common on less-xeric northern aspects and palustrine habitats in drier portions of its range. Soils are gravelly or stony sandy loams or sandy clay loams that are derived from a mixture of alluvium and colluvium. The vegetation is characterized by an open to moderately dense evergreen tall-shrub layer (10-60% cover) dominated by *Quercus oblongifolia*. The shrub canopy is typically 3 to 5 meters tall; however, it may extend beyond 5 meters and resemble a woodland or tree savanna. *Quercus arizonica*, *Quercus emoryi*, *Prosopis* spp., *Juniperus deppeana*, and occasional *Pinus discolor* may be present in the woody canopy. Associated shrubs and succulents include *Agave palmeri*, *Acacia constricta*, *Arctostaphylos pungens*, *Brickellia* spp., *Dasylirion wheeleri*, *Ericameria laricifolia*, *Eriogonum wrightii*, *Eysenhardtia orthocarpa*, *Garrya wrightii*, *Mimosa aculeaticarpa* var. *biuncifera*, *Mimosa dysocarpa*, *Nolina microcarpa*, *Opuntia phaeacantha*, *Cylindropuntia spinosior*, *Rhus trilobata*, and *Yucca madrensis*. The graminoid layer is moderately dense to dense (25-80% cover) and typically dominated by medium-tall bunchgrasses, such as *Bouteloua curtipendula*, *Schizachyrium cirratum*, or *Muhlenbergia emersleyi*; however, it can also be very diverse. Other common graminoids may include *Aristida ternipes*, *Bouteloua chondrosioides*, *Bouteloua eriopoda*, *Bouteloua gracilis*, *Bouteloua hirsuta*, *Bothriochloa barbinodis*, *Eragrostis intermedia*, *Leptochloa dubia*, *Muhlenbergia longiligula*, and *Piptochaetium fimbriatum*. The usually sparse, but often diverse, forb layer is composed of *Artemisia ludoviciana*, *Commelina* spp., *Chenopodium* spp., *Evolvulus* spp., *Hybanthus attenuatus*, *Ipomoea cristulata*, *Mirabilis longiflora*, *Viguiera* spp., and many others. Diagnostic of this association is the dominance of *Quercus oblongifolia* in the tall-shrub canopy with at least 5% cover and a grassy understory.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 137. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus oblongifolia* (1.0)
Subcanopy (0.5–2 m)	*Nolina microcarpa* (1.0)
Field (0–0.5 m)	*Agave schottii* (0.57), *Bouteloua curtipendula* (0.93), *Muhlenbergia emersleyi* (0.86)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 138. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus emoryi, Vauquelinia californica, Juniperus deppeana, Prosopis velutina, Quercus arizonica*
Subcanopy (0.5–2 m)	*Arctostaphylos pungens, Garrya wrightii, Dasylirion wheeleri, Gossypium thurberi, Ericameria laricifolia, Brickellia californica, Yucca madrensis, Opuntia engelmannii, Dalea versicolor*
Field (0–0.5 m)	*Aristida schiedeana, Muhlenbergia alopecuroides, Eragrostis intermedia, Eragrostis lehmanniana, Acacia angustissima, Eriogonum wrightii, Artemisia ludoviciana, Heteropogon contortus, Bothriochloa barbinodis*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 17 plots, 14 classification plots sampled during the 2013–2017 mapping and classification effort, and three upland soil and vegetation monitoring plots.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a pinyon, juniper, or cypress type defined by containing "20% or more of any of the above species, to the exclusion of commercial types of trees."

Global

This described community is an excellent fit for the *Quercus oblongifolia* / *Bouteloua curtipendula* Scrub Association (CEGL000973).

Classification confidence: Low

NatureServe conservation status: Data not available

Global status: G4

Rounded global status: Data not available

Global range: These shrublands occur in mountains in southeastern Arizona and the adjacent Mexican state of Sonora.

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IP415H, IP437U, IP439U, IP451U, IP469U, IPS101, IPS111, IPS116U, IPS616, IPS641, IPS709, IPS714, IP407H, IP417H, V405_008, V402_015, V402_019

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Stuever, M. C., and J. S. Hayden. 1997. *Quercus oblongifolia* / *Bouteloua curtipendula* Scrub Association, version date 16Oct2018. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed September 25, 2019.

65. *Quercus turbinella - Nolina microcarpa / Muhlenbergia emersleyi - Agave schottii* Shrub Savanna Association (P)

Translated name: Sonoran scrub oak - Beargrass / Bullgrass - Schott's century plant Shrub Savanna Association (P)

NVC name: N/A

Identifier: NPSSODN159

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [1.B.1.Nd]
Macrogroup	Madrean Lowland Evergreen Woodland [M010]
Group	Madrean Encinal [G201]
Alliance	–
Association	*Quercus turbinella - Nolina microcarpa / Muhlenbergia emersleyi - Agave schottii* Shrub Savanna (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This shrubland community was documented on the northern slopes of Tanque Verde Ridge within the boundaries of the historic Box Canyon, Windy, and/or Mother's Day fires.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is predominately present on north- to northwest-facing, steep (35–50%) mountain backslopes and lower-angle (<15%) shoulders/summits from 1,402 to 1,645 meters (4,600–5,400 ft). The surface cover is characterized by shallow and well-drained skeletal loam underlying a dominant layer of coarse gravel with consistent outcrops of exposed bedrock. The parent material is predominately composed of a mix of gneissic granodiorite and thin, layered sheets of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This shrubland community is characterized by a subcanopy stratum (0.5–2 m) dominated by Sonoran scrub oak (*Quercus turbinella*) and *beargrass* (*Nolina microcarpa*) with a field stratum (<0.5 m) dominated by bullgrass (*Muhlenbergia emersleyi*) and Schott's century plant (*Agave schottii*). The canopy stratum (>2 m) is extremely sparse (<1%) with Emory oak (*Quercus emoryi*) and alligator juniper (*Juniperus deppeana*) providing the most conspicuous cover; border pinyon (*Pinus discolor*) can provide rare occurrences. In places, this community has burned up to three times over the last 40 years. Snags and downed wood, most notably of alligator juniper (*Juniperus deppeana*), are spread throughout the community.

The subcanopy stratum is characterized by a variably dense (15–25%) mix of shrubs and succulents consistently (1.0) dominated by Sonoran scrub oak (*Quercus turbinella*) and Beargrass (*Nolina microcarpa*) with noteworthy, but less consistent (0.5), Wright's silktassel (*Garry wrightii*). Sonoran scrub oak (*Quercus turbinella*) provides a consistent 5% to 15% cover across the community; areas of high cover typically occur on sheltered, north-facing slopes. This species is diagnostic of this community and should always be a dominant. In general, it is a short-statured (0.5–1.5 m) shrub, but occasional tree-like individuals reaching above 2 meters may be present. Beargrass (*Nolina microcarpa*) is typically present as a subcanopy dominant with cover around 5%, but it may reach up to 10% on more exposed slopes. When present, Wright's silktassel (*Garry wrightii*) provides similar cover to the other dominants (5%), most often on the more sheltered north-facing slopes. Like Sonoran scrub oak (*Quercus turbinella*), this species is very short-statured with heights ranging from 0.5 to 1 meter. Living individuals of pointleaf manzanita (*Arctostaphylos pungens*) were documented in one example of this community, and scattered snags were present in most examples. In order from most to least frequent, other noteworthy subcanopy com-

ponents include common sotol (*Dasylirion wheeleri*), yucca (*Yucca madrensis*), gumhead (*Gymnosperma glutinosum*), California brickellbush (*Brickellia californica*), catclaw mimosa (*Mimosa aculeaticarpa*), and turpentine bush (*Ericameria laricifolia*).

The field stratum is characterized by a highly variable (10–40%) mix of grasses and succulents dominated by bullgrass (*Muhlenbergia emersleyi*) and Schott's century plant (*Agave schottii*) with occasional pockets of Lehmann lovegrass (*Eragrostis lehmanniana*) dominance. Schott's century plant (*Agave schottii*) provides consistent (1.0) cover ranging from 5% to 10%. Presence of bullgrass (*Muhlenbergia emersleyi*) is consistent (1.0), but cover varies greatly (1–15%) across the community. In general, cover of this species is higher (10–15%) on more sheltered slopes; cover is lower (1–5%) where exposure is higher and/or Lehmann lovegrass (*Eragrostis lehmanniana*) becomes more competitive. Lehmann lovegrass (*Eragrostis lehmanniana*) is a very inconsistent (0.5) component of this community, typically occurring on transitional summit and shoulder slopes where aspects trend more to the south. In those locations, this species may become the dominant grass species with cover ranging up to 20%. Other noteworthy field components include sideoats grama (*Bouteloua curtipendula*), plains lovegrass (*Eragrostis intermedia*), cane bluestem (*Bothriochloa barbinodis*), Texas bluestem (*Schizachyrium cirratum*), bastard sage (*Eriogonum wrightii*), white sagebrush (*Artemisia ludoviciana*), and Wright's cudweed (*Pseudognaphalium canescens*).

GLOBAL TYPE CONCEPT DESCRIPTION (GROUP LEVEL)

Madrean Encinal occurs in the Sierra Madre Occidentale and Sierra Madre Orientale in Mexico, extending north into Trans-Pecos Texas, southern New Mexico, and sub-Mogollon Arizona. These open-canopied to moderately closed woodlands are dominated by Madrean evergreen oaks; they occur at lower elevations than ~Madrean Lower Montane Pine - Oak Forest and Woodland Group (G203) and above Madrean Pinyon - Juniper Woodland Group (G200). Lower-elevation stands are typically open woodlands or savannas where they transition into desert grasslands, chaparral, or, in some cases, desert scrub. Dominant and diagnostic evergreen oak tree species include *Quercus albocincta*, *Quercus arizonica*, *Quercus chihuahuensis*, *Quercus emoryi*, *Quercus grisea*, and *Quercus oblongifolia*. *Arbutus arizonica* and *Arbutus xalapensis* may be present with evergreen oaks in some stands. Madrean pines, Arizona cypress, and pinyon and juniper trees may also be present but do not co-dominate. Chaparral species, such as *Arctostaphylos pungens*, *Cercocarpus montanus*, *Frangula betulifolia*, *Garrya wrightii*, *Purshia* spp., *Quercus turbinella*, *Quercus intricata*, *Quercus toumeyi*, or *Rhus* spp., are common in shrub understory layers, but they do not dominate the vegetation. An herbaceous layer is usually prominent, especially in interspaces between trees in open woodlands. Dominant species are typically warm-season perennial grasses, such as *Aristida* spp., *Bouteloua gracilis*, *Bouteloua curtipendula*, *Bouteloua rothrockii*, *Digitaria californica*, *Eragrostis intermedia*, *Hilaria belangeri*, *Leptochloa dubia*, *Muhlenbergia emersleyi*, *Muhlenbergia pauciflora*, or *Schizachyrium cirratum*; these are species typical of desert grasslands and steppe. Stands are found from 1,200 to 2,200 meters elevation in foothills, canyons, alluvial fan piedmonts (bajadas), and plateaus. Substrates are typically shallow, coarse-textured, lithic soils. This woodland group includes seral stands dominated by short (2–5 m tall) Madrean oak trees, typically with a strong graminoid layer. In transition areas with drier chaparral, the stands of chaparral are not dominated by Madrean oak species; however, Madrean Encinal may extend down along drainages.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 139. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Quercus turbinella* (1.0), *Nolina microcarpa* (1.0), *Garrya wrightii* (0.75)
Field (0–0.5 m)	*Muhlenbergia emersleyi* (1.0), *Agave schottii* (1.0), *Eragrostis lehmanniana* (0.5)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 140. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Juniperus deppeana, Quercus emoryi, Pinus discolor*
Subcanopy (0.5–2 m)	*Arctostaphylos pungens, Dasylirion wheeleri, Yucca madrensis, Gymnosperma glutinosum, Brickellia californica, Mimosa aculeaticarpa, Ericameria laricifolia*
Field (0–0.5 m)	*Bouteloua curtipendula, Eragrostis intermedia, Bothriochloa barbinodis, Schizachyrium cirratum, Eriogonum wrightii, Artemisia ludoviciana, Pseudognaphalium canescens*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from five plots sampled during the 2013–2017 mapping and classification effort.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a pinyon, juniper, or cypress type defined by containing "20% or more of any of the above species, to the exclusion of commercial types of trees."

Global

This described community fits within the Madrean Encinal Group [G201]. No USNVC-accepted alliance or association is a match for this community.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS105, IPS107, IPS113, IPS190, IP445U

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Brown, D. E., C. H. Lowe, and C. P. Pase. 1979. Madrean Encinal Group, version date 10Nov2015. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed September 25, 2019.

66. *Pinus discolor* (*Quercus arizonica - Juniperus deppeana - Quercus hypoleucoides*) Woodland Association (P)

Translated name: Border pinyon (Arizona white oak - Alligator juniper - Silverleaf oak) Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN169

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [1.B.1.Nd]
Macrogroup	Madrean Lowland Evergreen Woodland [M010]
Group	Madrean Pinyon - Juniper Woodland [G200]
Alliance	Madrean Pinyon - Juniper / Shrub Woodland [A3131]
Association	*Pinus discolor* (*Quercus arizonica - Juniperus deppeana - Quercus hypoleucoides*) Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This woodland community is distributed throughout the upper mid-elevation regions of the park.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is typically found on steep (35–50%), generally north-trending mountain backslopes from 1,676 to 2,133 meters (5,500–7,000 ft). The surface cover is characterized by moderately deep, well-drained, flaggy sandy loam underlying a dominant layer of decomposing pine litter and duff. Bedrock outcrops are sporadic throughout this community and typically composed of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is characterized by a variably dense (30–60%) canopy (>2 m) dominated by border pinyon (*Pinus discolor*) with common associates Arizona white oak (*Quercus arizonica*), alligator juniper (*Juniperus deppeana*), and silverleaf oak (*Quercus hypoleucoides*), and a sparse (<10%) understory that often includes Wright's silktassel (*Garrya wrightii*) and longtongue muhly (*Muhlenbergia longiligula*).

Of the four canopy species listed, border pinyon (*Pinus discolor*) provides the most consistent (1.0) dominance, providing cover ranging from 10% to 50% and averaging around 25%. At the higher elevational end of the community, this species is typically the sole canopy dominant with the other trees present as sparse to common associates. The oaks, Arizona white oak (*Quercus arizonica*) and silverleaf oak (*Quercus hypoleucoides*), are consistent (0.80 and 0.84) species that provide average cover around 9% and 6%, respectively, with inclusions of either ranging up to 20+%. These species typically align with an elevational/exposure gradient in which Arizona white oak (*Quercus arizonica*) is most prevalent in the lower elevational reaches of the community and/or in more exposed locations. Conversely, silverleaf oak (*Quercus hypoleucoides*) is more common within the upper reaches of this community and/or in sheltered locations, typically along the base of cliff bands. Alligator juniper (*Juniperus deppeana*) provides the least and most variable cover of the four species, with values typically ranging from 2% to 10% (with rare inclusions up to 18%). Overall, cover averages around 5%, and the species is almost exclusively a subdominant or common associate. In general, these four species are of similar heights, ranging from 4 to 6 meters, often increasing when growing in or along drainages. At the upper elevational range of this community and/or in sheltered drainages, large conifers, such as ponderosa pine (*Pinus ponderosa*), Chihuahuan pine (*Pinus leiophylla*), and Arizona pine (*Pinus arizonica*), as well as scrubby netleaf oak (*Quercus* rugosa), may start to appear but should never become dominant.

The sparse (<10%) subcanopy stratum is characterized by the presence of a few low-cover shrub species. Wright's silktassel (*Garrya wrightii*) is the most conspicuous of these species, occasionally providing small inclusions of dominance with cover above 5%. Other sparse associates include beargrass (*Nolina microcarpa*), gumhead (*Gymnosperma glutinosum*), pointleaf manzanita (*Arctostaphylos pungens*), common yucca (*Yucca madrensis*), fragrant sumac (*Rhus aromatica*), Fendler's ceanothus (*Ceanothus fendleri*), California brickellbush (*Brickellia californica*), and redberry buckthorn (*Rhamnus crocea*). In general, these species rarely provide more than scant cover (<1%).

The very sparse (<5%) field stratum is characterized by the presence of longtongue muhly (*Muhlenbergia longiligula*) and lipfern (*Cheilanthes* sp.). Longtongue muhly (*Muhlenbergia longiligula*) typically provides scattered, low-cover (1–2%) patches of presence, occasionally reaching up to 5%. This usually occurs where there are openings in the tree canopy. Lipfern (*Cheilanthes* sp.) is typically composed of Fendler's lipfern (*Cheilanthes fendleri*) and beaded lipfern (*Cheilanthes wootonii*) with patchy cover that is usually less than 1%. Other documented field species include coralbells (*Heuchera sanguinea*), New Mexico groundsel (*Packera neomexicana*), kingcup cactus (*Echinocereus triglochidiatus*), pineland figwort (*Scrophularia parviflora*), and bastard toadflax (*Comandra umbellata*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Madrean pinyon-juniper woodland alliance occurs in foothills and lower montane zones of southeastern Arizona and southern New Mexico, extending into western Texas and northern Mexico. These open to moderately dense woodlands have 10% to 60% cover of pinyon and juniper trees with shrubs in the understory forming an open to dense short-shrub layer. The presence of Madrean pinyons, *Pinus cembroides*, *Pinus discolor*, or *Pinus remota*, is diagnostic of this alliance. Junipers may be absent to dominant in the tree canopy, with *Juniperus coahuilensis*, *Juniperus deppeana*, *Juniperus flaccida*, or *Juniperus pinchotii* trees being characteristic. *Pinus edulis* and *Juniperus monosperma* may be present to dominant when diagnostic Madrean species are present. Evergreen oaks, such as *Quercus arizonica*, *Quercus emoryi*, *Quercus gravesii*, or *Quercus grisea*, are often present in the tree canopy but have lower total cover than conifers. The shrub layer is composed of a variety of shrubs and rosettes, such as *Agave lechuguilla*, *Arctostaphylos pungens*, *Cercocarpus montanus* var. *paucidentatus*, *Mimosa dysocarpa*, *Quercus emoryi*, *Quercus gambelii*, *Quercus graciliformis*, *Quercus hypoleucoides*, *Quercus mohriana*, *Quercus pungens*, *Quercus rugosa*, *Quercus toumeyi*, *Quercus turbinella*, *Quercus* x *pauciloba*, *Rhus trilobata*, and *Salvia regla*. Perennial graminoid cover is typically low and patchy because of high shrub cover on rocky sites. Herbaceous species are numerous and typical of the Chihuahuan Desert or Madrean foothills, and include *Muhlenbergia emersleyi*, *Muhlenbergia pauciflora*, *Muhlenbergia setifolia*, *Piptochaetium fimbriatum*, and *Piptochaetium pringlei*. Stands are typically found on cool aspects in canyons and on steep scarp slopes at elevations of 1,400 to 2,200 meters. Substrates are generally shallow and rocky soils, but they include deeper, loamy soils, especially on sites where trees have recently colonized.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 141. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Pinus discolor* (1.0), *Quercus arizonica* (0.80), *Juniperus deppeana* (0.96), *Quercus hypoleucoides* (0.84)
Subcanopy (0.5–2 m)	*Garrya wrightii* (0.92)
Field (0–0.5 m)	*Muhlenbergia longiligula* (0.57)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 142. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus hypoleucoides, Pinus ponderosa*
Subcanopy (0.5–2 m)	*Quercus rugosa, Nolina microcarpa, Yucca madrensis, Brickellia californica, Arctostaphylos pungens, Rhus aromatica, Ceanothus fendleri, Rhamnus crocea*
Field (0–0.5 m)	*Cheilanthes fendleri, Cheilanthes wootonii, Heuchera sanguinea, Packera neomexicana, Echinocereus triglochidiatus, Scrophularia parviflora, Comandra umbellata*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 15 plots, 13 classification plots sampled during the 2013–2017 mapping and classification effort, and two upland soil and vegetation monitoring plots.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a pinyon, juniper, or cypress type defined by containing "20% or more of any of the above species, to the exclusion of commercial types of trees."

Global

This described community fits extremely well within the *Pinus cembroides - Pinus discolor - Pinus edulis* / Shrub Understory Woodland Alliance (A3131). Its type concept includes all diagnostic species present within, and landforms covered by, our local description, NPSSODN169.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

***S*Plots:** IP406U, IP532U, IPS194, IPS624, IPS632, IPS635, IPS640, IPS645, IPS653, IPS656, IPS664, IPS673, IPS724, V402_025, V502_003

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Pinus cembroides - Pinus discolor - Pinus edulis* / Shrub Understory Woodland Alliance, version date 08Jan2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed September 7, 2019.

67. *Pinus discolor* / *Arctostaphylos* (*pungens - pringlei*) Wooded Shrubland Association (P)

Translated name: Border pinyon / Manzanita (pointleaf - Pringle) Wooded Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN171

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [D060]
Macrogroup	Madrean Lowland Evergreen Woodland [M010]
Group	Madrean Pinyon - Juniper Woodland [G200]
Alliance	Madrean Pinyon - Juniper / Shrub Woodland [A3131]
Association	*Pinus discolor* / *Arctostaphylos* (*pungens - pringlei*) Wooded Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This woodland community is distributed throughout the upper mid-elevation regions of the park, from the slopes of Rincon Peak to Tanque Verde Ridge.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is typically found on backslopes of variable grade (6–50%) and aspect from 1,900 to 2,200 meters (6,233–7,217 ft). The surface cover is characterized by shallow to very shallow, well-drained, skeletal loam underlying a variable mix of gravel, bare soil, and litter, depending on the canopy density and dominance of oak species. Bedrock outcrops are very common throughout this community, occasionally dominating the surface cover; they are typically composed of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded shrubland community is characterized by an open (10–30%) canopy stratum (>2 m) dominated solely by border pinyon (*Pinus discolor*), a variably dense (15–40%) subcanopy stratum (0.5–2 m) of manzanita (*Arctostaphylos* sp.), pointleaf manzanita (*Arctostaphylos pungens*), and Pringle's manzanita (*Arctostaphylos pungens*), and a very sparse (<<5 %) field stratum (<0.5 m) with no consistent dominants or associates. This community forms a pattern mosaic with formations ranging from moderately dense woodlands to sparsely wooded shrublands, or areas of shrub and tree co-dominance.

Border pinyon (*Pinus discolor*) is a very consistent canopy dominant (1.0) with 5 [7] meter tall individuals; it provides cover from 5% in the shrub-dominated areas to 25% in the woodland version. On average, this species provides 15% canopy cover across the community. A number of associate trees were documented throughout this community, including Arizona white oak (*Quercus arizonica*), Silverleaf oak (*Quercus hypoleucoides*), and alligator juniper (*Juniperus deppeana*). On average, each of these species provides around 3% cover (with rare inclusions surpassing 5%). In general, these species should not compete for dominance with border pinyon (*Pinus discolor*); however, in areas with significant exposed bedrock, silverleaf oak (*Quercus hypoleucoides*) may become a co-dominant or subdominant.

Within the subcanopy, one species of manzanita (either *Arctostaphylos pungens* or *Arctostaphylos pringlei*) provides dominance in every example of this community. Overall, pointleaf manzanita (*Arctostaphylos pungens*) is the more consistent (0.88) species; when dominant, it provides cover from 10% to 25%. Pringle's manzanita (*Arctostaphylos pringlei*) is a less-consistent (0.56) component that provides similar cover values. In one shrubland example, this species provided cover ranging up to 40%. In order from most to least frequent, other noteworthy

subcanopy species include Wright's silktassel (*Garrya wrightii*), beargrass (*Nolina microcarpa*), California brickellbush (*Brickellia californica*), yucca (*Yucca madrensis*), and netleaf oak (*Quercus rugosa*).

The very sparse (<<5%) field stratum contains a low-cover mix of perennial grasses and forbs with no consistent dominants or associates. In order from most to least frequent, these species include bullgrass (*Muhlenbergia emersleyi*), chaparral fleabane (*Erigeron oreophilus*), single threeawn (*Aristida schiedeana*), pinyon ricegrass (*Piptochaetium fimbriatum*), and Palmer's century plant (*Agave palmeri*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This Madrean pinyon-juniper woodland alliance occurs in foothills and lower montane zones of southeastern Arizona and southern New Mexico, extending into western Texas and northern Mexico. These open to moderately dense woodlands have 10% to 60% cover of pinyon and juniper trees, with shrubs in the understory forming an open to dense short-shrub layer. The presence of Madrean pinyons, *Pinus cembroides*, *Pinus discolor*, or *Pinus remota*, is diagnostic of this alliance. Junipers may be absent to dominant in the tree canopy, with *Juniperus coahuilensis*, *Juniperus deppeana*, *Juniperus flaccida*, or *Juniperus pinchotii* trees being characteristic. *Pinus edulis* and *Juniperus monosperma* may be present to dominant when diagnostic Madrean species are present. Evergreen oaks, such as *Quercus arizonica*, *Quercus emoryi*, *Quercus gravesii*, or *Quercus grisea*, are often present in the tree canopy but have lower total cover than conifers. The shrub layer is composed of a variety of shrubs and rosettes, such as *Agave lechuguilla*, *Arctostaphylos pungens*, *Cercocarpus montanus* var. *paucidentatus*, *Mimosa dysocarpa*, *Quercus emoryi*, *Quercus gambelii*, *Quercus graciliformis*, *Quercus hypoleucoides*, *Quercus mohriana*, *Quercus pungens*, *Quercus rugosa*, *Quercus toumeyi*, *Quercus turbinella*, *Quercus* x *pauciloba*, *Rhus trilobata*, and *Salvia regla*. Perennial graminoid cover is typically low and patchy because of high shrub cover on rocky sites. Herbaceous species are numerous and typical of the Chihuahuan Desert or Madrean foothills; they include *Muhlenbergia emersleyi*, *Muhlenbergia pauciflora*, *Muhlenbergia setifolia*, *Piptochaetium fimbriatum*, and *Piptochaetium pringlei*. Stands are typically found on cool aspects in canyons and on steep scarp slopes at elevations of 1,400 to 2,200 meters. Substrates are generally shallow, rocky soils, but include deeper loamy soils, especially on sites where trees have recently colonized.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 143. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Pinus discolor* (1.0)
Subcanopy (0.5–2 m)	*Arctostaphylos pungens* (0.86), *Arctostaphylos pringlei* (0.43)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 144. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus hypoleucoides, Juniperus deppeana, Quercus arizonica*
Subcanopy (0.5–2 m)	*Garrya wrightii, Nolina microcarpa, Yucca madrensis, Brickellia californica, Quercus rugosa*
Field (0–0.5 m)	*Aristida schiedeana, Erigeron oreophilus, Muhlenbergia emersleyi, Piptochaetium fimbriatum, Agave palmeri*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from nine plots sampled during the 2013–2017 mapping and classification effort.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a pinyon, juniper, or cypress type defined by containing "20% or more of any of the above species, to the exclusion of commercial types of trees."

Global

This described community fits well within the hierarchy that contains the *Pinus cembroides - Pinus discolor - Pinus edulis* / Shrub Understory Woodland Alliance (A3131). Currently, there is not an association that matches our local described community (NPSSODN171).

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IP518U, IP531U, IP539U, IP559U, IP567U, IPS698, IPS801, IPS830, IPS838

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Pinus cembroides - Pinus discolor - Pinus edulis* / Shrub Understory Woodland Alliance, version date 08Jan2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed September 25, 2019.

68. *Pinus discolor* / *Muhlenbergia emersleyi* Woodland Association

Translated name: Border pinyon / Bullgrass Woodland Association

NVC name: CEGL000767

Identifier: N/A

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [D060]
Macrogroup	Madrean Lowland Evergreen Woodland [M010]
Group	Madrean Pinyon - Juniper Woodland [G200]
Alliance	Madrean Pinyon - Juniper / Grass Woodland [A3132]
Association	*Pinus discolor* / *Muhlenbergia emersleyi* Woodland [CEGL000767]

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This open woodland community is primarily located on the slopes of Tanque Verde Ridge, just west of the Grass Shack campground.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is typically found on south-trending backslopes of variable grade (10–50%) from 1,580 to 1,940 meters (5,180–6,364 ft). The soils typically range from shallow to deep, well-drained, skeletal loam underlying a variable mix of gravel, bare soil, and litter with patches of exposed bedrock slabs. Bedrock outcrops are common throughout this community and are typically composed of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This open woodland community is characterized by an open (10–30 [40]%) canopy (>2 m) dominated by border pinyon (*Pinus discolor*) and a mix of Emory oak (*Quercus emoryi*) and/or Arizona white oak (*Quercus arizonica*) with noteworthy alligator juniper (*Juniperus deppeana*), a subcanopy (0.5–2 m) of pointleaf manzanita (*Arctostaphylos pungens*), and a field stratum (<0.5 m) of bullgrass (*Muhlenbergia emersleyi*). The overall formation of the community ranges from dense woodlands, often in proximity to drainages or on more sheltered slopes, to sparsely-wooded openings dominated by perennial grasses and/or bedrock slabs.

Overall, border pinyon (*Pinus discolor*) is the most consistent (1.0) canopy dominant, with average cover around 10% including some areas reaching up to 20%. Individuals of this species typically present as medium-sized (4–5 m) trees, with larger (6–7 m) examples occurring within included drainages. Emory oak (*Quercus emoryi*) and Arizona white oak (*Quercus arizonica*) are a consistent (0.61, 0.74) component with average cover around 5%, including some areas up to 20%. Heights are similar to that of border pinyon (*Pinus discolor*). In general, Arizona white oak (*Quercus arizonica*) is most common at higher elevations and/or in more sheltered locations, especially within included drainages. Emory oak (*Quercus emoryi*) is most common in the lower-elevation examples and on exposed slopes. These are transitional areas where Emory oak (*Quercus emoryi*) and Arizona white oak (*Quercus arizonica*) may appear as co-dominants. Alligator juniper (*Juniperus deppeana*) is a fairly consistent (0.77) canopy tree with average cover around 7% and denser patches up to 12%. Other documented, but sparse (<1%), canopy trees include Mexican blue oak (*Quercus oblongifolia*), Toumey oak (*Quercus toumeyi*), and velvet mesquite (*Prosopis velutina*).

The variable (10–30%) subcanopy is characterized by the patchy dominance of pointleaf manzanita (*Arctostaphylos pungens*) with noteworthy and occasionally dominant cover of beargrass (*Nolina microcarpa*) and Wright's silktassel (*Garrya wrightii*). When present (0.68), pointleaf manzanita (*Arctostaphylos pungens*) provides highly

variable cover ranging from scattered individuals contributing less than 5% cover to dense inclusions up to 20%. Wright's silktassel (*Garrya wrightii*) and beargrass (*Nolina microcarpa*) each provide consistent (0.71 and 0.80), low cover (<5%) with occasional inclusions up to 10%. In general, Wright's silktassel (*Garrya wrightii*) is most common where canopy trees are denser, while beargrass (*Nolina microcarpa*) is more commonly out in the open. Other noteworthy subcanopy species include catclaw mimosa (*Mimosa aculeaticarpa*), California brickellbush (*Brickellia californica*), gumhead (*Gymnosperma glutinosum*), dollarjoint pricklypear (*Opuntia chlorotica*), walking stick cholla (*Cylindropuntia spinosior*), common sotol (*Dasylirion wheeleri*), and yucca (*Yucca madrensis*).

The variably dense (5–30%) field stratum is characterized by the consistent presence (0.75) of beargrass (*Nolina microcarpa*) with patchy Schott's century plant (*Agave schottii*). Areas of low cover are generally linked to areas of dominant exposed bedrock and/or shallow, gravelly soils. Across the community, bullgrass (*Muhlenbergia emersleyi*) ranges from low cover (<5%) in areas with high canopy cover to dense (20–30%) inclusions where canopy cover decreases. When present, Schott's century plant (*Agave schottii*) provides cover around 5%; however, in many examples of this community it was not present or provided less than 1% cover. Other noteworthy field components include Texas bluestem (*Schizachyrium cirratum*), single threeawn (*Aristida schiedeana*), tanglehead (*Heteropogon contortus*), bristly wolfstail (*Muhlenbergia alopecuroides*), plains lovegrass (*Eragrostis intermedia*), prairie clover (*Dalea lumholtzii*), hairy grama (*Bouteloua hirsuta*), and Palmer's century plant (*Agave palmeri*).

GLOBAL TYPE CONCEPT DESCRIPTION (ASSOCIATION LEVEL)

This woodland association occurs in southeastern Arizona, southern New Mexico, and likely in adjacent Mexico. Stands occur on gently to moderately sloping alluvial plains, bajadas, and canyon bottoms to steep and rocky slopes in canyons, piedmont hills, and mountains. Elevation ranges from 1,460 to 2,010 meters (4,780–6,600 ft). Soils are shallow and gravelly or stony sandy loams or sandy clay loams; they are derived from a mixture of alluvium and colluvium. The vegetation is characterized by an open to moderately dense tree layer (15–70% cover) dominated by *Pinus discolor* and *Juniperus deppeana*. Evergreen oaks are often present in the tree subcanopy, but they generally have lower cover. An open shrub layer may be present, but the understory is typically dominated by the graminoid layer. The tree canopy ranges in height from 3 meters to over 5 meters. Stands range from open woodlands to moderately dense woodlands at higher elevations and in canyon bottoms. Other canopy trees are *Quercus arizonica*, *Quercus emoryi*, or *Quercus grisea*. A sparse to moderately dense shrub layer may be present, but graminoids dominate the understory. Characteristic shrubs and succulents include *Acacia angustissima, Arctostaphylos pungens, Cercocarpus montanus*, *Dasylirion wheeleri*, *Fendlera rupicola*, *Garrya wrightii*, *Nolina microcarpa*, *Quercus toumeyi*, *Rhus trilobata*, *Yucca baccata*, and *Yucca schottii*. The graminoid layer is moderate to dense (25–80% cover) and is typically dominated by medium-tall bunchgrasses, such as *Bouteloua curtipendula*, *Eragrostis intermedia*, or *Muhlenbergia emersleyi*; however, this layer can be very diverse with both forbs and grasses.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 145. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Pinus discolor* (1.0), *Quercus emoryi* (0.62), *Quercus arizonica* (0.74)
Subcanopy (0.5–2 m)	*Arctostaphylos pungens* (0.68)
Field (0–0.5 m)	*Muhlenbergia emersleyi* (0.75)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 146. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus arizonica*, *Juniperus deppeana*
Subcanopy (0.5–2 m)	*Nolina microcarpa, Mimosa aculeaticarpa, Dasylirion wheeleri, Yucca madrensis, Brickellia californica, Gymnosperma glutinosum, Opuntia chlorotica, Cylindropuntia spinosior*
Field (0–0.5 m)	*Agave schottii, Schizachyrium cirratum, Aristida schiedeana, Heteropogon contortus, Muhlenbergia alopecuroides, Eragrostis intermedia, Bouteloua hirsuta, Agave palmeri, Dalea lumholtzii*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 37 plots, 29 classification plots sampled during the 2013–2017 mapping and classification effort, and eight upland soil and vegetation monitoring plots.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a pinyon, juniper, or cypress type defined by containing "20% or more of any of the above species, to the exclusion of commercial types of trees."

Global

This described community fits extremely well within the *Pinus discolor* / *Muhlenbergia emersleyi* Association (CEGL000767). Its type concept includes all diagnostic species present within, and landforms covered by, our local description.

Classification confidence: Low - Poorly Documented

NatureServe conservation status: Data not available

Global status: G5 (23Feb1994)

Rounded global status: G5 - Secure

Global range: These woodlands occur in the mountains of southern New Mexico and southeastern Arizona. They likely also occur in the mountains of the Mexican states of Chihuahua and Sonora.

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS191, IPS193, IP404U, IP406H, IP408H, IP410U, IP419U, IP430H, IP433U, IP436H, IP436U, IP459U, IP470U, IP477U, IPS629, IPS639, IPS644, IPS647, IPS648, IPS649, IPS674, IPS682, IPS687, IPS700, IPS703, IPS705, IPS706, IPS7077, IPS800, V402_001, V402_003, V402_007, V402_024, V502_009, V502_008, V502_015, V502_016

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Western Ecology Group, K. A. Schulz. 1997. *Pinus discolor* / *Muhlenbergia emersleyi* Woodland, version date 16Aug2007. U.S. National Vegetation Classification Database, V2.01 (2017). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed December 17, 2018.

69. *Pinus discolor* / *Piptochaetium fimbriatum* Woodland Association

Translated name: Border pinyon / Pinyon ricegrass Woodland Association

NVC name: CEGL000768

Identifier: N/A

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [D060]
Macrogroup	Madrean Lowland Evergreen Woodland [M010]
Group	Madrean Pinyon - Juniper Woodland [G200]
Alliance	Madrean Pinyon - Juniper / Grass Woodland [A3132]
Association	*Pinus discolor* / *Piptochaetium fimbriatum* Woodland [CEGL000768]

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This woodland community is distributed throughout the unburned areas surrounding the Juniper Basin Campground.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is typically found on low-angle (<15%) slopes and included drainages within sheltered basins around 1,850 meters (6,069 ft). The surface cover is characterized by moderately deep, well-drained, flaggy sandy loam underlying a dominant layer of decomposing pine litter and duff.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is characterized by a dense (40–70%) canopy (>2 m) dominated by border pinyon (*Pinus discolor*), alligator juniper (*Juniperus deppeana*), and oak (*Quercus* sp.) with an understory dominated (10–20%) by pinyon ricegrass (*Piptochaetium fimbriatum*).

All three of the canopy trees listed provide consistent (1.0) presence across the community with each typically contributing 15% to 30%. Local dominance can vary, with any of these species providing sole dominance or similar dominance. The canopy height is higher than other communities with similar species composition; individuals usually range from 6 to 12 meters tall. As with other similar communities, Emory oak (*Quercus emoryi*) occupies the more exposed areas, while Arizona white oak (*Quercus arizonica*) tends to dominate in more sheltered locations. The community may present with these oaks as co-dominants or with either one as the sole dominant oak.

The sparse (<<10%) subcanopy stratum is characterized by the presence of a few low-cover shrub species. Documented subcanopy species include yucca (*Yucca madrensis*), pointleaf manzanita (*Arctostaphylos pungens*), beargrass (*Nolina microcarpa*), and walkingstick cactus (*Cylindropuntia spinosior*).

The variable (10–20%) field stratum (<0.5 m) is characterized by the dominance of pinyon ricegrass (*Piptochaetium fimbriatum*). This small bunch grass provides cover ranging from [5] 10% to 20%, often in dense patches surrounded by area without any field components. Longtongue muhly (*Muhlenbergia longiligula*) and bullgrass (*Muhlenbergia emersleyi*) are the next most common species with consistent cover that rarely reaches above 5%. Distribution of these species is dependent on exposure, with longtongue muhly (*Muhlenbergia longiligula*) occupying more sheltered locations and bullgrass (*Muhlenbergia emersleyi*) occupying those more exposed. Single threeawn (*Aristida schiedeana*) and Texas bluestem (*Schizachyrium cirratum*) are the only additional species documented within this stratum.

GLOBAL TYPE CONCEPT DESCRIPTION

This Madrean conifer woodland occurs in the "Borderlands" of southeastern Arizona, southwestern New Mexico, and into central New Mexico and (probably) adjacent Texas and northern Mexico. Stands are naturally small and patchy in distribution, and they are limited to moist microsites of canyons or cooler open slopes. This woodland type occupies alluvial slopes and benches, upper slopes, drainages, and washes, often with cooler northern aspects. Elevation is roughly 1,680 to 2,100 meters. Sampled stands in the Animas Mountains are on 12%, northwest-facing slopes. The substrate is loam derived from andesite with surface rock and gravel, together averaging 15% cover. Litter dominates the ground cover (72%). The tree canopy has 25% to 60% cover, and it is co-dominated by *Pinus discolor* and *Juniperus deppeana* with *Quercus grisea* or *Quercus* x *organensis* [*arizonica* x *grisea*] hybrid typically present. Scattered shrubs (<10% cover) are common, often with high diversity; they may include *Nolina microcarpa*, *Rhus trilobata*, *Cercocarpus montanus*, *Yucca baccata*, *Garrya wrightii*, *Quercus toumeyi*, and *Fendlera rupicola*. The moderately dense herbaceous layer (25–45% cover) is dominated by perennial grasses, such as *Piptochaetium fimbriatum*, *Bouteloua gracilis*, *Bouteloua curtipendula*, or *Eragrostis intermedia*, but it is typically diverse and includes sparse cover of many other grass and forb species. The perennial grass-dominated herbaceous layer is diagnostic of this late successional *Pinus discolor* / *Juniperus deppeana* woodland.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 147. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Pinus discolor* (1.0), *Quercus arizonica* (1.0), *Juniperus deppeana* (1.0), *Quercus emoryi* (1.0)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Piptochaetium fimbriatum* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 148. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Nolina microcarpa, Yucca madrensis, Arctostaphylos pungens, Cylindropuntia spinosior*
Field (0–0.5 m)	*Muhlenbergia emersleyi, Muhlenbergia longiligula, Schizachyrium cirratum, Aristida schiedeana*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from two classification plots sampled during the 2013–2017 mapping and classification effort.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a pinyon, juniper, or cypress type defined by containing "20% or more of any of the above species, to the exclusion of commercial types of trees."

Global

This described community fits extremely well within the *Pinus discolor* / *Piptochaetium fimbriatum* Association (CEGL000768). Its type concept includes all diagnostic species present within, and landforms covered by, our local description.

Classification confidence: Low - Poorly Documented

NatureServe conservation status: Data not available

Global status: G2 (21Oct1997)

Rounded global status: G2 - Imperiled

Global range: Only documented from the southwestern corner of New Mexico, but it probably occurs elsewhere in the "Borderlands" region of southeastern Arizona, southwestern New Mexico, and northwestern Mexico, and potentially in the Trans-Pecos region of Texas and Mexico.

Reasons: This association is limited in its distribution to the "Borderlands" of southeastern Arizona and southwestern New Mexico, and possibly in the Trans-Pecos region of western Texas and the northern Sierra Madre Occidentale of Mexico. Stands are small and reflect the late successional stage of mesic Sierra Madrean forest. They are very high in grass and forb diversity, with a preponderance of Sierra Madrean elements that have a restricted distribution in the U.S. Grazing and timber harvest (to a lesser degree) continue to impact the association throughout its range.

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS704, IPS711

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Stuever, M. C., and J. S. Hayden. 1997. *Pinus discolor* / *Piptochaetium fimbriatum* Woodland Association, version date 17Oct2018. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed September 25, 2019.

70. *Pinus discolor* / *Quercus rugosa* Woodland Association

Translated name: Border pinyon / Netleaf oak Woodland Association

NVC name: CEGL000772

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [D060]
Macrogroup	Madrean Lowland Evergreen Woodland [M010]
Group	Madrean Pinyon - Juniper Woodland [G200]
Alliance	Madrean Pinyon - Juniper / Shrub Woodland [A3131]
Association	*Pinus discolor* / *Quercus rugosa* Woodland (CEGL000772)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This woodland community is widespread throughout the upper elevational areas of the park from Rincon Peak to Mica Mountain.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is typically found on mountain backslopes and shoulders of variable grade (6–50+%) with a north- to northwest-trending aspect from 1,980 to 2,440 meters (6,500–8,000 ft). The surface cover is characterized by shallow to very shallow, well-drained, sandy loam underlying a variable mix of gravel, bare soil, and litter with consistent and sometimes dominant outcrops of exposed bedrock. Bedrock outcrops are very common throughout this community, occasionally dominating the surface cover; they are typically composed of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is characterized by a variably dense (30–60%) canopy stratum (>2 m) dominated by border pinyon (*Pinus discolor*) and a moderately dense (10–30%) subcanopy stratum (0.5–2 m) dominated by netleaf oak (*Quercus rugosa*). This community ranges from an open woodland with a dominant shrub layer to a very dense, short-statured woodland.

Border pinyon (*Pinus discolor*) is a very consistent canopy dominant (1.0) with 3 to 6 meter tall individuals providing cover that typically ranges from 20% to 40%; dense areas contain cover up to 60%. Alligator juniper (*Juniperus deppeana*) is a consistent (1.0) associate that provides variable cover, usually less than 10% and averaging around 5%. Typically, this species is present as trees with heights of 3 to 5 meters, but in one example trees reached above 7 meters. Netleaf oak (*Quercus rugosa*) and silverleaf oak (*Quercus hypoleucoides*) may be present (0.67 and 0.60) in the canopy as small trees (3–5 [7] m) with cover commonly less than 10%. The majority of netleaf oak (*Quercus rugosa*) cover is as shrubby individuals in the subcanopy stratum. At the lower elevational end of this community, Arizona white oak (*Quercus arizonica*) may be present, but it should never outcompete netleaf oak (*Quercus rugosa*). At the upper elevational range of this community, and/or when occurring in drainages, canyon live oak (*Quercus chrysolepis*) may begin to appear. At times, typically when spanning a drainage, large conifers, such as ponderosa pine (*Pinus ponderosa*), Arizona pine (*Pinus arizonica*), Chihuahuan pine (*Pinus leiophylla*), and Douglas fir (*Pseudotsuga menziesii*), may be present (0.33), but they should not be consistent throughout the community.

Within the subcanopy, netleaf oak (*Quercus rugosa*) is a consistently (1.0) dominant shrub that typically provides 10% to 30% cover. On occasion, any of the following can become a subcanopy co-dominant: silverleaf oak (*Quercus hypoleucoides*), Wright's silktassel (*Garrya wrightii*), pointleaf manzanita (*Arctostaphylos pungens*), and Pringle's manzanita (*Arctostaphylos pringlei*). Typically, these species never provide more than 10% cover and are

rarely more dominant than netleaf oak (*Quercus rugosa*). Other noteworthy subcanopy components include dollarjoint prickly pear (*Opuntia chlorotica*), yucca (*Yucca madrensis*), and beargrass (*Nolina microcarpa*).

The very sparse (<5%) field stratum contains a low-cover mix of perennial grasses and forbs with no consistent dominants or associates. Some noteworthy species include longtongue muhly (*Muhlenbergia longiligula*), New Mexico groundsel (*Packera neomexicana*), Pringle's speargrass (*Piptochaetium pringlei*), muttongrass (*Poa fendleriana*), and New Mexico fleabane (*Erigeron neomexicana*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 149. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Pinus discolor*
Subcanopy (0.5–2 m)	*Quercus rugosa*
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 150. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus hypoleucoides, Juniperus deppeana, Quercus arizonica, Quercus chrysolepis, Pinus ponderosa, Pinus arizonica, Pseudotsuga menziesii*
Subcanopy (0.5–2 m)	*Garrya wrightii, Arctostaphylos pungens, Arctostaphylos pringlei, Nolina microcarpa, Yucca madrensis, Opuntia chlorotica*
Field (0–0.5 m)	*Erigeron oreophilus, Piptochaetium pringlei, Muhlenbergia longiligula, Packera neomexicana, Poa fendleriana, Erigeron neomexicana*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 10 plots, nine classification plots sampled during the 2013–2017 mapping and classification effort, and one upland soil and vegetation monitoring plot.

Polygons assigned to this community are spread across three types mapped by Roseberry and Dole (1939). The first is a timberland chaparral type defined by containing "80% or more shrub species common to the transition life zone," which is predominately found on the southern slopes of Rincon Peak. The second is a pinyon, juniper, or cypress type defined by containing "20% or more of any of the above species, to the exclusion of commercial types of trees," which is predominately found on the northern slopes of Rincon Peak. The third is a pine type defined by "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir." Overlapping polygons are located around the upper slopes of Mica Mountain, typically in areas of historic fire disturbance.

Global

The accepted USNCV association with the most appropriate name, CEGL000772, lacks a detailed type concept. The association name and distribution are an excellent match for the described community.

Classification confidence: Low - Poorly Documented

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS006U, IP501U, IP522U, IP525H, IP526U, IP549U, IP565U, IPS628, IPS823, V502_010

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Milford, E., and E. Muldavin. 1979. *Pinus discolor* / *Quercus rugosa* Woodland Alliance, version date 26Nov1997. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed September 25, 2019.

71. *Pinus discolor* / *Quercus toumeyi* Woodland Association

Translated name: Border pinyon / Toumey oak Woodland Association

NVC name: CEGL000773

Identifier: N/A

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [D060]
Macrogroup	Madrean Lowland Evergreen Woodland [M010]
Group	Madrean Pinyon - Juniper Woodland [G200]
Association	Madrean Pinyon - Juniper / Shrub Woodland [A3131]
Association	*Pinus discolor* / *Quercus toumeyi* Woodland [CEGL000773]

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This woodland community is distributed across the low eastern slopes of Rincon Peak.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is typically found on very steep (50+%) backslopes and lower-angle (15–30%) shoulders and summits of variable aspect, from 1,676 to 1,889 meters (5,500–6,200 ft). The surface cover is characterized by shallow to very shallow, well-drained, skeletal loam with dominant expanses of exposed bedrock throughout. The parent material is typically composed of gneissic quartz monzonite.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded shrubland community is characterized by a generally sparse ([5] 10–15%) canopy stratum (>2 m) solely dominated by border pinyon (*Pinus discolor*) and a slightly more dense (10–20%) subcanopy stratum (0.5–2 m) dominated by Toumey oak (*Quercus* toumeyi) and manzanita (*Arctostaphylos* sp.). Due to the high percentage of exposed bedrock found throughout this community, species composition and abundance is tied to the availability of soil.

Border pinyon (*Pinus discolor*) is a very consistent canopy dominant (1.0) with relatively short (4 m) individuals providing cover from [5] 10% to 20%. On average, this species provides 14% cover across the community. Emory oak (*Quercus Emoryi*), alligator juniper (*Juniperus deppeana*), and silverleaf oak (*Quercus hypoleucoides*) are patchy associates that contribute little to the overall cover. In a few examples of this community, Arizona cypress (*Cupressus arizonica*) provided a few scattered, relatively short-statured (<5 m) individuals. This is mainly due to the close proximity of this community to one dominated by that species.

Within the subcanopy, Toumey oak (*Quercus* toumeyi) is consistently present (1.0) and typically dominant (0.83) with cover ranging from 5% to 10% in most examples. This species ranges from shrubby individuals with heights around 1.5 meters, to taller, more tree-like ones with heights reaching above 2 meters. In some examples, Sonoran scrub oak (*Quercus turbinella*) may present as co-dominant/subdominant with/to Toumey oak (*Quercus* toumeyi), providing cover ranging up to 5%. Manzanita (*Arctostaphylos* sp.) provides dominance in most (0.66) examples of this community. Pointleaf manzanita (*Arctostaphylos pungens*) is commonly found at the lower elevational range, while Pringle's manzanita (*Arctostaphylos pringlei*) is found at the upper range. When present, both species provide cover around 5% each. Silverleaf oak (*Quercus hypoleucoides*) is a patchy associate that is most commonly found in high, typically north-facing backslopes and/or along the base of bedrock outcrops/cliff bands. In order from most to least frequent, other noteworthy subcanopy species include beargrass (*Nolina microcarpa*),

common sotol (*Dasylirion wheeleri*), Wright's silktassel (*Garrya wrightii*), yucca (*Yucca madrensis*), and Palmer's century plant (*Agave palmeri*).

The sparse (<10%) field stratum contains a low-cover mix of species most commonly characterized by bullgrass (*Muhlenbergia emersleyi*) and rockloving spikemoss (*Selaginella rupincola*). Cover of these species varies widely and is very dependent on the availability of open soil. These species rarely provide more than 5% cover each, and they are typically most common on the lower-angle shoulders and summits. Schott's century plant (*Agave schottii*) is a patchy associate with inclusions of cover up to 5%.

GLOBAL TYPE CONCEPT DESCRIPTION (ASSOCIATION LEVEL)

This Madrean conifer woodland occurs in the "Borderlands" region in southeastern Arizona and extreme southwestern New Mexico (Animas and Peloncillo mountains), and it likely occurs in adjacent northern Mexico. Stands are small and patchy in distribution and limited to mountain and foothill slopes at elevations of 1,800 to 1,860 meters; they are often found within a matrix of *Quercus toumeyi* chaparral. Soils are derived from rhyolite parent material. This late-successional woodland association has an open to moderately dense tree canopy (20–80% cover) co-dominated by the evergreen trees *Pinus discolor* and *Juniperus deppeana*, with occasional *Juniperus coahuilensis* (= *Juniperus erythrocarpa*), *Juniperus monosperma, Quercus arizonica*, or *Quercus emoryi* present. The moderately dense to dense shrub layer (>25% cover) is dominated by the broad-leaved evergreen oaks *Quercus toumeyi* and *Quercus toumeyi x grisea* hybrid, and includes many other shrub species, such as *Arctostaphylos pungens*, *Garrya wrightii, Nolina microcarpa, Agave palmeri, Rhus trilobata, Rhus virens,* and *Dasylirion wheeleri*. The herbaceous layer is generally sparse and dominated by perennial grasses with scattered forbs. Species include *Schizachyrium cirratum*, *Aristida schiedeana var. orcuttiana* (= *Aristida orcuttiana*), *Bouteloua curtipendula, Muhlenbergia emersleyi, Eragrostis intermedia, Bouteloua gracilis, Piptochaetium fimbriatum, Phaseolus* spp., and *Desmodium* spp. The dominance of *Quercus toumeyi* in the shrub layer is diagnostic of this *Pinus discolor* woodland type.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 151. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Pinus discolor* (1.0)
Subcanopy (0.5–2 m)	*Quercus toumeyi* (1.0), *Arctostaphylos pungens* (0.55), *Arctostaphylos pringlei* (0.33)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 152. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Cupressus arizonica*
Subcanopy (0.5–2 m)	*Quercus turbinella, Quercus hypoleucoides, Quercus emoryi, Garrya wrightii, Nolina microcarpa, Yucca madrensis, Agave palmeri, Dasylirion wheeleri*
Field (0–0.5 m)	*Muhlenbergia emersleyi, Selaginella rupincola, Agave schottii*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on nine plots sampled during the 2013–2017 mapping and classification effort.

Polygons assigned to this community are spread across three types mapped by Roseberry and Dole (1939). The first is a timberland chaparral type defined by containing "80% or more shrub species common to the transition life zone." The second is a pinyon, juniper, or cypress type defined by containing "20% or more of any of the above species, to the exclusion of commercial types of trees." The third is a pine type defined by "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

This described community fits extremely well within *Pinus discolor* / *Quercus toumeyi* Woodland Association (CEGL000773). Its type concept includes all diagnostic species present within, and landforms covered by, our local description.

Classification confidence: Low - Poorly Documented

NatureServe conservation status: Data not available

Global status: G2

Rounded global status: G2 - Imperiled

Global range: Only documented from the southwestern corner of New Mexico, but it probably occurs elsewhere in the "Borderlands" region of southeastern Arizona, southwestern New Mexico, and northern Mexico.

Reasons: This association is restricted to the "Borderlands" of southeastern Arizona and southwestern New Mexico, and possibly the very northern Sierra Madre Occidentale of Mexico. Stands are small, and they reflect the late successional stage transformation of interior chaparral to pinyon woodland. Stands continue to be impacted by fuelwood harvest and grazing throughout the association's distribution.

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS187, IPS188, IP464U, IPS620, IPS621, IPS623, IPS781, IPS848, IPS851

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. *Pinus discolor* / *Quercus toumeyi* Woodland, version date 26Nov1997. U.S. National Vegetation Classification Database, V2.01 (2017). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed December 17, 2018.

72. *Quercus arizonica - Quercus emoryi* (*Platanus wrightii*) Intermittently Flooded Woodland Association (P)

Translated name: Arizona white oak - Emory oak (Arizona sycamore) Intermittently Flooded Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN167

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [1.B.1.Nd]
Macrogroup	Madrean Lowland Evergreen Woodland [M010]
Group	–
Alliance	–
Association	*Quercus arizonica - Quercus emoryi* (*Platanus wrightii*) Intermittently Flooded Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This woodland community is distributed throughout the mid-elevation regions of the park, mainly along the eastern boundary of the park.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community spans low-angle drainages and the adjacent slopes of variable aspects at elevations around 1,350 meters (4,429 ft). Within the watercourse, the surface cover is dominated by fine gravel with scattered boulders and occasional expanses of exposed bedrock. The adjacent slopes are typically dominated by bare soil with a considerable layer of oak-leaf litter and duff.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This intermittently flooded woodland community is characterized by a moderate to dense (27–50%) upper canopy (>5 m) co-dominated by Arizona white oak (*Quercus arizonica*) and Emory Oak (*Quercus emoryi*) with a sparse understory of mixed shrubs and perennial grasses. Arizonian white oak (*Quercus arizonica*) is present as large (7 m) trees with a total average cover of 19%. In general, this species is most dominant in the narrow, upper reaches of the drainages; it gradually becomes less and less common in the lower stretches where the canyon begins to widen and become more exposed. Emory oak (*Quercus emoryi*) is also present as large (7 m) trees with slightly lower total cover averaging 16%. Arizona sycamore (*Platanus wrightii*) is occasional (<5%) throughout with heights exceeding that of the oaks. Alligator juniper (*Juniperus deppeana*), border pinyon (*Pinus discolor*), and velvet ash (*Fraxinus velutina*) are low-cover associates. Arizona madrone (*Arbutus arizonica*), silverleaf oak (*Quercus hypoleucoides*), black cherry (*Prunus serotina*), and Arizona walnut (*Juglans major*) are occasional throughout.

The subcanopy stratum (0.5–2 m) is characterized by a diverse, but low-cover (3–10%), mix of shrubs and subshrubs. The most common of these are evergreen sumac (*Rhus virens*), pointleaf manzanita (*Arctostaphylos pungens*), betonyleaf brickellbush (*Brickellia betonicifolia*), catclaw mimosa (*Mimosa aculeaticarpa*), yucca (*Yucca madrensis*), Wright's silktassel (*Garrya wrightii*), Fendler's ceanothus (*Ceanothus fendleri*), fragrant sumac (*Rhus aromatic*), and Chihuahuan brickellbush (*Brickellia floribunda*). Mule-fat (*Baccharis salicifolia*), a facultative wetland species, is a sparse but noteworthy component of the shrub layer.

The field stratum (<0.5 m) is characterized by a sparse (4–7%) mix of perennial grasses and forbs. Typically, the highest cover, especially for the grasses, is along the margins of the community in the ecotone with the adjacent

tree savannas. Perennial grass cover is divided amongst a diverse suite of natives and non-natives, including sideoats grama (*Bouteloua curtipendula*), green sprangletop (*Leptochloa dubia*), deergrass (*Muhlenbergia rigens*), cane bluestem (*Bothriochloa barbinodis*), single threeawn (*Aristida schiedeana*), weeping lovegrass (*Eragrostis curvula*), and Lehmann lovegrass (*Eragrostis lehmanniana*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 153. Most abundant species for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Quercus arizonica, Quercus emoryi, Platanus wrightii*
Canopy (2–5 m)	*Quercus arizonica, Quercus emoryi*
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	None

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 154. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Juniperus deppeana, Pinus discolor, Quercus hypoleucoides*
Canopy (2–5 m)	*Arbutus arizonica*, *Juglans major, Prunus serotina*
Subcanopy (0.5–2 m)	*Rhus virens, Rhus aromatic, Brickellia floribunda*, *Garrya wrightii, Arctostaphylos* pungens, *Ceanothus fendleri, Garrya wrightii, Baccharis salicifolia*
Field (0–0.5 m)	*Eragrostis lehmanniana*, *Muhlenbergia emersleyi, Muhlenbergia rigens, Brickellia betonicifolia, Leptochloa dubia, Bouteloua curtipendula, Bothriochloa barbinodis, Aristida schiedeana, Elionurus barbiculmis, Eragrostis curvula,*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

Data not available

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: None

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

73. *Cupressus arizonica* / *Quercus hypoleucoides* Forest Association

Translated name: Arizona cypress / Silverleaf oak Forest Association

NVC name: CEGL000352

Identifier: N/A

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [D060]
Macrogroup	Madrean Lowland Evergreen Woodland [M010]
Group	Madrean Encinal [G201]
Alliance	Arizona Cypress Forest and Woodland [A0163]
Association	*Cupressus arizonica - Quercus hypoleucoides* Forest [CEGL000352]

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This forest community is widespread across the eastern slopes of Rincon Peak, especially throughout Paige and Ash canyons. One example was documented in a drainage on the western slopes of Heartbreak Ridge.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is typically found in steep (35–50%) mountain drainages and adjacent, north-facing slopes from 1,767 to 2,072 meters (5,800–6,800 ft). Within the drainages, the surface cover is characterized by a mix of exposed bedrock and large boulders along the watercourse; the banks are covered by shallow litter. The adjacent slopes are typically dominated by a dense layer of pine and oak litter with conspicuous outcrops of exposed bedrock.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forest community is characterized by an open to closed (20–50%) upper-canopy stratum (>5 m) dominated by Arizona cypress (*Cupressus arizonica*) and border pinyon (*Pinus discolor*) with a diverse understory of oaks (*Quercus* sp.) and assorted chaparral shrubs. This community typically occupies very narrow strips along drainages and adjacent slopes, and it may include many associate species more connected with the adjacent woodland communities than the drainage. While the drainage and adjacent slope versions have the same dominants, the composition and abundance of understory components can be quite different.

Arizona cypress (*Cupressus arizonica*) is a diagnostic species that is present as tall (10–15 m) individuals with cover ranging from 10% to 40%. Border pinyon (*Pinus discolor*) is not a diagnostic species and is typically present in the adjacent woodland communities, albeit with a noticeably shorter stature. In general, this species is slightly shorter (8–10 m) and provides lower cover (10–20%) than Arizona cypress (*Cupressus arizonica*). Shorter individuals of both species were documented in the low-canopy stratum (2–5 m), but they provided little cover (1%).

The low-canopy stratum (2–5 m) is characterized by a low-cover (5–15%) mix of oak trees including silverleaf oak (*Quercus hypoleucoides*), netleaf oak (*Quercus rugosa*), and Arizona white oak (*Quercus arizonica*). These species are typically present at heights ranging from 3 to 5 meters, with cover typically less than 5 [8]%. Each of these species, especially netleaf oak (*Quercus rugosa*), may be present with a shrubby growth form in the subcanopy stratum (0.5–2 m). In one example of this community, the combination of shrubby and tree-like netleaf oak (*Quercus rugosa*) provided cover (15%) approaching that of the upper-canopy trees. While present in the drainage version, netleaf oak (*Quercus rugosa*) and silverleaf oak (*Quercus hypoleucoides*) are more common, and may be dominant understory components, in the adjacent slope variation.

Excluding the shrubby oak species, the subcanopy stratum is defined by a mix of shrubs with manzanita (*Arctostaphylos* sp.) providing the most consistent cover. Both pointleaf manzanita (*Arctostaphylos pungens*) and Pringle's manzanita (*Arctostaphylos pringlei*) provide examples with cover above 5%. These species are typically dominants in the adjacent woodland communities and are not a diagnostic component of this community. Other documented subcanopy species include Fendler's ceanothus (*Ceanothus fendleri*), Wright's silktassel (*Garrya wrightii*), Arizona orange (*Choisya dumosa* var. *arizonica*), deerbrush (*Ceanothus integerrimus*), California brickellbush (*Brickellia californica*), and yucca (*Yucca madrensis*).

The field stratum (<0.5 m) is characterized by a low-cover (<10%) mix of grasses and forbs with no consistent dominants or common associates. The most noteworthy species include longtongue muhly (*Muhlenbergia longiligula*), Underwood's spikemoss (*Selaginella underwoodii*), bullgrass (*Muhlenbergia emersleyi*), Pringle's speargrass (*Piptochaetium pringlei*), pinyon ricegrass (*Piptochaetium fimbriatum*), muttongrass (*Poa fendleriana*), and plains lovegrass (*Eragrostis intermedia*).

GLOBAL TYPE CONCEPT DESCRIPTION

This Madrean semi-riparian woodland occurs in the "Borderlands" area of southwestern New Mexico, and it potentially extends into southeastern Arizona, western Texas, and the northern Sierra Madre Occidentale of Mexico. Stands are naturally small, being restricted to elevated alluvial stream terraces on mesic aspects. This association has only been documented from one site in the Animas Mountains at an elevation of 1,770 meters. The stand occurs in a narrow valley on a north-facing terrace near an intermittent stream channel. The site is gently sloping (4%) with a sandy alluvium substrate. There is high cover (96%) of plant litter. These late-successional woodlands are dominated by broad-leaved evergreen trees with a sparse shrub layer and a moderately sparse herbaceous layer (<25% cover). The tree canopy is generally between 25% to 60% cover, and it is co-dominated by *Quercus* emoryi and *Quercus arizonica* with scattered *Juniperus deppeana*. The shrub layer consists of scattered shrubs (<10% cover), and it often has high diversity. *Rhus trilobata, Nolina microcarpa, Garrya wrightii, Juniperus deppeana, Pinus discolor, Cercocarpus montanus, Ericameria laricifolia,* and *Opuntia imbricata* are commonly present. The herbaceous layer is co-dominated by the perennial grasses *Piptochaetium fimbriatum* and *Bouteloua curtipendula*, but it is typically very diverse and includes sparse cover of many other grass and forb species. The diagnostic characteristics of this late-successional oak woodland are a moderately dense tree layer that is dominated or co-dominated by *Quercus emoryi*, with *Piptochaetium fimbriatum* present to dominating in the herbaceous layer.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 155. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Cupressus arizonica* (1.0), *Pinus discolor* (1.0)
Canopy (2–5 m)	*Quercus rugosa* (1.0), *Quercus arizonica* (1.0), *Quercus hypoleucoides* (0.75)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 156. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Arctostaphylos pungens, Arctostaphylos pringlei, Garrya wrightii, Yucca madrensis, Brickellia californica, Quercus rugosa, Ceanothus integerrimus, Choisya dumosa* var. *arizonica*
Field (0–0.5 m)	*Muhlenbergia emersleyi, Muhlenbergia longiligula, Eragrostis intermedia, Piptochaetium pringlei, Piptochaetium fimbriatum, Poa fendleriana, Eragrostis intermedia, Selaginella underwoodii*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from four plots sampled during the 2013–2017 mapping and classification effort.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a broad group solely defined by the consistent presence of saguaro (*Carnegiea gigantea*).

Global

This described community fits well within the *Cupressus arizonica* / *Quercus hypoleucoides* Forest Association (CEGL000352). Its type concept includes all diagnostic species present within, and landforms covered by, our local description.

Classification confidence: Low - Poorly Documented

NatureServe conservation status: Data not available

Global status: G2 (21Oct1997)

Rounded global status: G2 - Imperiled

Global range: Only documented from the southwestern corner of New Mexico, but it probably occurs elsewhere in the "Borderlands" region of southeastern Arizona, southwestern New Mexico, and northwestern Mexico. It potentially occurs in the Trans-Pecos region of Texas and Mexico.

Reasons: This association is limited in its distribution to the "Borderlands" of southeastern Arizona and southwestern New Mexico, and possibly in the Trans-Pecos region of western Texas and the northern Sierra Madre Occidentale of Mexico. Stands are small and reflect the late successional stage of mesic Sierra Madrean forest. They are very high in grass and forb diversity, with a preponderance of Sierra Madrean elements that have a restricted distribution in the U.S. Grazing and timber harvesting (to a lesser degree) continue to impact the association throughout its range.

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS186, IP424H, IP511H, IPS622

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Western Ecology Group, K. A. Schulz. *Cupressus arizonica - Pinus discolor* Intermittently Flooded Woodland, version date 26Nov1997. U.S. National Vegetation Classification Database, V2.01 (2017). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed December 17, 2018.

74. *Pinus* (*arizonica - ponderosa*) Regenerating Woodland Association (P)

Translated name: Pine (Arizona - ponderosa) Regenerating Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN146

NVC CLASSIFICATION

Division	Madrean - Balconian Forest and Woodland [1.B.1.Nd]
Macrogroup	Madrean Montane Forest and Woodland [M011]
Group	Madrean Lower Montane Pine - Oak Forest and Woodland [G203]
Alliance	*Pinus arizonica - Pinus engelmannii - Pinus leiophylla* Woodland Alliance [A3112]
Association	*Pinus* (*arizonica - ponderosa*) Regenerating Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present throughout the trail system that surrounds Manning Camp.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This regenerating woodland community is typically found on mountain backslopes of variable grade (10–50+%) with a southern or eastern aspect from 2,140 to 2,480 meters (7,000–8,140 ft). The surface cover is characterized by moderately deep and well-drained loam underlying a thick layer of pine-needle litter and duff with patchy boulders and bedrock outcrops. The parent material is a mix of quartz monzonite and mica schist. All examples of this community show conspicuous sign of high severity fire disturbance.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This regenerating woodland community is characterized by a variably dense (20–50+%) lower canopy (>5 m) and subcanopy (0.5–2 m) dominated by regenerating Arizona pine (*Pinus arizonica*) and/or ponderosa pine (*Pinus ponderosa*). This type is a result of historic fire disturbance and pre-fire was likely a mature woodland/forest with a similar species composition. Currently, the upper canopy (>5 m) is absent, represented by scattered snags, or just a few mature trees.

The dominant layer of pines ranges from 1 to 2 meter tall saplings to 2 to 4 meter tall poles that are typically of the same age class within each mapped area. Arizona pine (*Pinus arizonica*) tends to dominate at the lower elevational range of this community and/or on steeper, more exposed slopes, while ponderosa pine (*Pinus ponderosa*) occupies the higher elevation, more-sheltered slopes. In addition to the listed dominants, the low/sub-canopies contain a number of associate trees and shrubs. Silverleaf oak (*Quercus hypoleucoides*) is a patchy associate that ranges from absent to occasional dense inclusions of dominance where it competes for dominance with the pine species. This species ranges from small (<2 m), shrubby individuals to larger (2–4 m) trees. Other documented associates include Fendler's ceanothus (*Ceanothus fendleri*), netleaf oak (*Quercus rugosa*), Arizona white oak (*Quercus arizonica*), and California buckthorn (*Frangula californica*).

The sparse (<5%) field stratum (<0.5 m) is characterized by a mix of low-cover associates, including longtongue muhly (*Muhlenbergia longiligula*), western brackenfern (*Pteridium aquilinum*), White Mountain sedge (*Carex geophila*), and screwleaf muhly (*Muhlenbergia virescens*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This woodland alliance occurs in mountains below the Mogollon Rim in southeastern Arizona, southwestern New Mexico, and northern Mexico. Woodlands included in this alliance are characterized by an open tree canopy, 10 to 25 meters tall, dominated by the Madrean evergreen conifer trees, *Pinus arizonica, Pinus engelmannii, Pinus leiophylla*, or less commonly, *Pinus ponderosa*, which often occurs at higher elevation or in the northern extent of the alliance. The moderately dense subcanopy is dominated by evergreen trees, such as *Quercus emoryi, Quercus hypoleucoides*, or *Quercus rugosa*, with a diverse mixture of small trees that may include *Juniperus deppeana, Pinus discolor, Pinus edulis, Quercus arizonica*, or *Quercus grisea*. The shrub layer is typically moderately dense to dense, depending on the density of the tree canopy, and is often dominated by the same *Quercus* species that make up the tree subcanopy and other shrubs, such as *Agave parryi, Arbutus arizonica, Ceanothus fendleri, Garrya wrightii, Quercus gambelii, Quercus toumeyi, Quercus turbinella, Rhus trilobata*, and *Yucca madrensis*. The herbaceous layer is composed primarily of perennial graminoids, particularly *Muhlenbergia longiligula* and *Piptochaetium fimbriatum*, which can dominate the understory when the shrub layer is sparse. Forb diversity may be high, but few species have much cover. Diagnostic of this woodland alliance is the tree canopy dominated by *Pinus engelmannii, Pinus leiophylla, Pinus arizonica*, or the more northern species, *Pinus ponderosa,* as long as Madrean species characterize the understory. Sites range from mesic, nearly level washes, stream terraces, toeslopes, benches, and terraces to very steep, rocky, xeric mountain slopes. Aspect is variable depending on elevation. Soils range from moderately deep alluvium to shallow, lithic colluvium and residuum. Elevation ranges from 1,460 to 2,400 (2,700) meters. Aspect varies with elevation. Soils range from moderately deep alluvium to shallow, lithic colluvium and residuum.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 157. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Pinus arizonica* (1.0), *Pinus ponderosa* (1.0), *Quercus hypoleucoides* (1.0)
Subcanopy (0.5–2 m)	*Pinus arizonica* (1.0), *Pinus ponderosa* (1.0), *Quercus hypoleucoides* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 158. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Ceanothus fendleri, Frangula californica, Quercus rugosa, Quercus arizonica*
Field (0–0.5 m)	*Muhlenbergia longiligula, Muhlenbergia virescens, Carex geophila, Pteridium aquilinum*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

Polygons attributed as NPSSODN131 overlap with one group classified by Roseberry and Dole (1939), a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: This community was classified using photo points and observations. No plot data were taken.

Plots:

Local description authors: J. Galvin, E. Sandoval

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Brown, D. E., C. H. Lowe, and C. P. Pase. 1979. *Pinus arizonica - Pinus engelmannii - Pinus leiophylla* Woodland Alliance, version date 08Jan2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed August 28, 2019.

75. *Pinus arizonica* / *Quercus hypoleucoides* Woodland Association (P)

Translated name: Arizona pine / Silverleaf oak Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN145

NVC CLASSIFICATION

Division	Madrean - Balconian Forest and Woodland [1.B.1.Nd]
Macrogroup	Madrean Montane Forest and Woodland [M011]
Group	Madrean Lower Montane Pine - Oak Forest and Woodland [G203]
Alliance	*Pinus arizonica - Pinus engelmannii - Pinus leiophylla* Woodland [A3112]
Association	*Pinus arizonica* / *Quercus hypoleucoides* Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present throughout the trail system that surrounds Manning Camp, on the slopes below Reef Rock, and on the upper slopes of Heartbreak Ridge.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is typically found on mountain backslopes of variable grade (10–50+%) with a southern or eastern aspect from 2,140 to 2,480 meters (7,000–8,140 ft). The surface cover is characterized by moderately deep and well-drained loam underlying a thick layer of pine-needle litter and duff with patchy boulders and bedrock outcrops. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is characterized by a variably dense (30–65%) upper canopy (>5 m) dominated by Arizona pine (*Pinus arizonica*) and silverleaf oak (*Quercus hypoleucoides*) with a variable understory typically composed of additional oak species. This community is present across broad slopes that include minor drainages where associate species may be distinctly different from the more upland version.

Arizona pine (*Pinus arizonica*) is present as large (10–30 m) trees with variable cover ranging from 10% to 45%, with an average around 30%. This species is the primary overstory species with all others typically present in the mid-canopy or as shrubby individuals in the understory. At the upper elevational range of this community and/or on less-exposed slopes, ponderosa pine (*Pinus ponderosa*) may begin to appear but should never outcompete Arizona pine (*Pinus arizonica*) as the dominant canopy tree. Southwestern white pine (*Pinus strobiformis*) is a patchy (0.43) canopy tree that ranges from absent to subdominant with cover ranging up to 25%. At the lower elevational range of this community, Chihuahuan pine (*Pinus leiophylla*) may begin to appear but should never become dominant. Silverleaf oak (*Quercus hypoleucoides*) provides very consistent (1.0) presence, often as a co-dominant or subdominant to Arizona pine (*Pinus arizonica*). This species is typically present as medium-sized (5–15 m) trees with cover ranging from a sparse associate with <5% cover to a co-dominant with some inclusions up to 40%. On average, this species provides around 17% across the broader community. Three additional mid-canopy trees are more inconsistently distributed (0.5–0.8) throughout the community with considerably lower average cover (5%). These species include alligator juniper (*Juniperus deppeana*), Arizona white oak (*Quercus arizonica*), and netleaf oak (*Quercus rugosa*). At times, any of these species can become a co-dominant or subdominant with cover approaching 20%. In general, netleaf oak (*Quercus rugosa*) is most common in and along drainages and at the higher elevational limit of this community.

The lower canopy (2–5 m) is dominated by shorter, sometimes shrubby versions of the upper canopy oaks and junipers. Other noteworthy but uncommon species include Arizona madrone (*Arbutus arizonica*), black cherry (*Prunus serotina*), and Arizona walnut (*Juglans major*). These species are most commonly found along drainages.

The subcanopy stratum (0.5–2 m) is generally quite sparse (<5%) with no consistent dominants or associates. Netleaf oak (*Quercus rugosa*) can often appear as a shrubby associate species in this height stratum. Other noteworthy species include California buckthorn (*Frangula californica*), New Mexico raspberry (*Rubus neomexicanus*), Wilcox's barberry (*Berberis wilcoxii*), canyon grape (*Vitis arizonica*), and Fendler's ceanothus (*Ceanothus fendleri*).

The sparse (<10 [15]%) field stratum (<0.5 m) is characterized by the consistent presence (0.88) of longtongue muhly (*Muhlenbergia longiligula*) and a diverse mix of associate grasses and forbs. Other noteworthy species include western brackenfern (*Pteridium aquilinum*), fragrant snakeroot (*Ageratina herbacea*), screwleaf muhly (*Muhlenbergia virescens*), Pringle's speargrass (*Piptochaetium pringlei*), mountain muhly (*Muhlenbergia montana*), and White Mountain sedge (*Carex geophila*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This woodland alliance occurs in mountains below the Mogollon Rim in southeastern Arizona, southwestern New Mexico, and northern Mexico. Woodlands included in this alliance are characterized by an open tree canopy, 10–25 meters tall, dominated by the Madrean evergreen conifer trees, *Pinus arizonica*, *Pinus engelmannii*, *Pinus leiophylla*, or less commonly, *Pinus ponderosa*, which often occurs at higher elevation or in the northern extent of the alliance. The moderately dense subcanopy is dominated by evergreen trees, such as *Quercus emoryi*, *Quercus hypoleucoides*, or *Quercus rugosa*, with a diverse mixture of small trees that may include *Juniperus deppeana*, *Pinus discolor*, *Pinus edulis*, *Quercus arizonica*, or *Quercus grisea*. The shrub layer is typically moderately dense to dense depending on the density of the tree canopy, and is often dominated by the same *Quercus* species that make up the tree subcanopy and other shrubs, such as *Agave parryi*, *Arbutus arizonica*, *Ceanothus fendleri*, *Garrya wrightii*, *Quercus gambelii*, *Quercus toumeyi*, *Quercus turbinella*, *Rhus trilobata*, and *Yucca madrensis*. The herbaceous layer is composed primarily of perennial graminoids, particularly *Muhlenbergia longiligula* and *Piptochaetium fimbriatum*, which can dominate the understory when the shrub layer is sparse. Forb diversity may be high, but few species have much cover. Diagnostic of this woodland alliance is the tree canopy dominated by *Pinus engelmannii, Pinus leiophylla, Pinus arizonica*, or the more northern species, *Pinus ponderosa*, as long as Madrean species characterize the understory. Sites range from mesic, nearly level washes, stream terraces, toeslopes, benches, and terraces, to very steep, rocky, xeric mountain slopes. Aspect is variable depending on elevation. Soils range from moderately deep alluvium to shallow, lithic colluvium and residuum. Elevation ranges from 1,460 to 2,400 (2,700) meters. Aspect varies with elevation. Soils range from moderately deep alluvium to shallow, lithic colluvium and residuum.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 159. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Pinus arizonica* (0.73), *Quercus hypoleucoides* (0.73), *Juniperus deppeana* (0.40), *Quercus arizonica* (0.53), *Quercus rugosa* (0.60), *Pinus strobiformis* (0.40)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Muhlenbergia longiligula* (0.60)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 160. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus ponderosa, Pinus leiophylla*
Canopy (2–5 m)	*Arbutus arizonica, Prunus serotina, Juglans major*
Subcanopy (0.5–2 m)	*Ceanothus fendleri, Frangula californica, Rubus neomexicanus, Berberis wilcoxii, Vitis arizonica*
Field (0–0.5 m)	*Muhlenbergia virescens, Carex geophila, Pteridium aquilinum, Muhlenbergia montana, Piptochaetium pringlei, Ageratina herbacea*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 15 plots, 11 classification plots sampled during the 2013–2017 mapping and classification effort, and four upland soil and vegetation monitoring plots.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a broad group that "contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

This described community fits extremely well within the *Pinus arizonica - Pinus engelmannii - Pinus leiophylla* Woodland Alliance (A3112). Its type concept includes all diagnostic species present within, and landforms covered by, NPSSODN095. Eleven associations are nested under this group, but *Pinus arizonica* is not listed as the primary pine of the descriptions.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IP502H, IP504H, IP508U, IP510U, IP512U, IP517U, IP562U, IP580U, IPS691, IPS908, IPS909, V502_006, V502_012, V502_013, V502_014

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Brown, D. E., C. H. Lowe, and C. P. Pase. 1979. *Pinus arizonica - Pinus engelmannii - Pinus leiophylla* Woodland Alliance, version date 08Jan2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed August 28, 2019.

76. *Pinus leiophylla* / *Quercus hypoleucoides* Woodland Association

Translated name: Chihuahuan pine / Silverleaf oak Woodland Association

NVC name: CEGL000824

Identifier: N/A

NVC CLASSIFICATION

Division	Madrean - Balconian Forest and Woodland [D060]
Macrogroup	Madrean Montane Forest and Woodland [M011]
Group	Madrean Lower Montane Pine - Oak Forest and Woodland [G203]
Alliance	Arizona pine - Apache pine - Chihuahuan pine Woodland [A3112]
Association	*Pinus leiophylla* / *Quercus hypoleucoides* Woodland [CEGL000824]

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community was documented near Tanque Verde Peak, Cow Head Saddle, Heartbreak Ridge, and Rincon Peak. This community is present within the transition between the short-statured pinyon woodland and the large conifer forests at the top of the range.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is typically found on moderate-grade (10–30+%), mountain backslopes or variable aspects from 1,700 to 2,250 m (5,577–7,381 ft.). The surface cover is characterized by moderately deep and well-drained loam underlying a thick layer of pine-needle litter and duff with patchy boulders and bedrock outcrops. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is characterized by a variably dense (10–40%) overstory canopy (>10 m) dominated by Chihuahuan pine (*Pinus leiophylla*) with a variable (10–40%) mid-canopy (5–10 m) dominated by silverleaf oak (*Quercus hypoleucoides*). This community is present across broad slopes that include minor drainages where associate species may be distinctly different from the more upland version.

Chihuahuan pine (*Pinus leiophylla*) is present as large (10–20 m) trees with average cover around 20% and ranging from 10% to 30%. This species is the primary upper-canopy species with all others typically present in the mid-canopy or as shrubby individuals in the understory. At the upper elevational range of this community and/or on less-exposed slopes, ponderosa pine (*Pinus ponderosa*) or Arizona pine (*Pinus arizonica*) may begin to appear, rarely with cover similar to that of Chihuahuan pine (*Pinus leiophylla*).

In the mid-canopy, silverleaf oak (*Quercus hypoleucoides*) is present as consistent (1.0), medium-sized (4–8 m) trees with cover ranging from a sparse associate with <5% cover to a dominant with cover ranging from 10% to 30%. On average, this species provides around 15% cover across the broader community. Arizona white oak (*Quercus arizonica*) is a consistent (0.83) associate that, when present, provides average cover around 8%, occasionally becoming co-dominant with silverleaf oak (*Quercus hypoleucoides*). Netleaf oak (*Quercus rugosa*) is a less-consistent (0.53) associate that, when present, provides cover similar to Arizona white oak (*Quercus arizonica*). These oak species tend to fall along an elevational gradient where Arizona white oak (*Quercus arizonica*) is most common at lower elevations and netleaf oak (*Quercus rugosa*) at upper elevations. Alligator juniper (*Juniperus deppeana*) and border pinyon (*Pinus discolor*) are low-cover (<5%) associates. Other noteworthy, but uncommon, species include Arizona madrone (*Arbutus arizonica*), black cherry (*Prunus serotina*, most commonly along drainages), and Arizona walnut (*Juglans major*).

The subcanopy stratum (0.5–2 m) is generally quite variable (1–25%) and is most commonly dominated by shrubby versions of the mid-canopy oak species. Within this stratum, silverleaf oak (*Quercus hypoleucoides*) is still the most consistent (0.92) and dominant oak species. In order from most to least frequent, other noteworthy species include yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), Fendler's ceanothus (*Ceanothus fendleri*), pointleaf manzanita (*Arctostaphylos pungens*), Wright's silktassel (*Garry wrightii*), and California buckthorn (*Frangula californica*).

The sparse (<10%) field stratum (<0.5 m) is characterized by a low-cover mix of graminoids and perennial forbs. Longtongue muhly (*Muhlenbergia longiligula*) is the most consistent (0.86) species that ranges from absent to up to 5% cover. Other noteworthy species include single threeawn (*Aristida schiedeana*), muttongrass (*Poa fendleriana*), New Mexico fleabane (*Erigeron neomexicana*), and Texas bluestem (*Schizachyrium cirratum*).

GLOBAL TYPE CONCEPT DESCRIPTION (ASSOCIATION LEVEL)

This highly diverse Madrean woodland association is restricted to the isolated sky-island mountain ranges of southwestern New Mexico, southern Arizona, and northern Mexico. It is specifically known from the Canelo Hills and Santa Catalina, Santa Rita, Patagonia, Chiricahua, Peloncillo, and Huachuca mountains. There are a few isolated outliers in the central highlands of Arizona (Fort Apache Indian Reservation). Stands typically occur at elevations from 1,740 to 2,165 meters (5,700–7,100 ft) on steep to very steep slopes with variable aspects. Generally, sites are warm and dry to very dry. The association is characterized by an open canopy of *Pinus leiophylla* with a subcanopy of *Pinus discolor*, *Juniperus deppeana*, and evergreen oaks, including *Quercus hypoleucoides* and *Quercus arizonica*. The dominance of *Quercus hypoleucoides* over *Quercus arizonica* is diagnostic. In some cases, *Quercus arizonica* will be absent; *Quercus emoryi* is also absent or rare. Along with evergreen oaks, the shrub layer may contain a variety of xeric species, such as *Arbutus arizonica*, *Nolina microcarpa*, *Agave parryi*, *Garrya wrightii*, *Agave schottii*, *Rhus aromatica*, and *Arctostaphylos* spp. Cover of *Arctostaphylos* spp. is generally less than 5%. The herb layer is characterized by xeric grasses, such as *Muhlenbergia longiligula*, *Muhlenbergia emersleyi*, or *Aristida schiedeana* var. *orcuttiana* [= *Aristida orcuttiana*]; *Piptochaetium fimbriatum* is absent or accidental. Forbs are diverse, variable, and sparse; the most constant are *Hedeoma hyssopifolia*, *Desmodium rosei*, *Cheilanthes fendleri*, *Gnaphalium* spp., and *Packera neomexicana* [= *Senecio neomexicanus*].

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 161. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Pinus leiophylla* (1.0)
Canopy (2–5 m)	*Quercus hypoleucoides* (1.0), *Quercus arizonica* (0.93)
Subcanopy (0.5–2 m)	*Quercus hypoleucoides* (1.0)
Field (0–0.5 m)	*Muhlenbergia longiligula* (0.75)

*Values in () indicate the frequency a species occurs in the classification plots used to describe this association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 162. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus ponderosa, Pinus arizonica*
Canopy (2–5 m)	*Juniperus deppeana, Quercus rugosa, Arbutus arizonica, Prunus serotina, Juglans major, Pinus discolor*
Subcanopy (0.5–2 m)	*Quercus arizonica, Quercus rugosa, Ceanothus fendleri, Frangula californica, Yucca madrensis, Nolina microcarpa, Ceanothus fendleri, Arctostaphylos pungens, Garrya wrightii*
Field (0–0.5 m)	*Aristida schiedeana, Poa fendleriana, Erigeron neomexicana, Schizachyrium cirratum*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 15 plots sampled during the 2013–2017 mapping and classification effort.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a broad group that "contain[s] 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

This described community fits extremely well within the USNVC-accepted *Pinus leiophylla* / *Quercus hypoleucoides* Woodland Association (CEGL000824). Its type concept includes all diagnostic species present within, and landforms covered by, this community.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: G3 (01Dec2000)

Rounded global status: G3 - Vulnerable

Global range: This woodland association is restricted to the isolated mountain ranges of southwestern New Mexico, southern Arizona, and northern Mexico. It is specifically known from the Canelo Hills and Santa Catalina, Santa Rita, Patagonia, Chiricahua, Peloncillo, and Huachuca mountains. There are a few isolated outliers in the central highlands of Arizona (Fort Apache Indian Reservation).

Reasons: This is a limited regional endemic community of the isolated sky-island mountain ranges of southwestern New Mexico, southern Arizona, and northern Mexico. It has a patchy occurrence throughout its range. The number of high-quality occurrences are not likely to exceed 100 and may be much less. Occurrence numbers in Mexico are unknown.

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IP501H, IP513H, IP520H, IPS612, IPS646, IPS654, IPS655, IPS676, IPS677, IPS726, IPS735, IPS835, IPS839, IPS847, IPS872

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Muldavin, E. 1996. *Pinus leiophylla* / *Quercus hypoleucoides* Woodland Association, version date 26Nov1997. U.S. National Vegetation Classification Database, V2.01 (2017). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed December 12, 2018.

77. *Pinus ponderosa* / *Quercus arizonica - Quercus emoryi* Woodland Association

Translated name: Ponderosa pine / Arizona white oak - Emory oak Woodland Association

NVC name: CEGL000869

NVC CLASSIFICATION

Division	Madrean - Balconian Forest and Woodland [1.B.1.Nd]
Macrogroup	Madrean Montane Forest and Woodland [M011]
Group	Madrean Lower Montane Pine - Oak Forest and Woodland [G203]
Alliance	*Pinus arizonica - Pinus engelmannii - Pinus leiophylla* Woodland Alliance [A3112]
Association	*Pinus ponderosa* / *Quercus arizonica - Quercus emoryi* Woodland [CEGL000869]

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community was only documented in one location—a small basin east of Juniper Basin Campground.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is typically found on low-angle (20%) slopes and in sheltered basins around 1,900 meters (6,233 ft). The surface cover is characterized by moderately deep and well-drained loam underlying a thick layer of pine-needle litter and duff with patchy boulders and bedrock outcrops. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is characterized by a moderately dense (40–60%) canopy (>5 m) dominated by emergent ponderosa pine (*Pinus ponderosa*) above Arizona white oak (*Quercus arizonica*) and Emory oak (*Quercus emoryi*) with a variable understory often composed of bullgrass (*Muhlenbergia emersleyi*). Ponderosa pine (*Pinus ponderosa*) is present as large (10–20 m) trees with variable cover ranging from 20% to 30%. This species is the primary overstory species, with all others typically present in the mid-canopy or as shrubby individuals in the understory. Arizona white oak (*Quercus arizonica*) and Emory oak (*Quercus emoryi*) are consistent (1.0) subdominants to ponderosa pine (*Pinus ponderosa*) as medium-sized (5–15 m) trees with average cover around 10% each. Alligator juniper (*Juniperus deppeana*) is a lower-cover associate with cover that rarely surpasses 5%.

The subcanopy stratum (0.5–2 m) is generally quite sparse (<5%) with no consistent dominants or associates. Documented species include yucca (*Yucca madrensis*), Wright's silktassel (*Garrya wrightii*), beargrass (*Nolina microcarpa*), and Fendler's ceanothus (*Ceanothus fendleri*).

The moderately sparse (10–20%) field stratum (<0.5 m) is characterized by the consistent presence (1.0) and typical dominance of bullgrass (*Muhlenbergia emersleyi*). On average, this species provides around 15% cover, typically in areas with low overstory canopy. Other documented species include pinyon ricegrass (*Piptochaetium fimbriatum*), single threeawn (*Aristida schiedeana*), and mutton grass (*Poa fendleri*).

GLOBAL TYPE CONCEPT DESCRIPTION (ASSOCIATION LEVEL)

This *Pinus ponderosa* woodland occurs at relatively low elevations in the mountains of Trans-Pecos Texas. *Quercus emoryi* dominates the oak understory, often with *Quercus grisea*. Grasses include *Bouteloua curtipendula*, *Bouteloua gracilis*, *Bothriochloa barbinodis*, and others. It may grade upslope to *Pinus ponderosa* / *Quercus grisea* Woodland (CEGL000871). In Texas, this community is known from the Davis Mountains.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 163. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Pinus ponderosa* (1.0), *Quercus arizonica* (1.0), *Quercus emoryi* (1.0)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Muhlenbergia emersleyi* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 164. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Juniperus deppeana*
Subcanopy (0.5–2 m)	*Ceanothus fendleri, Yucca madrensis, Garry wrightii, Nolina microcarpa*
Field (0–0.5 m)	*Piptochaetium fimbriatum, Poa fendleri, Aristida schiedeana*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from one plot sampled during the 2013–2017 mapping and classification effort.

Global

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS701

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Stuever, M. C., and J. S. Hayden. 1997. *Pinus ponderosa* / *Quercus emoryi* Woodland Association, version date 08Jan2018. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed August 28, 2019.

78. *Pinus ponderosa* / *Quercus hypoleucoides* Woodland Association

Translated name: Ponderosa pine / Silverleaf oak Woodland Association

NVC name: CEGL000872

Identifier: N/A

NVC CLASSIFICATION

Division	Madrean - Balconian Forest and Woodland [D060]
Macrogroup	Madrean Montane Forest and Woodland [M011]
Group	Madrean Lower Montane Pine - Oak Forest and Woodland [G203]
Alliance	Arizona pine - Apache pine - Chihuahuan pine Woodland [A3112]
Association	*Pinus ponderosa* / *Quercus hypoleucoides* Woodland [CEGL000872]

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present on the northern slopes of Mica Mountain and in the Happy Valley Saddle.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is typically found on mountain backslopes and ridges of variable grade (10–40%) from 1,820 to 2,353 meters (5,971–7,719 ft). The surface cover is characterized by moderately deep and well-drained loam underlying a thick layer of pine-needle litter and duff with patchy boulders and bedrock outcrops. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is characterized by a variably dense (30–65%) upper canopy (>5 m) dominated by ponderosa pine (*Pinus ponderosa*) and silverleaf oak (*Quercus hypoleucoides*) with a variable understory typically composed of additional oak species. This community is present across broad slopes that include minor drainages where associate species may be distinctly different from the more upland version.

Ponderosa pine (*Pinus ponderosa*) is present as large (10–30 m tall) trees with variable cover ranging from 10% to 45%, with an average around 30%. This species is the primary overstory species, with all others typically present in the mid-canopy or as shrubby individuals in the understory. Both southwestern white pine (*Pinus strobiformis*) and Chihuahuan pine (*Pinus leiophylla*) were present as patchy associates with occasional areas of subdominance. Silverleaf oak (*Quercus hypoleucoides*) provides very consistent (1.0) presence, often as a co-dominant or subdominant to Arizona pine (*Pinus ponderosa*). *Quercus hypoleucoides* is typically present as medium-sized (5–15 m) trees with cover ranging from a sparse associate with <5% cover to a co-dominant with some inclusions up to 40%. On average, this species provides around 17% cover across the broader community. Arizona white oak (*Quercus arizonica*) is a consistent (0.85) canopy tree that ranges from an associate to a co-dominant with average cover around 7%. At the lower elevational range of this community, Arizona white oak (*Quercus arizonica*) may begin to outcompete silverleaf oak (*Quercus hypoleucoides*). Two additional mid-canopy trees are more inconsistently distributed (0.5–0.8) throughout the community with considerably lower average cover (5%). These species are alligator juniper (*Juniperus deppeana*) and netleaf oak (*Quercus rugosa*). At times, either of these species can become co-dominant or subdominant with cover approaching 20%. In general, netleaf oak (*Quercus rugosa*) is most common in and along drainages and at the higher elevational limit of this community.

The lower canopy (2–5 m) is dominated by shorter, sometimes shrubby versions of the upper-canopy oaks and junipers. Other noteworthy, but uncommon, species include Arizona madrone (*Arbutus arizonica*), black cherry (*Prunus serotina;* most commonly along drainages), and Arizona walnut (*Juglans major*).

The subcanopy stratum (0.5–2 m) is generally quite sparse (<5%) with no consistent dominants or associates. Netleaf oak (*Quercus rugosa*) and silverleaf oak (*Quercus hypoleucoides*) can often appear as shrubby associate species in this height stratum. Other noteworthy species include California buckthorn (*Frangula californica*), New Mexico raspberry (*Rubus neomexicanus*), Wilcox's barberry (*Berberis wilcoxii*), canyon grape (*Vitis arizonica*), and Fendler's ceanothus (*Ceanothus fendleri*).

The sparse (<10 [15]%) field stratum (<0.5 m) is characterized by the consistent presence (0.85) of longtongue muhly (*Muhlenbergia longiligula*) and a diverse mix of associate grasses and forbs. Other noteworthy species include western brackenfern (*Pteridium aquilinum*), screwleaf muhly (*Muhlenbergia virescens*), Pringle's speargrass (*Piptochaetium pringlei*), mountain muhly (*Muhlenbergia montana*), and White Mountain sedge (*Carex geophila*).

GLOBAL TYPE CONCEPT DESCRIPTION (ASSOCIATION LEVEL)

This highly diverse Madrean woodland association is restricted to the isolated sky-island mountain ranges of southwestern New Mexico, southern Arizona, Trans-Pecos of Texas, and northern Mexico. It is specifically known from the Santa Catalina, Pinal, Santa Rita, Galiuro, Pinaleño, Chiricahua, Huachuca, Davis, and Peloncillo mountains. It is occasional along the southern edge of the Nantanes Plateau and uncommon along the eastern Mogollon Rim in the central highlands of Arizona. Stands typically occur in the mid-elevation range of *Pinus arizonica - Pinus engelmannii - Pinus leiophylla* Woodland Alliance (A3112) at 1,740 to 2,165 meters (5,700–7,100 ft). Slopes are steep to very steep with variable aspects, but generally the sites are mild and dry. Soils are predominantly Udic Haplustalfs, Udic Ustochrepts, and Lithic Ustochrepts derived from granite, rhyolite, or their metamorphic derivatives. *Pinus ponderosa* is the overstory dominant. *Pinus strobiformis* is occasionally a co-dominant. *Pseudotsuga menziesii*, *Pinus leiophylla*, and *Pinus engelmannii* are absent or accidental. *Juniperus deppeana* is often present as a minor climax species in the subcanopy. *Quercus hypoleucoides* is dominant in the undergrowth, reaching coverage as high as 60%. *Quercus arizonica* can be well represented, but it is either not dominant or is clearly successional. *Quercus rugosa* can be present, but it is usually poorly represented and never dominant. Other common shrubs are *Nolina microcarpa*, *Arbutus arizonica*, *Ceanothus fendleri*, and *Garrya wrightii*. *Muhlenbergia longiligula* is common and typically dominates the otherwise sparse herb layer. *Muhlenbergia virescens* may be present but is not dominant. The most constant forbs are *Hedeoma hyssopifolia*, *Pseudocymopterus montanus*, and *Comandra umbellata*. In Texas, this community is known from the Davis Mountains.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 165. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Pinus ponderosa* (1.0), *Quercus hypoleucoides* (0.86), *Juniperus deppeana* (1.0) *Quercus arizonica* (0.86), *Quercus rugosa* (0.57)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Muhlenbergia longiligula* (0.86)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 166. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus ponderosa, Pinus leiophylla, Pinus strobiformis*
Canopy (2–5 m)	*Arbutus arizonica, Prunus serotina, Juglans major*
Subcanopy (0.5–2 m)	*Ceanothus fendleri, Frangula californica, Rubus neomexicanus, Berberis wilcoxii, Vitis arizonica*
Field (0–0.5 m)	*Muhlenbergia virescens, Carex geophila, Pteridium aquilinum, Muhlenbergia montana, Piptochaetium pringlei*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from seven plots sampled during the 2013–2017 mapping and classification effort.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a broad group that "contain[s] 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

This described community fits extremely well within the USNVC-accepted *Pinus ponderosa* / *Quercus hypoleucoides* Woodland Association (CEGL000872). Its type concept includes all diagnostic species present within, and landforms covered by, this community.

Classification confidence: Low

NatureServe conservation status: Data not available

Global status: G3 (01Dec2000)

Rounded global status: G3 - Vulnerable

Global range: This association is restricted to the Apache Highlands (Ecoregion 22) of southwestern New Mexico, southern Arizona, Trans-Pecos Texas, and northern Mexico. It is specifically known from the Santa Catalina, Pinal, Santa Rita, Galiuro, Pinaleño, Chiricahua, Huachuca, Davis, and Peloncillo mountains. It is occasional along the southern edge of the Nantanes Plateau and uncommon along the eastern Mogollon Rim in the central highlands of Arizona. In Texas, this community is known from the Davis Mountains.

Reasons: This is a regional endemic community of the isolated sky-island mountain ranges of southwestern New Mexico, southern Arizona, Trans-Pecos Texas, and northern Mexico, and although somewhat common within its range, it has a very limited distribution in a global context. The number of high-quality occurrences in the U.S. is not likely to exceed 100, and the number of Mexican occurrences is unknown. Many of the stands have been impacted by fuelwood removals and altered fire regimes, leading to increasing fragmentation. In addition, the majority of the remaining high-quality occurrences are found in remote areas where livestock impacts are minimal. However, sufficient data exist to support the rank of G3.

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS003U, IP500U, IP515H, IPS636, IPS670, IPS696, IPS907

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Muldavin, E. 1996. *Pinus ponderosa* / *Quercus hypoleucoides* Woodland Association, version date 26Nov1997. U.S. National Vegetation Classification Database, V2.01 (2017). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed December 11, 2018.

79. *Pseudotsuga menziesii* / *Quercus rugosa* Forest Association

Translated name: Douglas fir / Netleaf oak Forest Association

NVC name: CEGL000454

Identifier: N/A

NVC CLASSIFICATION

Division	Madrean - Balconian Forest and Woodland [D060]
Macrogroup	Madrean Montane Forest and Woodland [M011]
Group	Madrean Upper Montane Conifer - Oak Forest and Woodland [G202]
Alliance	Madrean Douglas Fir / Oak Forest and Woodland [A3108]
Association	*Pseudotsuga menziesii* / *Quercus rugosa* Forest [CEGL000454]

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present on the north slope of Mica Mountain and Rincon Peak.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forest community is located on moderately steep (20–40%), exclusively north-facing backslopes and deep, sheltered drainages from 2,000 to 2,300 meters (6,561–7,545 ft). Often, this community is found to the north of large topographic/geologic features (e.g., Mica Mountain and Helen's Dome) that create areas with less exposure to solar radiation. This community is typically a bit farther removed from those features than the more sheltered Douglas fir (*Pseudotsuga menziesii*) and southwestern white pine (*Pinus strobiformis*) forests. The surface cover is characterized by moderately deep and well-drained skeletal loam underlying a dominant layer of conifer-needle litter and duff with patchy boulders and bedrock outcrops, especially when occurring in drainages. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forested community is characterized by a variable (40–70%) canopy (>2 m) with cover split between an overstory of conifers and an understory canopy of oaks. The overstory canopy is dominated by Douglas fir (*Pseudotsuga menziesii*) and a mix of ponderosa pine (*Pinus ponderosa*) and/or Arizona pine (*Pinus arizonica*). The understory canopy is dominated by a combination of netleaf oak (*Quercus rugosa*) and silverleaf oak (*Quercus hypoleucoides*). This community can occur across broad slopes and in and along major drainages. This often results in two distinct variations with the same dominant species but noticeably different abundance.

Douglas fir (*Pseudotsuga menziesii*) is present as large (15–20 m) trees with variable cover ranging from 10% to 25%. Ponderosa pine (*Pinus ponderosa*) and Arizona pine (*Pinus arizonica*) are slightly lower in the canopy (10–16m) with variable cover ranging from 10% to 30%. Local dominance of these overstory trees follows a distinct elevational gradient. At lower elevations, ponderosa pine (*Pinus ponderosa*) or Arizona pine (*Pinus arizonica*) may present as the sole dominant with Douglas fir (*Pseudotsuga menziesii*) as an associate. With increased elevation, that relationship switches and Douglas fir (*Pseudotsuga menziesii*) becomes the sole dominant. Additionally, areas of decreased solar radiation, such as drainages and adjacent slopes, typically have more dominant Douglas fir (*Pseudotsuga menziesii*) than more exposed slopes at the same elevation. Southwestern white pine (*Pinus strobiformis*) is a patchy (0.43) associate that is most commonly found in more sheltered locations and/or in the ecotone with the similar Douglas fir (*Pseudotsuga menziesii*) and southwestern white pine (*Pinus strobiformis*) forest association. When present, this species can provide cover ranging up to 5%.

Like the overstory trees, dominance and composition of mid-canopy oaks is dependent on elevation and/or exposure. In general, silverleaf oak (*Quercus hypoleucoides*) tends to be most dominant on the more exposed slopes, while netleaf oak (*Quercus rugosa*) prefers drainages and adjacent, sheltered slopes. Overall, silverleaf oak (*Quercus hypoleucoides*) provides cover at 5% to 20%, with heights typically around 5 meters but up to 10 meters. Netleaf oak (*Quercus rugosa*) provides similar cover (5–30%) with a more variable height range. This species may present as large trees (10 m; most commonly in drainages), medium-sized trees (5 m), or small, shrubby individuals with heights around 2 meters. In the drainage variation, Arizona walnut (*Juglans major*), black cherry (*Prunus serotina*), and Arizona alder (*Alnus oblongifolia*) were documented associates. Arizona madrone (*Arbutus arizonica*) and Gambel oak (*Quercus gambelii*) may be present as sparse associates.

The subcanopy stratum (0.5–2 m) is characterized by a sparse (<10%) mix of shrubs with no consistent dominants or common associates. When cover is high, it is typically associated with shrubby netleaf oak (*Quercus rugosa*) and/or conifer saplings. Other documented species include New Mexico locust (*Robinia neomexicana*), New Mexico raspberry (*Rubus neomexicana*), rock spirea (*Holodiscus dumosa*), beargrass (*Nolina microcarpa*), Fendler's ceanothus (*Ceanothus fendleri*), and California buckthorn (*Frangula californica*).

The field stratum (<0.5 m) is also sparse (<10%) with no clear dominants or associates. In sheltered locations and/or at the upper elevational limit of this community, western brackenfern (*Pteridium aquilinum*) may start to become a field dominant. Noteworthy associate grasses, forbs, and subshrubs include longtongue muhly (*Muhlenbergia longiligula*), mountain snowberry (*Symphoricarpos oreophilus*), coralbells (*Heuchera sanguinea*), White Mountain sedge (*Carex geophila*), muttongrass (*Poa fendleriana*), New Mexico groundsel (*Packera* neomexicana), meadow rue (*Thalictrum* fendleri), pineland figwort (*Scrophularia parviflora*), Pringle's speargrass (*Piptochaetium pringlei*), and Arizona wheatgrass (*Elymus arizonicus*).

GLOBAL TYPE CONCEPT DESCRIPTION

This minor conifer forest association occurs in mid-elevations of mountain ranges of southwestern New Mexico (Animas Mountains) and southeastern Arizona (Santa Catalina, Santa Rita, and Huachuca mountains, with outliers in the Mogollon Mountains). It is also likely to occur in adjacent Texas and northern Mexico. Stands are found in rugged, steep topography and are restricted to cool, dry to mesic sites; they are found at elevations from 1,980 to 2,285 meters (6,496–7,497 ft) on northerly aspects, and from 2,285 to 2,440 meters (7,497–8,005 ft) on warmer aspects. Soils are shallow and very rocky and are derived from rhyolite and granite parent materials. Rock outcrops are common. At higher elevations, the association occurs on steep middle and upper slopes with convex topography and windy exposures. Stands can also occur as a topo-edaphic climax at lower elevations in ravines and canyons, which have significant cold-air drainage. These sites have deeper soil but remain cool. The tree canopy is dominated by *Pseudotsuga menziesii* with *Pinus ponderosa* or *Pinus arizonica* often co-dominant. *Pinus strobiformis* and *Pinus discolor* may be present in some stands. The shrub layer is dominated by the broad-leaved evergreen, *Quercus rugosa*, often with >60% cover. *Quercus hypoleucoides* is also commonly present but with <5% cover. On very rocky sites, *Quercus chrysolepis* can be abundant with cover up to 20%. The herbaceous layer has low cover and moderate diversity. Perennial grasses may include *Koeleria macrantha*, *Muhlenbergia longiligula*, and *Poa fendleriana*. Forbs typically present include *Galium tinctorium*, *Hedeoma hyssopifolia*, *Lathyrus graminifolius*, *Packera neomexicana* (= *Senecio neomexicanus*), *Thalictrum fendleri*, and *Vicia americana*. The dominance of *Quercus rugosa* in the shrub layer distinguishes this association from other *Pseudotsuga menziesii*-dominated forests.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 167. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Pseudotsuga menziesii* (1.0), *Pinus ponderosa* (0.71), *Pinus arizonica* (0.28)
Canopy (2–5 m)	*Quercus hypoleucoides* (0.85), *Quercus rugosa* (1.0)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 168. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus ponderosa, Pinus strobiformis*
Canopy (2–5 m)	*Prunus serotina, Alnus oblongifolia, Arbutus arizonica, Quercus gambelii, Juglans major*
Subcanopy (0.5–2 m)	*Holodiscus dumosa, Robinia neomexicana, Nolina microcarpa, Ceanothus fendleri, Frangula californica, Rubus neomexicana*
Field (0–0.5 m)	*Poa fendleriana, Symphoricarpos oreophilus, Heuchera sanguinea, Pteridium aquilinum, Elymus arizonicus, Muhlenbergia longiligula, Piptochaetium pringlei, Thalictrum fendleri*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from seven plots sampled during the 2013–2017 mapping and classification effort.

Roseberry and Dole (1939) classified this community and many of the similar, adjacent communities into a broad group that "contain[s] 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

This described community fits extremely well within the USNVC-accepted *Pseudotsuga menziesii* / *Quercus rugosa* Forest Association (CEGL000454). Its type concept includes all diagnostic species present within, and landforms covered by, this community.

Classification confidence: Moderate

NatureServe conservation status: Data not available

Global status: G2 (21Oct1997)

Rounded global status: G2 - Imperiled

Global range: Uncommon in the "Borderlands" region of southeastern Arizona, southwestern New Mexico (and possibly northern Mexico), and potentially in the Trans-Pecos region of Texas and Mexico.

Reasons: This association is limited in its distribution to the "Borderlands" of southwestern New Mexico, southeastern Arizona, and possibly in the Trans-Pecos region of western Texas and the northern Sierra Madre Occidentale of Mexico. Stands are small and reflect the late successional stage of mesic Sierra Madrean forest. They have very high grass and forb diversity, with a preponderance of Sierra Madrean elements that have a restricted distribution in the United States. Grazing and timber harvesting (to a lesser degree) continue to impact the association throughout its range.

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS659, IPS660, IPS661, IPS777, IPS778, IPS783, IPS858

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Reid, M. S., modified by K. A. Schulz. 1993. *Pseudotsuga menziesii* / *Quercus rugosa* Forest, version date 26Jul1993. U.S. National Vegetation Classification Database, V2.01 (2017). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed December 11, 2018.

80. [*Quercus arizonica - Quercus hypoleucoides*] Intermittently Flooded Woodland Association (P)

Translated name: [Arizona white oak - Silverleaf oak] Intermittently Flooded Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN165

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [1.B.1.Nd]
Macrogroup	Madrean Montane Forest and Woodland [M011]
Group	–
Alliance	–
Association	[*Quercus arizonica - Quercus hypoleucoides*] Intermittently Flooded Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This woodland community is distributed throughout the mid-elevation regions of the park.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is typically found in mid-elevation drainages and sheltered gullies throughout the pinyon/oak woodland communities and up to the large conifer/oak forests ranging from 1,350 to 2,200 meters (4,429–7,217 ft). The surface cover is characterized by a mix of large boulders interspersed with fine gravel, often covered with a dense layer of oak-leaf litter.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is characterized by a variably dense (50–70%) upper canopy (>5 m) co-dominated by Arizona white oak (*Quercus arizonica*) and silverleaf oak (*Quercus hypoleucoides*) with a variable subcanopy (0.5–2 m) often containing Wright's silktassel (*Garry wrightii*).

In the canopy stratum, Arizona white oak (*Quercus arizonica*) and silverleaf oak (*Quercus hypoleucoides*) provide very consistent (1.0) cover ranging from [0] 10% to 35% of medium-height (5–12 m) trees. These species follow a distinct elevational/exposure gradient where Arizona white oak (*Quercus arizonica*) is most dominant in the low-elevation/more exposed examples, while silverleaf oak (*Quercus hypoleucoides*) prefers the higher-elevation/more sheltered locations. These species can present as co-dominants, or with either one becoming the sole dominant and the other a common associate. Border pinyon (*Pinus discolor*) and alligator juniper (*Juniperus deppeana*) are less consistent (0.55, 0.88) associates that, when present, typically provide cover less than 5% (with uncommon inclusions of co-dominance up to 20%). At the higher elevational end of this community, Arizona pine (*Pinus arizonica*), ponderosa pine (*Pinus ponderosa*), and Chihuahuan pine (*Pinus leiophylla*) may be present (0.25) as associates in the upper canopy (>5 m) with cover usually not surpassing 5%. These species should not compete for dominance with the characteristic oaks. Other associates include black cherry (*Prunus serotina*), velvet ash (*Fraxinus velutina*), Arizona madrone (*Arbutus arizonica*), Arizona sycamore (*Platanus wrightii*), and Arizona walnut (*Juglans major*).

The subcanopy stratum (0.5–2 m) is characterized by a highly variable (5–25%) mix of shrubs most commonly dominated by Wright's silktassel (*Garrya wrightii*). This species was documented in most (0.94) examples of this community with average cover of 6%, including some dense inclusions up to 20%. At the higher elevational end of this community, shrubby netleaf oak (*Quercus rugosa*) may begin to appear. Other noteworthy subcanopy com-

ponents include pointleaf manzanita (*Arctostaphylos pungens*), fragrant sumac (*Rhus aromatica*), catclaw mimosa (*Mimosa aculeaticarpa*), New Mexico locust (*Robinia neomexicana*), yucca (*Yucca madrensis*), and canyon grape (*Vitis arizonica*).

The field stratum (<0.5 m) is quite sparse (<10%) with no consistent dominants or associates.

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 169. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Quercus arizonica* (1.0), *Quercus hypoleucoides* (0.94)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Garrya wrightii* (0.94)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 170. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus ponderosa, Pinus arizonica, Pinus leiophylla, Platanus wrightii, Fraxinus velutina, Arbutus arizonica, Juglans major*
Canopy (2–5 m)	*Arbutus arizonica, Juglans major, Prunus serotina*
Subcanopy (0.5–2 m)	*Arctostaphylos pungens, Rhus aromatic, Mimosa aculeaticarpa, Robinia neomexicana, Yucca madrensis, Quercus rugosa, Vitis arizonica*
Field (0–0.5 m)	None

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 11 classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN165 bisect numerous upland groups classified by Roseberry and Dole (1939).

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IP405H, IP422H, IP425H, IP426H, IP509H, IP516H, IP521H, IP523U, IPS633, IPS681, IPS723

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

81. [*Quercus hypoleucoides - Quercus arizonica*] Woodland Association (P)

Translated name: [Silverleaf oak - Arizona white oak] Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN164

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [1.B.1.Nd]
Macrogroup	Madrean Montane Forest and Woodland [M011]
Group	–
Alliance	–
Association	[*Quercus hypoleucoides - Quercus arizonica*] Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present across the slopes below Reef Rock and Heartbreak Ridge.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is typically found on mountain backslopes of variable grade (10–50+%) from 1,860 to 2,160 meters (6,102–7,086 ft). This community may occur lower on the mountain, down to 1,640 meters (5,380 ft), exclusively on sheltered, north-facing slopes. The surface cover is characterized by moderately deep and well-drained loam underlying a thick layer of pine/oak litter and duff with patchy boulders and bedrock outcrops. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is characterized by a variably dense (30–65%) canopy (>5 m) co-dominated by silverleaf oak (*Quercus hypoleucoides*) and Arizona white oak (*Quercus* arizonica) with a sparse understory. This community spans a broad gradient between low-elevation oak-dominated woodlands and higher-elevation conifer forests. Overall, this community has been subjected to minimal fire effects in recent history.

Throughout this community, various large conifers may provide sporadic (<0.50), low cover (<5%) as emergent trees with heights above 10 meters. These species include ponderosa pine (*Pinus ponderosa*), Arizona pine (*Pinus arizonica*), and Chihuahuan pine (*Pinus leiophylla*).

Across the broader community, both dominant oaks, silverleaf oak (*Quercus hypoleucoides*) and Arizona white oak (*Quercus* arizonica), provide similar cover with an average of 25% and 20%, respectively. Local dominance aligns with an elevational gradient in which Arizona white oak (*Quercus* arizonica) is most dominant at the lower end and silverleaf oak (*Quercus hypoleucoides*) at the upper end. Across this gradient, either oak can range from a sparse 5% associate up to a very dense 40+% dominant, depending upon the elevation and/or exposure. Individuals range in height from 5 to 10 meters, either in consistent stands or those of mixed canopy heights. Alligator juniper (*Juniperus deppeana*) is the next most consistent (0.7) species with low cover that is typically less than 5%. Other documented canopy trees include Arizona madrone (*Arbutus arizonica*), netleaf oak (*Quercus rugosa*), and border pinyon (*Pinus discolor*).

The subcanopy stratum (0.5–2 m) is characterized by a diverse, but low-cover (<10%), mix of shrubs and succulents with no consistent dominants or common associates. In order from most to least frequent, noteworthy species include yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), Fendler's ceanothus (*Ceanothus fendleri*), Pringle's manzanita (*Arctostaphylos pringlei*), Wright's silktassel (*Garry wrightii*), and fragrant sumac (*Rhus*

aromatica). These species usually provide only scant cover (<1%), but they can occasionally provide noteworthy inclusion up to 5%. Other documented subcanopy species include California buckbrush (*Frangula californica*), pointleaf manzanita (*Arctostaphylos pungens*), gumhead (*Gymnosperma glutinosum*), California brickelbush (*Brickellia californica*), firecrackerbush (*Bouvardia ternifolia*), common hoptree (*Ptelea trifoliata*), walkingstick cactus (*Cylindropuntia spinosior*), and dollarjoint pricklypear (*Opuntia chlorotica*).

The very sparse (<5 %) field stratum (<0.5 m) is characterized by the consistent presence (0.78) of longtongue muhly (*Muhlenbergia longiligula*) with few associate species. This species was documented in most examples of this type with cover ranging from 1% to 3%. Other documented low-cover species include plains lovegrass (*Eragrostis intermedia*), Fendler's lipfern (*Cheilanthes fendleri*), pinyon ricegrass (*Piptochaetium fimbriatum*), pineland figwort (*Scrophularia parviflora*), mutton grass (*Poa fendleri*), Arizona wheatgrass (*Elymus arizonica*), and New Mexico groundsel (*Packera neomexicana*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 171. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus hypoleucoides* (1.0), *Quercus arizonica* (1.0)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Muhlenbergia longiligula* (0.78)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 172. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus leiophylla, Pinus ponderosa, Pinus arizonica*
Canopy (2–5 m)	*Juniperus deppeana, Arbutus arizonica, Pinus discolor, Quercus rugosa*
Subcanopy (0.5–2 m)	*Yucca madrensis, Nolina microcarpa, Ceanothus fendleri, Arctostaphylos pringlei, Garry wrightii, Rhus aromatica, Frangula californica, Arctostaphylos pungens, Gymnosperma glutinosum, Brickellia californica, Bouvardia ternifolia, Ptelea trifoliata, Cylindropuntia spinosior, Opuntia chlorotica*
Field (0–0.5 m)	*Eragrostis intermedia, Cheilanthes fendleri, Piptochaetium fimbriatum, Scrophularia parviflora, Poa fendleri, Elymus arizonica, Packera neomexicana*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from 17 plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN164 are spread across six high-elevation communities classified by Roseberry and Dole (1939).

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS012U, IPS184, IP515U, IP542U, IP552U, IPS607, IPS608, IPS609, IPS615, IPS637, IPS666, IPS668, IPS690, IPS729, IPS787, IPS819, IPS828

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

82. [*Quercus hypoleucoides - Quercus rugosa*] Intermittently Flooded Woodland Association (P)

Translated name: [Silverleaf oak - Netleaf oak] Intermittently Flooded Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN166

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [1.B.1.Nd]
Macrogroup	Madrean Montane Forest and Woodland [M011]
Group	–
Alliance	–
Association	[*Quercus hypoleucoides - Quercus rugosa*] Intermittently Flooded Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This woodland community is distributed throughout the upper-elevation regions of the park.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is typically found in mid-elevation drainages and sheltered gullies throughout the large conifer/oak forests ranging from 1,800 to 2,200 meters (5,905–7,217 ft) in elevation. The surface cover is characterized by a mix of large boulders interspersed with fine gravel, often covered with a dense layer of oak-leaf litter.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is characterized by a variably dense (50–70%) upper canopy (>5 m) co-dominated by silverleaf oak (*Quercus hypoleucoides*) and netleaf oak (*Quercus rugosa*) with a variable subcanopy (0.5–2 m) often containing Wright's silktassel (*Garry wrightii*).

In the canopy stratum, silverleaf oak (*Quercus hypoleucoides*) and netleaf oak (*Quercus rugosa*) provide very consistent (1.0) cover ranging from [5] 10% to 35% of medium-height (5–12 m) trees. These species follow a distinct elevational/exposure gradient where silverleaf oak (*Quercus hypoleucoides*) is most dominant in the low-elevation/more exposed examples, and netleaf oak (*Quercus rugosa*) prefers the higher-elevation/more sheltered locations. These species can present as co-dominants, or with either one becoming the sole dominant and the other a common associate. Arizona white oak (*Quercus arizonica*) may be present in some examples, but it should never outcompete the dominant oak species. Throughout this community, Arizona pine (*Pinus arizonica*), ponderosa pine (*Pinus ponderosa*), and Chihuahuan pine (*Pinus leiophylla*) may be present (<0.33) as associates in the upper canopy (>5 m), with cover usually not surpassing 5%. These species should not compete for dominance with the characteristic oaks. Other associates include black cherry (*Prunus serotina*), Arizona madrone (*Arbutus arizonica*), and Arizona walnut (*Juglans major*).

The subcanopy stratum is characterized by a sparse (<10%) mix of shrubs most commonly dominated by Wright's silktassel (*Garrya wrightii*). This species was documented in all (1.0) examples of this community, with average cover of 3%. Other noteworthy subcanopy components include New Mexico raspberry (*Rubus neomexicana*), New Mexico locust (*Robinia neomexicana*), yucca (*Yucca madrensis*), canyon grape (*Vitis arizonica*), and Fendler's ceanothus (*Ceanothus fendleri*).

The field stratum (<0.5 m) is quite sparse (<10%) with no consistent dominants or associates.

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 173. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Quercus rugosa* (1.0), *Quercus hypoleucoides* (1.0)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Garrya wrightii* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 174. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus ponderosa, Pinus arizonica, Pinus leiophylla, Arbutus arizonica, Juglans major, Quercus arizonica*
Canopy (2–5 m)	*Arbutus arizonica, Juglans major, Prunus serotina*
Subcanopy (0.5–2 m)	*Robinia neomexicana, Yucca madrensis, Ceanothus fendleri, Rubus neomexicana, Vitis arizonica*
Field (0–0.5 m)	None

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from two classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN166 bisect numerous upland groups classified by Roseberry and Dole (1939).

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS185, IPS716

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

83. [*Quercus rugosa - Quercus hypoleucoides*] Woodland Association (P)

Translated name: [Netleaf oak - Silverleaf oak] Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN162

NVC CLASSIFICATION

Division	Madrean-Balconian Forest and Woodland [1.B.1.Nd]
Macrogroup	Madrean Montane Forest and Woodland [M011]
Group	–
Alliance	–
Association	[*Quercus rugosa - Quercus hypoleucoides*] Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present throughout upper-elevation portions of the park with the main examples occurring around Rincon Peak, upper Madrona Canyon, below Reef Rock, and on the north slopes of Mica Mountain.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is typically found on mountain backslopes of variable grade (10– 0+%) from 2,000 to 2,500 meters (6,561–8,202 ft). This community may occur lower on the mountain, down to 1,800 meters (5,905 ft), exclusively on sheltered, north-facing slopes. The surface cover is characterized by moderately deep and well-drained loam underlying a thick layer of oak litter and duff with patchy boulders and bedrock outcrops. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is characterized by a variably dense (30–65%) canopy (>5 m) co-dominated by silverleaf oak (*Quercus hypoleucoides*) and netleaf oak (*Quercus rugosa*) with a sparse understory. This community spans a broad gradient between low-elevation oak-dominated woodlands and higher-elevation conifer forests. Overall, this community has been subjected to minimal fire effects in recent history.

Throughout this community, various large conifers may provide sporadic (<0.50), low cover (< 5%) as emergent trees with heights above 10 meters. These species include ponderosa pine (*Pinus ponderosa*), Arizona pine (*Pinus arizonica*), and Chihuahuan pine (*Pinus leiophylla*).

Across the broader community, both dominant oaks, silverleaf oak (*Quercus hypoleucoides*) and netleaf oak (*Quercus rugosa*), provide similar cover with an average of 25% and 20%, respectively. Local dominance aligns with an elevational gradient in which silverleaf oak (*Quercus hypoleucoides*) is most dominant at the lower end and netleaf oak (*Quercus rugosa*) at the upper end. Across this gradient, either oak can range from a sparse 5% associate up to a very dense 40+% dominant, depending upon the elevation and/or exposure. Individuals range in height from 5 to 10 meters, either in consistent stands or those of mixed canopy heights. Other documented canopy trees include Arizona madrone (*Arbutus arizonica*), alligator juniper (*Juniperus deppeana*), Arizona white oak (*Quercus arizonica*), and border pinyon (*Pinus discolor*).

The subcanopy stratum (0.5–2 m) is characterized by a diverse, but low-cover (<10%), mix of shrubs and succulents with no consistent dominants or common associates. In order from most to least frequent, noteworthy species include yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), Fendler's ceanothus (*Ceanothus fendleri*), Pringle's manzanita (*Arctostaphylos pringlei*), Wright's silktassel (*Garry wrightii*), and fragrant sumac (*Rhus*

aromatica). These species usually provide only scant cover (<1%), but they can occasionally provide noteworthy inclusion up to 5%. Other documented subcanopy species include California buckbrush (*Frangula californica*), pointleaf manzanita (*Arctostaphylos pungens*), gumhead (*Gymnosperma glutinosum*), California brickellbush (*Brickellia californica*), firecrackerbush (*Bouvardia ternifolia*), common hoptree (*Ptelea trifoliata*), walkingstick cactus (*Cylindropuntia spinosior*), and dollarjoint pricklypear (*Opuntia chlorotica*).

The very sparse (<5%) field stratum (<0.5 m) contains no consistent dominants or common associates. Documented species include longtongue muhly (*Muhlenbergia longiligula*), Fendler's lipfern (*Cheilanthes fendleri*), pineland figwort (*Scrophularia parviflora*), mutton grass (*Poa fendleri*), Arizona wheatgrass (*Elymus arizonica*), and New Mexico groundsel (*Packera neomexicana*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 175. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Quercus hypoleucoides* (1.0), *Quercus rugosa* (1.0)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 176. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus leiophylla, Pinus ponderosa, Pinus arizonica*
Canopy (2–5 m)	*Juniperus deppeana, Arbutus arizonica, Pinus discolor, Quercus rugosa*
Subcanopy (0.5–2 m)	*Yucca madrensis, Nolina microcarpa, Ceanothus fendleri, Arctostaphylos pringlei, Garry wrightii, Rhus aromatica, Frangula californica, Arctostaphylos pungens, Gymnosperma glutinosum, Brickellia californica, Bouvardia ternifolia, Ptelea trifoliata, Cylindropuntia spinosior, Opuntia chlorotica*
Field (0–0.5 m)	*Muhlenbergia longiligula, Cheilanthes fendleri, Scrophularia parviflora, Poa fendleri, Elymus arizonica, Packera neomexicana*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from 11 plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN162 are spread across six high-elevation communities classified by Roseberry and Dole (1939).

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IP557U, IPS627, IPS634, IPS662, IPS725, IPS727, IPS820, IPS832, IPS834, IPS836, IPS840

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

84. *Quercus gambelii* / *Symphoricarpos oreophilus* Shrubland Association

Translated name: Gambel oak / Mountain snowberry Shrubland Association

NVC name: CEGL001117

NVC CLASSIFICATION

Division	Western North American Grassland and Shrubland [2.B.2.Nf]
Macrogroup	Southern Rocky Mountain Montane Shrubland [M049]
Group	Southern Rocky Mountain Gambel Oak - Mixed Montane Shrubland [G277]
Alliance	Gambel Oak - Mountain Snowberry Shrubland [A3735]
Association	*Quercus gambelii* / *Symphoricarpos oreophilus* Shrubland [CEGL001117]

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is scattered along the north slopes of Mica Mountain. The largest examples are located on the slopes northeast of Mica secondary.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded shrubland community is typically found on moderately steep (30%), north-facing upper-backslopes from 2,250 to 2,500 meters (7,381–8,200 ft). The surface cover is characterized by a mix of well-drained, skeletal loam that ranges from very shallow to moderately deep; it underlies a dominant layer of bare soil and fine gravel with patches of dense litter. The parent material is a mix of quartz monzonite and mica schist. All examples of this community showed evidence of historic fire disturbance and occur within the boundaries of the 2003 Helen's 2, 1994 Rincon, and/or 1953 Manning Camp fires.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded community is characterized by a 10% to 20% low canopy (2–5 m) that is dominated solely by regenerating Gambel oak (*Quercus gambelii*). It has a variable understory most commonly dominated by mountain snowberry (*Symphoricarpos oreophilus*) or western brackenfern (*Pteridium aquilinum*). This community is a result of a complex fire history, with some examples subjected to three fire events in the last 75 years. In the absence of fire, these areas would likely present as dense forested communities dominated by large conifers. While snags are present in the upper canopy (>5 m), they are usually associated with areas that only burned in the most recent fire (Helen's 2).

In the low canopy, Gambel oak (*Quercus gambelii*) is present as short (3–5 m) and narrow-canopied regenerating trees with cover ranging from 10% to 20% across the community. No other noteworthy species were documented within this stratum.

The subcanopy stratum presents as two distinct variations, one dominated by mountain snowberry (*Symphoricarpos oreophilus*) and the other by western brackenfern (*Pteridium aquilinum*). When dominant, mountain snowberry (*Symphoricarpos oreophilus*) provides cover ranging from 5% to 10%, usually as a small (0.5–1 m) shrub, often spanning the field (<0.5 m) and subcanopy strata. In the other variation, western brackenfern (*Pteridium aquilinum*) provides variable cover ranging from 15% to 40%, also spanning the field and subcanopy strata. New Mexico locust (*Robinia neomexicana*) is a patchy (0.16), occasionally dominant associate, and New Mexico raspberry (*Rubus neomexicanus*) is a consistent (1.0), low-cover (1%) associate.

Beyond the shorter versions of the species documented in the subcanopy, the field stratum (<0.5 m) is a sparse (5%) mix of subshrubs, forbs, and grasses without any consistent dominants or associates. Noteworthy species

include screwleaf muhly (*Muhlenbergia virescens*), muttongrass (*Poa fendleriana*), Arizona wheatgrass (*Elymus arizonica*), fringed brome (*Bromus ciliatus*), pineywoods geranium (*Geranium caespitosum*), New Mexico fleabane (*Erigeron neomexicanus*), and Fendler's meadow rue (*Thalictrum fendleri*).

GLOBAL TYPE CONCEPT DESCRIPTION (ASSOCIATION LEVEL)

This shrubland association is found in foothills, plateaus, and mountains from western Texas to southern and western Colorado, and throughout southern Utah, north into the Wasatch Range. The association also probably occurs in northern Arizona. It is a mesic upland and non-obligate riparian community. Some stands, such as *Artemisia* spp., appear to be transitional between riparian areas and drier upland communities. It occurs on cool, moist sites, such as along drainages in canyons and steep draws in more xeric areas, and as a mesic upland shrubland forming extensive stands on cooler, northern slopes. Substrates are typically deep, well-drained, sandy loam to clay loam derived from alluvium or colluvium. The vegetation is characterized by an open to closed, typically tall-shrub layer (2–5 m tall) that is dominated by *Quercus gambelii*. The understory is composed of a short-shrub layer that is dominated by *Symphoricarpos oreophilus* or a closely-related, local *Symphoricarpos* species, such as *Symphoricarpos rotundifolius* or *Symphoricarpos palmeri*. Other mesic shrubs may be present, including *Amelanchier* spp., *Prunus virginiana*, *Robinia neomexicana*, and *Brickellia* sp. In some stands, the *Quercus gambelii* develop into small trees that form a tree canopy. These "woodlands" are included in this association because their floristic composition is identical to the tall shrublands. In other stands, the oaks are mostly under 2 meters tall, forming a short-shrub layer. The herbaceous layer is sparse to moderately dense, depending on the density of the woody canopy, and it is often dominated by graminoids, such as species of *Achnatherum*, *Bromus*, *Elymus*, *Poa*, and *Koeleria*. Common forbs include *Vicia americana*, *Thalictrum fendleri*, and *Achillea millefolium*. Occasionally, tree species are present in the overstory.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 177. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Symphoricarpos oreophilus* (1.0), *Pteridium aquilinum* (0.5)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 178. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Rubus neomexicanus, Robinia neomexicana*
Field (0–0.5 m)	*Muhlenbergia virescens, Poa fendleriana, Elymus arizonica, Bromus ciliatus,Geranium caespitosum, Erigeron neomexicanus, Thalictrum fendleri*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from three classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as CEGL001117 overlapped with two groups classified by Roseberry and Dole (1939), a pine-Douglas fir group defined as "areas that contain 20% of both commercial pines and Douglas fir," and a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

This association fits well within the *Quercus gambelii* / *Symphoricarpos oreophilus* Shrubland Association, CEGL001117. The only major difference between the global and local descriptions is presence and occasional dominance of western brackenfern (*Pteridium aquilinum*) in the local description.

Classification confidence: Moderate

NatureServe conservation status: Data not available

Global status: G5

Rounded global status: Data not available

Global range: This shrubland is reported from foothills, plateaus, and mountains of western Texas to southern and western Colorado, and throughout southern Utah, north into the Wasatch Range; it also likely occurs in Arizona.

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS868, IPS873, IPS900

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. *Quercus gambelii* / *Symphoricarpos oreophilus* Shrubland Association, version date 24Feb2009. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

85. (*Symphoricarpos oreophilus*) / *Ageratina herbacea* Shrubland Association (P)

Translated name: (Mountain snowberry) / Fragrant snakeroot Shrubland Association (P)

NVC name: N/A

Identifier: NPSSODN103

NVC CLASSIFICATION

Division	Western North American Grassland and Shrubland [2.B.2.Nf]
Macrogroup	Southern Rocky Mountain Montane Shrubland [M049]
Group	–
Alliance	–
Association	(*Symphoricarpos oreophilus*) / *Ageratina herbacea* Shrubland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present in areas of historic fire disturbance around Mica Mountain Summit.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is restricted to variably steep (23–70%), north-facing backslopes above 2,482 meters (8,149 ft). This community is a result of historic fire disturbance—specifically, the Helen's 2 fire that occurred in June of 2003. The surface cover is predominantly bare soil and gravel with consistent downed wood throughout.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This herbaceous community is characterized by a canopy (>5 m) of snags and a variable (10–30%) field stratum (<0.5 m) of mixed shrubs and grasses. It is most commonly dominated by fragrant snakeroot (*Ageratina herbacea*) with mountain snowberry (*Symphoricarpos oreophilus*) as a common associate. Pre-fire, this community was dominated by an upper canopy (>5 m) of large conifers, mainly Douglas fir (*Pseudotsuga menziesii*), Arizona pine (*Pinus arizonica*), and southwestern white pine (*Pinus strobiformis*). Currently, living canopy trees are extremely uncommon across this community; however, saplings of all these species were documented within the subcanopy stratum.

The subcanopy stratum is characterized by a low-cover (5–10%) mix of shrubs most commonly dominated by mountain snowberry (*Symphoricarpos oreophilus*). Other noteworthy shrubs include Gambel oak (*Quercus gambelii*), New Mexico locust (*Robinia neomexicana*), deerbrush (*Ceanothus integerrimus*), Fendler's meadow rue (*Thalictrum fendleri*), and New Mexico raspberry (*Rubus neomexicana*). These species are quite sparse with cover that is rarely more than 1%.

The field stratum is characterized by a moderately low-cover (<20%), diverse mix of forbs, subshrubs, and graminoids, with fragrant snakeroot (*A. herbacea*) providing the most consistent dominance. Typically, cover of this species ranges from 10% to 20%, with lower-cover (<5%) examples occurring along the margins of the community where perennial grasses begin to dominate. Cover of perennial grass tends to be quite variable, ranging from a scant 1% to co-dominance with fragrant snakeroot (*Ageratina herbacea*). Screwleaf muhly (*Muhlenbergia virescens*) and pine dropseed (*Blepharoneuron tricholepis*) are the most dominant grasses with mutton grass (*Poa fendleriana*) and fringed brome (*Bromus ciliaris*) providing low (<1%), but consistent, cover. Other noteworthy associates include western sedge (*Carex occidentalis*), pineywoods geranium (*Geranium caespitosum*), White Mountain sedge (*Carex geophila*), New Mexico fleabane (*Erigeron neomexicanus*), grassleaf pea (*Lathyrus graminifolius*), nodding chickweed (*Cerastium nutans*), American vetch (*Vicia americana*), and pineland figwort (*Scrophularia parviflora*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 179. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Symphoricarpos oreophilus* (1.0)
Field (0–0.5 m)	*Ageratina herbacea* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 180. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Pseudotsuga menziesii, Pinus ponderosa, Pinus arizonica, Pinus strobiformis, Quercus gambelii, Robinia neomexicana, Ceanothus integerrimus, Thalictrum fendleri, Rubus neomexicana*
Field (0–0.5 m)	*Muhlenbergia virescens, Blepharoneuron tricholepis, Poa fendleriana, Bromus ciliaris, Carex occidentalis, Geranium caespitosum, Vicia americana, Lathyrus graminifolius, Carex geophila, Scrophularia parviflora, Cerastium nutans*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from four classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN103 overlapped with two groups classified by Roseberry and Dole (1939), a pine-Douglas fir group defined as "areas that contain 20% of both commercial pines and Douglas fir," and a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS009U, IPS877, IPS878, IPS890

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

86. *Muhlenbergia virescens - Pteridium aquilinum - Ceanothus fendleri* Herbaceous Association (P)

Translated name: Screwleaf muhly - Western brackenfern - Fendler's ceanothus Herbaceous Association (P)

NVC name: N/A

Identifier: NPSSODN093

NVC CLASSIFICATION

Division	Western North American Grassland and Shrubland [2.B.2.Nf]
Macrogroup	Southern Rocky Mountain Montane Shrubland [M049]
Group	–
Alliance	–
Association	*Muhlenbergia virescens - Pteridium aquilinum - Ceanothus fendleri* Herbaceous (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present in areas of historic fire disturbance around Mica Mountain Summit.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is restricted to variably steep (15–50%), generally north-trending backslopes above 2,482 meters (8,143 ft). The surface cover is predominantly bare soil and gravel with consistent downed wood and inclusions of thick fern litter throughout. The underlying soil layer is a mix of well-drained, skeletal loam ranging from very shallow to moderately deep with parent material composed of a mix of Mica schist and gneissic quartz monzonite. All examples of this type contained evidence of historic fire disturbance resulting from a number of events spanning the Manning Camp fire in 1943 to the Helen's 2 in 1999.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This herbaceous/low shrubland community is characterized by a variably dense (30–50+%) field stratum (<0.5 m) of perennial grasses, subshrubs, and ferns, most commonly dominated by western brackenfern (*Pteridium aquilinum*), screwleaf muhly (*Muhlenbergia virescens*), and Fendler's ceanothus (*Ceanothus fendleri*). Pre-fire, this community was dominated by an upper canopy (>5 m) of large conifers, mainly Arizona pine (*Pinus arizonica*), ponderosa pine (*Pinus ponderosa*), and southwestern white pine (*Pinus strobiformis*). While inclusions of living canopy trees can be found throughout the community, they are rather uncommon (0.28). Saplings of these species were documented in most (0.85) examples of this community, with cover occasionally approaching 10%.

The subcanopy stratum is characterized by a low-cover (5%) mix of shrubs and regenerating trees without any consistent dominants or common associates. Documented species include Gambel oak (*Quercus gambelii*), New Mexico locust (*Robinia neomexicana*), California buckthorn (*Frangula californica*), mountain snowberry (*Symphoricarpos oreophilus*), Pringle's manzanita (*Arctostaphylos pringlei*), silverleaf oak (*Quercus hypoleucoides*), netleaf oak (*Quercus rugosa*), and New Mexico raspberry (*Rubus neomexicana*). Cover of these species is typically less than 1%, but any of them can provide local cover up to 5%.

This community is defined by the dense (30–50+%) field stratum dominated by a suite of species that include western brackenfern (*Pteridium aquilinum*), screwleaf muhly (*Muhlenbergia virescens*), and Fendler's ceanothus (*Ceanothus fendleri*). Of these, screwleaf muhly (*Muhlenbergia virescens*) is the most consistent (1.0) species, which, when dominant (0.6), provides cover ranging from 15% to 40%. Western brackenfern (*Pteridium aquilinum*) is a slightly less consistent (0.86) species that, when dominant (0.6), provides cover ranging from 10% to

30%. Fendler's ceanothus (*Ceanothus fendleri*) is a consistent (0.86) but less dominant (0.43) species with average cover less than 10%. Local dominance of these species is quite variable with any combination of them, from a single species to all three contributing dominant cover. The composition of dominants can change rather abruptly and frequently, and it typically coincides with minor shifts in slope and/or aspect. Pine dropseed (*Blepharoneuron tricholepis*) is a patchy (0.57) associate with uncommon (0.28) inclusions of dominance with cover up to 10%. Other documented species include fragrant snakeroot (*Ageratina herbacea*), elkweed (*Frasera speciosa*), fringed brome (*Bromus ciliatus*), muttongrass (*Poa fendleriana*), stinking brickellbush (*Brickellia rusbyi*), sawtooth candyleaf (*Stevia serrata*), White Mountain sedge (*Carex geophila*), Wright's goldenrod (*Solidago wrightii*), and New Mexico fleabane (*Erigeron neomexicanus*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 181. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Muhlenbergia virescens* (1.0), *Pteridium aquilinum* (0.86), *Ceanothus fendleri* (0.86)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 182. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus ponderosa, Pinus arizonica, Pinus strobiformis*
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Quercus gambelii, Quercus rugosa, Quercus hypoleucoides, Arctostaphylos pringlei, Frangula californica, Symphoricarpos oreophilus, Robinia neomexicana, Rubus neomexicana, Pinus ponderosa, Pinus arizonica, Pinus strobiformis*
Field (0–0.5 m)	*Ageratina herbacea*, *Blepharoneuron tricholepis, Poa fendleriana, Bromus ciliatus, Brickellia rusbyi, Frasera speciosa, Stevia serrata, Carex geophila, Solidago wrightii, Erigeron neomexicanus*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from seven classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN093 overlapped with two groups classified by Roseberry and Dole (1939), a pine-Douglas fir group defined as "areas that contain 20% of both commercial pines and Douglas fir," and a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS861, IPS867, IPS870, IPS882, IPS892, IPS902, IPS910

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

87. *Pteridium aquilinum* Herbaceous Association (P)

Translated name: Western brackenfern Herbaceous Association (P)

NVC name: N/A

Identifier: NPSSODN104

NVC CLASSIFICATION

Division	Western North American Grassland and Shrubland [2.B.2.Nf]
Macrogroup	Southern Rocky Mountain Montane Shrubland [M049]
Group	–
Alliance	–
Association	*Pteridium aquilinum* Herbaceous (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present in areas of historic fire disturbance around Mica Mountain Summit.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This community is restricted to variably steep (23–70%), north-facing backslopes above 2,482 meters (8,149 ft). This community is a result of historic fire disturbance—specifically, the Helen's 2 fire that occurred in June of 2003. The surface cover is dominated by dense fern litter with downed wood throughout.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This herbaceous community is characterized by a canopy (>5 m) of snags and a variably dense (30–60%) subcanopy (0.5–2 m) stratum dominated by western brackenfern (*Pteridium aquilinum*). Pre-fire, this community was dominated by large conifers in the upper canopy (>5 m), mainly Douglas fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), and southwestern white pine (*Pinus strobiformis*). Currently, living canopy trees are extremely rare.

The lower canopy (2–5 m) is quite sparse (<5%) without any consistent dominants or common associates. New Mexico locust (*Robinia neomexicana*) provides patchy cover that is typically associated with the numerous drainages that cross this community. While typically absent, this species can become co-dominant with western brackenfern (*Pteridium aquilinum*) with cover above 30%.

The subcanopy stratum is consistently dominated by a dense (25–50+%) layer of western brackenfern (*Pteridium aquilinum*). This species is present as variably dense clumps that can range in height from 0.5 meters up to 1.5 meters. Other noteworthy shrubs and subshrubs include black elderberry (*Sambucus nigra*), Gambel's oak (*Quercus gambelii*), rock spirea (*Holodiscus dumosa*), and mountain snowberry (*Symphoricarpos oreophilus*). Douglas fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*), and Arizona pine (*Pinus arizonica*) saplings were documented in most (0.75) examples of this type.

The field stratum is a low-cover (<10%), diverse mix of forbs, subshrubs, and graminoids, with no consistent dominants or common associates. Throughout the community, sporadic inclusions of western sedge (*Carex occidentalis*) dominance may appear with cover far exceeding that of western brackenfern (*Pteridium aquilinum*). This most commonly occurs where slopes become more exposed. In one example, western sedge (*Carex occidentalis*) provided 30% cover, while western brackenfern (*Pteridium aquilinum*) provided only 5% cover. Other noteworthy associates include parasitic lady's tresses (*Schiedeella parasitica*), fragrant snakeroot (*Ageratina herbacea*), fringed brome (*Bromus ciliatus*), pineland figwort (*Scrophularia parviflora*), pineywoods geranium (*Geranium*

caespitosum), American vetch (*Vicia americana*), grassleaf pea (*Lathyrus graminifolius*), and White Mountain sedge (*Carex geophila*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 183. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Pteridium aquilinum* (1.0)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 184. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Quercus gambelii, Sambucus nigra, Holodiscus dumosa, Symphoricarpos oreophilus, Pinus ponderosa, Pseudotsuga menziesii, Pinus arizonica*
Field (0–0.5 m)	*Carex occidentalis, Schiedeella parasitica, Ageratina herbacea, Geranium caespitosum, Vicia Americana, Lathyrus graminifolius, Carex geophila*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from eight classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN104 overlapped with two groups classified by Roseberry and Dole (1939), a pine-Douglas fir group defined as "areas that contain 20% of both commercial pines and Douglas fir," and a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

The closest accepted USNVC association is CEGL002544, *Pteridium aquilinum* Meadow. This association has only been documented in Wyoming and is a meadow ecosystem. NPSSODN104 does not include meadows and is completely a result of recent fire history.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IP573U, IPS860, IPS879, IPS887, IPS888, IPS889, IP578U, IPS875

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Kittel, G. 2012. *Pteridium aquilinum* Meadow, version date 06Apr2012. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 29, 2019.

88. *Populus tremuloides* Forest Association (P)

Translated name: Quaking aspen Forest Association (P)

NVC name: N/A

Identifier: NPSSODN107

NVC CLASSIFICATION

Division	Rocky Mountain Forest and Woodland [D194]
Macrogroup	Rocky Mountain Subalpine-High Montane Conifer Forest [M020]
Group	Rocky Mountain Subalpine-Montane Aspen Forest and Woodland [G222]
Alliance	Rocky Mountain Aspen Forest and Woodland [A2036]
Association	*Populus tremuloides* Forest (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is found throughout the upper-elevation reaches of the park. The largest occurrence is located southwest of Spud Rock Campground.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forested community is found on variably steep (20–50%) and predominantly north- to northeast-facing slopes from 2,200 to 2,500 meters (7,217–8,200 ft). The surface cover is characterized by moderately deep and well-drained soils underlying a dense layer of litter and downed wood with large, scattered boulders throughout some examples. The parent material ranges from a disordered jumble of coarse blocks at the Spud Rock Campground grove to Mica schist and gneissic quartz monzonite at the remaining groves. Excluding the grove near Spud Rock Campground, most examples of this community have been subjected to historic fire disturbance, mainly from the 2003 Helen's 2 and 1994 Rincon fires.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forest community is characterized by a dense (40–60%) canopy (>2 m) dominated solely by quaking aspen (*Populus tremuloides*) with a variable understory lacking any consistent dominants. This community presents in two distinct formations—mature, broad-canopied groves with limited fire history, and regenerating, narrow-canopied groves with recent and potentially severe fire disturbance. Within the mature groves, quaking aspen (*Populus tremuloides*) are present in various layers of the canopy structure, ranging from small understory trees with height from 4 to 10 meters to large overstory trees up to 25 meters. In general, cover is quite high (50+%) due to the dominance of mature, broad-canopied trees. In the fire-disturbed groves, trees are typically of similar heights (4–10 m) that vary based on the time they were subjected to a fire event. Due to their narrow canopies, each tree contributes little to the overall cover; however, tree density is so high that overall cover can be similar to the mature groves. Alligator juniper (*Juniperus deppeana*), ponderosa pine (*Pinus ponderosa*), western white pine (*Pinus strobiformis*), Gambel oak (*Quercus gambelii*), and Arizona white oak (*Quercus arizonica*) were the only additional tree species documented within the aspen grove.

The understory strata, subcanopy (0.5–2 m) and field (<0.5 m), vary based on fire history. The mature groves typically have a more robust understory with cover ranging from 20% to 60%. California buckbrush (*Frangula californica*) and mountain snowberry (*Symphoricarpos oreophilus*) were each dominant in at least one example of this community, with cover around 15% and 20%, respectively. The regenerating groves tend to have a sparse to non-existent subcanopy with cover less than 5%. Other noteworthy subcanopy species, that could appear in either variation, include wild hop (*Humulus lupulus*), western brackenfern (*Pteridium aquilinum*), canyon grape

(*Vitis arizonica*), New Mexico locust (*Robinia neomexicana*), poison ivy (*Toxicodendron radicans*), cutleaf coneflower (*Rudbeckia laciniata*), Fendler's meadow rue (*Thalictrum fendleri*), blue elderberry (*Sambucus cerulea*), wild bergamot (*Monarda fistulosa*), Arizona wheatgrass (*Elymus arizonicus*), three-nerve goldenrod (*Solidago velutina*), and tassel-flower brickellbush (*Brickellia grandiflora*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

This alliance is widespread in the montane and subalpine zones of the Rocky Mountains and adjacent regions, including the Sierra Nevada and Black Hills. Stands are found on a variety of landscape positions, but they are consistently in mesic habitats. Stands in this alliance often originate following disturbance. The dominant species of the canopy is *Populus tremuloides*. Scattered conifer trees, such as *Pseudotsuga menziesii*, and species of *Pinus*, *Picea*, and *Abie*s, may also be present. Common shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Artemisia tridentata*, *Juniperus communis*, *Prunus virginiana*, *Rosa woodsii*, *Shepherdia canadensis*, and *Symphoricarpos oreophilus*, and the dwarf shrubs, *Mahonia repens* and *Vaccinium myrtillus*. The herbaceous layer may be lush and iverse. Common graminoids may include *Bromus carinatus*, *Calamagrostis rubescens*, *Carex siccata*, *Carex geyeri*, *Carex rossii*, *Elymus glaucus*, *Elymus trachycaulus*, *Festuca thurberi*, and *Hesperostipa comata*. Associated forbs may include *Achillea millefolium*, *Eucephalus engelmannii*, *Delphinium* x *occidentale*, *Geranium viscosissimum*, *Heracleum sphondylium*, *Ligusticum filicinum*, *Lupinus argenteus*, *Osmorhiza berteroi*, *Pteridium aquilinum*, *Rudbeckia occidentalis*, *Thalictrum fendleri*, *Valeriana occidentalis*, *Wyethia amplexicaulis*, and many others. Elevations generally range from 1,525 to 3,050 meters (5,000–10,000 ft), but occurrences can be found at lower elevations in some regions. Topographic positions are variable, but occurrences tend to occupy cooler and moist aspects.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 185. Most abundant species for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Populus tremuloides* (1.0)
Canopy (2–5 m)	*Populus tremuloides* (1.0)
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 186. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus ponderosa, Quercus arizonica, Juniperus deppeana*
Canopy (2–5 m)	*Quercus gambelii*
Subcanopy (0.5–2 m)	*Frangula californica, Humulus lupulus, Vitis arizonica, Scrophularia parviflora, Sambucus cerulea, Robinia neomexicana*
Field (0–0.5 m)	*Symphoricarpos oreophilus, Rudbeckia laciniata, Pteridium aquilinum, Solidago velutina, Salvia arizonica, Monarda fistulosa, Elymus arizonicus, Brickellia grandiflora, Toxicodendron radicans*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from four classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN107 overlapped with three groups classified by Roseberry and Dole (1939), a pine-Douglas fir group defined as "areas that contain 20% of both commercial pines and Douglas fir," a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir," and a woodland group defined as "areas that contain 80% or more broadleaf tree species."

Global

This provisional association fits well within the *Populus tremuloides* Rocky Mountain Forest and Woodland Alliance, A2036. All associations under this alliance contain one to two understory dominants that are listed in the name. The groves documented for this project typically have a sparse understory or are dominated by a diverse suite of species without any consistent dominants.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS011U, IPS796, IPS903, IPS905

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2013. *Populus tremuloides* Rocky Mountain Forest and Woodland Alliance, version date 08Jan2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Washington, D.C. http://usnvc.org, accessed October 29, 2019.

89. *Pinus arizonica* (*Pinus strobiformis*) / *Muhlenbergia virescens* Forest Association (P)

Translated name: Arizona pine (Southwestern white pine) / Screwleaf muhly Forest Association (P)

NVC name: N/A

Identifier: NPSSODN142

NVC CLASSIFICATION

Division	Rocky Mountain Forest and Woodland [1.B.2.Nb]
Macrogroup	Southern Rocky Mountain Lower Montane Forest [M022]
Group	–
Alliance	–
Association	*Pinus arizonica* (*Pinus strobiformis*) / *Muhlenbergia virescens* Forest (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present where the low-angle basin around the Manning Camp trail system begins to drop off to the south.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is found on moderate (20–30%) slopes of varying aspects above 2,400 meters (7,874 ft). The surface cover is dominated by a thick layer of pine-needle litter and duff with patchy boulders and bedrock outcrops. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is characterized by a variably dense (30–60%) upper canopy (>5 m) dominated by Arizona pine (*Pinus arizonica*) with southwestern white pine (*Pinus strobiformis*), and a field layer (< 0.5 m) dominated by perennial grasses, typically screwleaf muhly (*Muhlenbergia virescens*). The formation of this community ranges from a sparse forest/woodland with a dense understory of perennial grass to a densely forested version with lower cover and often patchy perennial grass. Arizona pine (*Pinus arizonica*) is present as large (10–20 m) trees with variable cover ranging from 40% to 50%. At the upper elevational range of this community, and/or on more sheltered slopes, ponderosa pine (*Pinus ponderosa*) may begin to appear, but it should not become dominant. Southwestern white pine (*Pinus strobiformis*) is an associate tree, providing a very consistent 5% across the community with heights similar to that of the Arizona pine (*Pinus arizonica*). Gambel oak (*Quercus gambelii*) is an occasional (0.5) associate that can provide noteworthy inclusions with cover up to 10%. This species is often shorter statured than the neighboring pines with heights usually in the 5 to 10 meter range. Pineland dwarf mistletoe (*Arceuthobium vaginatum*) is a low-cover (<1%), but very consistent, native, pine (*Pinus* sp.)-specific, aerial parasite throughout this association.

The lower-canopy (2–5 m) and subcanopy (0.5–2 m) strata are extremely sparse (<5%) with no clear dominants or common associates. In areas of disturbance (i.e., tree fall, fire), saplings of the canopy trees may be present but are rarely a dominant component. Fendler's ceanothus (*Ceanothus fendleri*) and California buckthorn (*Frangula californica*) are uncommon associate shrubs.

The field stratum (<0.5 m) is dominated by a mix of perennial grasses whose cover is linked to the density of the canopy trees. Overall, screwleaf muhly (*Muhlenbergia virescens*) is the most consistent with average cover around 10% (with some areas ranging up to 20%). In order from most to least dominant, other noteworthy graminoids include pine dropseed (*Blepharoneuron tricholepis*), White Mountain sedge (*Carex geophila*), prairie Junegrass

(*Koeleria macrantha*), mountain muhly (*Muhlenbergia montana*), Pringle's speargrass (*Piptochaetium pringlei*), and Arizona wheatgrass (*Elymus arizonica*). New Mexico groundsel (*Packera neomexicana*), Navajo cinquefoil (*Potentilla subviscosa*), and aromatic false pennyroyal (*Hedeoma hyssopifolia*) are sparse associate forbs.

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 187. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Pinus arizonica* (1.0), *Pinus strobiformis* (1.0)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Muhlenbergia virescens* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 188. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Arceuthobium vaginatum, Pinus ponderosa*
Canopy (2–5 m)	*Quercus gambelii*
Subcanopy (0.5–2 m)	*Ceanothus fendleri, Frangula californica*
Field (0–0.5 m)	*Muhlenbergia tricholepis, Carex geophila, Koeleria macrantha, Muhlenbergia montana, Piptochaetium pringlei, Elymus arizonica, Packera neomexicana, Potentilla subviscosa, Hedeoma hyssopifolia*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from four classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN142 overlapped with one group classified by Roseberry and Dole (1939), a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

This provisional association is essentially an Arizona pine (*Pinus arizonica*)-dominated version of CEGL000863, *Pinus ponderosa* / *Muhlenbergia straminea* Woodland Association. Currently there are very few Arizona pine (*Pinus arizonica*) associations in the USNVC, and all of them are associated with the low-elevation Madrean pine-oak communities.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IP558U, IP560U, IPS791, IPS853

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Stuever, M. C., and J. S. Hayden. 1997. *Pinus ponderosa* / *Muhlenbergia straminea* Woodland, version date 24Oct2018. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 29, 2019.

90. *Pinus arizonica* / *Pteridium aquilinum* Forest Association (P)

Translated name: Arizona pine / Western brackenfern Forest Association (P)

NVC name: N/A

Identifier: NPSSODN144

NVC CLASSIFICATION

Division	Rocky Mountain Forest and Woodland [1.b.2.Nb]
Macrogroup	Southern Rocky Mountain Lower Montane Forest [M022]
Group	–
Alliance	–
Association	*Pinus arizonica* / *Pteridium aquilinum* Forest (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present throughout the trail system that surrounds Manning Camp, Spud Rock, Helen's Dome, and Mica Mountain summit.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forest community is found on low-angle (<20%) slopes and along drainages of varying aspects above 2,400 meters (7,874 ft). The surface cover is dominated by a thick layer of pine-needle litter and duff with patchy boulders and bedrock outcrops. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forested community is characterized by a variably dense (40–80%) upper canopy (>5 m) solely dominated by Arizona pine (*Pinus arizonica*) with a 20% to 40% understory of western brackenfern (*Pteridium aquilinum*). Arizona pine (*Pinus arizonica*) is present as large ([15] 20–30 m) trees with variable cover ranging from 40% to 60%, excluding some areas with fire disturbance where cover was closer to 30%. Southwestern white pine (*Pinus strobiformis*) is a consistent (0.80) associate that, when present, ranges from scattered trees providing <5% cover to dominant inclusions with cover from 15% to 30%, at times becoming a subdominant or codominant tree. At the upper elevational end of this community and/or lower-angle, less-exposed slopes, ponderosa pine (*Pinus ponderosa*) may begin to appear but should never become dominant. Gambel oak (*Quercus gambelii*) is another consistent (0.80) associate with cover that is usually less than 5%.

The lower-canopy (2–5 m) and subcanopy (0.5–2 m) strata are extremely sparse (<5%) with no clear dominants or common associates. California buckthorn (*Frangula californica*), New Mexico locust (*Robinia* neomexicana), and Fendler's ceanothus (*Ceanothus fendleri*) are noteworthy associate shrubs. When running in or along drainages, boxelder (*Acer negundo*) may appear.

The field stratum (<0.5 m) is characterized by the sole dominance of western bracken fern (*Pteridium aquilinum*). This species contributes cover ranging from 15% to 40% with the highest cover occurring in and along low-angle drainages. While cover values may vary across the community, this species should always be present as the dominant field component. Other noteworthy field components include Arizona wheatgrass (*Elymus arizonica*), muttongrass (*Poa fendleriana*), fragrant snakeroot (*Ageratina herbacea*), White Mountain sedge (*Carex geophila*), and fringed brome (*Bromus ciliatus*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 199. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Pinus arizonica* (1.0)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Pteridium aquilinum* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 200. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus strobiformis, Pinus ponderosa*
Canopy (2–5 m)	*Quercus gambelii*
Subcanopy (0.5–2 m)	*Acer negundo, Ceanothus fendleri, Frangula californica, Robinia neomexicana*
Field (0–0.5 m)	*Carex geophila, Elymus arizonica, Poa fendleriana, Ageratina herbacea, Bromus ciliatus*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from four classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as CEGL007091 overlapped with one group classified by Roseberry and Dole (1939), a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

This provisional association is essentially an Arizona pine (*Pinus arizonica*)-dominated version of CEGL002944, *Pinus ponderosa* / *Pteridium aquilinum* Forest Association. Currently there are very few Arizona pine (*Pinus arizonica*) associations in the USNVC, and all of them are associated with the low-elevation Madrean pine-oak communities.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS854, IPS855, IPS862, IPS869

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Cogan et al. 2004. *Pinus ponderosa* / *Pteridium aquilinum* Woodland Association, version date 25Apr2017. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 29, 2019.

91. *Pinus arizonica* Forest Association (P)

Translated name: Arizona pine Forest Association (P)

NVC name: N/A

Identifier: NPSSODN143

NVC CLASSIFICATION

Division	Rocky Mountain Forest and Woodland [D194]
Macrogroup	Southern Rocky Mountain Lower Montane Forest [M022]
Group	–
Alliance	–
Association	*Pinus arizonica* Forest (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present on the slopes of Heartbreak Ridge and the low-angle, south-trending areas surrounding Manning Camp.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forest community is found on moderate (20%) slopes with a generally south-trending aspect above 2,100 meters (6,889 ft). The surface cover is dominated by a moderately deep and well-drained, sandy loam underlying a thick layer of pine-needle litter and duff with patchy boulders and bedrock outcrops. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forested community is characterized by a variably dense (40–80%) upper canopy (>5 m) solely dominated by Arizona pine (*Pinus arizonica*) with a sparse understory containing no consistent dominants or common associates. Arizona pine (*Pinus arizonica*) is present as large (10–20 m) trees with variable cover ranging from 30% to 60%. Southwestern white pine (*Pinus strobiformis*) is an inconsistent (0.33) associate that typically occurs at the upper elevational range of this community. When present, this species ranges from scattered trees providing <5% cover to dominant inclusions with cover from 15 to 30%, at times becoming a subdominant tree. At the upper elevational range of this community and/or on more sheltered/lower-angle slopes, ponderosa pine (*Pinus ponderosa*) may begin to appear but should not become dominant. Scattered oaks such as silverleaf oak (*Quercus hypoleucoides*) and Arizona white oak (*Quercus arizonica*), and alligator juniper (*Juniperus deppeana*), are low-cover (<5%) associates within this community. Chihuahuan pine (*Pinus leiophylla* var. *chihuahuana*) is an uncommon associate at the lower end of the elevational range.

The lower-canopy (2–5 m) and subcanopy (0.5–2 m) strata are extremely sparse (<5%) with no clear dominants or common associates. Typically, shrubby examples of the canopy oaks are found in this stratum. In order from most to least frequent, noteworthy subcanopy shrubs include California buckthorn (*Frangula californica*), Fendler's ceanothus (*Ceanothus fendleri*), New Mexico locust (*Robinia neomexicana*), and Wright's silktassel (*Garry wrightii*). In areas of disturbance (i.e. tree fall, fire), saplings of the canopy trees may be present but are rarely a dominant component.

The field stratum (<0.5 m) is extremely sparse (<5%) with no clear dominants or associates. A suite of perennial graminoids provide patchy, but occasionally noteworthy, cover, including longtongue muhly (*Muhlenbergia longiligula*), screwleaf muhly (*Muhlenbergia virescens*), muttongrass (*Poa fendleriana*), White Mountain sedge (*Carex geophila*), Arizona wheatgrass (*Elymus arizonica*), and Pringle's speargrass (*Piptochaetium pringlei*). Combined,

these species typically provide less than 5% cover; however, examples with more dominant grass (10%) exist that are transitional with the similar, and often adjacent, Arizona pine (*Pinus arizonica*) / screwleaf muhly (*Muhlenbergia virescens*) woodland community. Western brackenfern (*Pteridium aquilinum*) is a patchy associate that ranges from absent to scattered, dense patches with cover up to 5%. While sometimes appearing dominant in small areas, this species should not be consistently dominant over large areas. In a couple examples of this forest that spanned low-angle drainages, Wilcox's barberry (*Berberis wilcoxii*) became a conspicuous associate. Other noteworthy, but sparse (<1%), field components include New Mexico groundsel (*Packera neomexicana*), fragrant snakeroot (*Ageratina herbacea*), Wright's goldenrod (*Solidago wrightii*), threenerve goldenrod (*Solidago velutina*), and aromatic false pennyroyal (*Hedeoma hyssopifolia*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 201. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Pinus arizonica* (1.0)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 202. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus strobiformis, Quercus hypoleucoides, Quercus arizonica, Juniperus deppeana*
Canopy (2–5 m)	*Quercus hypoleucoides, Quercus arizonica, Juniperus deppeana*
Subcanopy (0.5–2 m)	*Frangula californica, Ceanothus fendleri, Robinia neomexicana, Garry wrightii*
Field (0–0.5 m)	*Muhlenbergia longiligula, Muhlenbergia virescens, Carex geophila, Packera neomexicana, Piptochaetium pringlei, Elymus arizonica, Solidago wrightii, Hedeoma hyssopifolia, Solidago velutina, Pteridium aquilinum, Berberis wilcoxii*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from eight classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as CEGL007091 overlapped with one group classified by Roseberry and Dole (1939), a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

This provisional association is essentially an Arizona pine (*Pinus arizonica*)-dominated version of CEGL007091, *Pinus ponderosa - Pinus strobiformis* Forest Association. Currently there are very few Arizona pine (*Pinus arizonica*) associations in the USNVC, and all of them are associated with the low-elevation Madrean pine-oak communities.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IP500H, IP517H, IP544U, IP579U, IPS785, IPS793, IPS794, IPS852

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Weakley, A. S., and K. D. Patterson. *Pinus ponderosa - Pinus strobiformis* Forest Association, version date 26Nov1997. U.S. National Vegetation Classification Database, V2.01 (2017). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed December 10, 2018.

92. *Pinus ponderosa - Pinus strobiformis* Forest Association

Translated name: Ponderosa pine - Southwestern white pine Forest Association

NVC name: CEGL007091

Identifier: N/A

NVC CLASSIFICATION

Division	Rocky Mountain Forest and Woodland [D194]
Macrogroup	Southern Rocky Mountain Lower Montane Forest [M022]
Group	Southern Rocky Mountain Ponderosa Pine Forest and Woodland [G228]
Alliance	Southern Rocky Mountain Ponderosa Pine Forest and Woodland [A3398]
Association	*Pinus ponderosa - Pinus strobiformis* Forest [CEGL007091]

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present throughout the trail system that surrounds Manning Camp and Devil's Bathtub, with some occurrences on the south side of Rincon Peak.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forest community is found on moderate (20%) to steep (50+%) slopes of varying aspects from 1,700 to 2,522 meters (5,577–8,274 ft). The surface cover is dominated by moderately deep and well-drained sandy loam underlying a thick layer of pine-needle litter and duff with patchy boulders and bedrock outcrops. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forested community is characterized by a variably dense (40–80%) upper canopy (>5 m) solely dominated by ponderosa pine (*Pinus ponderosa*) with a sparse understory containing no consistent dominants or common associates. Ponderosa pine (*Pinus ponderosa*) is present as large (10–20 m) trees with variable cover ranging from 30% to 70%. Southwestern white pine (*Pinus strobiformis*) is an inconsistent (0.56) associate that typically occurs at the upper elevational range of this community. When present, this species ranges from scattered trees providing 5% cover to dominant inclusions with cover from 15% to 30%, at times becoming a subdominant tree. At the lower elevational end of this community and/or on steeper, more exposed slopes, Arizona pine (*Pinus arizonica*) may begin to appear but should never become dominant. Gambel oak (*Quercus gambelii*) is a patchy (0.67) associate with cover that is usually less than 5% [10%]. Chihuahuan pine (*Pinus leiophylla*) is an uncommon canopy associate that is most common at the lower elevational range of this community.

The lower-canopy (2–5 m) and subcanopy (0.5–2 m) strata are extremely sparse (<5%) with no clear dominants or common associates. Alligator juniper (*Juniperus deppeana*), silverleaf oak (*Quercus hypoleucoides*), Arizona white oak (*Quercus arizonica*), and netleaf oak (*Quercus rugosa*) can begin to provide noteworthy cover as this community transitions to the lower elevation, large pine (*Pinus* sp.) and oak (*Quercus* sp.)-dominated communities. In areas of disturbance (i.e., tree fall, fire) saplings of the canopy trees may be present but rarely a dominant component. Mountain snowberry (*Symphoricarpos oreophilus*), Fendler's ceanothus (*Ceanothus fendleri*), and California buckthorn (*Frangula californica*) are uncommon associate shrubs.

The field stratum (<0.5 m) is extremely sparse (<5%) with no clear dominants or associates. A suite of perennial graminoids provides patchy, but occasionally noteworthy, cover, including Screwleaf muhly (*Muhlenbergia virescens*), muttongrass (*Poa fendleriana*), White Mountain sedge (*Carex geophila*), Arizona wheatgrass (*Elymus arizonica*), fringed brome (*Bromus ciliatus*), Pringle's speargrass (*Piptochaetium pringlei*), and prairie Junegrass

(*Koeleria macrantha*). Combined, these species typically provide less than 5% cover; however, examples with more dominant grass (10%) exist that are transitional with the similar, and often adjacent, ponderosa pine (western white pine) / screwleaf muhly woodland community. Western brackenfern (*Pteridium aquilinum*) is a patchy associate that ranges from absent to scattered and dense patches with cover up to 5%. While sometimes appearing dominant in small areas, this species should not be consistently dominant over large areas. Other noteworthy, but sparse (<1%), field components include owl's claw (*Hymenoxys hoopesii*), New Mexico groundsel (*Packera neomexicana*), Navajo cinquefoil (*Potentilla subviscosa*), pineland figwort (*Scrophularia parviflora*), threenerve goldenrod (*Solidago velutina*), and aromatic false pennyroyal (*Hedeoma hyssopifolia*).

GLOBAL TYPE CONCEPT DESCRIPTION (ASSOCIATION LEVEL)

This forest occurs at high elevations in the mountain ranges of the Trans-Pecos region of Texas. Dominant canopy species are *Pinus ponderosa* var. *scopulorum* and *Pinus strobiformis*. Other canopy species sometimes present include *Pseudotsuga menziesii* var. *glauca* and *Pinus edulis*. The subcanopy can include *Quercus gambelii*. Herbs and shrubs are sparse but may include *Piptochaetium fimbriatum*, *Lonicera albiflora*, *Holodiscus discolor*, *Carex geophila*, *Bromus anomalus*, *Amelanchier utahensis*, and *Mahonia repens*. In grassy openings, typical species include *Muhlenbergia dubia*, *Koeleria macrantha*, *Festuca arizonica*, and *Bouteloua curtipendula*. It intergrades with various woodlands, including *Pinus ponderosa*-dominated woodlands.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 203. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Pinus ponderosa* (1.0)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 204. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus strobiformis, Quercus gambelii, Pinus arizonica, Pinus leiophylla*
Canopy (2–5 m)	*Quercus hypoleucoides, Quercus arizonica, Juniperus deppeana*
Subcanopy (0.5–2 m)	*Quercus rugosa, Ceanothus fendleri, Frangula californica, Symphoricarpos oreophilus*
Field (0–0.5 m)	*Muhlenbergia virescens, Poa fendleriana, Elymus arizonica, Bromus ciliatus, Carex geophila, Piptochaetium pringlei, Koeleria macrantha, Packera neomexicana, Potentilla subviscosa, Hedeoma hyssopifolia, Solidago velutina, Pteridium aquilinum, Hymenoxys hoopesii, Scrophularia parviflora*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from 10 classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as CEGL007091 overlapped with one group classified by Roseberry and Dole (1939), a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

Data not available

Classification confidence: Low - Poorly Documented

NatureServe conservation status: Data not available

Global status: G3 (31Jul2009)

Rounded global status: G3 - Vulnerable

Global range: This forest occurs at high elevations in the mountain ranges of Trans-Pecos, Texas.

Reasons: This association is naturally very restricted in range and environmental setting. It is currently known only from the highest elevations of the Guadalupe and Davis mountains in western Texas. While ponderosa pine (*Pinus ponderosa*) is fairly widespread in the Trans-Pecos Mountains, southwestern white pine (*Pinus strobiformis*) is very restricted, and relatively few examples of this association are estimated to occur. The uncertainty in the rank reflects the need for further inventory for this community. Threats are thought to be relatively minimal.

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS008U, IPS697, IP563U, IPS669, IPS697, IPS881, IPS821, IPS826, IPS883, IPS904

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Weakley, A. S., and K. D. Patterson. 1997. *Pinus ponderosa - Pinus strobiformis* Forest, version date 26Nov1997. U.S. National Vegetation Classification, V2.01 (2017). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed December 10, 2018.

93. *Pinus ponderosa* (*Pinus strobiformis*) / *Muhlenbergia virescens* Woodland Association (P)

Translated name: Ponderosa pine (Southwestern white pine) / Screwleaf muhly Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN140

NVC CLASSIFICATION

Division	Rocky Mountain Forest and Woodland [1.b.2.Nb]
Macrogroup	Southern Rocky Mountain Lower Montane Forest [M022]
Group	Southern Rocky Mountain Ponderosa Pine Open Woodland [G229]
Alliance	Southern Rocky Mountain Ponderosa Pine / Grass Open Woodland [A3419]
Association	*Pinus ponderosa* (*Pinus strobiformis*) / *Muhlenbergia virescens* Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present throughout the trail system that surrounds Manning Camp, Spud Rock, Helen's Dome, and Mica Mountain summit.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is found on moderate (20%) slopes of varying aspects above 2,400 meters (7,874 ft). The surface cover is dominated by a thick layer of pine-needle litter and duff with patchy boulders and bedrock outcrops. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is characterized by a variably open (10–40%) upper canopy (>5 m) dominated by ponderosa pine (*Pinus ponderosa*) with southwestern white pine (*Pinus strobiformis*), and a field layer (<0.5 m) dominated by perennial grasses (typically screwleaf muhly [*Muhlenbergia virescens*]) with cover ranging from 10% to 40%. Ponderosa pine (*Pinus ponderosa*) is present as 8 to 15 meter tall trees with variable cover ranging from 10% to 35%. Southwestern white pine (*Pinus strobiformis*) is an associate tree, providing very consistent cover (5 [10]%) across the community, with heights similar to that of the ponderosa pine (*Pinus ponderosa*). A few sparse associates were documented throughout this woodland, including Douglas fir (*Pseudotsuga menziesii*), border pinyon (*Pinus discolor*), Arizona pine (*Pinus arizonica*), and alligator juniper (*Juniperus deppeana*). Pineland dwarf mistletoe (*Arceuthobium vaginatum*) is a low-cover (<1%) but very consistent native, pine (*Pinus* sp.)-specific, aerial parasite throughout this association.

The lower-canopy (2–5 m) and subcanopy (0.5–2 m) strata are extremely sparse (<5%) with no clear dominants or common associates. Silverleaf oak (*Quercus hypoleucoides*) and netleaf oak (*Quercus rugosa*) can begin to provide noteworthy cover as this community transitions to the lower-elevation, large pine (*Pinus* sp.)- and oak (*Quercus* sp.)-dominated communities. In areas of disturbance (i.e., tree fall, fire), saplings of the canopy trees may be present but rarely a dominant component.

The field stratum (<0.5 m) is characterized by a mix of perennial graminoids most commonly dominated by screwleaf muhly (*Muhlenbergia virescens*). In general, cover of perennial graminoids across the community should be similar to that of the overstory trees, excluding areas with dominant surface rock and/or extremely shallow soils where cover is likely to be less than 10%. Overall, screwleaf muhly (*Muhlenbergia virescens*) is the most consistent (1.0) grass with cover ranging from 10% to 30%; it provides dominance in all examples of this community. Pine dropseed (*Muhlenbergia tricholepis*) is a less consistent (0.63) grass that, when present, provides cover from 5

to 10+%. In order of most to least frequent, other noteworthy graminoids include muttongrass (*Poa fendleriana*), White Mountain sedge (*Carex geophila*), prairie Junegrass (*Koeleria macrantha*), mountain muhly (*Muhlenbergia montana*), Pringle's speargrass (*Piptochaetium pringlei*), and Arizona wheatgrass (*Elymus arizonica*). New Mexico groundsel (*Packera neomexicana*), Navajo cinquefoil (*Potentilla subviscosa*), western brackenfern (*Pteridium aquilinum*), and aromatic false pennyroyal (*Hedeoma hyssopifolia*) are sparse associate forbs.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

These woodlands are characterized by widely-spaced canopies dominated primarily by *Pinus ponderosa* in association with other conifers, including *Juniperus* spp., *Pinus discolor*, *Pinus edulis*, and *Pseudotsuga menziesii*. The typically moderately dense herbaceous layer has greater cover than the shrub layer, and it is dominated by graminoids. The most common dominant graminoids include *Andropogon gerardii*, *Bouteloua gracilis*, *Festuca arizonica*, *Muhlenbergia montana*, *Muhlenbergia straminea*, and *Schizachyrium scoparium*. These woodlands extend from the central and southern Rocky Mountains south to the mountains of western Texas and escarpments of the Great Plains, and west to the Mogollon Rim and Colorado Plateau. Stands occur on bottomlands, elevated plains, cinder cones, piedmont slopes, mesas, foothills, and mountains at elevations ranging from 1,700 to 2,900 meters (5,577– 9,514 ft).

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 205. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Pinus ponderosa* (1.0), *Pinus strobiformis* (1.0)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Muhlenbergia virescens* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 206. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pseudotsuga menziesii, Arceuthobium vaginatum, Pinus arizonica*
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Quercus hypoleucoides, Quercus rugosa*
Field (0–0.5 m)	*Muhlenbergia tricholepis, Carex geophila, Koeleria macrantha, Muhlenbergia montana, Piptochaetium pringlei, Elymus arizonica, Packera neomexicana, Potentilla subviscosa, Hedeoma hyssopifolia, Pteridium aquilinum*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from nine plots, seven classification plots sampled during the 2013–2017 mapping and classification effort, and two upland soil and vegetation monitoring plots.

Polygons attributed as NPSODN140 overlapped with one group classified by Roseberry and Dole (1939), a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

This association shares a title with USNVC association CEGL000863, Pinus ponderosa / Muhlenbergia virescens woodland; however, the USNVC type is lacking any description. It is possible that NPSSODN140 should be placed in CEGL000863, but we are unable to make that determination at this time.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IP520U, IP524U, IP529U, IPS885, IPS891, IPS901, IPS911, V502_001, V502_017

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Stuever, M. C., and J. S. Hayden. 1997. *Pinus ponderosa* / *Muhlenbergia straminea* Woodland, version date 24Oct2018. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 29, 2019.

Reid, M. S., and D. Sarr. 2013. *Pinus ponderosa* / Grass Understory Southern Rocky Mountain Open Woodland Alliance, version date 14Mar2014. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 29, 2019.

94. *Pinus ponderosa / Pteridium aquilinum* Forest Association

Translated name: Ponderosa pine / Western brackenfern Forest Association

NVC name: CEGL002944

NVC CLASSIFICATION

Division	Rocky Mountain Forest and Woodland [1.B.2.Nb]
Macrogroup	Southern Rocky Mountain Lower Montane Forest [M022]
Group	Southern Rocky Mountain Ponderosa Pine Forest and Woodland [G228]
Alliance	Southern Rocky Mountain Ponderosa Pine Forest and Woodland [A3398]
Association	*Pinus ponderosa / Pteridium aquilinum* Forest [CEGL002944]

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present throughout the trail system that surrounds Manning Camp, Spud Rock, Helen's Dome, and Mica Mountain summit.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forest community is found on low-angle (<20%) slopes and along drainages of varying aspects above 2,400 meters (7,874 ft). The surface cover is dominated by a thick layer of pine-needle litter and duff with patchy boulders and bedrock outcrops. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forested community is characterized by a variably dense (40–80%) upper canopy (>5 m) solely dominated by ponderosa pine (*Pinus ponderosa*) with a 20% to 40% understory of western brackenfern (*Pteridium aquilinum*). Ponderosa pine (*Pinus ponderosa*) is present as large ([15] 20–30 m) trees with variable cover ranging from 40% to 60%; in some fire-disturbed areas cover was closer to 30%. Southwestern white pine (*Pinus strobiformis*) is a consistent (0.80) associate that, when present, ranges from scattered trees providing <5% cover to dominant inclusions with cover from 15% to 30%, at times becoming a subdominant or codominant tree. At the lower elevational end of this community and/or on steeper, more exposed slopes, Arizona pine (*Pinus arizonica*) may begin to appear but should never become dominant. Gambel oak (*Quercus gambelii*) is another consistent (0.80) associate with cover that is usually less than 5%.

The lower-canopy (2–5 m) and subcanopy (0.5–2 m) strata are extremely sparse (<5%) with no clear dominants or common associates. California buckthorn (*Frangula californica*), New Mexico locust (*Robinia* neomexicana), and Fendler's ceanothus (*Ceanothus fendleri*) are noteworthy associate shrubs. When running in or along drainages, boxelder (*Acer negundo*) may appear.

The field stratum (<0.5 m) is characterized by the sole dominance of western brackenfern (*Pteridium aquilinum*). This species contributes cover ranging from 15% to 40% with the highest cover occurring in and along low-angle drainages. While cover values may vary across the community, this species should always be present as the dominant field component. Other noteworthy field components include Arizona wheatgrass (*Elymus arizonica*), muttongrass (*Poa fendleriana*), fragrant snakeroot (*Ageratina herbacea*), White Mountain sedge (*Carex geophila*), and fringed brome (*Bromus ciliatus*).

GLOBAL TYPE CONCEPT DESCRIPTION (ASSOCIATION LEVEL)

This association has only been described from Zion National Park in Utah. Additional global information will be added as it becomes available. At Zion National Park, *Pinus ponderosa* has 50% to 60% canopy cover with an understory dominated by *Pteridium aquilinum* at 80% foliar cover. Grasses and forbs are present and contribute less than 5% cover. Where openings in the canopy of the mature ponderosa pines occur, grasses and sedges dominate mesic meadows. Small stream channels meander through Pine Valley from the Upper Kolob Plateau, feeding ponderosa pine woodlands and grassland meadows at an elevation of 2,103 meters (6,900 ft). Following a prescribed surface fire in 1998, brackenfern established as dense understory vegetation. The terrain is gentle with moderately well-drained, sandy soils.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 207. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Pinus ponderosa* (1.0)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Pteridium aquilinum* (1.0)

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 208. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus strobiformis, Pinus arizonica*
Canopy (2–5 m)	*Quercus gambelii*
Subcanopy (0.5–2 m)	*Acer negundo, Ceanothus fendleri, Frangula californica, Robinia neomexicana*
Field (0–0.5 m)	*Carex geophila, Elymus arizonica, Poa fendleriana, Ageratina herbacea, Bromus ciliatus*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies. It is based on data from one classification plot sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as CEGL002944 overlapped with one group classified by Roseberry and Dole (1939), a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

Data not available

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS906

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Cogan et al. 2004. *Pinus ponderosa* / *Pteridium aquilinum* Woodland Association, version date 25Apr2017. U.S. National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 29, 2019.

95. *Pseudotsuga menziesii - Pinus* (*arizonica - ponderosa*) / (*Quercus gambelii*) Forest Association (P)

Translated name: Douglas fir - Pine (Arizona - ponderosa) / (Gambel oak) Forest Association (P)

NVC name: N/A

Identifier: NPSSODN108

NVC CLASSIFICATION

Division	Rocky Mountain Forest and Woodland [1.B.C.Nb]
Macrogroup	Southern Rocky Mountain Lower Montane Forest [M022]
Group	Southern Rocky Mountain White Fir - Douglas-fir Dry Forest [G226]
Alliance	Southern Rocky Mountain Douglas-fir Forest and Woodland [A3454]
Association	*Pseudotsuga menziesii - Pinus* (*arizonica - ponderosa*) / (*Quercus gambelii*) Forest (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present near the summits of Mica Mountain and Rincon Peak.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forest community is located on moderately steep (20–30 [50]%), exclusively north-facing backslopes above 2,150 meters (7,053 ft). This community is often found north of large topographic/geologic features (i.e., Rincon Peak, Mica Mountain, and Helen's Dome) that create areas less exposed to solar radiation. This community is typically a bit further removed from those features than the more sheltered Douglas fir (*Pseudotsuga menziesii*) / Gambel oak (*Quercus gambelii*) forest association. The surface cover is characterized by shallow to moderately deep, well-drained, skeletal loam underlying a dominant layer of conifer-needle litter and duff with patchy boulders and bedrock outcrops, especially when occurring in drainages. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forested community is characterized by a dense (30–60%) upper canopy (>5 m) dominated by Douglas fir (*Pseudotsuga menziesii*) and Arizona pine (*Pinus arizonica*) or ponderosa pine (*Pinus ponderosa*) with one shorter-statured common associate, Gambel oak (*Quercus gambelii*). Douglas fir (*Pseudotsuga menziesii*) is present as large (10–20 m) trees with variable cover ranging from 20% to 30%. Overall, the two pines are slightly lower in the canopy (8–15m) with similar cover ranging from 15% to 30%. In general, either Arizona pine (*Pinus arizonica*) or ponderosa pine (*Pinus ponderosa*) is present; they typically do not co-occur. Arizona pine (*Pinus arizonica*) tends to occupy the more exposed and/or low-elevational examples of this community, while ponderosa pine (*Pinus ponderosa*) is found in more sheltered and/or higher-elevation examples. Gambel oak (*Quercus gambelii*) is variably positioned in the canopy structure; it can have heights ranging from low (5 m) trees in the understory to large (13 m) trees with heights similar to the conifers. This species provides inconsistent cover throughout, ranging from a sparse associate (<5%) to a co-dominant (20%) with the conifers. Southwestern white pine (*Pinus strobiformis*) is a rare associate that is most commonly found in more sheltered locations and/or in the ecotone with the similar Douglas fir (*Pseudotsuga menziesii*) / Gambel oak (*Quercus gambelii*) forest association. At times, netleaf oak (*Quercus rugosa*) and silverleaf oak (*Quercus hypoleucoides*) may be present as associates in the canopy strata, especially in close proximity to drainages. These species should not become consistently dominant.

The subcanopy stratum (0.5–2 m) is extremely sparse (<5%) with no consistent dominants or common associates. When cover is high, it is typically associated with shrubby individuals of the canopy oaks (*Quercus* sp.) and/

or conifer saplings. Other documented species include New Mexico locust (*Robinia neomexicana*), mock orange (*Philadelphus* sp.), rock spirea (*Holodiscus dumosa*), and California false indigo (*Amorpha californica*).

The field stratum (<0.5 m) is also sparse (<10%) with no clear dominants or associates. Noteworthy associate grasses, forbs, and subshrubs include Mountain snowberry (*Symphoricarpos oreophilus*), coralbells (*Heuchera sanguinea*), Navajo cinquefoil (*Potentilla subviscosa*), White Mountain sedge (Carex geophila), muttongrass (*Poa fendleriana*), toadflax penstemon (*Penstemon linarioides*), Wooton's ragwort (*Senecio wootonii*), screwleaf muhly (*Muhlenbergia virescens*), western brackenfern (*Pteridium aquilinum*), and Arizona wheatgrass (*Elymus arizonicus*).

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE LEVEL)

These forests and woodlands are primarily distributed in the southern Rocky Mountains and as far east as Texas. They include evergreen forests dominated by *Pseudotsuga menziesii*. Canopy associates vary widely depending on geographic location; they may include *Abies lasiocarpa*, *Juniperus scopulorum*, *Pinus contorta*, *Pinus flexilis*, *Pinus ponderosa*, *Pinus strobiformis*, and *Populus tremuloides*. Understories are most often shrub dominated, but in some associations a layer of graminoids takes prominence. Common dominant shrubs may include *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Artemisia tridentata*, *Cercocarpus montanus*, *Holodiscus dumosus*, *Juniperus communis*, *Paxistima myrsinites*, *Physocarpus monogynus*, *Quercus gambelii*, and *Quercus* x *pauciloba*. Herbaceous dominants may include *Festuca arizonica*, *Jamesia americana*, *Muhlenbergia montana*, *Muhlenbergia straminea*, and *Poa fendleriana*. Elevations range from less than 1,000 meters (3,280 ft) in the northern Rocky Mountains to nearly 2,900 meters (9,514 ft) in the Southern Rockies and plateaus of the southwestern U.S. Lower-elevation stands typically occupy protected northern exposures or mesic ravines and canyons, often on steep slopes. At higher elevations, these forests occur primarily on southerly aspects or ridgetops.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 209. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Pseudotsuga menziesii* (1.0), *Pinus arizonica* (0.66), *Pinus arizonica* (0.20) *Quercus gambelii* (0.83)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 210. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus strobiformis*
Canopy (2–5 m)	*Quercus hypoleucoides, Quercus rugosa*
Subcanopy (0.5–2 m)	*Holodiscus dumosa, Robinia neomexicana, Amorpha californica, Philadelphus* sp.
Field (0–0.5 m)	*Potentilla subviscosa, Poa fendleriana, Symphoricarpos oreophilus, Heuchera sanguinea, Penstemon linarioides, Senecio wootonii, Muhlenbergia virescens, Pteridium aquilinum, Elymus arizonicus*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from six plots, five classification plots sampled during the 2013–2017 mapping and classification effort, and one upland soil and vegetation monitoring plot.

Roseberry and Dole (1939) classified this community and many of the similar adjacent communities into a broad group that "contain[s] 20% or more Douglas fir, to the exclusion of commercial pines."

Global

This described community fits extremely well within the USNVC-accepted Southern Rocky Mountain Douglas-fir Forest and Woodland Alliance (A3454). Its type concept includes all diagnostic species present within, and landforms covered by, this community. Currently there are 18 associations grouped under this alliance. Due to the similar dominance of both *Pseudotsuga menziesii* (Douglas fir) and *Pinus arizonica* (Arizona pine) within our described community, none of the accepted USNVC types were a great fit.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IP507U, IP524H, IPS784, IPS857, IP507U, V502_007

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Reid, M. S., and D. Sarr. 2013. *Pseudotsuga menziesii* Southern Rocky Mountain Forest and Woodland Alliance, version date 14Aug2017. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed September 7, 2019.

96. *Pseudotsuga menziesii / Pinus strobiformis* Forest Association (P)

Translated name: Douglas fir / Southwestern white pine Forest Association (P)

NVC name: N/A

Identifier: NPSSODN176

NVC CLASSIFICATION

Division	Rocky Mountain Forest and Woodland [1.B.2.Nb]
Macrogroup	Southern Rocky Mountain Lower Montane Forest [M022]
Group	Southern Rocky Mountain White Fir – Douglas fir Dry Forest [G226]
Alliance	Southern Rocky Mountain Douglas fir Forest and Woodland [A3454]
Association	*Pseudotsuga menziesii - Pinus strobiformis* Forest (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is present near the summits of Mica Mountain and Rincon Peak.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forest community is found on steep (30–50+%), exclusively north-facing backslopes above 2,200 meters (7,217 ft), and deep, sheltered drainages that can reach down to lower elevations. Often, this community is found just north of large features (e.g., Rincon Peak and Mica Mountain) that create an area less exposed to solar radiation. The surface cover is characterized by shallow to moderately deep, well-drained skeletal loam underlying a dominant layer of conifer-needle litter and duff with patchy boulders and bedrock outcrops, especially when occurring in drainages. The parent material is a mix of quartz monzonite and mica schist.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This forested community is characterized by a dense (50–80%) upper canopy (>5 m) dominated by Douglas fir (*Pseudotsuga menziesii*) with subdominant southwestern white pine (*Pinus strobiformis*). Douglas fir (*Pseudotsuga menziesii*) is present as large (15–30 m) trees with dense cover ranging from 35% to 70%. Southwestern white pine (*Pinus strobiformis*) is a shorter-statured tree that provides variable cover ranging from 10% to 30%. Gambel oak (*Quercus gambelii*) is an inconsistent (0.33) tree that, when present, provides cover ranging from 5% to 15%. This species can be positioned in multiple layers of the canopy structure; it can occur as low (5 m) trees in the understory up to large (15 m) trees with heights similar to some of the shorter conifers. White fir (*Abies concolor*) is an occasional (0.2) canopy associate that, when present, usually provides cover less than 5%. This species may provide small inclusions of subdominance where cover can approach 20%. All examples with white fir (*Abies concolor*) were documented on the north slopes of Mica Mountain. As this community becomes more exposed due to aspect changes and/or increased solar radiation, ponderosa pine (*Pinus ponderosa*) and Arizona pine (*Pinus arizonica*) may start to appear with low cover; they should not become dominant. Cover of these species is typically less than 10%.

Scattered throughout this community, principally on the north slopes of Rincon Peak, quaking aspen (*Populus tremuloides*) can become a canopy associate or a co-dominant with Douglas fir (*Pseudotsuga menziesii*). Sometimes this species forms a homogenous stand, or it can be present at the margins of un-vegetated talus slopes where light is more plentiful.

The lower-canopy (2–5 m) and subcanopy (0.5–2 m) strata are extremely sparse (<5%) with no clear dominants or common associates. In one example of this community, canyon live oak (*Quercus chrysolepis*) provided an inclusion of understory dominance with cover around 20%. Rockspirea (*Holodiscus dumosa*), New Mexico locust

(*Robinia neomexicana*), New Mexico raspberry (*Rubus neomexicana*), and hop tree (*Ptelea trifoliata*) are patchy associates that are most commonly found along the many minor drainages that bisect this community. Blue elderberry (*Sambucus cerulea*) is a rare associate.

The field stratum (<0.5 m) presents as two distinct variations; one is extremely sparse (<5%) with no clear dominants or associates, while the other contains a dominant layer of western brackenfern (*Pteridium aquilinum*). When present, this species provides cover ranging from 5% to 20%. This variation is most common in areas of fire disturbance that have a more open canopy, but it was also documented in densely forested areas. Mountain snowberry (*Symphoricarpos oreophilus*), coralbells (*Heuchera sanguinea*), Navajo cinquefoil (*Potentilla subviscosa*), White Mountain sedge (*Carex geophila*), muttongrass (*Poa fendleriana*), fringed brome (*Bromus ciliatus*), Fendler's meadow-rue (*Thalictrum fendleri*), and Pringle's speargrass (*Piptochaetium pringlei*) are occasional associates.

GLOBAL TYPE CONCEPT DESCRIPTION (ALLIANCE)

These forests and woodlands are primarily distributed in the southern Rocky Mountains and as far east as Texas. They include evergreen forests dominated by *Pseudotsuga menziesii*. Canopy associates vary widely depending on geographic location; they may include *Abies lasiocarpa*, *Juniperus scopulorum*, *Pinus contorta*, *Pinus flexilis*, *Pinus ponderosa*, *Pinus strobiformis*, and *Populus tremuloides*. Understories are most often shrub dominated, but in some associations a layer of graminoids takes prominence. Common dominant shrubs may include *Arctostaphylos patula*, *Arctostaphylos uva-ursi*, *Artemisia tridentata*, *Cercocarpus montanus*, *Holodiscus dumosus*, *Juniperus communis*, *Paxistima myrsinites*, *Physocarpus monogynus*, *Quercus gambelii*, and *Quercus* x *pauciloba*. Herbaceous dominants may include *Festuca arizonica*, *Jamesia americana*, *Muhlenbergia montana*, *Muhlenbergia straminea*, and *Poa fendleriana*. Elevations range from less than 1,000 meters in the northern Rocky Mountains to nearly 2,900 meters in the Southern Rockies and plateaus of the southwestern U.S. Lower-elevation stands typically occupy protected northern exposures or mesic ravines and canyons, often on steep slopes. At higher elevations, these forests occur primarily on southerly aspects or ridgetops.

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 211. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Pseudotsuga menziesii* (1.0), *Pinus strobiformis* (1.0)
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 212. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	*Pinus ponderosa, Pinus arizonica, Populus tremuloides, Quercus gambelii, Abies concolor*
Canopy (2–5 m)	*Quercus chrysolepis*
Subcanopy (0.5–2 m)	*Rubus neomexicana, Holodiscus dumosa, Robinia neomexicana, Ptelea trifoliata, Sambucus cerulea*
Field (0–0.5 m)	*Carex geophila, Potentilla subviscosa, Poa fendleriana, Thalictrum fendleri, Symphoricarpos oreophilus, Heuchera sanguinea, Piptochaetium pringlei, Bromus ciliatus*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from 12 plots, 11 classification plots sampled during the 2013–2017 mapping and classification effort, and one upland soil and vegetation monitoring plot.

Roseberry and Dole (1939) classified this community and many of the similar adjacent communities into a broad group that "contain[s] 20% or more Douglas fir, to the exclusion of commercial pines."

Global

This described community fits extremely well within the USNVC-accepted Southern Rocky Mountain Douglas-fir Forest and Woodland Alliance (A3454). Its type concept includes all diagnostic species present within, and landforms covered by, this community. Currently there are 18 associations grouped under this alliance. Of those, the *Pseudotsuga menziesii* / *Quercus gambelii* Forest Association (CEGL000452) is the best match; however, due to the inconsistent presence (0.33) of *Quercus gambelii* (Gambel oak) in our described community, we decided to maintain it as a provisional type.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS004U, IPS007U, IPS776, IPS782, IPS789, IPS790, IPS884, IPS880, IPS886, IP502U, IP553U, V502_027

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Reid, M. S., and D. Sarr. 2013. *Pseudotsuga menziesii* Southern Rocky Mountain Forest and Woodland Alliance, version date 14Aug2017. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed September 7, 2019.

97. *Quercus gambelii* / *Robinia neomexicana* / *Symphoricarpos oreophilus* Woodland Association (P)

Translated name: Gambel oak / New Mexico locust / Mountain snowberry Woodland Association (P)

NVC name: N/A

Identifier: NPSSODN106

NVC CLASSIFICATION

Division	Rocky Mountain Forest and Woodland [1.B.2.Nb]
Macrogroup	Southern Rocky Mountain Lower Montane Forest [M022]
Group	–
Alliance	–
Association	*Quercus gambelii* / *Robinia neomexicana* / *Symphoricarpos oreophilus* Woodland (P)

DISTRIBUTION

Saguaro National Park, Rincon Mountain District

This community is scattered along the north slopes of Mica Mountain, from 1.5 kilometers (0.9 miles) west of Helen's Dome to Italian Springs.

ENVIRONMENTAL DESCRIPTION

Saguaro National Park, Rincon Mountain District

This woodland community is typically found on moderately steep (30%), north-facing upper backslopes from 2,100 to 2,500 meters (6,890–8,200 ft). Typically, areas of this type are extremely sheltered, often occurring below large bands of exposed bedrock. The surface cover is characterized by a mix of well-drained, skeletal loam underlying a dominant layer of dense litter and duff with patchy boulders and bedrock outcrops. The parent material is a mix of quartz monzonite and mica schist. While not all examples exhibited obvious signs of fire disturbance, all examples fall within the boundaries of the 2003 Helen's 2 fire.

VEGETATION DESCRIPTION

Saguaro National Park, Rincon Mountain District

This wooded community is characterized by a 20% to 30% canopy (>5 m) dominated solely by Gambel oak (*Quercus gambelii*), a variable (15–40%) low canopy (2–5 m) dominated by New Mexico locust (*Robinia neomexicana*), and a variable (15–50%) subcanopy (0.5–2 m) dominated by mountain snowberry (*Symphoricarpos oreophilus*) and a mix of associate shrubs. This community is present in two distinct forms, a dense, unburned woodland of tall (10+ m) and broad-canopied Gambel oak (*Quercus gambelii*), and a burned, open woodland with a mix of shrubby (<4 m), narrow-canopied individuals with scattered mature (10+ m) trees. As such, the Gambel oak (*Quercus gambelii*) overstory can range from a sparse 5% to a dense 20% to 30% depending on fire history. Mature ponderosa pine (*Pinus ponderosa*), Arizona pine (*Pinus arizonica*), and Douglas fir (*Pseudotsuga menziesii*) were documented and primarily associated with adjacent, large conifer forests; they were usually found along the transitional margins. Quaking aspen (*Populus tremuloides*) may provide small inclusions of local dominance. Arizona walnut (*Juglans major*) is the only other documented canopy tree that, when present, provides cover around 1%.

The low-canopy stratum is characterized by the consistent and sole dominance (1.0) of New Mexico locust (*R. neomexicana*). Overall, this species provides average cover of 20%, with values ranging from 10% to 30%. This species is typically present as small (3–4 [5] m) trees, but can occasionally become short (<2 m) and shrubby. Blue elderberry (*Sambucus cerulea*) was documented in one example of this community.

The subcanopy stratum is characterized by a variable mix of shrubs and ferns most commonly dominated by mountain snowberry (*Symphoricarpos oreophilus*). While consistently (0.86) dominant, this species provides

highly variable cover ranging from a scant <5% to a dense 40%. When dominant, average cover is typically around 25%. Rock spirea (*Holodiscus dumosa*) and New Mexico raspberry (*Rubus neomexicanus*) are consistent (0.82 and 0.71), low-cover (<5%) associates that rarely compete for dominance with mountain snowberry (*Symphoricarpos oreophilus*). While typically absent to extremely sparse (<1%), Western brackenfern (*Pteridium aquilinum*) provided dominance in one example of this community with cover up to 40%.

The field stratum (<0.5 m) is quite sparse, usually consisting of smaller versions of the subcanopy species. Noteworthy species documented in the field include fragrant snakeroot (*Ageratina herbacea*), stinking brickellbush (*Brickellia rusbyi*), fringed brome (*Bromus ciliatus*), Porter's melic grass (*Melica porteri*), pineland figwort (*Scrophularia parviflora*), New Mexico fleabane (*Erigeron neomexicanus*), and pineywoods geranium (*Geranium caespitosum*).

GLOBAL TYPE CONCEPT DESCRIPTION

Data not available

The tables in the section below show the most abundant and associate species for this association.

MOST ABUNDANT SPECIES

Table 213. Most abundant species for this association in Saguaro National Park.

Stratum	Species*
Canopy (>5 m)	*Quercus gambelii* (1.0)
Canopy (2–5 m)	*Robinia neomexicana* (1.0)
Subcanopy (0.5–2 m)	*Symphoricarpos oreophilus* (0.86)
Field (0–0.5 m)	None

*Values in () indicate the frequency a species occurs in the classification plots used to describe the association.

OTHER NOTEWORTHY ASSOCIATE SPECIES

Table 214. Noteworthy associates for this association in Saguaro National Park.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Sambucus cerulea*
Subcanopy (0.5–2 m)	*Holodiscus dumosus, Rubus neomexicanus, Brickellia rusbyi, Pteridium aquilinum*
Field (0–0.5 m)	*Scrophularia parviflora, Ageratina herbacea, Brickellia rusbyi, Bromus ciliatus, Melica porteri, Erigeron neomexicanus, Geranium caespitosum*

CLASSIFICATION COMMENTS

Saguaro National Park, Rincon Mountain District

This association has been described based solely on data collected during this inventory project and other recent studies, and it is based on data from eight classification plots sampled during the 2013–2017 mapping and classification effort.

Polygons attributed as NPSSODN106 overlapped with two groups classified by Roseberry and Dole (1939), a pine-Douglas fir group defined as "areas that contain 20% of both commercial pines and Douglas fir," and a pine group defined as "areas that contain 20% or more commercial pines, to the exclusion of Douglas fir and white fir."

Global

This provisional association has similar species composition to the USNVC-accepted association, CEGL001117, but it is a forest/dense woodland and not an open shrubland.

Classification confidence: Data not available

NatureServe conservation status: Data not available

Global status: Data not available

Rounded global status: Data not available

Global range: Data not available

Reasons: Data not available

ELEMENT SOURCES

Saguaro National Park, Rincon Mountain District

Inventory notes: Data not available

Plots: IPS792, IPS798, IPS856, IPS859, IPS874, IPS875, IP570U, IP578U

Local description authors: J. Galvin

Citations

Roseberry, R. D., and N. E. Dole. 1939. The vegetation type survey of Saguaro National Park. National Park Service Branch of Forestry, San Francisco, California.

Schulz, K. A. 2009. *Quercus gambelii* / *Symphoricarpos oreophilus* Shrubland Association, version date 24Feb2009. U.S. National Vegetation Classification Database, V2.03 (2019). Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. http://usnvc.org, accessed October 28, 2019.

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